MXDLN16GE

GPS Low Noise Amplifier

QC 11

APPROVED

General Description

MXDLN16GE high gain, low noise amplifier(LNA) is dedicated to GPS, GLONASS GalileoandBeidou standards. This product has an extremely low noise figure of 0.6dB, 19dB gain and excellent linearity.

MXDLN16GE works under a 1.1V to 2.85V single power supply while consumes 7.5 mA current, in power down (PD) mode, the power consumption will be reduced to less than 1uA.

MXDLN16GE uses a small 1mm×1.5mm×0.75mm DFN 6-pin package.

Features

- High Gain: 19dB
- Low noise figure 0.6dB @ 1575.42MHz
- Low operation current 6mA & PD current less than 1uA
- 3.5mA current under 1.2V power supply
- Single supply voltage range 1.1V to 2.85V
- Small package 1mm×1.5mm×0.75mm
- Low cost BOM
- Lead-Free and RoHS-Compliant

Applications

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

Pin Configuration/Application Diagram (Top view)

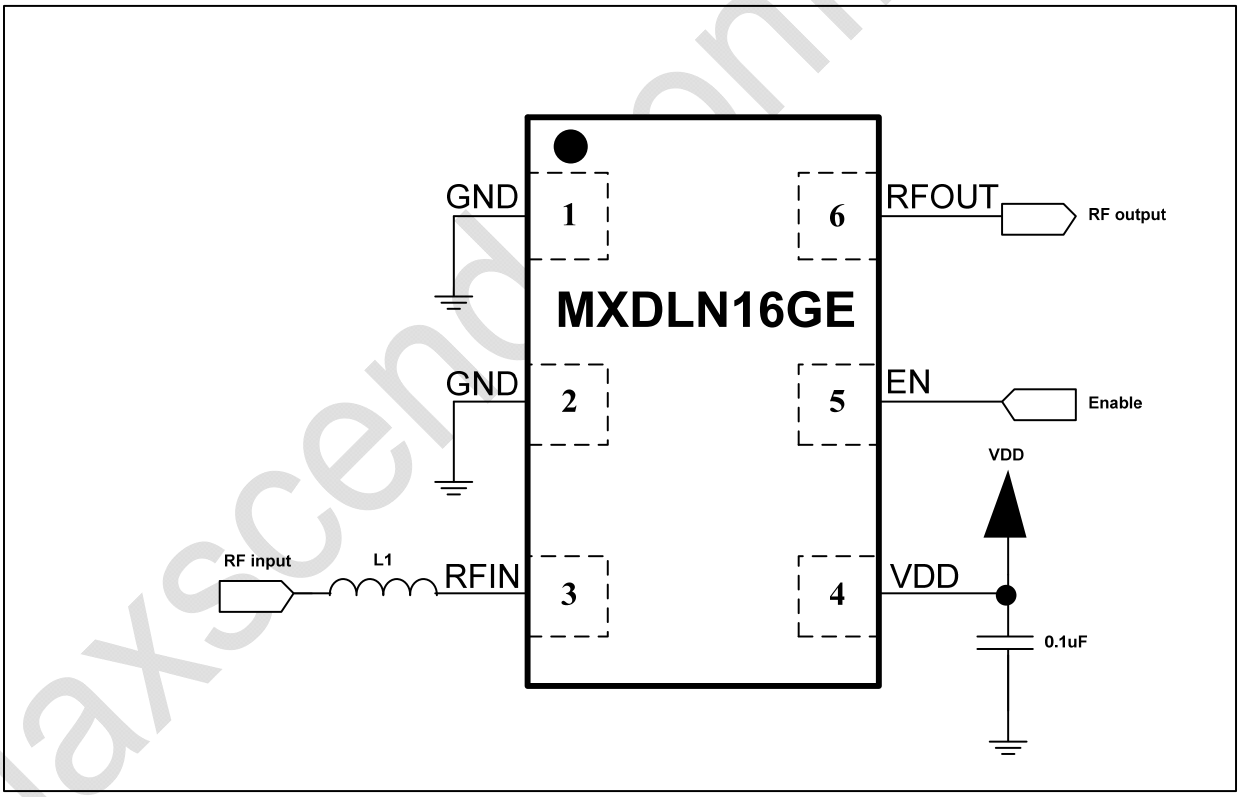


Figure 1MXDLN16GE application circuit

Table 1.

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

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	-150~+150	V
Charge Device Mode ESD	-500~+500	V

DC Characteristics

T_A=-40~+85℃, 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		3.5		
	EN=Low			1	uA
EN Input High		0.8			V
EN Input Low				0.6	V

AC Characteristics

T_A=-40~+85℃, 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			0.6		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		-9		dBm
	1575MHz, 1.2V		-12		
	900MHz		-10		
	2400MHz		-5		
Input In-Band IP3	Note4		-1		dBm
Input Out-Band IP3	Note5		+15		dBm
Input IP2	Note6		43		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

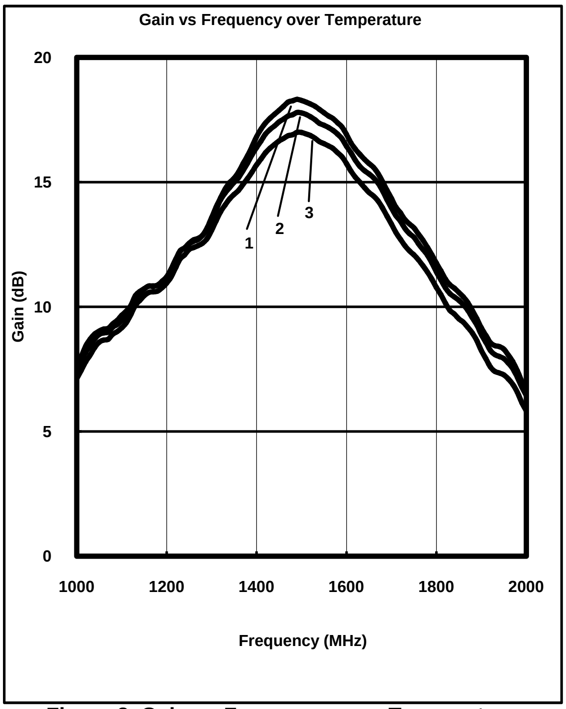


Figure 2. Gain vs Frequency over Temperature

VDD = 1.2V
1. - 40℃
2. +25℃
3. +85℃

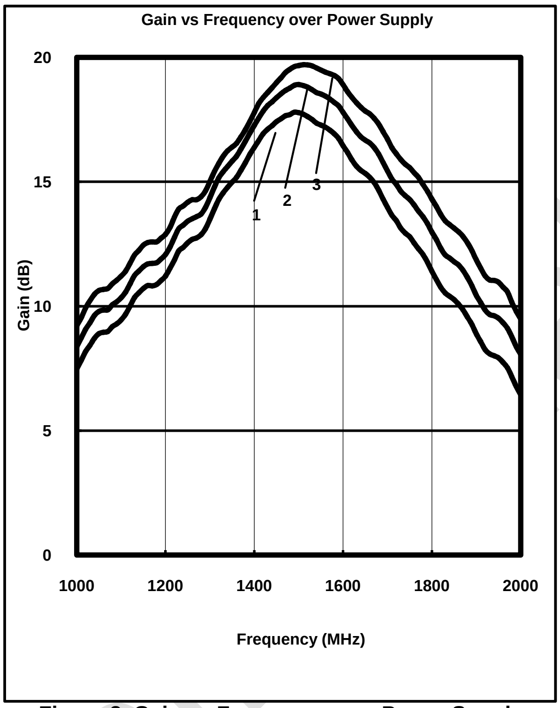


Figure 3. Gain vs Frequency over Power Supply

Ta = 25℃
1. 1.2V
2. 1.8V
3. 2.8V

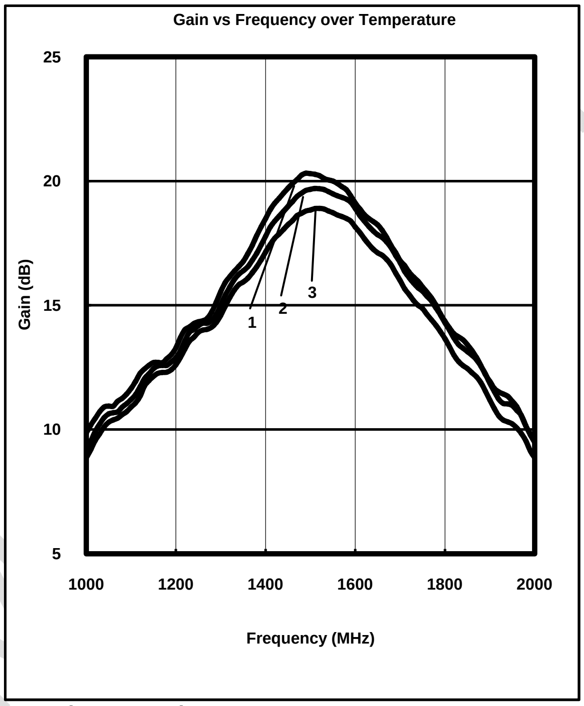


Figure 4. Gain vs Frequency over Temperature

VDD = 2.8V
1. - 40℃
2. +25℃
3. +85℃

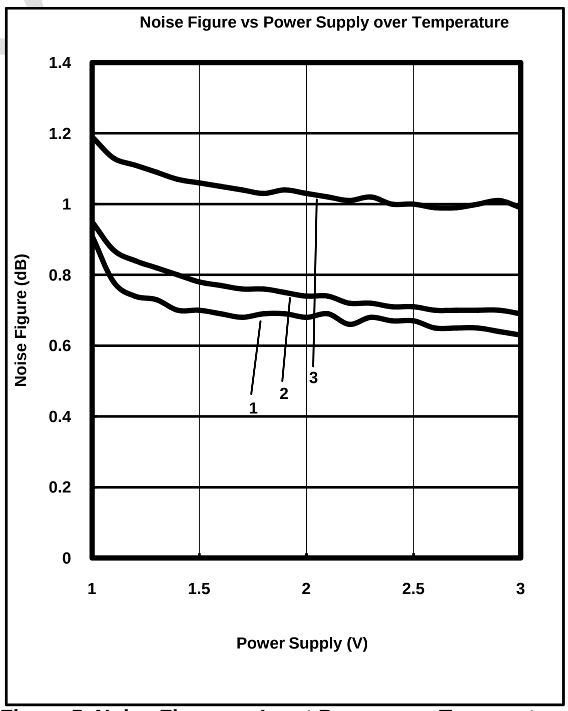


Figure 5. Noise Figure vs Input Power over Temperature

VDD = 2.8V
1. - 40℃
2. +25℃
3. +85℃

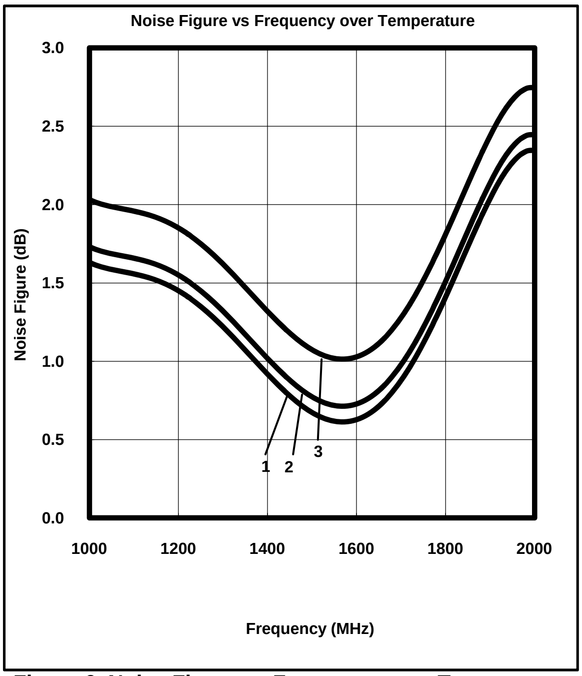


Figure 6. Noise Figure vs Frequency over Temperature

VDD = 2.8V
1. - 40℃
2. +25℃
3. +85℃

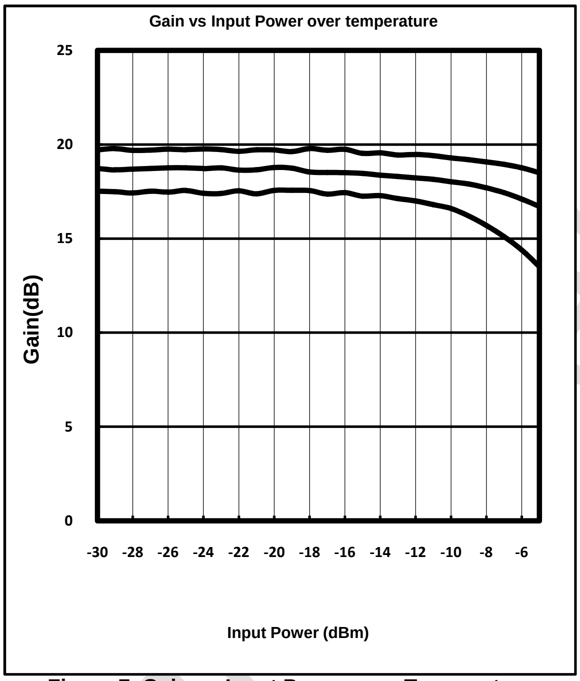


Figure 7. Gain vs Input Power over Temperature

VDD = 2.8V
1. - 40℃
2. +25℃
3. +85℃

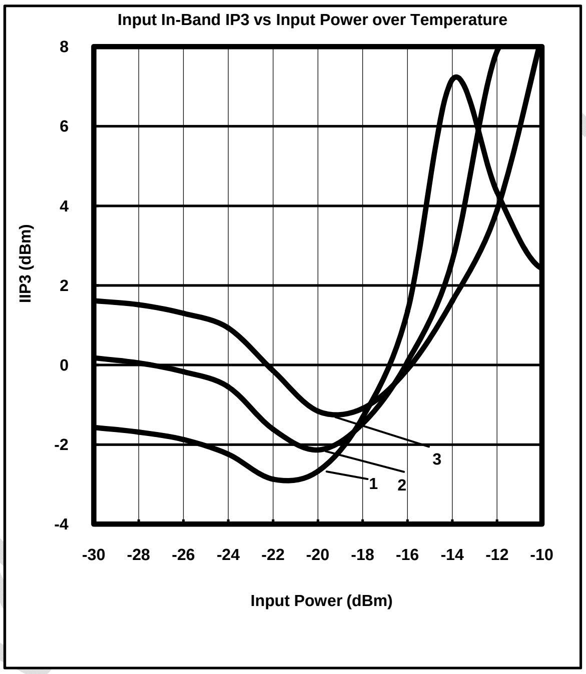


Figure 8. In-Band IIP3 vs Input Power over Temperature

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

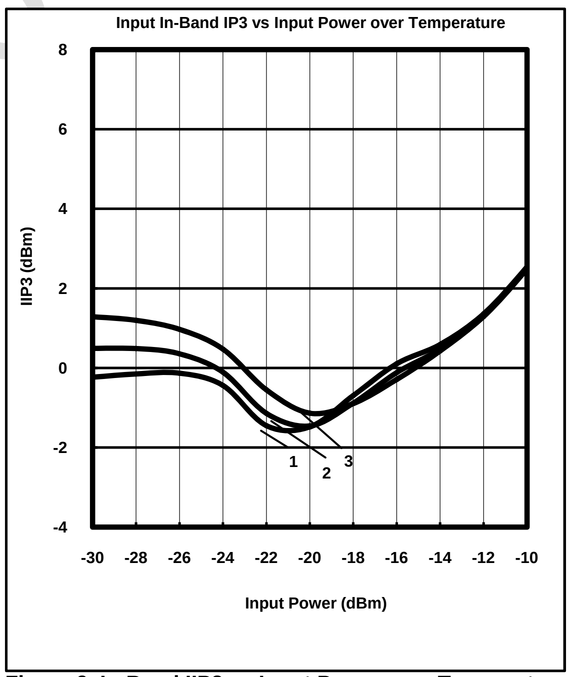


Figure 9. In-Band IIP3 vs Input Power over Temperature

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

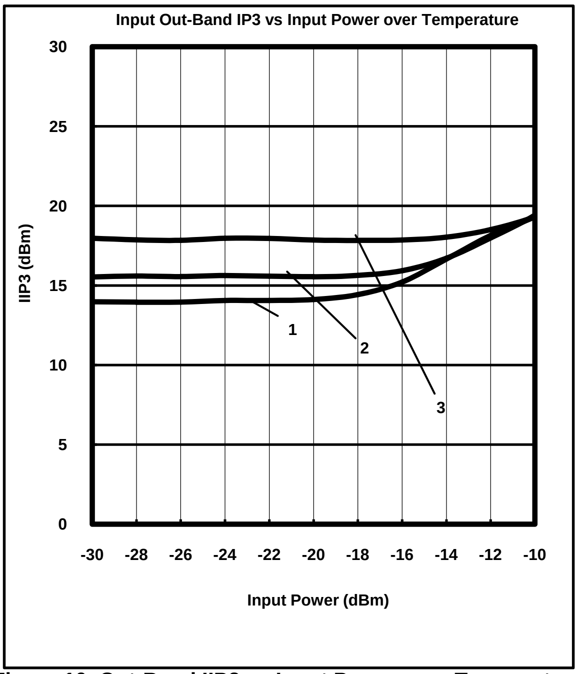


Figure 10. Out-Band IIP3 vs Input Power over Temperature

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

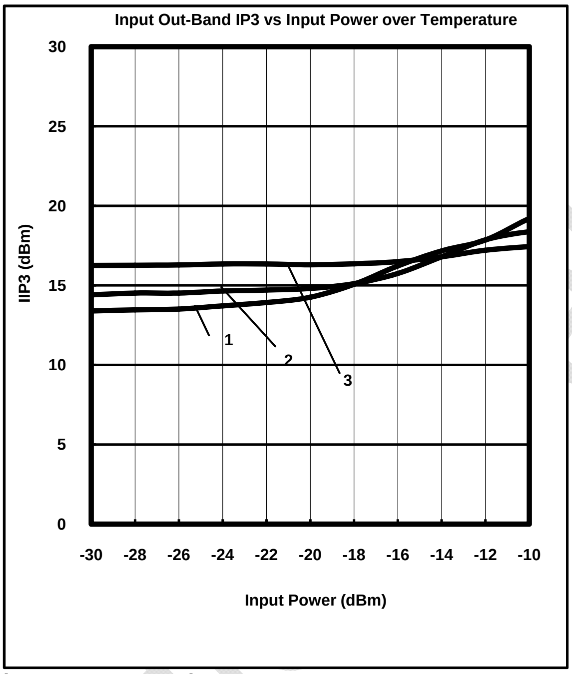


Figure 11. Out-Band IIP3 vs Input Power over Temperature

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

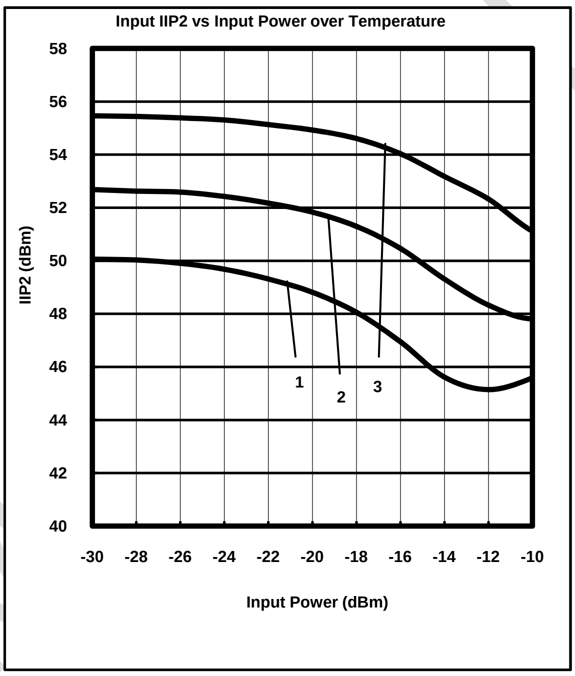


Figure 12. IIP2 vs Input Power over Temperature

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

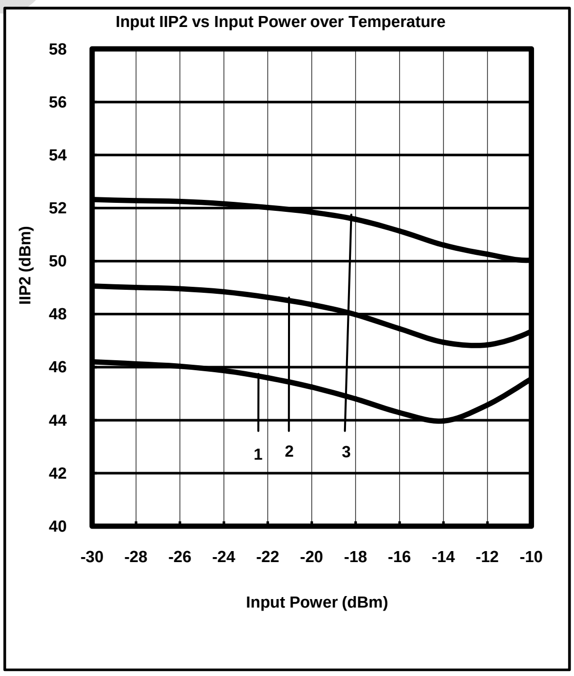


Figure 13. IIP2 vs Input Power over Temperature

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

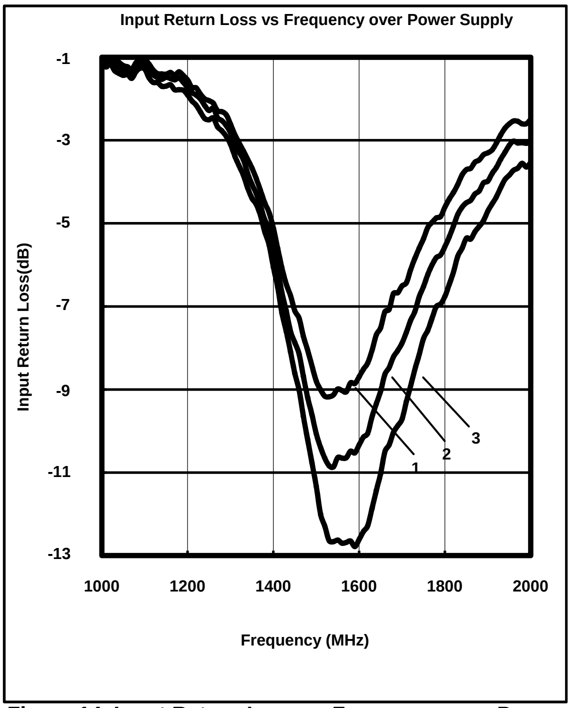


Figure 14. Input Return Loss vs Frequency over Power Supply

Ta = 25℃
1. 1.2V
2. 1.8V
3. 2.8V

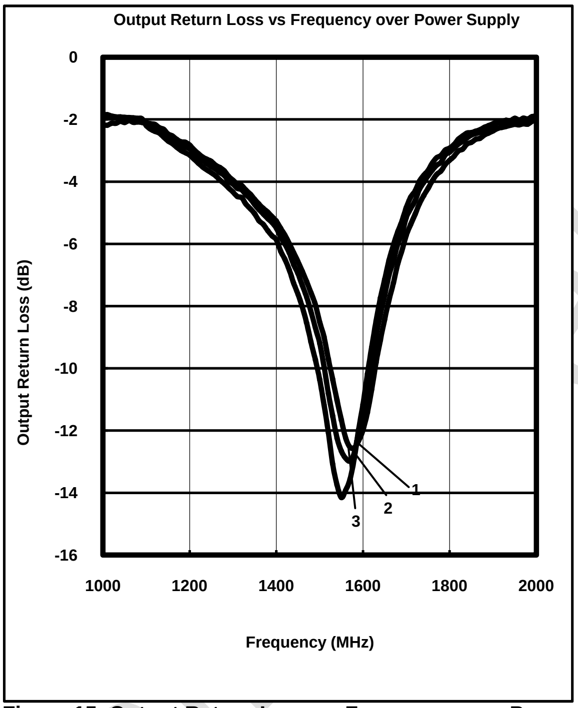


Figure 15. Output Return Loss vs Frequency over Power Supply

Ta = 25℃
1. 1.2V
2. 1.8V
3. 2.8V

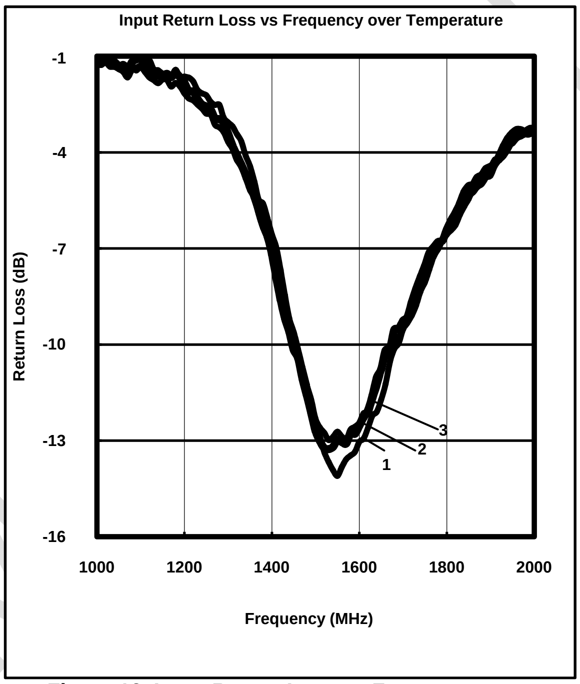


Figure 16. Input Return Loss vs Frequency over Temperature

VDD = 2.8V
1. - 40℃
2. +25℃
3. +85℃

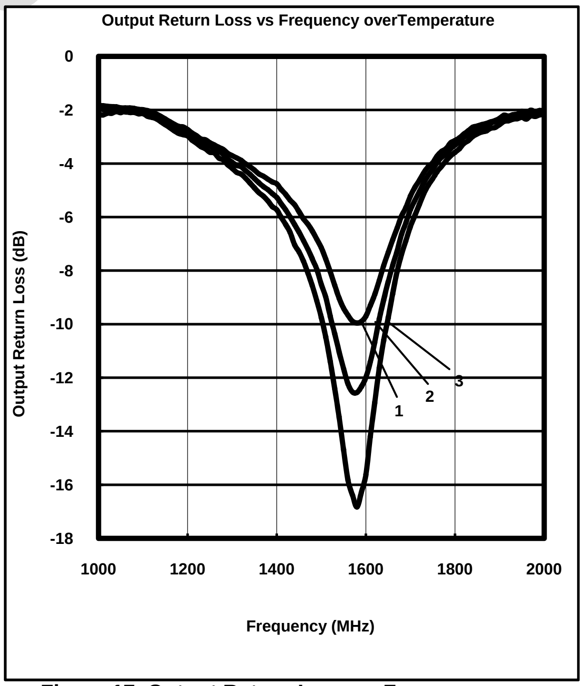


Figure 17. Output Return Loss vs Frequency over Temperature

VDD = 2.8V
1. - 40℃
2. +25℃
3. +85℃

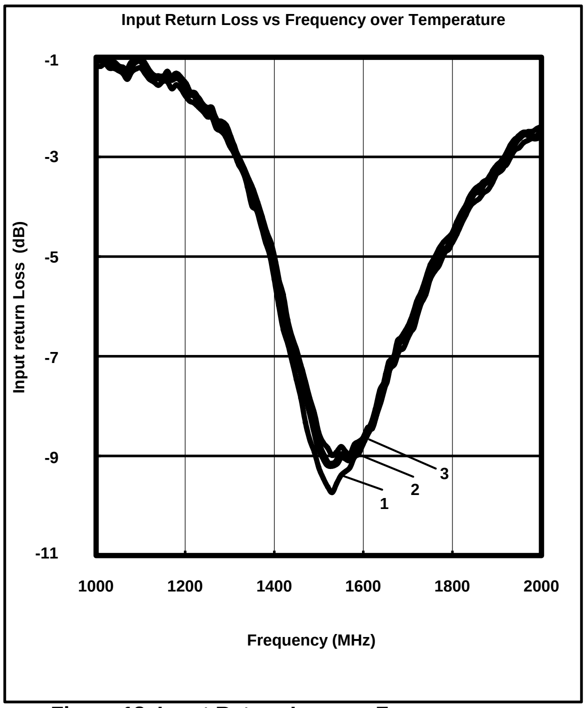


Figure 18. Input Return Loss vs Frequency over Temperature

VDD = 1.2V
1. - 40℃
2. +25 ℃
3. +85℃

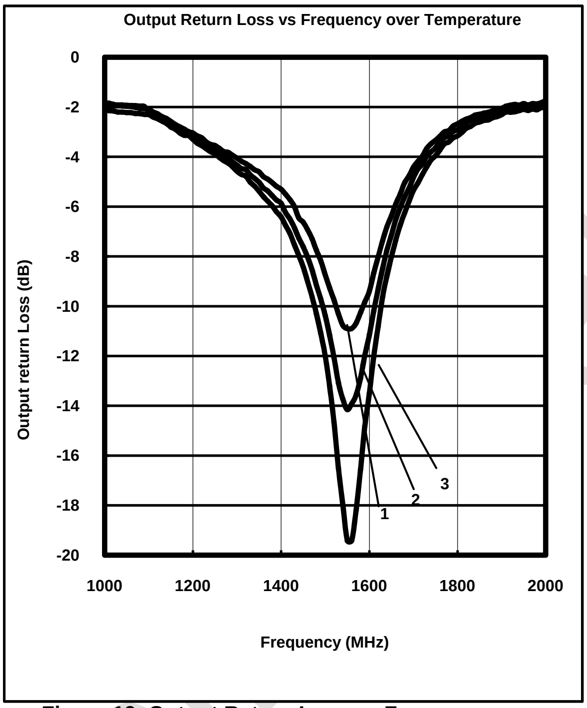


Figure 19. Output Return Loss vs Frequency over Temperature

VDD = 1.2V
1. - 40℃
2. +25 ℃
3. +85℃

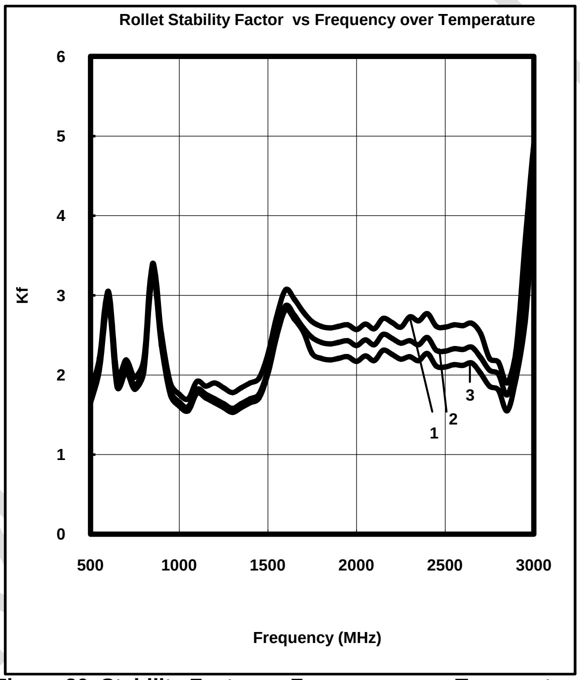


Figure 20. Stability Factor vs Frequency over Temperature

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

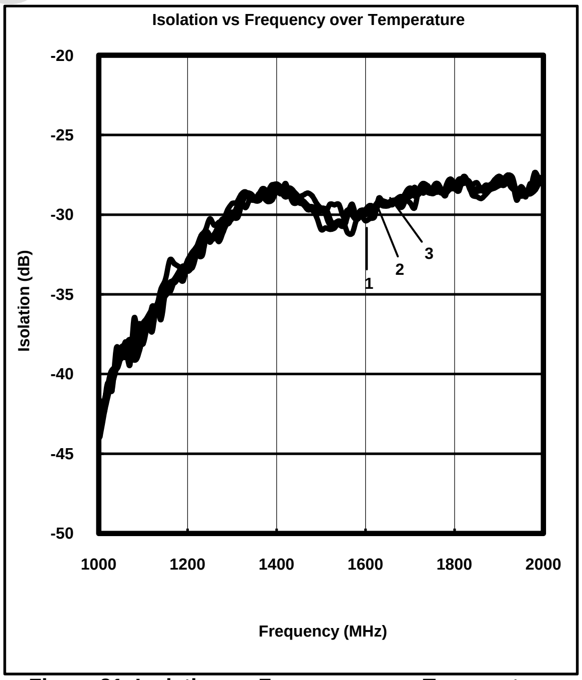


Figure 21. Isolation vs Frequency over Temperature

VDD = 1.2V
1. +85℃
2. +25 ℃
3. - 40 ℃

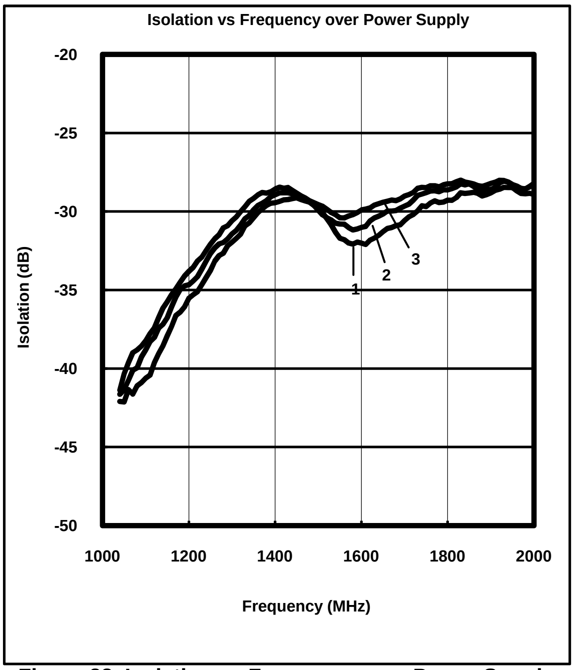


Figure 22. Isolation vs Frequency over Power Supply

Input power -30dBm

Ta = 25℃
1. 1.2V
2. 1.8V
3. 2.8V

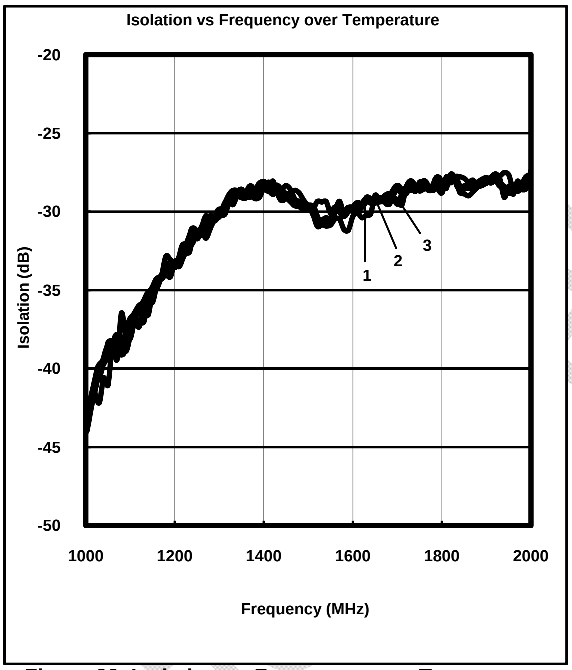


Figure 23. Isolation vs Frequency over Temperature

Input power -30dBm

VDD = 2.8V
1. - 40℃
2. +25℃
3. +85℃

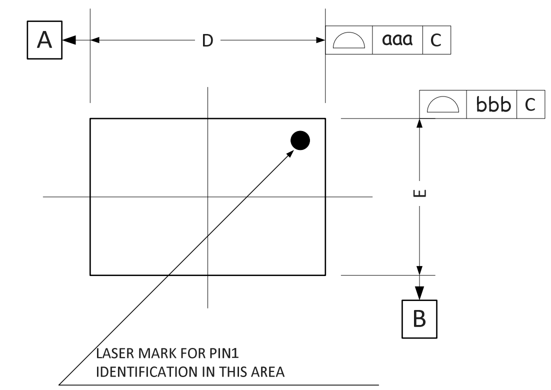
Pin Descriptions

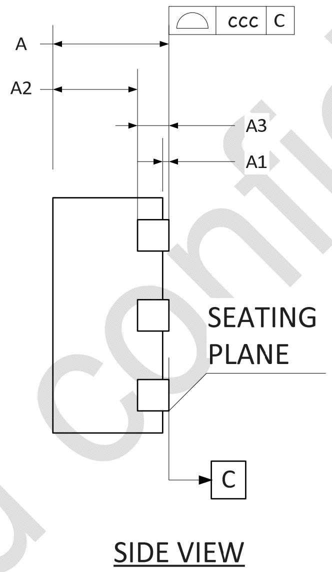
Table 5.

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

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





* CONTROLLING DIMENSION : MM

SYMBOL	MILLIMETER			INCH		
	MIN.	NOR.	MAX.	MIN.	NOR.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.032
A1	———	———	0.05	———	———	0.002
A2	0.50	0.55	0.60	0.020	0.022	0.024
A3	0.20 REF			0.008 REF		
b	0.17	0.20	0.23	0.007	0.008	0.009
D	1.50 bsc			0.060 bsc		
D2	0.87	0.90	0.96	0.033	0.035	0.037
E	1.00 bsc			0.040 bsc		
E2	1.15	1.20	1.25	0.046	0.048	0.050
L	0.25	0.30	0.35	0.010	0.012	0.014
e	0.50 bsc			0.020 bsc		
TOLERANCES OF FORM AND POSITION						
aaa	0.10			0.004		
bbb	0.10			0.004		
ccc	0.05			0.002		

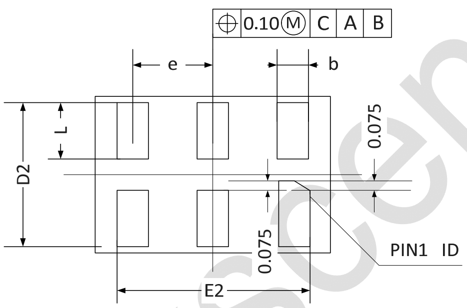


Figure 24. MXDLN16GE outline dimension

Reflow Chart

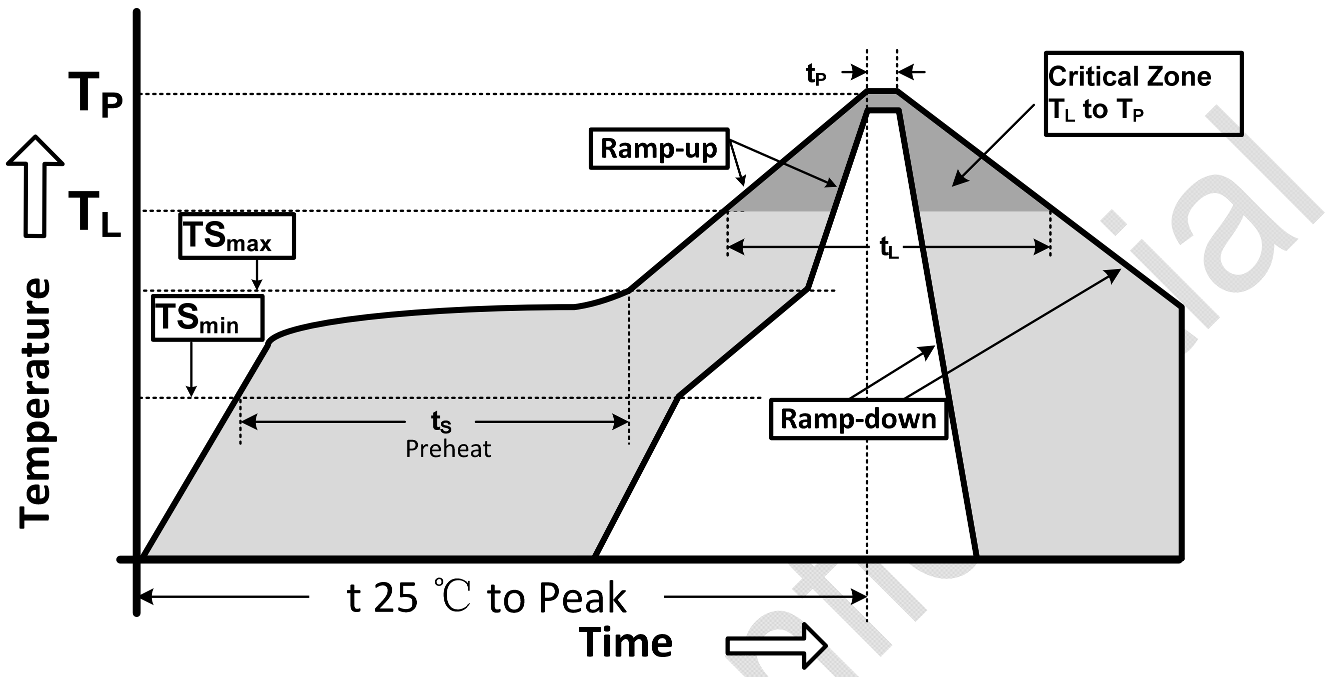


Figure 25. Recommended Lead-Free Reflow Profile

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 polybrominateddiphenyl ethers (PBDE), and are considered RoHS compliant.