MXDLN16U GPS Low Noise Amplifier

Datasheet

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General Description

MXDLN16U high gain, low noise amplifier (LNA) is dedicated to GPS, GLONASS Galileo and Beidou standards. This product has an extremely low noise figure of 0.7dB, 19dB gain and excellent linearity.

MXDLN16U works under a 1.2V to 2.85V single power supply while consumes 6mA current, in power down (PD) mode, the power consumption will be reduced to less than 1uA.

MXDLN16U uses a small 1.1mmx0.9 mmx0.45mm LGA 6-pin package.

Applications

Automotive Navigation
Personal Navigation Device (PND)
Cell Phone with GPS
MID/PAD with GPS

Features

- High Gain: 19dB
- Low noise figure 0.7dB @ 1575.42MHz
- Low operation current 6mA & PD current less than 1uA
- 3.6mA current under 1.2V power supply
- Single supply voltage range 1.2V to 2.85V
- Small package 1.1mmx0.9 mmx0.45mm
- Low cost BOM
- Lead-Free and RoHS-Compliant

Pin Configuration/Application Diagram (Top view)

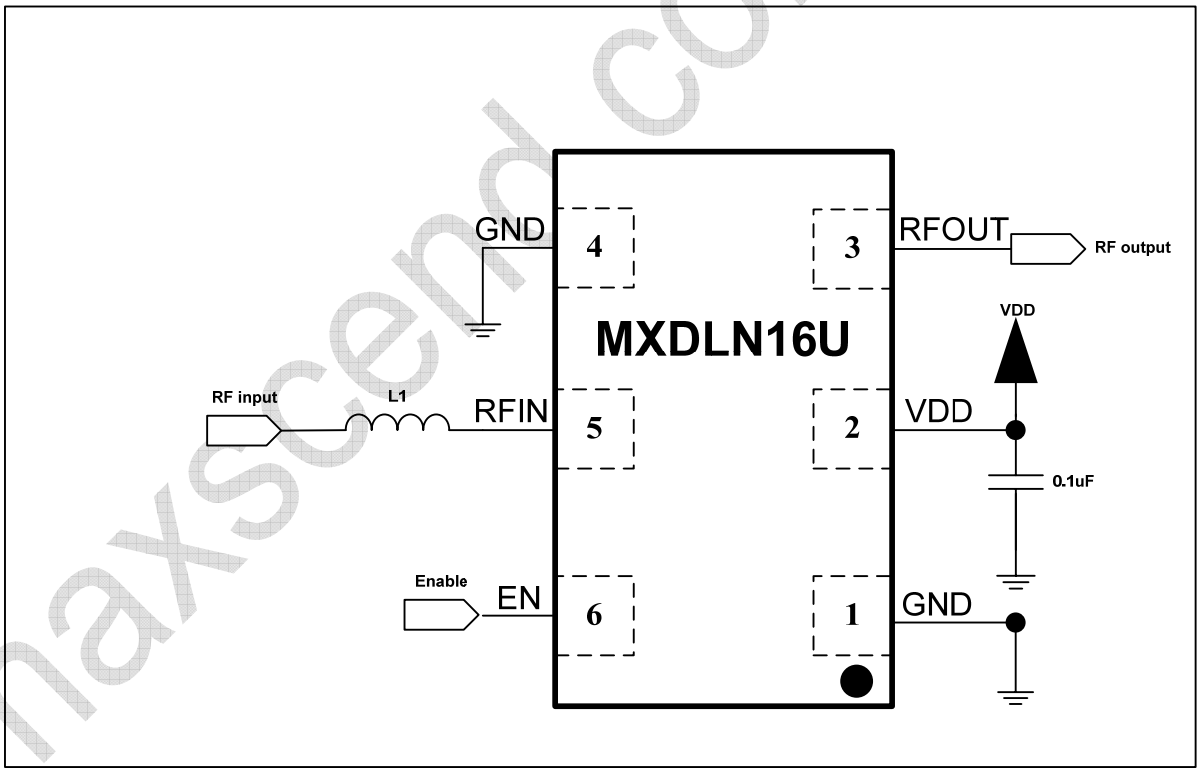

Figure 1.MXDLN16U application circuit

Table 1.

Component	Vendor	Type	Part Number & value
L1	Murata	Wired inductor, high Q	LQW15AN12N, 12nH
	various	Ceramic inductor, low Q	10nH

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Absolute Maximum Ratings

Table 2.

Parameters	Range	Units
Power supply	-0.3 ~ 3	V
Other Pin to GND	-0.3~VDD+0.3	V
Maximum RF Input Power	10	dBm
Operation Temperature Range	-40~85	℃
Junction Temperature	150	℃
Storage temperature Range	-65~160	℃
Lead Temperature (soldering)	260	℃
Soldering Temperature (reflow)	260	℃
Human Body Mode ESD	-2000~+2000	V
Machine Mode ESD	-125~+125	V
Charge Device Mode ESD	-500~+500	V

Specifications

DC Characteristics

Typically T_A=25℃ VDD=2.8V, unless otherwise noted

Table 3.

Parameters	Condition	Min	Typ	Max	Units
Supply Voltage		1.1	2.8	2.85	V
Supply Current	EN=High		6		mA
	VDD = 1.2V		3.6		
	EN=Low			1	uA
EN Input High		0.9			V
EN Input Low				0.6	V

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AC Characteristics

Typically T_A=25℃ VDD=2.8V, all data measured on Maxscend's EVB, unless otherwise noted

Table 4.

Parameters	Conditions	Min	Typ	Max	Units
RF Frequency Range	None		1575.42		MHz
Power Gain			19		dB
	Note7		19		
Noise Figure			0.7		dB
	Note7		0.8		
Input Return Loss	Note1		-12		dB
	Note7		-10		
Output Return Loss	Note1		-12		dB
	Note7		-11		
Reverse Isolation	Note1		-28		dB
VSWR	Note1		1.7		
Jammed Noise Figure	Note2		0.85		dB
Stability	Note3	1.5			
Input Power 1-dB Compression Point	1575MHz		-16		dBm
	900MHz		-13		
	2400MHz		-5		
Input In-Band IP3	Note4		-2		dBm
Input Out-Band IP3	Note5		+15		dBm
Input IP2	Note6		42.8		dBm

Note1: sweep power -30dBm, 1575.42MHz
Note2: jammed signal @ 1.8GHz & 950MHz, -30dBm
Note3: frequency range 500MHz-5GHz
Note4: f1 = 1574.5 MHz, f2 = 1575.5 MHz, -30dBm
Note5: f1 = 2400 MHz, f2 = 2000 MHz, -30dBm IP3 = pin-(IM3- $Gain_{1575MHz}$)/2
Note6: f1 = 2475 MHz, f2 = 900 MHz, -30dBm, IP2 = pin-(IM2-$Gain_{1575MHz}$), IMD2 referred to input port.
Note7: Beidou frequency range B1：1559.052MHz---1591.788MHz

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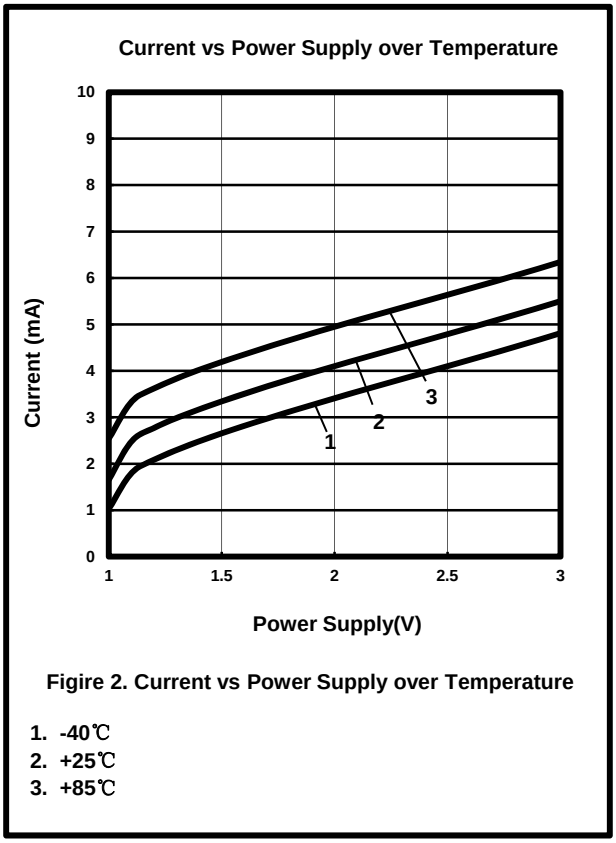
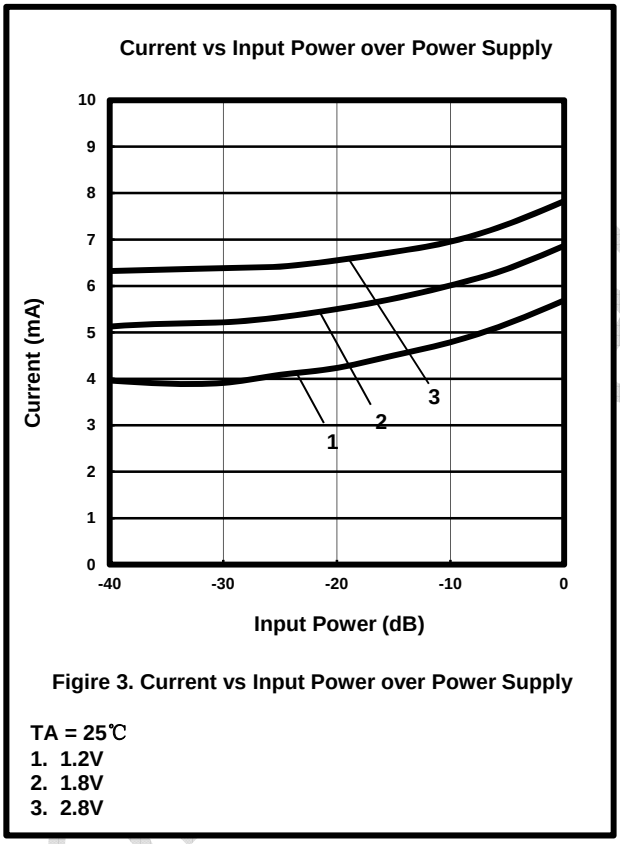


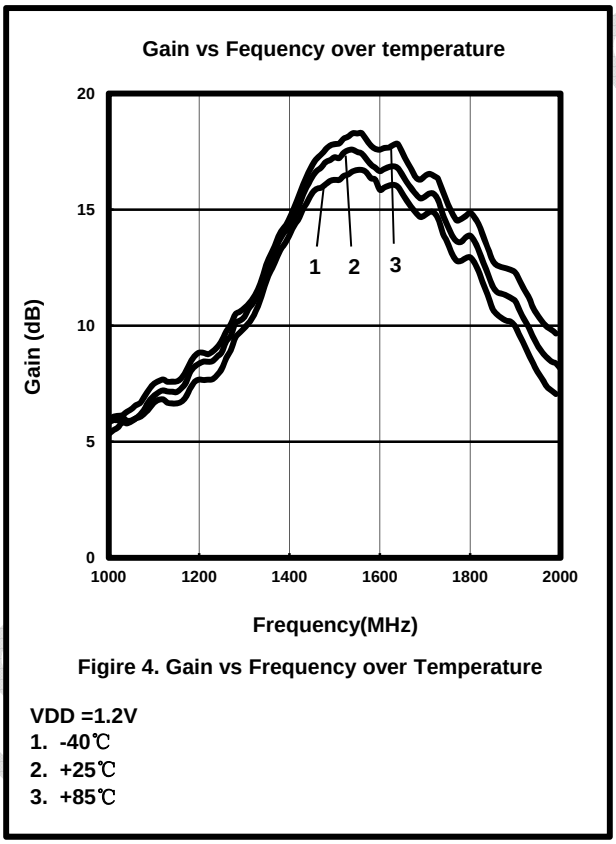
Figire 2. Current vs Power Supply over Temperature

1. -40℃
2. +25℃
3. +85℃



Figire 3. Current vs Input Power over Power Supply

TA = 25℃
1. 1.2V
2. 1.8V
3. 2.8V



Figire 4. Gain vs Frequency over Temperature

VDD =1.2V
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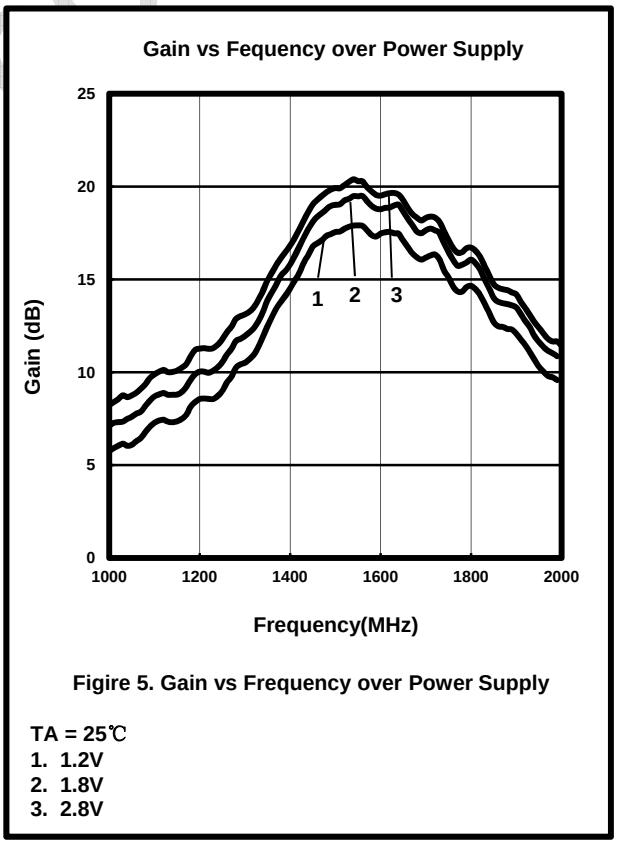
2. +25℃
3. +85℃



Figire 5. Gain vs Frequency over Power Supply

TA = 25℃
1. 1.2V
2. 1.8V
3. 2.8V

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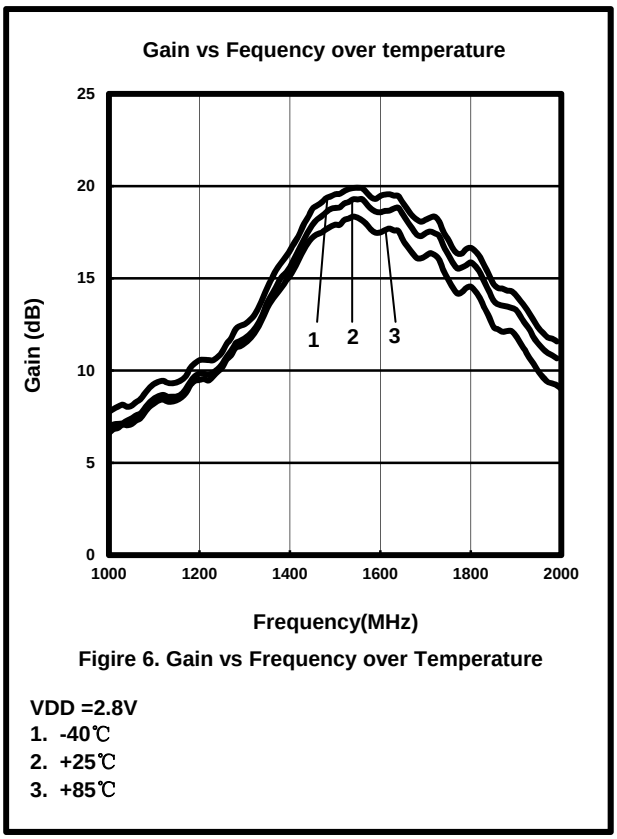
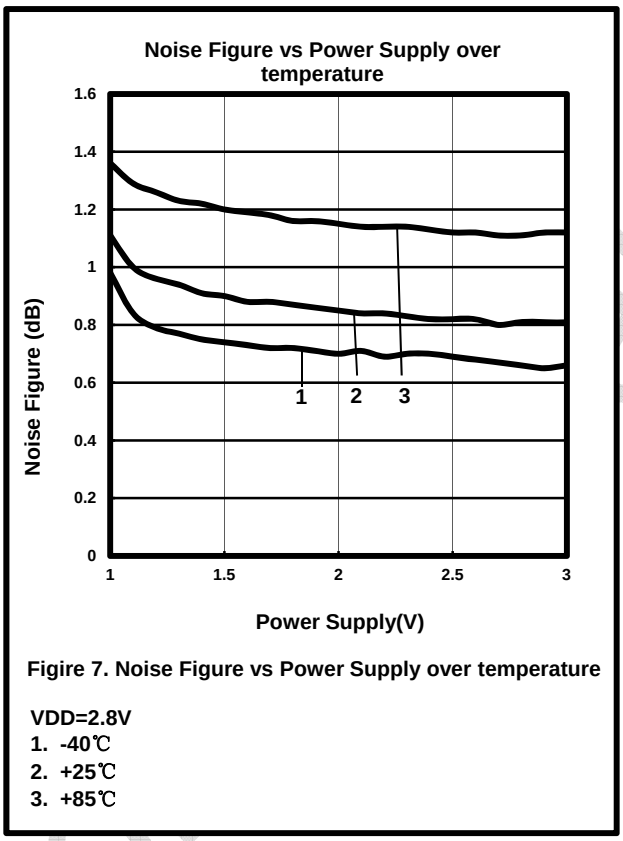


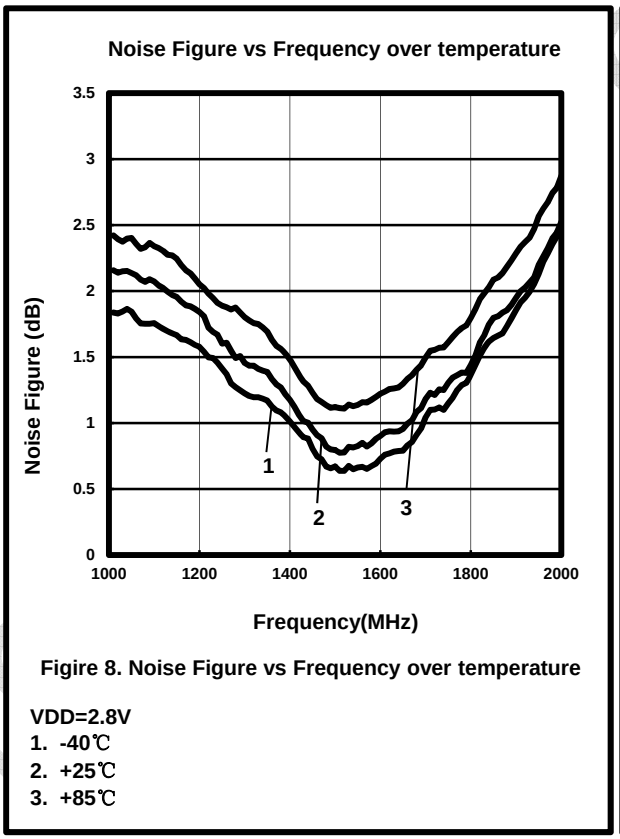
Figire 6. Gain vs Frequency over Temperature

VDD =2.8V
1. -40℃
2. +25℃
3. +85℃



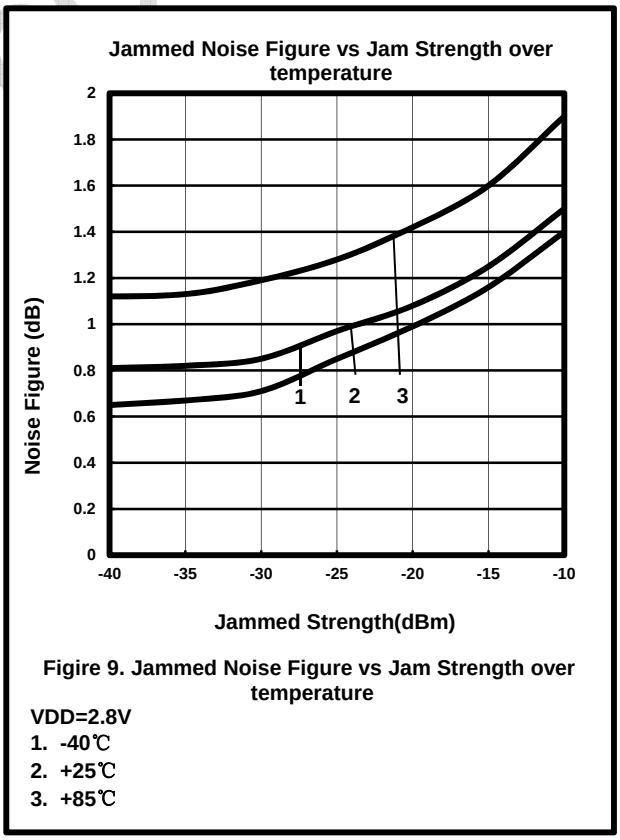
Figire 7. Noise Figure vs Power Supply over temperature

VDD=2.8V
1. -40℃
2. +25℃
3. +85℃



Figire 8. Noise Figure vs Frequency over temperature

VDD=2.8V
1. -40℃
2. +25℃
3. +85℃



Figire 9. Jammed Noise Figure vs Jam Strength over temperature

VDD=2.8V
1. -40℃
2. +25℃
3. +85℃

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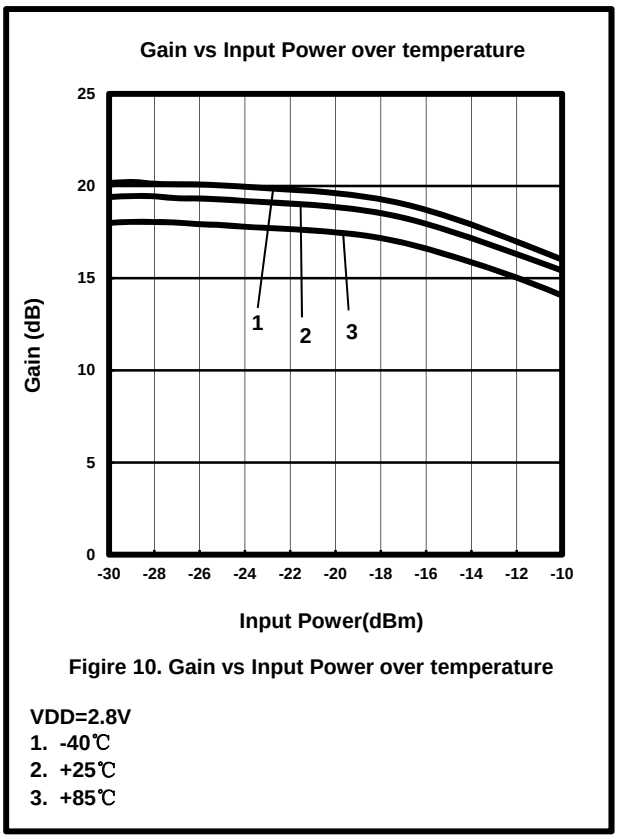
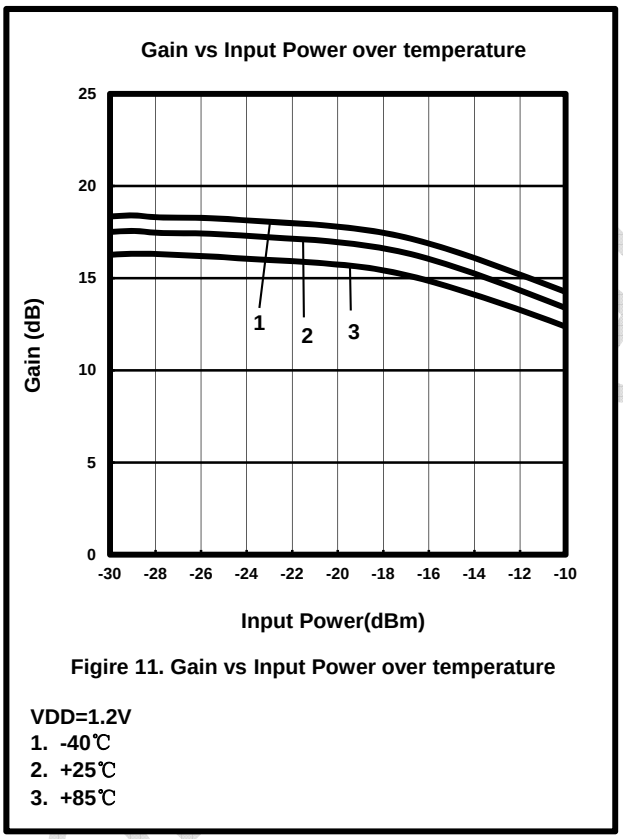


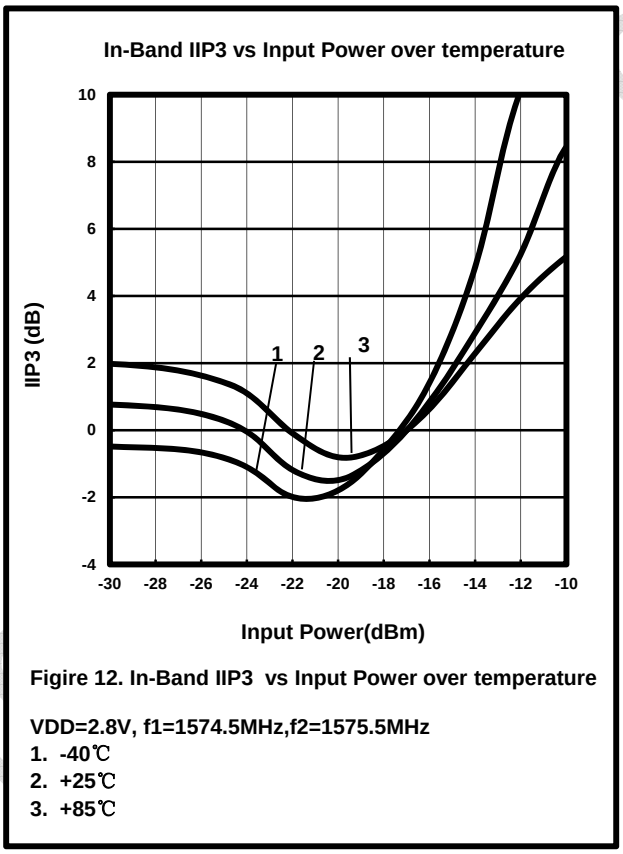
Figire 10. Gain vs Input Power over temperature

VDD=2.8V
1. -40℃
2. +25℃
3. +85℃



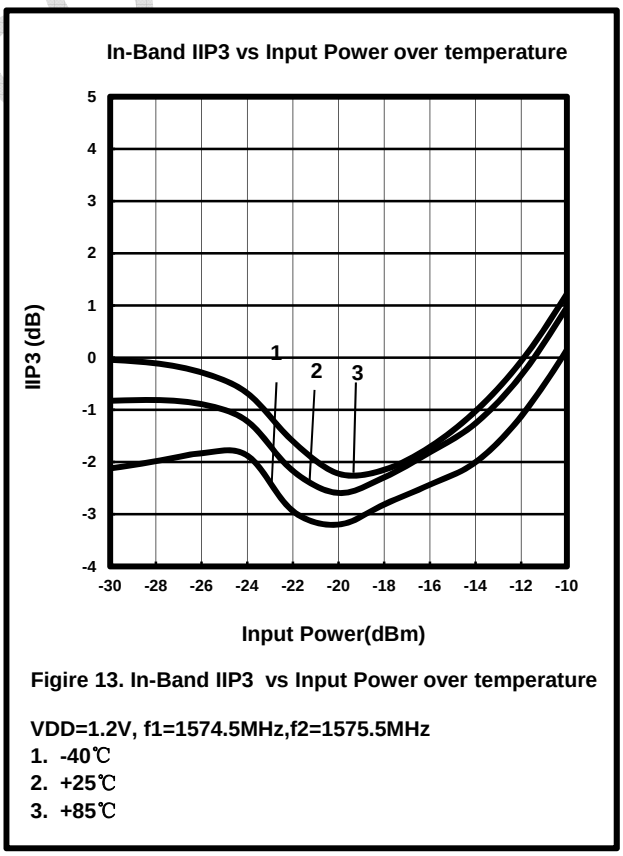
Figire 11. Gain vs Input Power over temperature

VDD=1.2V
1. -40℃
2. +25℃
3. +85℃



Figire 12. In-Band IIP3 vs Input Power over temperature

VDD=2.8V, f1=1574.5MHz,f2=1575.5MHz
1. -40℃
2. +25℃
3. +85℃



Figire 13. In-Band IIP3 vs Input Power over temperature

VDD=1.2V, f1=1574.5MHz,f2=1575.5MHz
1. -40℃
2. +25℃
3. +85℃

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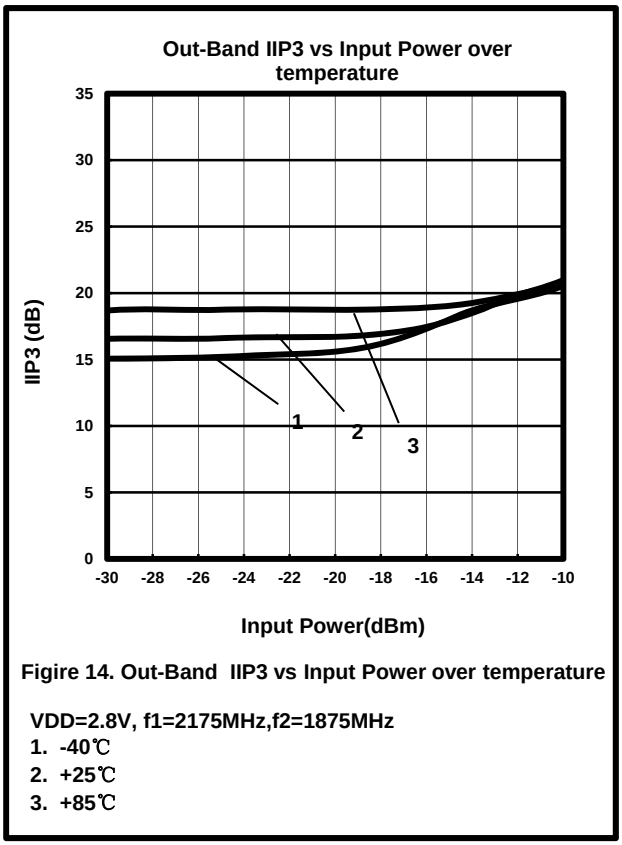
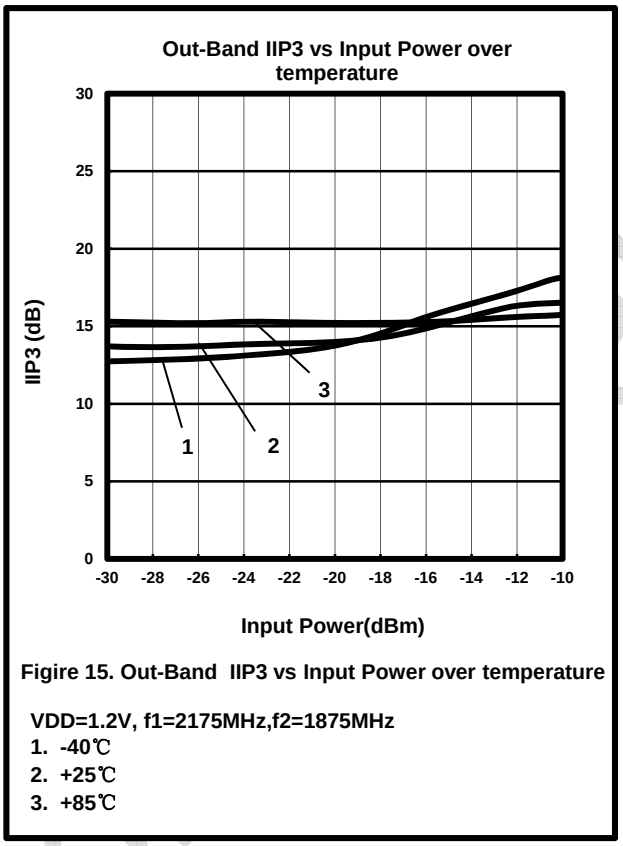


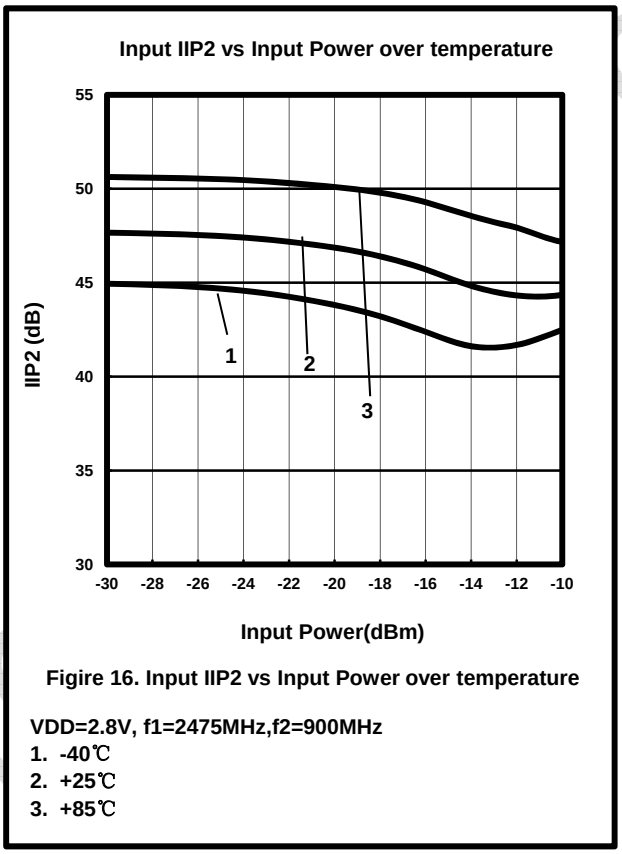
Figire 14. Out-Band IIP3 vs Input Power over temperature

VDD=2.8V, f1=2175MHz,f2=1875MHz
1. -40℃
2. +25℃
3. +85℃



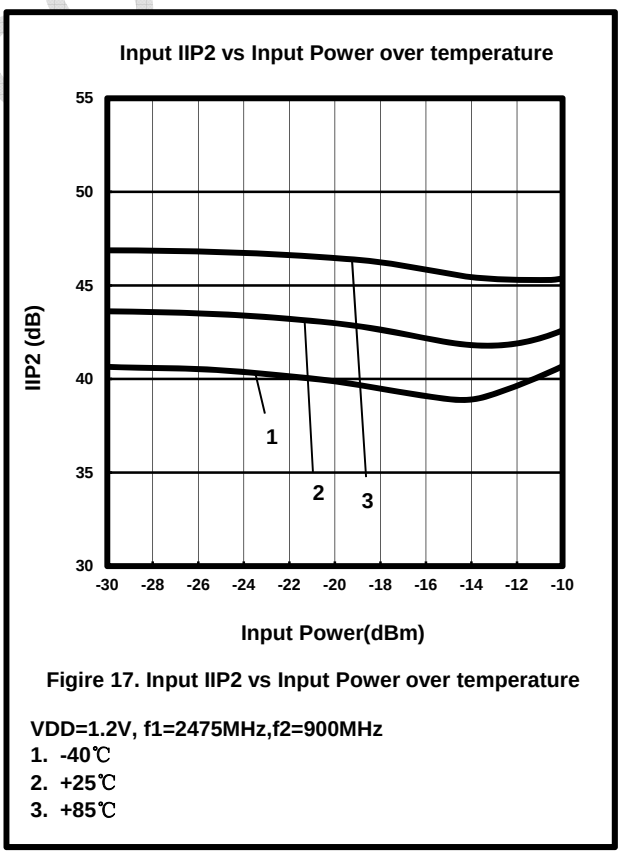
Figire 15. Out-Band IIP3 vs Input Power over temperature

VDD=1.2V, f1=2175MHz,f2=1875MHz
1. -40℃
2. +25℃
3. +85℃



Figire 16. Input IIP2 vs Input Power over temperature

VDD=2.8V, f1=2475MHz,f2=900MHz
1. -40℃
2. +25℃
3. +85℃



Figire 17. Input IIP2 vs Input Power over temperature

VDD=1.2V, f1=2475MHz,f2=900MHz
1. -40℃
2. +25℃
3. +85℃

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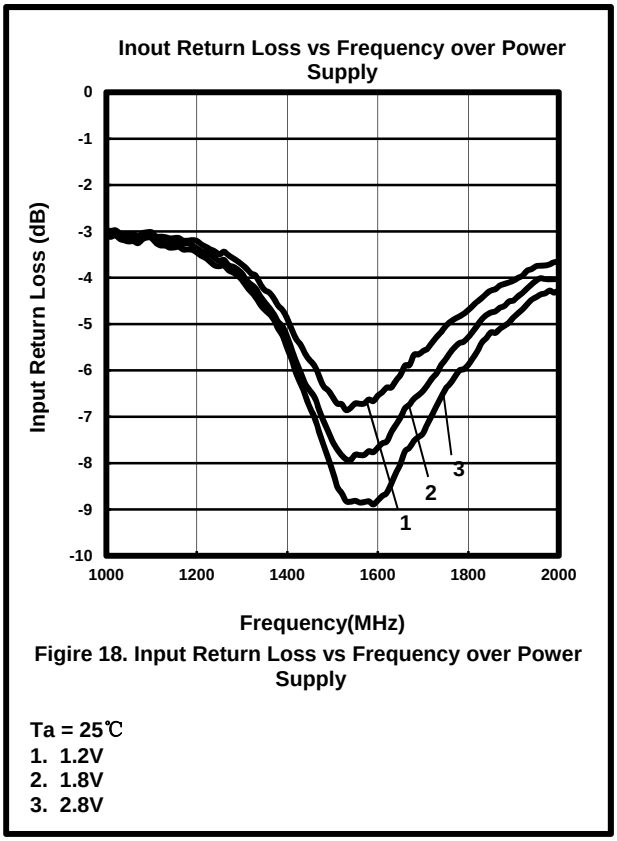
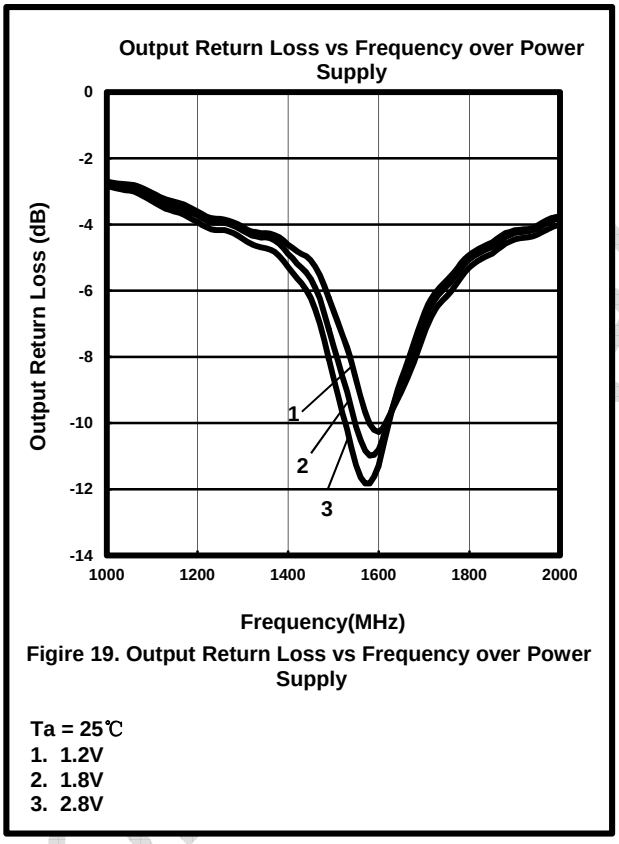


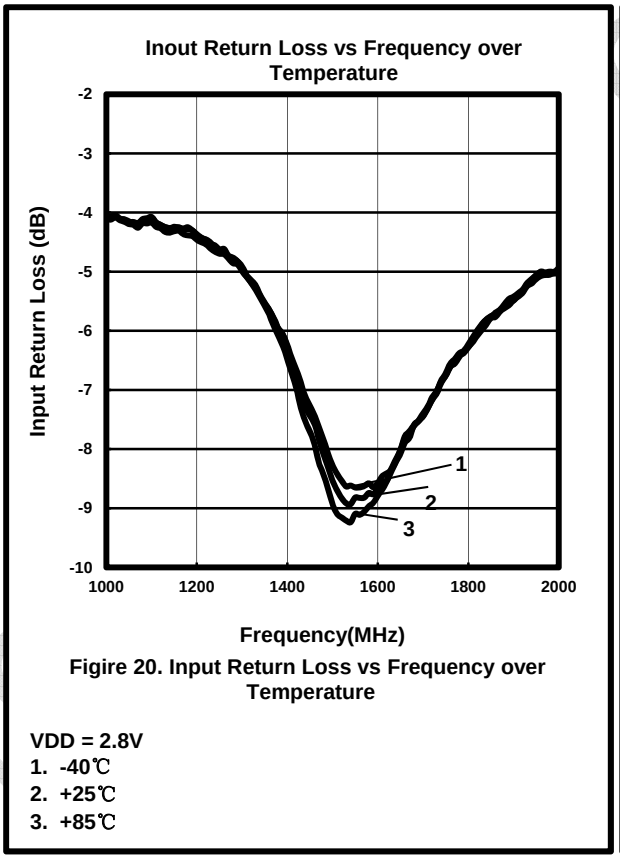
Figire 18. Input Return Loss vs Frequency over Power Supply

Ta = 25℃
1. 1.2V
2. 1.8V
3. 2.8V



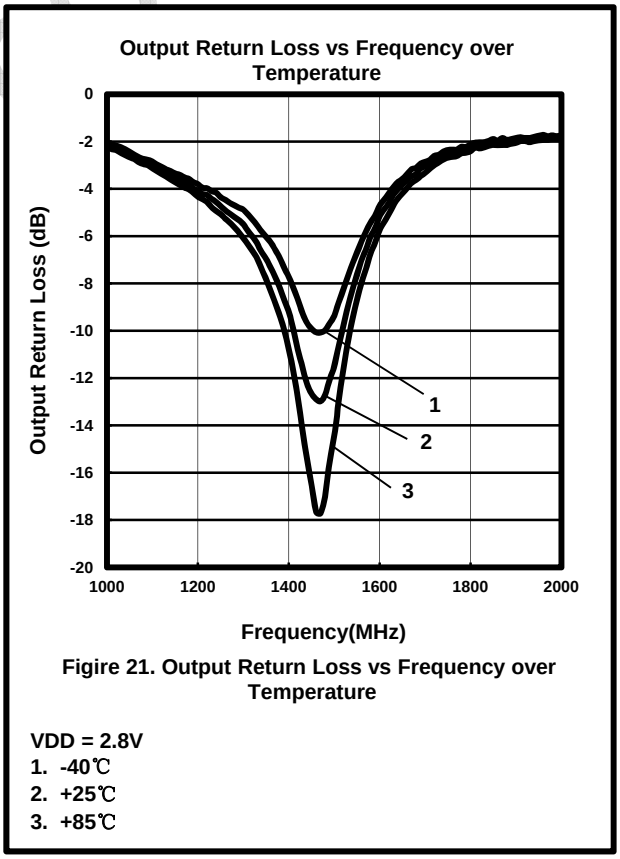
Figire 19. Output Return Loss vs Frequency over Power Supply

Ta = 25℃
1. 1.2V
2. 1.8V
3. 2.8V



Figire 20. Input Return Loss vs Frequency over Temperature

VDD = 2.8V
1. -40℃
2. +25℃
3. +85℃



Figire 21. Output Return Loss vs Frequency over Temperature

VDD = 2.8V
1. -40℃
2. +25℃
3. +85℃

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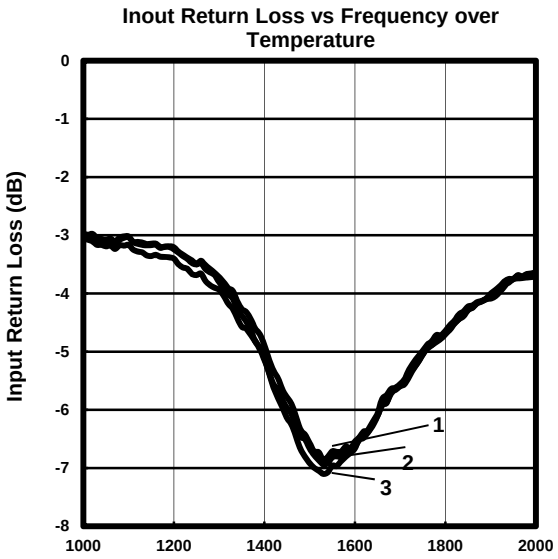
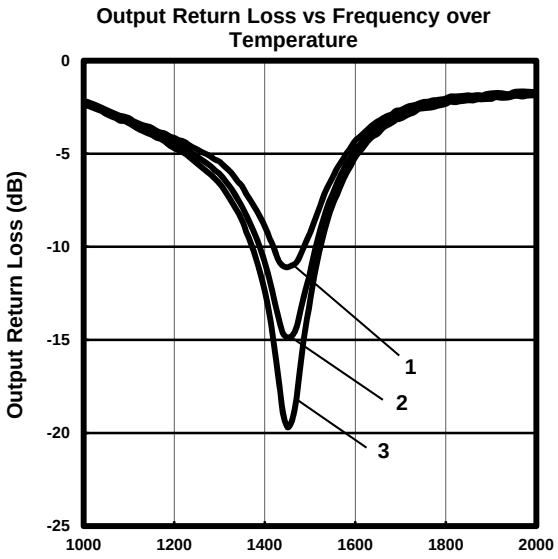


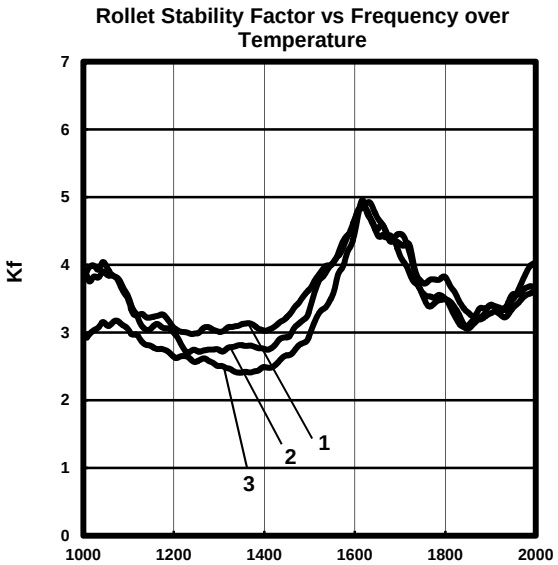
Figire 22. Input Return Loss vs Frequency over Temperature

VDD = 1.2V
1. **-40℃**
2. **+25℃**
3. **+85℃**



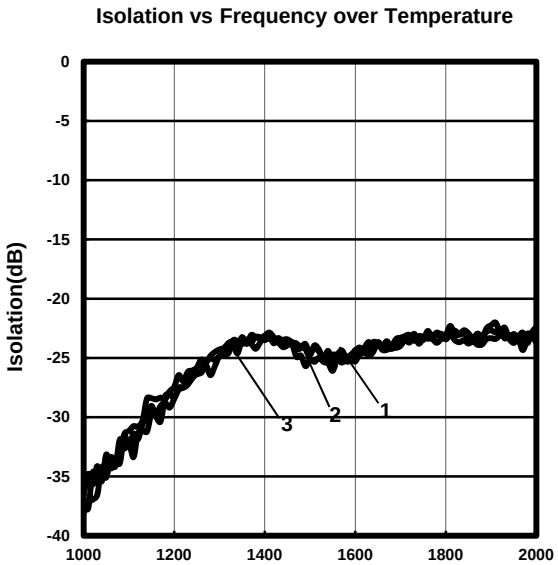
Figire 23. Output Return Loss vs Frequency over Temperature

VDD = 1.2V
1. **-40℃**
2. **+25℃**
3. **+85℃**



Figire 24. Rollet Stability Factor vs Frequency over Temperature

VDD = 2.8V, Input Power = -50dBm
1. **-40℃**
2. **+25℃**
3. **+85℃**



Figire 25. Isolation vs Frequency over Temperature

VDD = 1.2V, Input Power = -30dBm
1. **-40℃**
2. **+25℃**
3. **+85℃**

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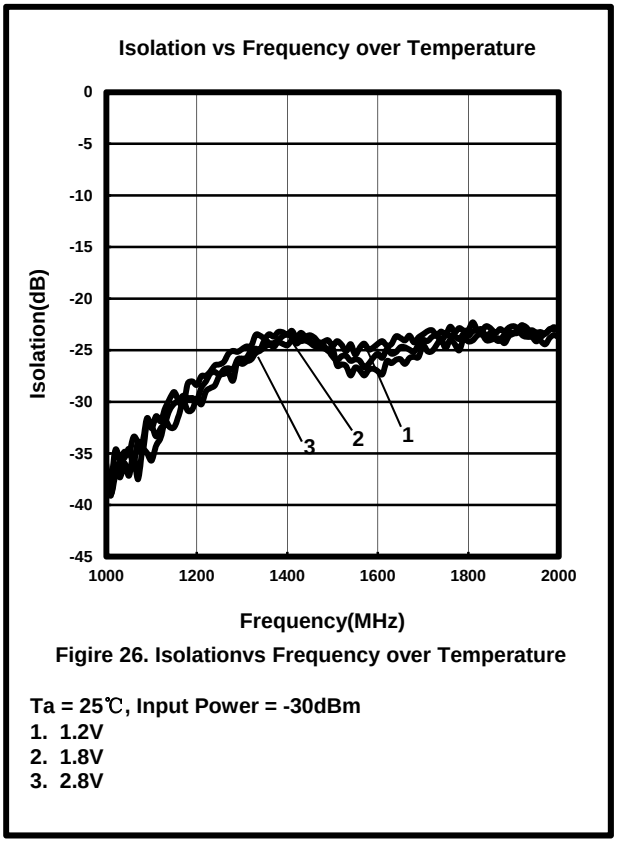
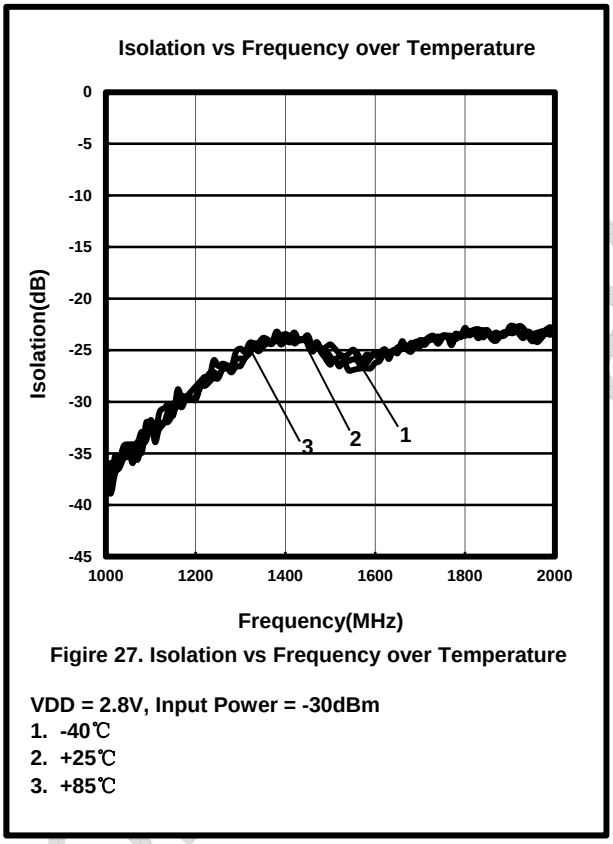


Figire 26. Isolationvs Frequency over Temperature

Ta = 25℃, Input Power = -30dBm
1. 1.2V
2. 1.8V
3. 2.8V



Figire 27. Isolation vs Frequency over Temperature

VDD = 2.8V, Input Power = -30dBm
1. -40℃
2. +25℃
3. +85℃

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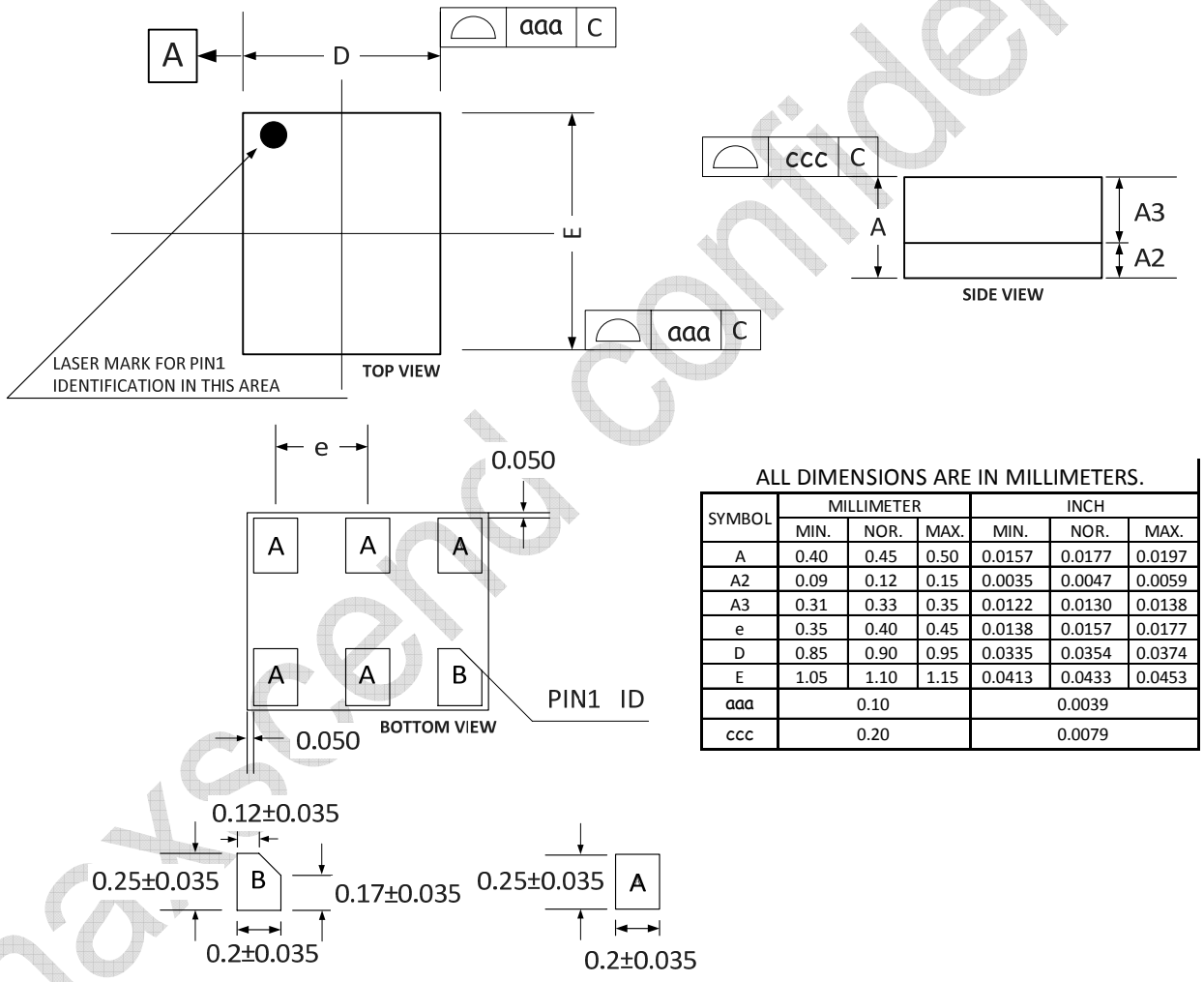
Pin Descriptions

Table 5.

Pin	Pin Name	I/O	Pin Description
1	GND	AG	Analog VSS
2	VDD	AP	Power supply, 1.1~2.85V
3	RFOUT	AO	LNA output
4	GND	AG	Analog VSS
5	RFIN	AI	LNA input from antenna
6	EN	DI	Pull high enable, pull low into power down mode

Note: *DI* (digital input), *DO* (digital output), *DIO* (digital bidirectional), *AI* (analog input), *AO* (analog output), *AIO* (analog bidirectional), *AP* (analog power), *AG* (analog ground),

Outline Dimensions



ALL DIMENSIONS ARE IN MILLIMETERS.

SYMBOL	MILLIMETER			INCH		
	MIN.	NOR.	MAX.	MIN.	NOR.	MAX.
A	0.40	0.45	0.50	0.0157	0.0177	0.0197
A2	0.09	0.12	0.15	0.0035	0.0047	0.0059
A3	0.31	0.33	0.35	0.0122	0.0130	0.0138
e	0.35	0.40	0.45	0.0138	0.0157	0.0177
D	0.85	0.90	0.95	0.0335	0.0354	0.0374
E	1.05	1.10	1.15	0.0413	0.0433	0.0453
aaa	0.10			0.0039		
ccc	0.20			0.0079		

Figure 28. MXDLN16U outline dimension

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Reflow Chart

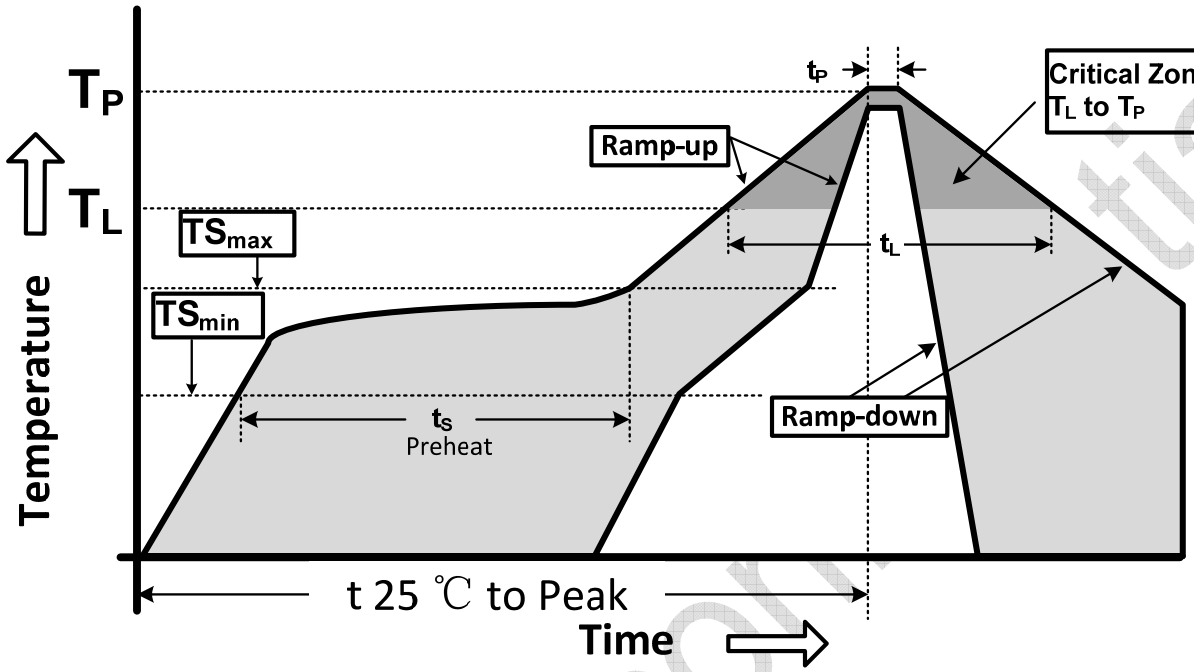

Figure 29. Recommended Lead-Free Reflow Profile

Table 6.

Profile Parameter	Lead-Free Assembly, Convection, IR/Convection
Ramp-up rate（TS_{max} to T_p）	3℃/second max.
Preheat temperature（TS_{min} to TS_{max}）	150℃ to 200℃
Preheat time（t_s）	60 - 180 seconds
Time above TL , 217℃（t_L）	60 - 150 seconds
Peak temperature（T_p）	260℃
Time within 5℃ of peak temperature(t_p)	20 - 40 seconds
Ramp-down rate	6℃/second max.
Time 25℃ to peak temperature	8 minutes max.

ESD Sensitivity

Integrated circuits are ESD sensitive and can be damaged by static electric charge. Proper ESD protection techniques should be used when handling these devices.

RoHS Compliant

This product does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), and are considered RoHS compliant.

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