MXDLN16GF

GPS Low Noise Amplifier

Description

MXDLN16GF high gain, low noise amplifier (LNA) is dedicated to GPS, GLONASS, Galileo and Beidou standards. This product has an extremely low noise figure of 0.6dB, 18.5dB gain and excellent linearity.

MXDLN16GF works under a 1.6V to 3.3V single power supply while consumes 6.0 mA current, in power down (PD) mode, the power consumption will be reduced to less than 1uA.

MXDLN16GF uses a small 1mmx1.5mmx0.75mm DFN 6-pin package.

Applications

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

Features

- High Gain: 18.5dB
- Low noise figure 0.6dB @ 1575.42MHz
- Low operation current 6.0mA & PD current less than 1uA
- Single supply voltage range 1.6V to 3.3V
- Small package 1mmx1.5mmx0.75mm，MSL1
- Low cost BOM
- Lead-Free and RoHS-Compliant

Pin Configuration/Application Diagram (Top view)

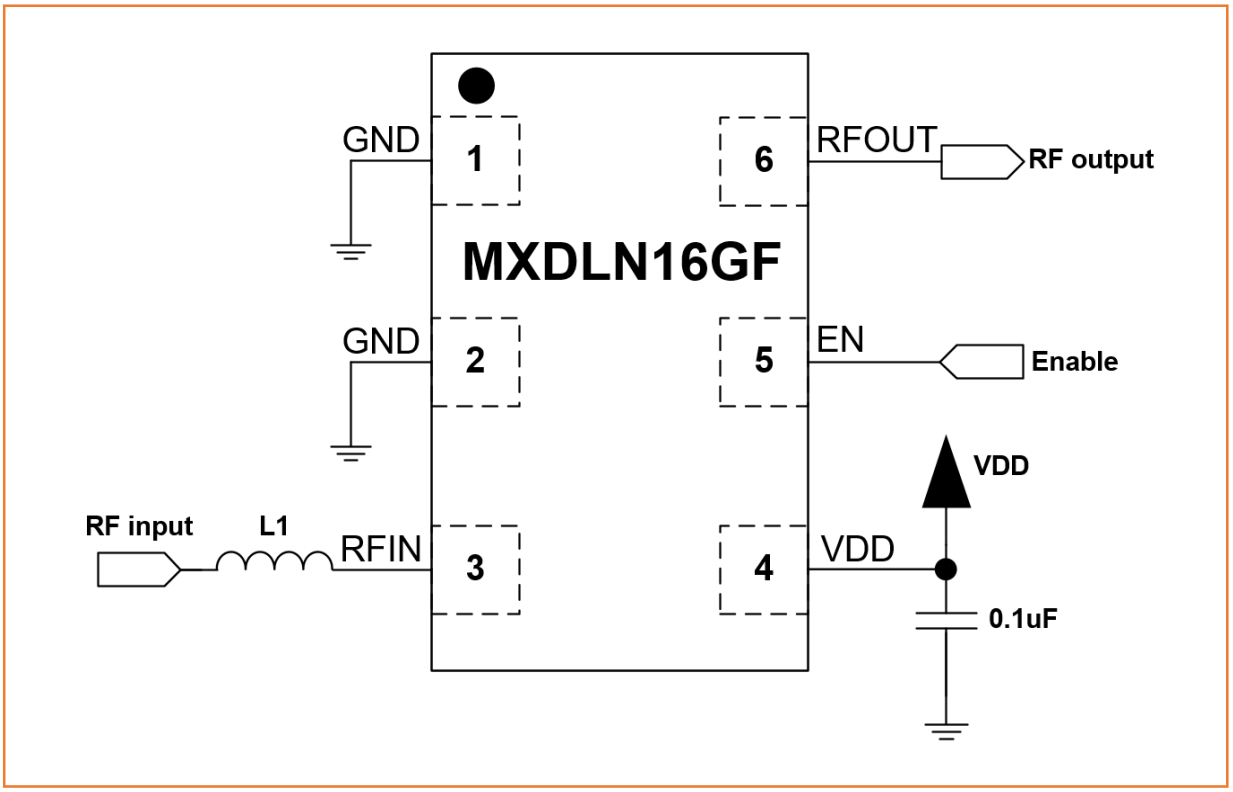


Figure 1 MXDLN16GF application circuit

Table 1 Pin Descriptions

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
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),*

Table 2 Recommended component value in application circuit

Component	Vendor	Type	Part Number & value
L1	Murata	Wired inductor, high Q	LQW15AN10N, 10nH
	Various	Ceramic inductor, low Q	9.1nH

Electrical Characteristics

Table 3 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
DC Supply Voltage	V_{DD}	-0.3	3.6	V
Supply Voltage For Other Pin	V_{IO}	-0.3	V_{DD}+0.3	
Maximum RF Input Power	P_{IN}	TBD		dBm
Device Operating Temperature	T_{OP}	-40	90	℃
Device Storage Temperature	T_{STG}	-65	160	℃
Lead Temperature (soldering)	T_{LT}	260		℃
Soldering Temperature (reflow)	T_{ST}	260		
Electrostatic Discharge	$V_{ESD(HBM)}$	TBD	TBD	V
	$V_{ESD(CDM)}$	TBD	TBD	

Notice: *Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.*

Table 4 Recommended Operating Conditions

Parameters	Condition	Min.	Typ.	Max.	Units
Supply Voltage	-	1.6	2.8	3.3	V
Supply Current	EN=High, VDD=2.8V	-	6.0	-	mA
	EN=High, VDD=1.8V	-	5.0	-	mA
	EN=Low	-	0.05	1	uA
EN Input High	-	1.6	1.8	VDD	V
EN Input Low	-	0	0	0.3	V

AC Characteristics

TA=-40~+90℃, typically TA=25℃ VDD=2.8V, all data measured on Maxscend's EVB, unless otherwise noted

Table 5 AC Characteristics（VDD=2.8V）

Parameters	Conditions	Min	Typ	Max	Units
RF Frequency Range	None	1550	1575.42	1615	MHz
Power Gain	-	-	18.5	-	dB
	Note8	-	18.5	-	dB
Noise Figure	-	-	0.6	-	dB
	Note8	-	0.8	-	dB
Input Return Loss	Note1	-	-10	-	dB
	Note8	-	-10	-	dB
Output Return Loss	Note1	-	-12	-	dB
	Note8	-	-11	-	dB
Reverse Isolation	Note1	-	-28	-	dB
VSWR	Note1	-	1.7	-	-
Desense	Note2	-	0.25	-	dB
Stability	Note3	1.0	-	-	-
Input Power 1-dB Compression Point	1575MHz	-	-7	-	dBm
	900MHz	-	-2	-	dBm
	2400MHz	-	4	-	dBm
700M Harmonic	Note4	-	-56.5	-	dBm
Input In-Band IP3	Note5	-	+1	-	dBm
Input Out-Band IP3	Note6	-	+5	-	dBm
Input Out-Band IP2	Note7	-	42.7	-	dBm

Note1: *sweep power -30dBm, 1575.42MHz*

Note2: *jammed signal @ 1463MHz & 1712MHz, -20dBm*

Note3: *frequency range 500MHz-5GHz*

Note4: *f1 = 787.76MHz, -25dBm, Input referred 2nd Harmonics*

Note5: *f1 = 1574.5 MHz, f2 = 1575.5 MHz, -30dBm*

Note6: *f1 = 1712.7 MHz, -20dBm, f2 = 1850 MHz, -65dBm, IP3=（2*P1+P2+* $Gain_{1575MHz}$ *-IM3)/2*

Note7: *f1 = 824.6 MHz, -25dBm, f2 = 2400 MHz, -32dBm, IP2 = Pin_avg-(IM2-*$Gain_{1575MHz}$*)*

Note8: *Beidou frequency range B1：1559.052MHz---1591.788MHz*

TA=-40~+90℃, typically TA=25℃ VDD=1.8V, all data measured on Maxscend's EVB, unless otherwise noted

Table 6 AC Characteristics (VDD=1.8V)

Parameters	Conditions	Min	Typ	Max	Units
RF Frequency Range	None	1550	1575.42	1615	MHz
Power Gain	-	-	17.8	-	dB
	Note8	-	17.8	-	dB
Noise Figure	-	-	0.85	-	dB
	Note8	-	0.90	-	dB
Input Return Loss	Note1	-	-8	-	dB
	Note8	-	-8	-	dB
Output Return Loss	Note1	-	-11	-	dB
	Note8	-	-10	-	dB
Reverse Isolation	Note1	-	-28	-	dB
VSWR	Note1	-	2.3	-	-
Desense	Note2	-	0.35	-	dB
Stability	Note3	1.0	-	-	-
Input Power 1-dB Compression Point	1575MHz	-	-10	-	dBm
	900MHz	-	-4	-	dBm
	2400MHz	-	2	-	dBm
700M Harmonic	Note4	-	-55.5	-	dBm
Input In-Band IP3	Note5	-	-1	-	dBm
Input Out-Band IP3	Note6	-	+2.5	-	dBm
Input Out-Band IP2	Note7	-	31.5	-	dBm

Note1: *sweep power -30dBm, 1575.42MHz*

Note2: *jammed signal @ 1463MHz & 1712MHz, -20dBm*

Note3: *frequency range 500MHz-5GHz*

Note4: *f1 = 787.76MHz, -25dBm, Input referred 2nd Harmonics*

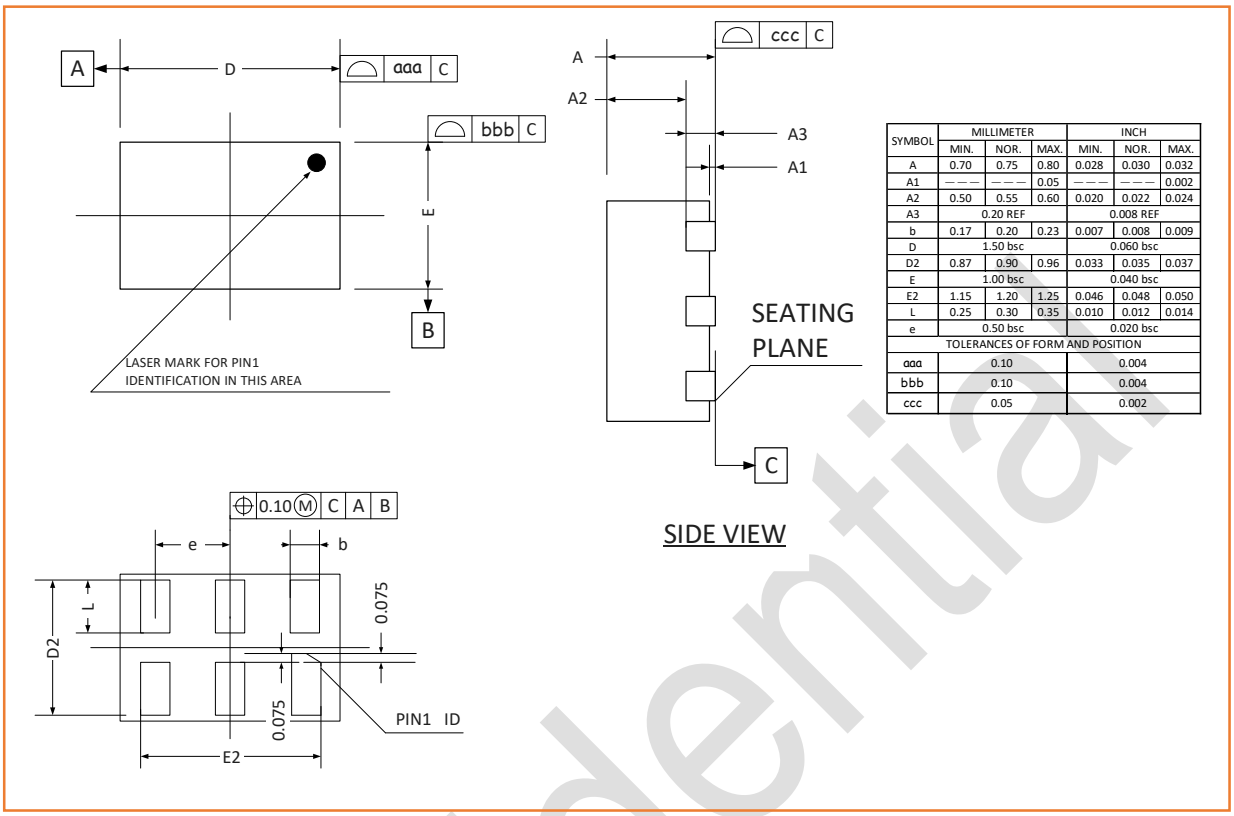
Note5: *f1 = 1574.5 MHz, f2 = 1575.5 MHz, -30dBm*

Note6: *f1 = 1712.7 MHz, -20dBm, f2 = 1850 MHz, -65dBm, IP3=（2*P1+P2+ $Gain_{1575MHz}$ -IM3)/2*

Note7: *f1 = 824.6 MHz, -25dBm, f2 = 2400 MHz, -32dBm, IP2 = Pin_avg-(IM2-$Gain_{1575MHz}$)*

Note8: *Beidou frequency range B1：1559.052MHz---1591.788MHz*

Package Outline Dimensions



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 2 Package Outline Dimensions

Marking Specifications

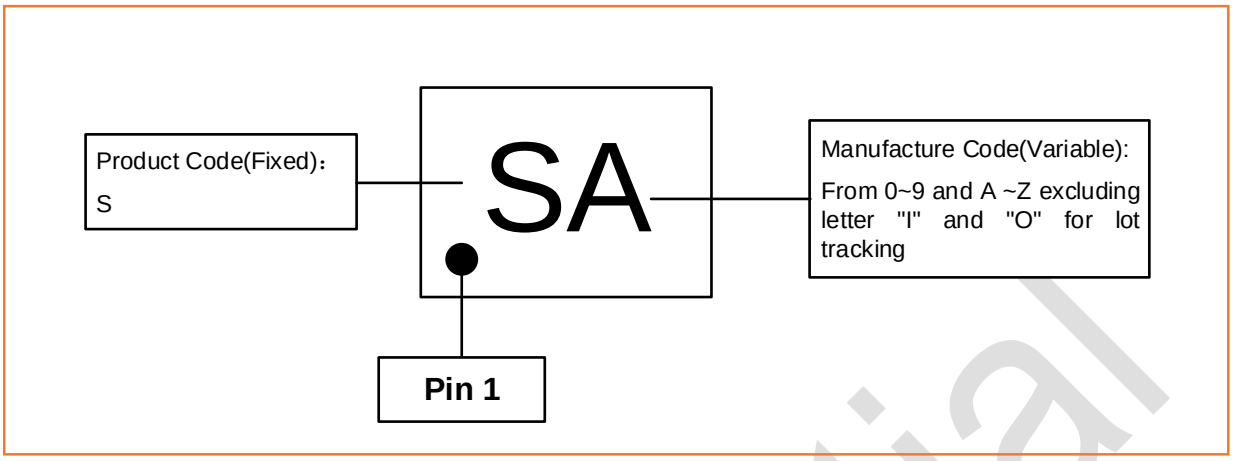


Figure 3 Marking Specification (Top View)

Reflow Chart

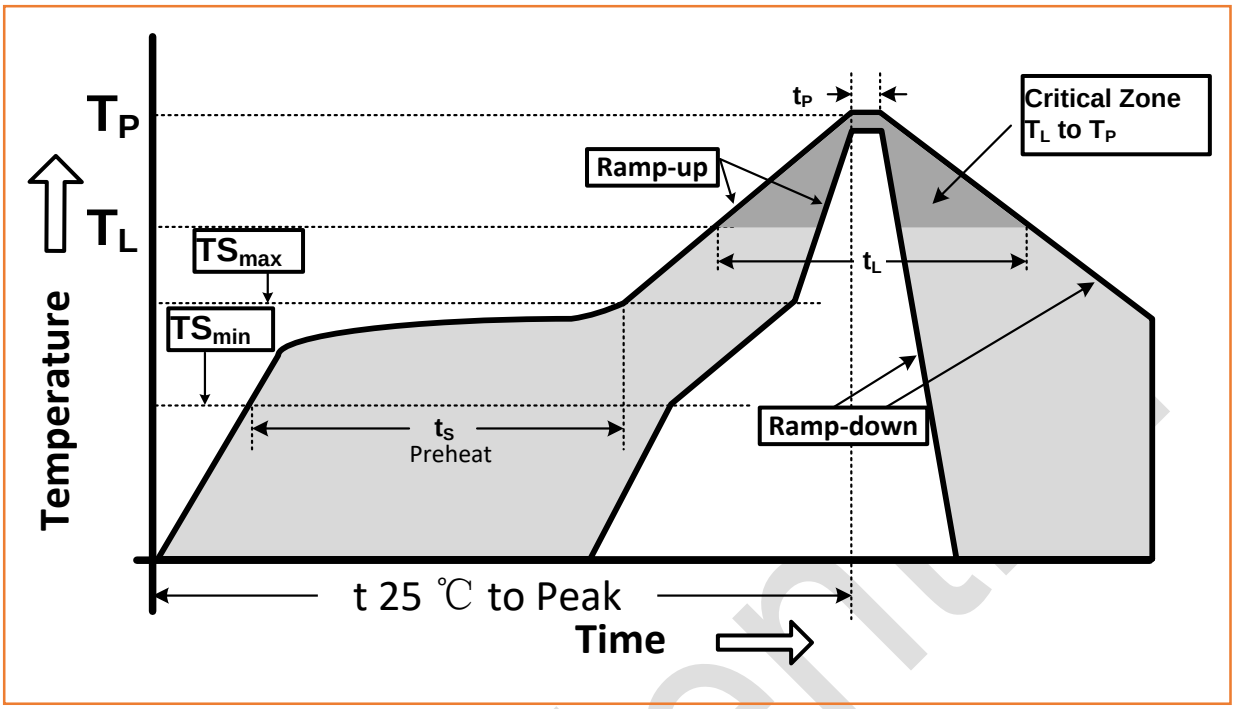


Figure 4 Recommended Lead-Free Reflow Profile

Table 7 Reflow condition

Profile Parameter	Lead-Free Assembly, Convection, IR/Convection
Ramp-up rate (TSmax to T_p)	3℃/second max.
Preheat temperature (TSmin 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(tp)	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.