# MXDLN16UEGPS Low Noise Amplifier

# Datasheet

## General Description

MXDLN16UE high gain, low noise amplifier(LNA) is dedicated to GPS, GLONASS GalileoandBeidou standards. This product has an extremely low noise figure of 0.7dB, 19dB gain and excellent linearity.

MXDLN16UE 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.

MXDLN16UE uses a small 1.1mmx0.9mmx0.45mmLGA 6-pin package.

## 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

## Applications

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

## Pin Configuration/Application Diagram (Top view)

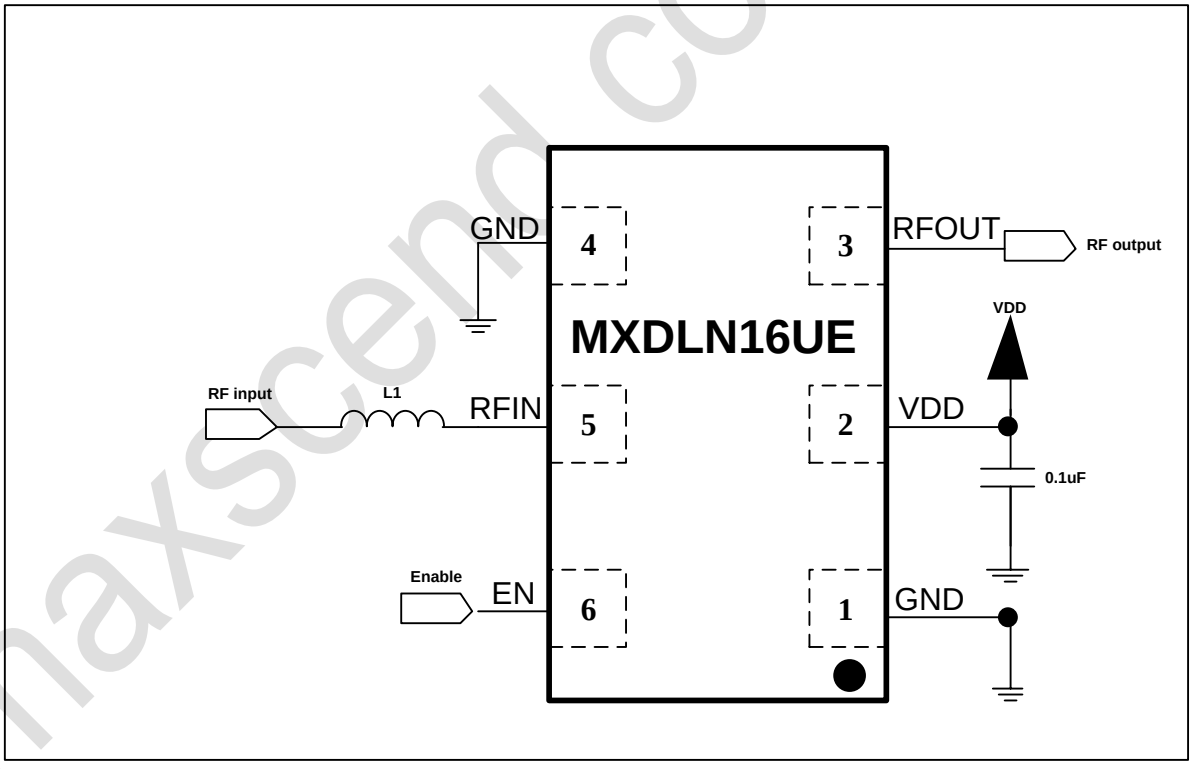



**Figure 1.MXDLN16UE application circuit**

**Table 1.**

| Component | Vendor | Type | Part Number& value |
|---|---|---|---|
| L1 | Murata | Wired inductor, high Q | LQW15AN12N, 12nH |
| | 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 |

## 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 |

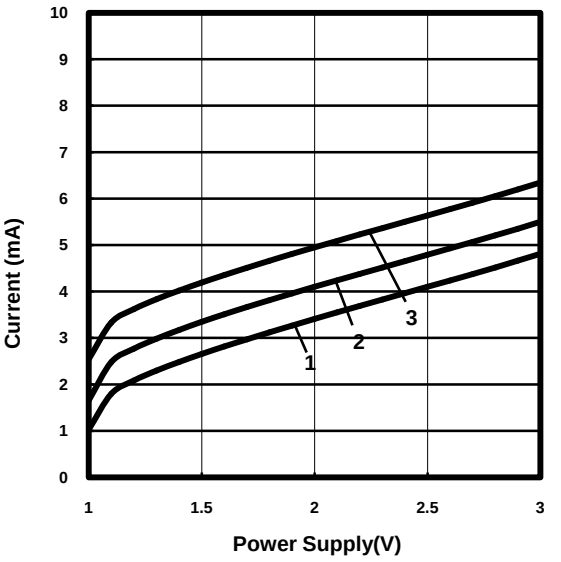
## AC Characteristics

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

**Table 4.**

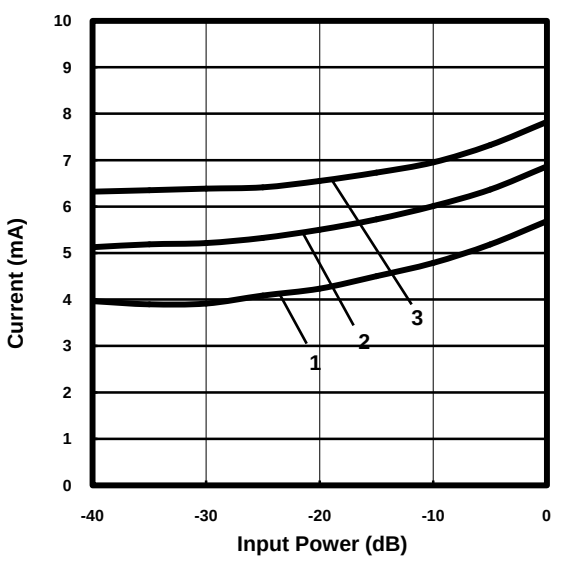
| Parameters | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| RF FrequencyRange | None | | 1575.42 | | MHz |
| Power Gain | | | 19 | | dB |
| | Note7 | | 19 | | |
| Noise Figure | | | 0.7 | | dB |
| | Note7 | | 0.8 | | |
| Input Return Loss | Note1 | | -12 | | dB |
| | Note7 | | -10 | | |
| 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



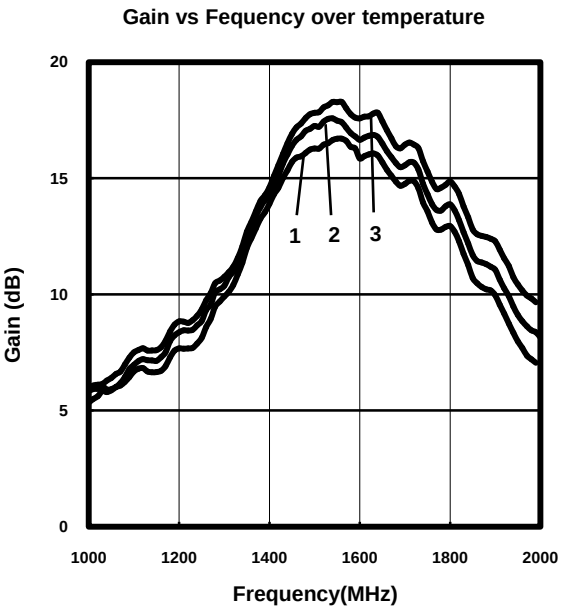

Figire 2. Current vs Power Supply over Temperature

1. -40℃
2. +25℃
3. +85℃



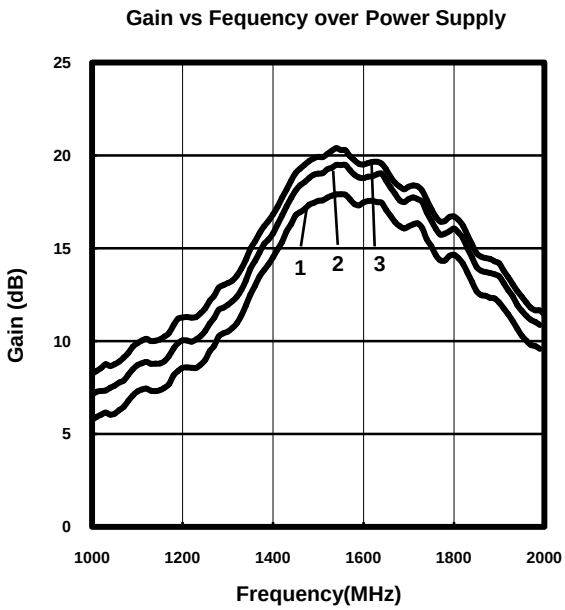

Figire 3. Current vs Input Power over Power Supply

TA = 25℃
1. 1.2V
2. 1.8V
3. 2.8V



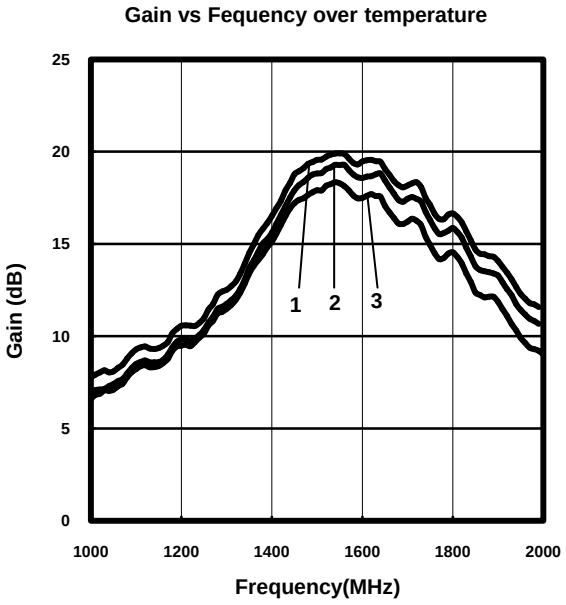

Figire 4. Gain vs Frequency over Temperature

VDD =1.2V
1. -40℃
2. +25℃
3. +85℃



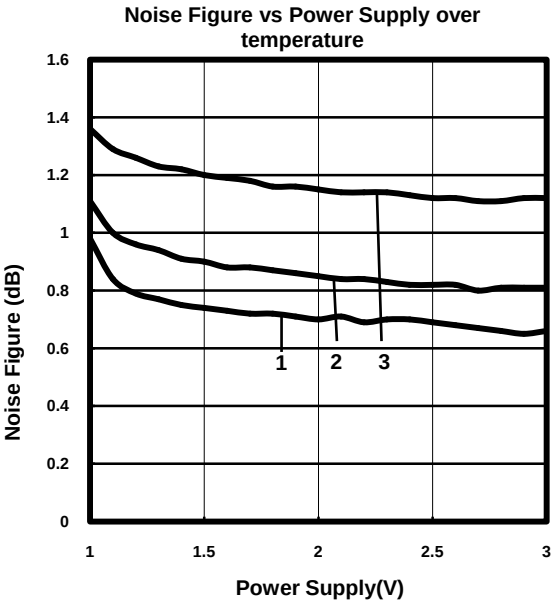

Figire 5. Gain vs Frequency over Power Supply

TA = 25℃
1. 1.2V
2. 1.8V
3. 2.8V



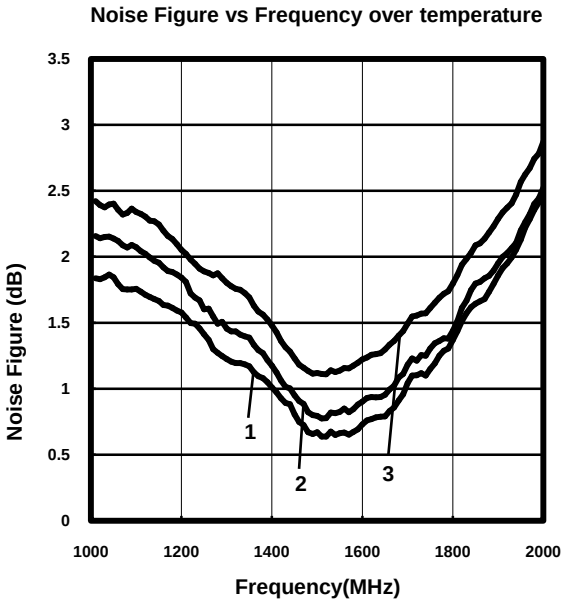

Figire 6. Gain vs Frequency over Temperature

VDD =2.8V
1. -40℃
2. +25℃
3. +85℃



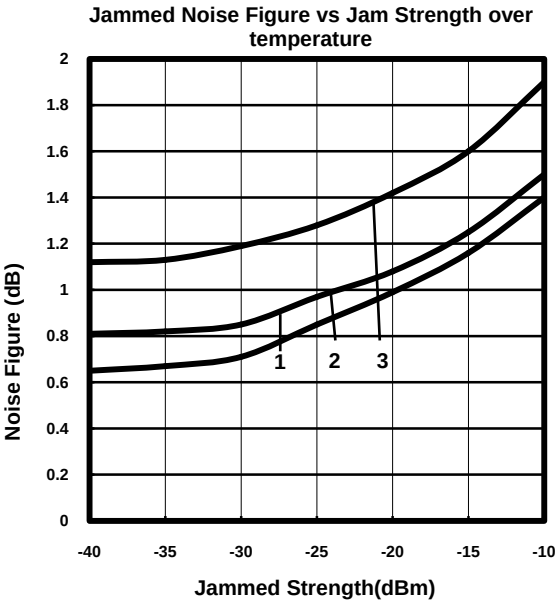

Figire 7. Noise Figure vs Power Supply over temperature

VDD=2.8V
1. -40℃
2. +25℃
3. +85℃



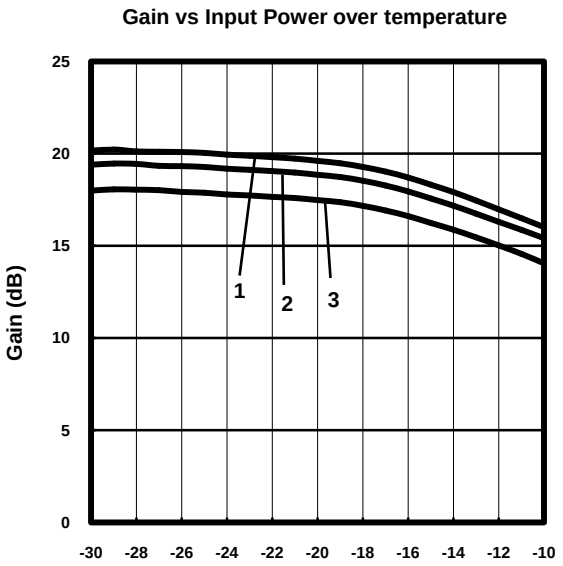

Figire 8. Noise Figure vs Frequency over temperature

VDD=2.8V
1. -40℃
2. +25℃
3. +85℃



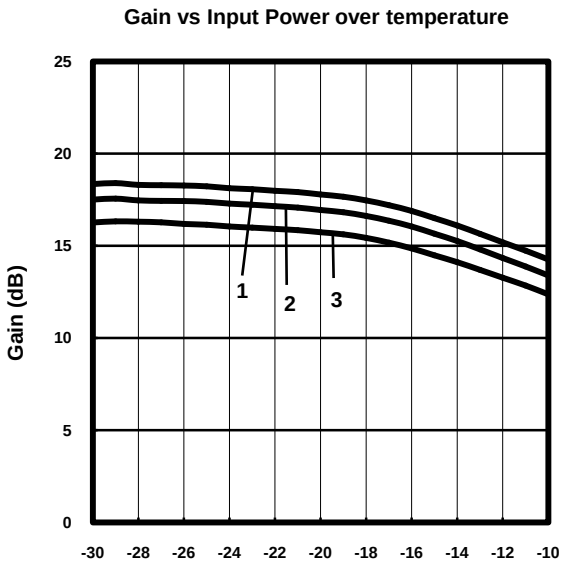

Figire 9. Jammed Noise Figure vs Jam Strength over temperature

VDD=2.8V
1. -40℃
2. +25℃
3. +85℃



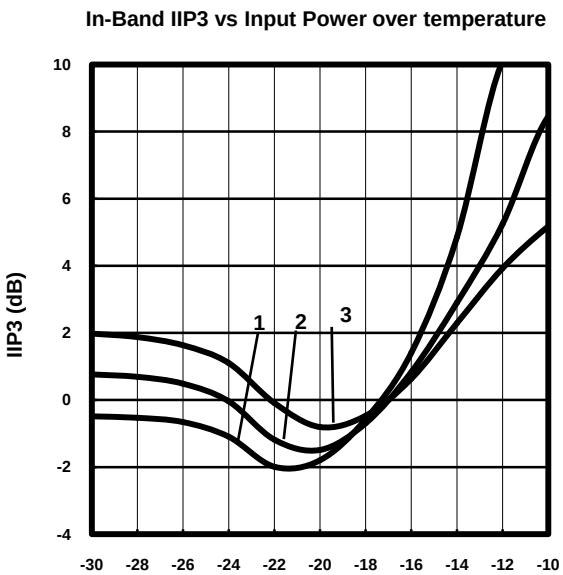

Figire 10. Gain vs Input Power over temperature

VDD=2.8V
1. -40℃
2. +25℃
3. +85℃



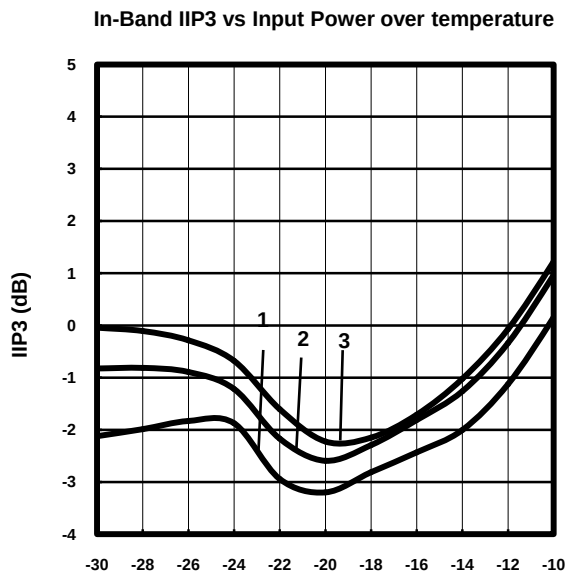

Figire 11. Gain vs Input Power over temperature

VDD=1.2V
1. -40℃
2. +25℃
3. +85℃



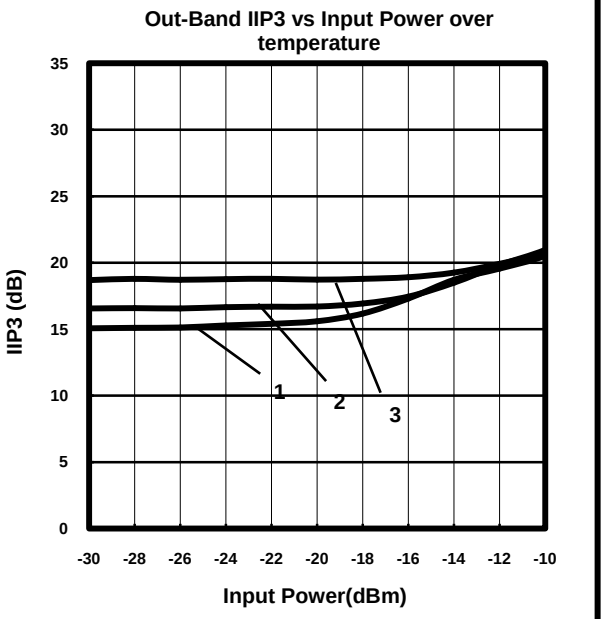

Figire 12. In-Band IIP3 vs Input Power over temperature

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



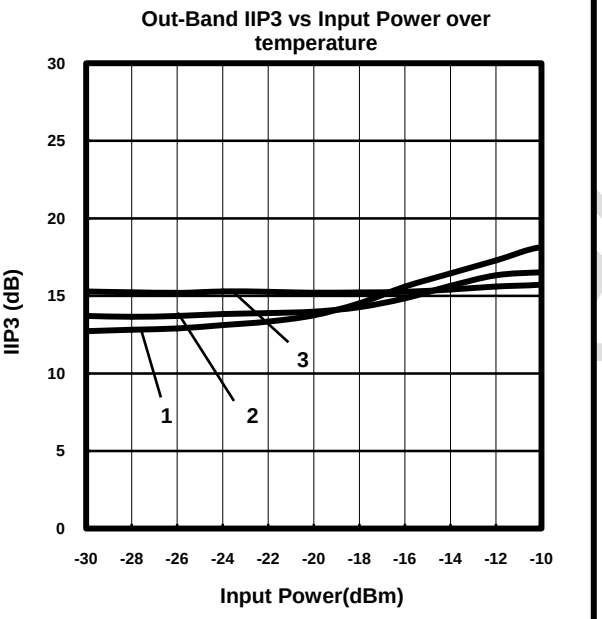

Figire 13. In-Band IIP3 vs Input Power over temperature

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



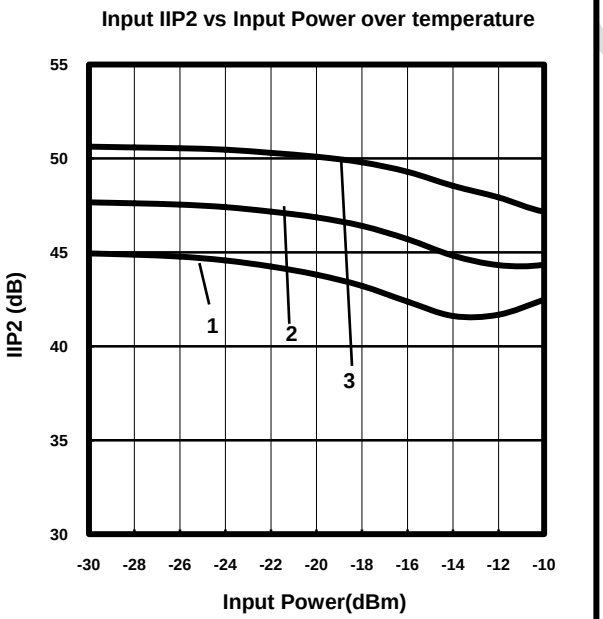

Figire 14. Out-Band IIP3 vs Input Power over temperature

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



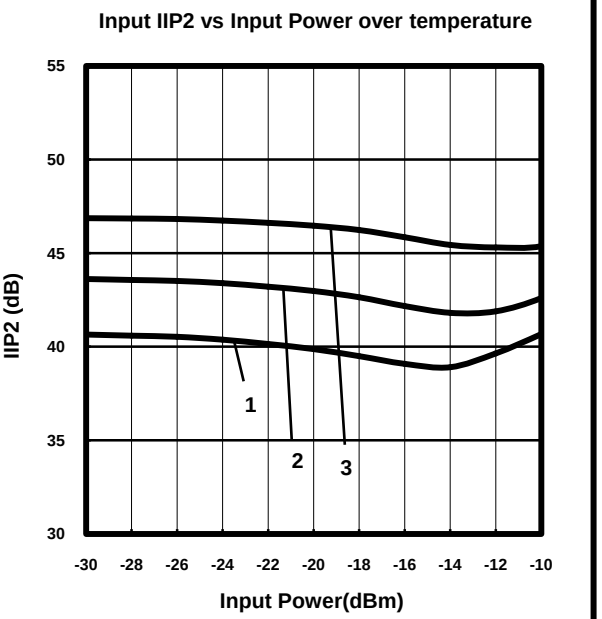

Figire 15. Out-Band IIP3 vs Input Power over temperature

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



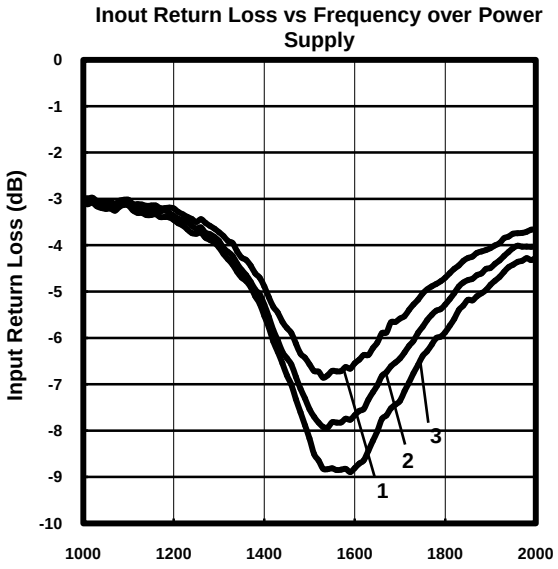

Figire 16. Input IIP2 vs Input Power over temperature

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



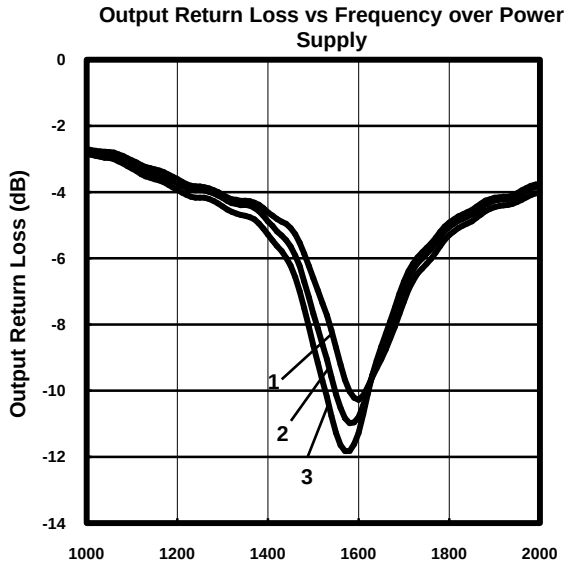

Figire 17. Input IIP2 vs Input Power over temperature

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



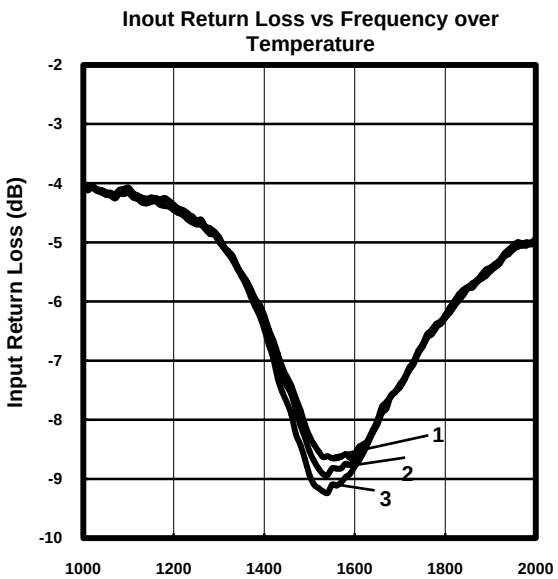

Figire 18. Input Return Loss vs Frequency over Power Supply

Ta = 25℃
1. 1.2V
2. 1.8V
3. 2.8V



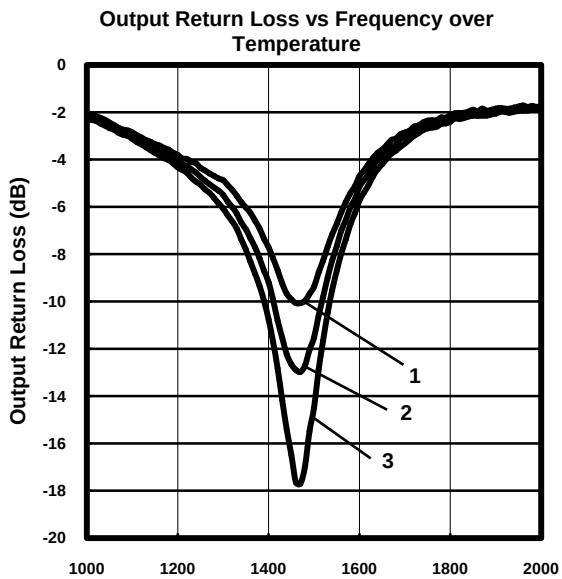

Figire 19. Output Return Loss vs Frequency over Power Supply

Ta = 25℃
1. 1.2V
2. 1.8V
3. 2.8V



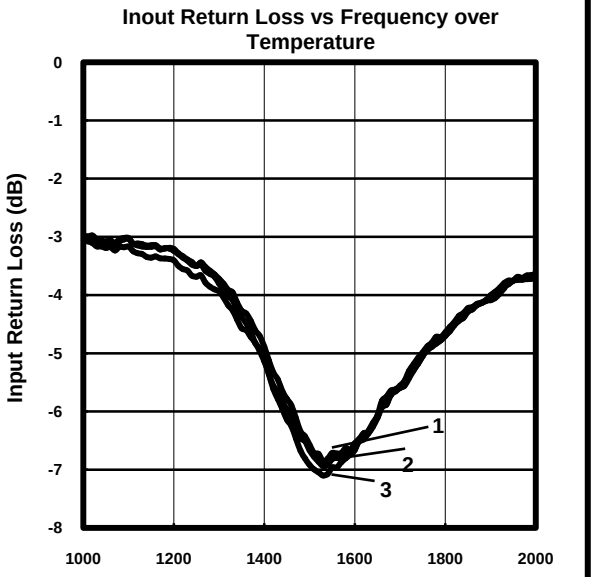

Figire 20. Input Return Loss vs Frequency over Temperature

VDD = 2.8V
1. -40℃
2. +25℃
3. +85℃



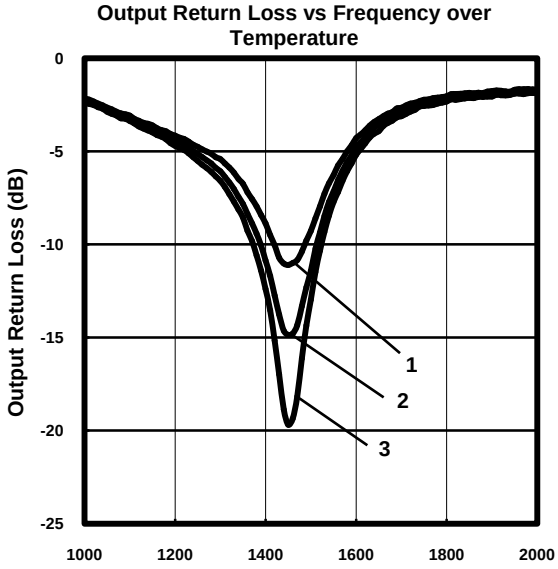

Figire 21. Output Return Loss vs Frequency over Temperature

VDD = 2.8V
1. -40℃
2. +25℃
3. +85℃



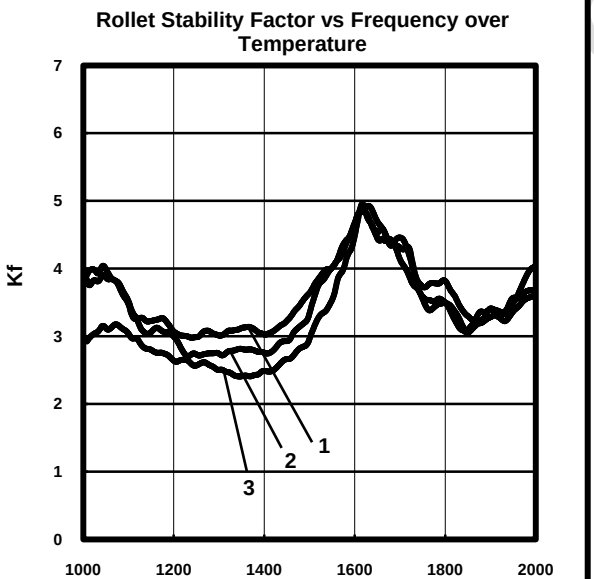

Figire 22. Input Return Loss vs Frequency over Temperature

VDD = 1.2V
1. -40℃
2. +25℃
3. +85℃



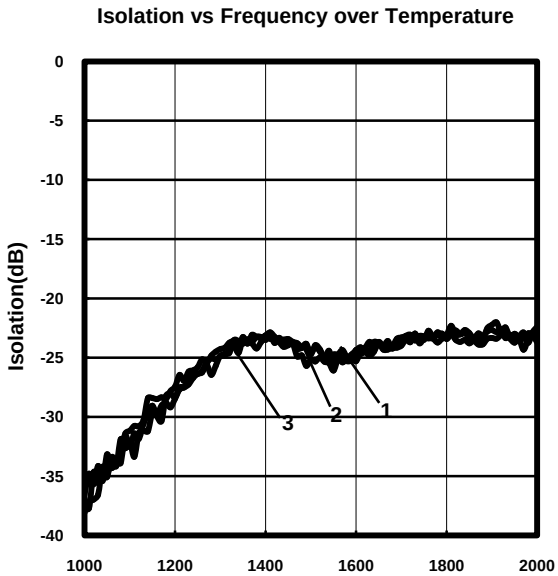

Figire 23. Output Return Loss vs Frequency over Temperature

VDD = 1.2V
1. -40℃
2. +25℃
3. +85℃



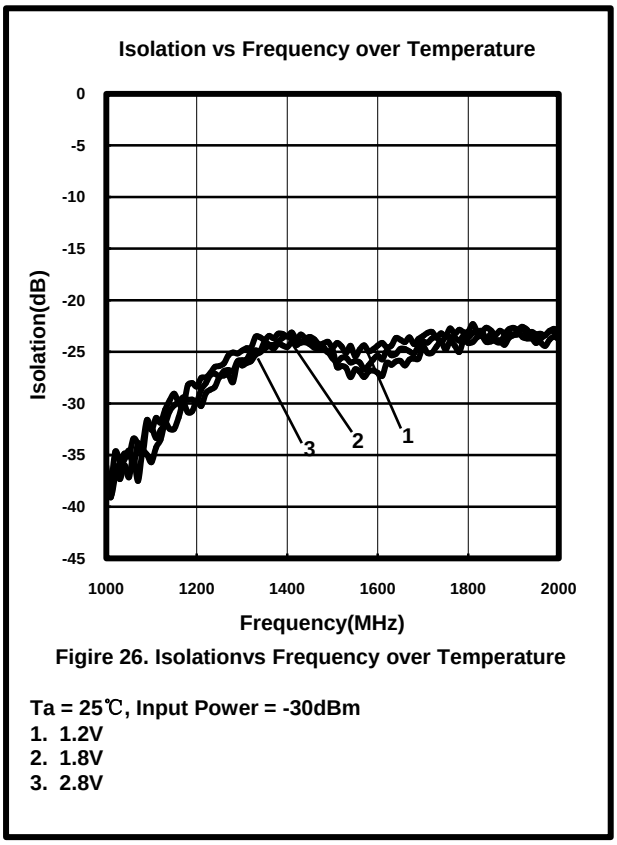

Figire 24. Rollet Stability Factor vs Frequency over Temperature

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



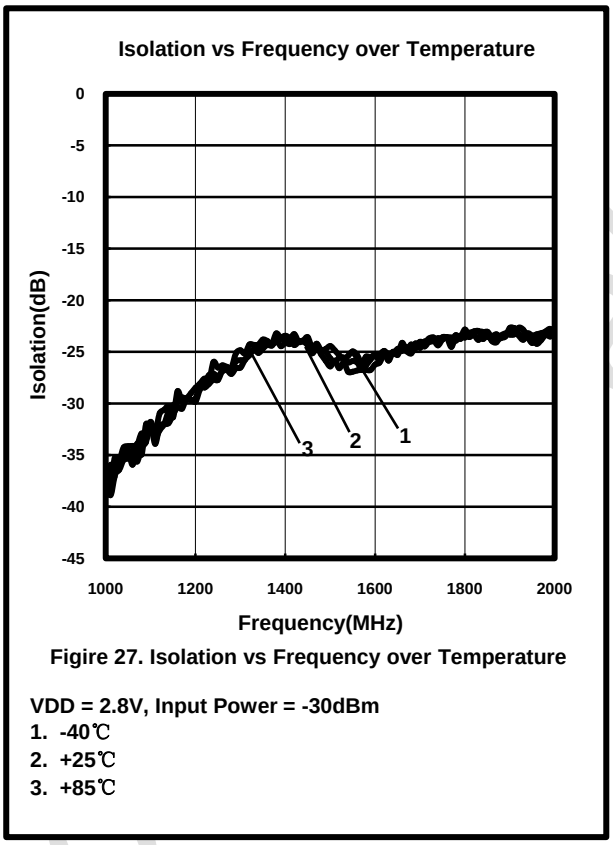

Figire 25. Isolation vs Frequency over Temperature

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




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℃

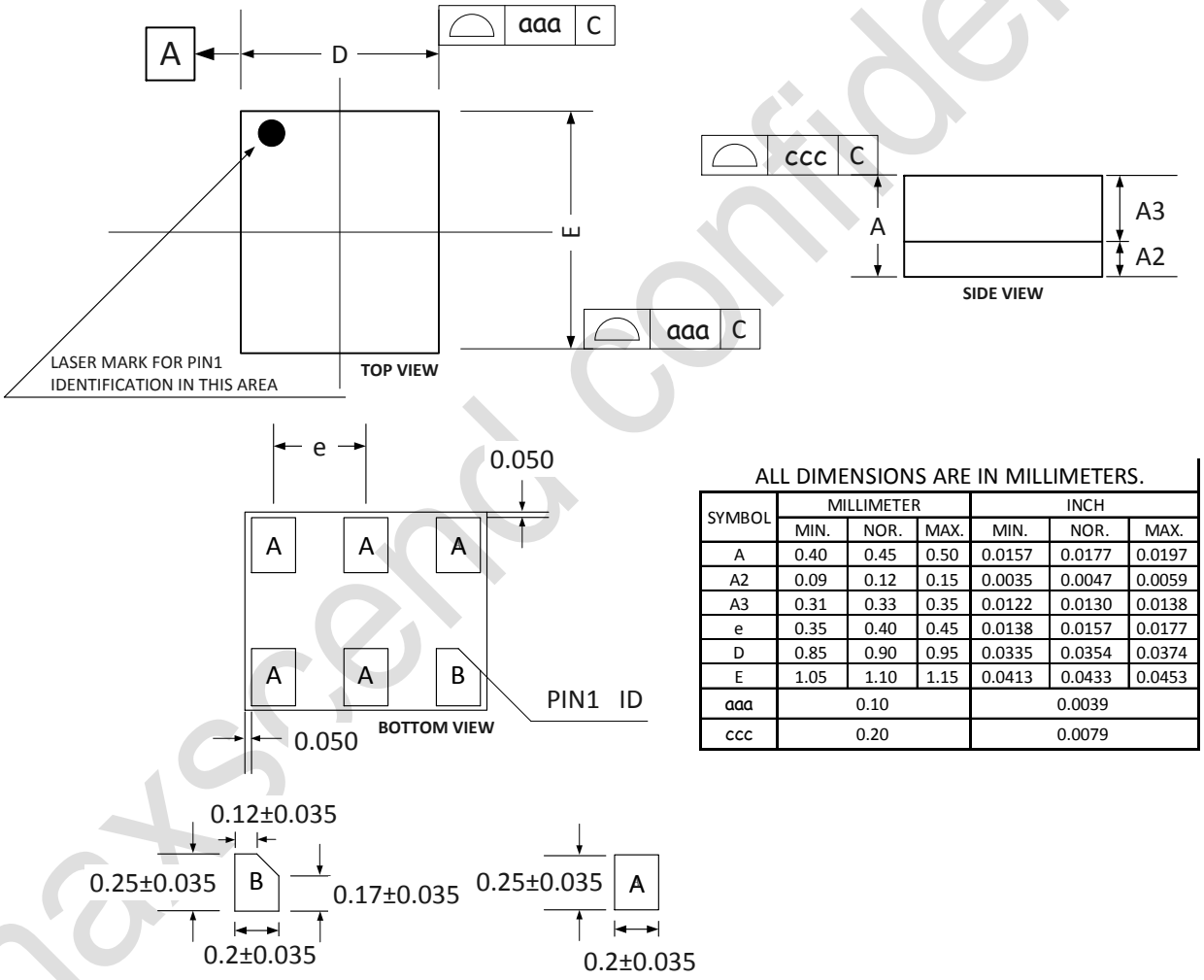
## Pin Descriptions

**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. MXDLN16UE outline dimension**

## Reflow Chart

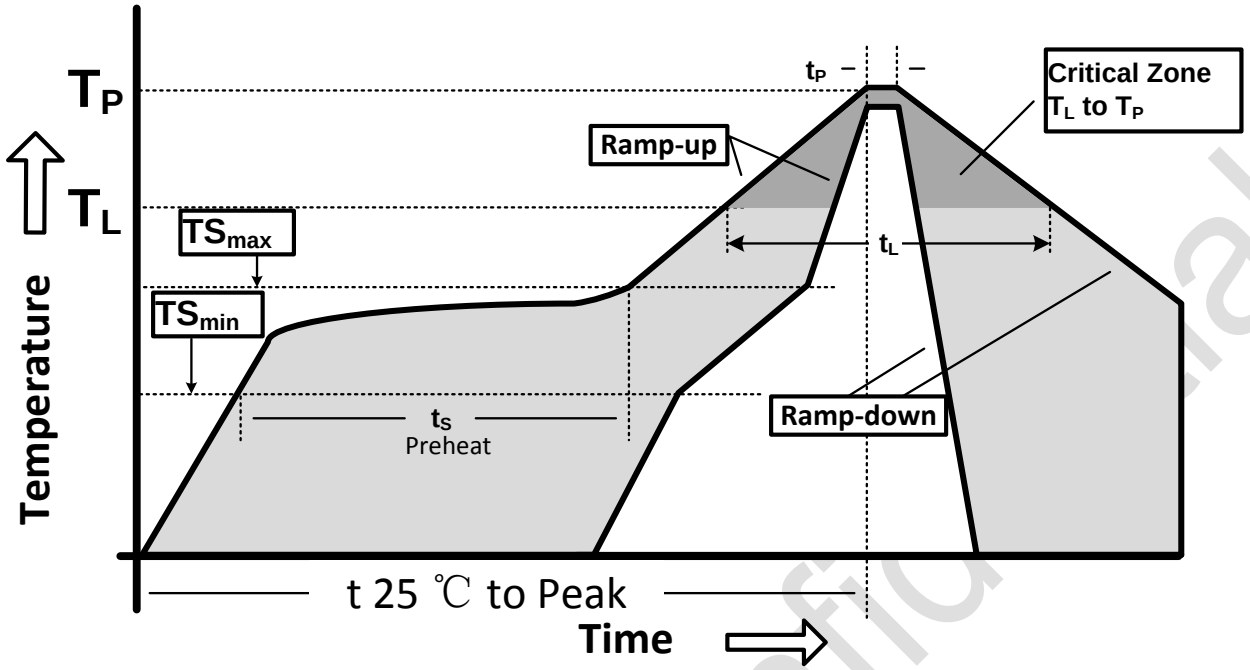



**Figure 29. Recommended Lead-Free Reflow Profile**

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

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