ARDTECH
ADVANCED RADIO DEVICE

RFIC & MMIC Selection and data sheet

2019.10

Advanced Wireless Solution For Next Generation

Products Summary

- RF Gain-block MMIC

Part No.	Frequency [MHz]	Gain [dB]	P1dB [dBm]	OIP3 [dBm]	NF [dB]	Vcc [V]	Id [mA]	PKG Type
RG201	850	23.5	20.5	33.4	2.9	5	65	SOT89
	1850	21.6	19.1	32.4	3.0			
	2140	20.9	18.6	31.2	3.0			
	2450	20.2	17.7	30.2	3.0			
	2600	19.6	19.0	30.0	3.0			
RG206	850	21.0	18.1	34.2	5.5	5	61	SOT89
	1850	20.0	19.0	34.3	5.6			
	2140	19.9	18.5	32.2	5.6			
	2450	19.7	17.7	31.6	5.6			
	2600	18.9	19.0	31.0	5.6			
RG301	850	17.6	17.3	31.1	3.2	5	44	SOT89
	1850	17.0	15.5	28.7	3.3			
	2140	16.8	14.3	27.5	3.3			
	2450	16.5	13.3	25.7	3.3			
	2600	16.5	15.5	25.5	3.3			

- 3.3V Gain-block MMIC

Part No.	Frequency [MHz]	Gain [dB]	P1dB [dBm]	OIP3 [dBm]	NF [dB]	Vcc [V]	Id [mA]	PKG Type
RG511	70	25.8	19.0	31.0	1.63	3.3	51	SOT363-6L
	900	19.0	20.0	33.5	1.60			
	1900	13.6	19.7	33.1	1.60			
	2650	11.3	19.7	31.7	1.70			
RG512	700	19.2	15.0	24.0	1.65	3.3	27	
	900	18.9	17.0	25.7	1.62			
	1900	14.2	20.0	30.0	1.62			
	2650	11.7	21.6	31.4	1.65			

- Driver Amplifier

Part No.	Frequency [MHz]	Gain [dB]	P1dB [dBm]	OIP3 [dBm]	NF [dB]	Vcc [V]	Id [mA]	PKG Type
RA031	850	20.7	24.1	44.1	4.4	5	82	SOT89
	1850	16.6	24.0	40.0	4.4			
	2140	15.2	23.9	39.0	4.5			
	2350	14.4	24.3	39.1	4.4			
	2600	13.4	25.0	37.0	4.4			

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Products Summary

- IF Gain-block MMIC

Part No.	Frequency [MHz]	Gain [dB]	P1dB [dBm]	OIP3 [dBm]	NF [dB]	Vcc [V]	Id [mA]	PKG Type
RG614	70	27.1	21.0	38.2	3.2	5	90	SOT89
	140	26.9	21.0	37.9	3.2			
	240	26.6	21.0	37.7	3.5			
	500	26.2	21.0	37.3	3.5			
RG625	70	18.8	24.0	44.0	4.6	5	84	SOT89
	140	18.6	24.3	42.0	4.8			
	240	18.6	24.7	43.0	4.9			
	500	18.1	24.2	38.5	4.6			

- Low Noise Amplifier MMIC

Part No.	Frequency [MHz]	Gain [dB]	P1dB [dBm]	OIP3 [dBm]	NF [dB]	Vcc [V]	Id [mA]	PKG Type
RL101	850	19.8/19.5	23.0/21.5	37.0/34.0	0.85/0.85	5/3.3	79/55	SOT89
	1850	14.5/14.3	22.5/19.0	39.0/33.0	0.82/0.82			
	2140	13.5/13.2	22.5/19.0	39.2/33.2	0.91/0.90			
	2600	11.8/11.5	22.5/18.0	39.5/31.3	0.96/0.94			
RL102	850	20.4/19.8	21.0/16.0	31.0/28.5	1.15/1.10	5/3.3	46/28	SOT89
	1850	15.5/15.2	23.5/19.0	35.0/28.4	0.95/0.93			
	2140	14.5/14.1	24.0/19.5	35.0/28.1	1.13/1.10			
	2600	12.7/12.5	24.6/20.0	36.0/29.3	1.14/1.12			
RL531	900	19.0	20.0	33.0	0.85	3.3	50	SOT363
	1900	13.5	19.8	32.9	0.87			
	2140	12.9	19.5	33.0	0.91			
	2650	11.2	19.3	31.3	0.98			
RL532	900	18.9	17.0	25.7	0.92	3.3	27	SOT363
	1900	14.2	20.0	30.0	0.92			
	2140	13.5	20.6	30.3	0.93			
	2650	11.7	21.6	31.4	0.95			

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Products Summary

- 2-way RF Power Divider

Part No.	Frequency [MHz]	Insertion Loss [dB]	Isolation [dB]	Return loss [dB]		Amplitude Balance [dB]	Phase Balance [deg]	PKG Type
				IN	Out			
RD103	700	3.64	17.0	22.3	21.9	0.03	0.2	SOT26
	800	3.62	24.6	38.7	23.3	0.02	0.2	
	900	3.65	23.2	22.2	24.5	0.03	0.2	
	1000	3.72	16.5	15.8	25.8	0.03	0.1	
RD104	1700	3.59	15.0	17.7	22.1	0.03	0.2	SOT26
	2000	3.59	26.6	17.1	29.7	0.02	0.1	
	2300	3.64	28.0	14.8	34.9	0.01	0.1	
	2500	3.86	16.2	10.9	20.4	0.06	0.1	

- RF Mixer MMIC

LO power = 0dBm, IF = 70MHz, T_L=25°C, Z_S=Z_L=50

Part No.	LO & RF Frequency [GHz]	IF Frequency [MHz]	ConversionLoss [dB]	IIP3 [dBm]	LO – RF Isolation [dB]	Input P1dB [dBm]	Vcc/Id [V][mA]	PKG Type
RM101	0.8 – 1.1	DC – 350	9.2	32.1	-14.0	24.0	3.3/22	MSOP8
	0.7 – 1.5		9.1	32.3	-12.8	22.0		
	0.8 – 1.1	DC – 350	8.8	30.0	-14.6	24.2	5/34	
	0.7 – 1.5		9.2	31.0	-15.6	23.6		
RM102	1.7 – 1.9	50 – 300	9	28.5	-7.8	20.5	3.3/23	MSOP8
	1.9 – 2.1		9	30.5	-6.8	20.0		
	2.1 – 2.4		9	30.0	-7.0	18.0		
	1.7 – 1.9	50 – 300	8.5	27.6	-8.0	22.0	5/35	
	1.9 – 2.1		8.8	29.5	-8.0	20.0		
	2.1 – 2.4		9.2	29.5	-8.6	18.0		
RM210	0.85/0.71	140	6.7	24.0	10.0	19.0	3.3/5	SC70-6L
	1.80/1.66		5.4	26.5	6.6	17.5		
	2.10/1.96		4.7	29.5	4.8	18.0		
	2.60/2.46		5.2	25.0	5.2	17.5		
RM210D	0.85/0.71	140	7.6	27.7	11.2	18.1	3.3/9	DFN2X2-6L
	1.80/1.66		6.4	30.7	5.8	19.3		
	2.10/1.96		6.2	30.4	5.8	18.0		
	2.60/2.46		6.8	30.5	5.0	18.2		

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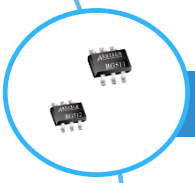
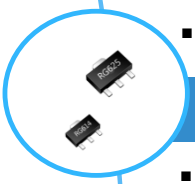
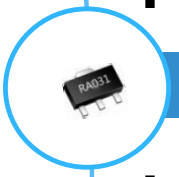
Gain Block MMIC



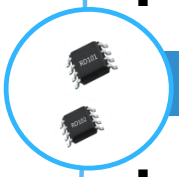
3.3V Gain Block MMIC



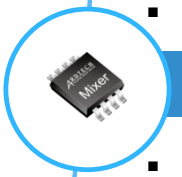
IF Amplifier MMIC



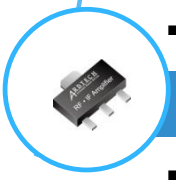
Driver Amplifier MMIC



RF Power Divider



RF Mixer MMIC



Low Noise Amplifier MMIC

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RG201
50-6000MHz
InGap HBT Gain Block MMIC Amplifier

Product Description

RG201 is a high performance InGap HBT MMIC gain block amplifier utilizing a Darlington pair configuration with an active bias circuit and it can be used as a cascadable 50 ohm RF gain block applications that require high gain and excellent stable amplification. It's housed in a lead-free/ green/RoHS-compliant SOT-89 industry-standard SMT package and internally matched to minimize number of external bias component

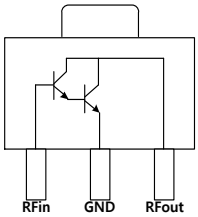
Features

- High gain 23.5dB at 850MHz
- P1dB=20.5dBm at 850MHz
- Unconditionally stable
- Single fixed 5V supply
- Industry standard SOT-89 package
- Lead-free, RoHS compliant, Green

Applications

- PA driver amplifier
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, LTE
- Wireless data system, Satellite terminals

Component Diagram



Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	22.0	23.5		850MHz	dB
	20.1	21.6		1850MHz	dB
	19.4	20.9		2140MHz	dB
Output power at 1-dB Compression	19.0	20.5		850MHz	dBm
	17.6	19.1		1850MHz	dBm
Third Order Intercept Point	31.4	33.4		850MHz	dBm
	30.4	32.4		1850MHz	dBm
Input Return Loss		-18.0		850MHz	dB
Output Return Loss		-18.4		850MHz	dB
Reverse Isolation		-26.2		850MHz	dB
Noise Figure		2.9		850MHz	dB
Device Voltage		5			V
Device current (Icq)	57	65	75		mA
Thermal Resistance		66		Junction to lead	°C/W

Test condition: Vcc=5V, I_D=65mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=7dBm T_L=25°C, Z_S=Z_L=50

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Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Voltage(V_D)	5.5	V
Max Device Current(I_D)	100	mA
Max RF Input Power	20	dBm
Max Operating Dissipated Power	0.55	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1C	
Moisture Sensitivity Level	MSL1	

Typical Electrical Specification

Parameter	850MHz	1850MHz	2140MHz	2450MHz	Unit
S21	23.5	21.6	20.9	20.2	dB
OIP3	33.4	32.4	31.2	30.2	dBm
P1dB	20.5	19.1	18.6	17.7	dBm
S11	-18.0	-22.6	-19.7	-17.4	dB
S22	-18.4	-12.6	-12.5	-12.7	dB
S12	-26.2	-25.5	-25.3	-25.1	dB
NF	2.9	3.0	3.0	3.0	dB

Test condition: Vcc=5V, I_D=65mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=7dBm T_L=25°C, Z_S=Z_L=50

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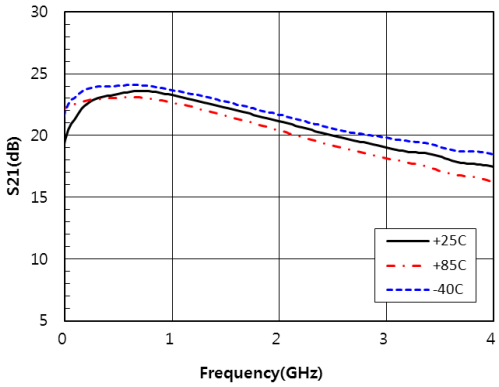
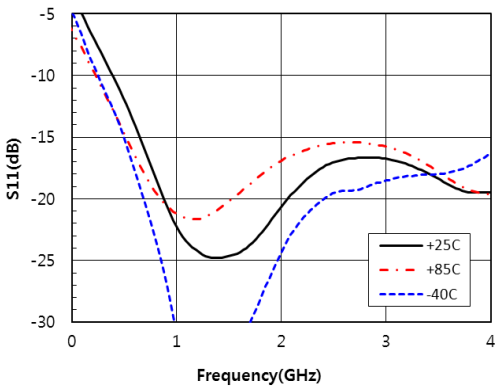
S-Parameter Over Temperature

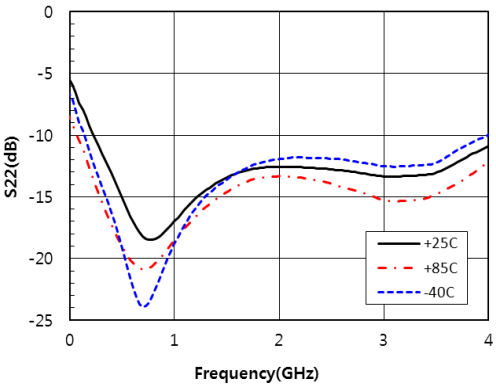
S21



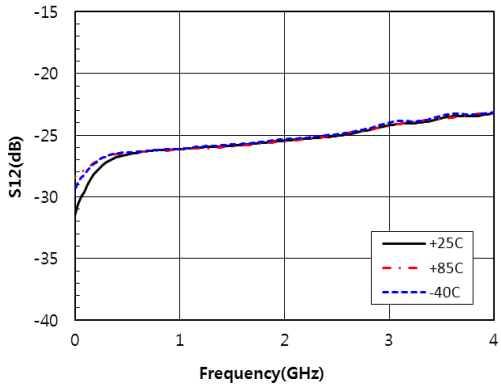
S11



S22

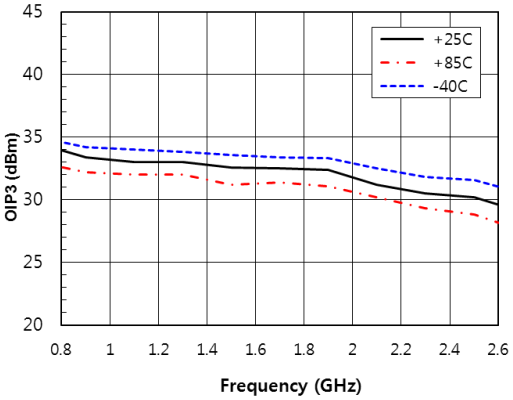


S12

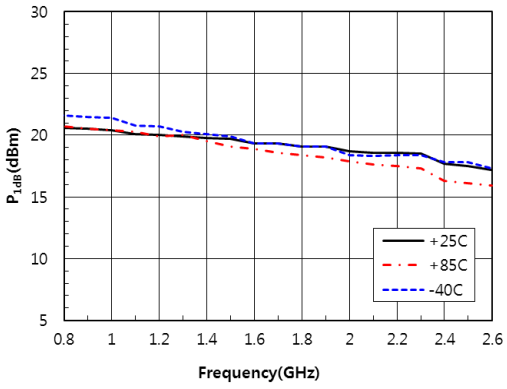


P1dB and OIP3 vs. Frequency

OIP3 vs. Frequency



P_{1dB} vs. Frequency



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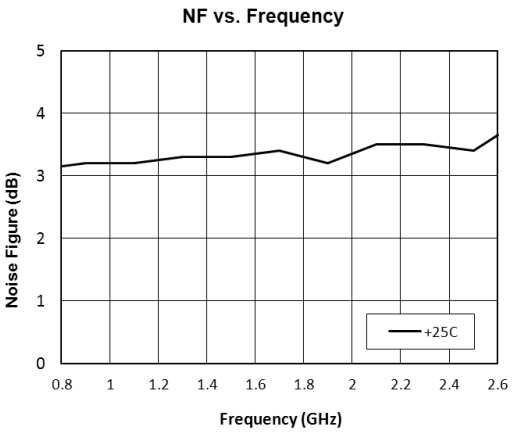
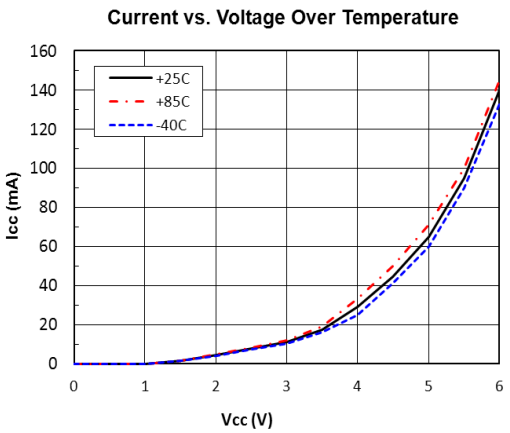
Icc vs. Vcc Over Temperature and Noise Figure





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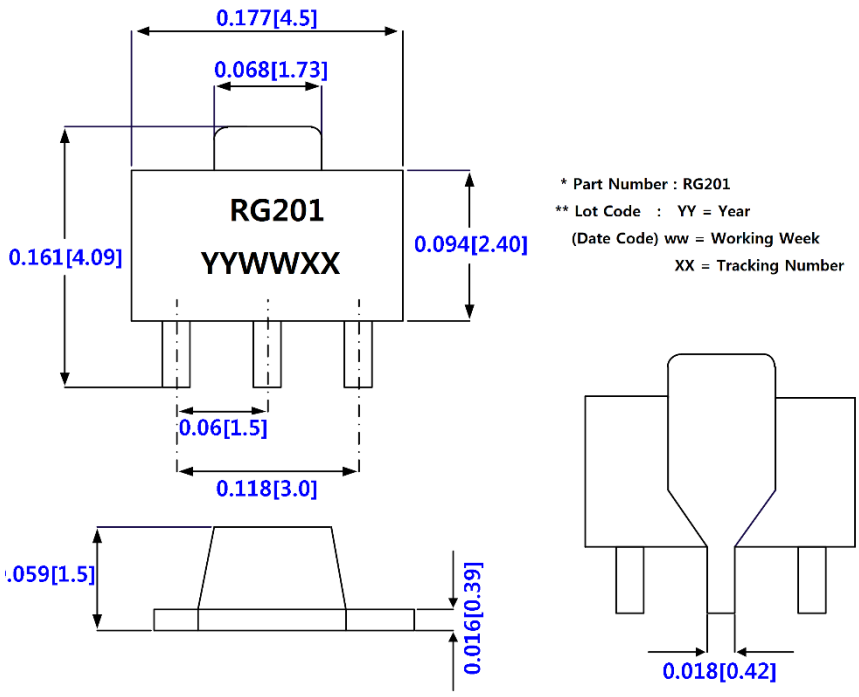
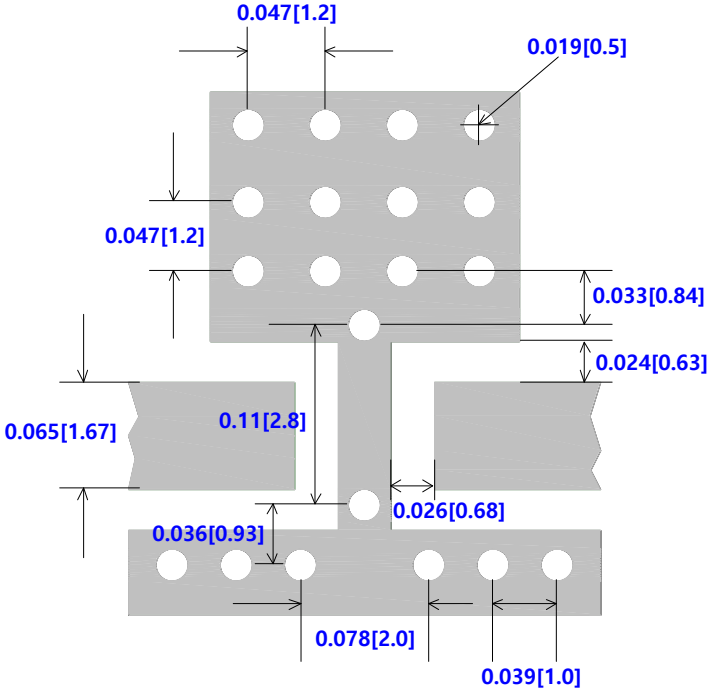
Package Mark and Dimensions

Dimension in inches[Millimeters]



Recommended PCB Pad Pattern

Dimension in inches[Millimeters]



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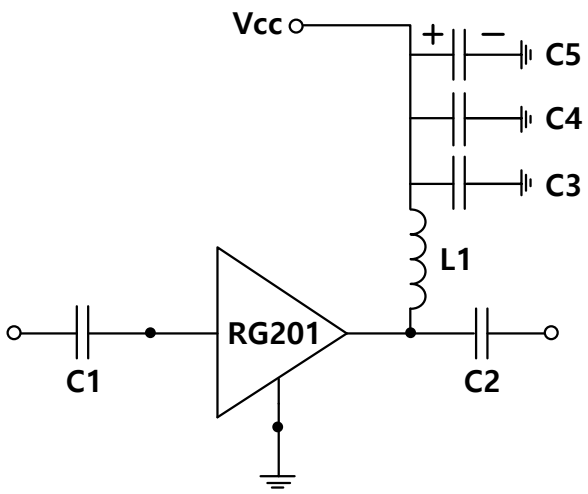
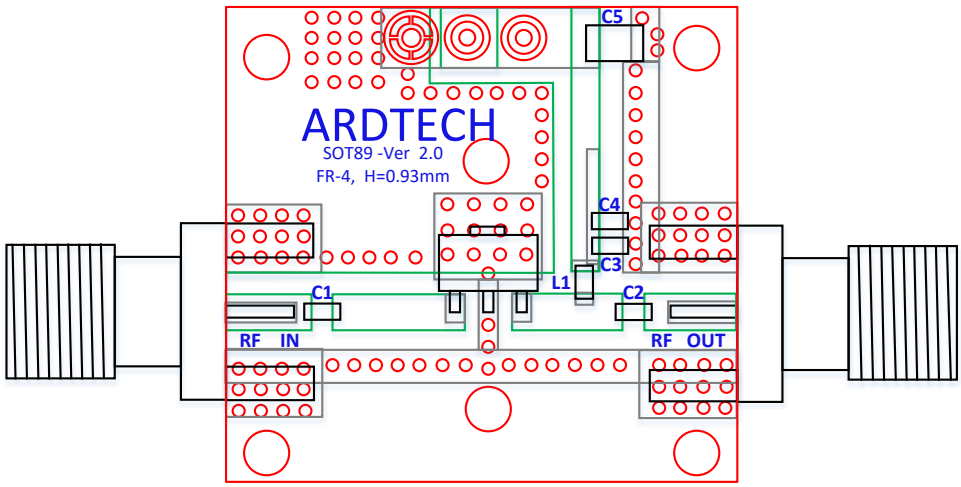
Application Schematic & BOM



Reference BOM	
C1	100pF Capacitor, 0603 type
C2	100pF Capacitor, 0603 type
C3	100pF Capacitor, 0603 type
C4	1000pF Capacitor, 0603 type
C5	10uF Capacitor, Tantalum
L1	39nH Chip inductor, 0805 type

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.036[0.93]
Copper Thickness	1 oz.

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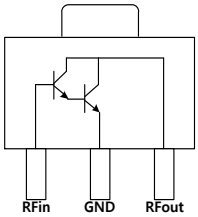
RG206
50-6000MHz
InGap HBT Gain Block MMIC Amplifier

Product Description

RG206 is a high performance InGap HBT MMIC gain block amplifier utilizing a Darlington pair configuration with an active bias circuit and it can be used as a cascadable 50 ohm RF gain block applications that require high gain and excellent stable amplification. It's housed in a lead-free/ green/RoHS-compliant SOT-89 industry-standard SMT package and internally matched to minimize number of external bias component

Component Diagram



Features

- High OIP3 = 34.2dBm at 850MHz
- P1dB=18.1dBm at 850MHz
- Unconditionally stable
- Single fixed 5V supply
- Industry standard SOT-89 package
- Lead-free, RoHS compliant, Green

Applications

- PA driver amplifier
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, LTE
- Wireless data system, Satellite terminals

Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	19.5	21.0		850MHz	dB
	18.5	20.0		1850MHz	dB
	18.2	19.7		2140MHz	dB
Output power at 1-dB Compression	16.6	18.1		850MHz	dBm
	17.5	19.0		1850MHz	dBm
Third Order Intercept Point	32.2	34.2		850MHz	dBm
	32.3	34.3		1850MHz	dBm
Input Return Loss		-18.0		850MHz	dB
Output Return Loss		-12.1		850MHz	dB
Reverse Isolation		-28.9		850MHz	dB
Noise Figure		5.5		850MHz	dB
Device Voltage		5			V
Device current (Icq)	53	61	71		mA
Thermal Resistance		66		Junction to lead	°C/W

Test condition: Vcc=5V, I_D=61mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=7dBm T_L=25°C, Z_S=Z_L=50

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Absolute Maximum Ratings

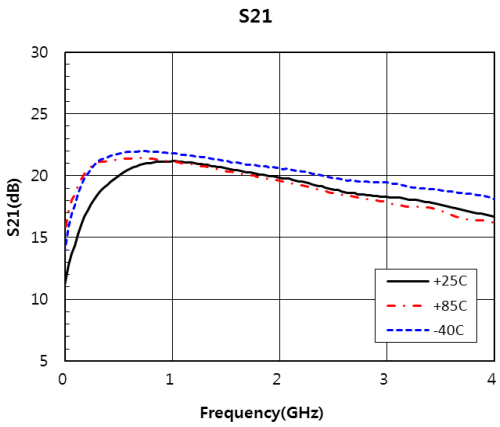
Parameter	Rating	Unit
Max Device Voltage(V_D)	5.5	V
Max Device Current(I_D)	100	mA
Max RF Input Power	24	dBm
Max Operating Dissipated Power	0.55	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1C	
Moisture Sensitivity Level	MSL1	

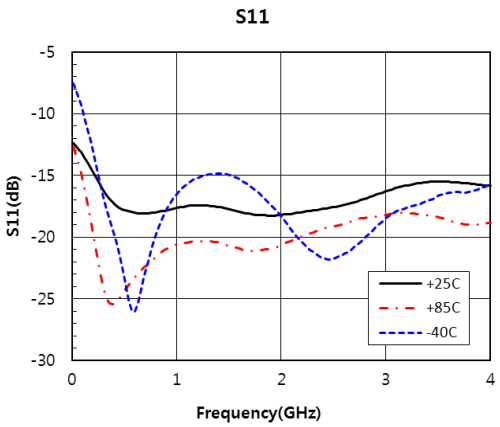
Typical Electrical Specification

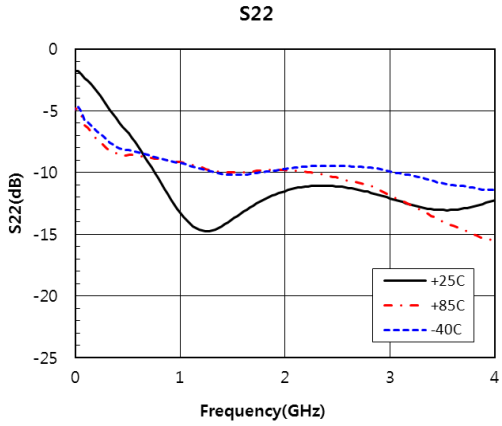
Parameter	850MHz	1850MHz	2140MHz	2450MHz	Unit
S21	21.0	20.0	19.9	19.7	dB
OIP3	34.2	34.3	32.2	31.6	dBm
P1dB	18.1	19.0	18.5	17.7	dBm
S11	-18.0	-18.2	-18.1	-17.6	dB
S22	-10.4	-12.1	-11.2	-11.0	dB
S12	-28.9	-28.2	-28.1	-27.7	dB
NF	5.5	5.6	5.6	5.6	dB

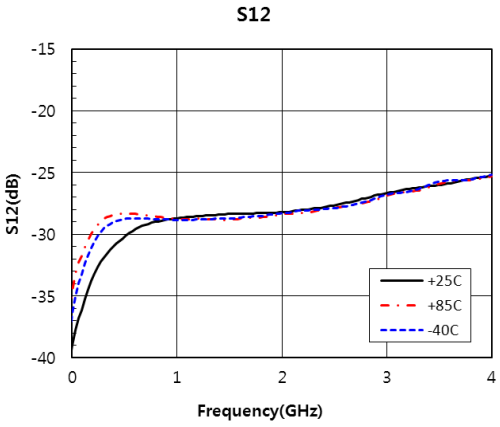
Test condition: Vcc=5V, I_D=61mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=7dBm T_L=25°C, Z_S=Z_L=50

S-Parameter Over Temperature

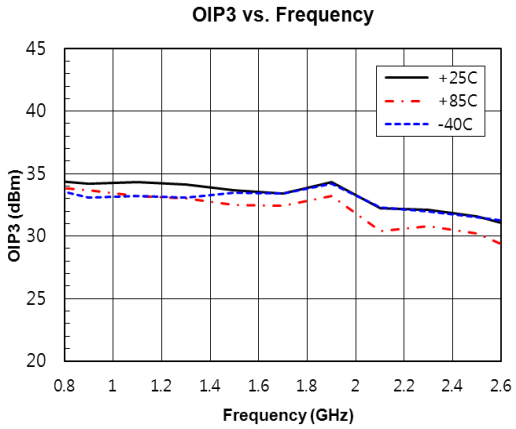


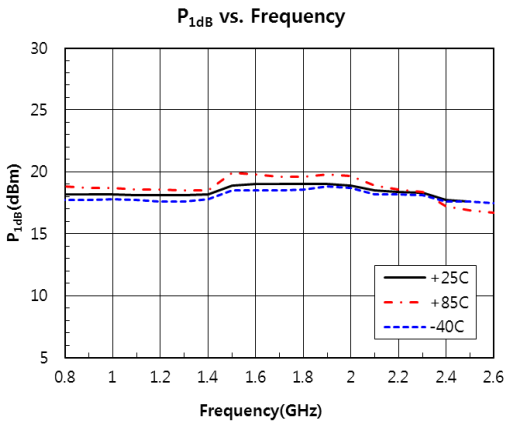






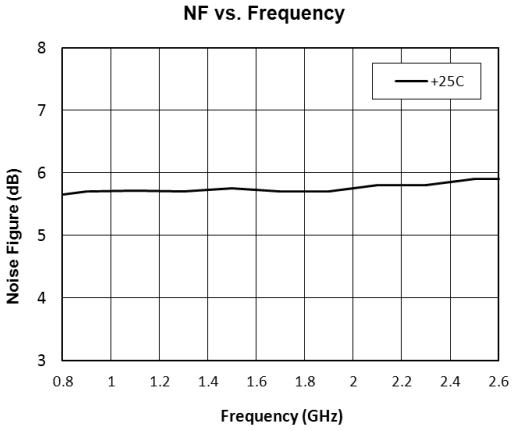
P1dB and OIP3 vs. Frequency

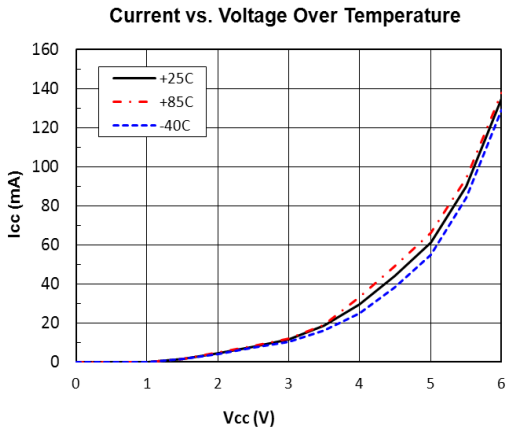




Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Icc vs. Vcc Over Temperature and Noise Figure

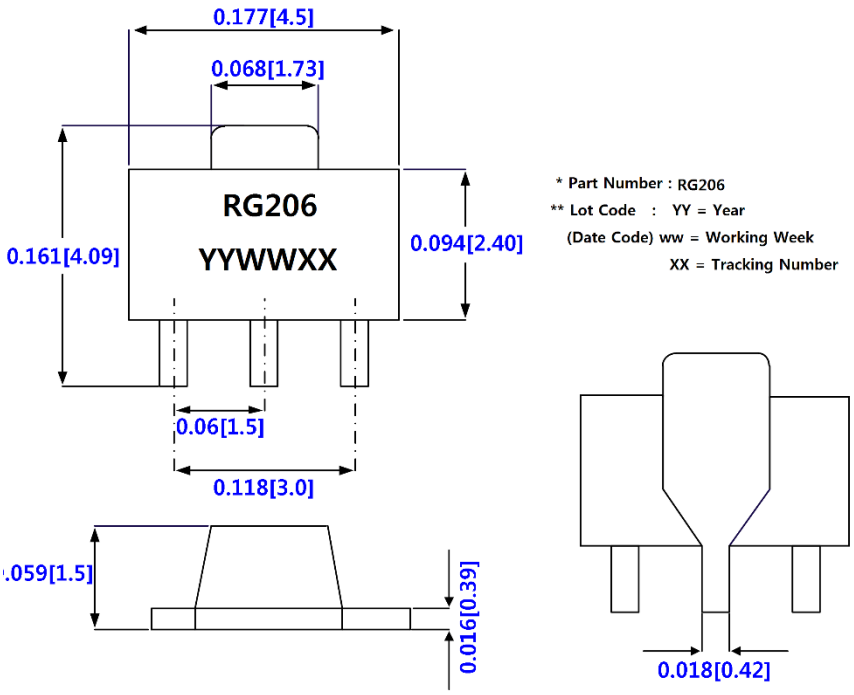




Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

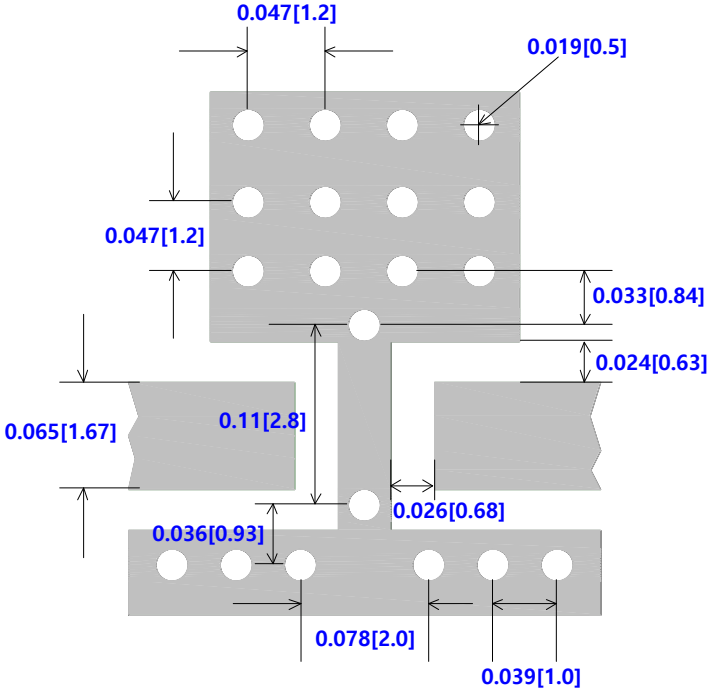
Package Mark and Dimensions

Dimension in inches[Millimeters]

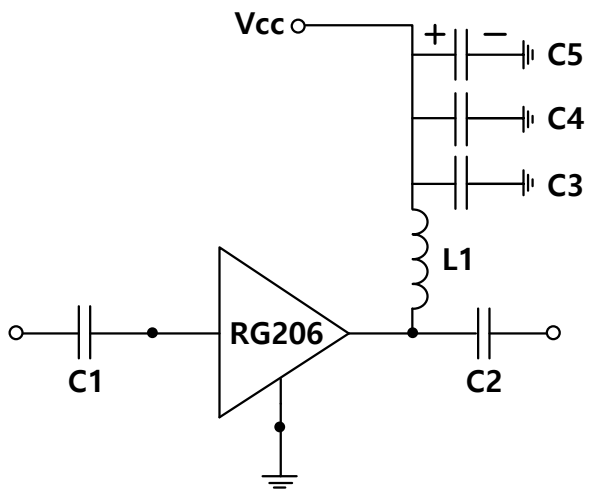


Recommended PCB Pad Pattern

Dimension in inches[Millimeters]

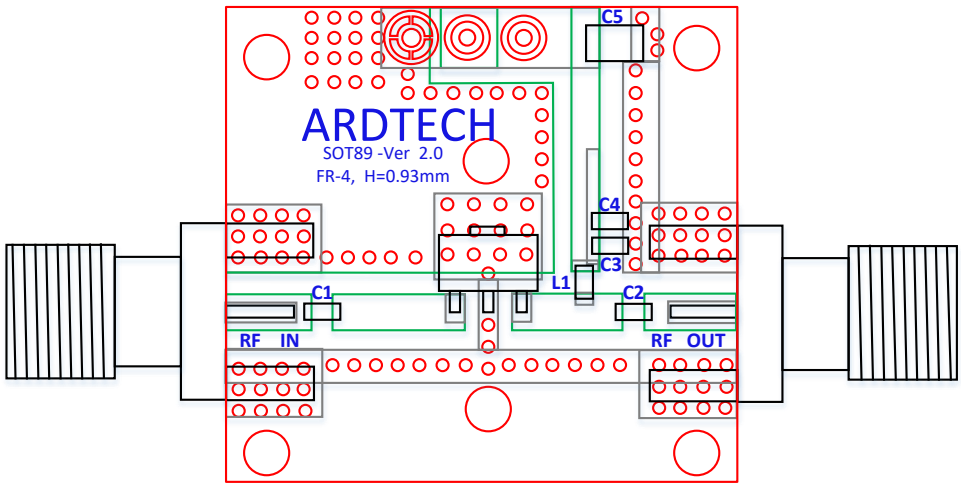


Application Schematic & BOM



Reference BOM	
C1	100pF Capacitor, 0603 type
C2	100pF Capacitor, 0603 type
C3	100pF Capacitor, 0603 type
C4	1000pF Capacitor, 0603 type
C5	10uF Capacitor, Tantalum
L1	12nH Chip inductor, 0805 type

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.036[0.93]
Copper Thickness	1 oz.

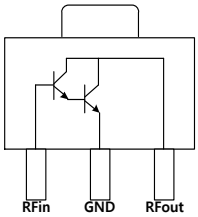
ARDTECH
ADVANCED RADIO DEVICE

RG301
50-6000MHz
InGap HBT Gain Block MMIC Amplifier

Product Description

RG301 is a high performance InGap HBT MMIC gain block amplifier utilizing a Darlington pair configuration with an active bias circuit and it can be used as a cascadable 50 ohm RF gain block applications that require high gain and excellent stable amplification. It's housed in a lead-free/ green/RoHS-compliant SOT-89 industry-standard SMT package and internally matched to minimize number of external bias component

Component Diagram



Features

- High OIP3 versus Low current value at 850MHz
- P1dB=17.9dBm at 850MHz
- Unconditionally stable
- Single fixed 5V supply
- Industry standard SOT-89 package
- Robust ESD, Class 1C
- Lead-free, RoHS compliant, Green

Applications

- PA driver amplifier
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, LTE
- Wireless data system, Satellite terminals

Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	16.3	17.8		850MHz	dB
	15.5	17.0		1850MHz	dB
	15.0	16.5		2140MHz	dB
Output power at 1-dB Compression	16.4	17.9		850MHz	dBm
	14.7	16.2		1850MHz	dBm
Third Order Intercept Point	29.1	31.1		850MHz	dBm
	26.7	28.7		1850MHz	dBm
Input Return Loss		-24.9		850MHz	dB
Output Return Loss		-23.6		850MHz	dB
Reverse Isolation		-20.7		850MHz	dB
Noise Figure		3.2		850MHz	dB
Device Voltage		5			V
Device current (Icq)	38	44	50		mA
Thermal Resistance		66		Junction to lead	°C/W

Test condition: Vcc=5V, I_D=44mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=7dBm T_L=25°C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Voltage(V_D)	5.5	V
Max Device Current(I_D)	75	mA
Max RF Input Power	18	dBm
Max Operating Dissipated Power	0.41	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1C	
Moisture Sensitivity Level	MSL1	

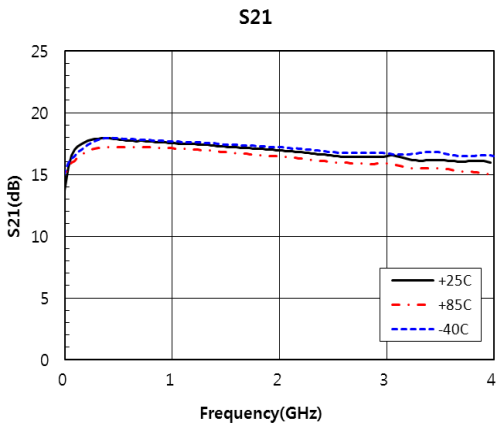
Typical Electrical Specification

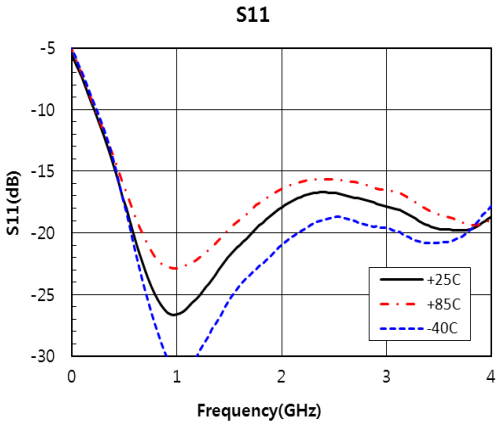
Parameter	850MHz	1850MHz	2140MHz	2450MHz	Unit
S21	17.6	17.0	16.8	16.5	dB
OIP3	31.1	28.7	27.5	25.7	dBm
P1dB	17.3	15.5	14.3	13.3	dBm
S11	-24.9	-19.0	-17.4	-16.7	dB
S22	-23.6	-13.9	-12.9	-12.4	dB
S12	-20.7	-20.7	-20.8	-20.9	dB
NF	3.2	3.3	3.3	3.3	dB

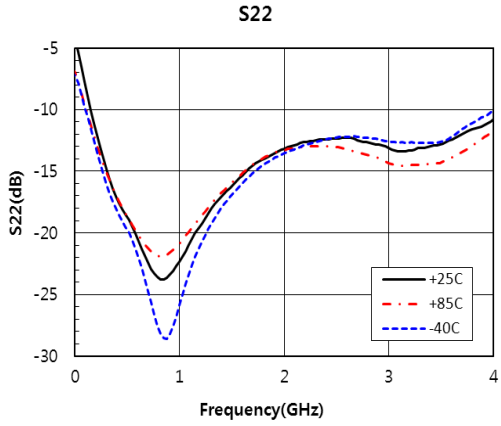
Test condition: Vcc=5V, I_D=44mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=7dBm T_L=25°C, Z_S=Z_L=50

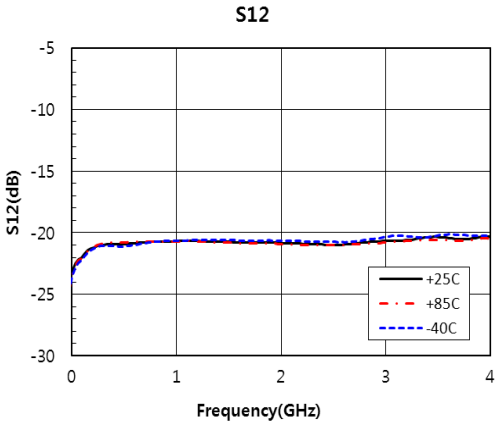
Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

S-Parameter Over Temperature

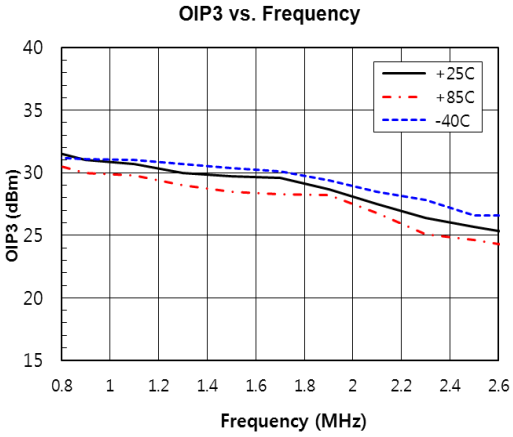


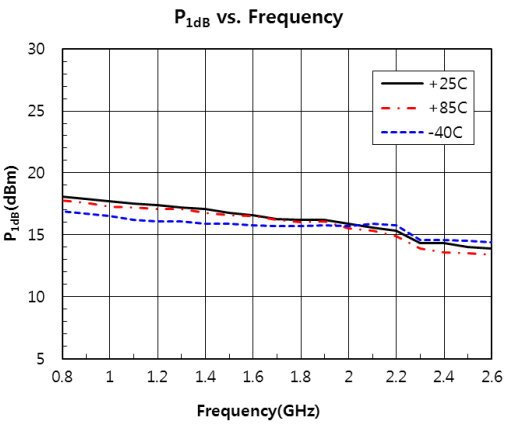




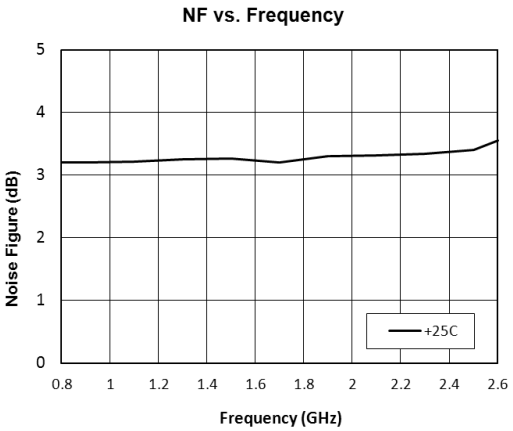


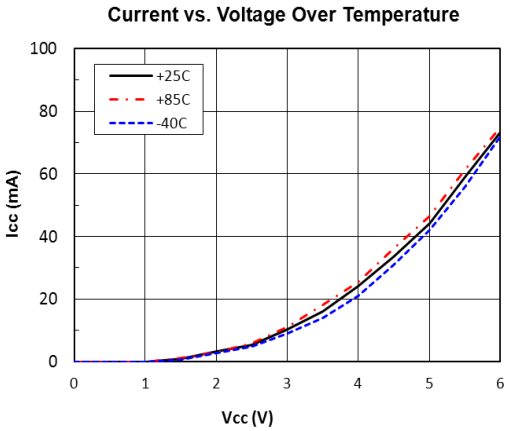
P1dB and OIP3 vs. Frequency





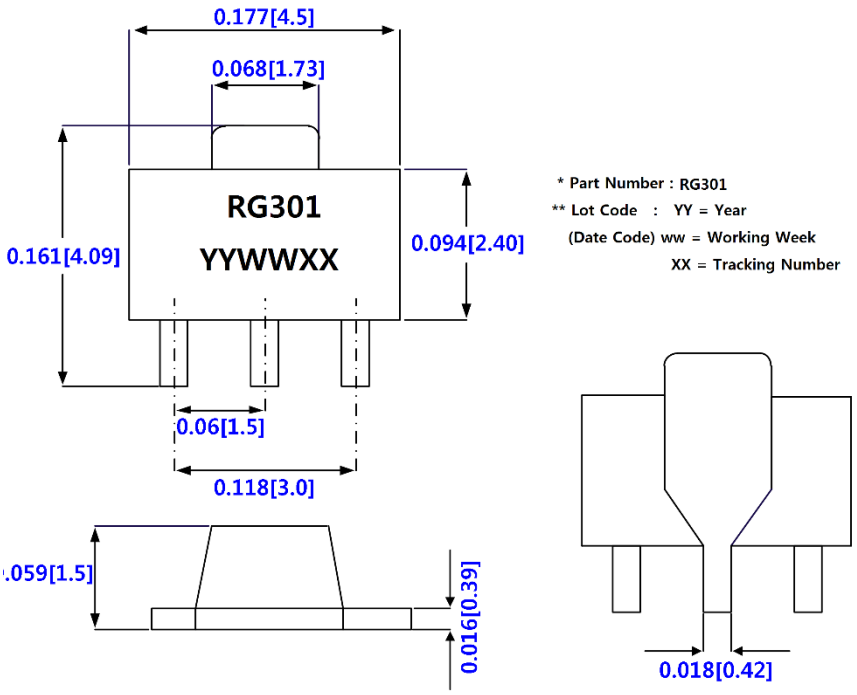
Icc vs. Vcc Over Temperature and Noise Figure





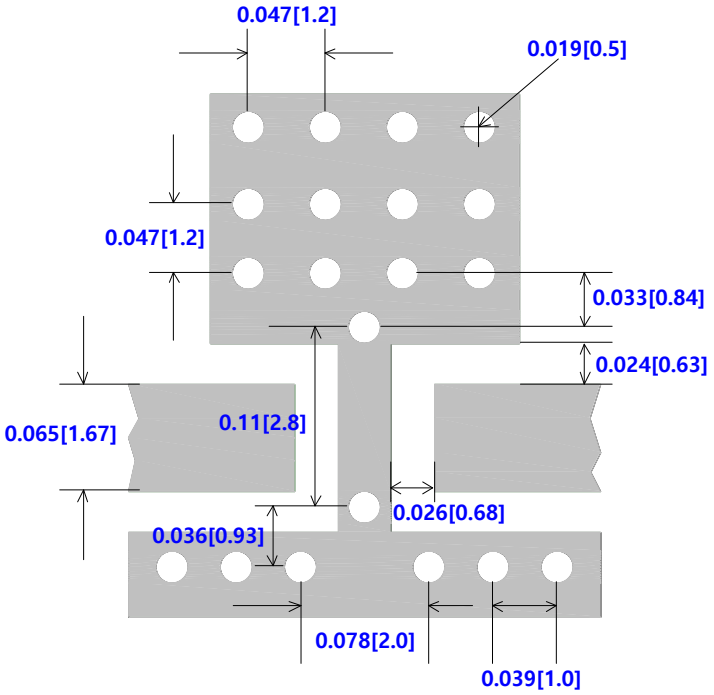
Package Mark and Dimensions

Dimension in inches[Millimeters]

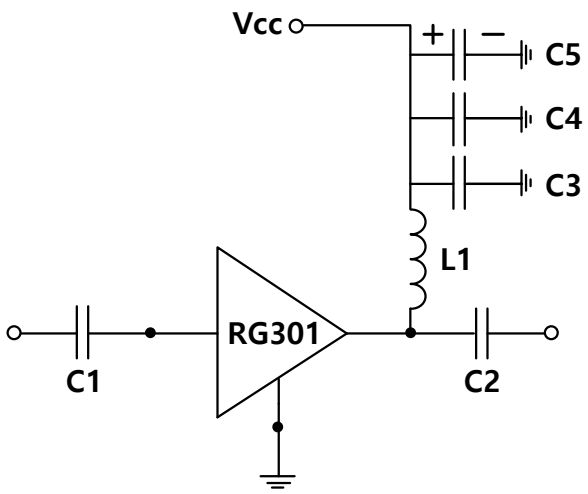


Recommended PCB Pad Pattern

Dimension in inches[Millimeters]

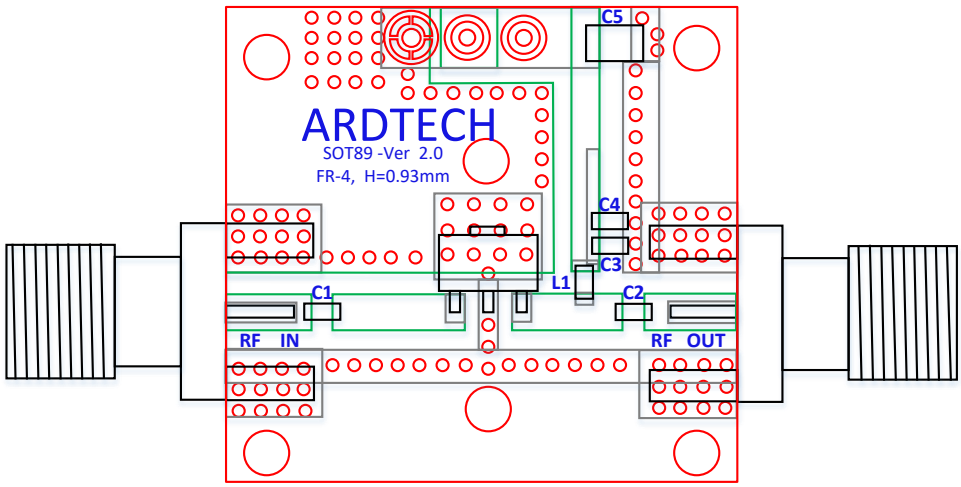


Application Schematic & BOM



Reference BOM	
C1	100pF Capacitor, 0603 type
C2	100pF Capacitor, 0603 type
C3	100pF Capacitor, 0603 type
C4	1000pF Capacitor, 0603 type
C5	10uF Capacitor, Tantalum
L1	39nH Chip inductor, 0805 type

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.036[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RG511

50-4000MHz
High Linearity 3V Gain Block Amplifier

Product Description

RG511 is a high linearity and low noise Gain Block Amplifier in a low-cost surface mount package and provides 33.5dBm high OIP3 and 1.6dB Noise Figure at 900MHz. It is fabricated on a compound semiconductor material and conventional device technology. RG511 is available in a lead-free / green / RoHS-compliant SOT363(SC70) package. The performance target is designed for use as a receiver and transmitter in wireless infrastructure system where high linearity and low noise is required. Internal active bias circuitry allows RG511 to maintain high linearity and gain performance over temperature and operate directly off a single +3.3V supply. All devices are 100% RF and DC tested.

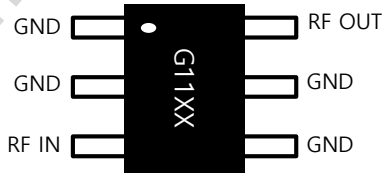
Features

- High OIP3 33.5dBm at 900MHz
- 19dB Gain at 900MHz
- P1dB=20dBm at 900MHz
- 1.6dB Noise Figure at 900MHz
- Unconditionally stable
- Single 3.3V supply, 50mA current
- No dropping resistor required
- Industry standard SOT363(SC70) package
- Lead-free, RoHS compliant, Green

Applications

- Broadband Gain Block
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, WiBro, LTE

Component Diagram



SOT-363(SC70)

Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	17.6	19.0		900MHz	dB
	12.3	13.6		1900MHz	dB
	11.5	12.8		2140MHz	dB
Output power at 1-dB Compression	18.5	20.0		900MHz	dBm
	18.2	19.7		1900MHz	dBm
Third Order Intercept Point	31.5	33.5		900MHz	dBm
	31.1	33.1		1900MHz	dBm
Input Return Loss		-19.8		900MHz	dB
Output Return Loss		-16.7		900MHz	dB
Reverse Isolation		-25.3		900MHz	dB
Noise Figure		1.6		900MHz	dB
Device Voltage		3.3			V
Device current (Icq)	35	49			mA
Thermal Resistance		41.6		Junction to lead	°C/W

Test condition: Vcc=3.3V, I_D=49mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Voltage(V_D)	5.0	V
Max Device Current(I_D)	100	mA
Max RF Input Power	10	dBm
Max Operating Dissipated Power	0.5	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1B	
Moisture Sensitivity Level	MSL1	

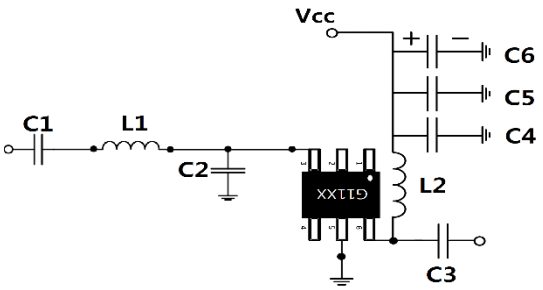
Typical Electrical Specification

Parameter	70MHz	150MHz	700MHz	900MHz	Unit
S21	25.8	25.1	20.2	19.0	dB
OIP3	31.0	31.2	32.7	33.5	dBm
P1dB	19.0	18.8	19.8	20.0	dBm
S11	-17.8	-20.1	-19.8	-19.8	dB
S22	-18.2	-27.8	-17.2	-16.3	dB
S12	-30.1	-29.9	-26.6	-25.3	dB
NF	1.63	16.2	1.61	1.60	dB

Parameter	1900MHz	2140MHz	2650MHz		Unit
S21	13.6	12.8	11.3		dB
OIP3	33.1	33.3	31.7		dBm
P1dB	19.7	19.8	19.7		dBm
S11	-16.7	-16.8	-28.7		dB
S22	-16.9	-22.1	-18.4		dB
S12	-20.0	-19.3	-17.6		dB
NF	1.60	1.65	1.70		dB

Test condition: Vcc=3.3V, I_D=49mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

60~80MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	8200pF	C4	100pF	L1	120nH
C2	10pF	C5	1000pF	L2	560nH
C3	8200pF	C6	10uF		

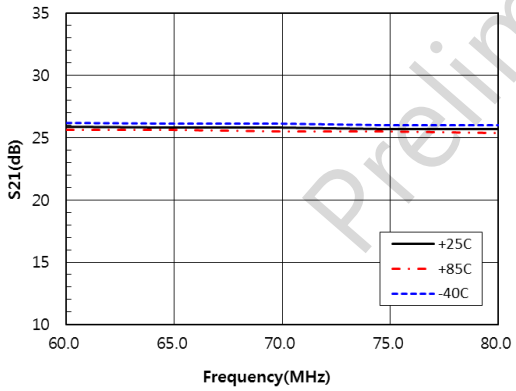
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	60	70	80	Unit
Small Signal Gain	25.9	25.8	25.7	dB
S11	-13.4	-17.8	-25.3	dB
S22	-17.4	-18.2	-17.9	dB
Output P1dB	18.9	19.0	19.2	dBm
Output OIP3*	30.6	31.0	31.7	dBm
Noise Figure	1.63	1.63	1.63	dB
Icq	51			mA
Vcc	3.3			V

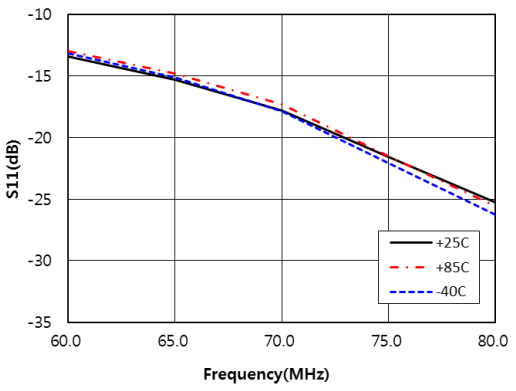
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 60~80MHz

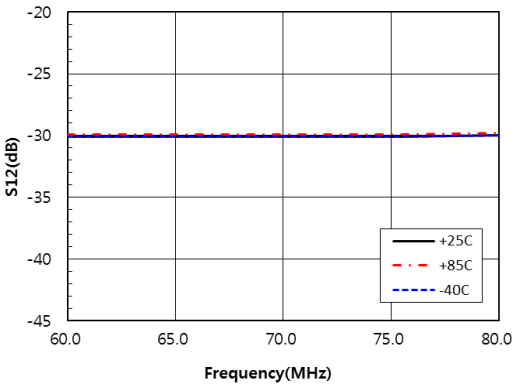
S21



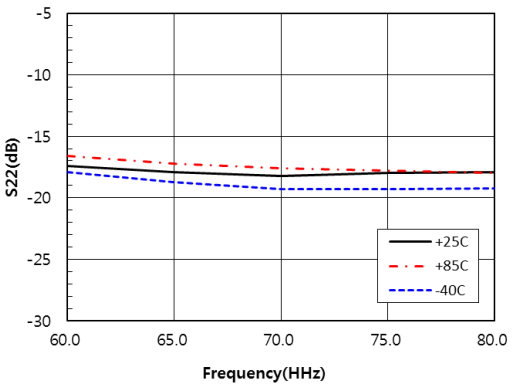
S11



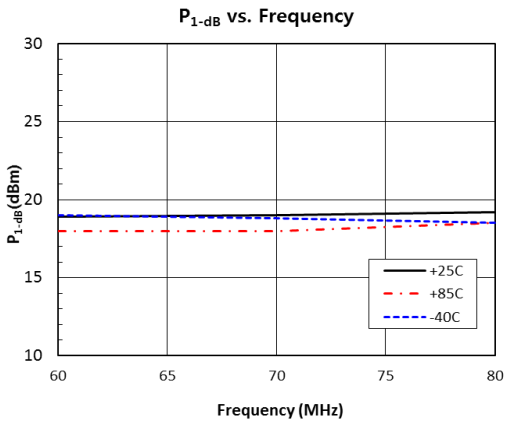
S12

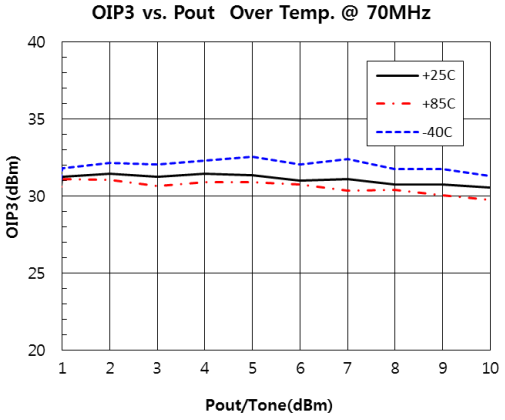


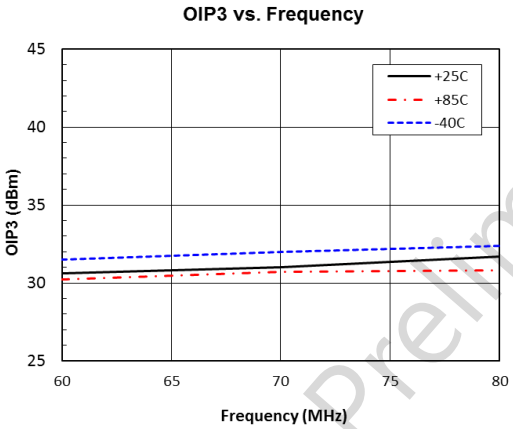
S22

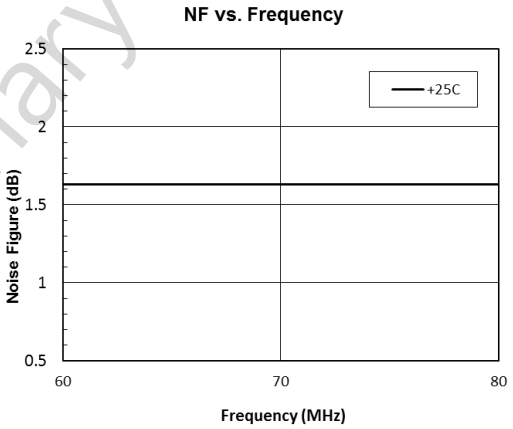


P1dB, OIP3 and Noise Figure Performance at 60~80MHz

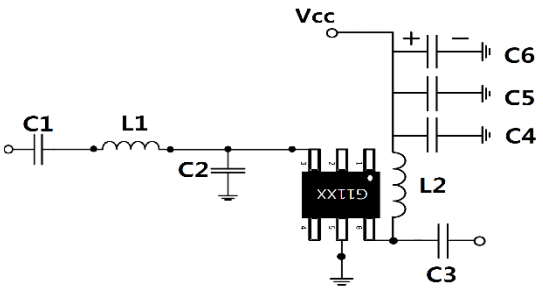








140~150MHz Reference Application Circuit



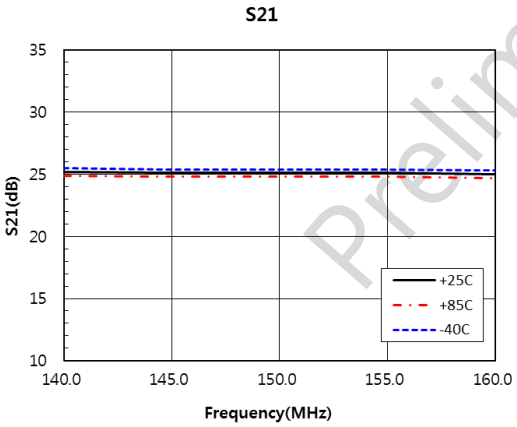
BOM	Value	BOM	Value	BOM	Value
C1	8200pF	C4	100pF	L1	47nH
C2	6pF	C5	1000pF	L2	560nH
C3	8200pF	C6	10uF		

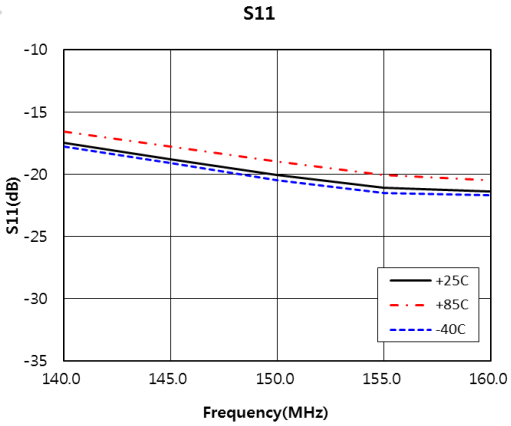
*Width and Length of Micro-strip line dimension in mm[mil]

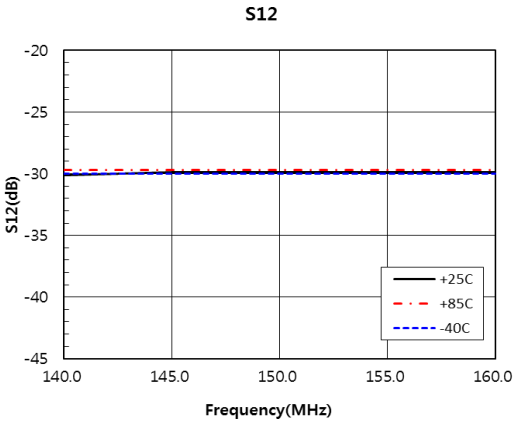
Parameter/Freq.(MHz)	140	150	160	Unit
Small Signal Gain	25.2	25.1	25	dB
S11	-17.5	-20.1	-21.4	dB
S22	-28.2	-27.8	-26.4	dB
Output P1dB	18.7	18.8	18.9	dBm
Output OIP3*	30.8	31.2	61.4	dBm
Noise Figure	1.62	1.62	1.62	dB
Icq	51			mA
Vcc	3.3			V

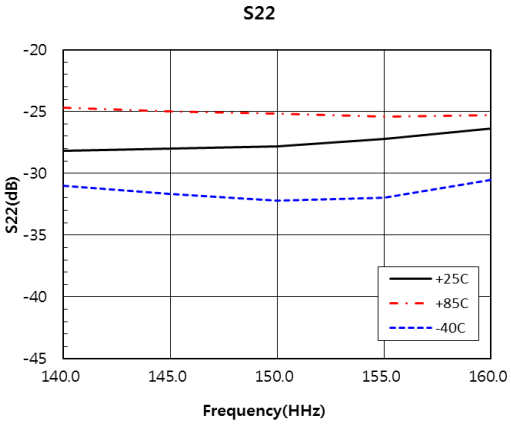
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 140~150MHz

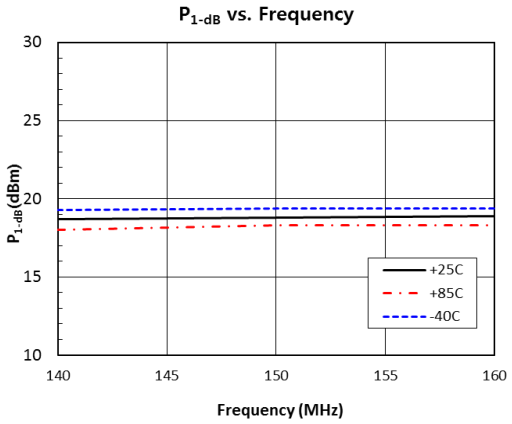


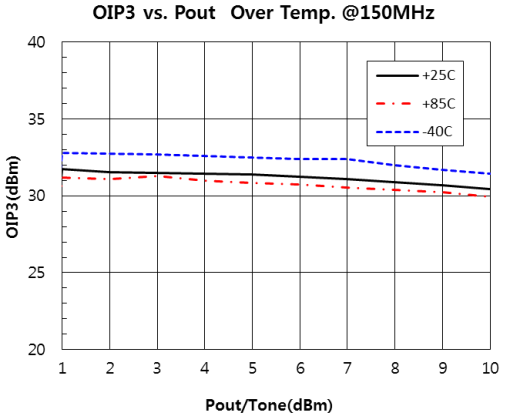


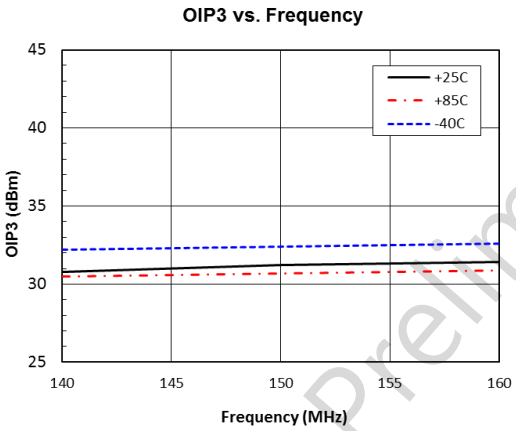


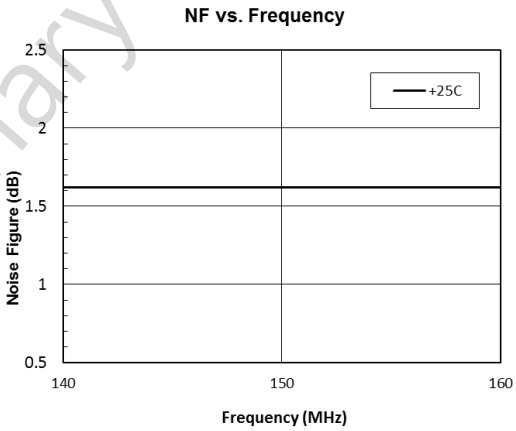


P1dB, OIP3 and Noise Figure Performance at 140~150MHz









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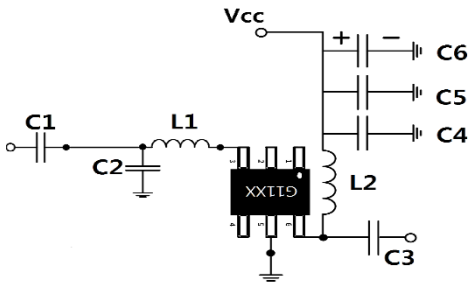
600~800MHz Reference Application Circuit



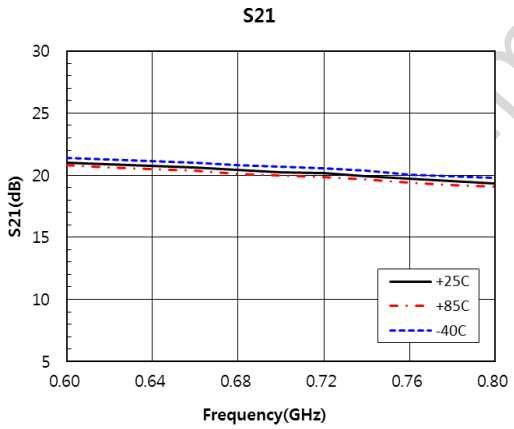
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	10nH
C2	1.8pF	C5	1000pF	L2	56nH
C3	100pF	C6	10uF		

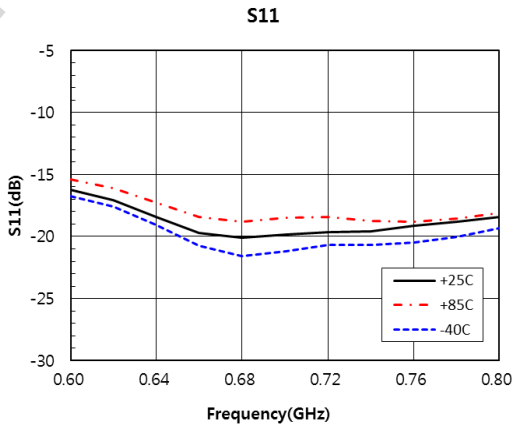
*Width and Length of Micro-strip line dimension in mm[mil]

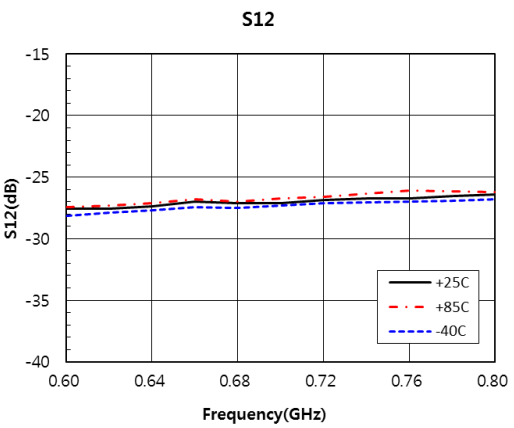
Parameter/Freq.(MHz)	600	700	800	Unit
Small Signal Gain	21.0	20.2	19.3	dB
S11	-16.2	-19.8	-18.4	dB
S22	-15.6	-17.2	-18.1	dB
Output P1dB	19.0	19.8	19.9	dBm
Output OIP3*	31.6	32.7	33.1	dBm
Noise Figure	1.61	1.61	1.61	dB
Icq	49			mA
Vcc	3.3			V

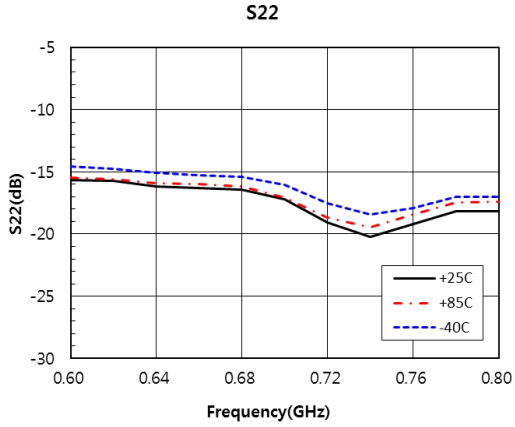
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 600~800MHz

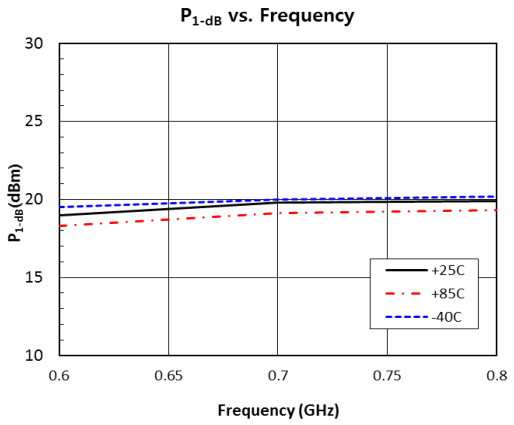


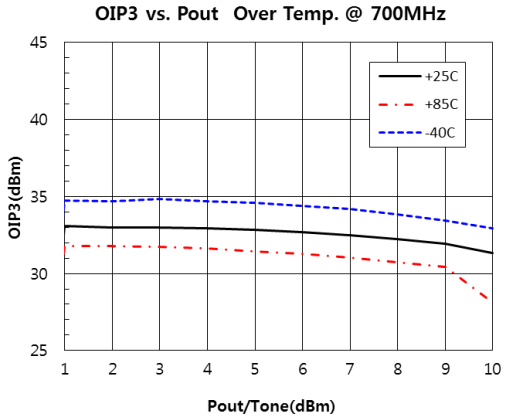


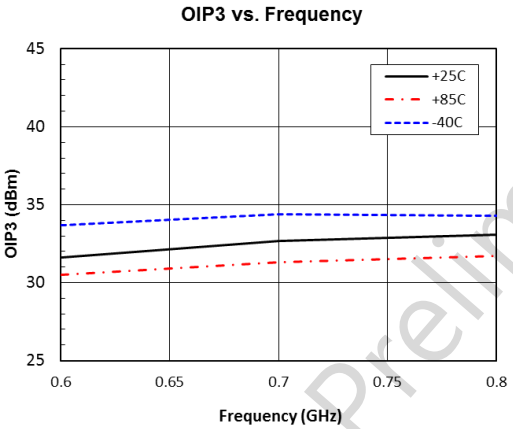


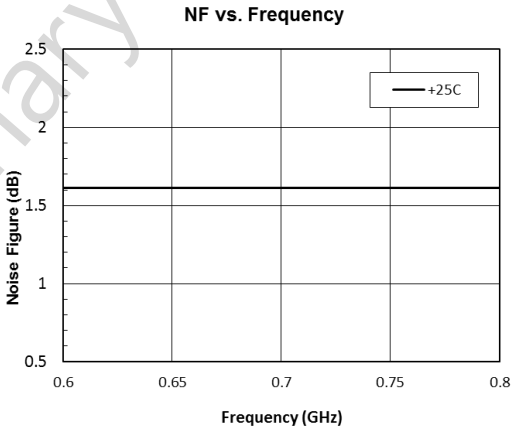


P1dB, OIP3 and Noise Figure Performance at 600~800MHz

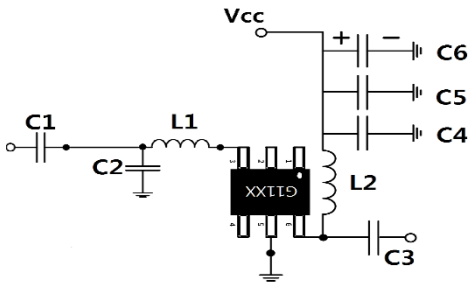








850~950MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	8.2nH
C2	1.8pF	C5	1000pF	L2	39nH
C3	100pF	C6	10uF		

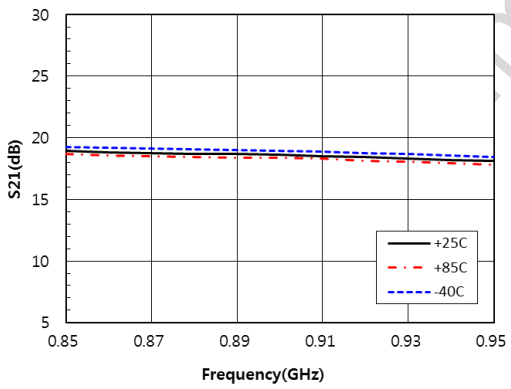
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	850	900	950	Unit
Small Signal Gain	19.3	19.0	18.1	dB
S11	-22.6	-19.8	-19.2	dB
S22	-15.0	-16.3	-16.6	dB
Output P1dB	19.5	20.0	19.9	dBm
Output OIP3*	32.5	33.5	32.8	dBm
Noise Figure	1.60	1.60	1.60	dB
Icq	49			mA
Vcc	3.3			V

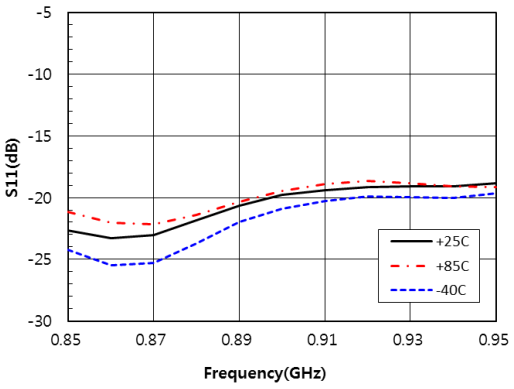
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 850~950MHz

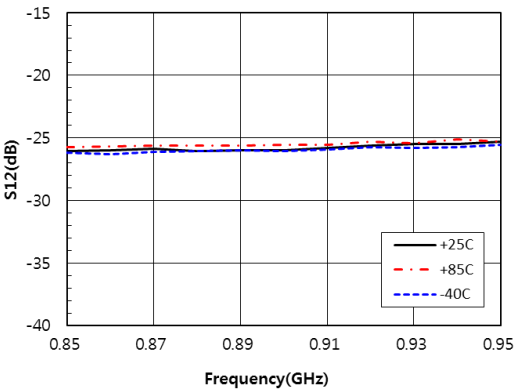
S21



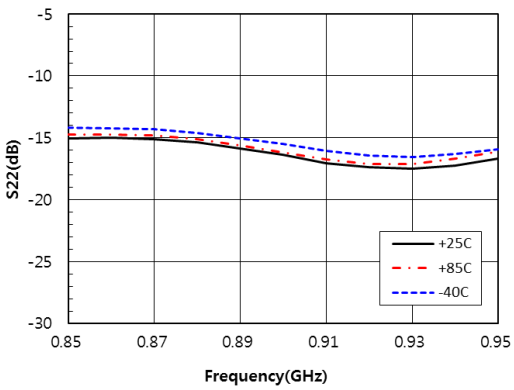
S11



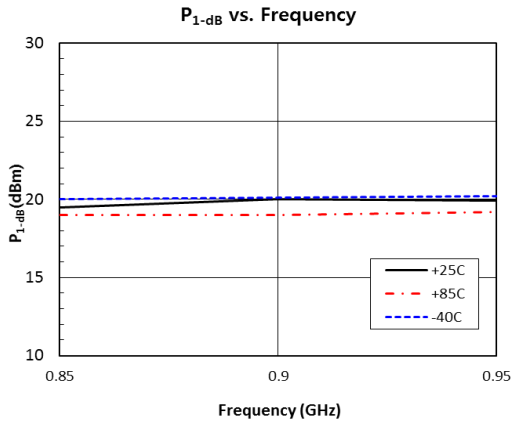
S12

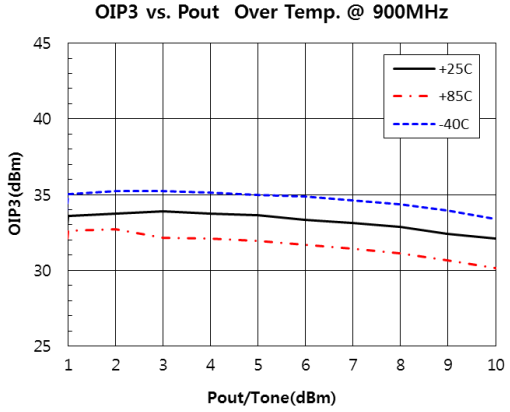


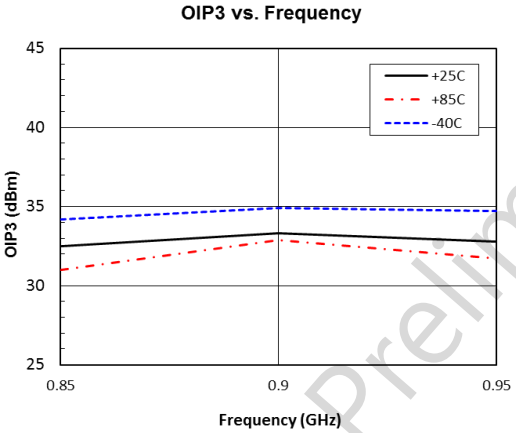
S22

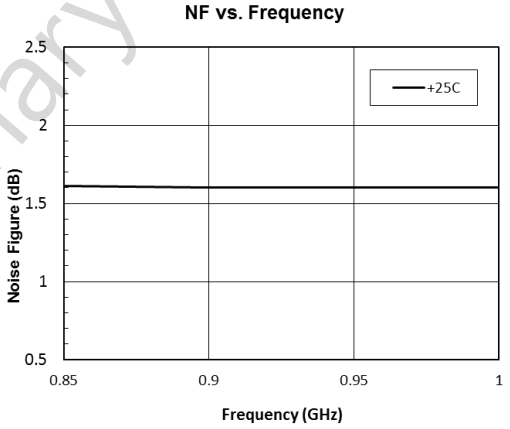


P1dB, OIP3 and Noise Figure Performance at 850~950MHz

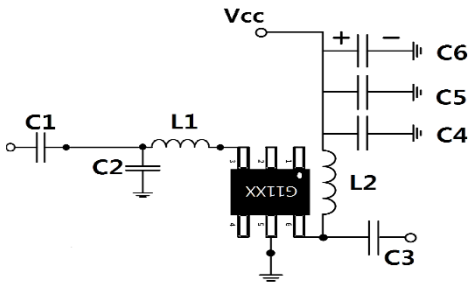








1800~2200MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	1.5nH
C2	1pF	C5	1000pF	L2	8.2nH
C3	100pF	C6	10uF		

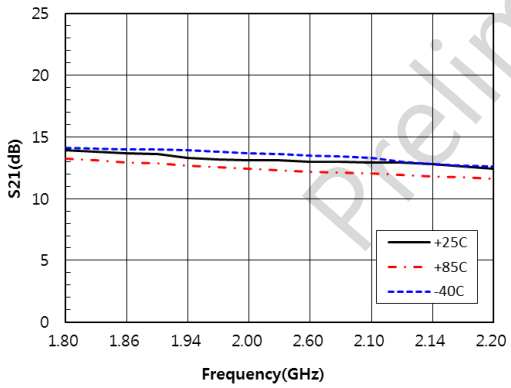
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	1800	1900	2140	Unit
Small Signal Gain	13.9	13.6	12.8	dB
S11	-15.7	-16.7	-16.8	dB
S22	-15.5	-16.9	-22.1	dB
Output P1dB	19.3	19.7	19.8	dBm
Output OIP3*	32.7	33.1	33.3	dBm
Noise Figure	1.60	1.60	1.61	dB
Icq	50			mA
Vcc	3.3			V

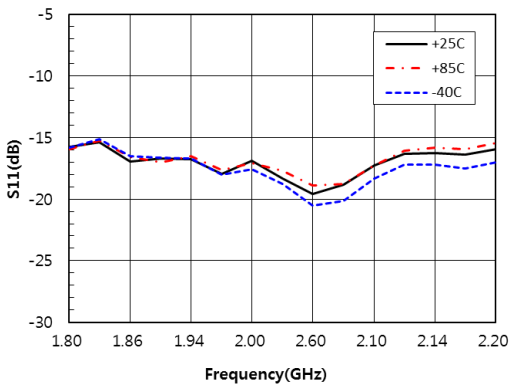
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 1800~2200MHz

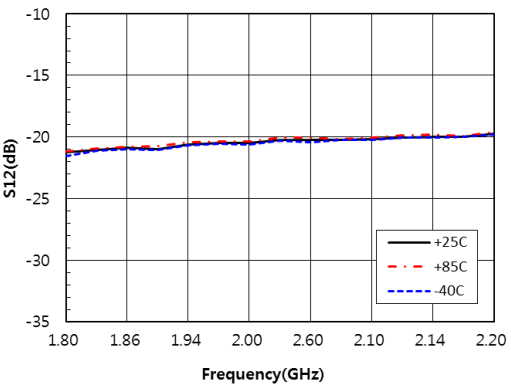
S21



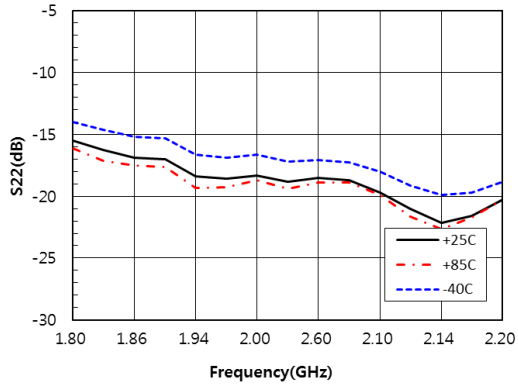
S11



S12

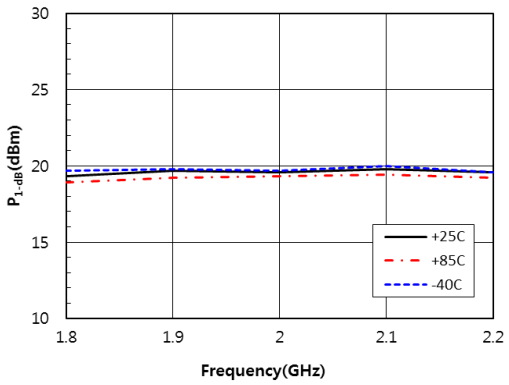


S22

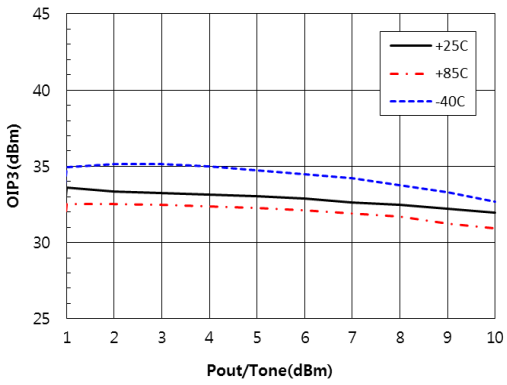


P1dB, OIP3 and Noise Figure Performance at 1800~2200MHz

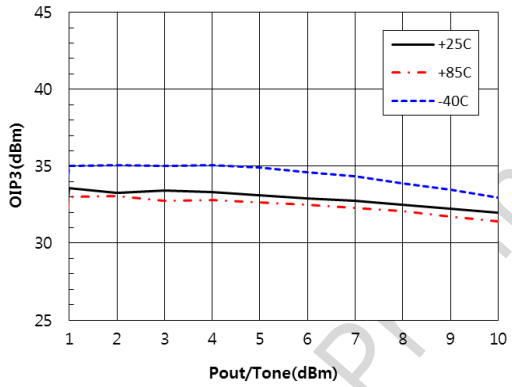
$P_{1\text{-}dB}$ vs. Frequency



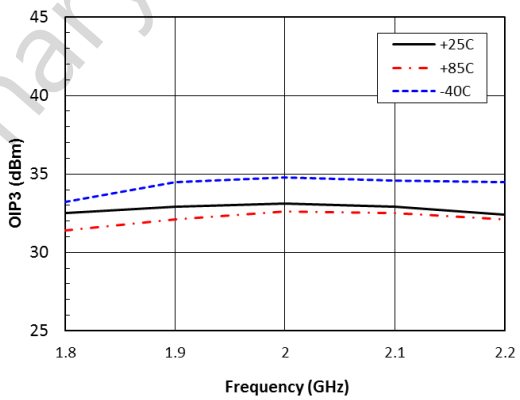
OIP3 vs. Pout Over Temp. @ 1900MHz



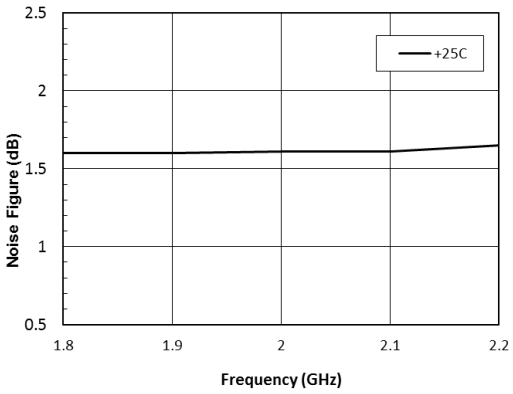
OIP3 vs. Pout Over Temp. @ 2140MHz



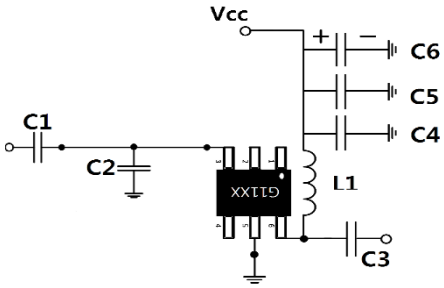
OIP3 vs. Frequency



NF vs. Frequency



2300~2700MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	47nH
C2	1.0pF	C5	1000pF		
C3	100pF	C6	10uF		

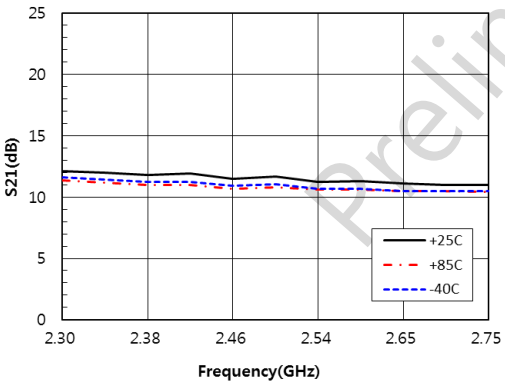
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	2300	2650	2750	Unit
Small Signal Gain	12.4	11.3	11.0	dB
S11	-14.5	-28.7	-31.4	dB
S22	-19.5	-18.4	-18.1	dB
Output P1dB	19.6	19.7	19.9	dBm
Output OIP3*	32.6	31.7	31.0	dBm
Noise Figure	1.69	1.70	1.71	dB
Icq	51			mA
Vcc	3.3			V

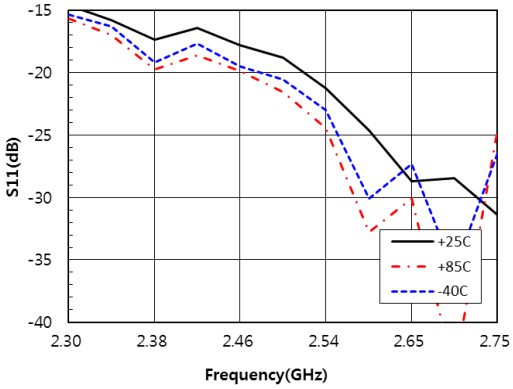
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 2300~2700MHz

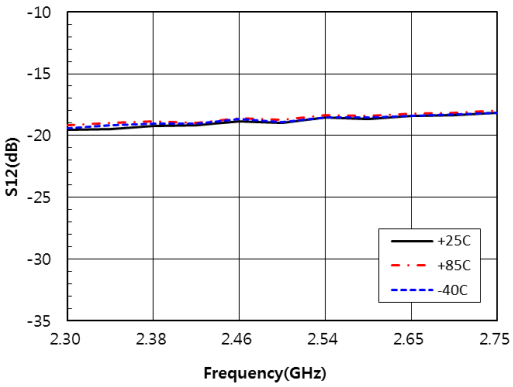
S21



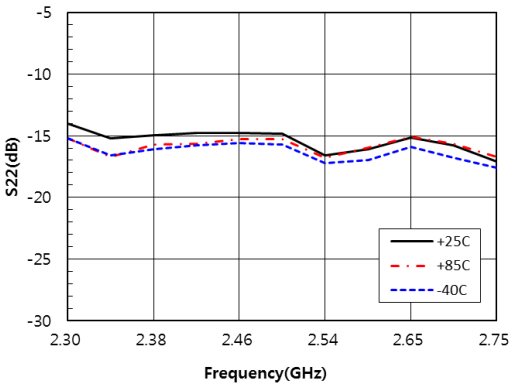
S11



S12

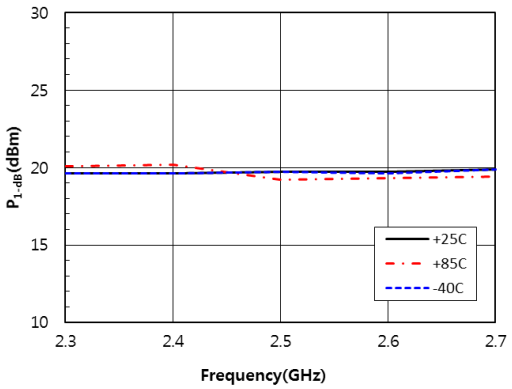


S22

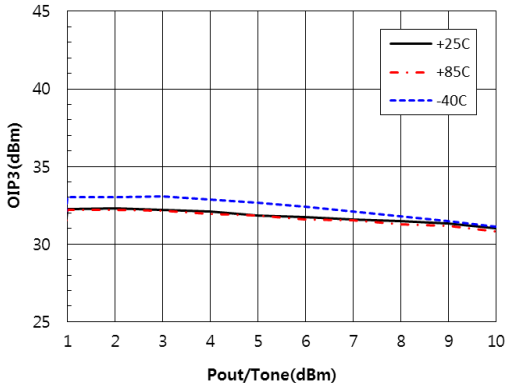


P1dB, OIP3 and Noise Figure Performance at 2300~2700MHz

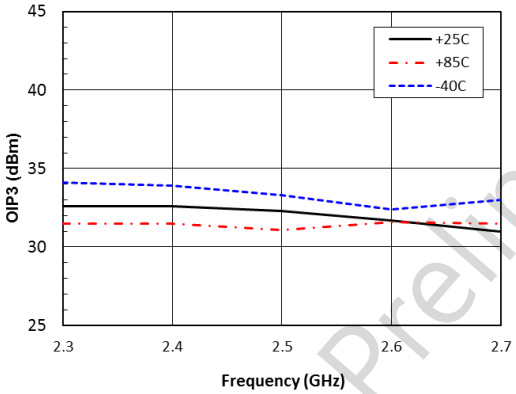
$P_{1\text{-}dB}$ vs. Frequency



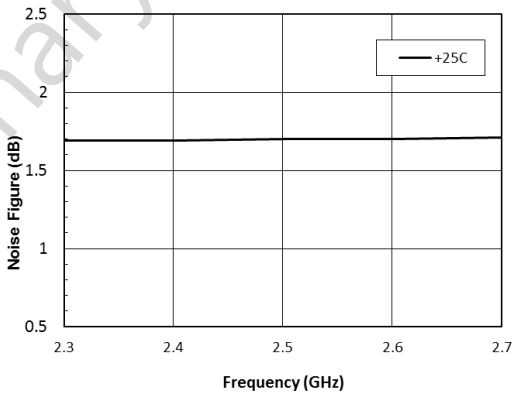
OIP3 vs. Pout Over Temp. @ 2650MHz



OIP3 vs. Frequency



NF vs. Frequency



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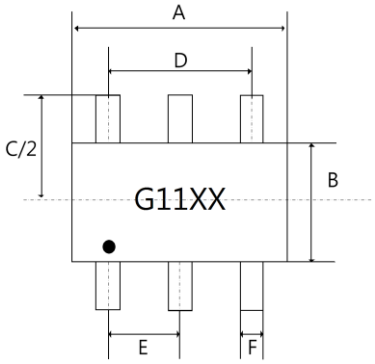
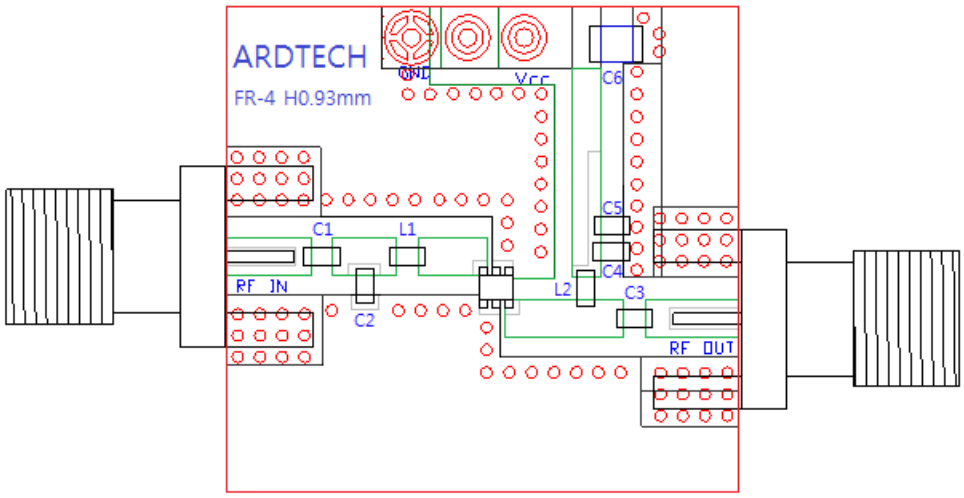
Application support: dukielee@ardtech.co.kr

Package Mark and Dimensions



Symbol	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.90	2.10	2.15	0.074	0.082	0.084
B	1.15	1.25	1.35	0.045	0.050	0.055
C	2.00	2.10	2.20	0.078	0.082	0.086
D		1.3			0.0512	
E		0.65			0.0255	
F	0.15	-	0.30	0.006	-	0.012

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.037[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RG512

500-4000MHz
High Linearity 3V Gain Block Amplifier

Product Description

RG512 is a low current and low noise Gain Block Amplifier in a low-cost surface mount package and provides 30dBm high OIP3 and 1.62dB Noise Figure at 1900MHz. It is fabricated on a compound semiconductor material and conventional device technology. RG512 is available in a lead-free / green / RoHS-compliant SOT363(SC70) package. The performance is targeted for use as a receiver and transmitter in wireless infrastructure system where high linearity and low noise is required. Internal active bias circuitry allows RG512 to maintain high linearity and gain performance over temperature and operate directly off a single +3V supply. All devices are 100% RF and DC tested and internally matched to 50 ohms without additional external components.

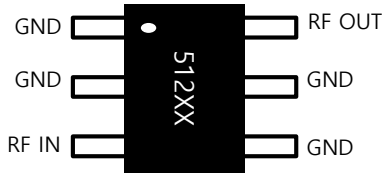
Features

- High OIP3 30dBm at 1900MHz
- 18.9dB Gain at 900MHz
- P1dB=20dBm at 1900MHz
- 1.62dB Noise Figure at 1900MHz
- Unconditionally stable
- Single 3.3V supply, 27mA current
- No dropping resistor required
- Industry standard SOT363(SC70) package
- Lead-free, RoHS compliant, Green

Applications

- Broadband Gain Block
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, WiBro, LTE

Component Diagram



SOT-363(SC70)

Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	17.4	18.9		900MHz	dB
	12.7	14.2		1900MHz	dB
	11.0	13.5		2140MHz	dB
Output power at 1-dB Compression	18.5	20.0		1900MHz	dBm
	19.0	20.6		2140MHz	dBm
Third Order Intercept Point	23.7	25.7		1900MHz	dBm
	28.3	30.3		2140MHz	dBm
Input Return Loss		-22.1		1900MHz	dB
Output Return Loss		-16.8		1900MHz	dB
Reverse Isolation		-22.5		1900MHz	dB
Noise Figure		1.62		1900MHz	dB
Device Voltage		3.3			V
Device current (Icq)	17	27			mA
Thermal Resistance		41.6		Junction to lead	°C/W

Test condition: Vcc=3.3V, I_D=27mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

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Application support: dukielee@ardtech.co.kr

Absolute Maximum Ratings

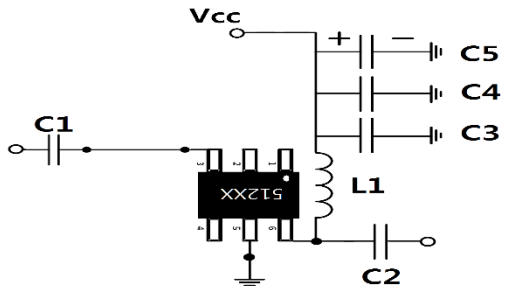
Parameter	Rating	Unit
Max Device Voltage(V_D)	5.0	V
Max Device Current(I_D)	60	mA
Max RF Input Power	10	dBm
Max Operating Dissipated Power	0.3	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1B	
Moisture Sensitivity Level	MSL1	

Typical Electrical Specification

Parameter	700MHz	900MHz	1900MHz	2140MHz	2650MHz	Unit
S21	19.2	18.9	14.2	13.5	11.7	dB
OIP3	24.0	25.7	30.0	30.3	31.4	dBm
P1dB	15.0	17.0	20.0	20.6	21.6	dBm
S11	-8.8	-14.4	-22.1	-19.8	-17.7	dB
S22	-7.7	-10.7	-16.8	-17.0	-16.3	dB
S12	-28.2	-25.9	-22.5	-22.3	-21.4	dB
NF	1.65	1.62	1.62	1.63	1.65	dB

Test condition: Vcc=3.3V, I_D=27mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

700~900MHz Reference Application Circuit



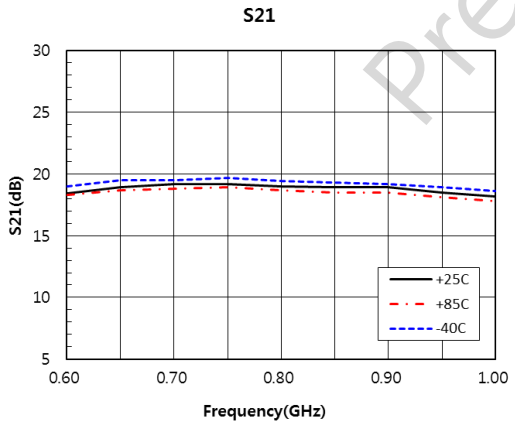
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	1000pF	L1	22nH
C2	100pF	C5	10uF		
C3	100pF				

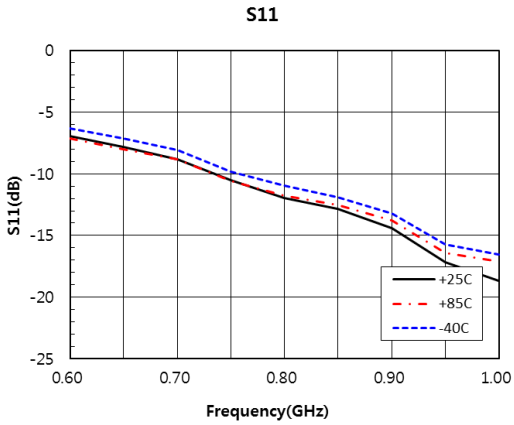
*Width and Length of Micro-strip line dimension in mm[mil]

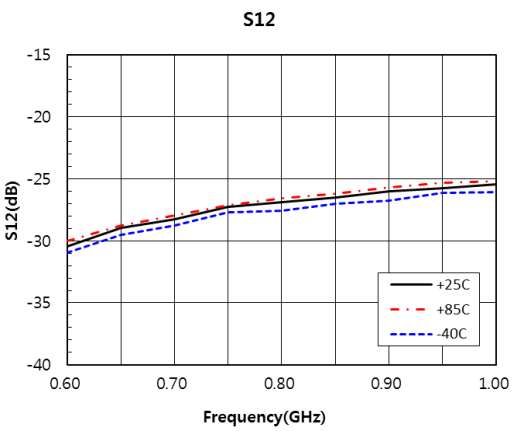
Parameter/Freq.(MHz)	700	800	900	Unit
Small Signal Gain	19.2	19.0	18.9	dB
S11	-8.8	-11.9	-14.4	dB
S22	-7.7	-9.3	-10.7	dB
Output P1dB	15	16.8	17	dBm
Output OIP3*	24.0	25.0	25.7	dBm
Noise Figure	1.65	1.64	1.62	dB
Icq	27			mA
Vcc	3.3			V

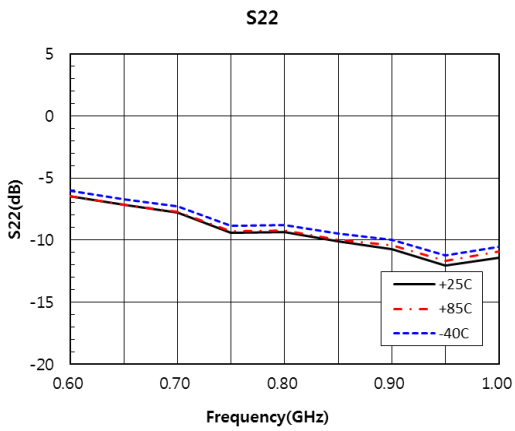
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 700~900MHz



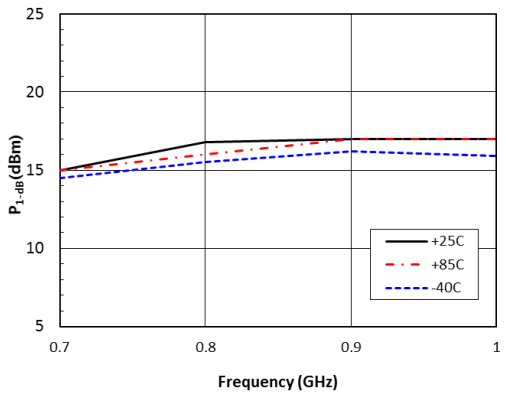




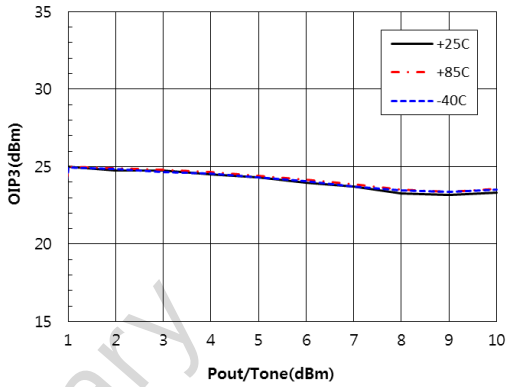


P1dB, OIP3 and Noise Figure Performance at 700~900MHz

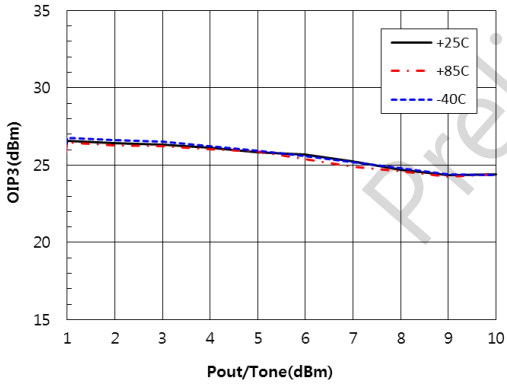
$P_{1\text{-}dB}$ vs. Frequency



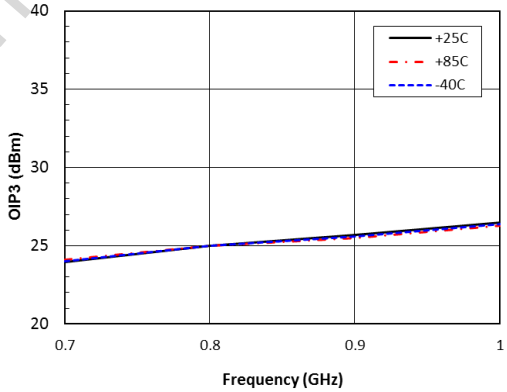
OIP3 vs. Pout Over Temp. @ 700MHz



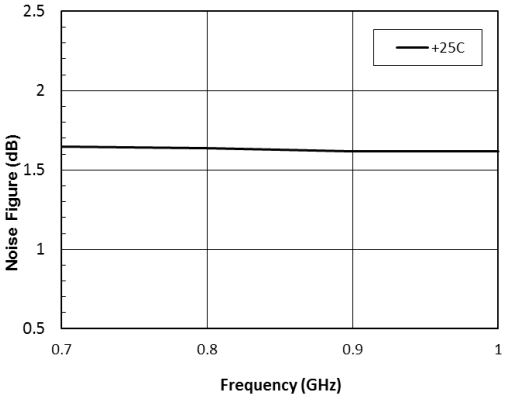
OIP3 vs. Pout Over Temp. @ 900MHz



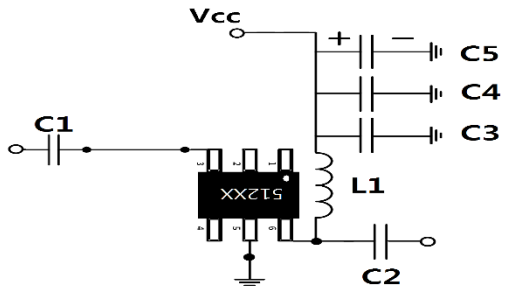
OIP3 vs. Frequency



NF vs. Frequency



1800~2200MHz Reference Application Circuit



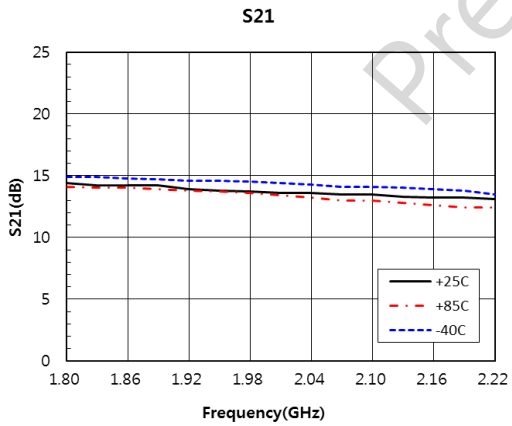
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	1000pF	L1	10nH
C2	100pF	C5	10uF		
C3	100pF				

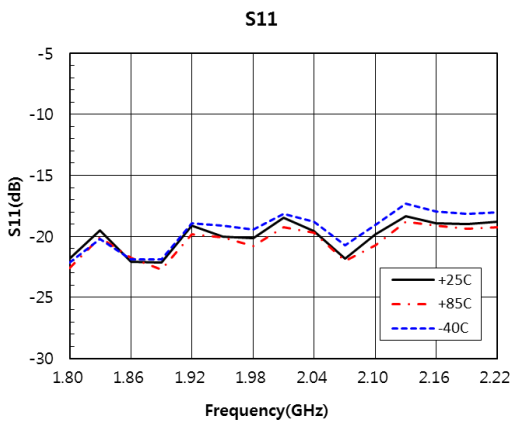
*Width and Length of Micro-strip line dimension in mm[mil]

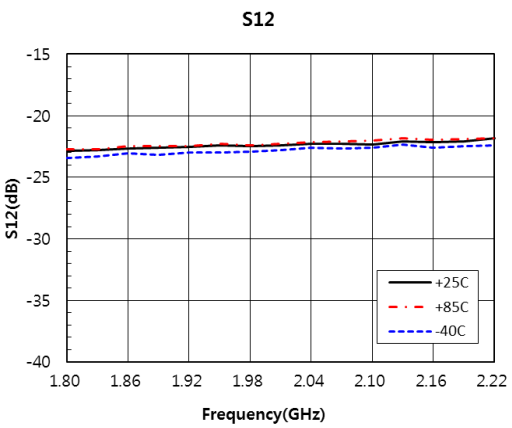
Parameter/Freq.(MHz)	1800	1900	2140	Unit
Small Signal Gain	14.4	14.2	13.5	dB
S11	-21.8	-22.1	-19.8	dB
S22	-16.3	-16.8	-17.0	dB
Output P1dB	19.5	20.0	20.6	dBm
Output OIP3*	29.9	30.0	30.3	dBm
Noise Figure	1.62	1.62	1.63	dB
Icq	27			mA
Vcc	3.3			V

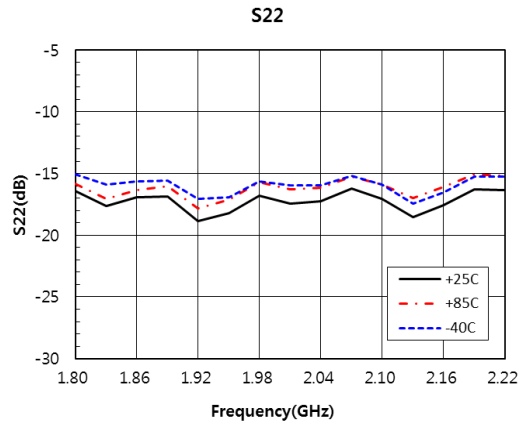
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 1800~2200MHz



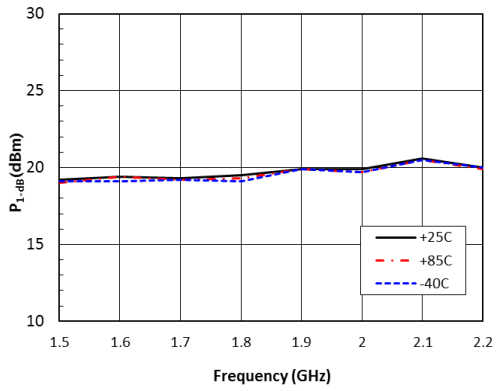




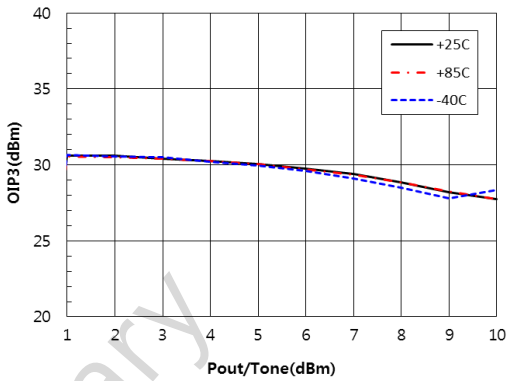


P1dB, OIP3 and Noise Figure Performance at 1800~2200MHz

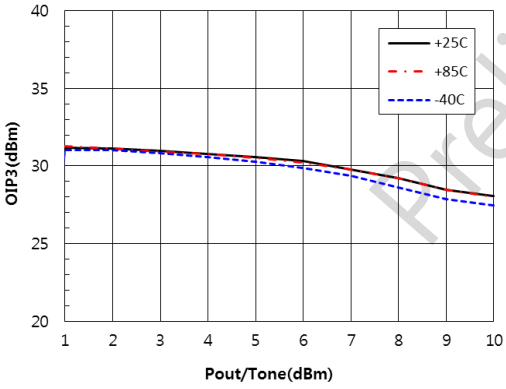
$P_{1\text{-}dB}$ vs. Frequency



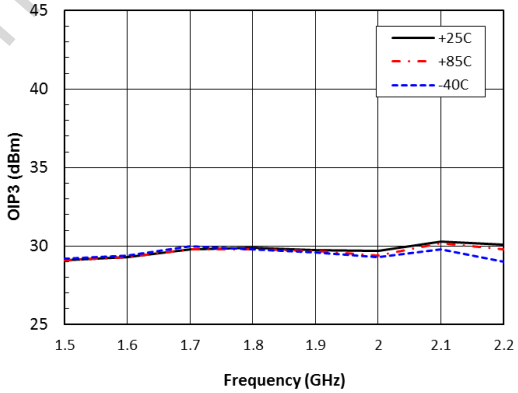
OIP3 vs. Pout Over Temp. @ 1900MHz



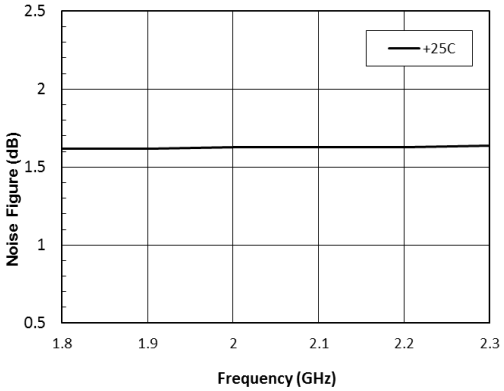
OIP3 vs. Pout Over Temp. @ 2140MHz



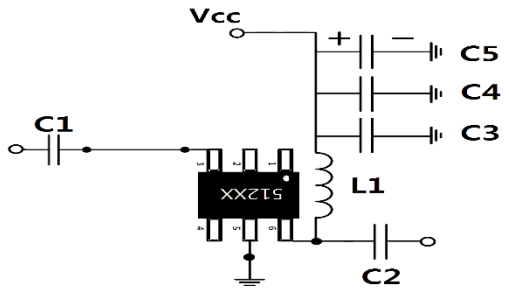
OIP3 vs. Frequency



NF vs. Frequency



2300~2700MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	1000pF	L1	10nH
C2	100pF	C5	10uF		
C3	100pF				

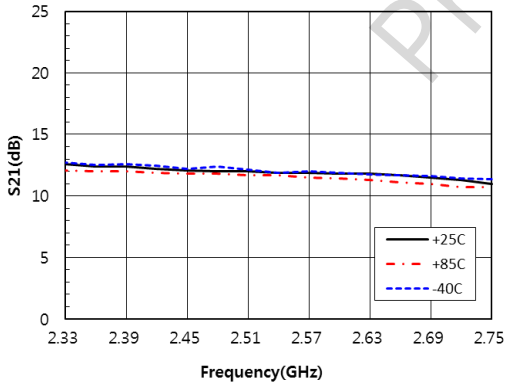
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	2300	2650	2750	Unit
Small Signal Gain	12.7	11.7	11.0	dB
S11	-18.4	-17.7	-18.0	dB
S22	-16.9	-16.3	-18.1	dB
Output P1dB	20.3	21.5	21.6	dBm
Output OIP3*	31.0	31.4	31.2	dBm
Noise Figure	1.64	1.65	1.66	dB
Icq	27			mA
Vcc	3.3			V

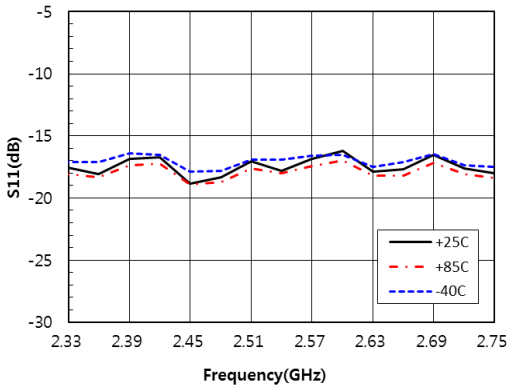
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 2300~2700MHz

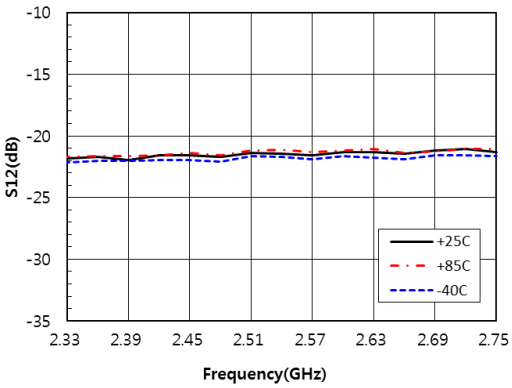
S21



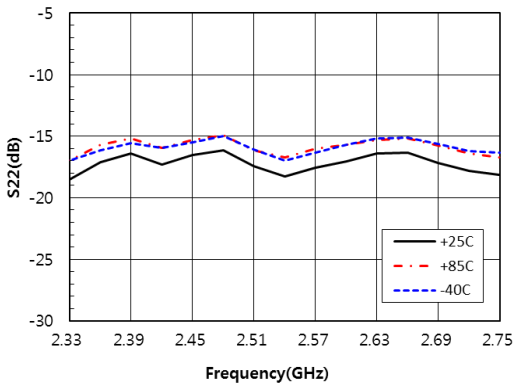
S11



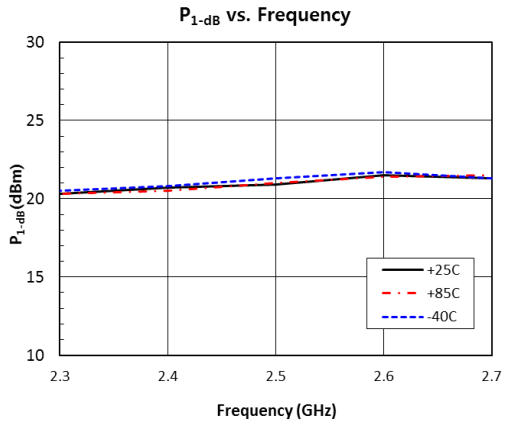
S12

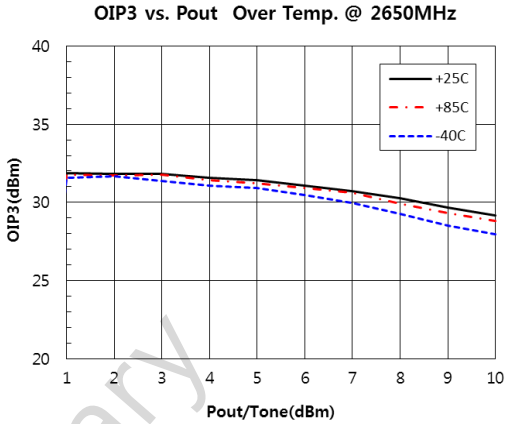


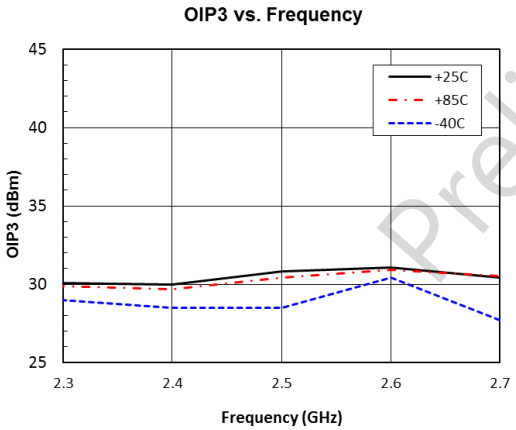
S22

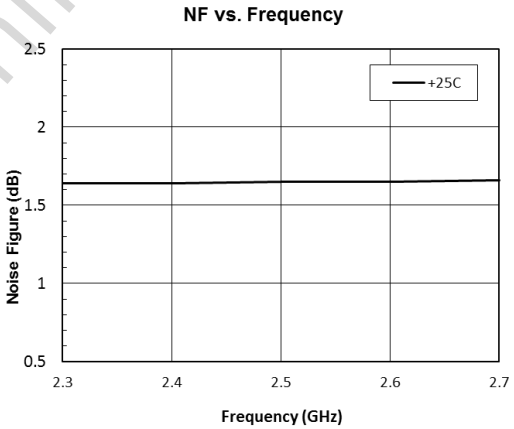


P1dB, OIP3 and Noise Figure Performance at 2300~2700MHz

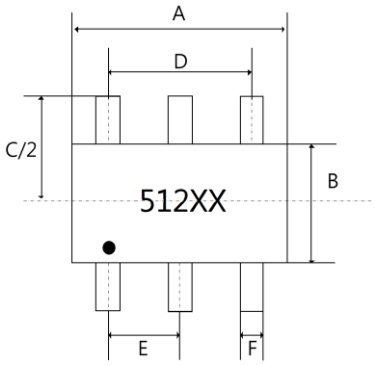






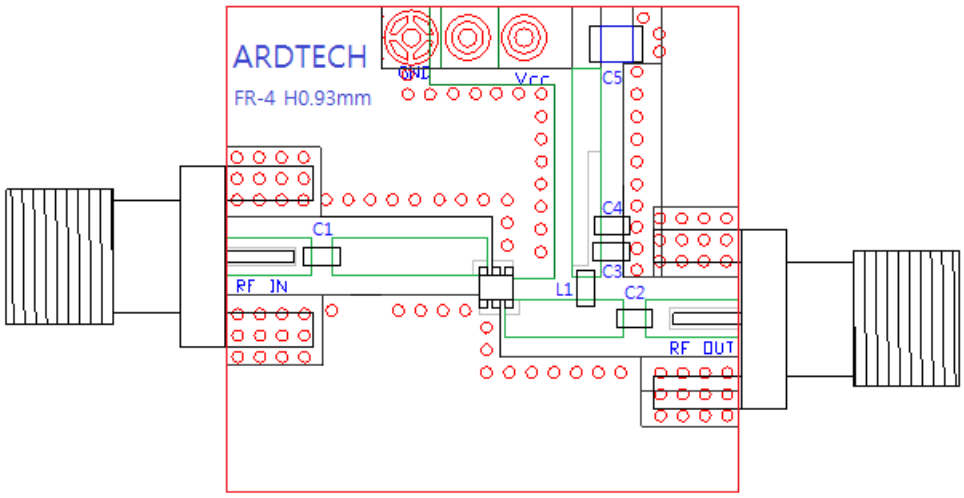


Package Mark and Dimensions



Symbol	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.90	2.10	2.15	0.074	0.082	0.084
B	1.15	1.25	1.35	0.045	0.050	0.055
C	2.00	2.10	2.20	0.078	0.082	0.086
D		1.3			0.0512	
E		0.65			0.0255	
F	0.15	-	0.30	0.006	-	0.012

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.037[0.93]
Copper Thickness	1 oz.

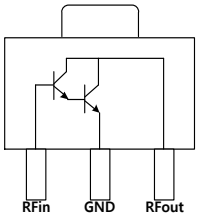
ARDTECH
ADVANCED RADIO DEVICE

RG614
50-500MHz
InGap HBT IF Gain Block MMIC Amplifier

Product Description

RG614 is a high performance InGap HBT MMIC IF gain block amplifier utilizing a Darlington pair configuration with an active bias circuit and it can be used as a cascadable 50 ohm IF gain block applications that require high gain and excellent stable amplification. It's housed in a lead-free/ green/RoHS-compliant SOT-89 industry-standard SMT package and internally matched to minimize number of external bias component

Component Diagram



Features

- High Gain 27.1dB at 70MHz
- P1dB=21dBm at 140MHz
- Unconditionally stable
- Single fixed 5V supply
- Industry standard SOT-89 package
- Robust ESD, Class 1C
- Lead-free, RoHS compliant, Green

Applications

- LO signal boosting Amplifier
- Receive IF Amplifier
- Cellular, PCS, GSM, WCDMA, LTE
- CATV, Cable Modem & DBS

Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	25.6	27.1		70MHz	dB
	25.2	26.7		140MHz	dB
	25.1	26.6		240MHz	dB
Output power at 1-dB Compression	19.5	21.0		70MHz	dBm
	19.5	21.0		140MHz	dBm
Third Order Intercept Point	36.2	38.2		70MHz	dBm
	35.9	37.9		140MHz	dBm
Input Return Loss		-36.9		70MHz	dB
Output Return Loss		-11.9		70MHz	dB
Reverse Isolation		-32.8		70MHz	dB
Noise Figure		3.2		70MHz	dB
Device Voltage		5			V
Device current (Icq)	82	90	100		mA
Thermal Resistance		34		Junction to lead	°C/W

Test condition: Vcc=5V, I_D=90mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=10dBm T_L=25°C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Absolute Maximum Ratings

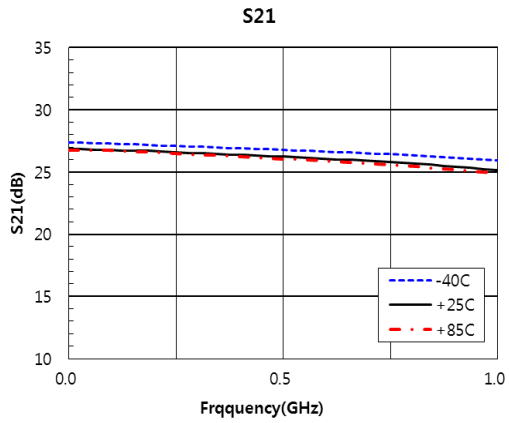
Parameter	Rating	Unit
Max Device Voltage(V_D)	5.5	V
Max Device Current(I_D)	136	mA
Max RF Input Power	18	dBm
Max Operating Dissipated Power	0.74	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1C	
Moisture Sensitivity Level	MSL1	

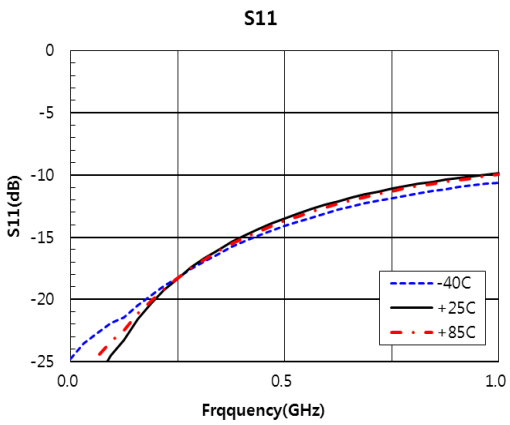
Typical Electrical Specification

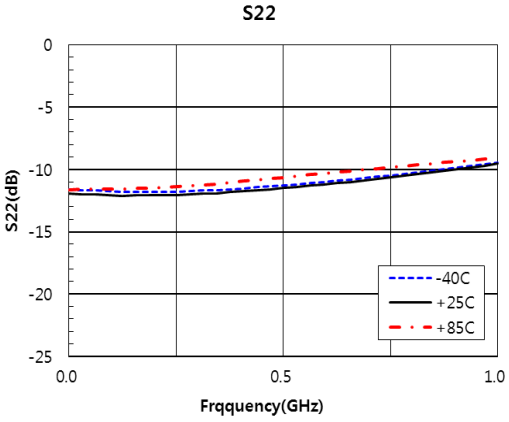
Parameter	70MHz	140MHz	240MHz	500MHz	Unit
S21	27.1	26.9	26.6	26.2	dB
OIP3	38.2	37.9	37.7	37.3	dBm
P1dB	21.0	21.0	21.0	21.0	dBm
S11	-36.9	-24.5	-20.3	-13.9	dB
S22	-11.9	-12.0	-12.0	-11.5	dB
S12	-32.8	-32.8	-33.0	-33.3	dB
NF	3.2	3.2	3.5	3.5	dB

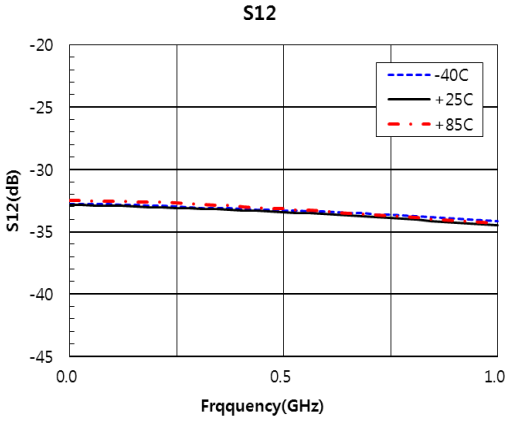
Test condition: Vcc=5V, I_D=90mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=10dBm T_L=25°C, Z_S=Z_L=50

S-Parameter Over Temperature

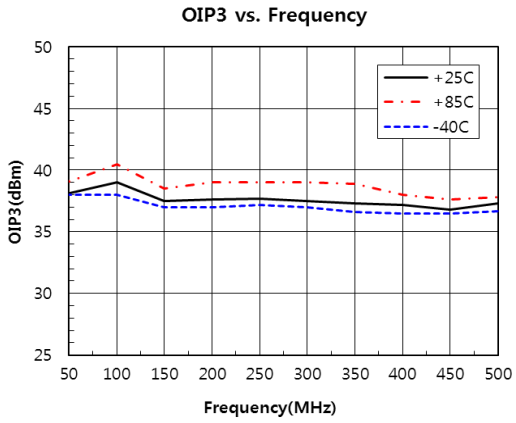


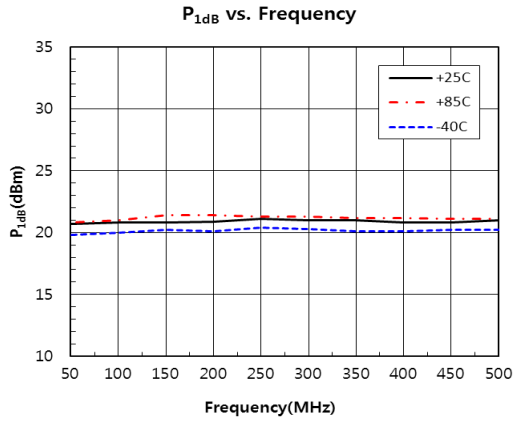






P1dB and OIP3 vs. Frequency

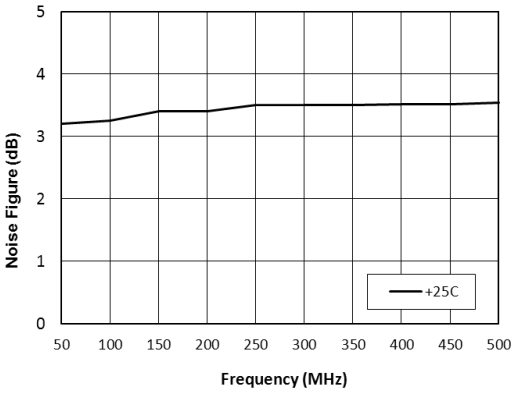




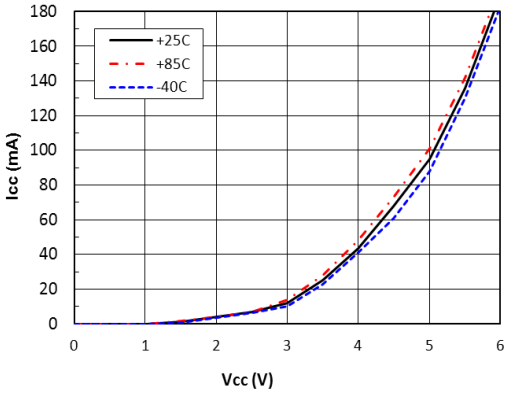
Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Icc vs. Vcc Over Temperature and Noise Figure

NF vs. Frequency



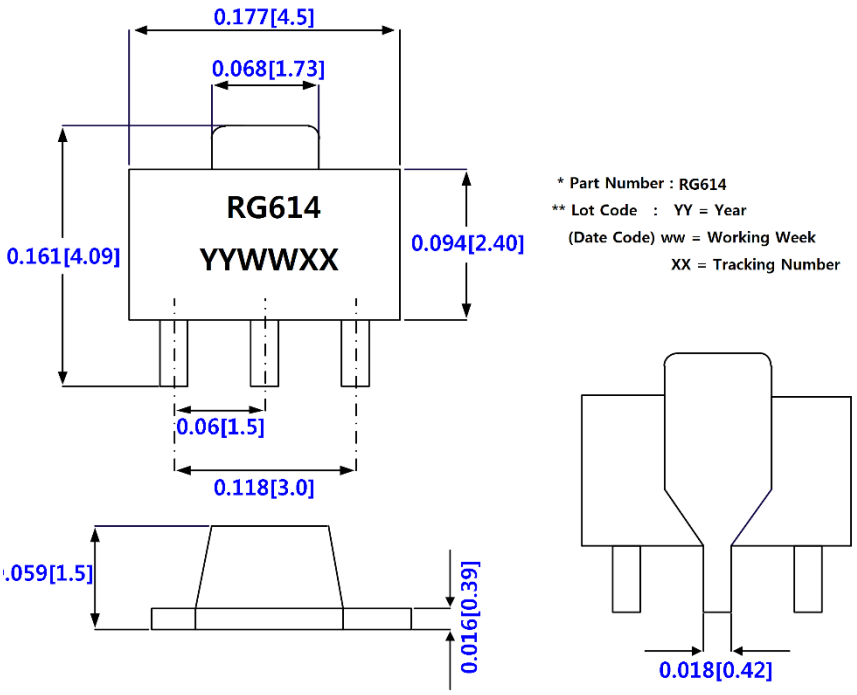
Current vs. Voltage Over Temperature



Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

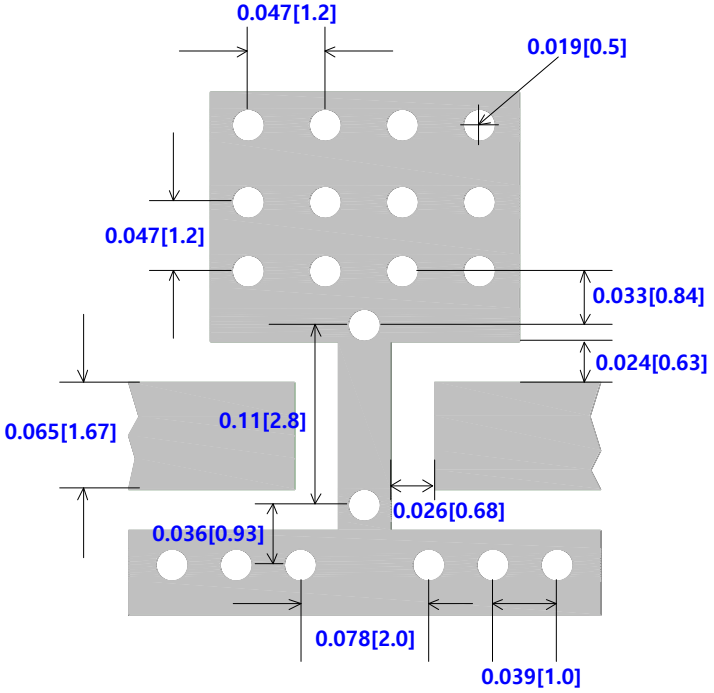
Package Mark and Dimensions

Dimension in inches[Millimeters]

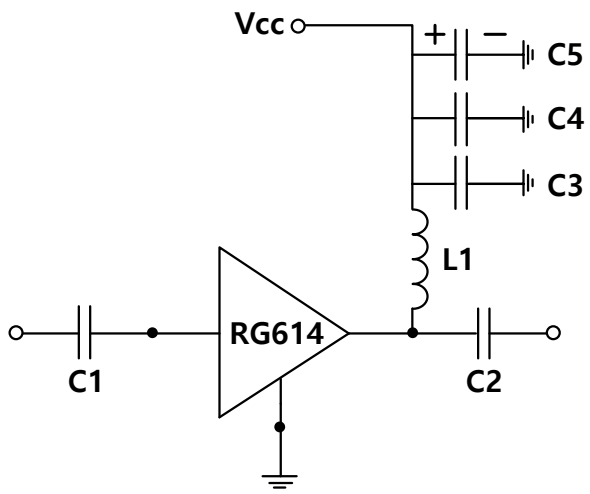


Recommended PCB Pad Pattern

Dimension in inches[Millimeters]

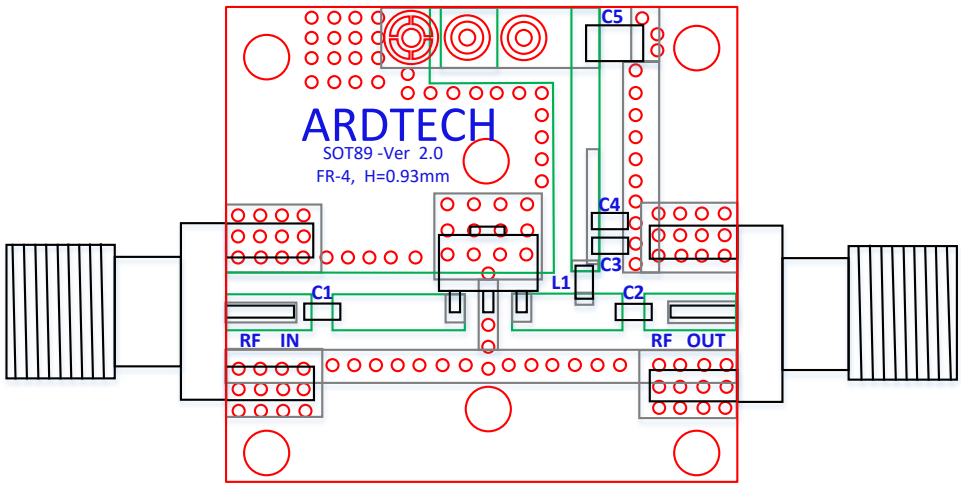


Application Schematic & BOM



Reference BOM	
C1	8200pF Capacitor, 0603 type
C2	8200pF Capacitor, 0603 type
C3	100pF Capacitor, 0603 type
C4	1000pF Capacitor, 0603 type
C5	10uF Capacitor, Tantalum
L1	1uH Chip inductor, 0805 type

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.036[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RG625
50-500MHz
InGap HBT IF Gain Block MMIC Amplifier

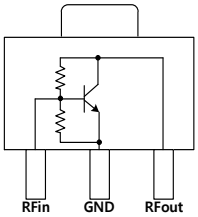
Product Description

RG625 is a high performance InGap HBT MMIC IF gain block amplifier with an active bias circuit and it can be used as a cascadable 50 ohm IF gain block applications that require high OIP3 and P1dB performance. It's housed in a lead-free/green/ RoHS-compliant SOT-89 industry-standard SMT package and internally matched to minimize number of external bias component

Features

- High OIP3= 44.0dBm at 70MHz
- P1dB=24.3dBm at 140MHz
- Unconditionally stable
- Single fixed 5V supply
- Industry standard SOT-89 package
- Robust ESD, Class 1C
- Lead-free, RoHS compliant, Green

Component Diagram



Applications

- LO signal boosting Amplifier
- Receive IF Amplifier
- Cellular, PCS, GSM, WCDMA, LTE
- CATV, Cable Modem & DBS

Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	17.3	18.8		70MHz	dB
	17.1	18.6		140MHz	dB
	17.1	18.6		240MHz	dB
Output power at 1-dB Compression	22.5	24.0		70MHz	dBm
	22.8	24.3		140MHz	dBm
Third Order Intercept Point	43.5	45.5		70MHz	dBm
	40.0	42.0		140MHz	dBm
Input Return Loss		-17.1		70MHz	dB
Output Return Loss		-25.0		70MHz	dB
Reverse Isolation		-22.9		70MHz	dB
Noise Figure		4.6		70MHz	dB
Device Voltage		5			V
Device current (Icq)	76	84	94		mA
Thermal Resistance		45		Junction to lead	°C/W

Test condition: Vcc=5V, I_D=84mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=8dBm T_L=25°C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Absolute Maximum Ratings

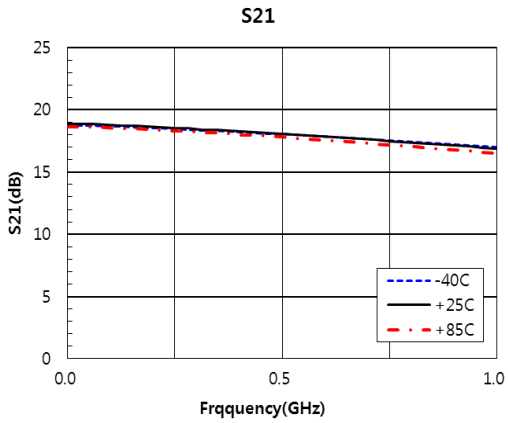
Parameter	Rating	Unit
Max Device Voltage(V_D)	5.5	V
Max Device Current(I_D)	130	mA
Max RF Input Power	20	dBm
Max Operating Dissipated Power	0.71	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1C	
Moisture Sensitivity Level	MSL1	

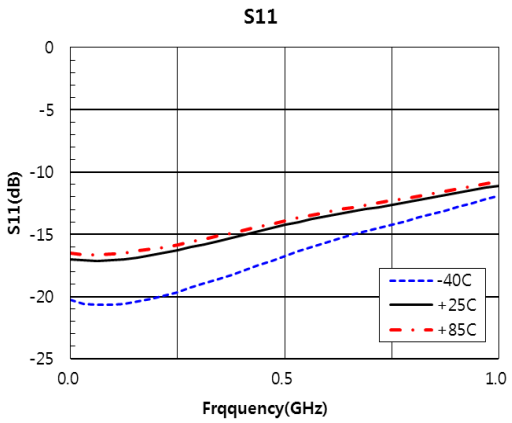
Typical Electrical Specification

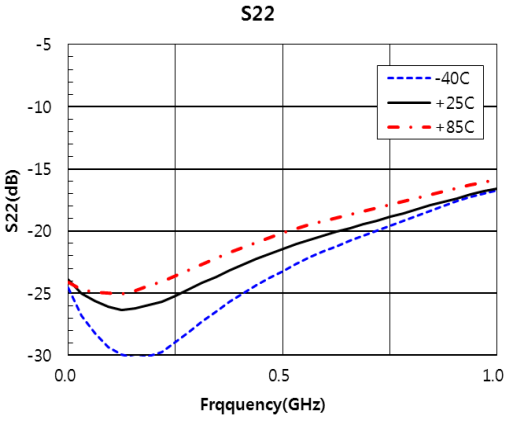
Parameter	70MHz	140MHz	240MHz	500MHz	Unit
S21	18.8	18.6	18.6	18.1	dB
OIP3	44.0	42.0	43.0	38.5	dBm
P1dB	24	24.3	24.7	24.2	dBm
S11	-17.1	-17.0	-16.6	-14.5	dB
S22	-25.0	-26.0	-25.9	-21.8	dB
S12	-22.9	-22.9	-22.9	-23.0	dB
NF	4.6	4.8	4.9	4.6	dB

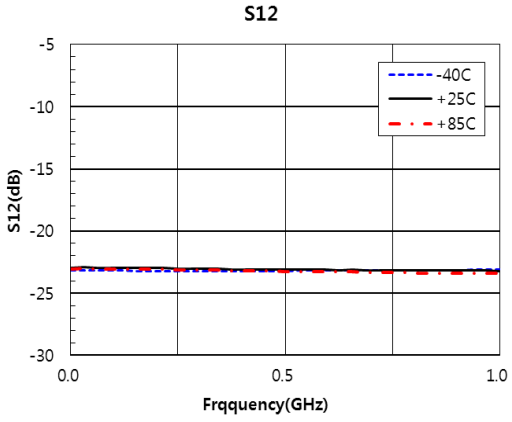
Test condition: Vcc=5V, I_D=84mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=8dBm T_L=25°C, Z_S=Z_L=50

S-Parameter Over Temperature

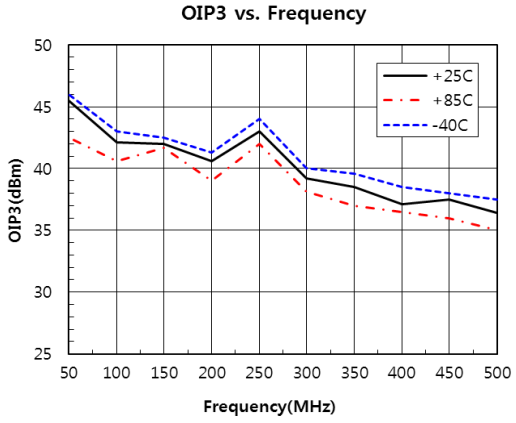


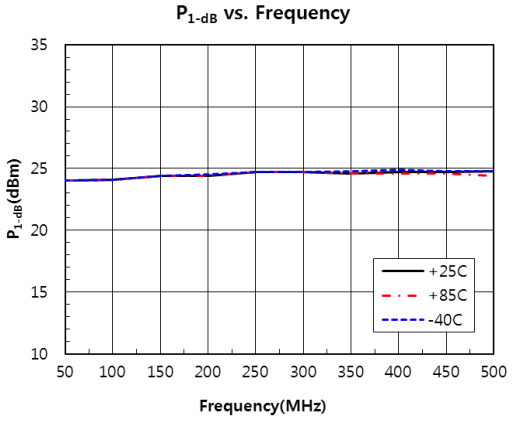






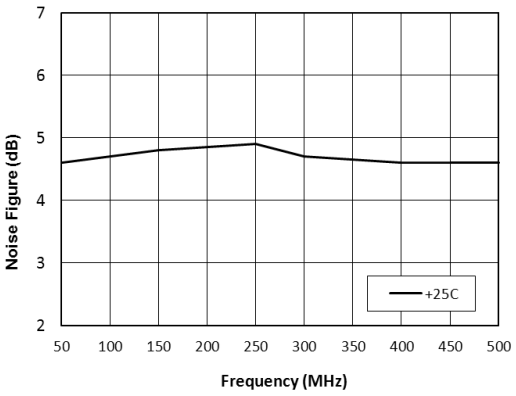
P1dB and OIP3 vs. Frequency



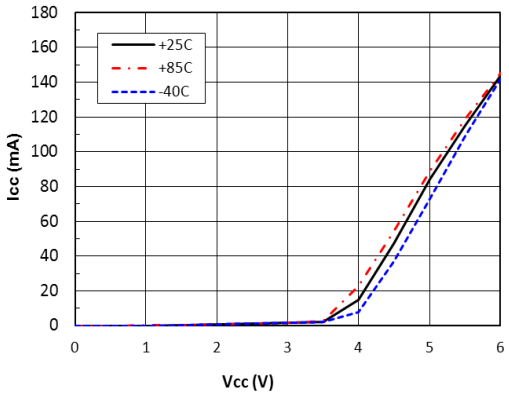


Icc vs. Vcc Over Temperature and Noise Figure

NF vs. Frequency



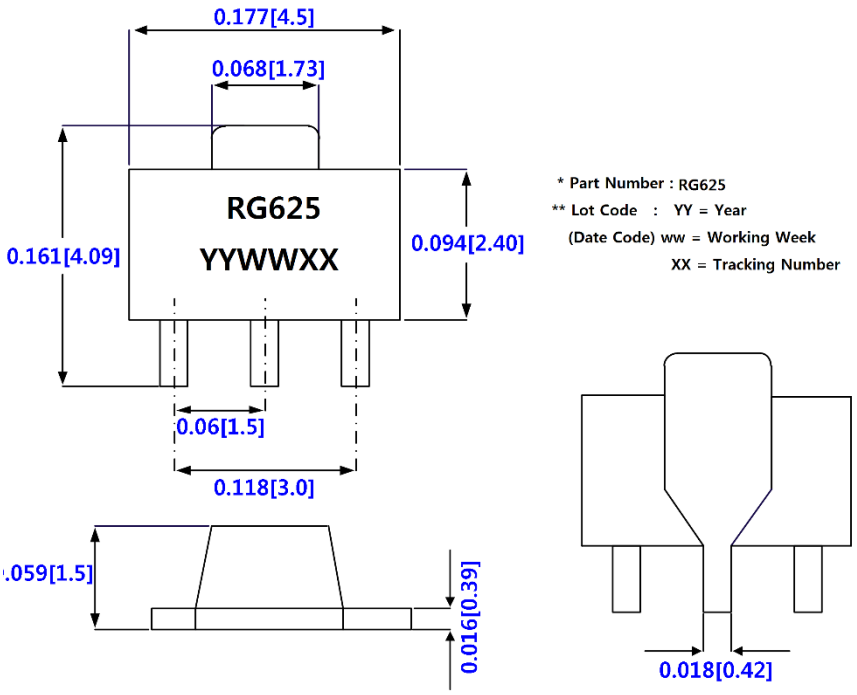
Current vs. Voltage Over Temperature



Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

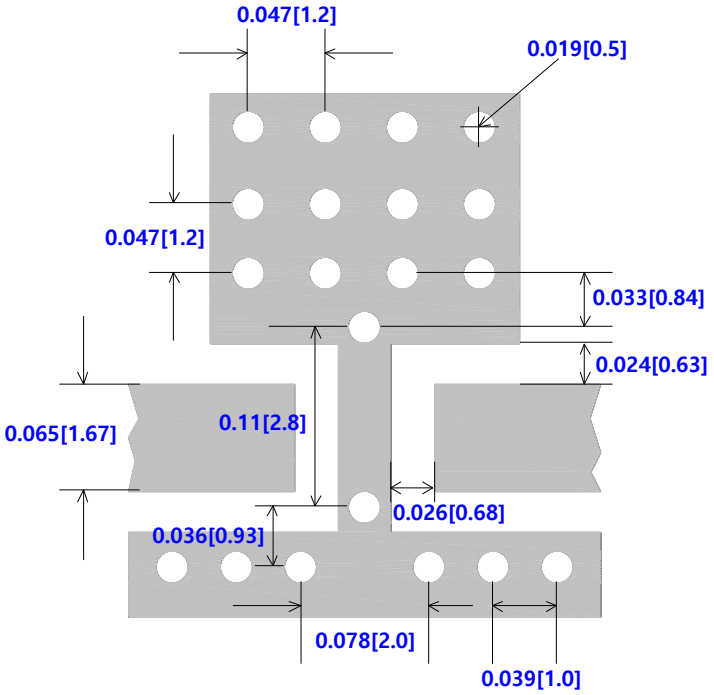
Package Mark and Dimensions

Dimension in inches[Millimeters]

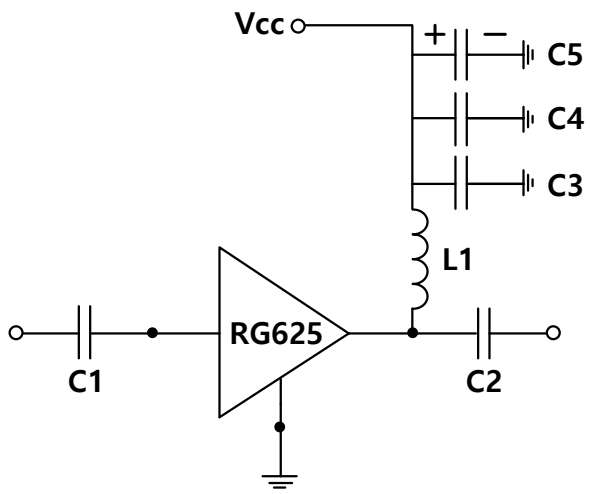


Recommended PCB Pad Pattern

Dimension in inches[Millimeters]

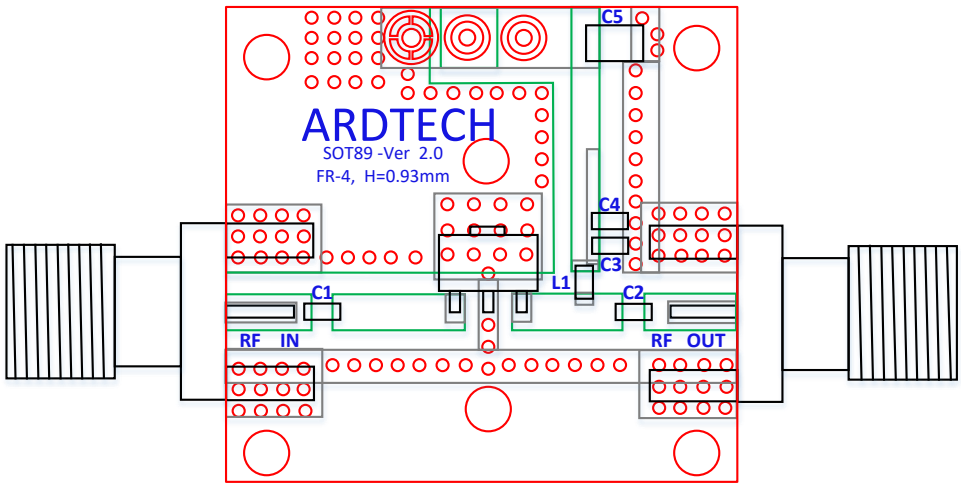


Application Schematic & BOM



Reference BOM	
C1	8200pF Capacitor, 0603 type
C2	8200pF Capacitor, 0603 type
C3	100pF Capacitor, 0603 type
C4	1000pF Capacitor, 0603 type
C5	10uF Capacitor, Tantalum
L1	680nH Chip inductor, 0805 type

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.036[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RA031

50-3600MHz
0.25W High Linearity InGap HBT Amplifier

Product Description

RA031 is a high linearity InGap HBT 0.25W driver amplifier in a low-cost surface mount package. The InGaP/GaAs HBT is able to achieve high performance across a broad range and it is available in a lead-free / green / RoHS-compliant SOT-89 package. RA031 is targeted for use as a driver amplifier in wireless infrastructure where high linearity and medium power is required. Internal biasing allows RA031 to maintain high linearity over temperature and operate directly off a single +5V supply. All devices are 100% RF and DC tested.

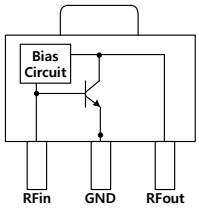
Features

- High OIP3 44.1dBm @ 900MHz
- P1dB=24.1dBm @ 900MHz
- No output matching @ 1.8~2.4GHz application
- Unconditionally stable
- Single fixed 5V supply, 82mA current
- Industry standard SOT-89 package
- Lead-free, RoHS compliant, Green

Applications

- PA driver amplifier
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA,

Component Diagram



Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	18.2	20.7		900MHz	dB
	15.1	16.6		1900MHz	dB
	13.7	15.2		2140MHz	dB
Output power at 1-dB Compression	22.6	24.1		900MHz	dBm
	22.5	24.0		1900MHz	dBm
Third Order Intercept Point	42.1	44.1		900MHz	dBm
	38.0	40.0		1900MHz	dBm
Input Return Loss		-15.0		1900MHz	dB
Output Return Loss		-16.8		1900MHz	dB
Reverse Isolation		-28.5		900MHz	dB
Noise Figure		4.4		900MHz	dB
Device Voltage		5			V
Device current (Icq)	75	82	95		mA
Thermal Resistance		23		Junction to lead	°C/W

Test condition: Vcc=5V, I_D=82mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=14dBm T_L=25°C, Z_S=Z_L=50

Absolute Maximum Ratings

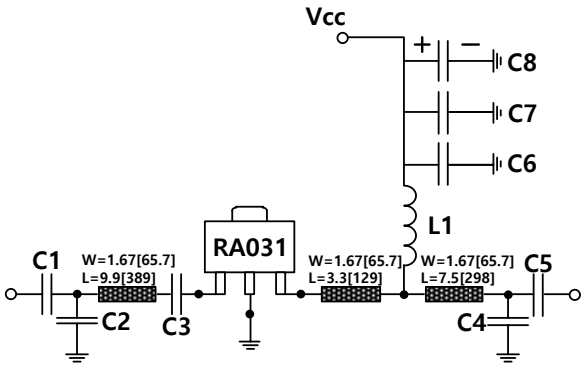
Parameter	Rating	Unit
Max Device Voltage(V_D)	6.0	V
Max Device Current(I_D)	185	mA
Max RF Input Power	23	dBm
Max Operating Dissipated Power	1.11	W
Junction Temperature(T_J)	+150	℃
Operating Temperature(T_L)	-40 to +85	℃
Storage Temperature	-65 to +150	℃
ESD Sensitivity(HBM)	Class 2	
Moisture Sensitivity Level	MSL1	

Typical Electrical Specification

Parameter	900MHz	1900MHz	2140MHz	2350MHz	Unit
S21	20.7	16.6	15.2	14.4	dB
OIP3	44.1	40.0	39.0	39.1	dBm
P1dB	24.1	24.0	23.9	24.3	dBm
ACLR	-48.0	-48.3	-46.0	-46.2	dBc
S11	-11.0	-15.0	-15.9	-15.1	dB
S22	-15.2	-16.8	-11.9	-15.2	dB
S12	-28.5	-26.5	-26.0	-25.1	dB
NF	4.4	4.4	4.5	4.4	dB

Test condition: Vcc=5V, I_D=65mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=14dBm T_L=25°C, Z_S=Z_L=50, ACLR=3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

800~900MHz Reference Application Circuit



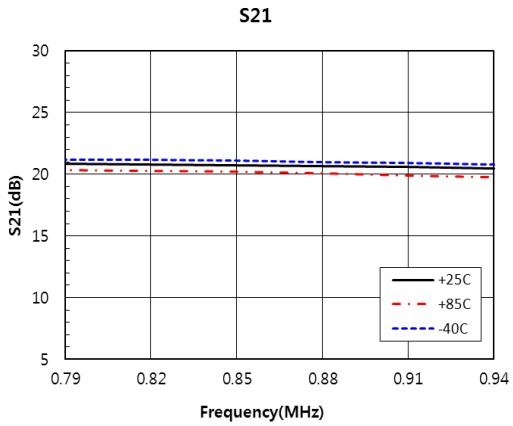
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	1.8pF	C7	1000pF
C2	3.9pF	C5	100pF	C8	10uF
C3	NA	C6	100pF	L1	33nH

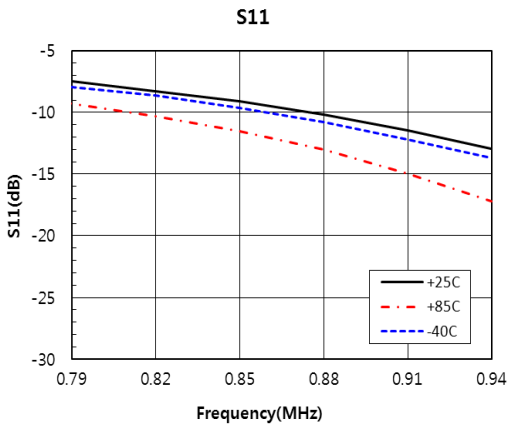
*Width and Length of Micro-strip line dimension in mm[mil]

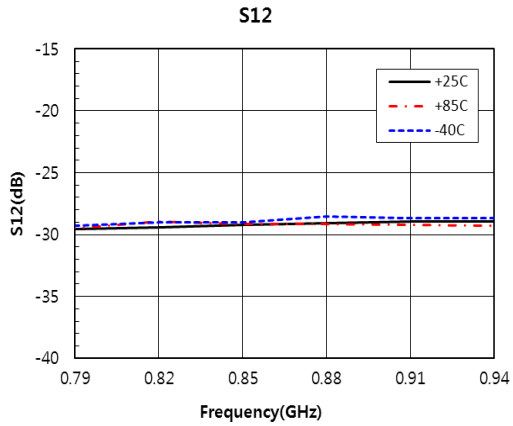
Parameter/Freq.(MHz)	820	850	900	Unit
Small Signal Gain	21.3	20.8	20.7	dB
S11	-8.2	-9.1	-11.0	dB
S22	-17.4	-16.8	-15.2	dB
ACLR@Pout=14dBm*	-46.5	-47.5	-48.0	dBc
Output P1dB	23.7	24.0	24.1	dBm
Output OIP3**	39.6	39.1	44.1	dBm
Noise Figure	4.3	4.4	4.4	dB
Icq	82			mA
Vcc	5			V

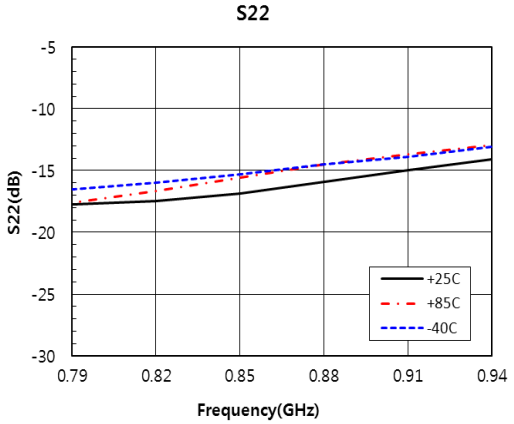
* 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA / ** Pout=14dBm/tone

S-Parameter Over Temperature vs. Freq. at 800~900MHz



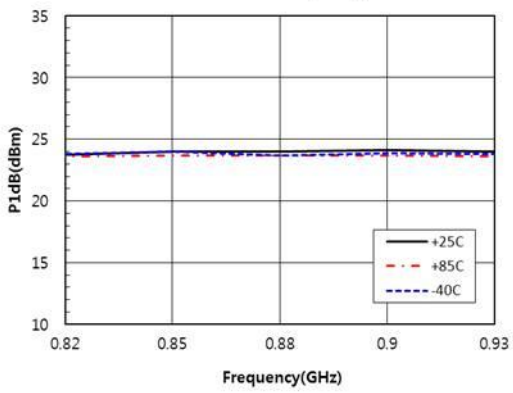




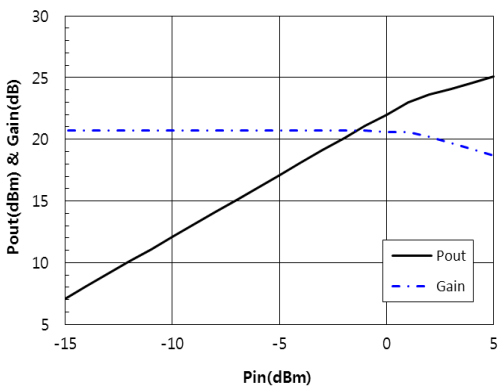


P1dB, OIP3, ACLR Performance at 800~900MHz

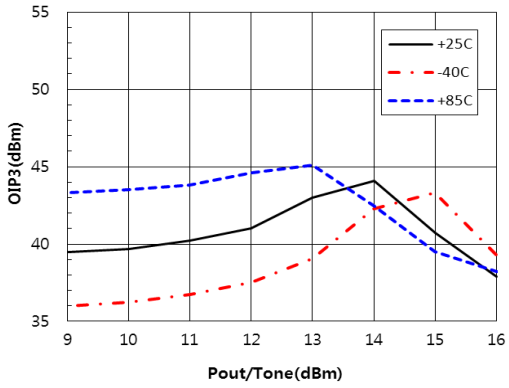
P1dB vs. Frequency



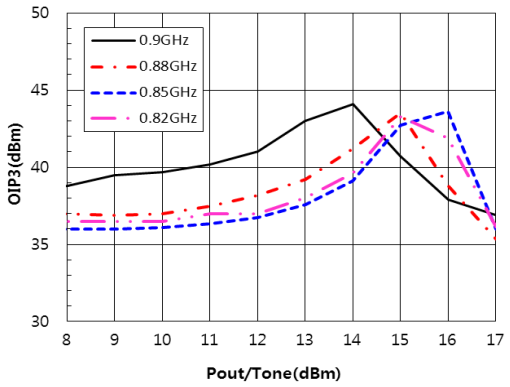
Pout vs. Pin @ 0.9GHz



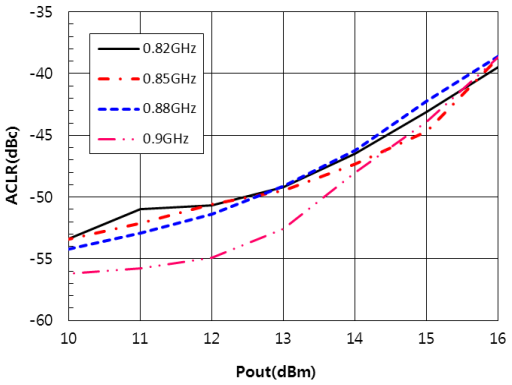
OIP3 vs. Pout Over Temp. @ 0.9GHz



OIP3 vs. Pout/Tone

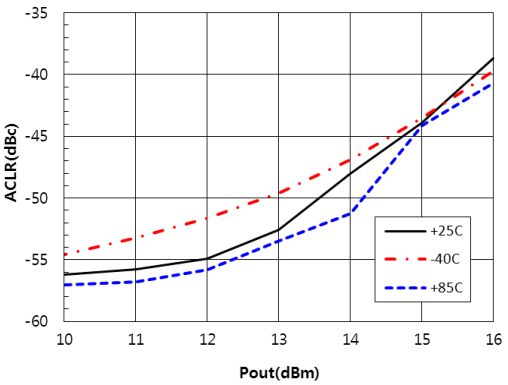


ACLR vs. Pout



Test condition: 3GPP Test model 1+64 DPCH,
PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

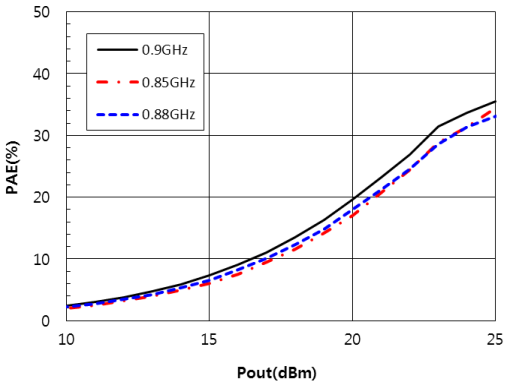
ACLR vs. Pout Over Temp. @ 0.9GHz



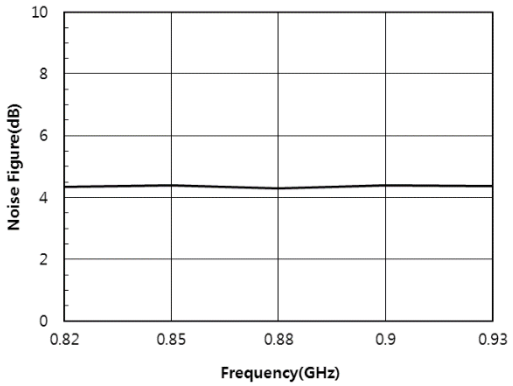
Test condition: 3GPP Test model 1+64 DPCH,
PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

PAE, Noise Figure Performance at 800~900MHz

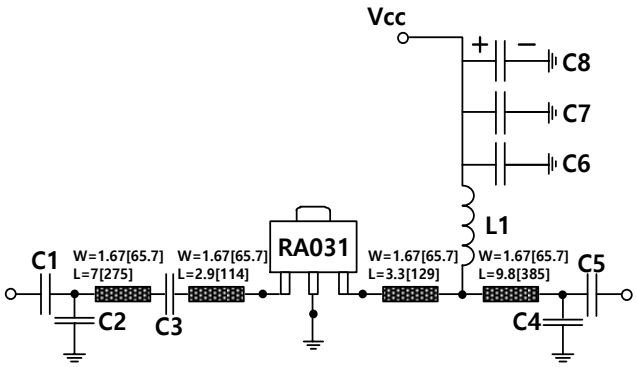
PAE vs. Pout



Noise Figure vs. Frequency, T=+25°C



1800~1900MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	NA	C7	1000pF
C2	2pF	C5	100pF	C8	10uF
C3	2.7pF	C6	100pF	L1	39nH

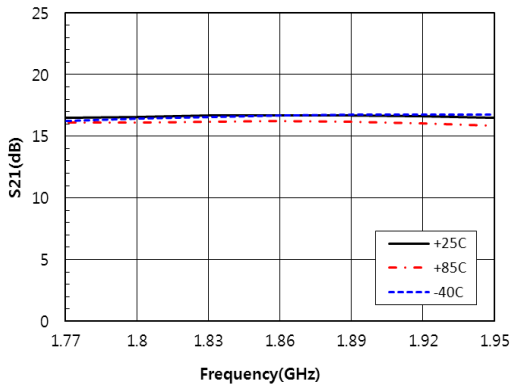
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	1860	1880	1900	Unit
Small Signal Gain	16.7	16.7	16.6	dB
S11	-11.8	-13.9	-15.0	dB
S22	-19.4	-17.9	-16.8	dB
ACLR@Pout=14dBm*	-49.0	-48.4	-48.3	dBc
Output P1dB	24.3	24.2	24.0	dBm
Output OIP3**	38.0	37.9	40.0	dBm
Noise Figure	4.5	4.3	4.4	dB
Icq	82			mA
Vcc	5			V

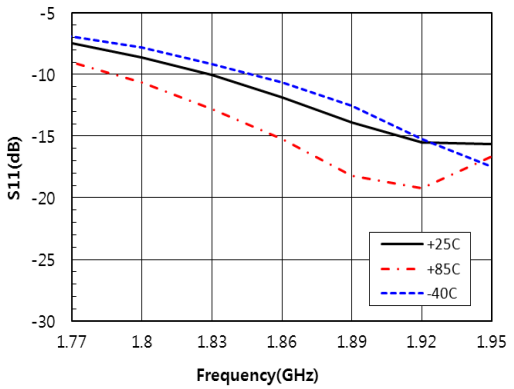
* 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA / ** Pout=14dBm/tone

S-Parameter Over Temperature vs. Freq. at 1800~1900MHz

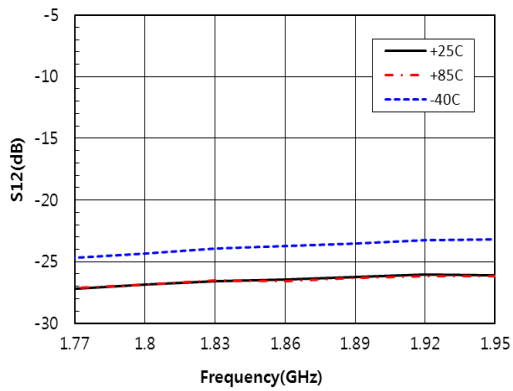
S21



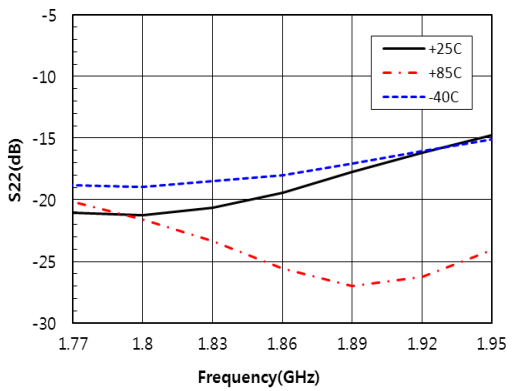
S11



S12

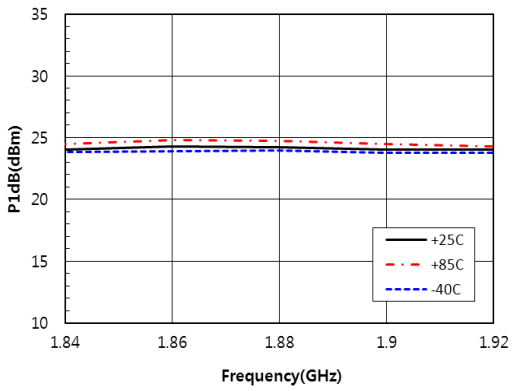


S22

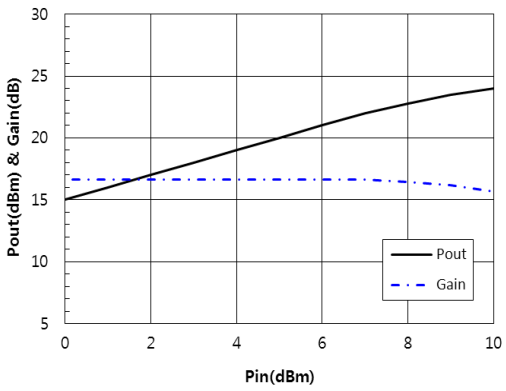


P1dB, OIP3, ACLR Performance at 1800~1900MHz

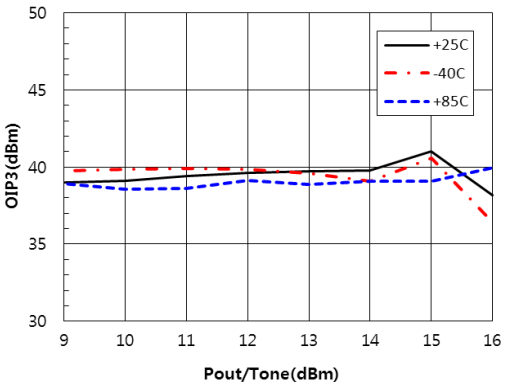
P1dB vs. Frequency



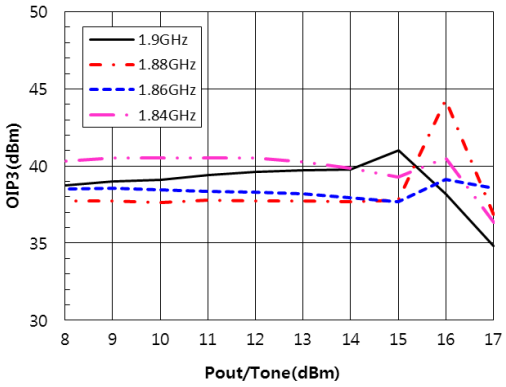
Pout vs. Pin @ 1.9GHz



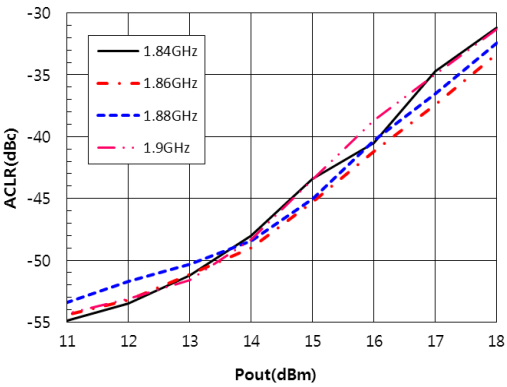
OIP3 vs. Pout Over Temp. @ 1.9GHz



OIP3 vs. Pout/Tone

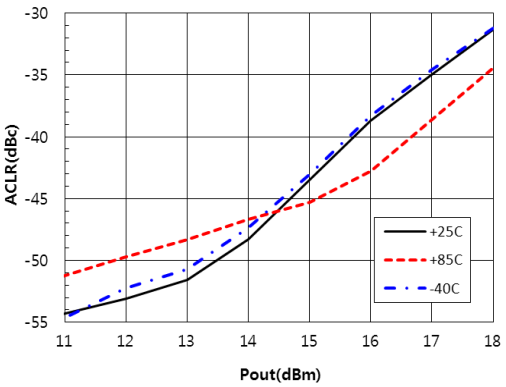


ACLR vs. Pout



Test condition: 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

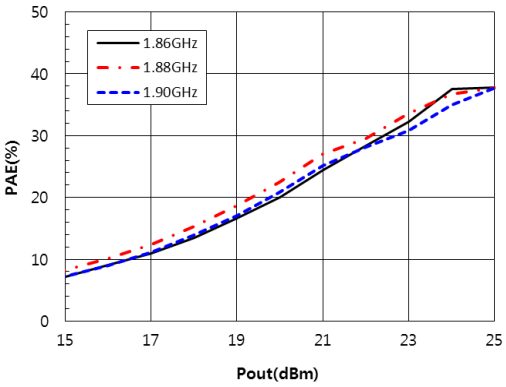
ACLR vs. Pout Over Temp. @ 1.9GHz



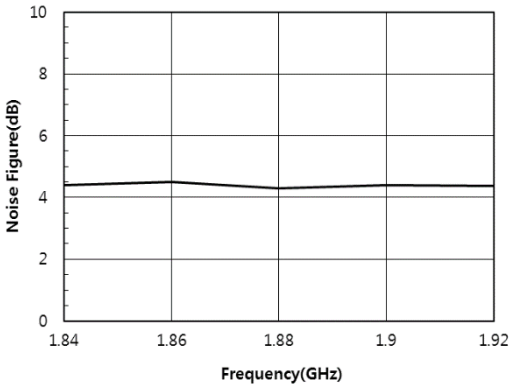
Test condition: 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

PAE, Noise Figure Performance at 1800~1900MHz

PAE vs. Pout



Noise Figure vs. Frequency, T=+25°C



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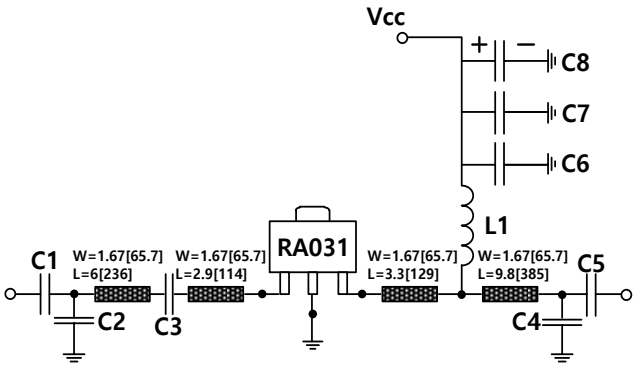
RA031
50-3600MHz
0.25W High Linearity Amplifier

2110~2170MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	NA	C7	1000pF
C2	1.5pF	C5	100pF	C8	10uF
C3	2pF	C6	100pF	L1	18nH

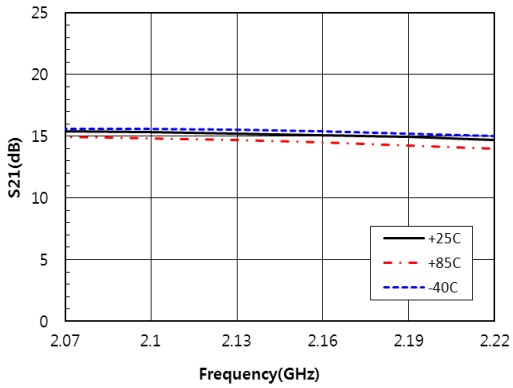
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	2110	2140	2170	Unit
Small Signal Gain	15.3	15.2	15.1	dB
S11	-15.4	-15.9	-16.0	dB
S22	-12.3	-11.9	-11.2	dB
ACLR@Pout=14dBm*	-48.5	-46.0	-47.0	dBc
Output P1dB	24.3	23.9	23.6	dBm
Output OIP3**	40.1	39.0	39.0	dBm
Noise Figure	4.4	4.5	4.5	dB
Icq	84			mA
Vcc	5			V

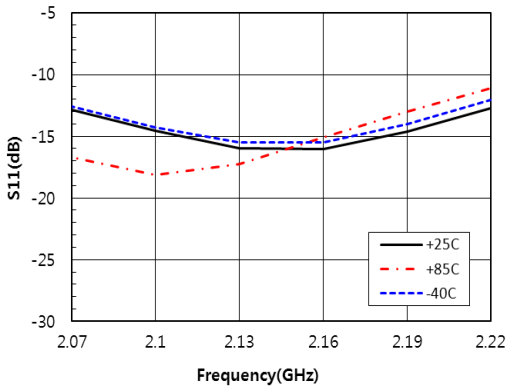
* 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA / ** Pout=14dBm/tone

S-Parameter Over Temperature vs. Freq. at 2110~2170MHz

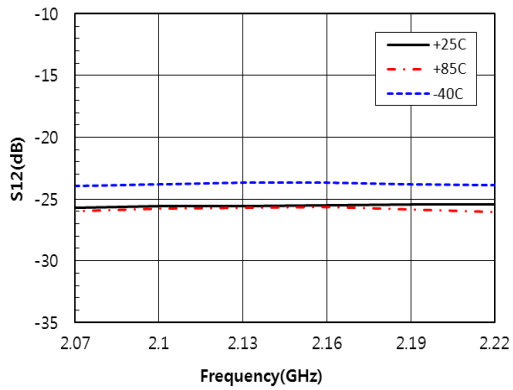
S21



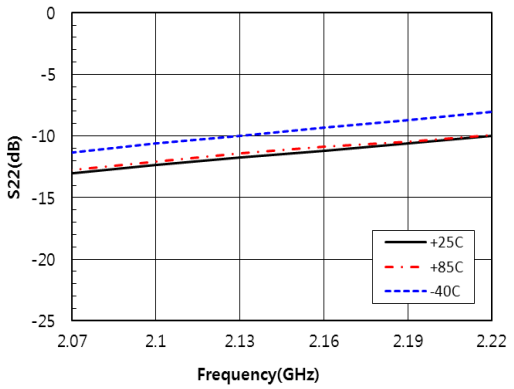
S11



S12



S22



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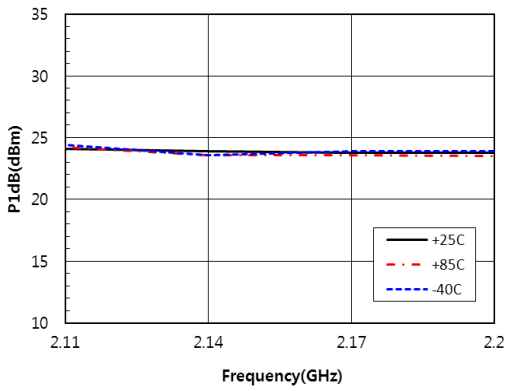
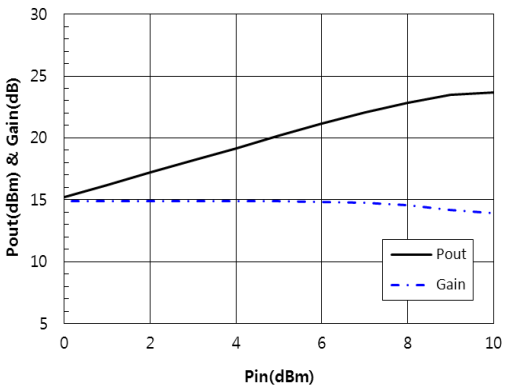
P1dB, OIP3, ACLR Performance at 2110~2170MHz

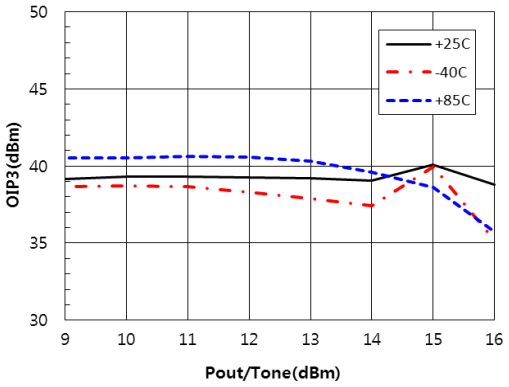
P1dB vs. Frequency



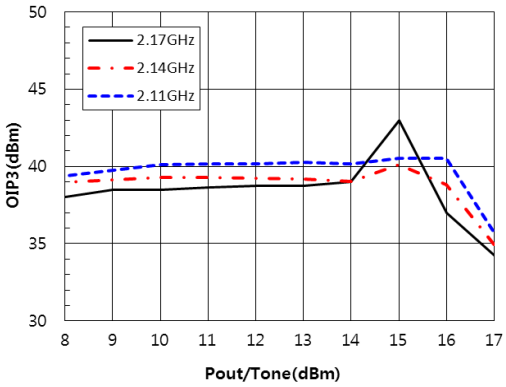
Pout vs. Pin @ 2.14GHz



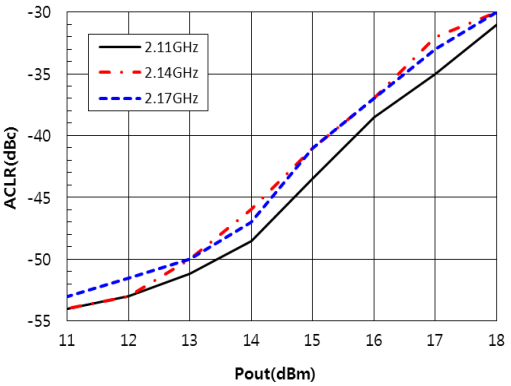
OIP3 vs. Pout Over Temp. @ 2.14GHz



OIP3 vs. Pout/Tone

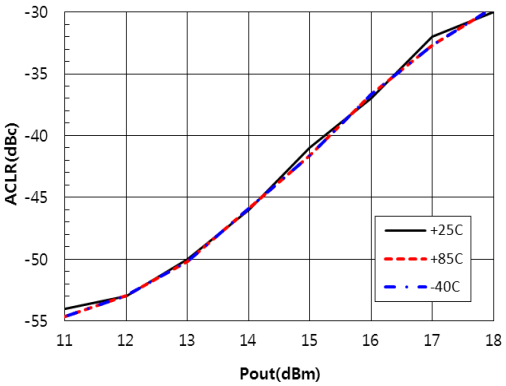


ACLR vs. Pout



Test condition: 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

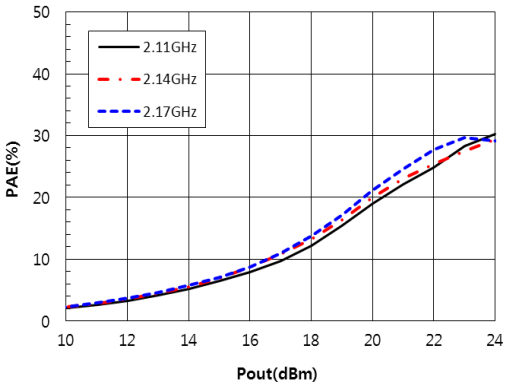
ACLR vs. Pout Over Temp. @ 2.14GHz



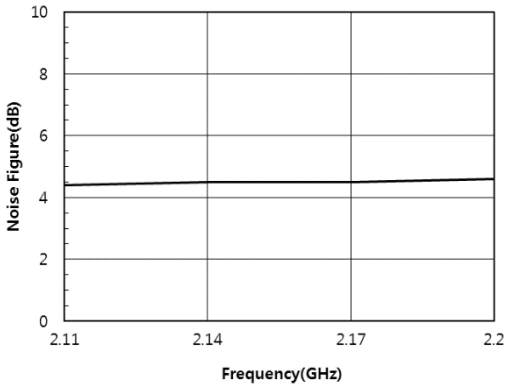
Test condition: 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

PAE, Noise Figure Performance at 2110~2170MHz

PAE vs. Pout



Noise Figure vs. Frequency, T=+25°C



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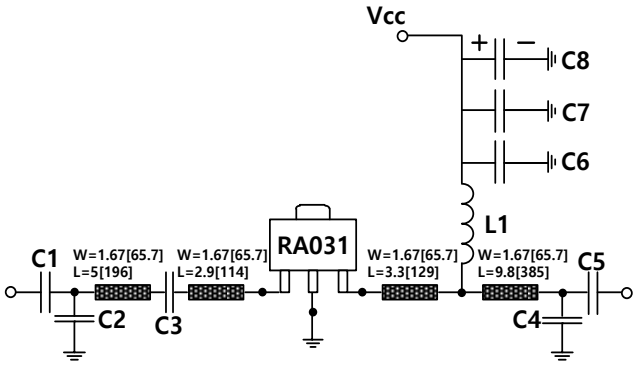
2300~2400MHz Reference Application Circuit



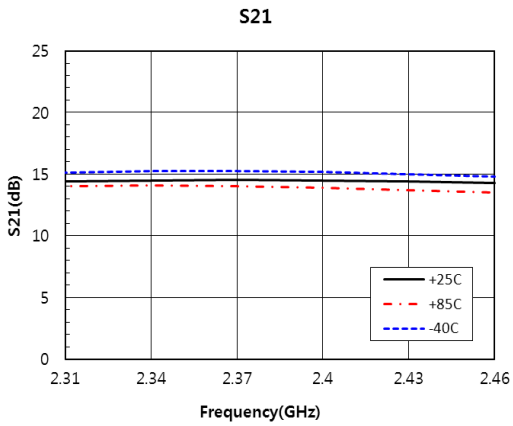
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	NA	C7	1000pF
C2	1.5pF	C5	10pF	C8	10uF
C3	1.5pF	C6	100pF	L1	12nH

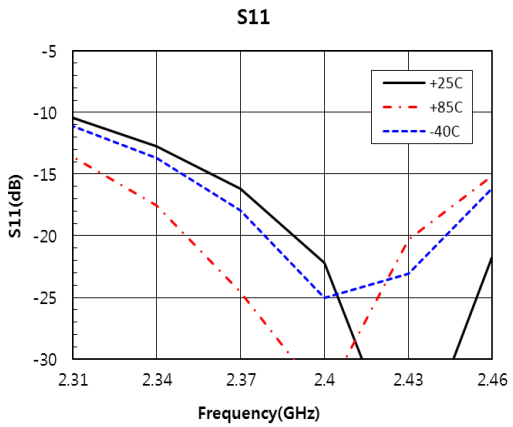
*Width and Length of Micro-strip line dimension in mm[mil]

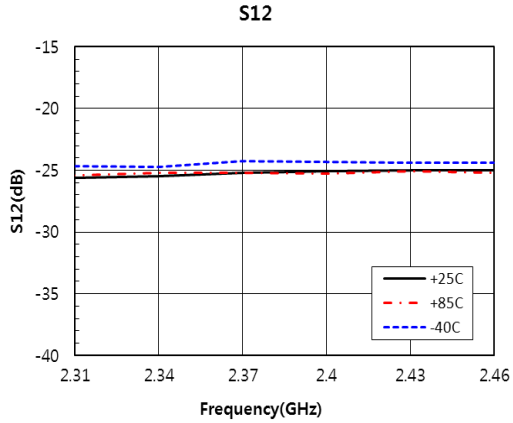
Parameter/Freq.(MHz)	2300	2350	2400	Unit
Small Signal Gain	14.5	14.4	14.4	dB
S11	-10.4	-15.1	-22.1	dB
S22	-16.5	-15.2	-13.5	dB
ACLR@Pout=14dBm*	-47.5	-46.2	-48.8	dBc
Output P1dB	25.0	24.3	24.4	dBm
Output OIP3**	39.1	39.1	40	dBm
Noise Figure	4.4	4.4	4.5	dB
Icq	81			mA
Vcc	5			V

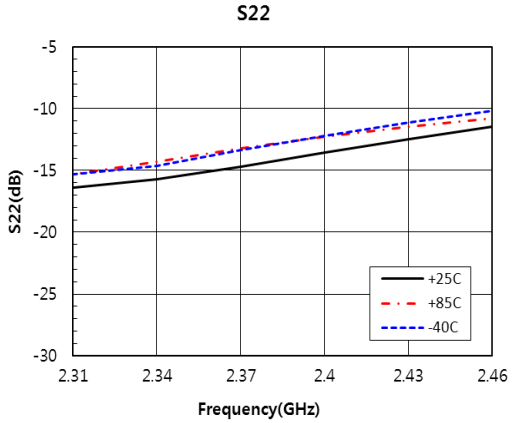
* 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA / ** Pout=14dBm/tone

S-Parameter Over Temperature vs. Freq. at 2300~2400MHz



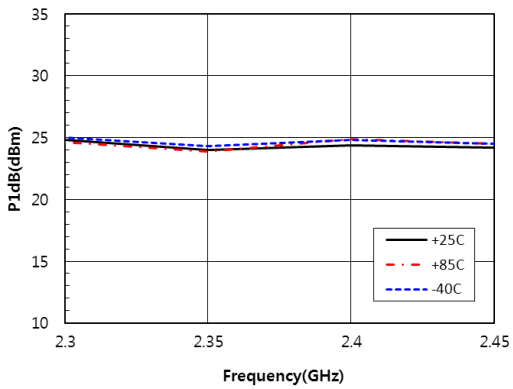




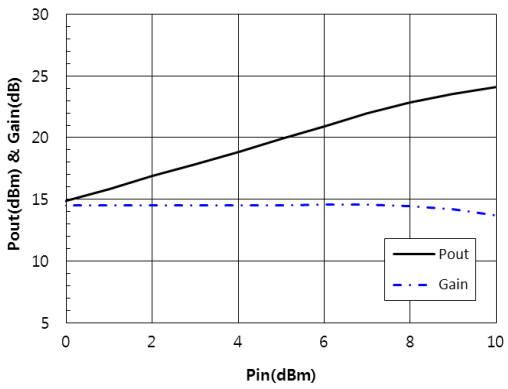


P1dB, OIP3, ACLR Performance at 2300~2400MHz

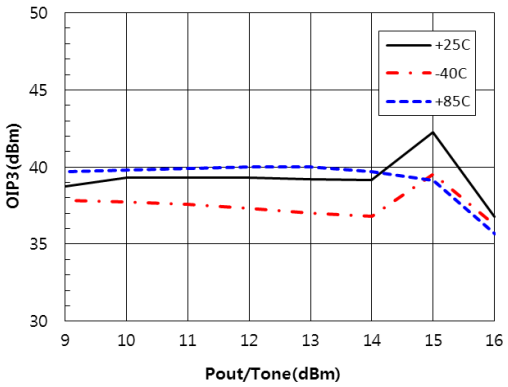
P1dB vs. Frequency



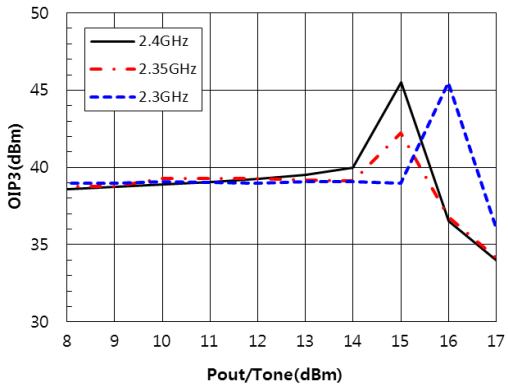
Pout vs. Pin @ 2.35GHz



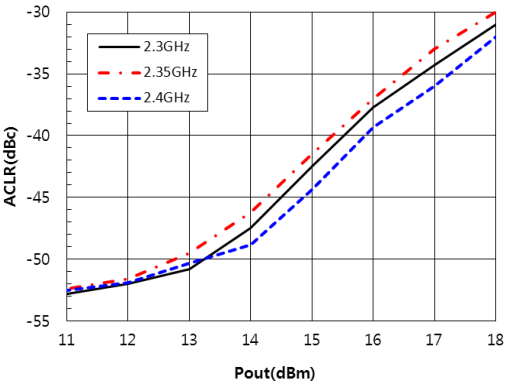
OIP3 vs. Pout Over Temp. @ 2.35GHz



OIP3 vs. Pout/Tone

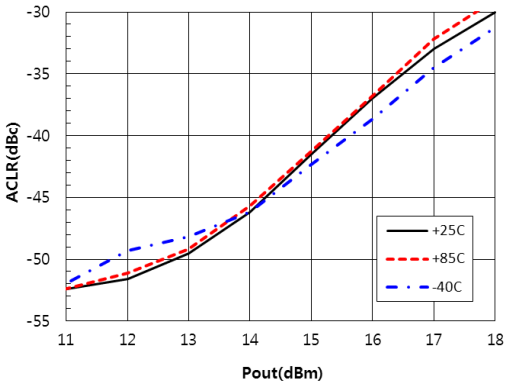


ACLR vs. Pout



Test condition: 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

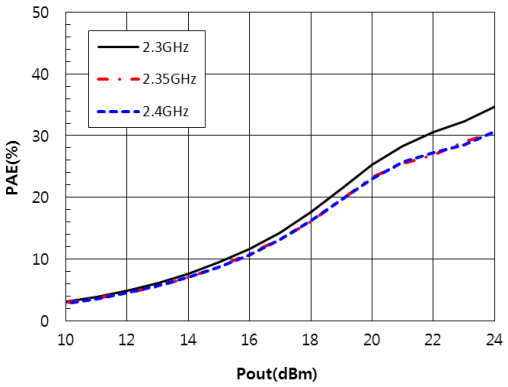
ACLR vs. Pout Over Temp. @ 2.35GHz



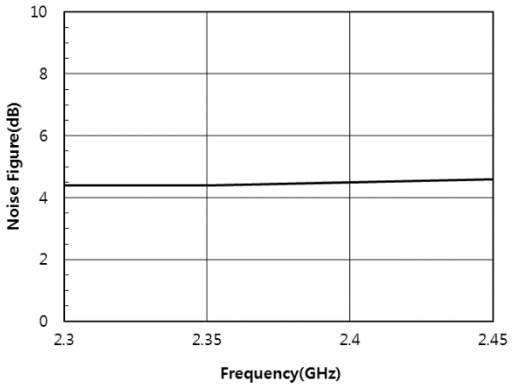
Test condition: 3GPP Test model 1+64 DPCH, PAR=10.3@0.01% Probability, 15.36MHz BW, 4FA

PAE, Noise Figure Performance at 2300~2400MHz

PAE vs. Pout



Noise Figure vs. Frequency, T=+25°C



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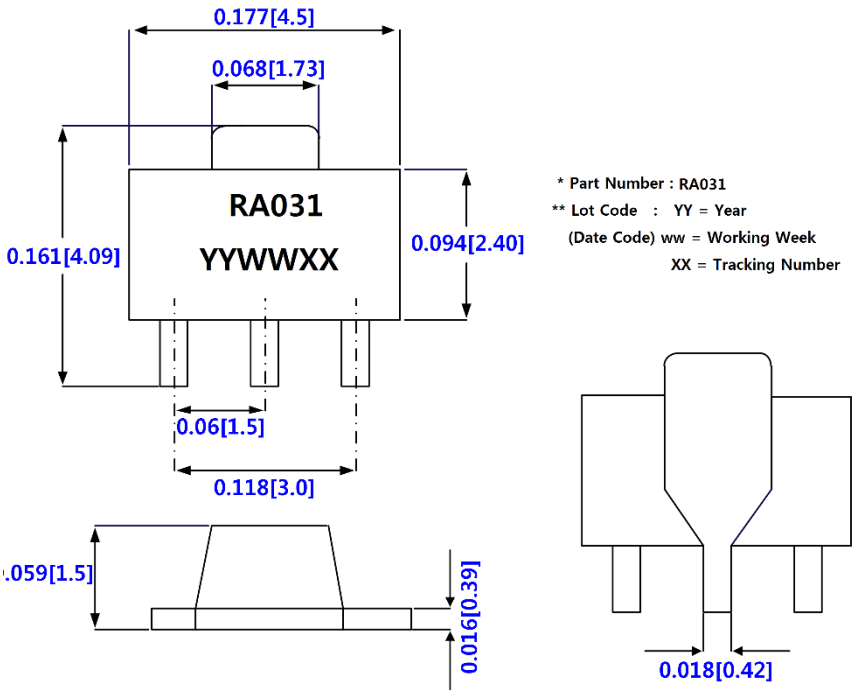
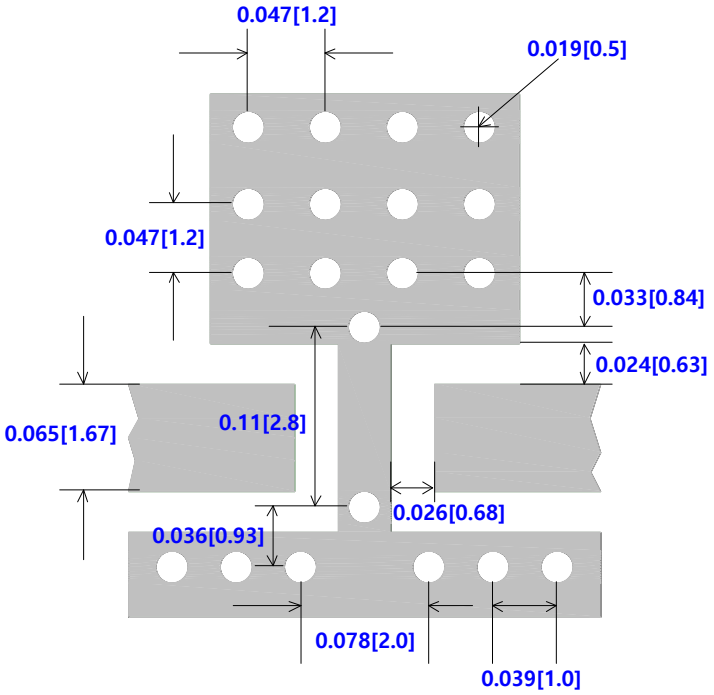
Package Mark and Dimensions

Dimension in inches[Millimeters]



Recommended PCB Pad Pattern

Dimension in inches[Millimeters]



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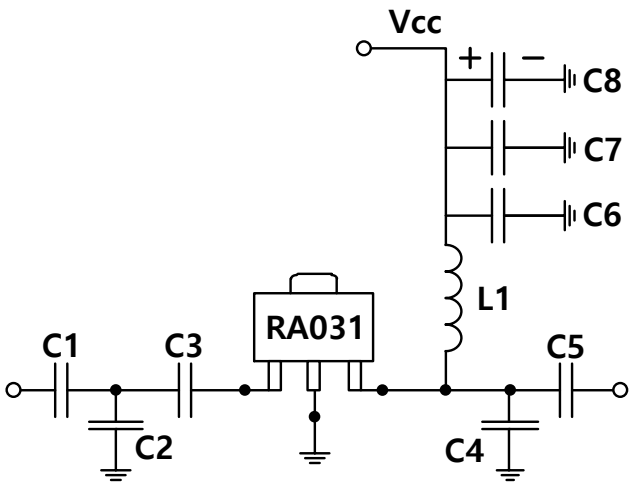
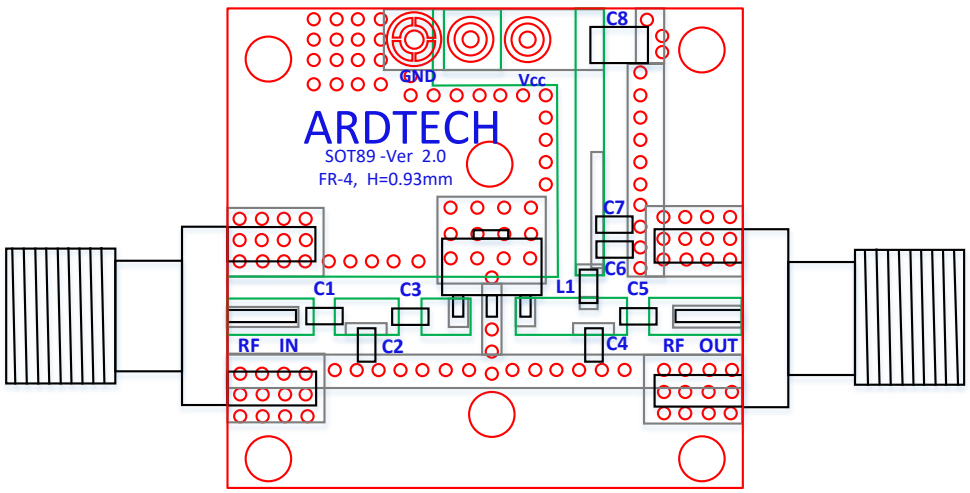
Application Schematic & BOM



Reference BOM Size	
C1	Chip Capacitor, 0603 type
C2	Chip Capacitor, 0603 type
C3	Chip Capacitor, 0603 type
C4	Chip Capacitor, 0603 type
C5	Chip Capacitor, 0603 type
C6	Chip Capacitor, 0603 type
C7	Chip Capacitor, 0603 type
C8	Tantalum Capacitor, 1206 type
L1	Wire-wound coil inductor, 0805 type

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.036[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RD103
700-1000MHz
Reactive Power Splitter

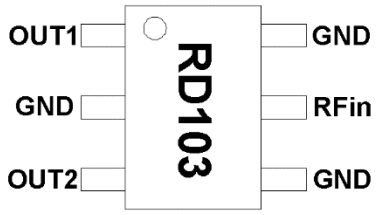
Product Description

RD103 is a monolithic two-way in-phase Wilkinson power splitter designed for applications require low loss, high isolation, good in/out matching and exceptional phase/amplitude balance. This product is built with Lead-Free and RoHS Compliant.

Features

- Isolation 23dB at 900MHz
- Insertion loss 3.65dB at 900MHz
- 50 Ω Characteristic Impedance
- Lead-free, RoHS compliant, Green

Component Diagram



Applications

- Base station Infrastructure
- Wireless Infrastructure

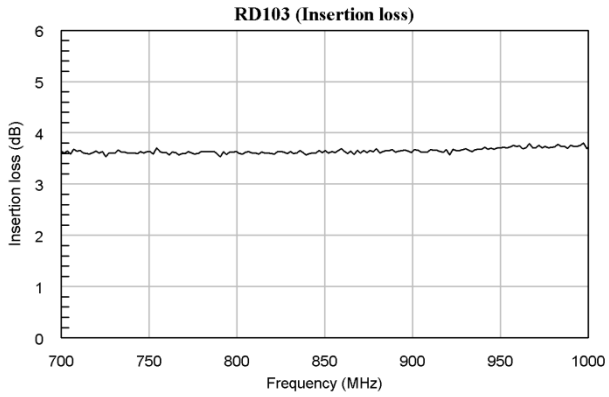
Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Insertion Loss / Isolation		3.64 / -17.0		700MHz	dB
		3.62 / -24.6		800MHz	dB
		3.65 / -23.2		900MHz	dB
		3.72 / -16.5		1000MHz	dB
IRL / ORL		-22.3/ -21.9		700MHz	dB
		-38.7 / -23.3		800MHz	dB
		-22.2 / -24.5		900MHz	dB
		-15.8 / -25.8		1000MHz	dB
Amplitude Balance / Phase Balance		0.031 / 0.24		700MHz	dB / deg
		0.021 / 0.20		800MHz	dB / deg
		0.035 / 0.20		900MHz	dB / deg
		0.037 / 0.10		1000MHz	dB / deg

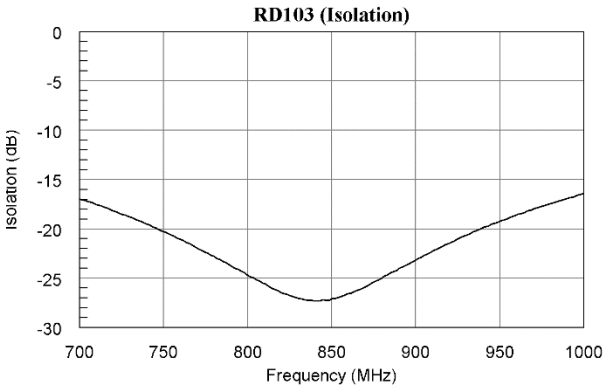
Absolute Maximum Ratings

Parameter	Rating	Unit
Input power	30 (CW)	dBm
Operating Temperature(T_L)	-40 to +85	℃
Storage Temperature	-65 to +150	℃

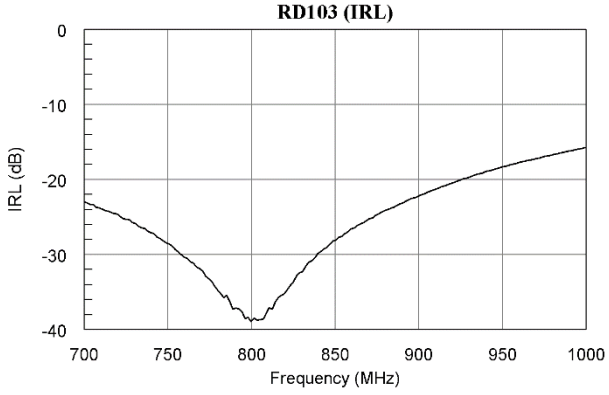
ATTENTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE DEVICES

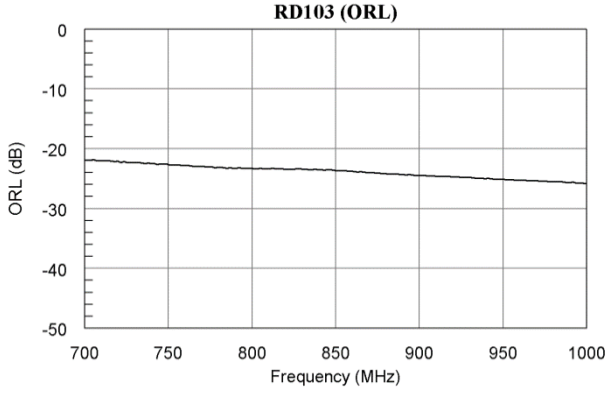
Insertion Loss, Isolation vs. Frequency



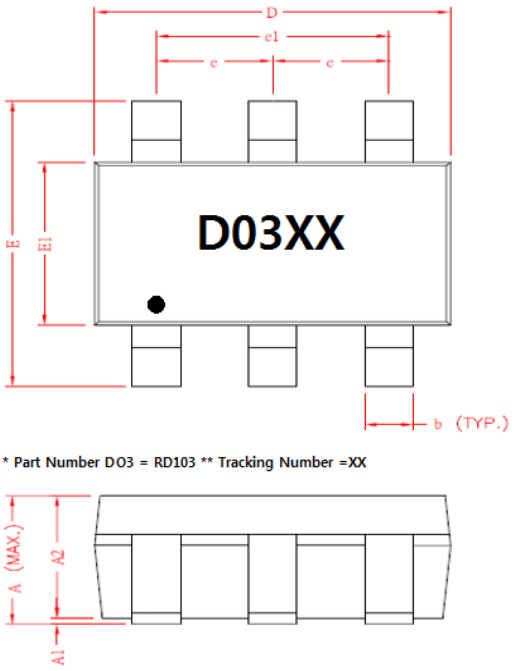


In/Out Return Loss vs. Frequency





Package Mark and Dimensions

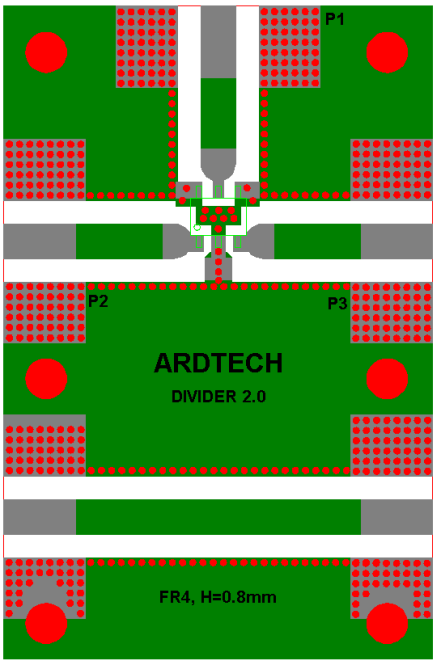


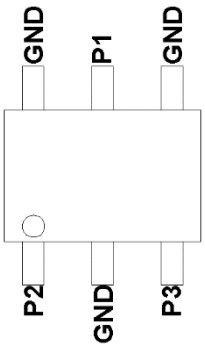
Package Dimension

REF	Millimeter	
	Min.	Max.
A		1.45
A1	0	0.1
A2	1.1	1.3
b	0.3	0.5
c	0.12 REF.	
D	2.7	3.1
E	2.6	3
E1	1.4	1.8
e	0.95 REF.	
e1	1.9 REF.	

Evaluation PCB Information

Evaluation PCB Layout





PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.037[0.93]
Copper Thickness	1 oz.

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

NOTE

ARDTECH
ADVANCED RADIO DEVICE

RD104
1700-2500MHz
Reactive Power Splitter

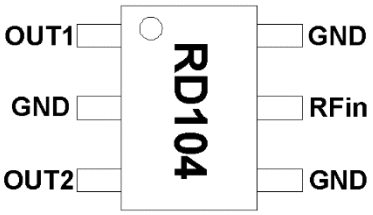
Product Description

RD104 is a monolithic two-way in-phase Wilkinson power splitter designed for applications require low loss, high isolation, good in/out matching and exceptional phase/amplitude balance. This product is built with Lead-Free and RoHS Compliant.

Features

- Isolation 28dB at 2100MHz
- Insertion loss 3.64dB at 2100MHz
- 50 Ω Characteristic Impedance
- Lead-free, RoHS compliant, Green

Component Diagram



Applications

- Base station Infrastructure
- Wireless Infrastructure

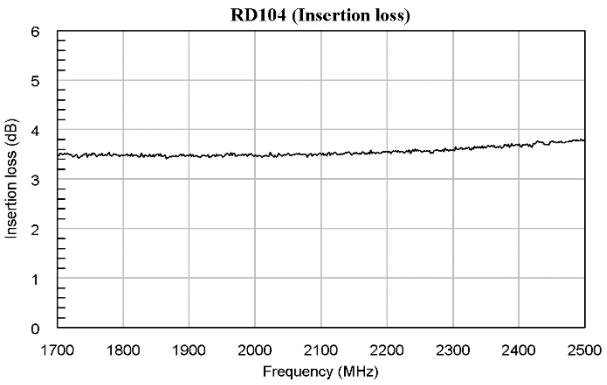
Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Insertion Loss / Isolation		3.59 / -15.0		1700MHz	dB
		3.59/ -20.6		1900MHz	dB
		3.64 / -28.0		2100MHz	dB
		3.86 / -16.2		2400MHz	dB
IRL / ORL		-17.7/ -22.1		1700MHz	dB
		-17.1 / -29.7		1900MHz	dB
		-14.8 / -34.9		2100MHz	dB
		-10.9 / -20.4		2400MHz	dB
Amplitude Balance / Phase Balance		0.035 / 0.20		1700MHz	dB / deg
		0.028 / 0.10		1900MHz	dB / deg
		0.014 / 0.10		2100MHz	dB / deg
		0.065 / 0.12		2400MHz	dB / deg

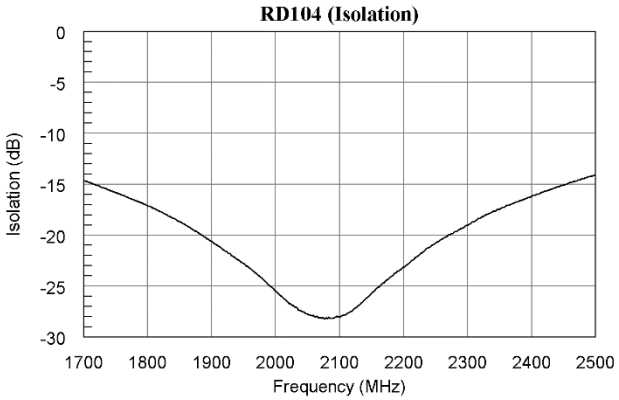
Absolute Maximum Ratings

Parameter	Rating	Unit
Input power	30 (CW)	dBm
Operating Temperature(T_L)	-40 to +85	℃
Storage Temperature	-65 to +150	℃

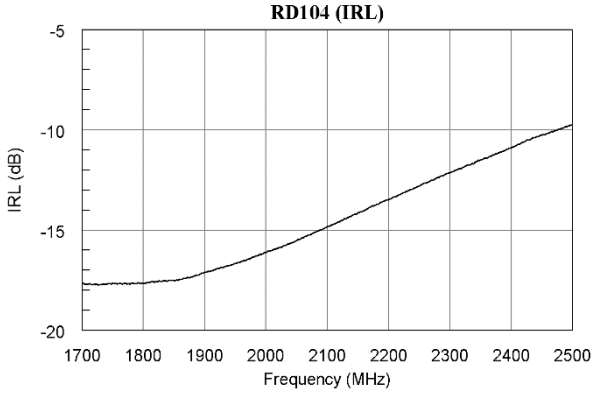
ATTENTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE DEVICES

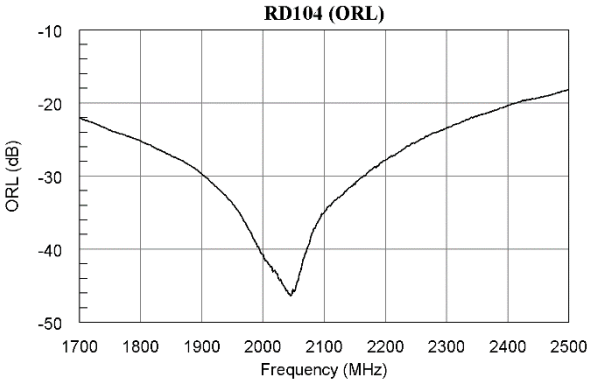
Insertion Loss, Isolation vs. Frequency



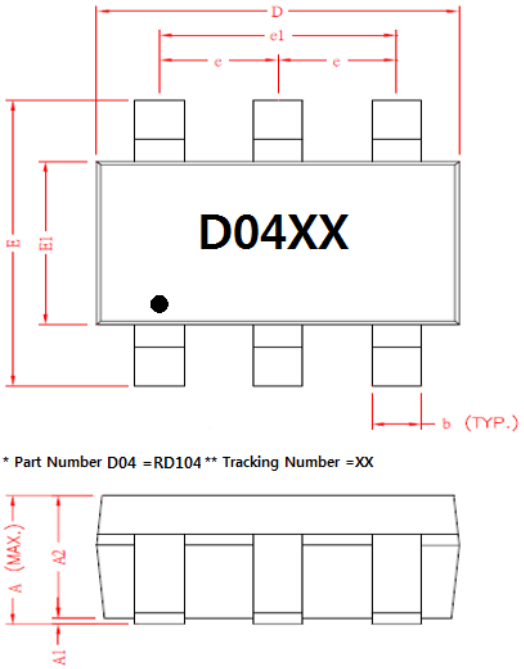


In/Out Return Loss vs. Frequency





Package Mark and Dimensions

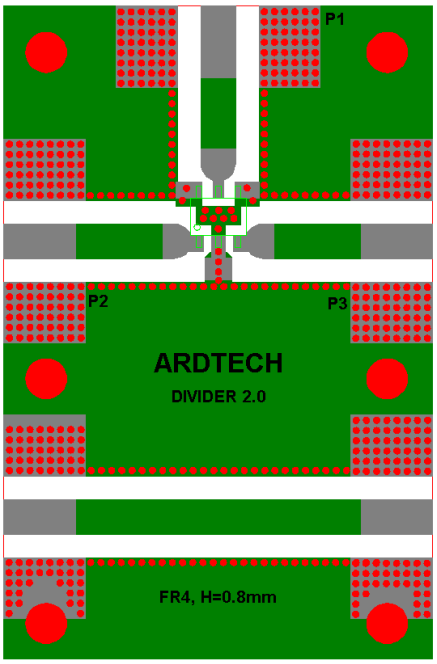


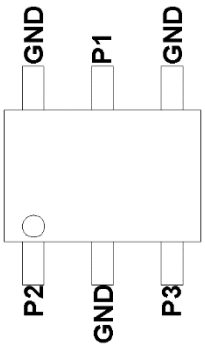
Package Dimension

REF	Millimeter	
	Min.	Max.
A		1.45
A1	0	0.1
A2	1.1	1.3
b	0.3	0.5
c	0.12 REF.	
D	2.7	3.1
E	2.6	3
E1	1.4	1.8
e	0.95 REF.	
e1	1.9 REF.	

Evaluation PCB Information

Evaluation PCB Layout





PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.037[0.93]
Copper Thickness	1 oz.

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

NOTE

ARDTECH
ADVANCED RADIO DEVICE

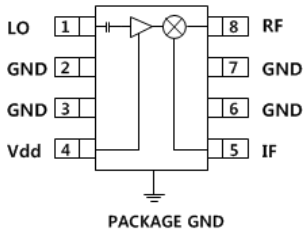
RM101

HIGH IIP3 GaAs MMIC MIXER With INTEGRATED LO AMPLIFIER, 700 – 1500MHz

Product Description

RM101 can use at 3.3V to 5V. It is a high dynamic range passive MMIC mixer with an integrated LO amplifier in a plastic surface mount 8 lead Mini Small Outline Package (MSOP) covering 700MHz to 1500MHz. It has excellent input IP3 performance of +32.3dBm at 3.3V. RM101 is pin to pin compatible with RM102 which is 1700-2400MHz Mixers with LO amplifiers.

Component Diagram



Features

- + 32.35 dBm input IP3 at 3.3V
- Conversion Loss : 9.1 dB
- Single Positive Supply : 22mA @ 3.3V
- Low LO drive level: -2 to +4dBm
- Available 3.0 to 5 V single voltage
- High ESD level: Class 1B
- Lead-free, RoHS compliant, Green

Applications

- High Dynamic Range Infrastructure system
- GSM GPRS & EDGE
- CDMA & WCDMA
- Cable Modem Termination Systems

Parameter	3.3V		5.0V		Units
Frequency Range. RF	0.8 – 1.1	0.7 – 1.5	0.8 – 1.1	0.7 – 1.5	GHz
Frequency Range. LO	0.8 – 1.1	0.7 – 1.5	0.8 – 1.1	0.7 – 1.5	GHz
Frequency Range. IF	DC-350				MHz
Conversion Loss	TYP 9.2 MAX 10.5				dB
Noise Figure(SSB)	TYP 9.2 MAX 10.5				dB
LO to RF Isolation	-14	-12.8	-14.6	-15.6	dB
LO to IF Isolation	-22	-23	-24	-27.2	dB
RF to IF Isolation	-11.6	-17.5	-13.7	-16	dB
IP3(Input)	32.1	32.35	30	31	dBm
Pin1dB	24	22	24.4	23.6	dBm
LO Input Drive Level (Typical)	0				dBm
Supply Current	22		34		

Test condition: LO = 0dBm, IF = 70MHz, T_L=25°C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

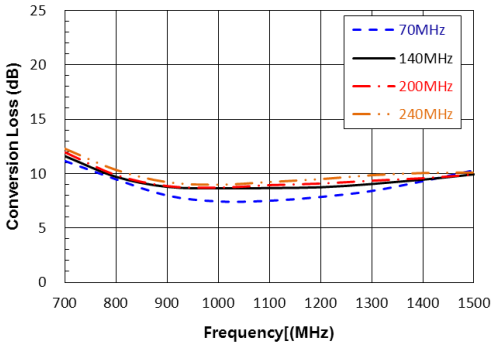
Absolute Maximum Ratings

Parameter	Rating	Unit
Max RF/IF Input Power	27	dBm
Max LO Drive Input Power	10	dBm
Max Device Voltage(V_D)	6.5	V
Max Operating Dissipated Power	0.5	W
Junction Temperature(T_J)	150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1B	
Moisture Sensitivity Level	MSL1	

Performances at 3.3V

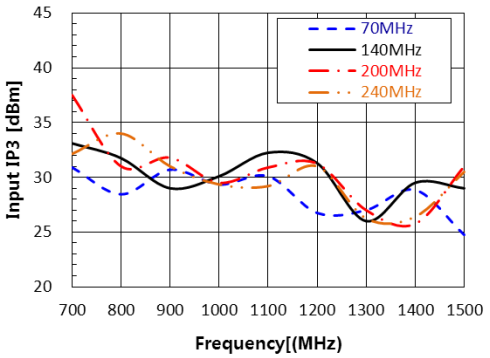
Conversion Loss vs. RF Freq vs. IF Freq

+25℃ LO = 0dBm, low-side LO



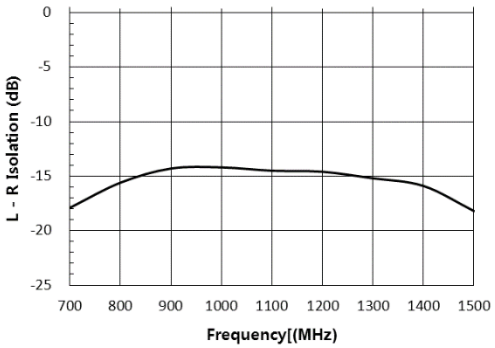
Input IP3 vs. RF Freq vs. IF Freq

+25℃ LO = 0dBm, low-side LO



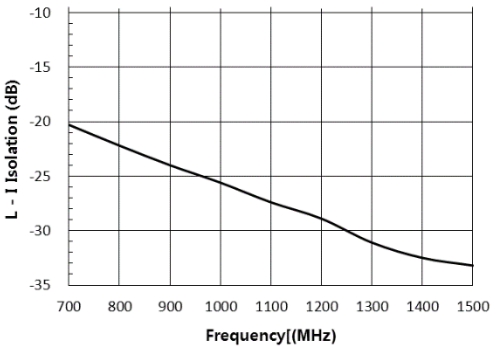
L - R Isolation vs. LO Freq

Referenced with LO = 0dBm



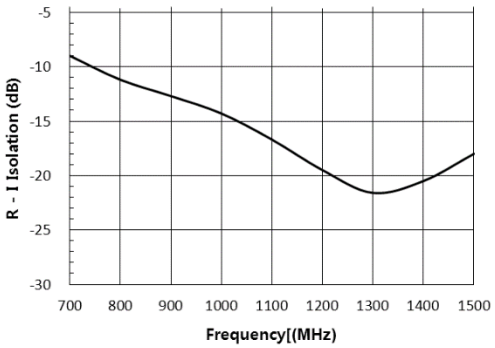
L - I Isolation vs. LO Freq

Referenced with LO = 0dBm



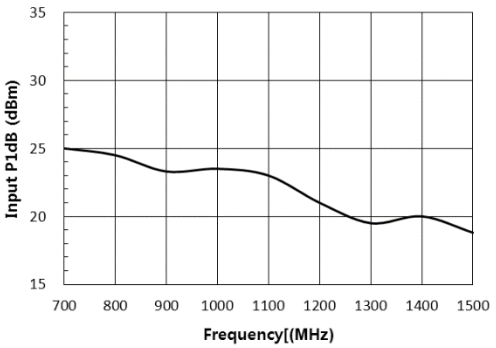
R - I Isolation vs. LO Freq

Referenced with LO = 0dBm



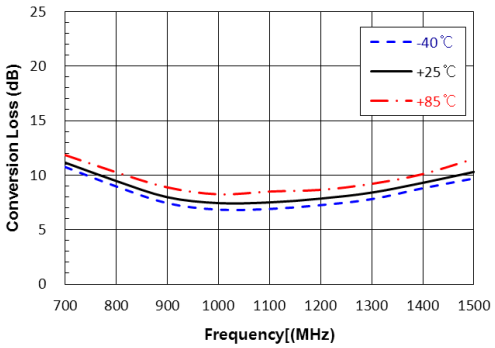
Input P1dB vs. RF Frequency

+25℃ LO = 0dBm, IF = 70MHz, low-side LO

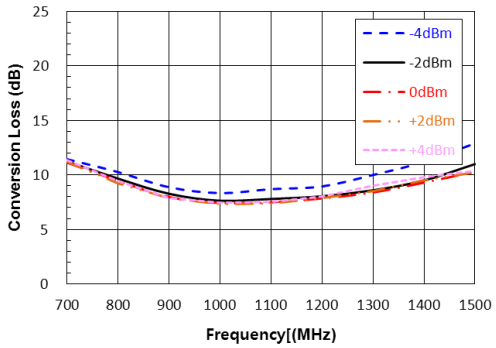


Performances at 3.3V

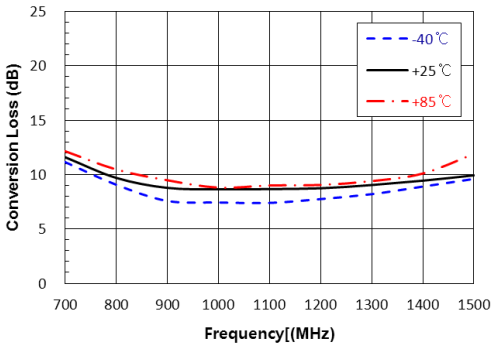
Conversion Loss vs. RF Freq vs. IF Freq
LO = 0dBm, IF = 70MHz, low-side LO



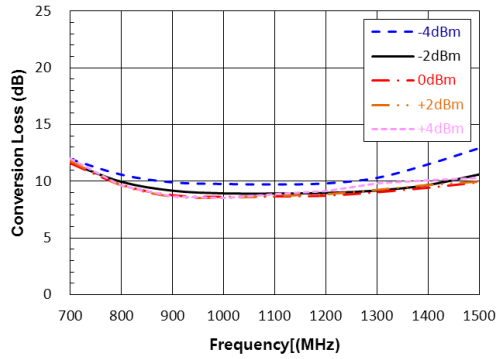
Conversion Loss vs. RF Freq vs. IF Freq
+25℃. IF = 70MHz, low-side LO



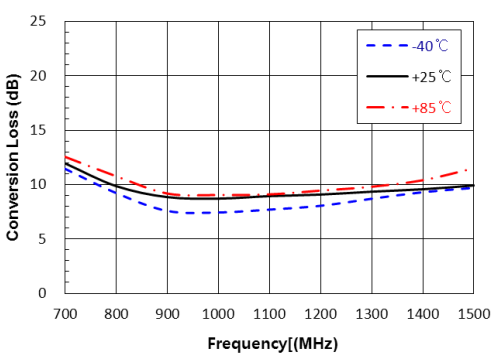
Conversion Loss vs. RF Freq vs. IF Freq
LO = 0dBm, IF = 140MHz, low-side LO



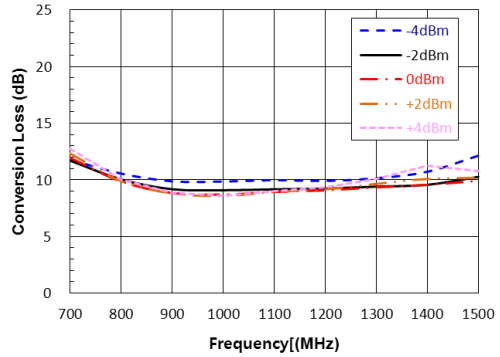
Conversion Loss vs. RF Freq vs. IF Freq
+25℃. IF =140MHz, low-side LO



Conversion Loss vs. RF Freq vs. IF Freq
LO = 0dBm, IF = 200MHz, low-side LO



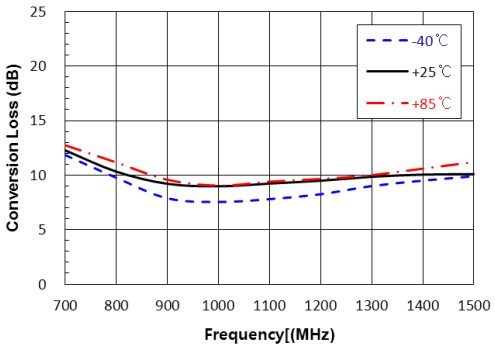
Conversion Loss vs. RF Freq vs. IF Freq
+25℃. IF =200MHz, low-side LO



Performances at 3.3V

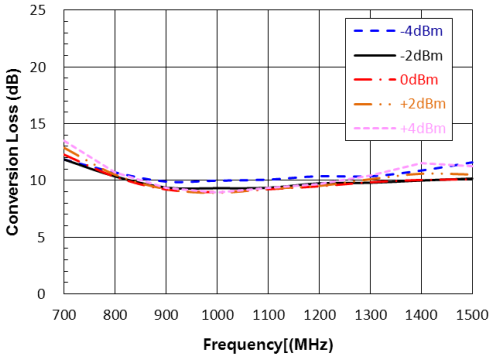
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 240MHz, low-side LO



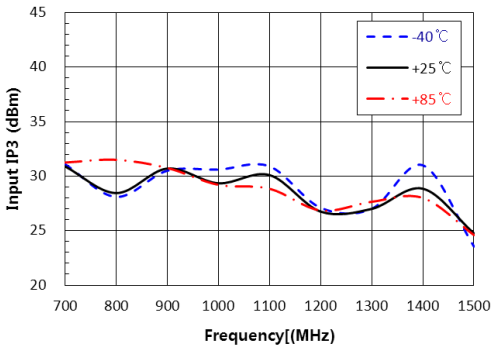
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =240MHz, low-side LO



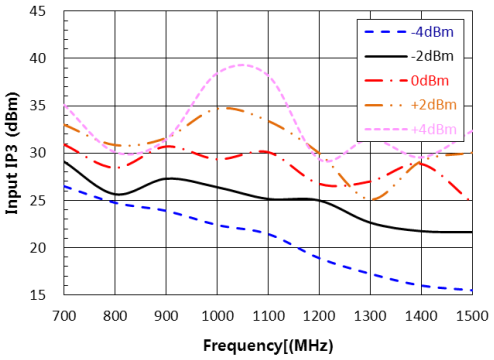
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 70MHz, low-side LO



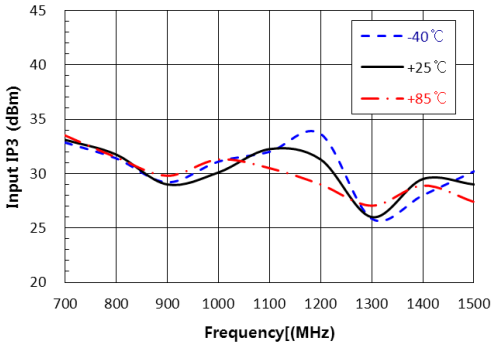
Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 70MHz, low-side LO



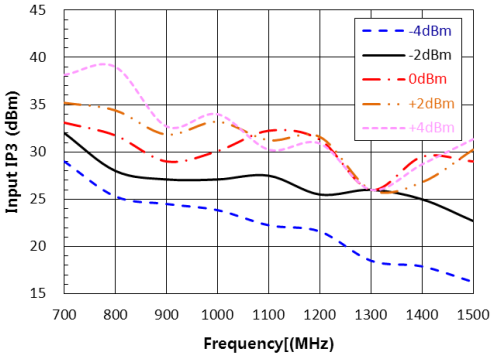
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 140MHz, low-side LO



Input IP3 vs. RF Freq vs. LO Power

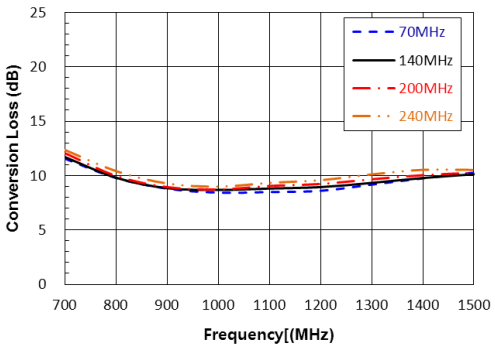
+25℃. IF = 140MHz, low-side LO



Performances at 5.0V

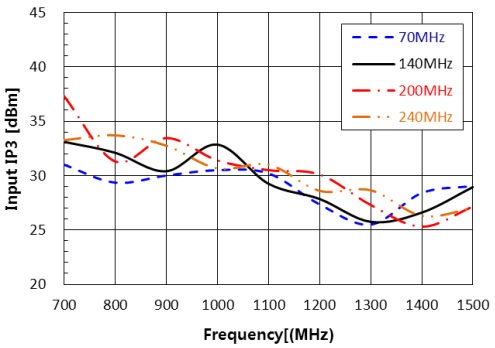
Conversion Loss vs. RF Freq vs. IF Freq

+25°C. LO = 0dBm, low-side LO



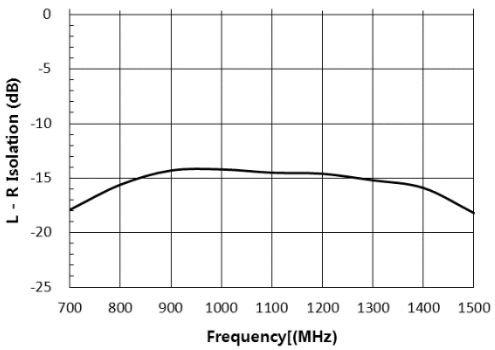
Input IP3 vs. RF Freq vs. IF Freq

+25°C LO = 0dBm, low-side LO



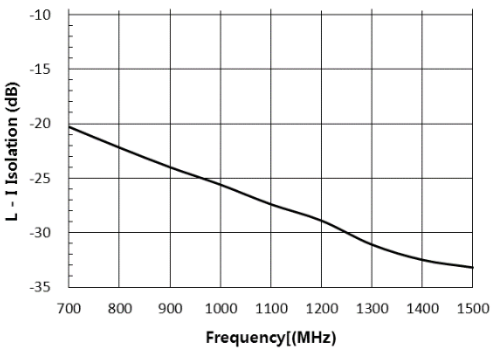
L - R Isolation vs. LO Freq

Referenced with LO = 0dBm



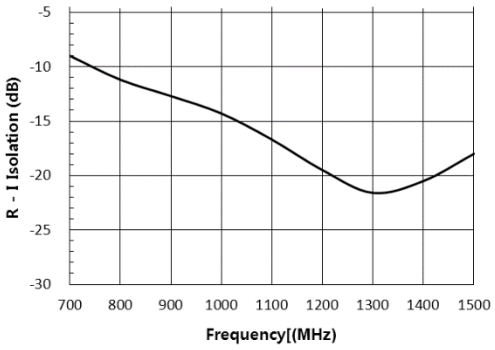
L - I Isolation vs. LO Freq

Referenced with LO = 0dBm



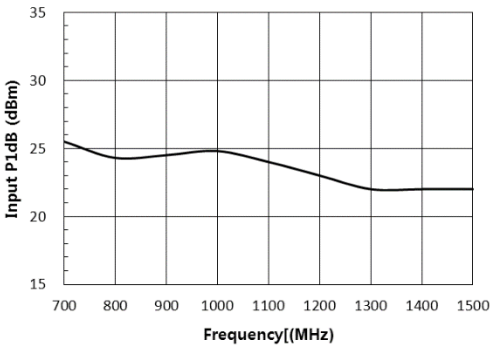
R - I Isolation vs. LO Freq

Referenced with LO = 0dBm



Input P1dB vs. RF Frequency

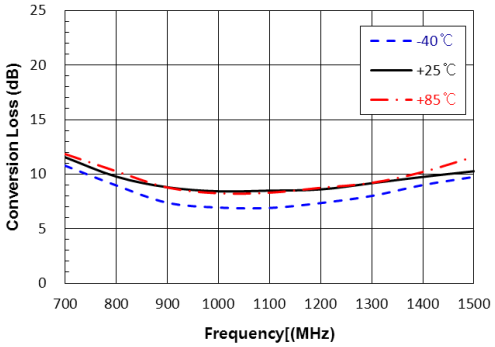
+25°C LO = 0dBm, IF = 70MHz, low-side LO



Performances at 5.0V

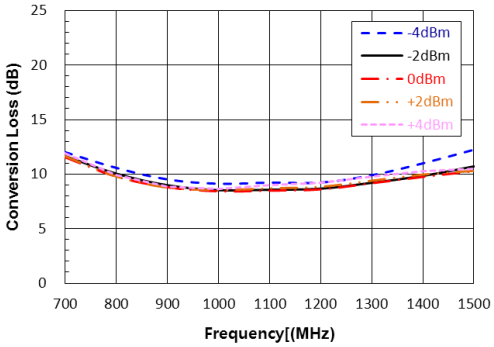
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 70MHz, low-side LO



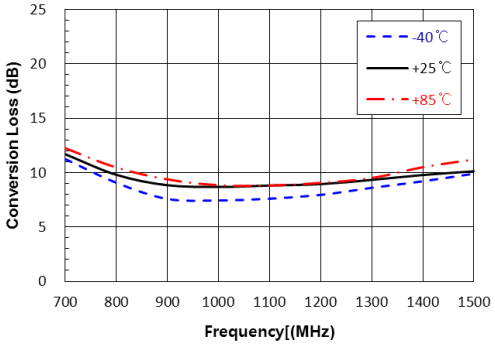
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF = 70MHz, low-side LO



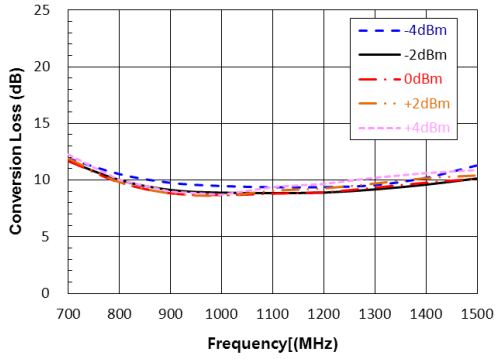
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 140MHz, low-side LO



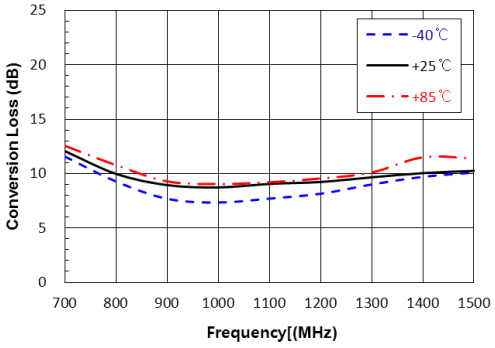
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =140MHz, low-side LO



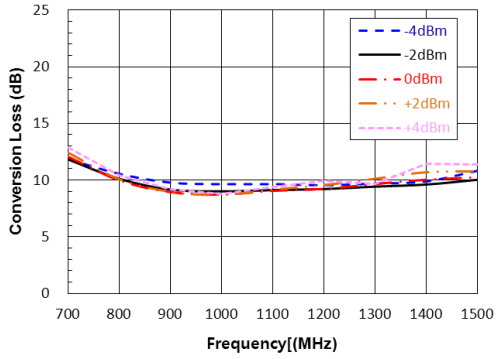
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 200MHz, low-side LO



Conversion Loss vs. RF Freq vs. IF Freq

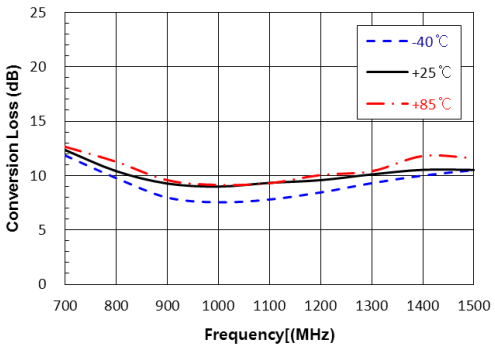
+25℃. IF =200MHz, low-side LO



Performances at 5.0V

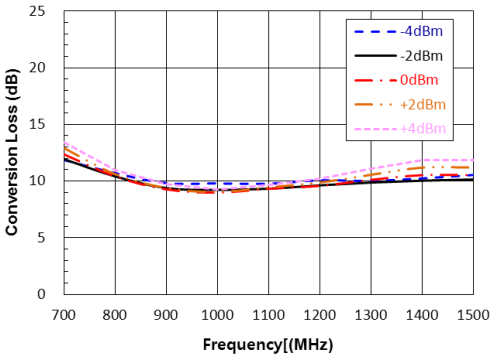
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 240MHz, low-side LO



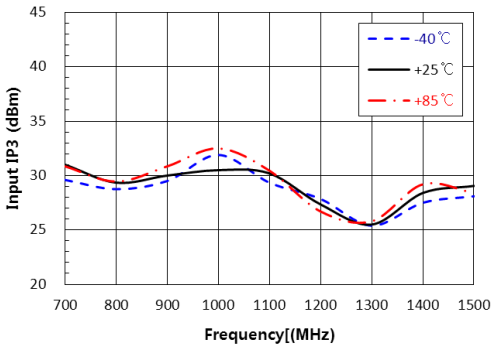
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =240MHz, low-side LO



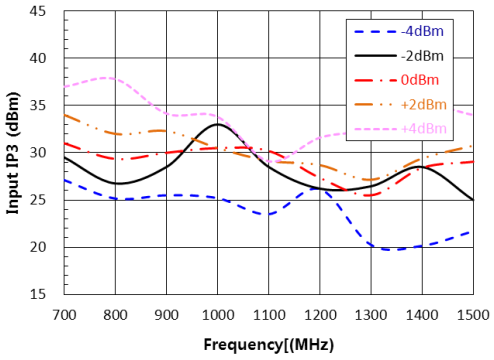
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 70MHz, low-side LO



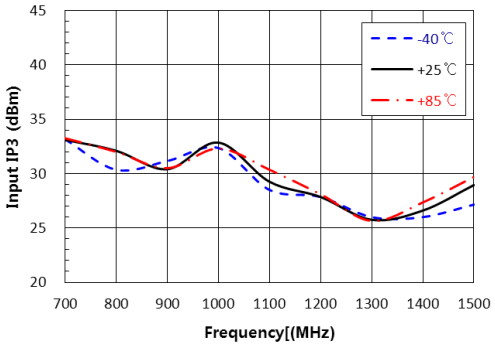
Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 70MHz, low-side LO



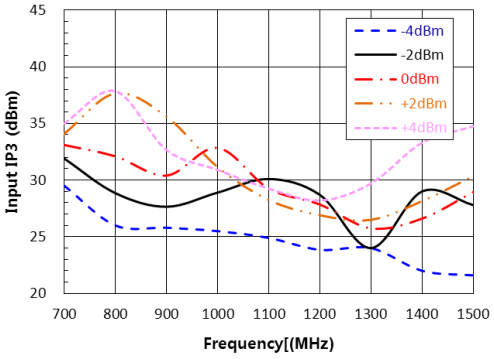
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 140MHz, low-side LO



Input IP3 vs. RF Freq vs. LO Power

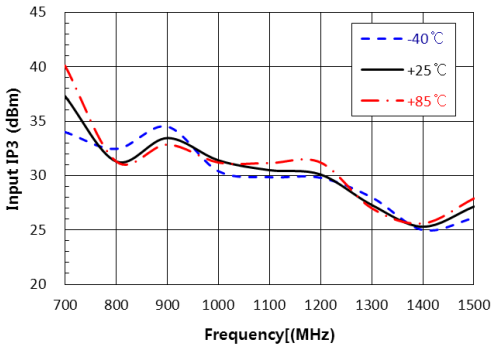
+25℃. IF = 140MHz, low-side LO



Performances at 5.0V

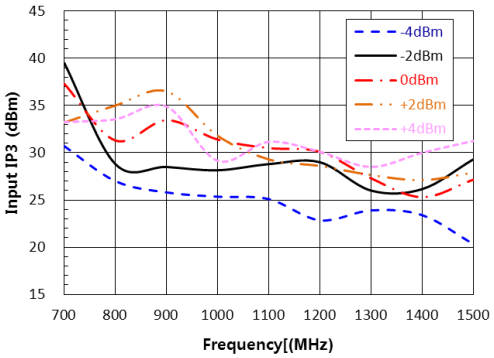
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 200MHz, low-side LO



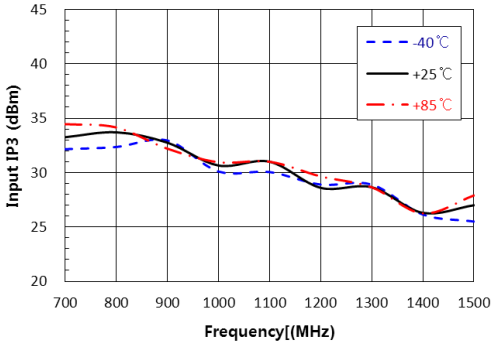
Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 200MHz, low-side LO



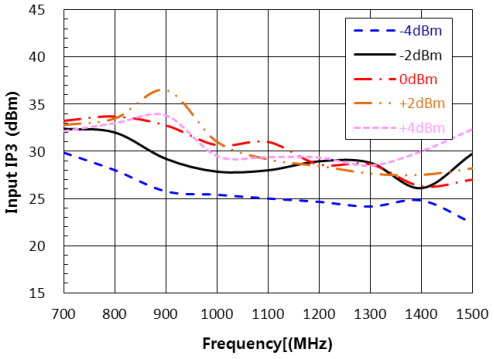
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 240MHz, low-side LO

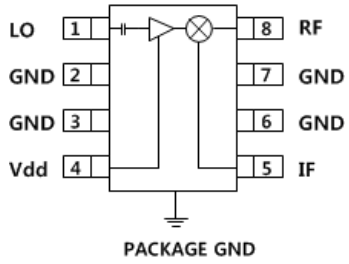


Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 240MHz, low-side LO

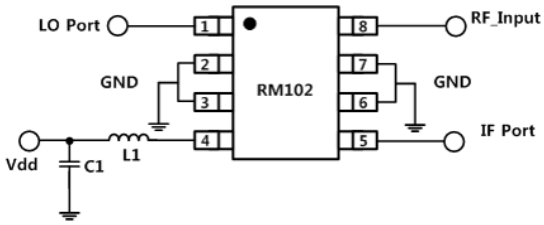


Pin Configuration and Description



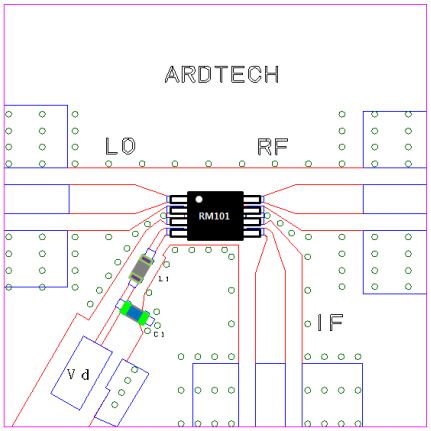
Pin No.	Symbol	Description
1	LO	Local Oscillator Input, Internally DC Block
2,3,6,7	GND	RF/DC Ground
4	Vdd	Supply Voltage,
5	IF	Intermediate Frequency
8	RF	Radio Frequency
Backside Plate	GND	RF/DC Ground. Follow recommended via pattern and ensure good solder attach for best thermal and electrical performance.

Application Circuit



Test condition : L1=33nH, C1=100pF

Evaluation PCB Layout



Harmonics of LO

LO Freq GHz	3.3V			
	1	2	3	4
0.5	30.6	26.1	42.9	30.3
0.6	25.1	21.0	33.7	26.9
0.7	23.5	19.5	34.3	25.2
0.8	17.6	18.3	24.8	28.3
0.9	15.7	18.6	26.2	25.1
1.0	14.6	19.6	24.2	27.1

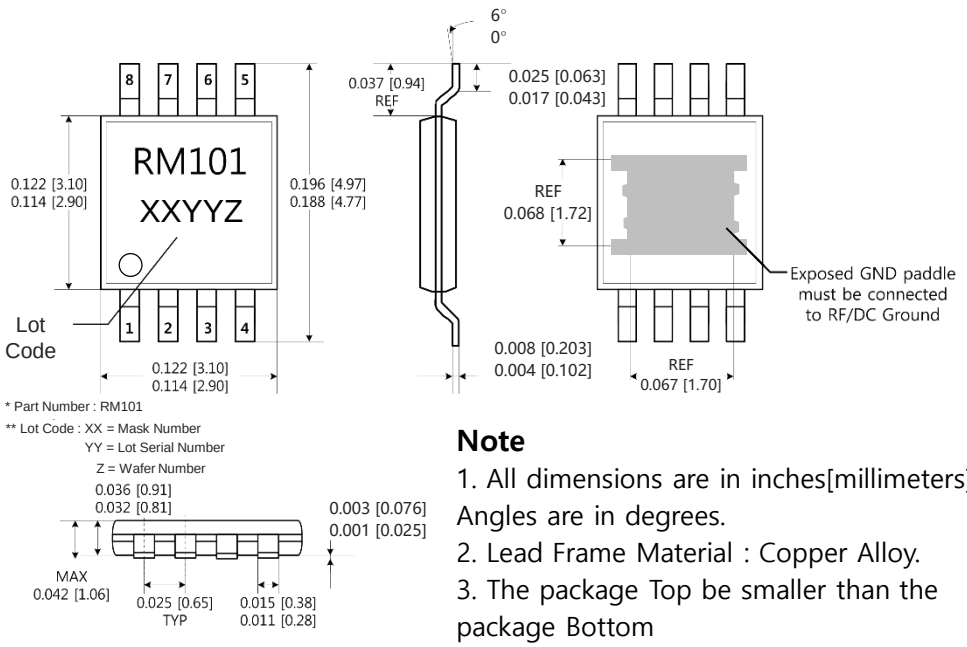
LO power = 0 dBm
All values in dBc below input LO level measured at RF port

LO Freq GHz	5V			
	1	2	3	4
0.5	28.6	26.3	43.2	30
0.6	23.3	21.5	61.3	26
0.7	20.1	19.1	44.5	24.8
0.8	16.7	17.5	38.4	24.8
0.9	14.9	16.6	34.3	22.4
1.0	14.1	16.6	27.6	23.7

LO power = 0 dBm
All values in dBc below input LO level measured at RF port

Package Mark and Dimensions

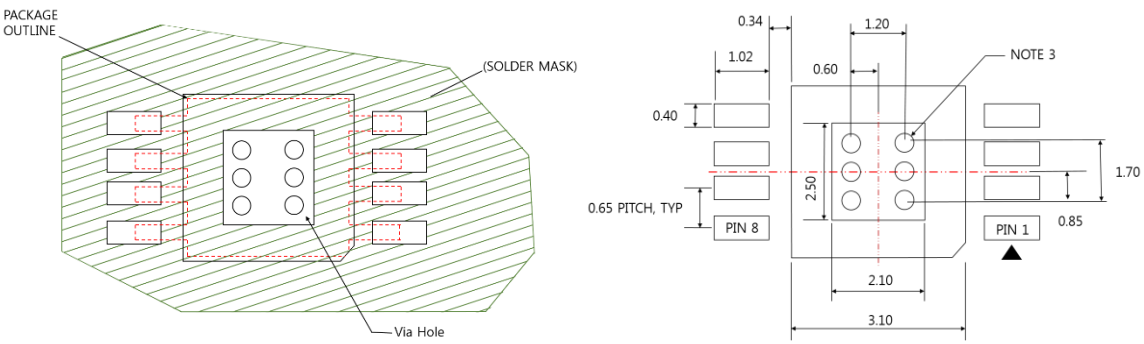
Dimension in inches[Millimeters]



Note

1. All dimensions are in inches[millimeters]. Angles are in degrees.
2. Lead Frame Material : Copper Alloy.
3. The package Top be smaller than the package Bottom

PCB Mounting Pattern



Note

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. We recommend a 0.35mm diameter bit for drilling via holes and a final plated thru diameter of 0.25mm.
4. If possible, the recommended thickness of metal mask is 0.12mm

NOTE

ARDTECH
ADVANCED RADIO DEVICE

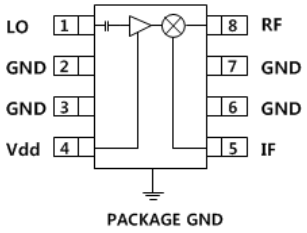
RM102

HIGH IIP3 GaAs MMIC MIXER With INTEGRATED LO AMPLIFIER, 1700 – 2400MHz

Product Description

RM102 can use at 3.3V to 5V. It is a high dynamic range passive MMIC mixer with an integrated LO amplifier in a plastic surface mount 8 lead Mini Small Outline Package (MSOP) covering 1700 to 2400MHz. It has excellent input IP3 performance of +30.5dBm at 3.3V. Conversion Loss is 9dBm Typical. RM102 is pin to pin compatible with RM101 which is 700-1500MHz Mixers with LO amplifiers.

Component Diagram



Features

- + 30.5 dBm input IP3
- Conversion Loss : 9.0 dB
- Single Positive Supply : 23mA @ 3.3V
- Low LO drive level: -2 to +4dBm
- Available 3.0 to 5 V single voltage
- High ESD level: Class 1B
- Lead-free, RoHS compliant, Green

Applications

- High Dynamic Range Infrastructure system
- GSM GPRS & EDGE
- CDMA & WCDMA
- Cable Modem Termination Systems

Parameter	3.3 V			5 V			Units
Frequency Range. RF	1.7 – 1.9	1.9 – 2.1	2.1 – 2.4	1.7 - 2.9	1.9 - 2.1	2.1 – 2.4	GHz
Frequency Range. LO	1.7 – 1.8	1.8 – 2.0	2.0 – 2.2	1.7 – 1.8	1.8 - 2.0	2.0 – 2.2	GHz
Frequency Range. IF	50 - 300						MHz
Conversion Loss	TYP 9.3 MAX 10.5						dB
Noise Figure(SSB)	TYP 9.3 MAX 10.5						dB
LO to RF Isolation	-7.8	-6.8	-7	-8	-8	-8.6	dB
LO to IF Isolation	-16	-13.4	-13.5	-16	-13.4	-13.5	dB
RF to IF Isolation	-12.8	-17	-15	-15	-17.2	-15.3	dB
IP3(Input)	28.5	30.5	30	27.6	29.5	29.5	dBm
Pin1dB	20.5	20	18	22	20	18	dBm
LO Input Drive Level(Typical)	0						dBm

Test condition: Vcc = 3.3 V, I_D=23mA, Vcc=5V, I_D=35mA, Typ., LO = 0dBm, IF = 200MHz, T_L=25°C, Z_S=Z_L=50

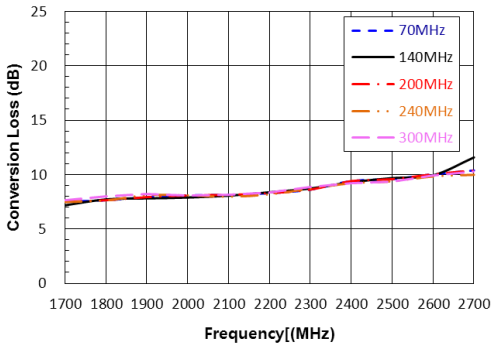
Absolute Maximum Ratings

Parameter	Rating	Unit
Max RF/IF Input Power	27	dBm
Max LO Drive Input Power	10	dBm
Max Device Voltage(V_D)	6.5	V
Max Operating Dissipated Power	0.5	W
Junction Temperature(T_J)	150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1B	
Moisture Sensitivity Level	MSL1	

Performances at 3.3V

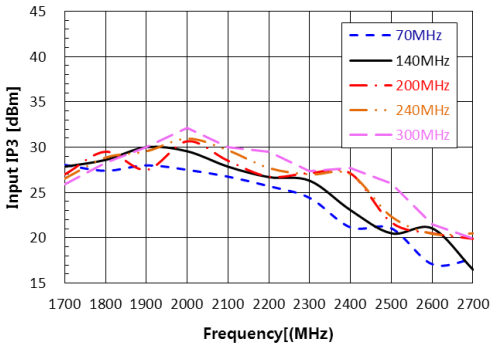
Conversion Loss vs. RF Freq vs. IF Freq

+25℃ LO = 0dBm, low-side LO



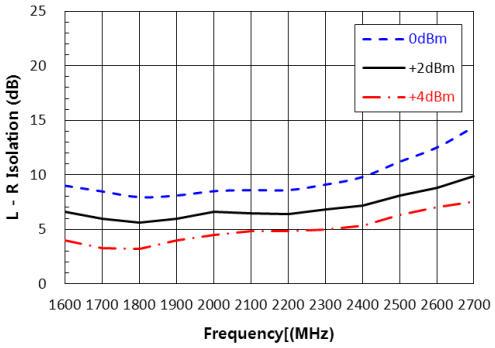
Input IP3 vs. RF Freq vs. IF Freq

+25℃ LO = 0dBm, low-side LO



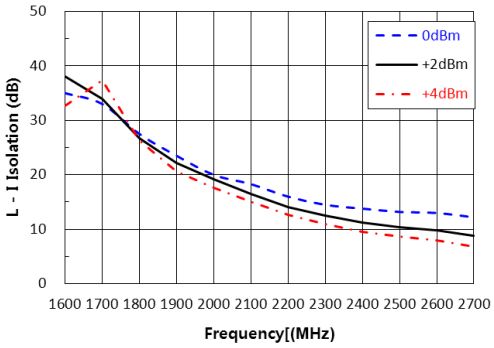
L - R Isolation vs. LO Freq

+25℃ Referenced with



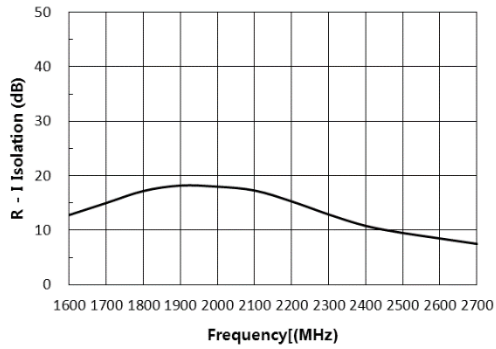
L - I Isolation vs. LO Freq

+25℃ Referenced with



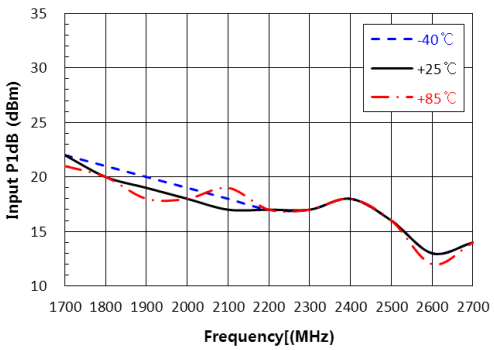
R - I Isolation vs. LO Freq

+25℃ LO at 0 dBm Referenced with



Input P1dB vs. RF Frequency

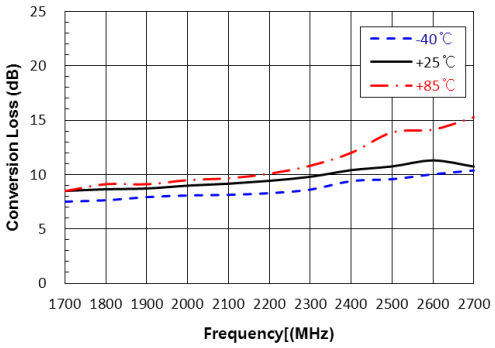
LO at 0 dBm, IF = 200MHz, Low-side LO



Performances at 3.3V

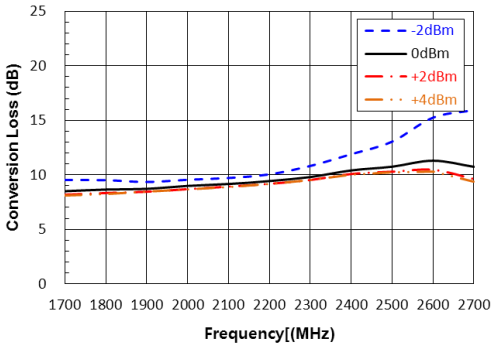
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 70MHz, low-side LO



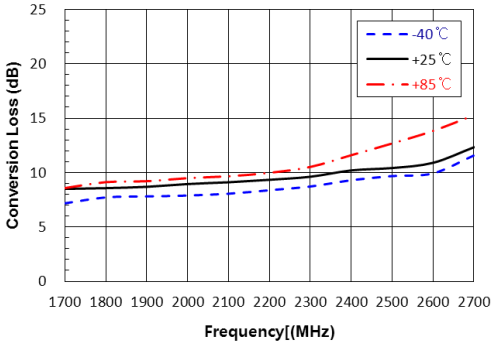
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF = 70MHz, low-side LO



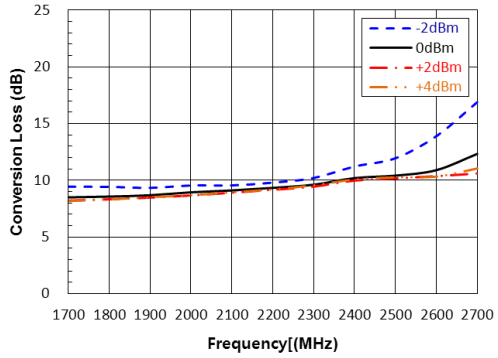
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 140MHz, low-side LO



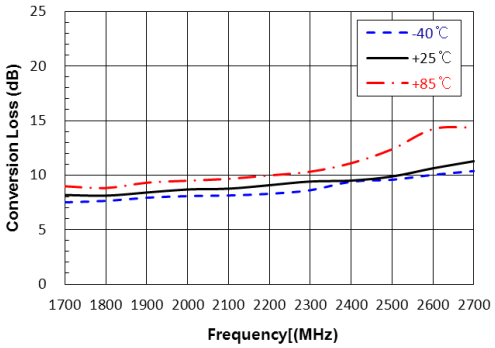
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =140MHz, low-side LO



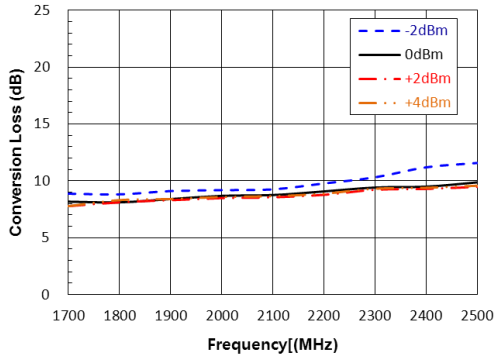
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 200MHz, low-side LO



Conversion Loss vs. RF Freq vs. IF Freq

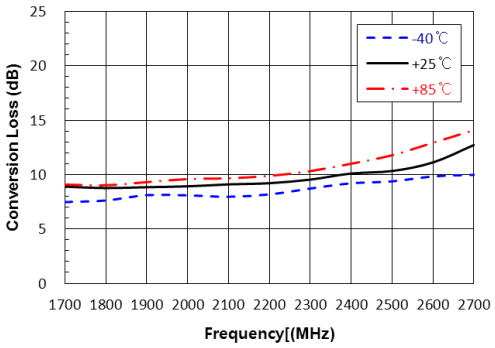
+25℃. IF =200MHz, low-side LO



Performances at 3.3V

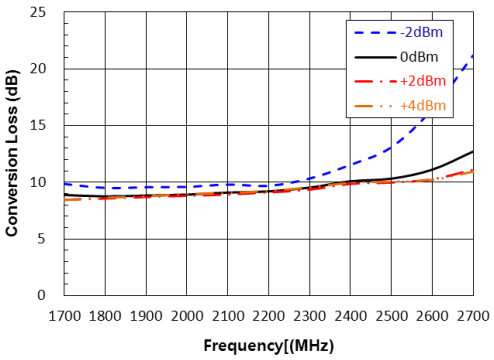
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 240MHz, low-side LO



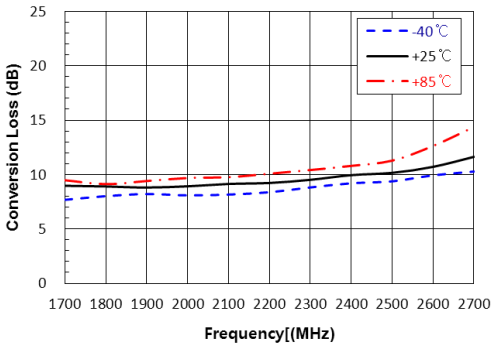
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =240MHz, low-side LO



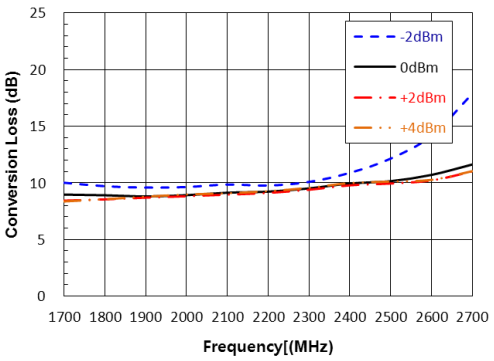
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 300MHz, low-side LO



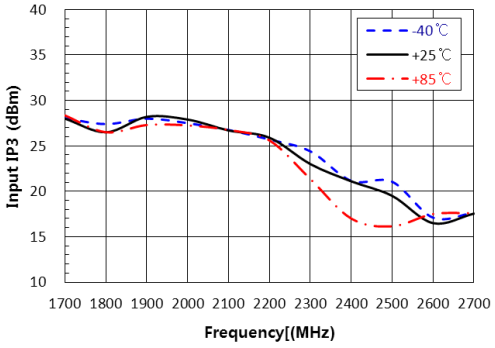
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =300MHz, low-side LO



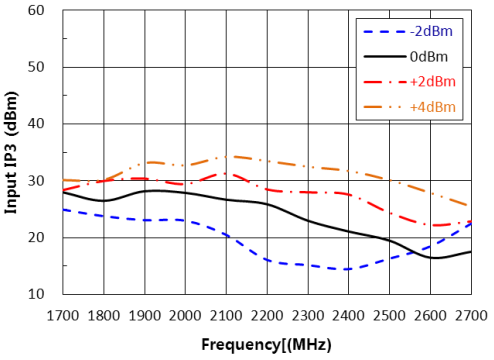
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 70MHz, low-side LO



Input IP3 vs. RF Freq vs. LO Power

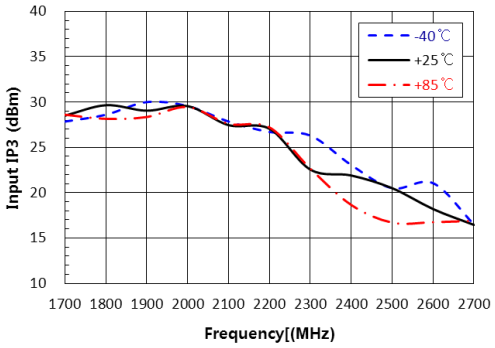
+25℃. IF = 70MHz, low-side LO



Performances at 3.3V

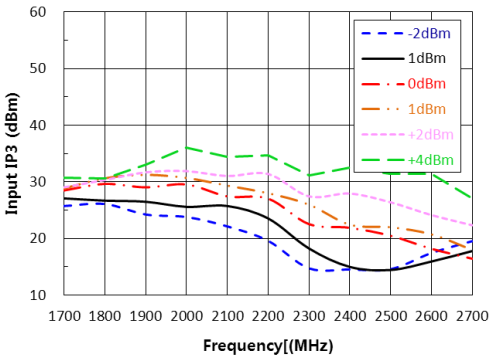
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 140MHz, low-side LO



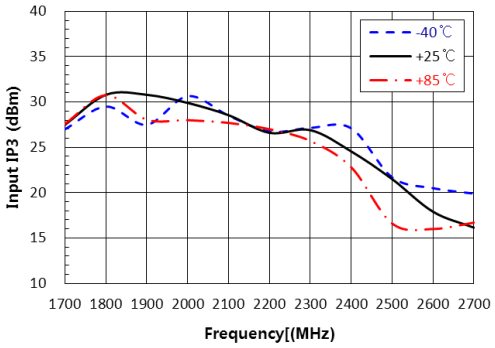
Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 140MHz, low-side LO



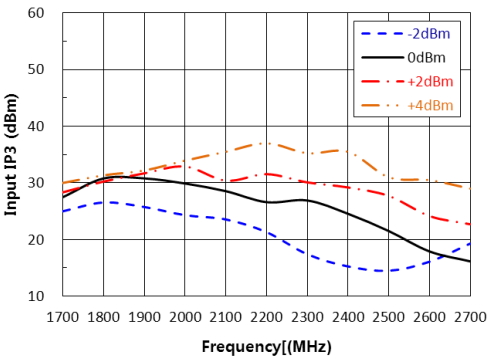
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 200MHz, low-side LO



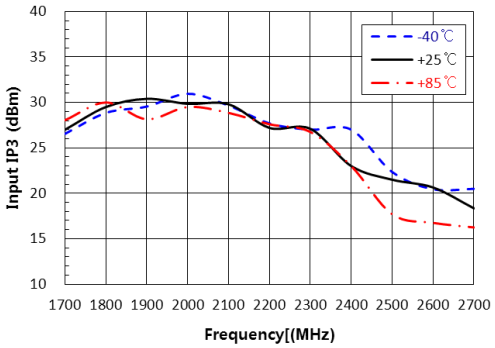
Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 200MHz, low-side LO



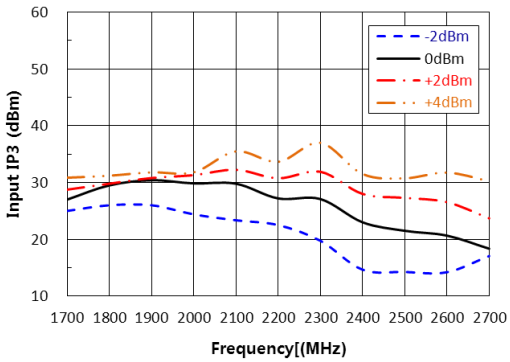
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 240MHz, low-side LO



Input IP3 vs. RF Freq vs. LO Power

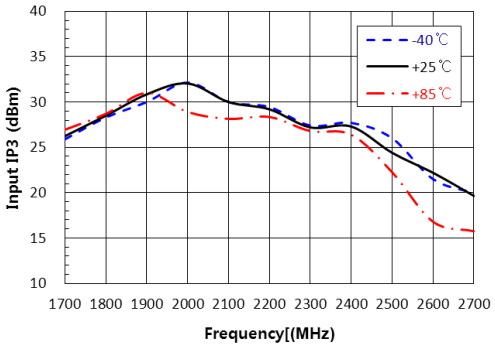
+25℃. IF = 240MHz, low-side LO



Performances at 3.3V

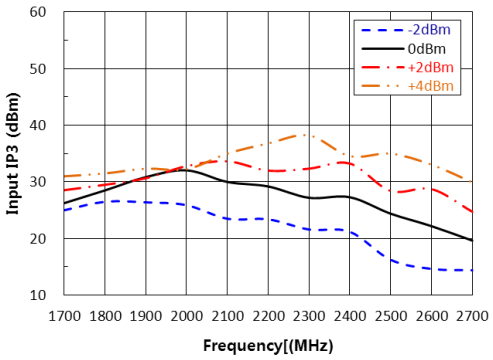
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 300MHz, low-side LO



Input IP3 vs. RF Freq vs. LO Power

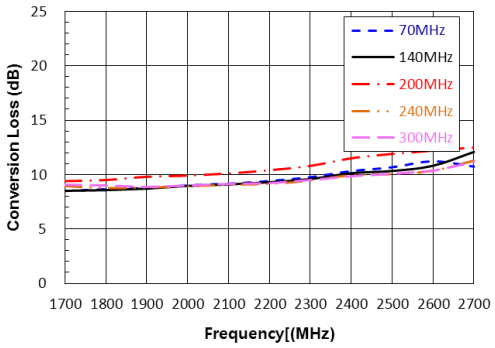
+25℃. IF = 300MHz, low-side LO



Performances at 5.0V

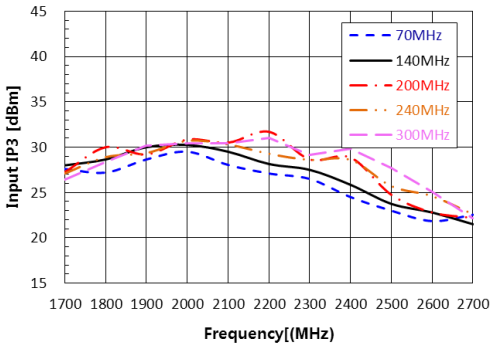
Conversion Loss vs. RF Freq vs. IF Freq

+25℃ LO = 0dBm, low-side LO



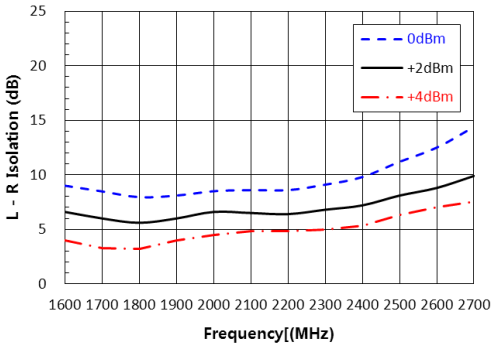
Input IP3 vs. RF Freq vs. IF Freq

+25℃ LO = 0dBm, low-side LO



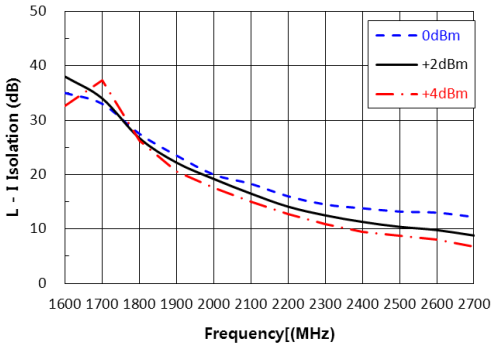
L - R Isolation vs. LO Freq

+25℃ Referenced with



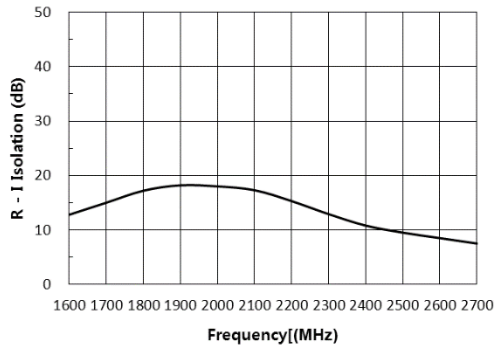
L - I Isolation vs. LO Freq

+25℃ Referenced with



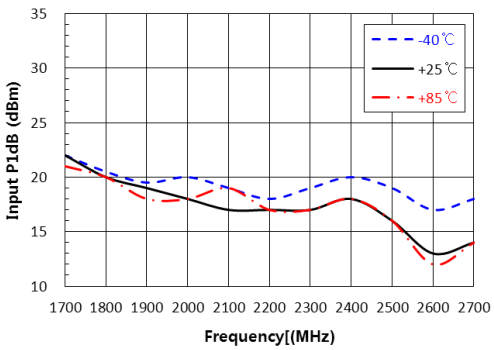
R - I Isolation vs. LO Freq

+25℃ LO at 0 dBm Referenced with



Input P1dB vs. RF Frequency

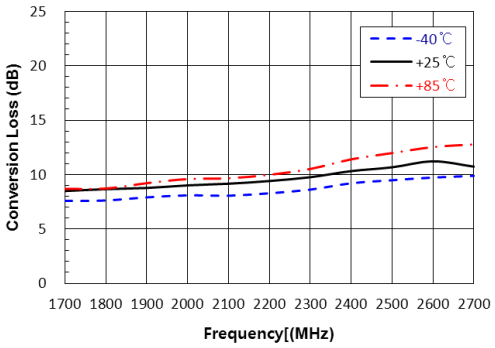
LO at 0 dBm, IF = 200MHz, Low-side LO



Performances at 5.0V

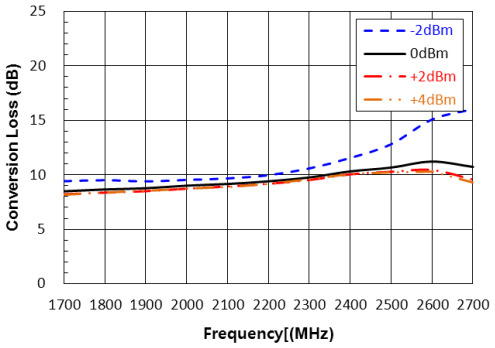
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 70MHz, low-side LO



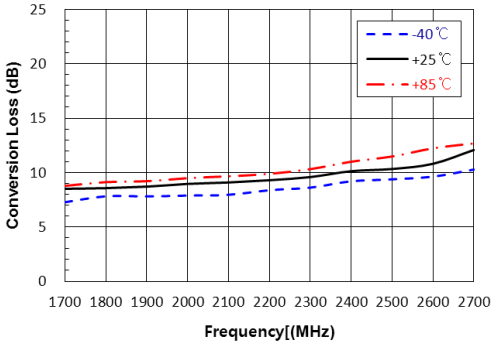
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF = 70MHz, low-side LO



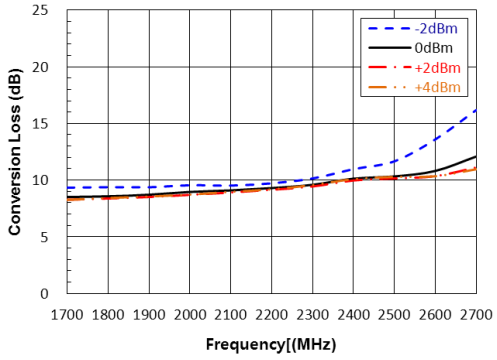
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 140MHz, low-side LO



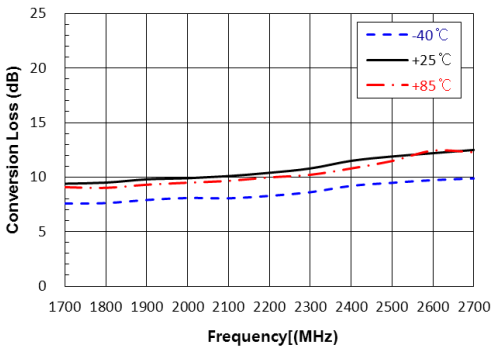
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =140MHz, low-side LO



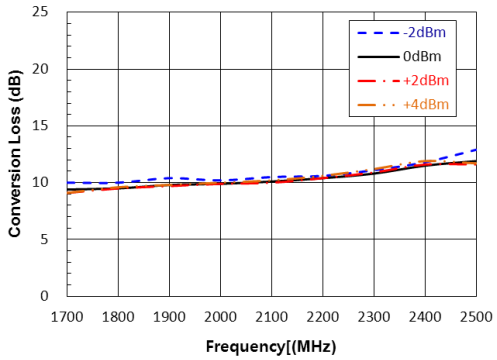
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 200MHz, low-side LO



Conversion Loss vs. RF Freq vs. IF Freq

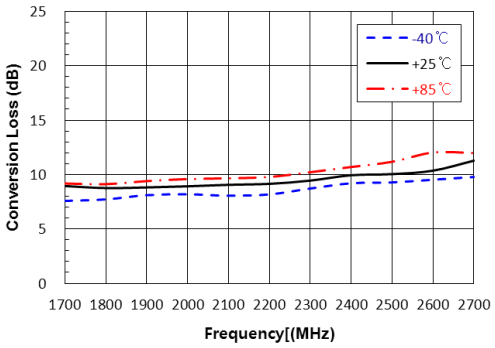
+25℃. IF =200MHz, low-side LO



Performances at 5.0V

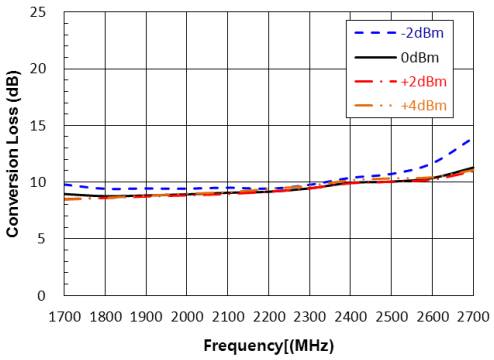
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 240MHz, low-side LO



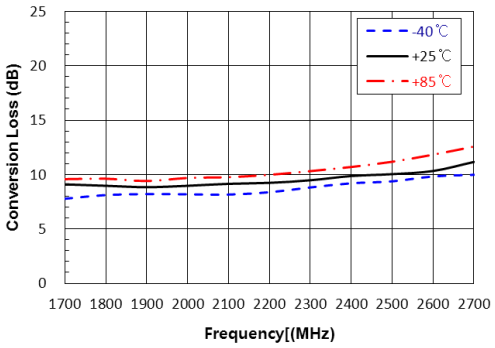
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =240MHz, low-side LO



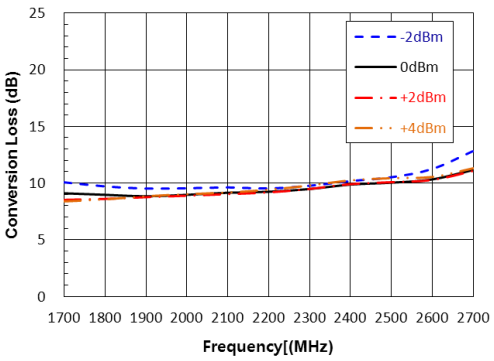
Conversion Loss vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 300MHz, low-side LO



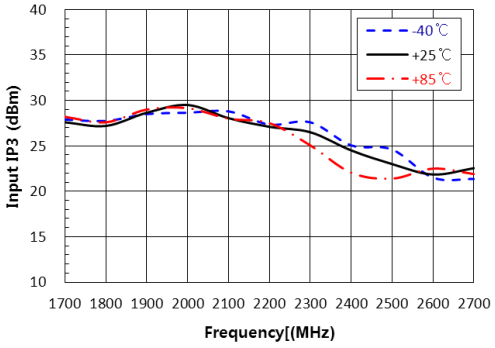
Conversion Loss vs. RF Freq vs. IF Freq

+25℃. IF =300MHz, low-side LO



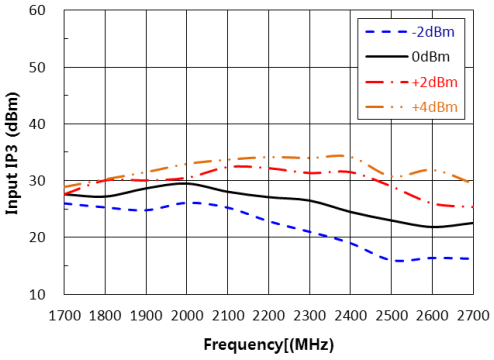
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 70MHz, low-side LO



Input IP3 vs. RF Freq vs. LO Power

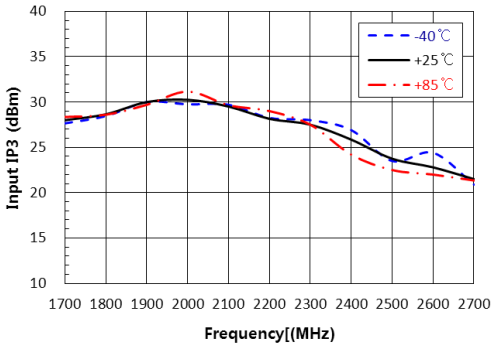
+25℃. IF = 70MHz, low-side LO



Performances at 5.0V

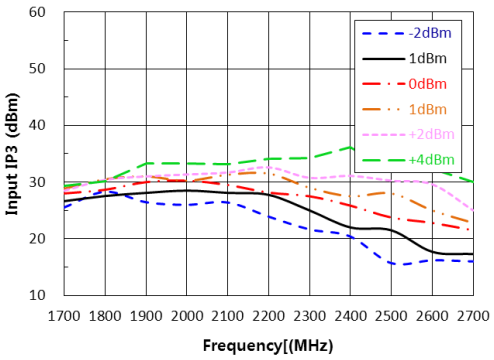
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 140MHz, low-side LO



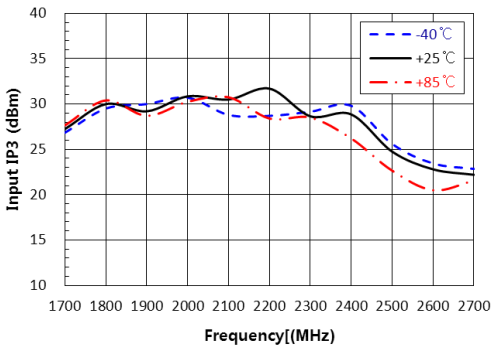
Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 140MHz, low-side LO



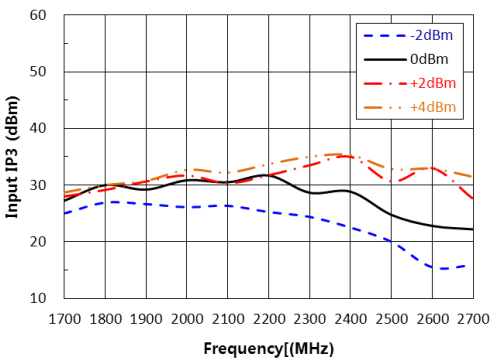
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 200MHz, low-side LO



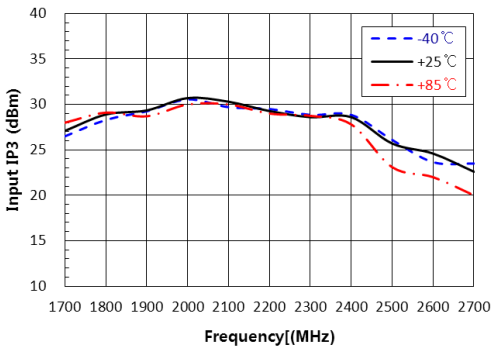
Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 200MHz, low-side LO



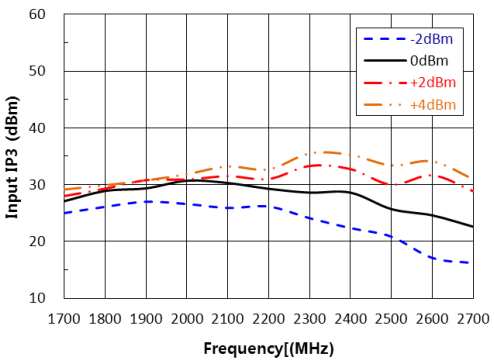
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 240MHz, low-side LO



Input IP3 vs. RF Freq vs. LO Power

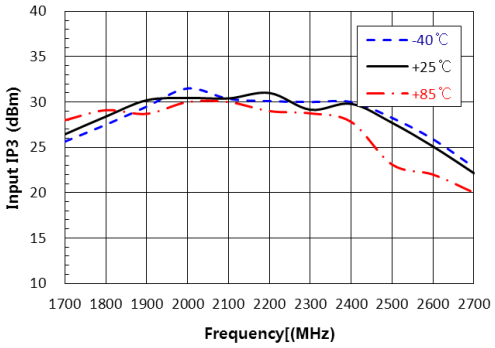
+25℃. IF = 240MHz, low-side LO



Performances at 5.0V

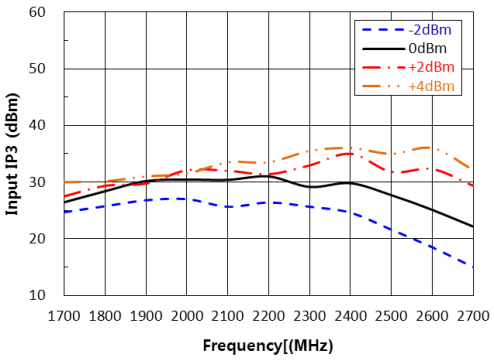
Input IP3 vs. RF Freq vs. IF Freq

LO = 0dBm, IF = 300MHz, low-side LO

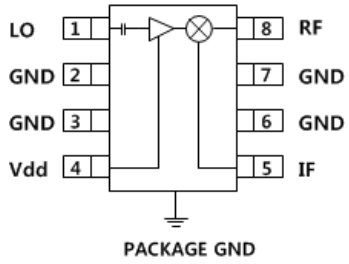


Input IP3 vs. RF Freq vs. LO Power

+25℃. IF = 300MHz, low-side LO

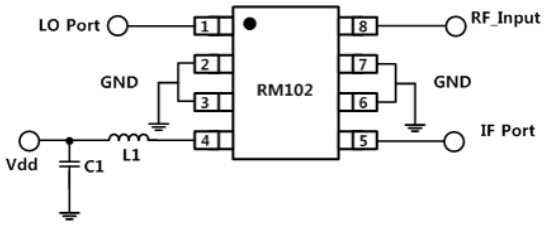


Pin Configuration and Description



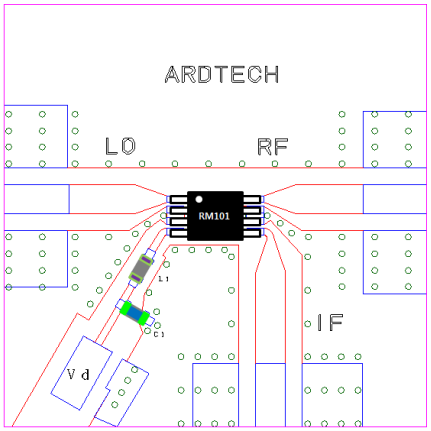
Pin No.	Symbol	Description
1	LO	Local Oscillator Input, Internally DC Block
2,3,6,7	GND	RF/DC Ground
4	Vdd	Supply Voltage,
5	IF	Intermediate Frequency
8	RF	Radio Frequency
Backside Plate	GND	RF/DC Ground. Follow recommended via pattern and ensure good solder attach for best thermal and electrical performance.

Application Circuit



Frequency(MHz)	L1(nH)	C1(pF)
1700~1950	2.2	8
1950~2150	2.2	6
2150~2400	1.0	5

Evaluation PCB Layout



Harmonics of LO

LO Freq GHz	3.3V			
	1	2	3	4
1.5	18.9	15.5	17.7	32.7
1.6	16.1	14.4	17.7	30.9
1.7	13.9	15.8	16.9	30.9
1.8	14.8	16.9	19.3	27.1
1.9	13.3	19	20.7	25.6
2.0	14	23.6	25.3	28.2

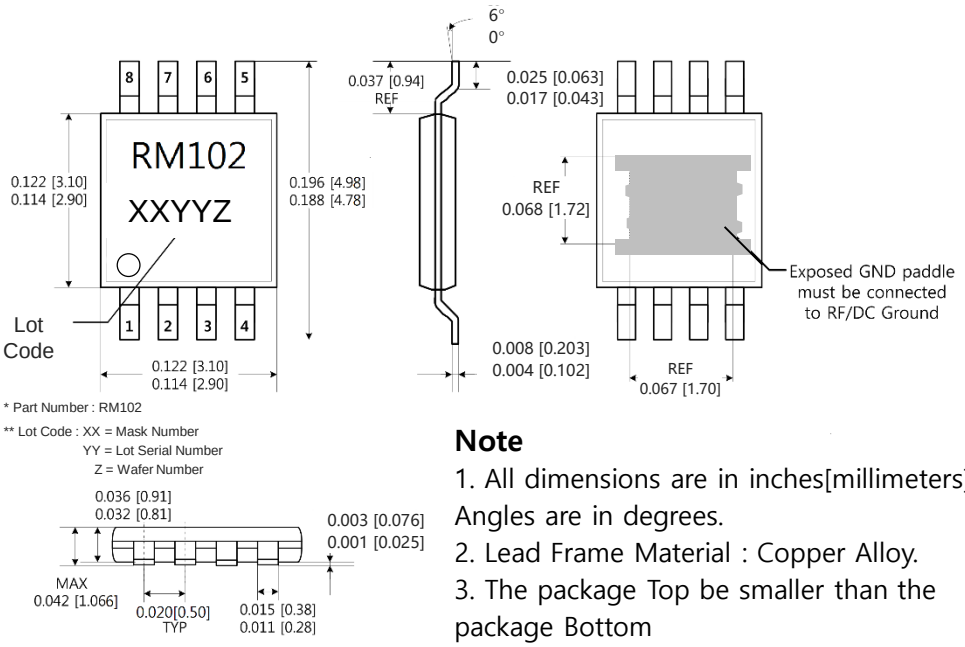
LO power = 0 dBm
All values in dBc below input LO level measured at RF port

LO Freq GHz	5V			
	1	2	3	4
1.5	17.5	15.5	17.2	32.3
1.6	14.4	14.3	16.9	30.9
1.7	12.6	14.8	16.3	28.6
1.8	13.3	15.5	19.4	25.1
1.9	12	16.4	21.4	22.4
2.0	12.8	19.2	27.1	23.1

LO power = 0 dBm
All values in dBc below input LO level measured at RF port

Package Mark and Dimensions

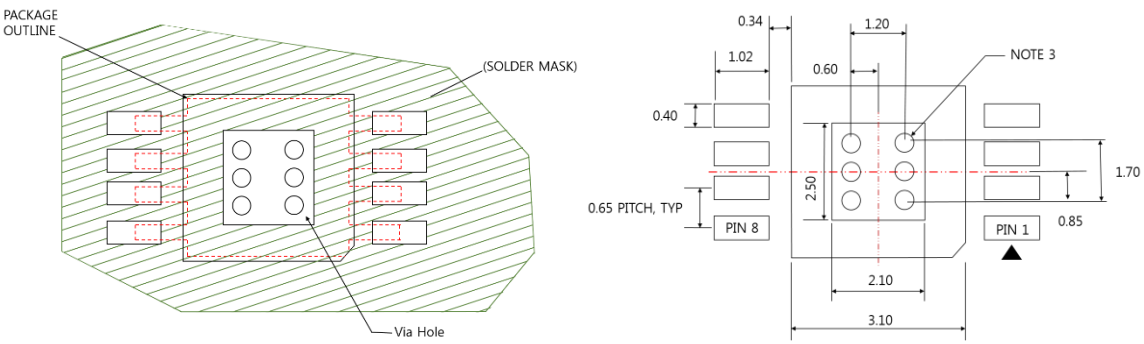
Dimension in inches[Millimeters]



Note

1. All dimensions are in inches[millimeters]. Angles are in degrees.
2. Lead Frame Material : Copper Alloy.
3. The package Top be smaller than the package Bottom

PCB Mounting Pattern



Note

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. We recommend a 0.35mm diameter bit for drilling via holes and a final plated thru diameter of 0.25mm.
4. If possible, the recommended thickness of metal mask is 0.12mm

ARDTECH
ADVANCED RADIO DEVICE

RM210

HIGH IIP3 GaAs MMIC MIXER With INTEGRATED LO AMPLIFIER, 300 – 2700MHz

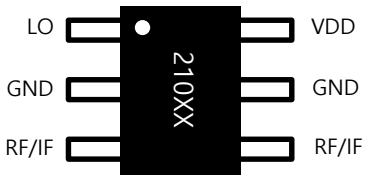
Product Description

RM210 can use at 3V to 5.5V. It is a high dynamic range passive MMIC mixer with an integrated LO amplifier covering 300 to 2700MHz. It combines low conversion losses and excellent input IP3 characteristics with a low demand of LO power and DC power.

Features

- + 24 dBm input IP3 @ 850MHz
- Conversion Loss : 6.7 dB @ 850MHz
- Single Positive Supply : 5mA @ 3.3V
- LO drive level: -8 to +8dBm
- Available 3.0 to 5.5 V single voltage

Component Diagram



SC70-6L

Applications

- High Dynamic Range Infrastructure system
- GSM GPRS & EDGE
- CDMA & WCDMA
- Cable Modem Termination Systems

Parameter	3.3 V				Units
TEST Frequency (RF)	850	1800	2100	2600	MHz
TEST Frequency (LO)	710	1660	1960	2460	MHz
TEST Frequency (IF)	140				MHz
Conversion Loss	6.7	5.4	4.7	5.2	dB
Noise Figure(SSB)	6.7	5.4	4.7	5.2	dB
LO to RF Isolation	10	6.6	4.8	5.5	dB
LO to IF Isolation	20	13	24.5	11.7	dB
RF to IF Isolation	24	20	33	13	dB
IP3(Input)	24	26.5	29.5	25	dBm
Pin1dB	19	17.5	18	17.5	dBm
Ids	6	7	11	10	mA
LO Input Drive Level	0				dBm

Test condition: Vcc = 3.3 V, Typ., LO = 0dBm, IF = 140MHz, T_L=25°C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

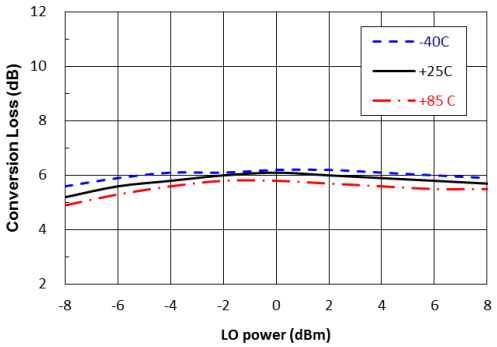
Absolute Maximum Ratings

Parameter	Rating	Unit
Max RF/IF Input Power	17	dBm
Max LO Drive Input Power	10	dBm
Max Device Voltage(V_D)	6	V
Junction Temperature(T_J)	150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1A	
Moisture Sensitivity Level	MSL1	

Performances at 850MHz

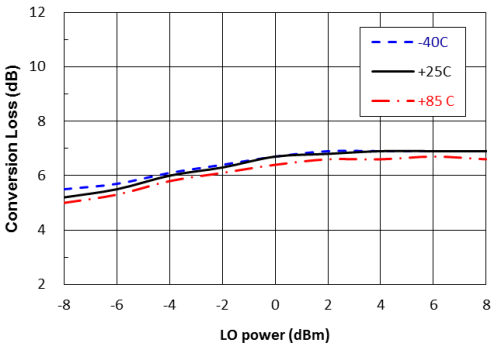
Conversion Loss vs. RF 850MHz

IF = 70MHz



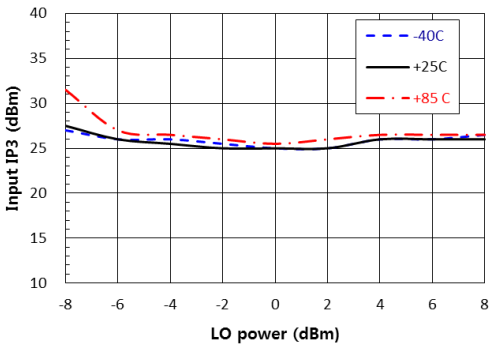
Conversion Loss vs. RF 850MHz

IF = 140MHz



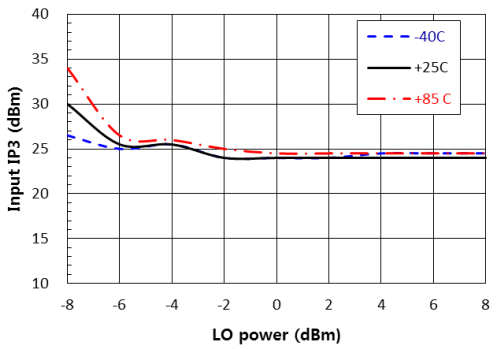
Input IP3 vs. RF 850MHz

IF = 70MHz



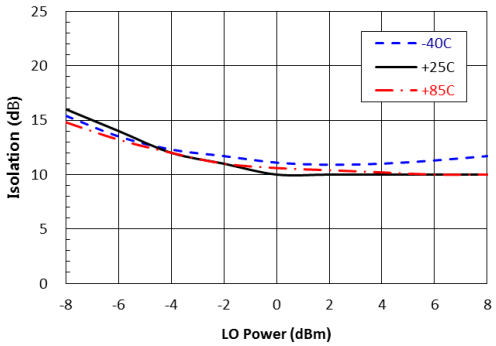
Input IP3 vs. RF 850MHz

IF = 140MHz



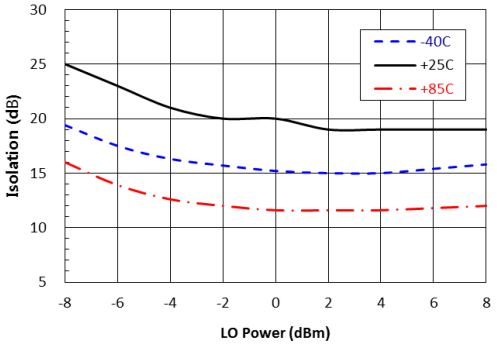
LO leakage at RF port (850M)

IF = 70/140MHz



LO leakage at IF port (850M)

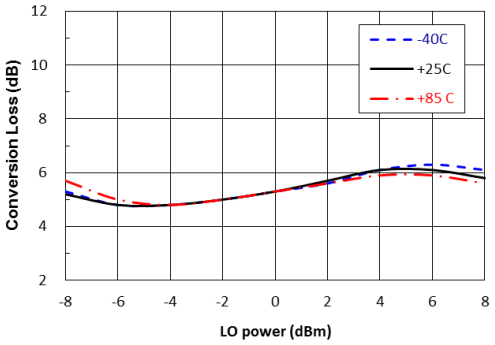
IF = 70/140MHz



Performances at 1800MHz

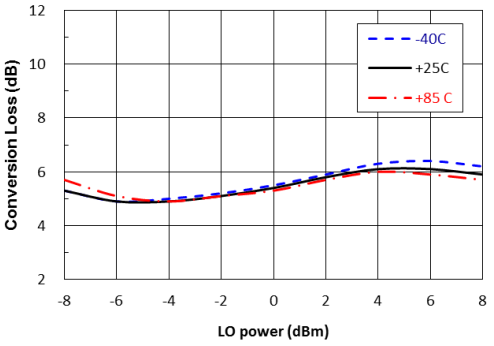
Conversion Loss vs. RF 1800MHz

IF = 70MHz



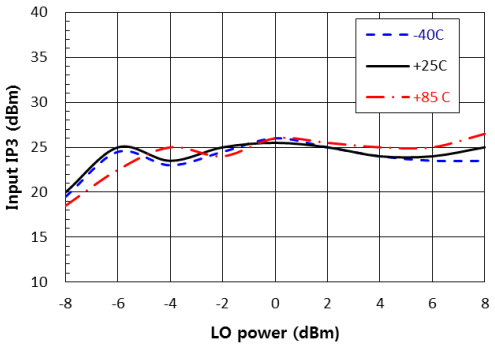
Conversion Loss vs. RF 1800MHz

IF = 140MHz



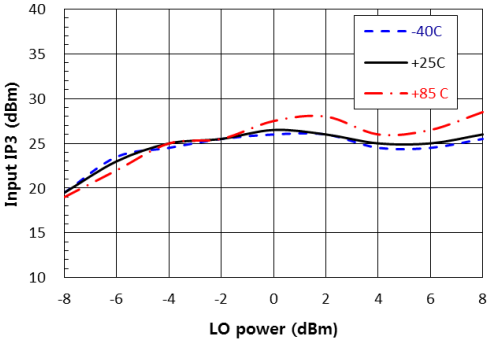
Input IP3 vs. RF 1800MHz

IF = 70MHz



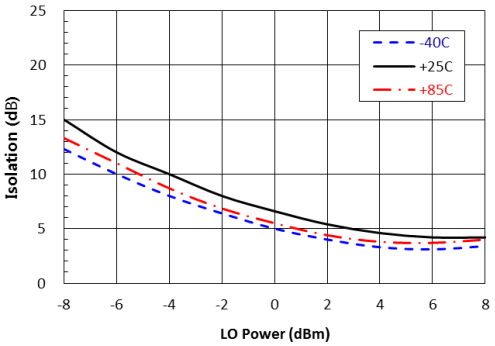
Input IP3 vs. RF 1800MHz

IF = 140MHz



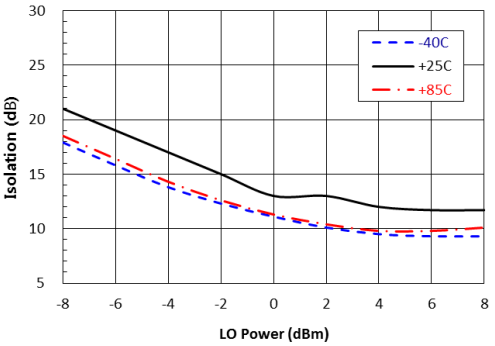
LO leakage at RF port (1800M)

IF = 70/140MHz



LO leakage at IF port (1800M)

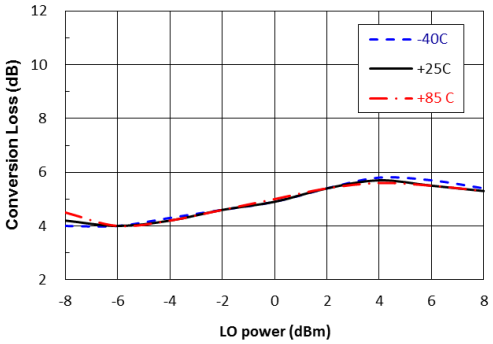
IF = 70/140MHz



Performances at 2100MHz

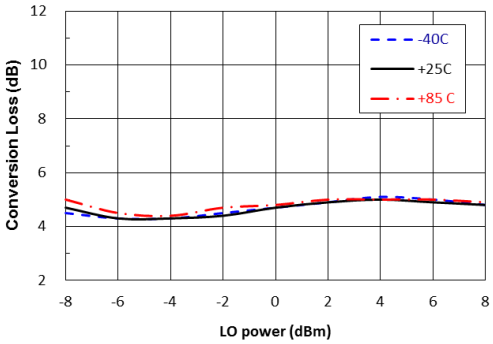
Conversion Loss vs. RF 2100MHz

IF = 70MHz



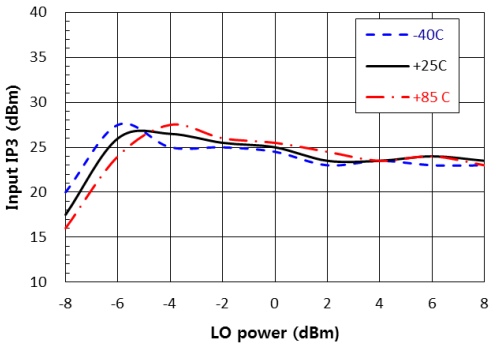
Conversion Loss vs. RF 2100MHz

IF = 140MHz



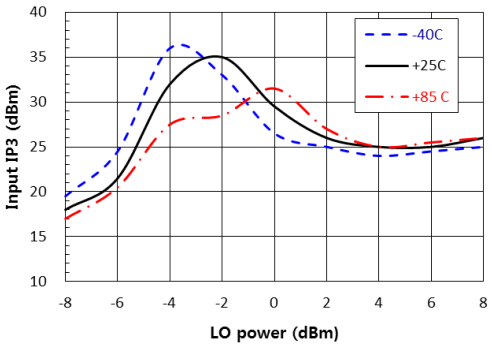
Input IP3 vs. RF 2100MHz

IF = 70MHz



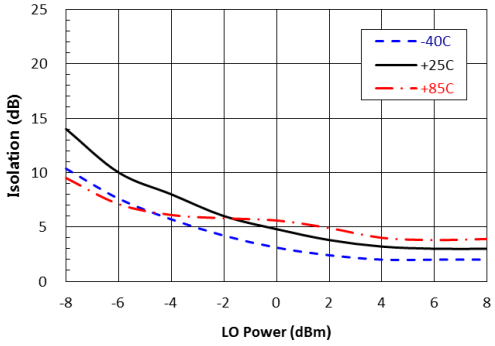
Input IP3 vs. RF 2100MHz

IF = 140MHz



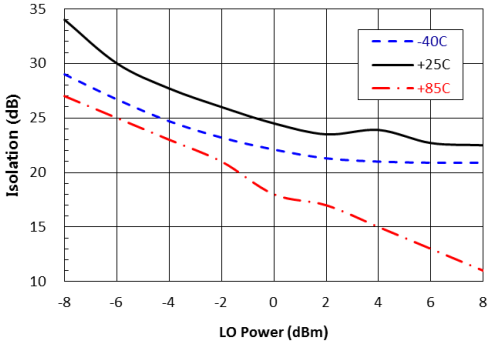
LO leakage at RF port (2100M)

IF = 70/140MHz



LO leakage at IF port (2100M)

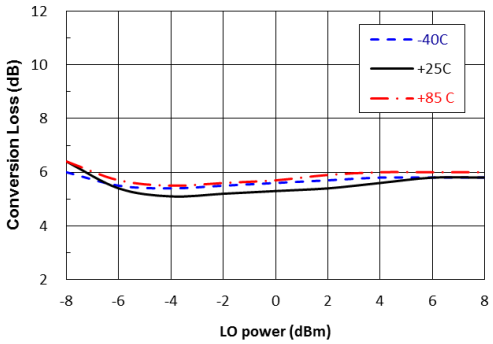
IF = 70/140MHz



Performances at 2600MHz

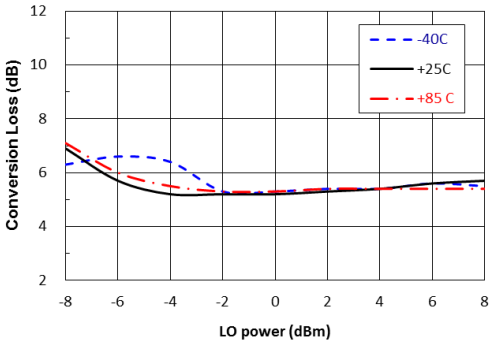
Conversion Loss vs. RF 2600MHz

IF = 70MHz



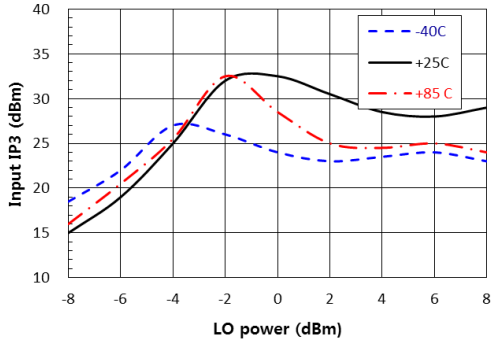
Conversion Loss vs. RF 2600MHz

IF = 140MHz



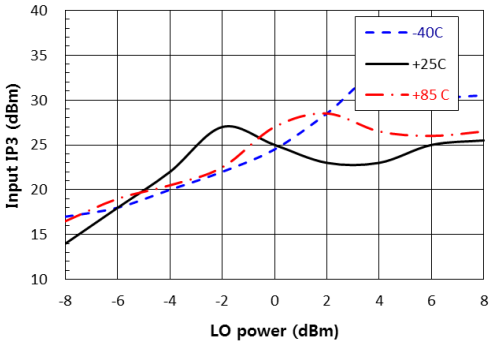
Input IP3 vs. RF 2600MHz

IF = 70MHz



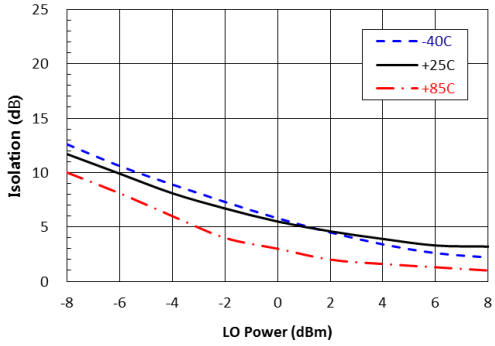
Input IP3 vs. RF 2600MHz

IF = 140MHz



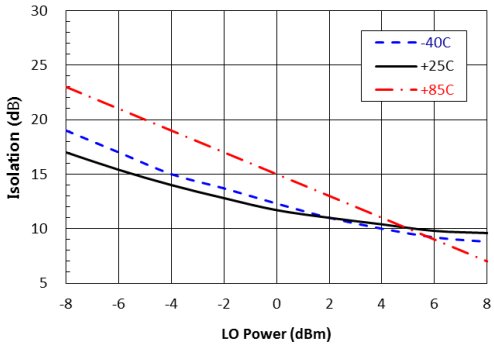
LO leakage at RF port (2600M)

IF = 70/140MHz

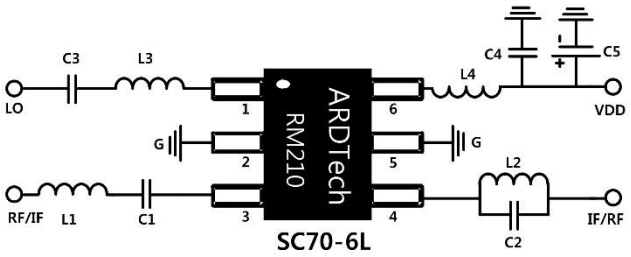


LO leakage at IF port (2600M)

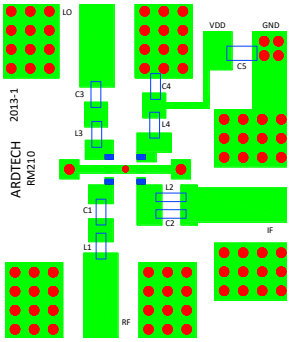
IF = 70/140MHz



Down Conversion Application Circuit



TEST Circuit



Evaluation PCB Layout

Typical lumped element values for different RF frequencies :

RF[MHz]	IF[MHz]	L1(nH)	C1(pF)	L2(nH)	C2(pF)	L3(nH)	C3(pF)	L4(nH)	C4(pF)	C5(uF)
850	70/140	5.6	3.9	6.8	3.9	6.8	3.9	22	100	10
1800	70/140	3.3	1.8	3.9	1.8	5.6	3.3	3.9	100	10
2100	70/140	3.9	1.8	3.3	1.8	4.7	1.8	3.3	100	10
2600	70/140	1	1.8	1.8	1.8	2.7	1.8	1.5	82	10

Pin Configuration and Description

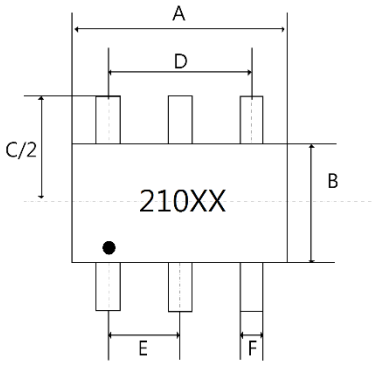
Pin No.	Symbol	Description
1	LO	Local Oscillator Input
2,5	GND	RF/DC Ground
6	Vdd	Supply Voltage
3	IF/RF	Intermediate Frequency or Radio Frequency
4	IF/RF	Radio Frequency or Intermediate Frequency

Harmonics of LO

LO Freq GHz	3.3V			
	1	2	3	4
780	29.7	17.7	40	40
710	29.3	18.8	32	31
1780	18.1	13	45.3	25.4
1710	15.4	10.7	41.9	20.7
2030	11.9	10.3	27.6	30.4
1960	11.3	15.5	33.5	25.7
2530	19.5	20.2	30.2	32.1

LO power = 0 dBm
All values in dBc below input LO level measured at RF port

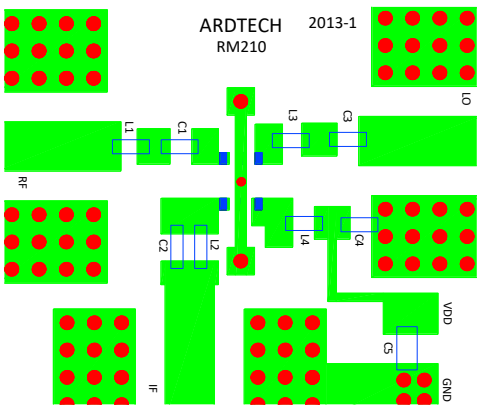
Package Mark and Dimensions



Symbol	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.90	2.10	2.15	0.074	0.082	0.084
B	1.15	1.25	1.35	0.045	0.050	0.055
C	2.00	2.10	2.20	0.078	0.082	0.086
D		1.3			0.0512	
E		0.65			0.0255	
F	0.15	-	0.30	0.006	-	0.012

* Part Number : 210 =RM210
** Tracking Number : XX

Evaluation PCB Information



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.037[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RM210D

HIGH IIP3 GaAs MMIC MIXER With INTEGRATED LO AMPLIFIER, 300 – 2700MHz

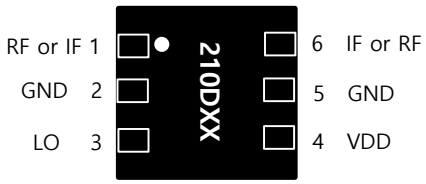
Product Description

RM210D can use at 3.3V to 5.0V. It is a high dynamic range passive MMIC mixer with an integrated LO amplifier covering 300 to 2700MHz. It combines low conversion losses and excellent input IP3 characteristics with a low demand of LO power and DC power.

Features

- + 25 dBm input IP3 @ 850MHz
- Conversion Loss : 6.7 dB @ 850MHz
- Single Positive Supply : 5mA @ 3.3V
- LO drive level: -2 to +2dBm
- Available 3.3 to 5.0 V single voltage
- Lead-free, RoHS compliant, Green

Component Diagram



DFN2X2-6L

Applications

- High Dynamic Range Infrastructure system
- GSM GPRS & EDGE
- CDMA & WCDMA
- Cable Modem Termination Systems

Parameter	3.3 V				Units
TEST Frequency (RF)	850	1800	2100	2600	MHz
TEST Frequency (LO)	710	1660	1960	2460	MHz
TEST Frequency (IF)	140				MHz
Conversion Loss	7.6	6.3	6.2	6.8	dB
Noise Figure(SSB)	7.2	6.1	6.0	6.7	dB
LO to RF Isolation	11.2	5.8	5.8	5.0	dB
LO to IF Isolation	18.1	17.9	12.8	12.8	dB
RF to IF Isolation	18.5	23.7	10.9	14	dB
IP3(Input)	27.7	30.7	30.4	30.5	dBm
Pin1dB	18.1	19.3	18	18.2	dBm
Ids	5	9	10	14	mA
LO Input Drive Level	0				dBm

Test condition: Vcc = 3.3 V, Typ., LO = 0dBm, IF = 140MHz, T_L=25°C, Z_S=Z_L=50

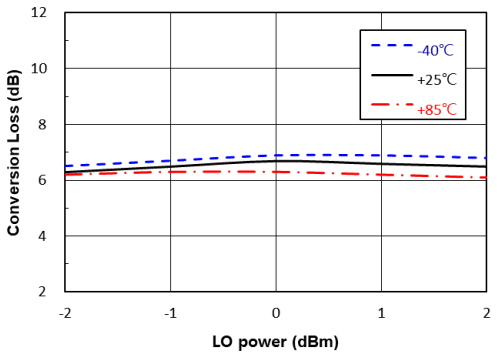
Absolute Maximum Ratings

Parameter	Rating	Unit
Max RF/IF Input Power	17	dBm
Max LO Drive Input Power	10	dBm
Max Device Voltage(V_D)	6	V
Junction Temperature(T_J)	150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1A	
Moisture Sensitivity Level	MSL1	

Performances at 850MHz

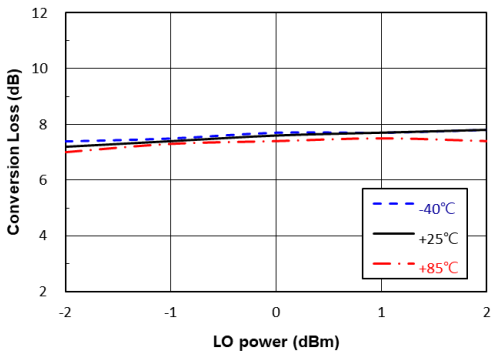
Conversion Loss vs. RF 850MHz

IF = 70MHz



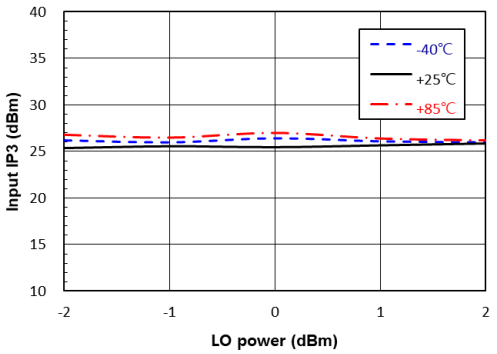
Conversion Loss vs. RF 850MHz

IF = 140MHz



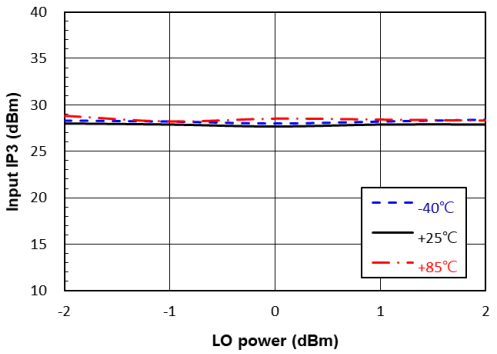
Input IP3 vs. RF 850MHz

IF = 70MHz



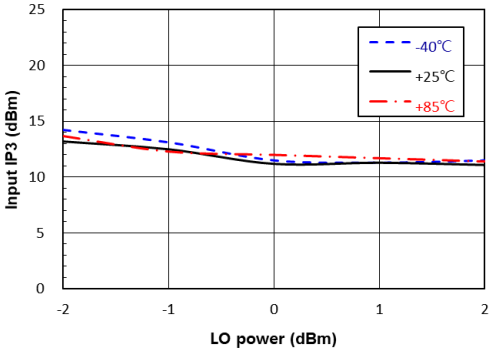
Input IP3 vs. RF 850MHz

IF = 140MHz



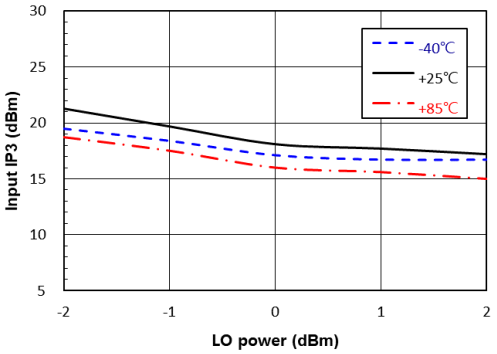
LO leakage at RF port (850MHz)

IF = 140MHz



LO leakage at IF port (850MHz)

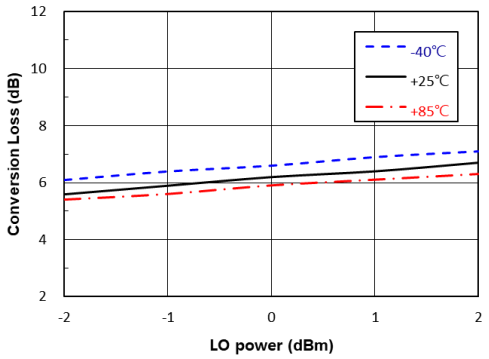
IF = 140MHz



Performances at 1800MHz

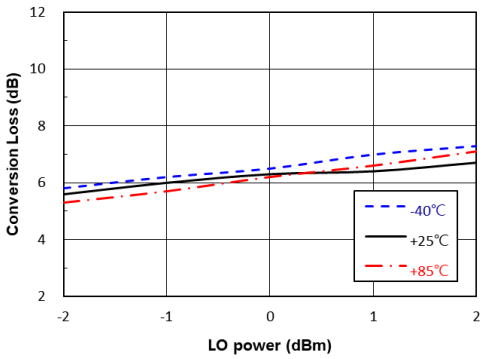
Conversion Loss vs. RF 1800MHz

IF = 70MHz



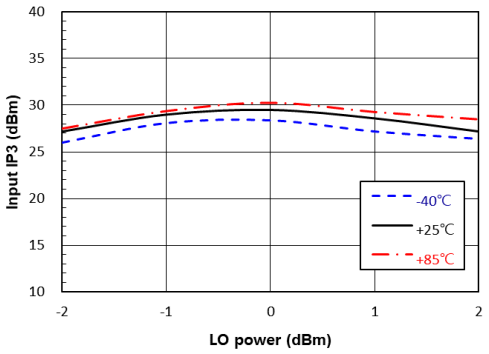
Conversion Loss vs. RF 1800MHz

IF = 140MHz



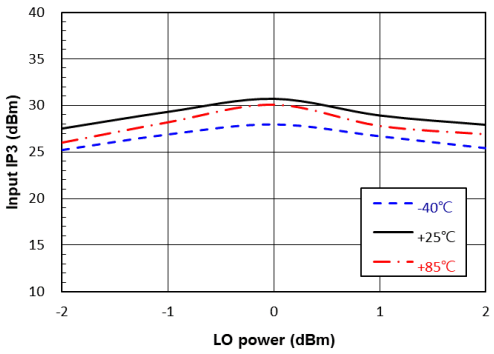
Input IP3 vs. RF 1800MHz

IF = 70MHz



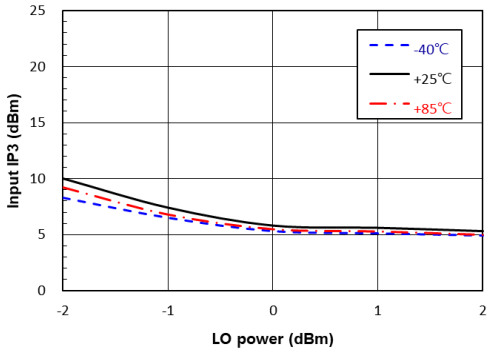
Input IP3 vs. RF 1800MHz

IF = 140MHz



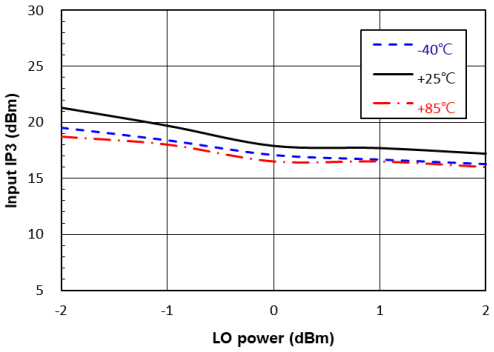
LO leakage at RF port (1800MHz)

IF = 140MHz



LO leakage at IF port (1800MHz)

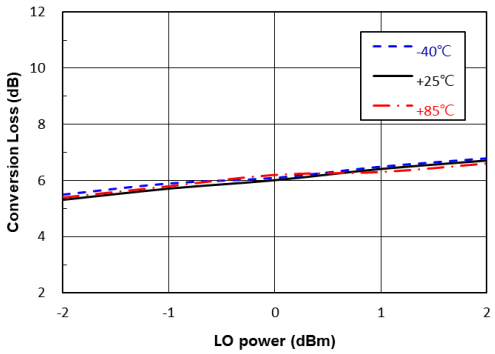
IF = 140MHz



Performances at 2100MHz

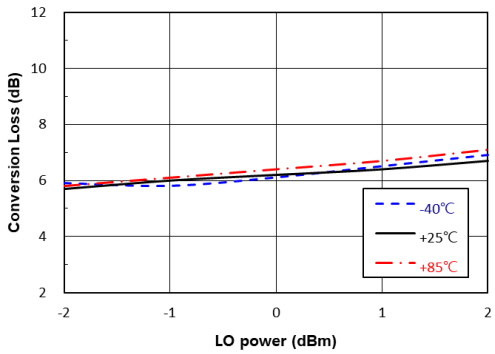
Conversion Loss vs. RF 2100MHz

IF = 70MHz



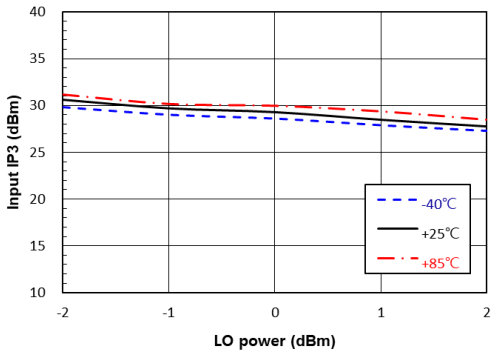
Conversion Loss vs. RF 2100MHz

IF = 140MHz



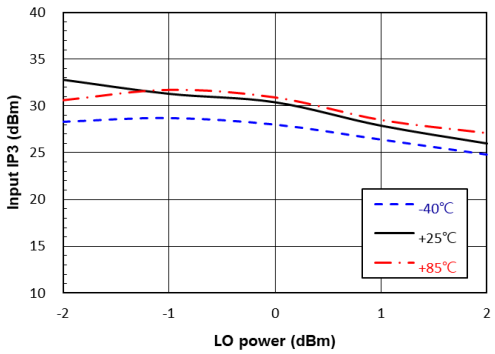
Input IP3 vs. RF 2100MHz

IF = 70MHz



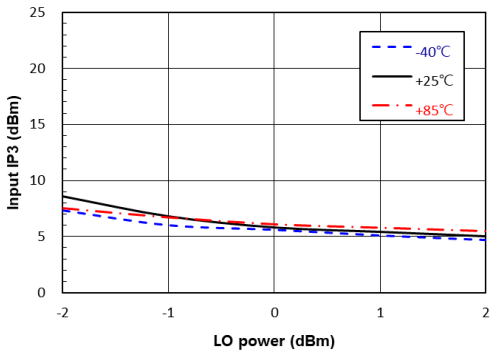
Input IP3 vs. RF 2100MHz

IF = 140MHz



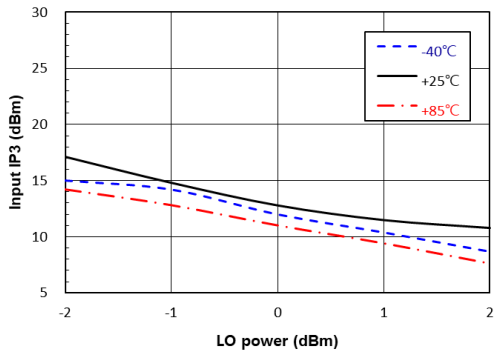
LO leakage at RF port (2100MHz)

IF = 140MHz



LO leakage at IF port (2100MHz)

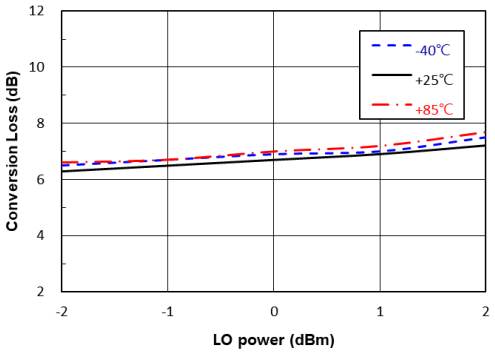
IF = 140MHz



Performances at 2600MHz

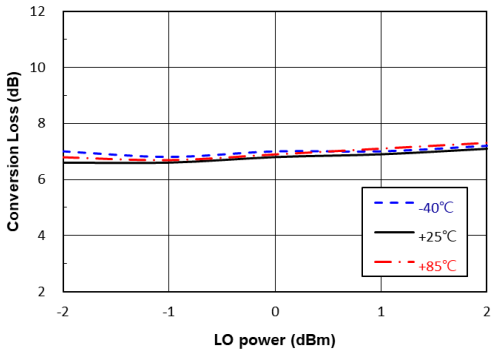
Conversion Loss vs. RF 2600MHz

IF = 70MHz



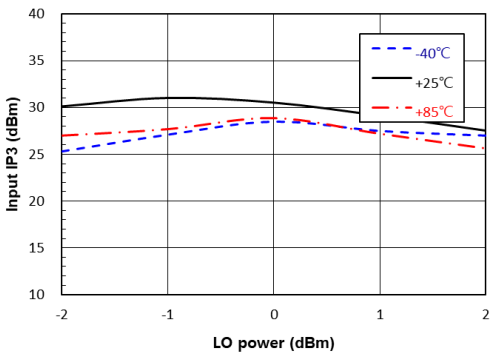
Conversion Loss vs. RF 2600MHz

IF = 140MHz



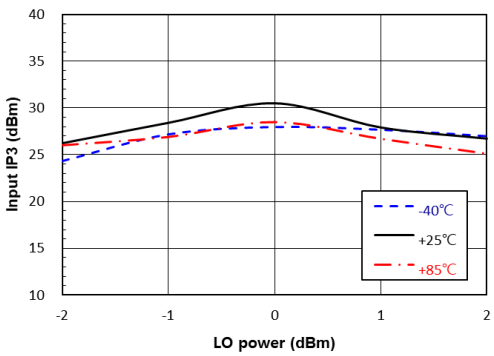
Input IP3 vs. RF 2600MHz

IF = 70MHz



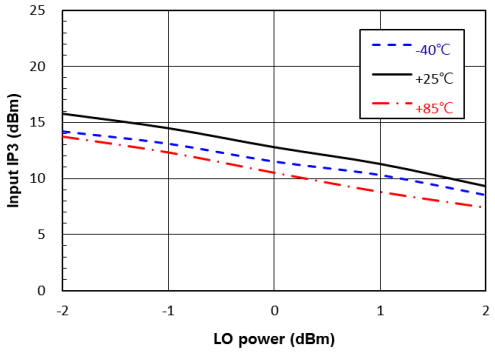
Input IP3 vs. RF 2600MHz

IF = 140MHz



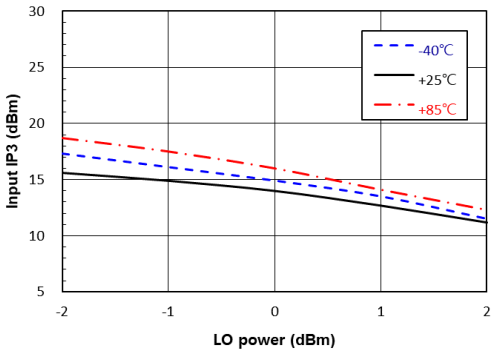
LO leakage at RF port (2600MHz)

IF = 140MHz

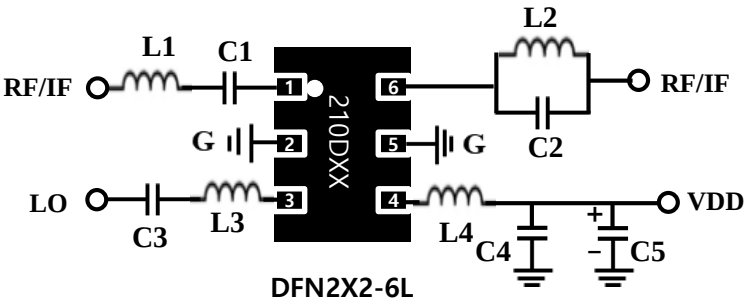


LO leakage at IF port (2600MHz)

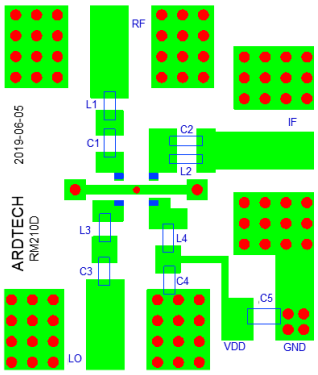
IF = 140MHz



Down Conversion Application Circuit



TEST Circuit



Evaluation PCB Layout

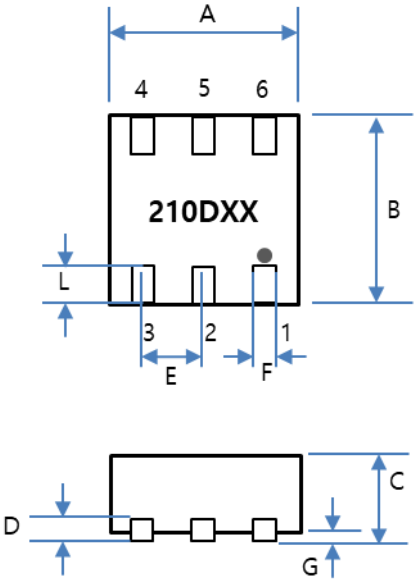
Typical lumped element values for different RF frequencies :

RF[MHz]	IF[MHz]	L1(nH)	C1(pF)	L2(nH)	C2(pF)	L3(nH)	C3(pF)	L4(nH)	C4(pF)	C5(uF)
850	70/140	6.8	3.9	6.8	5.0	5.6	3.9	22	100	10
1800	70/140	4.7	1.5	3.3	1.8	5.6	3.3	3.9	100	10
2100	70/140	2.2	1.5	2.2	1.5	5.6	2.7	2.7	100	10
2600	70/140	1.8	1.5	1.8	1.5	3.3	1.8	1.5	100	10

Pin Configuration and Description

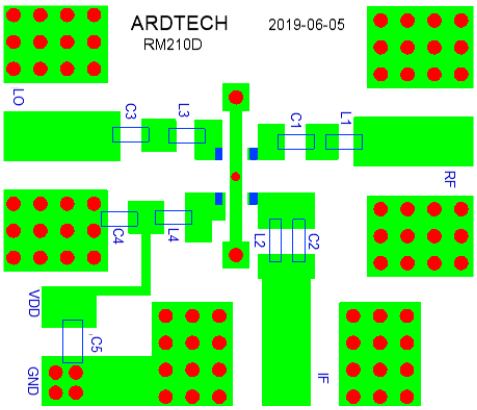
Pin No.	Symbol	Description
1	RF/IF	Radio Frequency or Intermediate Frequency
2	GND	RF/DC Ground
3	LO	Local Oscillator Input
4	VDD	Supply Voltage
5	GND	RF/DC Ground
6	IF/RF	Intermediate Frequency or Radio Frequency

Package Mark and Dimensions



Symbol	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.95	2.00	2.05	0.077	0.079	0.081
B	1.95	2.00	2.05	0.077	0.079	0.081
C	0.70	0.75	0.80	0.028	0.030	0.032
D	0.203 REF			0.008 REF		
E	0.65 BSC			0.026 BSC		
F	0.25	0.30	0.35	0.010	0.012	0.014
G	0.00	0.02	0.05	0.000	0.001	0.002
L	0.27	2.10	2.20	0.011	0.013	0.015

Evaluation PCB Information



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.037[0.93]
Copper Thickness	1 oz.

RL101

50-4000MHz
High Linearity Low Noise Amplifier

Product Description

RL101 is a high linearity wide-band low noise amplifier in a low-cost surface mount package and provides 39dBm high OIP3 and 0.85dB Noise Figure at 1.85GHz. RL101 using enhancement pHEMT process is able to achieve high performance across a broad range and is available in a lead-free / green / RoHS-compliant SOT-89 package. RL101 is targeted for use as a receiver and transmitter in wireless infrastructure where high linearity and medium power is required. Internal active bias circuitry allows RL101 to maintain high linearity and gain performance over temperature and operate directly off a single +5V supply. All devices are 100% RF and DC tested.

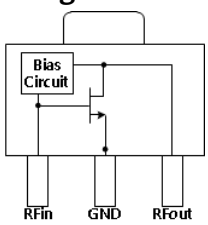
Features

- High OIP3 39dBm @ 1.85GHz
- P1dB=23.0dBm @ 850MHz
- No output matching component @ 0.7~2.6GHz
- Unconditionally stable
- Single fixed 5V supply, 79mA current
- Industry standard SOT-89 package
- Lead-free, RoHS compliant, Green

Applications

- Low noise amplifier for wireless repeaters
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, LTE

Component Diagram



Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	18.3	19.8		850MHz	dB
	13.0	14.5		1850MHz	dB
	12.0	13.5		2140MHz	dB
Output power at 1-dB Compression	21.0	23.0		850MHz	dBm
	20.5	22.5		1850MHz	dBm
Third Order Intercept Point	34.0	36.0		850MHz	dBm
	37.0	39.0		1850MHz	dBm
Input Return Loss		-27.4		2140MHz	dB
Output Return Loss		-19.5		2140MHz	dB
Reverse Isolation		-26.7		850MHz	dB
Noise Figure		0.85	1.1	1850MHz	dB
Device Voltage		5			V
Device current (Icq)	60	79	95		mA
Thermal Resistance		41.6		Junction to lead	°C/W

Test condition: Vcc=5V, I_D=79mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25° C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Voltage(V_D)	6.0	V
Max Device Current(I_D)	120	mA
Max RF Input Power	18	dBm
Max Operating Dissipated Power	0.72	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 0B	
Moisture Sensitivity Level	MSL1	

Typical Electrical Specification

Parameter	850MHz	1850MHz	2140MHz	2600MHz	Unit
S21	19.8	14.5	13.5	11.8	dB
OIP3	37.0	39.0	39.2	39.5	dBm
P1dB	23.0	22.5	22.5	22.5	dBm
S11	-16.0	-15.0	-24.7	-17.3	dB
S22	-13.6	-13.7	-19.5	-19.2	dB
S12	-26.7	-21.0	-19.7	-18.3	dB
NF	0.85	0.82	0.91	0.96	dB

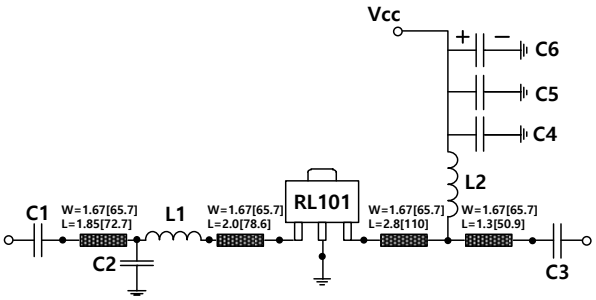
Test condition: Vcc=5V, I_D=79mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

Typical 3.3V Performance

Parameter	850MHz	1850MHz	2140MHz	2600MHz	Unit
S21	19.5	14.3	13.2	11.5	dB
OIP3	34.0	33.1	33.3	31.5	dBm
P1dB	21.5	19.0	19.0	18.0	dBm
S11	-14.5	-13.7	-25.3	-15.8	dB
S22	-16.0	-17.3	-23.2	-19.6	dB
S12	-25.5	-20.1	-18.8	-17.7	dB
NF	0.85	0.82	0.91	0.96	dB

Test condition: Vcc=3.3V, I_D=55mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

700~1000MHz Reference Application Circuit



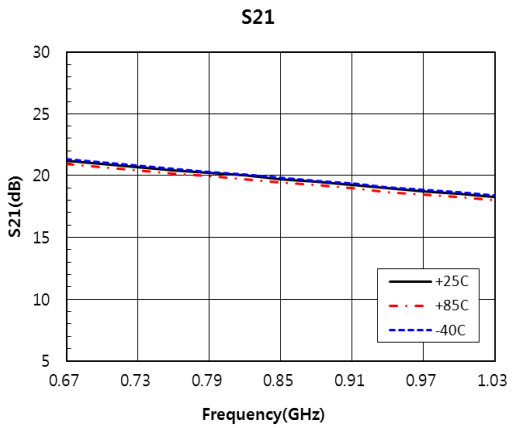
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	6.8nH
C2	1.0pF	C5	1000pF	L2	33nH
C3	100pF	C6	10uF		

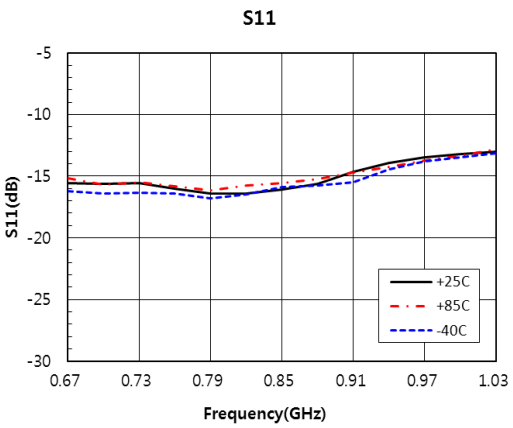
*Width and Length of Micro-strip line dimension in mm[mil]

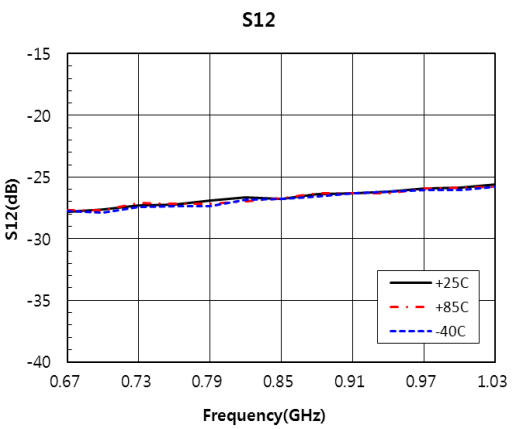
Parameter/Freq.(MHz)	750	800	850	Unit
Small Signal Gain	20.5	20.1	19.7	dB
S11	-15.7	-16.4	-16.0	dB
S22	-13.2	-13.3	-13.6	dB
Output P1dB	23.0	23.0	23.0	dBm
Output OIP3*	35.5	36.0	36.0	dBm
Noise Figure	0.83	0.89	0.85	dB
Icq	79			mA
Vcc	5			V

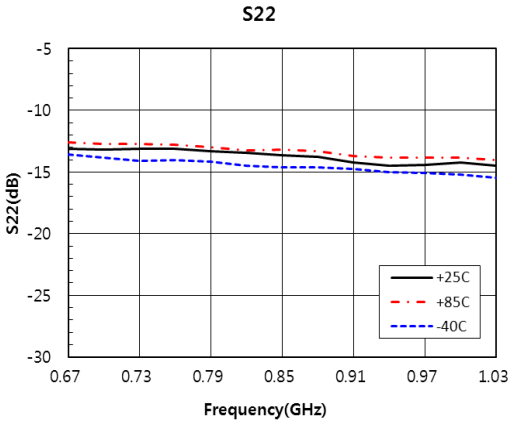
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 700~1000MHz

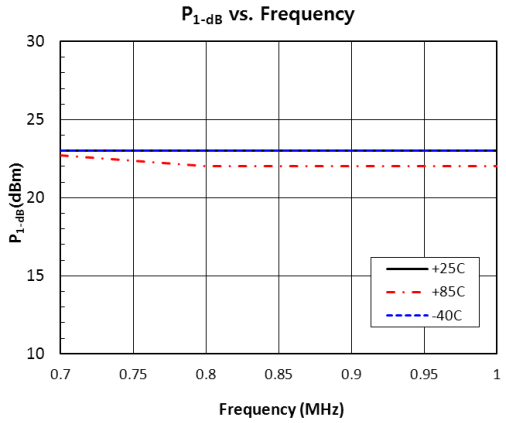


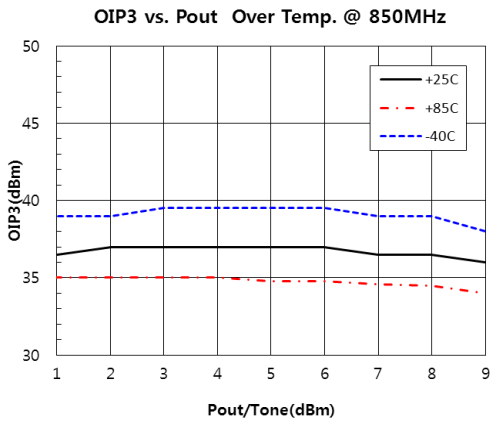


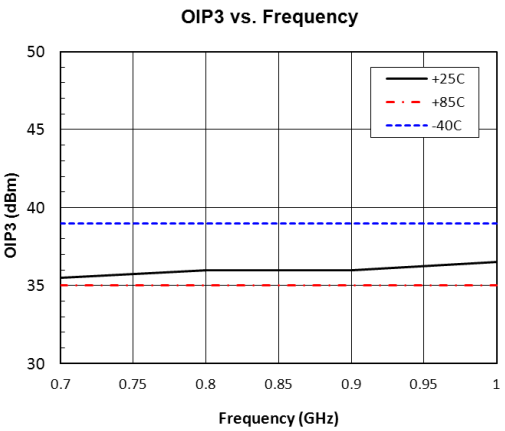


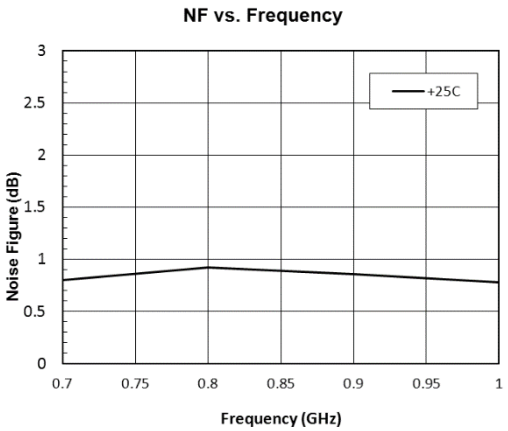


P1dB, OIP3 and Noise Figure Performance at 700~1000MHz



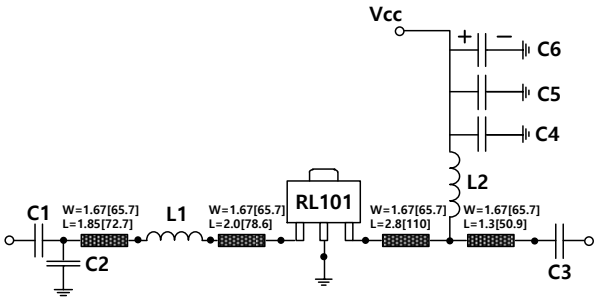






RL101
50-4000MHz
High Linearity Low Noise Amplifier

1800~2200MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	NA
C2	1pF	C5	1000pF	L2	8.2nH
C3	100pF	C6	10uF		

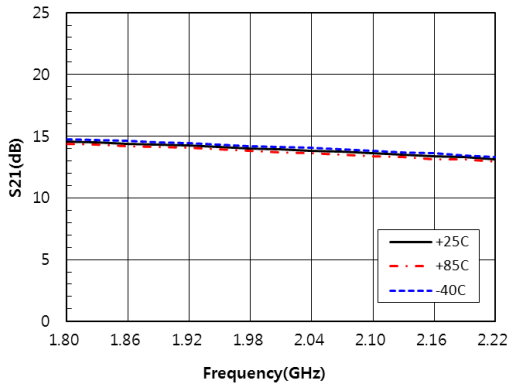
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	1800	1900	2140	Unit
Small Signal Gain	14.6	14.3	13.4	dB
S11	-13.2	-17.2	-28.0	dB
S22	-13.1	-15.2	-20.0	dB
Output P1dB	22.5	22.5	22.5	dBm
Output OIP3*	39.0	39.5	40.0	dBm
Noise Figure	0.82	0.90	0.95	dB
Icq	79			mA
Vcc	5			V

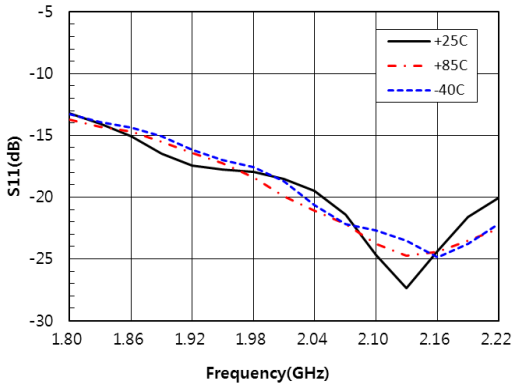
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 1800~2200MHz

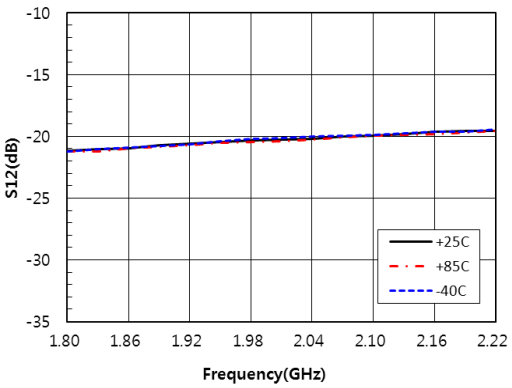
S21



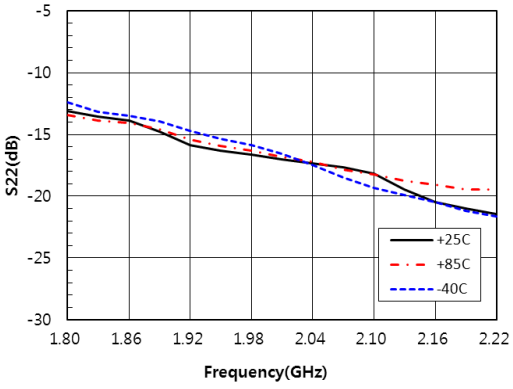
S11



S12

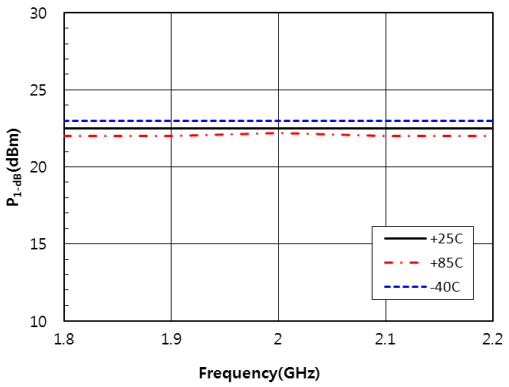


S22

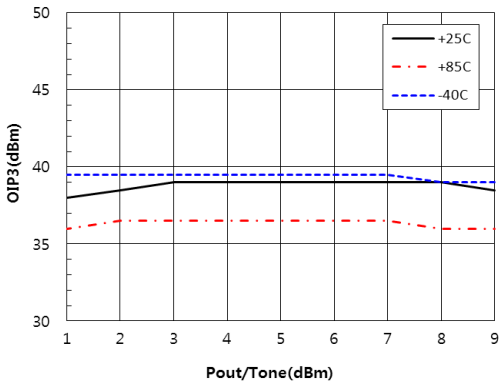


P1dB, OIP3 and Noise Figure Performance at 1800~2200MHz

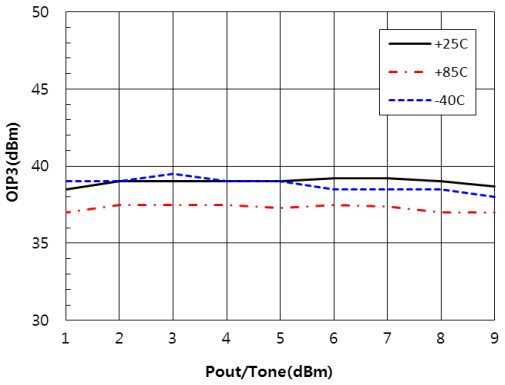
$P_{1\text{-}dB}$ vs. Frequency



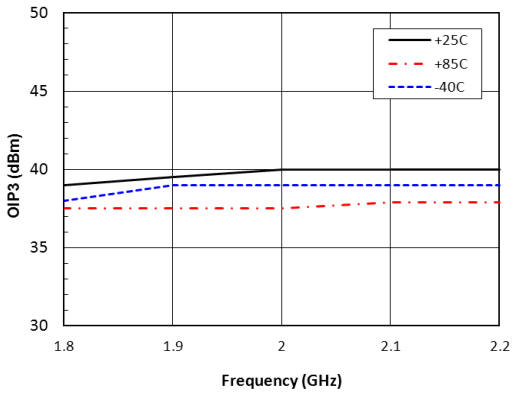
OIP3 vs. Pout Over Temp. @ 1850MHz



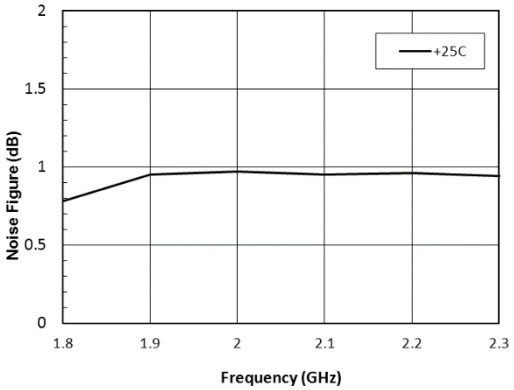
OIP3 vs. Pout Over Temp. @ 2140MHz



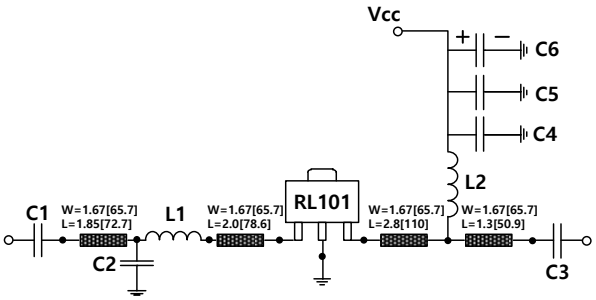
OIP3 vs. Frequency



NF vs. Frequency



2300~2700MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	NA
C2	1.0pF	C5	1000pF	L2	5.6nH
C3	100pF	C6	10uF		

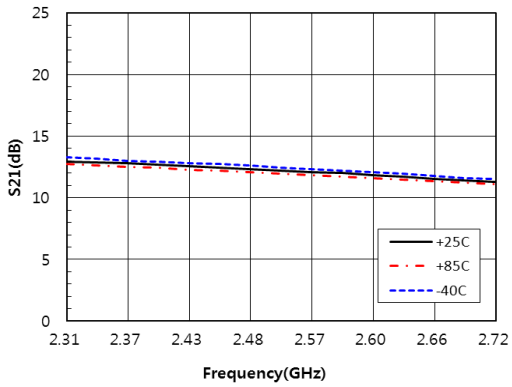
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	2300	2500	2600	Unit
Small Signal Gain	13.0	12.3	11.8	dB
S11	-19.6	-21.0	-17.3	dB
S22	-17.7	-22.5	-19.2	dB
Output P1dB	22.0	22.0	22.5	dBm
Output OIP3*	40.0	40.0	40.0	dBm
Noise Figure	0.92	0.91	0.95	dB
Icq	79			mA
Vcc	5			V

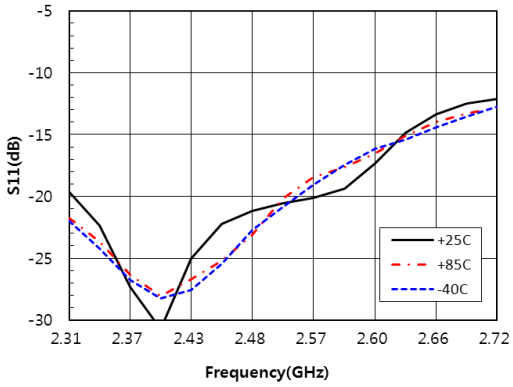
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 2300~2700MHz

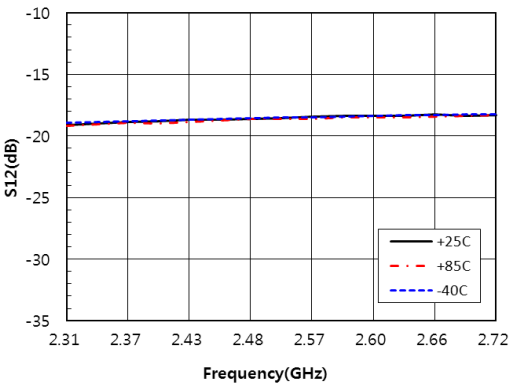
S21



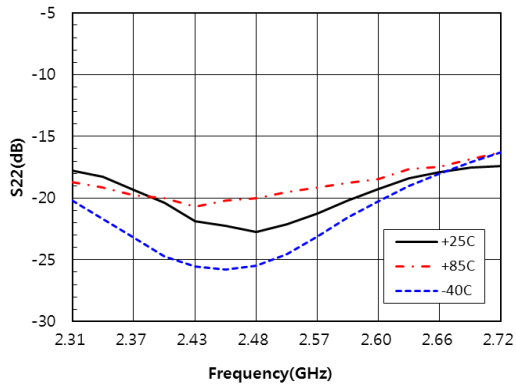
S11



S12

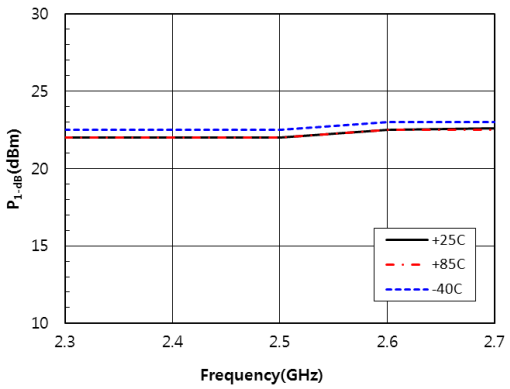


S22

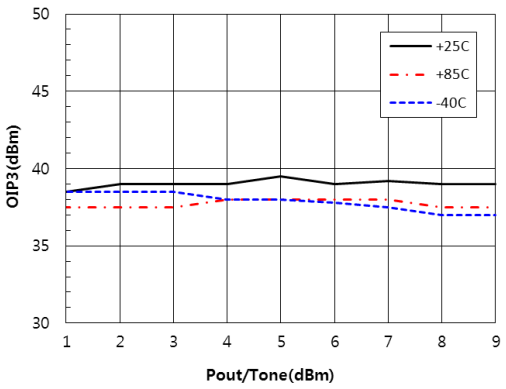


P1dB, OIP3 and Noise Figure Performance at 2300~2700MHz

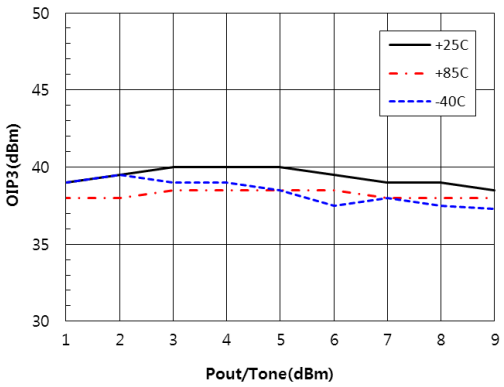
$P_{1\text{-}dB}$ vs. Frequency



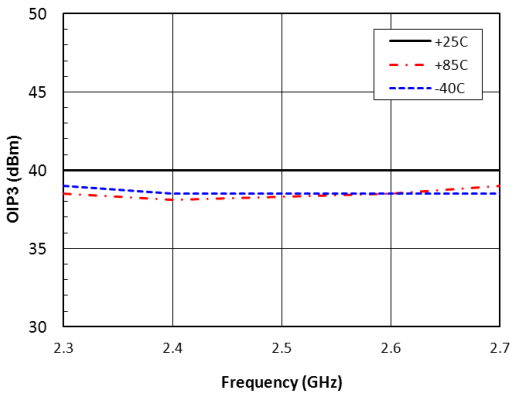
OIP3 vs. Pout Over Temp. @ 2350MHz



OIP3 vs. Pout Over Temp. @ 2600MHz

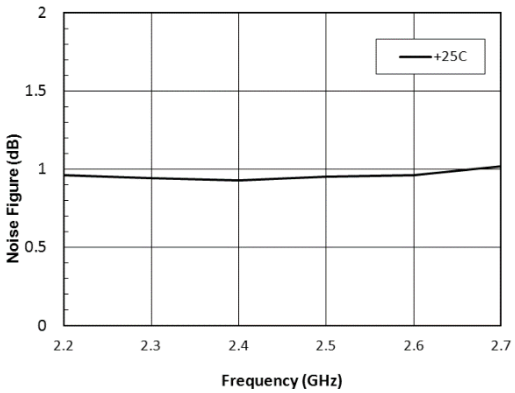


OIP3 vs. Frequency



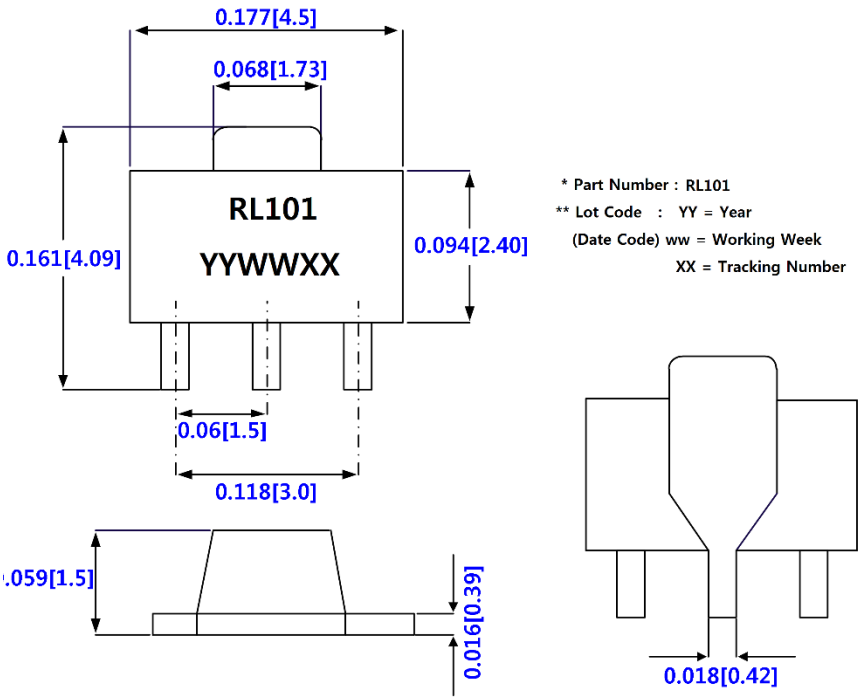
Test condition: Pout 7dBm per tone

NF vs. Frequency



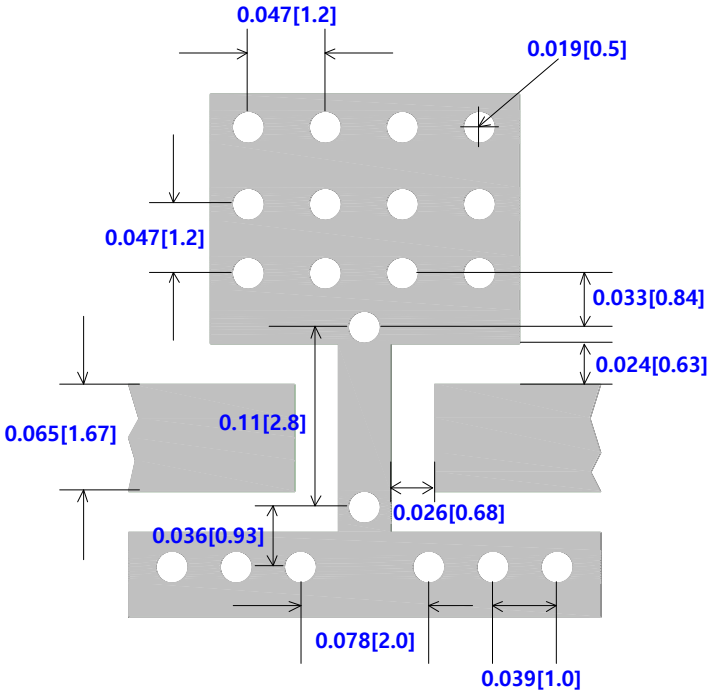
Package Mark and Dimensions

Dimension in inches[Millimeters]

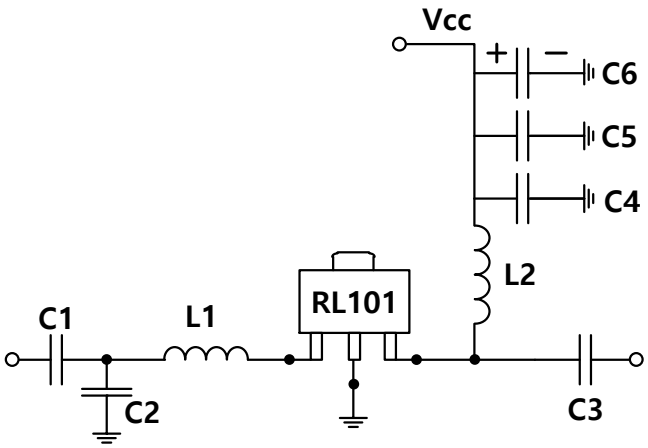


Recommended PCB Pad Pattern

Dimension in inches[Millimeters]

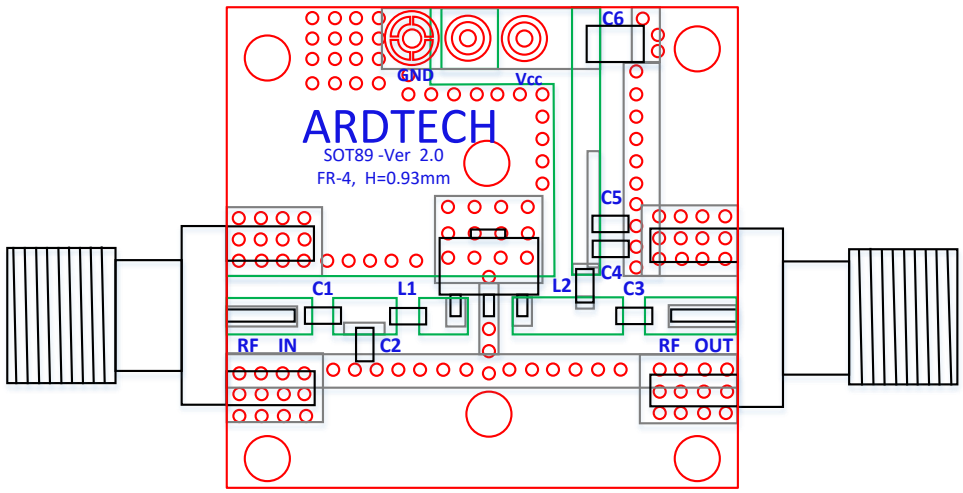


Application Schematic & BOM



Reference BOM Size	
C1	Chip Capacitor, 0603 type
C2	Chip Capacitor, 0603 type
C3	Chip Capacitor, 0603 type
C4	Chip Capacitor, 0603 type
C5	Chip Capacitor, 0603 type
C6	Tantalum Capacitor, 1206 type
L1	Chip Inductor, 0603 type
L2	Chip Inductor, 0603 type

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.036[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RL102

50-4000MHz
High Linearity Low Noise Amplifier

Product Description

RL102 is a high linearity wide-band low noise amplifier in a low-cost surface mount package and internally matched. RL102 provides 35dBm high OIP3 and 0.95dB Noise Figure at 1.85GHz. RL102 using enhancement pHEMT process is able to achieve high performance across a broad range with low current consumption and is available in a lead-free/green/RoHS-compliant SOT-89 package. RL102 is targeted for use as a receiver and transmitter in wireless infrastructure. Internal active bias circuitry allows RL102 to maintain high linearity and gain performance over temperature and operate directly off a single +5V supply. All devices are 100% RF and DC tested.

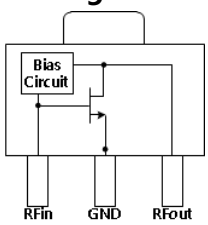
Features

- Full internal matched @ 0.7~3.0GHz
- High OIP3 35dBm @ 1.85GHz
- P1dB=24.0dBm @ 2.14GHz
- Unconditionally stable
- Single fixed 5V supply, 46mA current
- Industry standard SOT-89 package
- Lead-free, RoHS compliant, Green

Applications

- Low noise amplifier for wireless repeaters
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, LTE

Component Diagram



Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	18.9	20.4		850MHz	dB
	14.0	15.5		1850MHz	dB
	13.0	14.5		2140MHz	dB
Output power at 1-dB Compression	19.0	21.0		850MHz	dBm
	21.5	23.5		1850MHz	dBm
Third Order Intercept Point	29.0	31.0		850MHz	dBm
	33.0	35.0		1850MHz	dBm
Input Return Loss		-16.0		2140MHz	dB
Output Return Loss		-18.0		2140MHz	dB
Reverse Isolation		-27.3		850MHz	dB
Noise Figure		0.95		1850MHz	dB
Device Voltage		5			V
Device current (Icq)		46			mA
Thermal Resistance		46.2		Junction to lead	°C/W

Test condition: Vcc=5V, I_D=46mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Voltage(V_D)	6.0	V
Max Device Current(I_D)	65	mA
Max RF Input Power	18	dBm
Max Operating Dissipated Power	0.39	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 0B	
Moisture Sensitivity Level	MSL1	

Typical Electrical Specification

Parameter	850MHz	1850MHz	2140MHz	2600MHz	Unit
S21	20.4	15.5	14.5	12.7	dB
OIP3	31.0	35.0	35.0	36.0	dBm
P1dB	21.0	23.5	24.0	24.6	dBm
S11	-15.0	-16.0	-16.0	-17.7	dB
S22	-11.0	-18.1	-18.0	-15.4	dB
S12	-27.3	-23.4	-22.6	-21.6	dB
NF	1.15	0.95	1.13	1.14	dB

Test condition: Vcc=5V, I_D=46mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

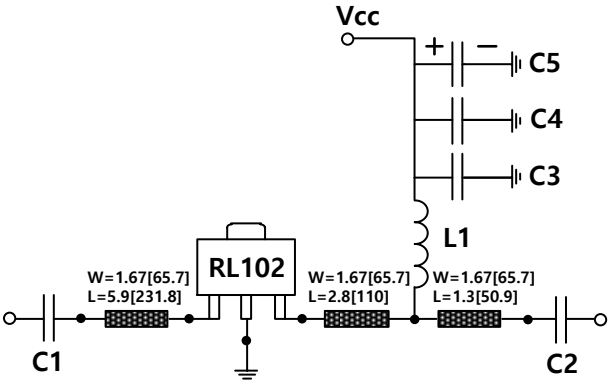
Typical 3.3V Performance

Parameter	850MHz	1850MHz	2140MHz	2600MHz	Unit
S21	19.8	15.2	14.1	12.5	dB
OIP3	25.5	28.4	28.1	29.3	dBm
P1dB	16.0	19.0	19.5	20.0	dBm
S11	-12.3	-14.6	-15.0	-16.8	dB
S22	-10.5	-23.0	-21.7	-18.2	dB
S12	-25.9	-22.0	-21.5	-20.4	dB
NF	1.15	0.95	1.13	1.14	dB

Test condition: Vcc=3.3V, I_D=28mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

RL102
50-4000MHz
High Linearity Low Noise Amplifier

700~1000MHz Reference Application Circuit



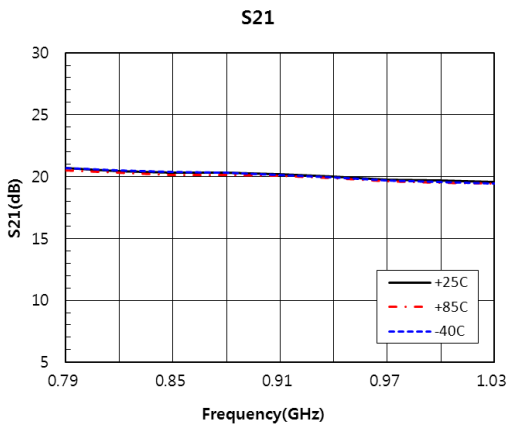
BOM	Value	BOM	Value
C1	100pF	C4	1000pF
C2	100pF	C5	10uF
C3	100pF	L1	22nH

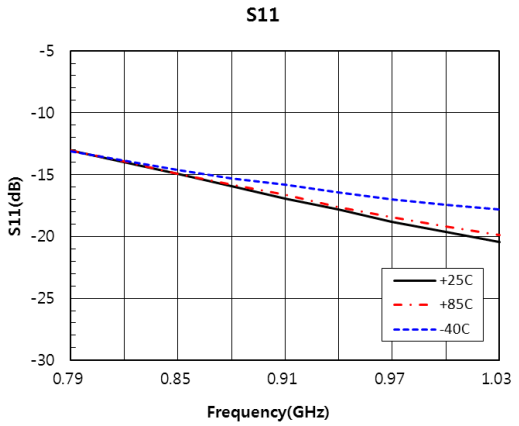
*Width and Length of Micro-strip line dimension in mm[mil]

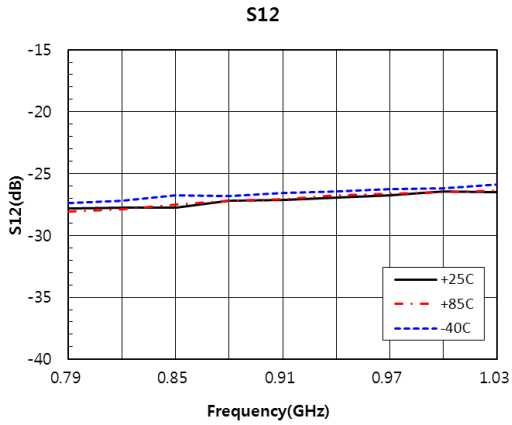
Parameter/Freq.(MHz)	800	850	900	Unit
Small Signal Gain	20.5	20.4	20.2	dB
S11	-13.8	-15.0	-16.9	dB
S22	-10.5	-11.0	-11.5	dB
Output P1dB	21.0	21.5	21.5	dBm
Output OIP3*	31.0	31.0	31.0	dBm
Noise Figure	1.27	1.28	1.24	dB
Icq	46			mA
Vcc	5			V

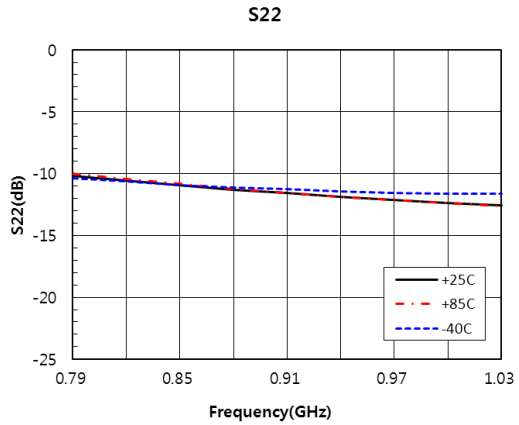
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 800~1000MHz

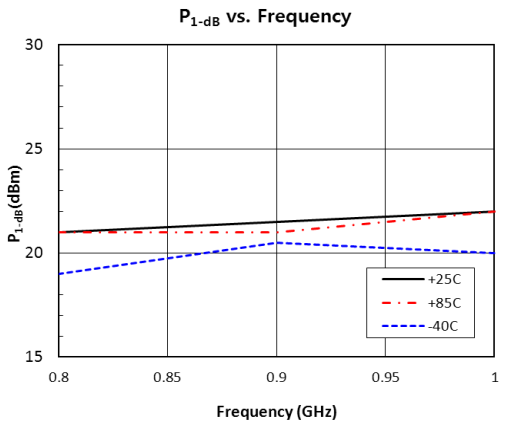


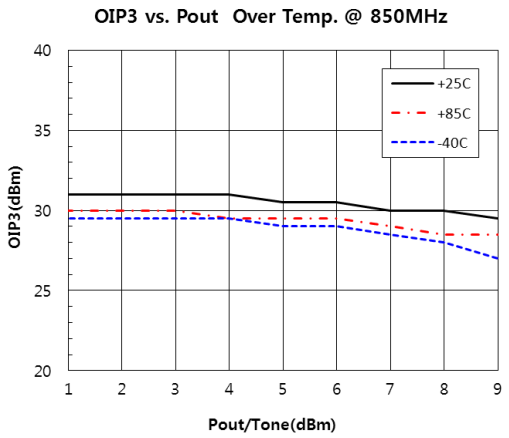


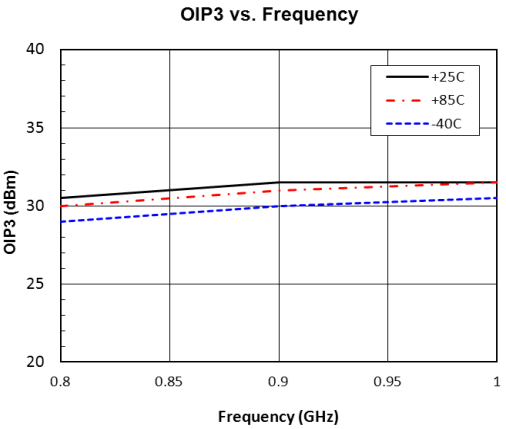


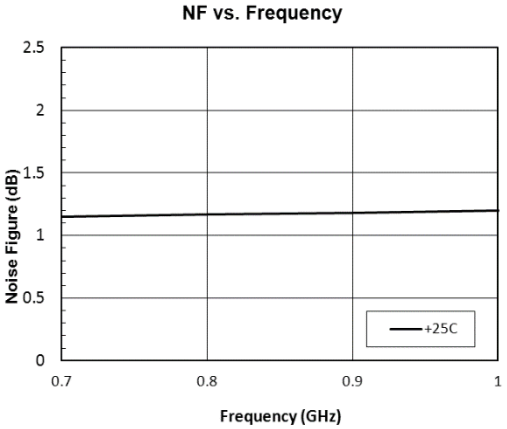


P1dB, OIP3 and Noise Figure Performance at 800~1000MHz

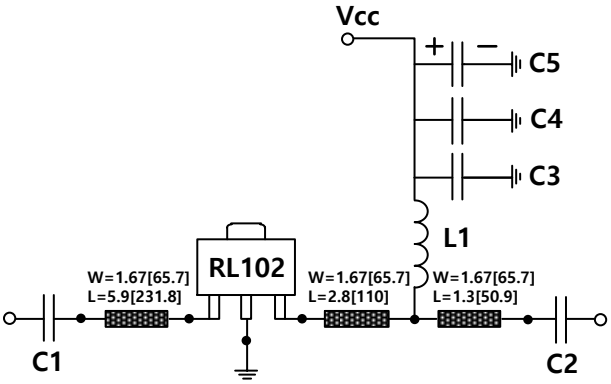








1800~2200MHz Reference Application Circuit



BOM	Value	BOM	Value
C1	100pF	C4	1000pF
C2	100pF	C5	10uF
C3	100pF	L1	12nH

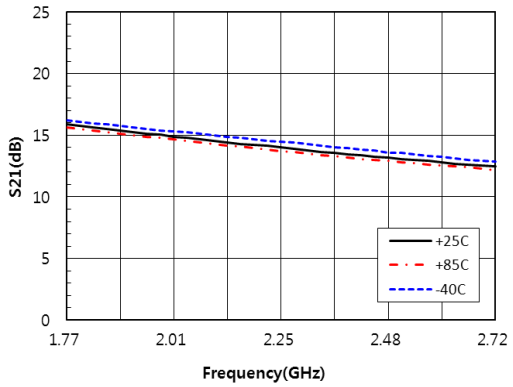
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	1850	2140	2600	Unit
Small Signal Gain	15.5	14.5	12.7	dB
S11	-16.0	-16.0	-17.7	dB
S22	-18.0	-18.0	-15.4	dB
Output P1dB	23.5	24.0	24.6	dBm
Output OIP3*	35.0	35.0	36.0	dBm
Noise Figure	0.95	1.13	1.14	dB
Icq	46			mA
Vcc	5			V

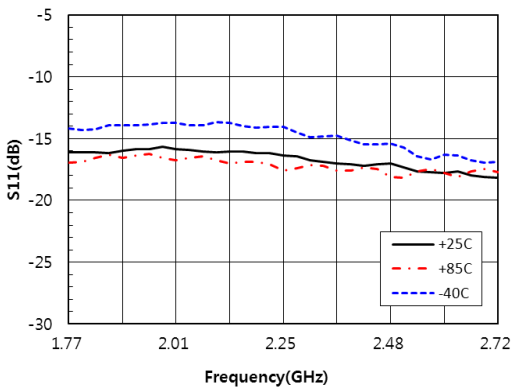
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 1800~2600MHz

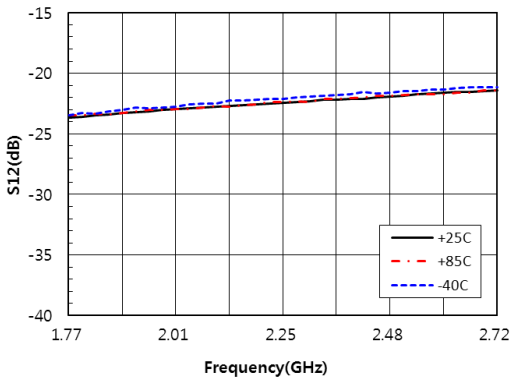
S21



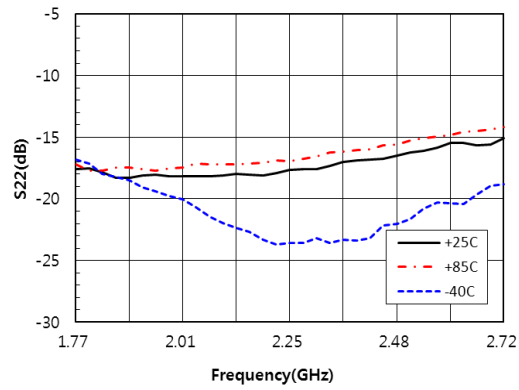
S11



S12

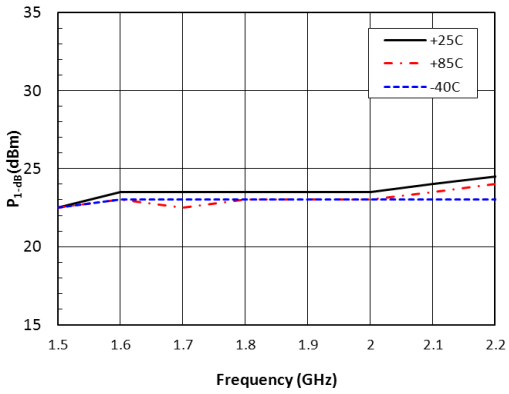


S22

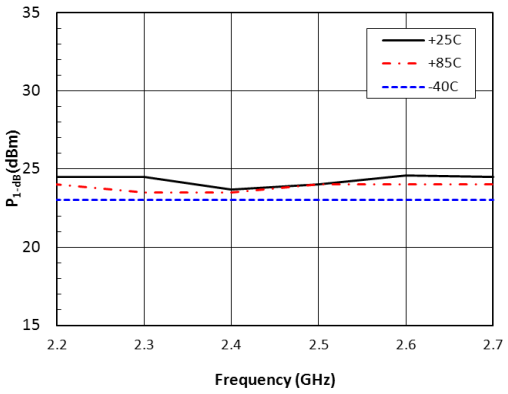


P1dB, OIP3 and Noise Figure Performance at 1800~2600MHz

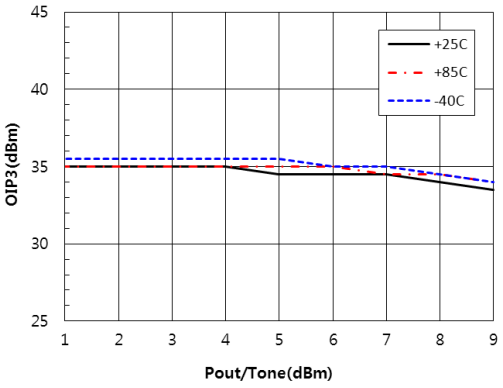
$P_{1\text{-}dB}$ vs. Frequency



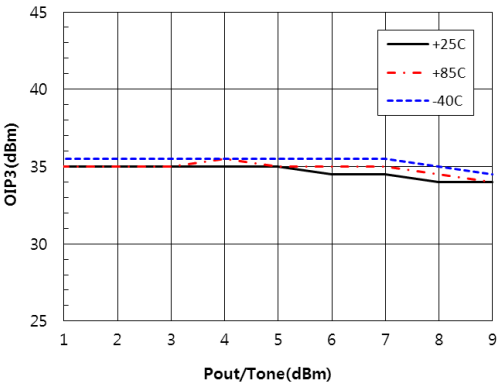
$P_{1\text{-}dB}$ vs. Frequency



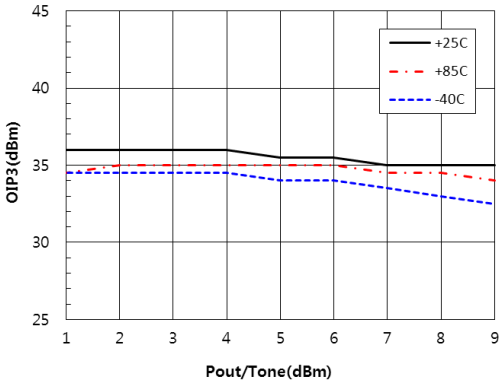
OIP3 vs. Pout Over Temp. @ 1850MHz



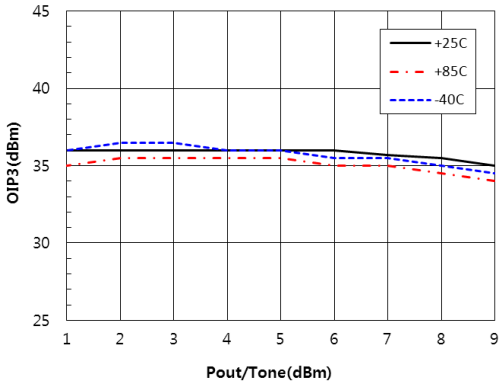
OIP3 vs. Pout Over Temp. @ 2140MHz



OIP3 vs. Pout Over Temp. @ 2350MHz

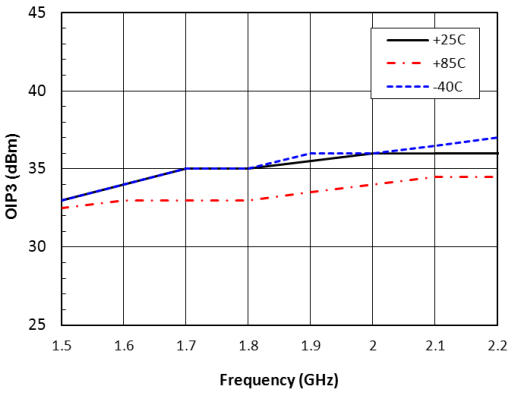


OIP3 vs. Pout Over Temp. @ 2600MHz

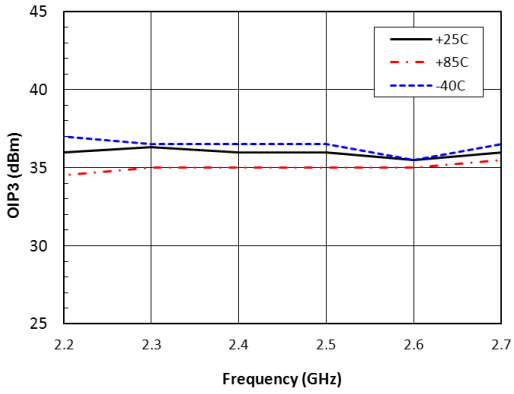


P1dB, OIP3 and Noise Figure Performance at 1800~2600MHz

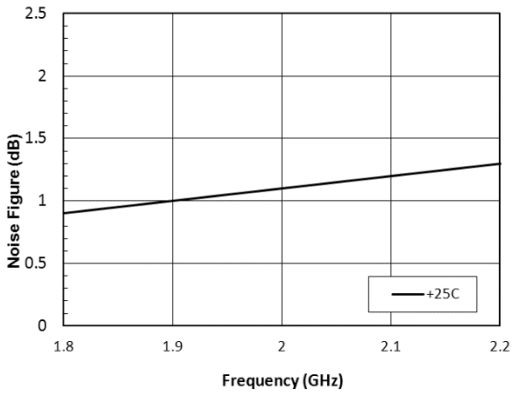
OIP3 vs. Frequency



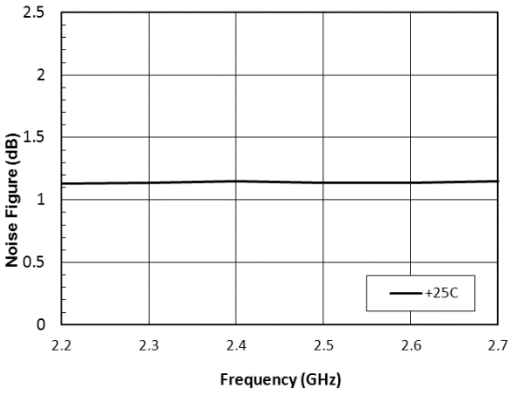
OIP3 vs. Frequency



NF vs. Frequency

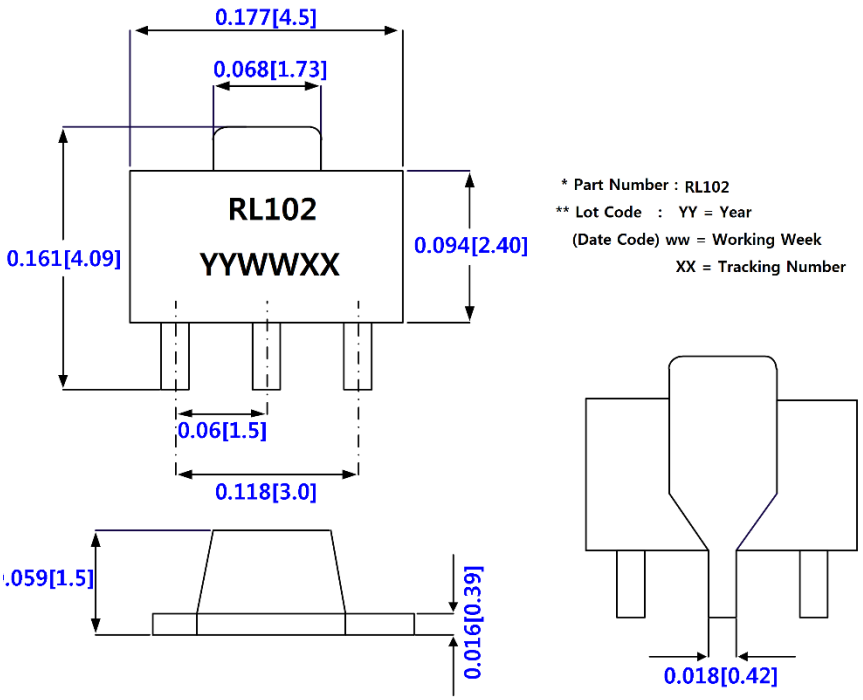


NF vs. Frequency



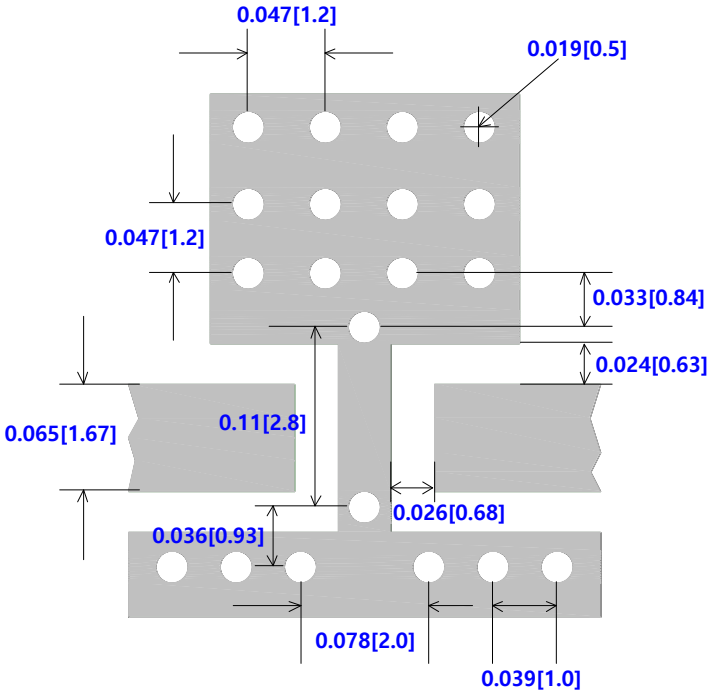
Package Mark and Dimensions

Dimension in inches[Millimeters]

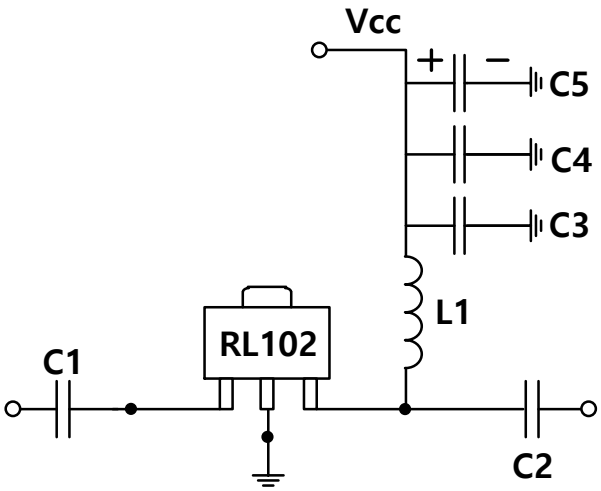


Recommended PCB Pad Pattern

Dimension in inches[Millimeters]

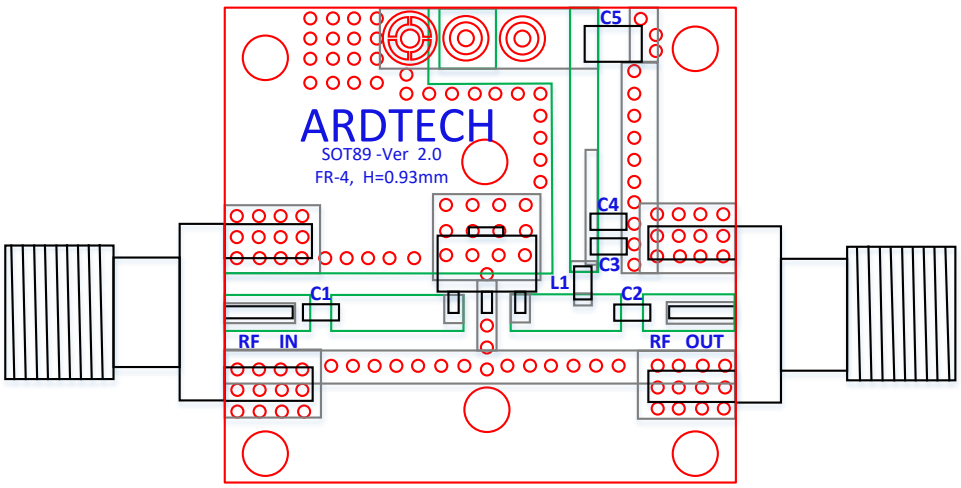


Application Schematic & BOM



Reference BOM Size	
C1	Chip Capacitor, 0603 type
C2	Chip Capacitor, 0603 type
C3	Chip Capacitor, 0603 type
C4	Chip Capacitor, 0603 type
C5	Tantalum Capacitor, 1206 type
L1	Chip Inductor, 0603 type

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.036[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RL531

50-4000MHz
High Linearity 3V Low Noise Amplifier

Product Description

RL531 is a high linearity wide-band low noise Amplifier in a low-cost surface mount package and provides 33dBm high OIP3 and 0.85dB Noise Figure at 900MHz. It is fabricated on a compound semiconductor material and pHEMT device technology. RL531 is available in a lead-free / green / RoHS-compliant SOT363(SC70) package. The performance target is designed for use as a receiver and transmitter in wireless infrastructure system where high linearity and low noise is required. Internal active bias circuitry allows RL531 to maintain high linearity and gain performance over temperature and operate directly off a single +3.3V supply. All devices are 100% RF and DC tested.

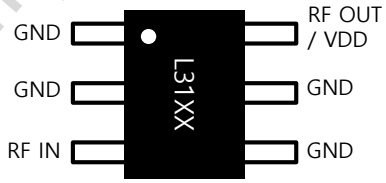
Features

- High OIP3 33dBm at 900MHz
- 19dB Gain at 900MHz
- P1dB=20dBm at 900MHz
- 0.85dB Noise Figure at 900MHz
- Unconditionally stable
- Single 3.3V supply, 50mA current
- No dropping resistor required
- Industry standard SOT363(SC70) package
- Lead-free, RoHS compliant, Green

Applications

- Broadband Gain Block
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, WiBro, LTE

Component Diagram



SOT-363(SC70)

Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	17.2	19.0		900MHz	dB
	12.1	13.5		1900MHz	dB
	11.1	12.6		2140MHz	dB
Output power at 1-dB Compression	18.3	20.0		900MHz	dBm
	18.0	19.5		1900MHz	dBm
Third Order Intercept Point	31.2	33.0		900MHz	dBm
	30.8	32.8		1900MHz	dBm
Input Return Loss		-19.5		900MHz	dB
Output Return Loss		-16.4		900MHz	dB
Reverse Isolation		-25.0		900MHz	dB
Noise Figure		0.85		900MHz	dB
Device Voltage		3.3			V
Device current (Icq)	40	50			mA
Thermal Resistance		42.4		Junction to lead	°C/W

Test condition: Vcc=3.3V, I_D=50mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Voltage(V_D)	5.0	V
Max Device Current(I_D)	100	mA
Max RF Input Power	10	dBm
Max Operating Dissipated Power	0.5	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1B	
Moisture Sensitivity Level	MSL1	

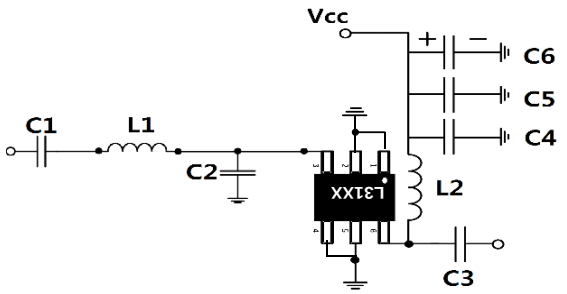
Typical Electrical Specification

Parameter	70MHz	150MHz	700MHz	900MHz	Unit
S21	25.6	24.8	20.0	19.0	dB
OIP3	30.8	31.0	32.7	33.0	dBm
P1dB	18.9	19.2	19.8	20.0	dBm
S11	-17.6	-20.3	-19.8	-19.6	dB
S22	-18.0	-27.5	-18.2	-16.2	dB
S12	-30.0	-29.6	-26.3	-25.1	dB
NF	0.83	0.84	0.85	0.85	dB

Parameter	1900MHz	2140MHz	2650MHz		Unit
S21	13.5	12.9	11.2		dB
OIP3	32.9	33.0	31.3		dBm
P1dB	19.8	19.5	19.3		dBm
S11	-16.5	-16.6	-27.5		dB
S22	-16.7	-22.0	-15.1		dB
S12	-19.8	-19.1	-17.5		dB
NF	0.87	0.91	0.98		dB

Test condition: Vcc=3.3V, I_D=50mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

60~80MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	8200pF	C4	100pF	L1	120nH
C2	10pF	C5	1000pF	L2	560nH
C3	8200pF	C6	10uF		

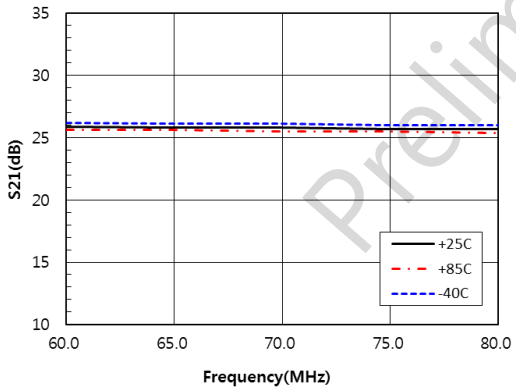
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	60	70	80	Unit
Small Signal Gain	25.6	25.6	25.5	dB
S11	-13.3	-17.6	-25.0	dB
S22	-17.4	-18.0	-17.7	dB
Output P1dB	18.7	18.9	19.1	dBm
Output OIP3*	30.5	30.8	31.5	dBm
Noise Figure		0.83		dB
Icq	50			mA
Vcc	3.3			V

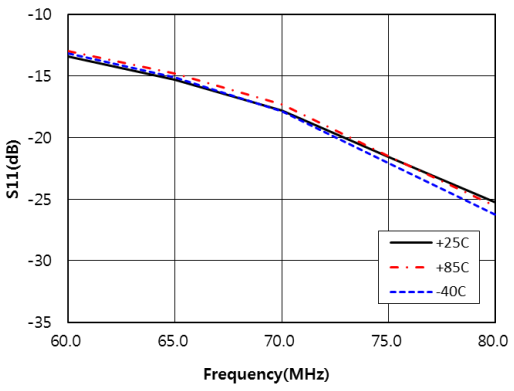
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 60~80MHz

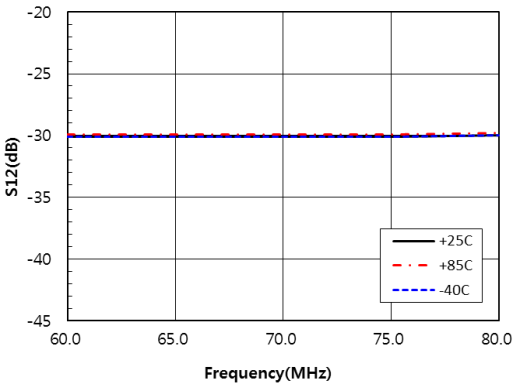
S21



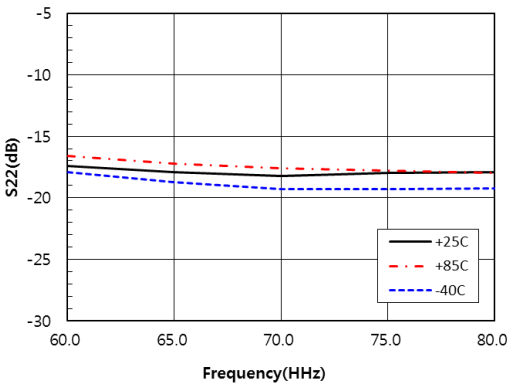
S11



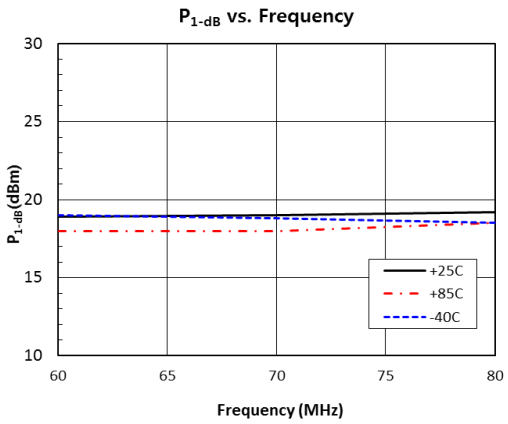
S12

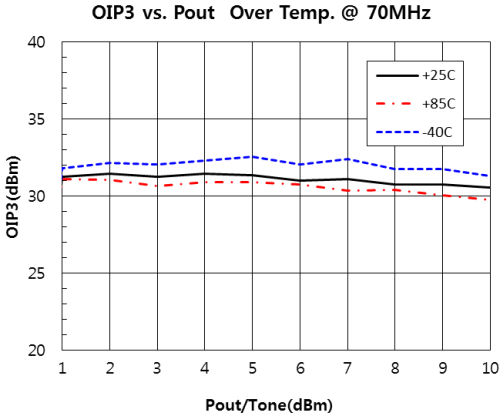


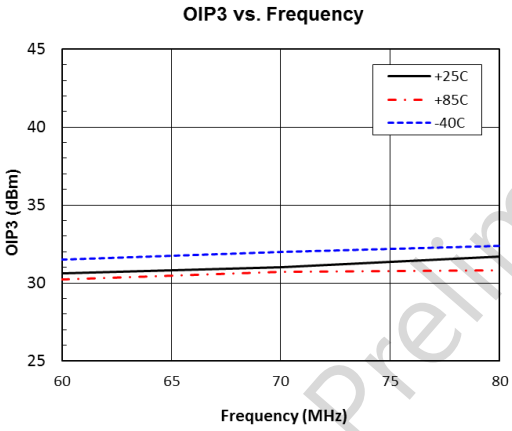
S22

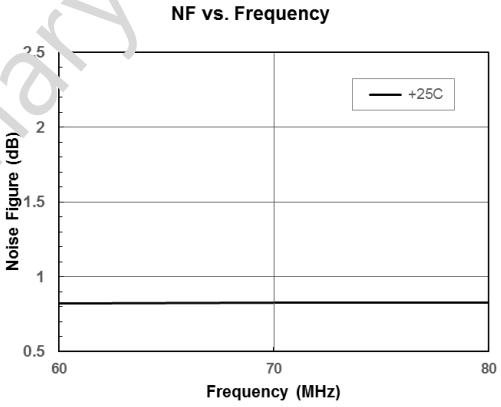


P1dB, OIP3 and Noise Figure Performance at 60~80MHz

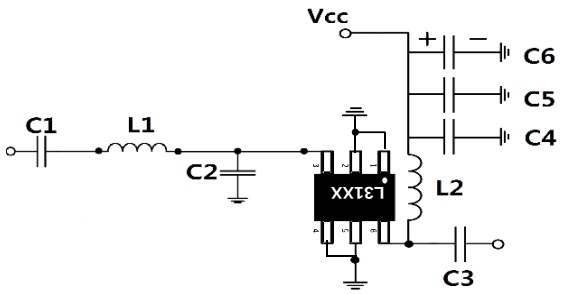








140~150MHz Reference Application Circuit



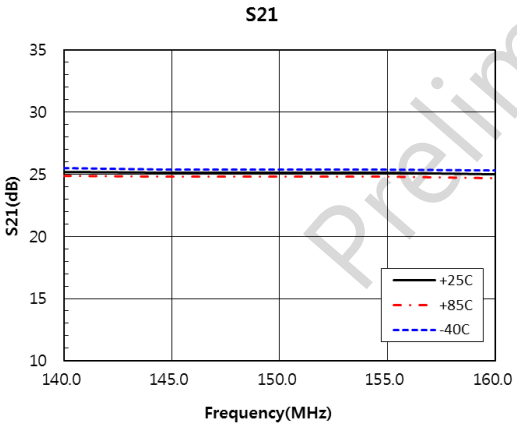
BOM	Value	BOM	Value	BOM	Value
C1	8200pF	C4	100pF	L1	47nH
C2	6pF	C5	1000pF	L2	560nH
C3	8200pF	C6	10uF		

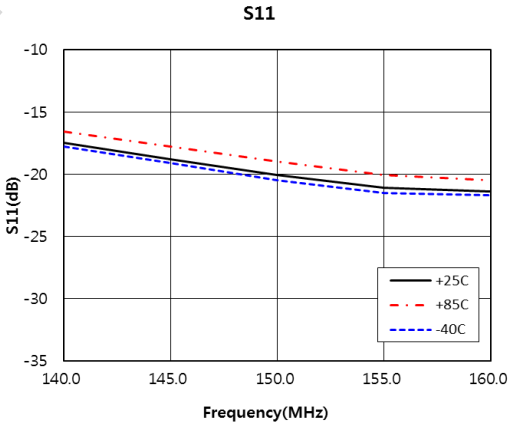
*Width and Length of Micro-strip line dimension in mm[mil]

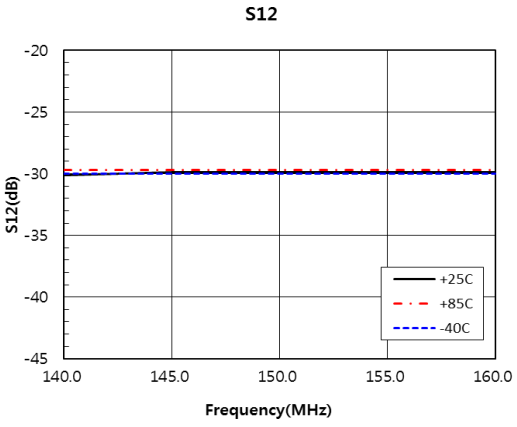
Parameter/Freq.(MHz)	140	150	160	Unit
Small Signal Gain	24.9	24.8	24.8	dB
S11	-17.7	-20.3	-21.2	dB
S22	-28.0	-27.5	-26.1	dB
Output P1dB	19.0	19.2	19.3	dBm
Output OIP3*	30.5	31.0	31.2	dBm
Noise Figure		0.84		dB
Icq	50			mA
Vcc	3.3			V

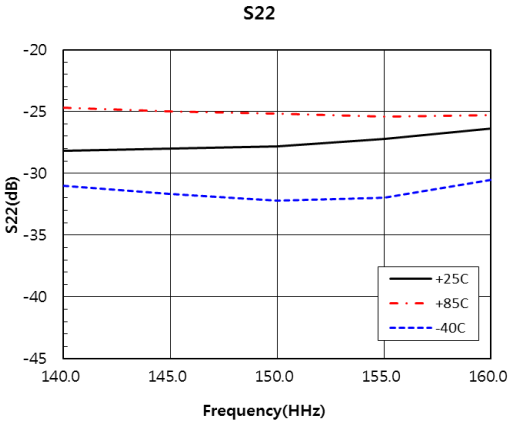
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 140~150MHz

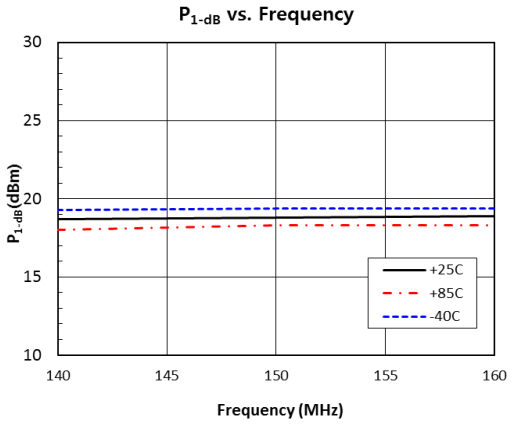


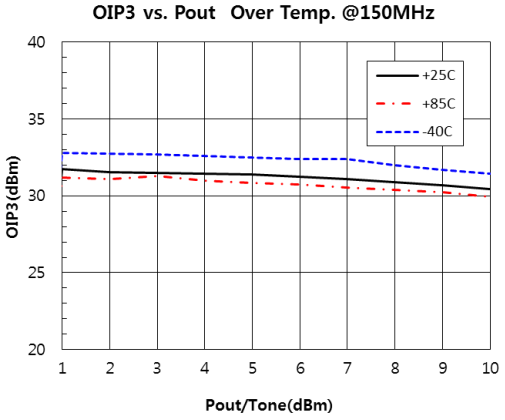


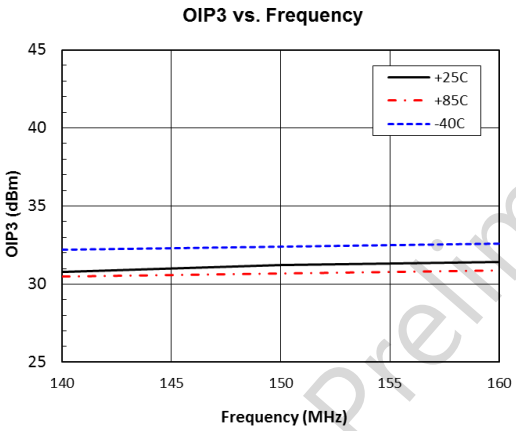


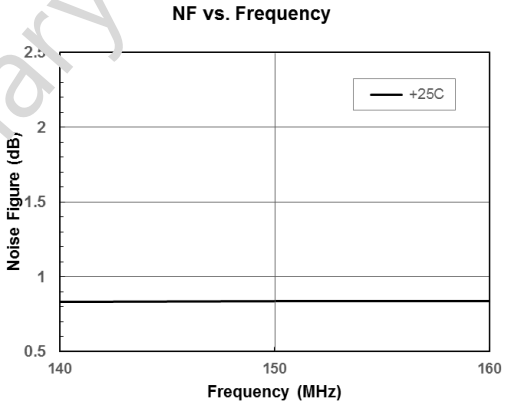


P1dB, OIP3 and Noise Figure Performance at 140~150MHz

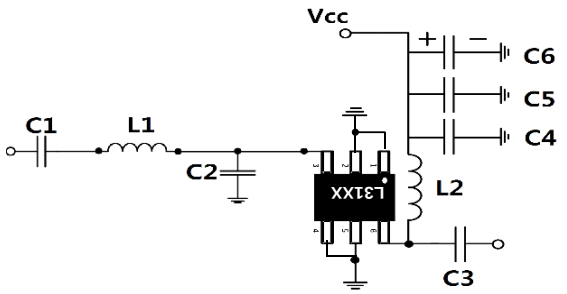








600~800MHz Reference Application Circuit



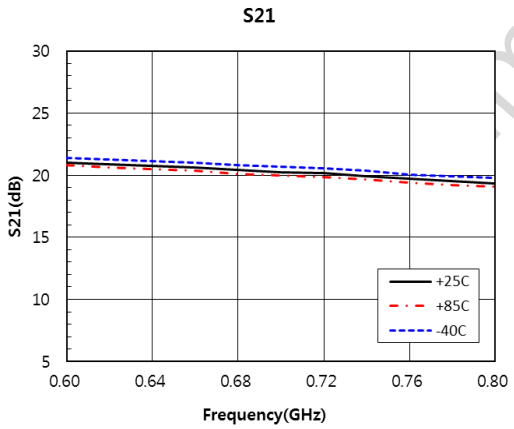
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	10nH
C2	1.8pF	C5	1000pF	L2	56nH
C3	100pF	C6	10uF		

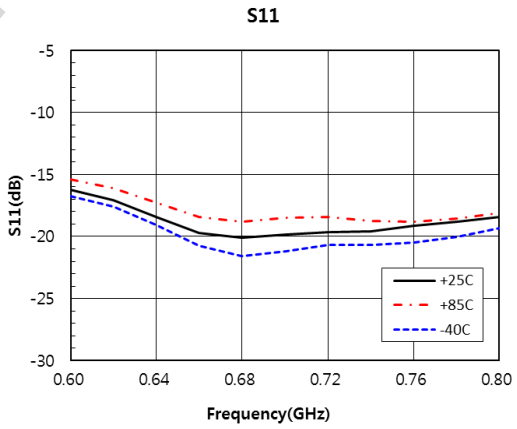
*Width and Length of Micro-strip line dimension in mm[mil]

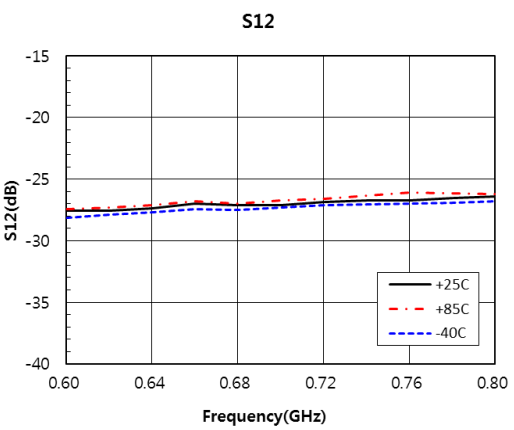
Parameter/Freq.(MHz)	600	700	800	Unit
Small Signal Gain	20.8	20.0	19.2	dB
S11	-16.5	-19.8	-18.6	dB
S22	-16.1	-18.2	-18.5	dB
Output P1dB	19.2	19.8	19.9	dBm
Output OIP3*	31.8	32.7	33.0	dBm
Noise Figure		0.85		dB
Icq	50			mA
Vcc	3.3			V

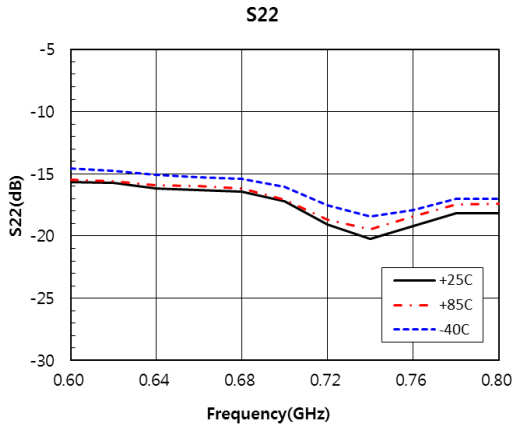
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 600~800MHz

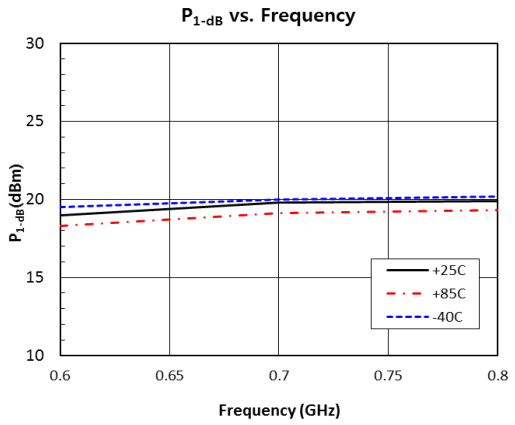


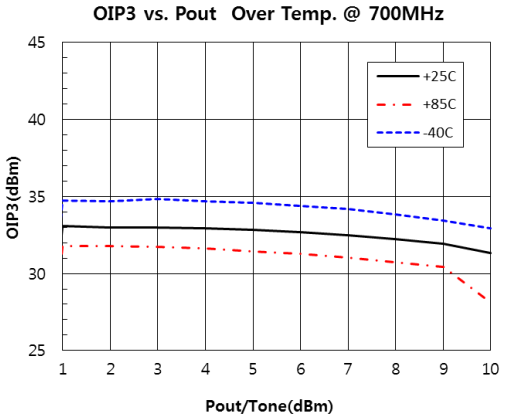


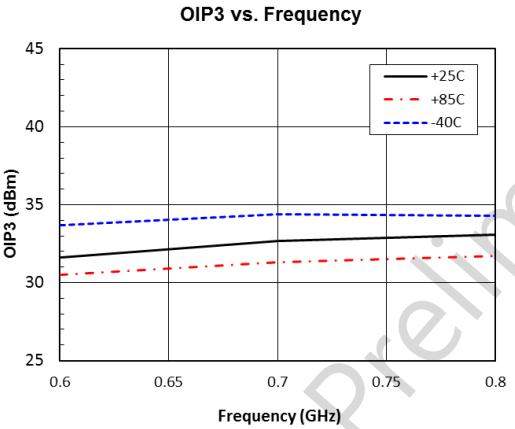


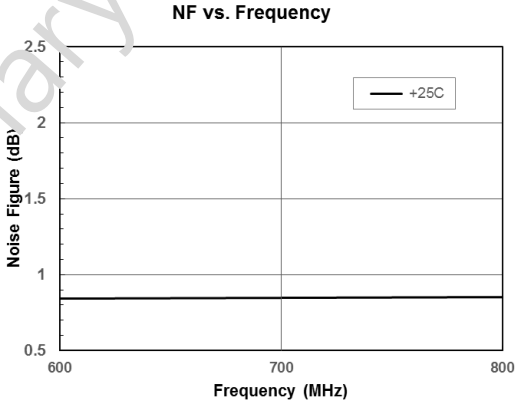


P1dB, OIP3 and Noise Figure Performance at 600~800MHz

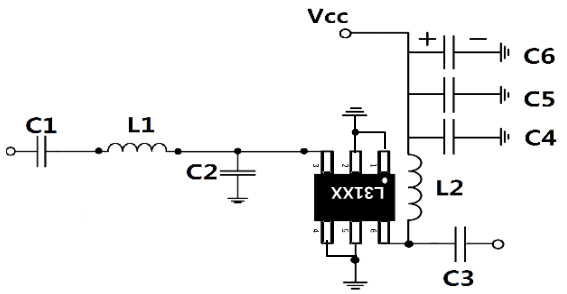








850~950MHz Reference Application Circuit



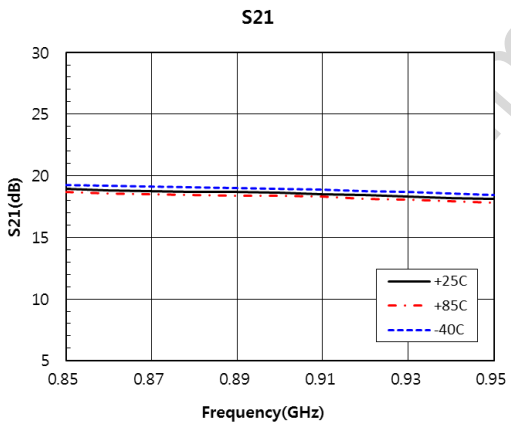
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	8.2nH
C2	1.8pF	C5	1000pF	L2	39nH
C3	100pF	C6	10uF		

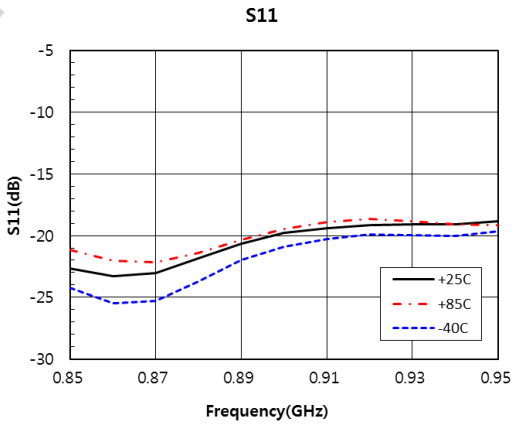
*Width and Length of Micro-strip line dimension in mm[mil]

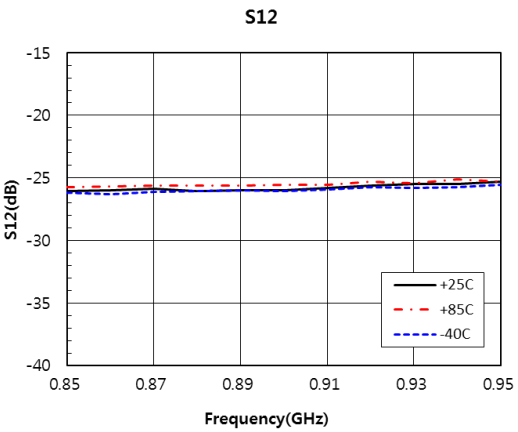
Parameter/Freq.(MHz)	850	900	950	Unit
Small Signal Gain	19.2	19.0	18.3	dB
S11	-22.2	-19.6	-19.0	dB
S22	-15.2	-16.2	-16.5	dB
Output P1dB	19.6	20.0	19.8	dBm
Output OIP3*	32.6	33.0	32.7	dBm
Noise Figure		0.85		dB
Icq	50			mA
Vcc	3.3			V

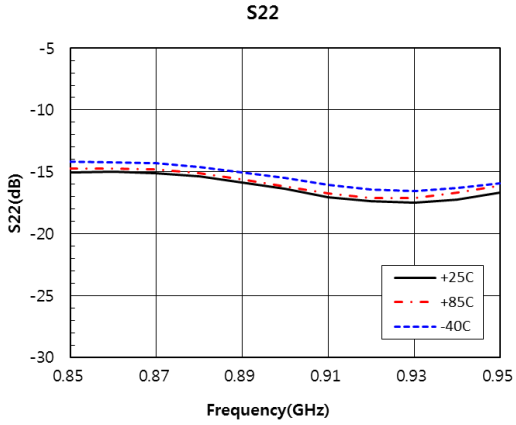
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 850~950MHz

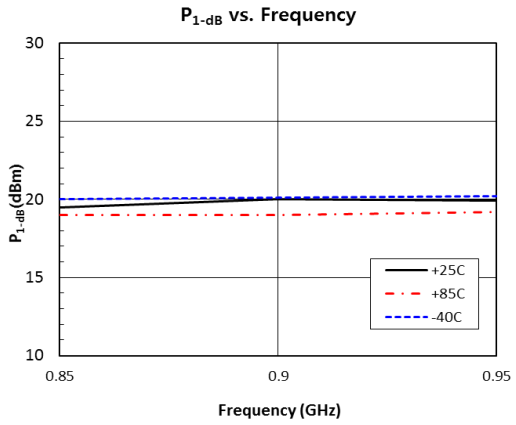


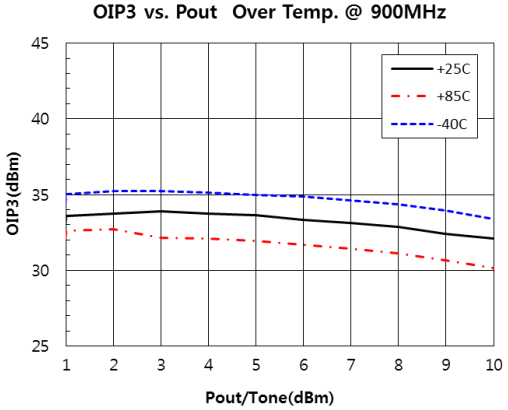


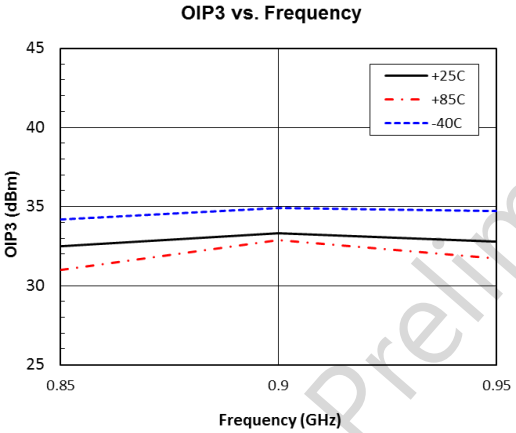


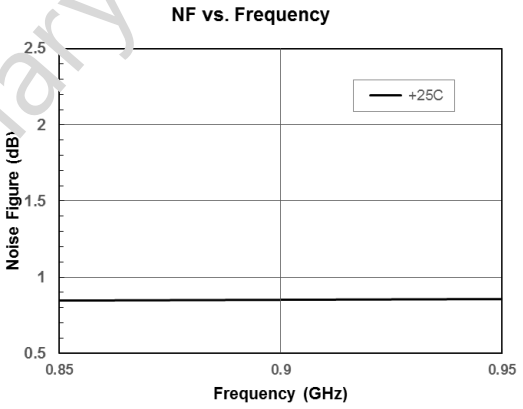


P1dB, OIP3 and Noise Figure Performance at 850~950MHz

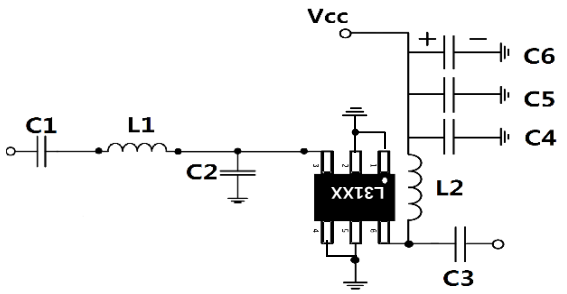








1800~2200MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	1.5nH
C2	1pF	C5	1000pF	L2	8.2nH
C3	100pF	C6	10uF		

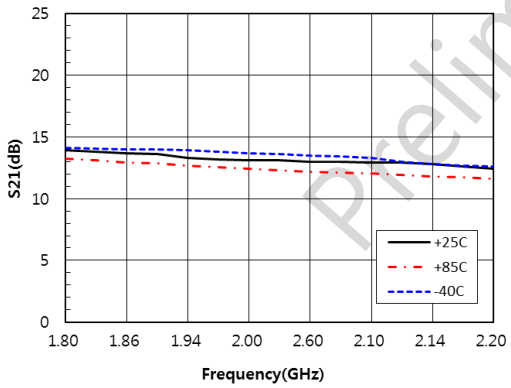
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	1800	1900	2140	Unit
Small Signal Gain	13.8	13.5	12.9	dB
S11	-15.8	-16.5	-16.6	dB
S22	-15.7	-16.7	-22.0	dB
Output P1dB	19.4	19.8	19.5	dBm
Output OIP3*	32.8	32.9	33.0	dBm
Noise Figure		0.87		dB
Icq	50			mA
Vcc	3.3			V

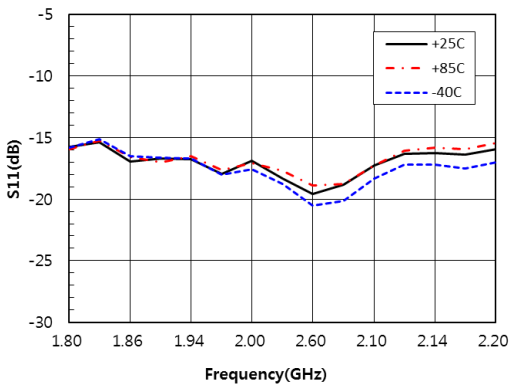
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 1800~2200MHz

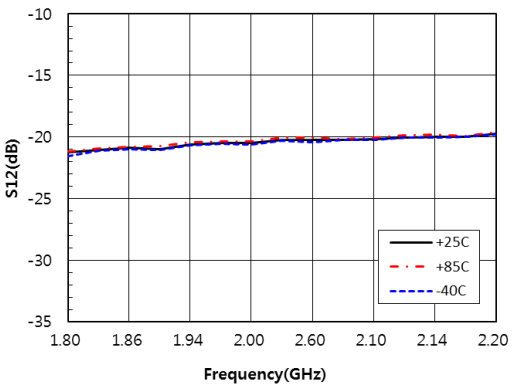
S21



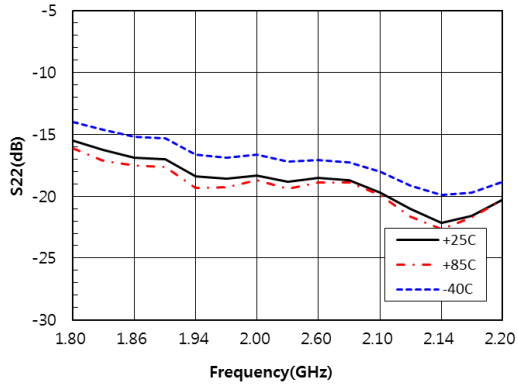
S11



S12

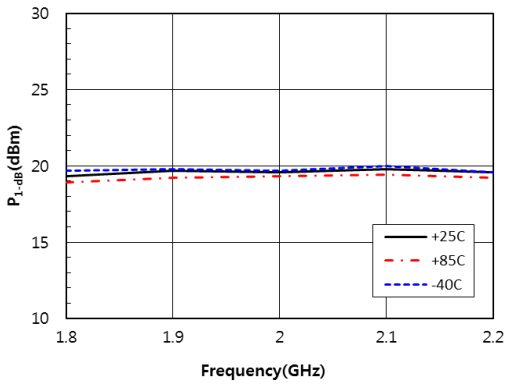


S22

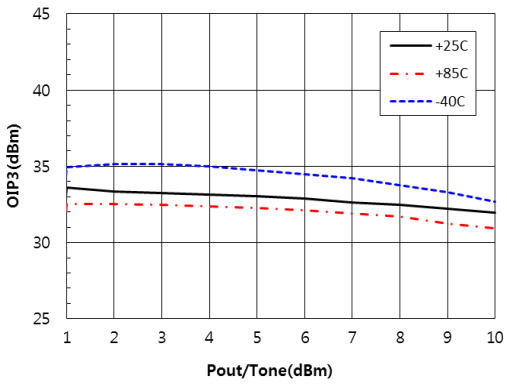


P1dB, OIP3 and Noise Figure Performance at 1800~2200MHz

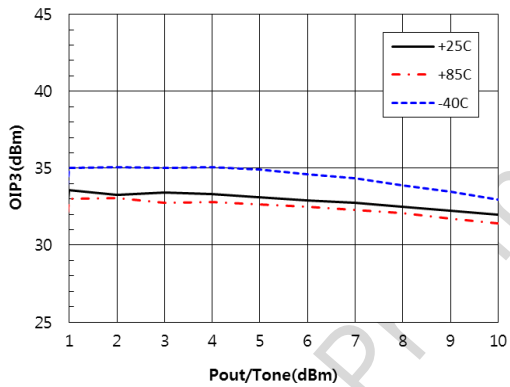
$P_{1\text{-}dB}$ vs. Frequency



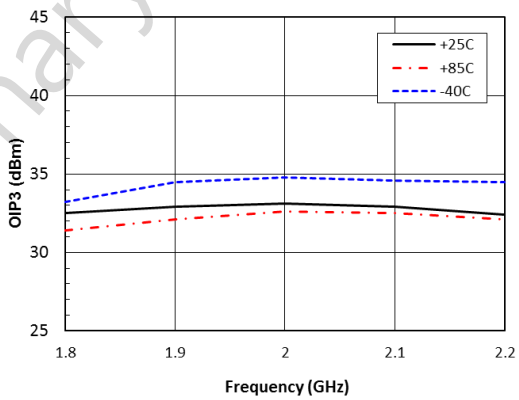
OIP3 vs. Pout Over Temp. @ 1900MHz



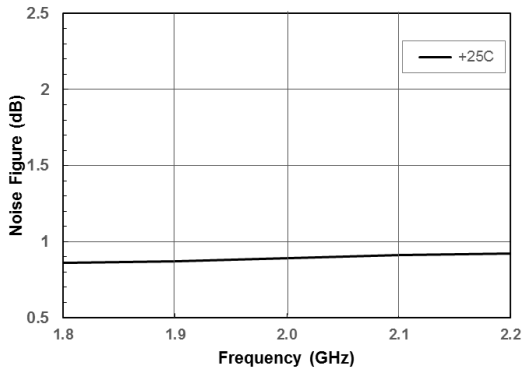
OIP3 vs. Pout Over Temp. @ 2140MHz



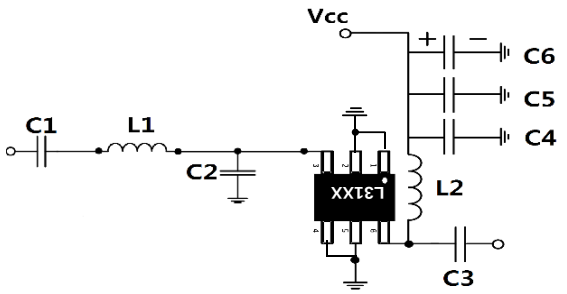
OIP3 vs. Frequency



NF vs. Frequency



2300~2700MHz Reference Application Circuit



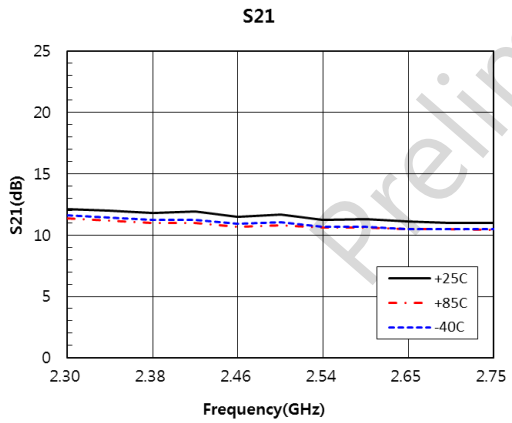
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	100pF	L1	47nH
C2	1.0pF	C5	1000pF		
C3	100pF	C6	10uF		

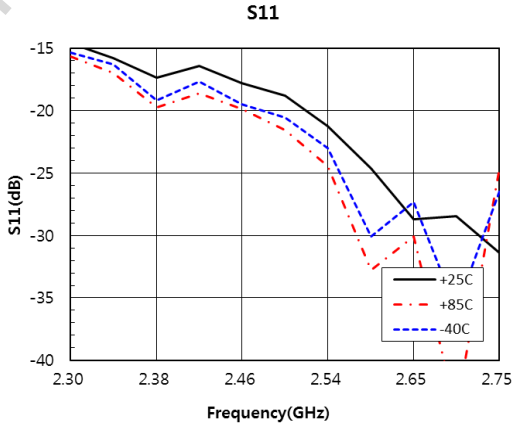
*Width and Length of Micro-strip line dimension in mm[mil]

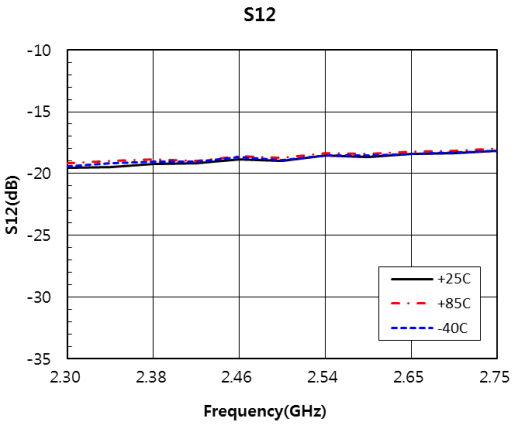
Parameter/Freq.(MHz)	2300	2650	2750	Unit
Small Signal Gain	12.4	11.2	11.0	dB
S11	-14.2	-27.5	-31.8	dB
S22	-14.0	-15.1	-17.9	dB
Output P1dB	19.3	19.3	19.7	dBm
Output OIP3*	32.2	31.3	31.0	dBm
Noise Figure		0.97		dB
Icq	50			mA
Vcc	3.3			V

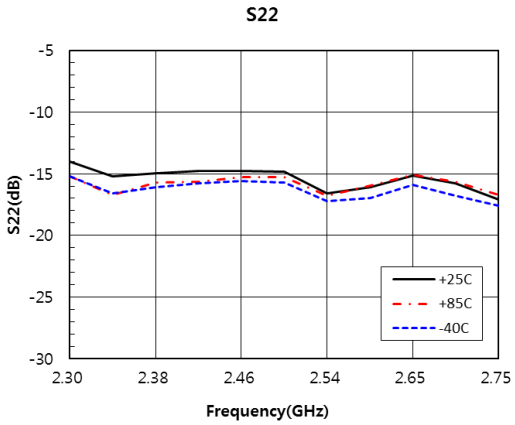
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 2300~2700MHz

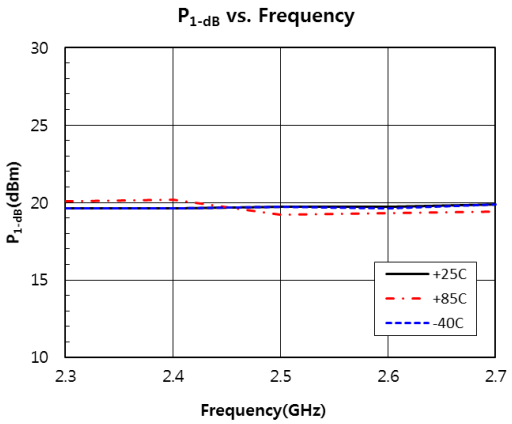


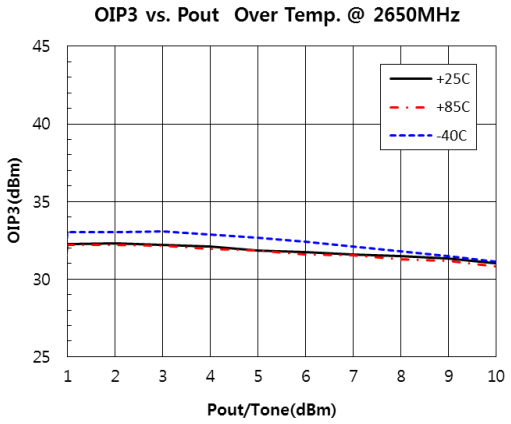


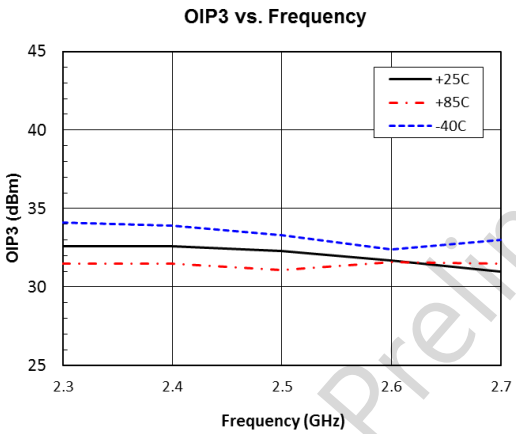


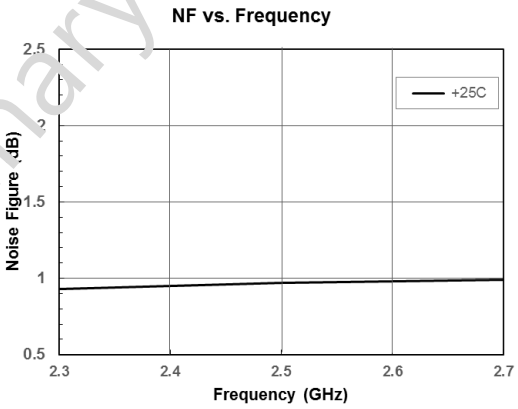


P1dB, OIP3 and Noise Figure Performance at 2300~2700MHz

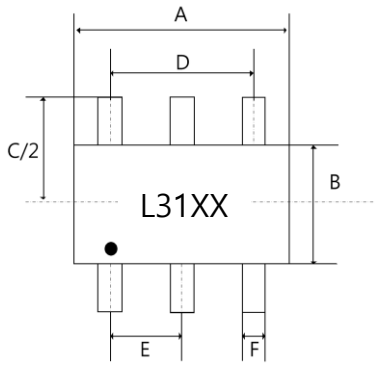






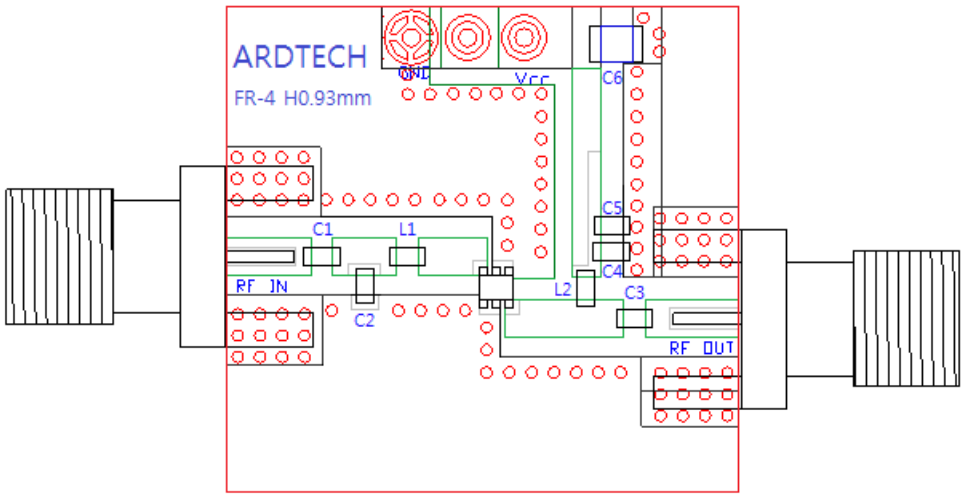


Package Mark and Dimensions



Symbol	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.90	2.10	2.15	0.074	0.082	0.084
B	1.15	1.25	1.35	0.045	0.050	0.055
C	2.00	2.10	2.20	0.078	0.082	0.086
D	1.3			0.0512		
E	0.65			0.0255		
F	0.15	-	0.30	0.006	-	0.012

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.037[0.93]
Copper Thickness	1 oz.

ARDTECH
ADVANCED RADIO DEVICE

RG532

500-4000MHz
High Linearity 3V Low Noise Amplifier

Product Description

RL532 is a low current and low noise Amplifier in a low-cost surface mount package and provides 26dBm high OIP3 and 0.92dB Noise Figure at 1900MHz. It is fabricated on a compound semiconductor material and conventional device technology. RL532 is available in a lead-free / green / RoHS-compliant SOT363(SC70) package. The performance is targeted for use as a receiver and transmitter in wireless infrastructure system where high linearity and low noise is required. Internal active bias circuitry allows RL532 to maintain high linearity and gain performance over temperature and operate directly off a single +3V supply. All devices are 100% RF and DC tested and internally matched to 50 ohms without additional external components.

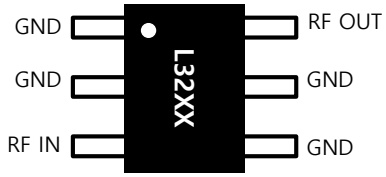
Features

- High OIP3 26dBm at 1900MHz
- 14.2dB Gain at 1900MHz
- P1dB=20dBm at 1900MHz
- 0.92dB Noise Figure at 1900MHz
- Unconditionally stable
- Single 3.3V supply, 27mA current
- No dropping resistor required
- Industry standard SOT363(SC70) package
- Lead-free, RoHS compliant, Green

Applications

- Broadband Gain Block
- Wireless infrastructure
- Cellular, PCS, GSM, WCDMA, WiBro, LTE

Component Diagram



SOT-363(SC70)

Parameter	Specification			Condition	Units
	Min.	Typ.	Max.		
Small Signal Gain	17.4	18.9		900MHz	dB
	12.7	14.2		1900MHz	dB
	11.0	13.5		2140MHz	dB
Output power at 1-dB Compression	18.5	20.0		1900MHz	dBm
	19.0	20.6		2140MHz	dBm
Third Order Intercept Point	23.7	25.7		1900MHz	dBm
	28.3	30.3		2140MHz	dBm
Input Return Loss		-22.1		1900MHz	dB
Output Return Loss		-16.8		1900MHz	dB
Reverse Isolation		-22.5		1900MHz	dB
Noise Figure		0.92		1900MHz	dB
Device Voltage		3.3			V
Device current (Icq)	18	27			mA
Thermal Resistance		41.6		Junction to lead	°C/W

Test condition: Vcc=3.3V, I_D=27mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

Phone: 82-31-304-8118 Fax: 82-31-624-5444 Order on-line at www.ardtech.co.kr
Application support: dukielee@ardtech.co.kr

Absolute Maximum Ratings

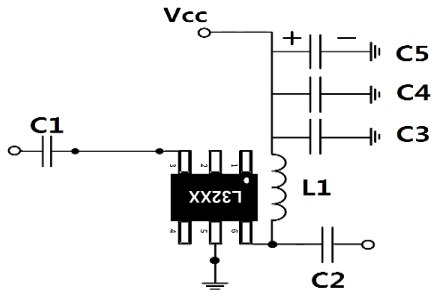
Parameter	Rating	Unit
Max Device Voltage(V_D)	5.0	V
Max Device Current(I_D)	60	mA
Max RF Input Power	10	dBm
Max Operating Dissipated Power	0.3	W
Junction Temperature(T_J)	+150	°C
Operating Temperature(T_L)	-40 to +85	°C
Storage Temperature	-65 to +150	°C
ESD Sensitivity(HBM)	Class 1B	
Moisture Sensitivity Level	MSL1	

Typical Electrical Specification

Parameter	700MHz	900MHz	1900MHz	2140MHz	2650MHz	Unit
S21	19.2	18.9	14.2	13.5	11.7	dB
OIP3	24.0	25.7	30.0	30.3	31.4	dBm
P1dB	15.0	17.0	20.0	20.6	21.6	dBm
S11	-8.8	-14.4	-22.1	-19.8	-17.7	dB
S22	-7.7	-10.7	-16.8	-17.0	-16.3	dB
S12	-28.2	-25.9	-22.5	-22.3	-21.4	dB
NF	0.93	0.92	0.92	0.93	0.95	dB

Test condition: Vcc=3.3V, I_D=27mA Typ., OIP_3 Tone Spacing=1MHz, P_{out} per tone=6dBm T_L=25°C, Z_S=Z_L=50

700~900MHz Reference Application Circuit



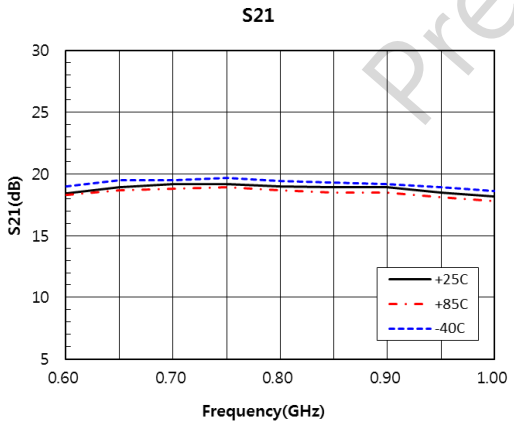
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	1000pF	L1	22nH
C2	100pF	C5	10uF		
C3	100pF				

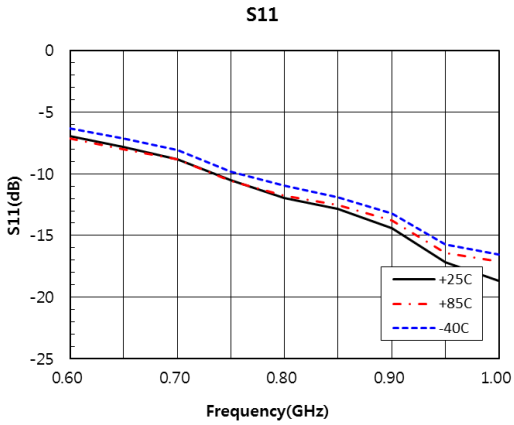
*Width and Length of Micro-strip line dimension in mm[mil]

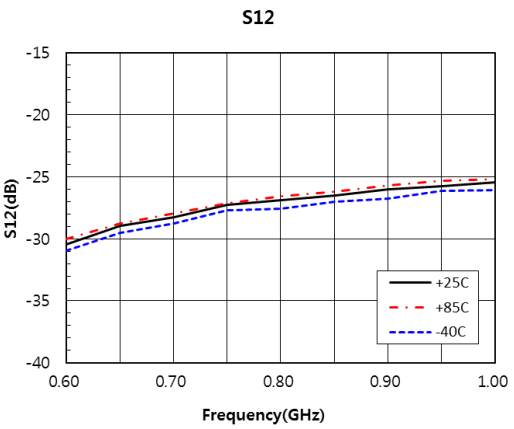
Parameter/Freq.(MHz)	700	800	900	Unit
Small Signal Gain	19.2	19.0	18.9	dB
S11	-8.8	-11.9	-14.4	dB
S22	-7.7	-9.3	-10.7	dB
Output P1dB	15	16.8	17	dBm
Output OIP3*	24.0	25.0	25.7	dBm
Noise Figure	0.93	0.93	0.92	dB
Icq	27			mA
Vcc	3.3			V

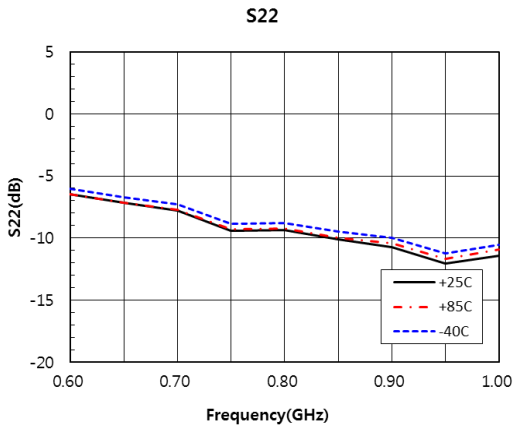
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 700~900MHz



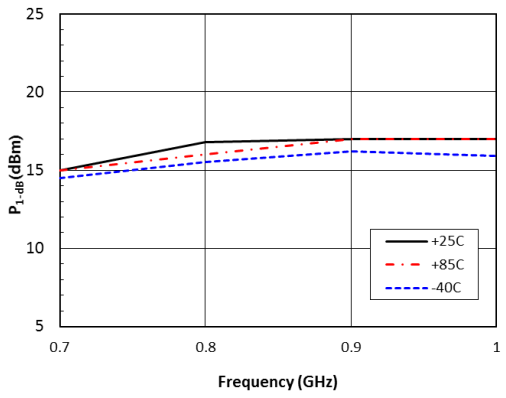




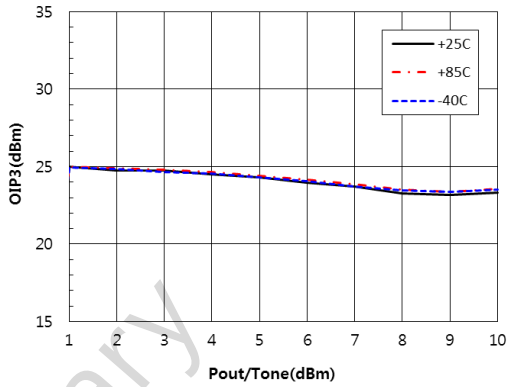


P1dB, OIP3 and Noise Figure Performance at 700~900MHz

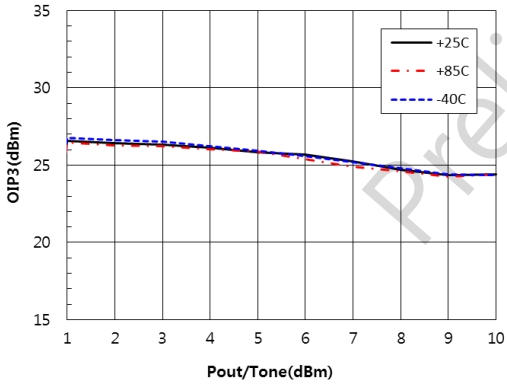
$P_{1\text{-}dB}$ vs. Frequency



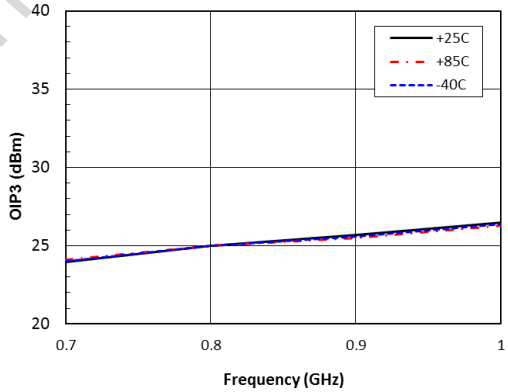
OIP3 vs. Pout Over Temp. @ 700MHz



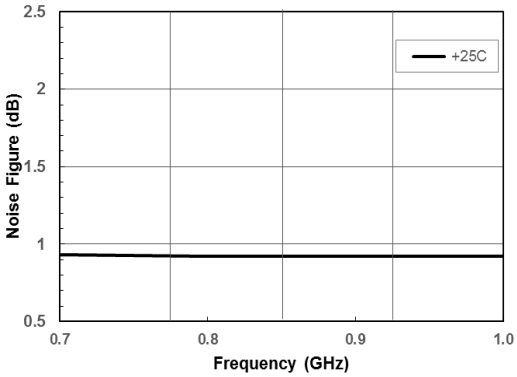
OIP3 vs. Pout Over Temp. @ 900MHz



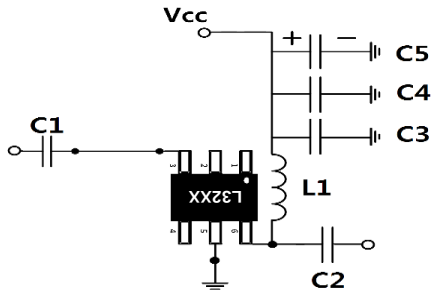
OIP3 vs. Frequency



NF vs. Frequency



1800~2200MHz Reference Application Circuit



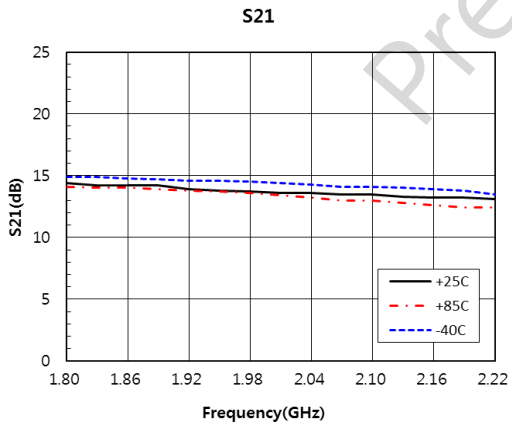
BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	1000pF	L1	10nH
C2	100pF	C5	10uF		
C3	100pF				

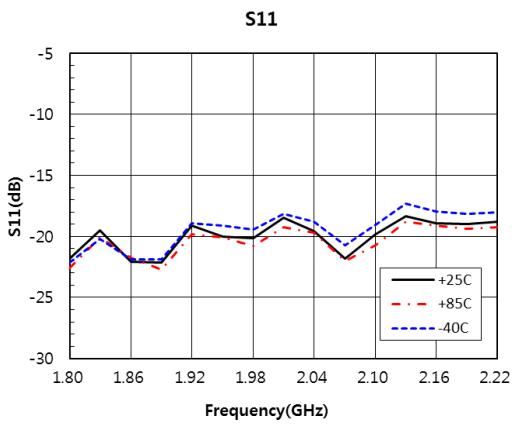
*Width and Length of Micro-strip line dimension in mm[mil]

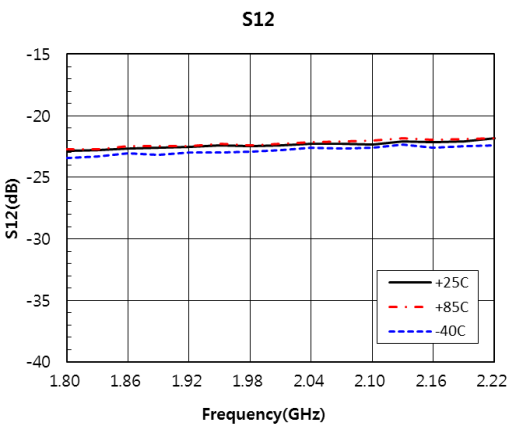
Parameter/Freq.(MHz)	1800	1900	2140	Unit
Small Signal Gain	14.4	14.2	13.5	dB
S11	-21.8	-22.1	-19.8	dB
S22	-16.3	-16.8	-17.0	dB
Output P1dB	19.5	20.0	20.6	dBm
Output OIP3*	29.9	30.0	30.3	dBm
Noise Figure	0.92	0.92	0.93	dB
Icq	27			mA
Vcc	3.3			V

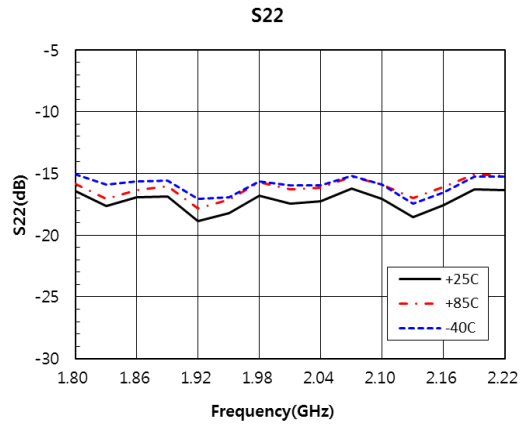
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 1800~2200MHz



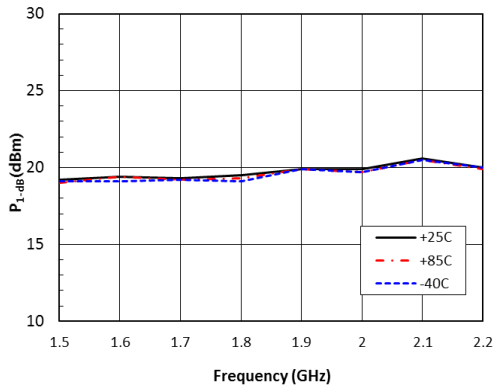




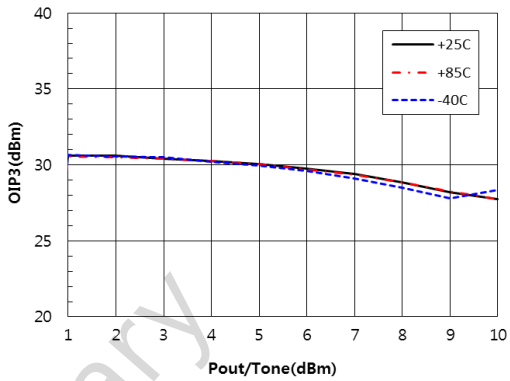


P1dB, OIP3 and Noise Figure Performance at 1800~2200MHz

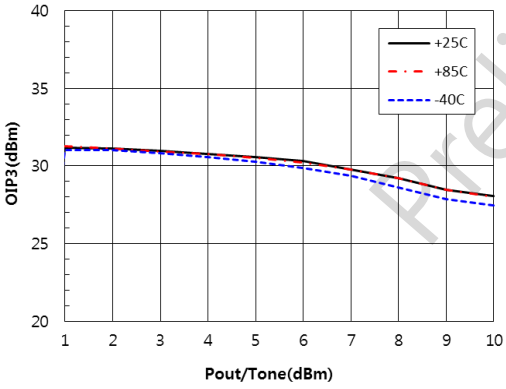
$P_{1\text{-}dB}$ vs. Frequency



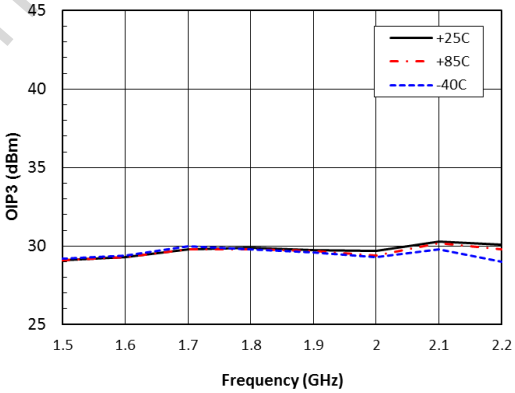
OIP3 vs. Pout Over Temp. @ 1900MHz



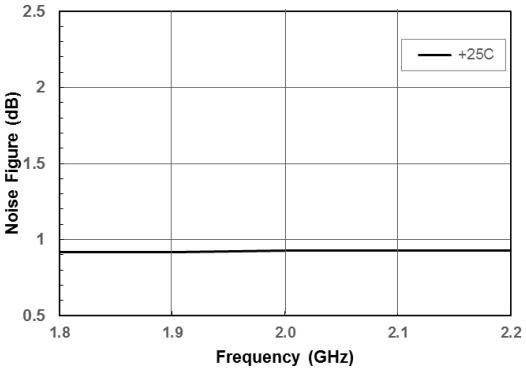
OIP3 vs. Pout Over Temp. @ 2140MHz



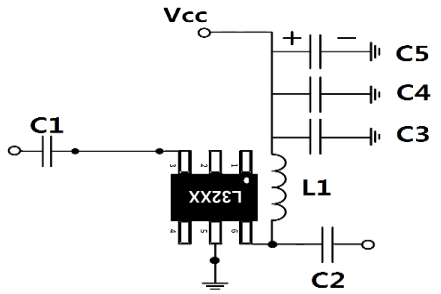
OIP3 vs. Frequency



NF vs. Frequency



2300~2700MHz Reference Application Circuit



BOM	Value	BOM	Value	BOM	Value
C1	100pF	C4	1000pF	L1	10nH
C2	100pF	C5	10uF		
C3	100pF				

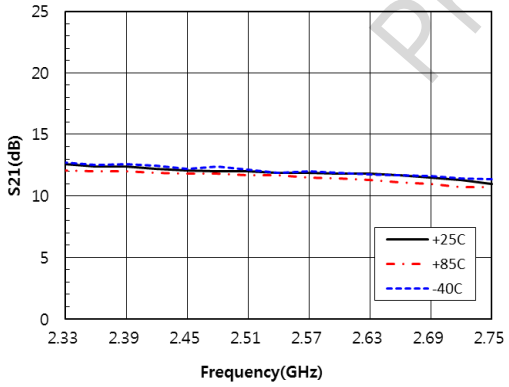
*Width and Length of Micro-strip line dimension in mm[mil]

Parameter/Freq.(MHz)	2300	2650	2750	Unit
Small Signal Gain	12.7	11.7	11.0	dB
S11	-18.4	-17.7	-18.0	dB
S22	-16.9	-16.3	-18.1	dB
Output P1dB	20.3	21.5	21.6	dBm
Output OIP3*	31.0	31.4	31.2	dBm
Noise Figure	0.94	0.95	0.96	dB
Icq	27			mA
Vcc	3.3			V

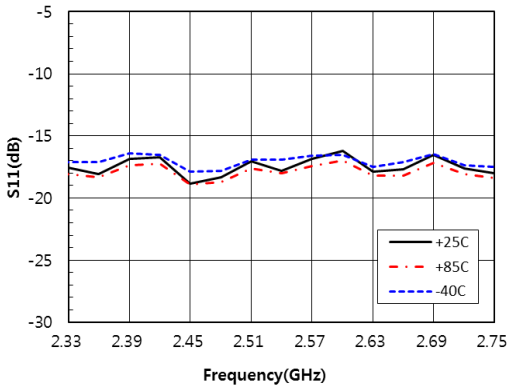
* Pout=6dBm/tone

S-Parameter Over Temperature vs. Freq. at 2300~2700MHz

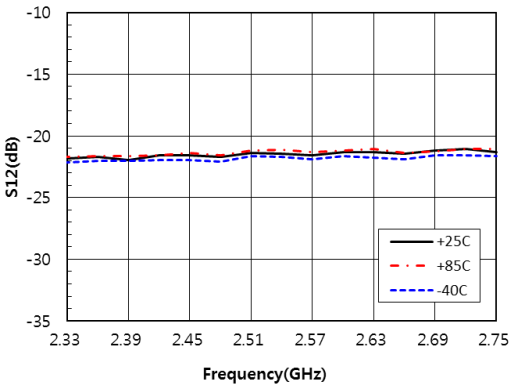
S21



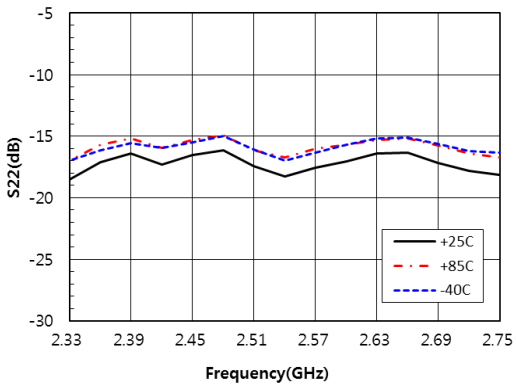
S11



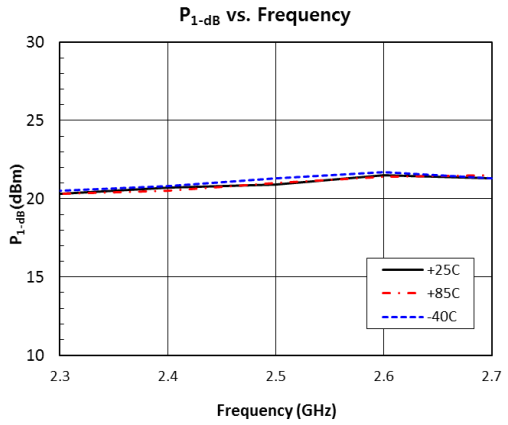
S12

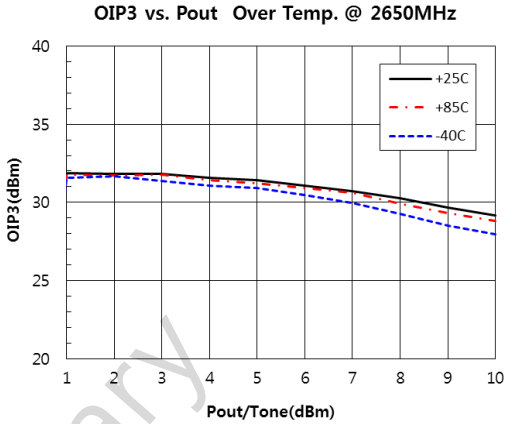


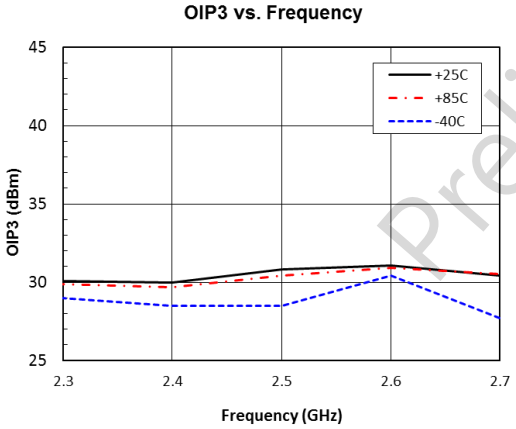
S22

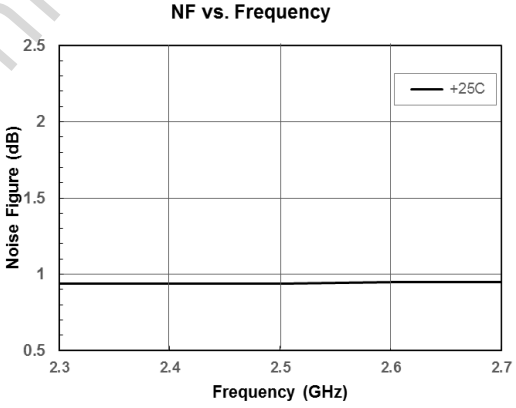


P1dB, OIP3 and Noise Figure Performance at 2300~2700MHz

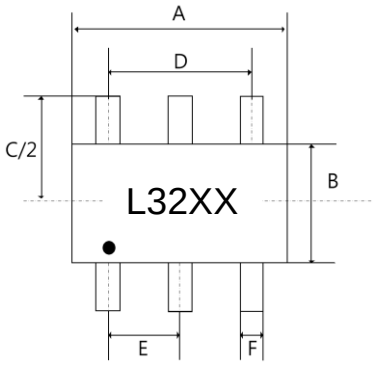






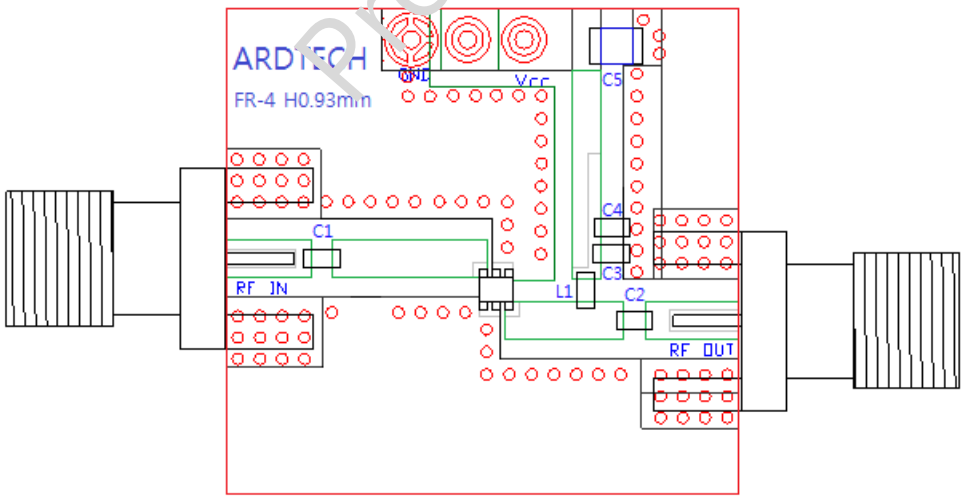


Package Mark and Dimensions



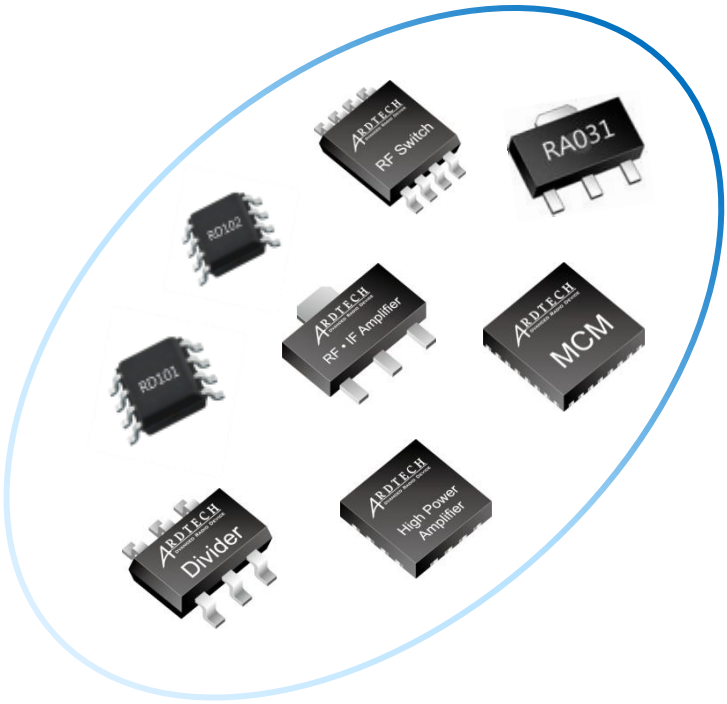
Symbol	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.90	2.10	2.15	0.074	0.082	0.084
B	1.15	1.25	1.35	0.045	0.050	0.055
C	2.00	2.10	2.20	0.078	0.082	0.086
D		1.3			0.0512	
E		0.65			0.0255	
F	0.15	-	0.30	0.006	-	0.012

Evaluation PCB Layout



PCB Substrate Information[mm]	
Dielectric Constant	FR-4/4.6
Dielectric Height	0.037[0.93]
Copper Thickness	1 oz.

For Better Wireless World



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