



# MXD8015LC

## Low Noise Amplifier for LTE Low Band



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### General Description

MXD8015LC high gain, low noise amplifier (LNA) is dedicated to LTE low band receive using advanced RFCMOS process. The high linearity performance and low noise figure makes the device an ideal choice for LTE receiving Applications.

MXD8015LC works under a 1.6V to 3.3V single power supply while consumes 5.5 mA current in low noise mode, in power down mode, the power consumption will be reduced to less than 1uA.

MXD8015LC uses a small 1.1mm × 0.7mm × 0.45mm DFN 6-pin package.

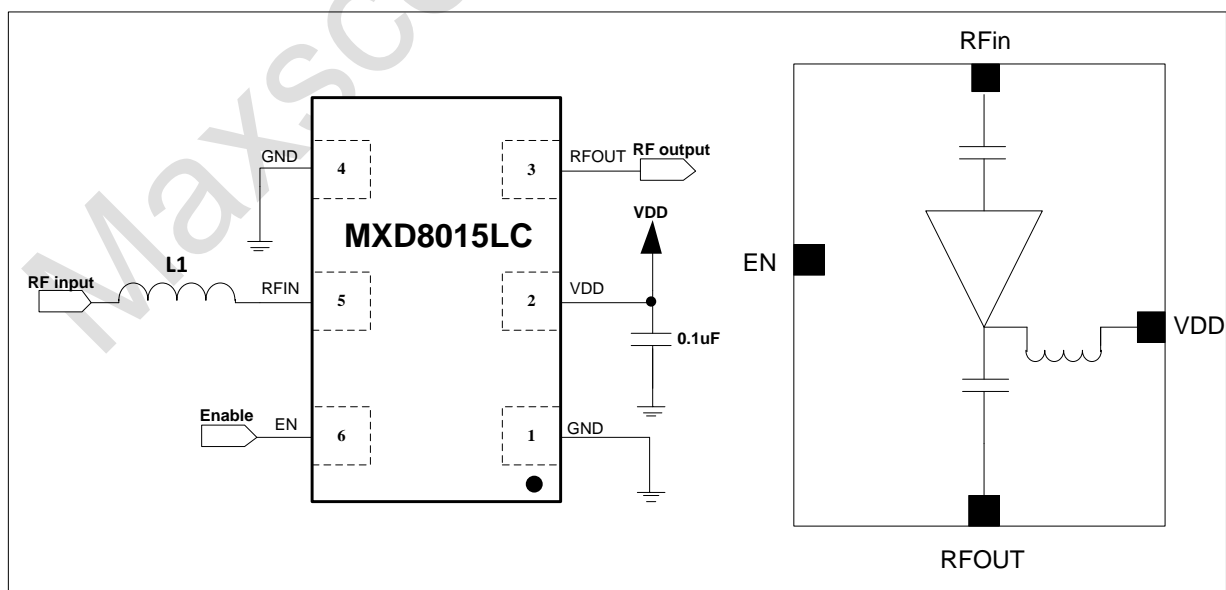
### Applications

- LTE low band receiving

### Features

- Broadband frequency range: 716 to 960MHz
- High Gain
  - 15 dB gain at 2.8V 716MHz to 960MHz
  - 13 dB gain at 1.8V 716MHz to 960MHz
- Low noise figure
  - 0.8dB noise figure at 2.8V 716MHz to 960MHz
  - 1.0dB noise figure at 1.8V 716MHz to 960MHz
- Operation current 5.5mA
- Small, DFN (6-pin, 1.1mm x 0.7mm x 0.45mm) package , MSL1
- No DC blocking capacitors required.

### Pin Configuration/Application Diagram (Top view)



**Figure 1 MXD8015LC application circuit**

## Pin Descriptions & Input matching inductance

**Table 1**

Pin	Pin Name	I/O	Pin Description
1	GND	AG	Analog VSS
2	VDD	AP	Power supply
3	RFOUT	AO	LNA output
4	GND	AG	Analog VSS
5	RFIN	AI	LNA input from antenna
6	EN	DI	Pull high into low noise mode, pull low into shutdown 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).

**Table 2 Input matching inductance**

Component	Matching Band	Vendor	Type	Part Number & value
L1	716MHz – 821MHz	Murata	Wired inductor, high Q	LQW15AN33N, 33nH
		various	Ceramic inductor, low Q	30nH
	850MHz – 970MHz	Murata	Wired inductor, high Q	LQW15AN33N, 20nH
		various	Ceramic inductor, low Q	18nH

## Recommended Operation Range

**Table 3**

Parameters	Symbol	Min	Typ	Max	Units
Operation Frequency	f1	716	-	960	MHz
Power supply	V <sub>DD</sub>	1.6	2.8	3.3	V
Control Voltage High	V <sub>CTL_H</sub>	1.0	1.8	VDD	V
Control Voltage Low	V <sub>CTL_L</sub>	0	0	0.3	V

## Absolute Maximum Ratings

**Table 4 Maximum ratings**

Parameters	Symbol	Minimum	Maximum	Units
Supply voltage	V <sub>DD</sub>	-0.3	+3.6	V
Digital control voltage	V <sub>CTL</sub>	-0.3	VDD+0.3, Max: 3.6	V
RF input power	P <sub>IN</sub>		+20	dBm
Operating temperature	T <sub>OP</sub>	-35	+90	°C
Storage temperature	T <sub>STG</sub>	-55	+150	°C
Electrostatic Discharge Human body model (HBM), Class 2 <sup>Note1</sup>	ESD_HBM		2000	V
Machine Model (MM), Class B <sup>Note2</sup>	ESD_MM	-	200	
Charged device model (CDM), Class III <sup>Note3</sup>	ESD_CDM		500	

**Note:** 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.

**Note1:** According to ESDA/JEDECJS-001-2014

**Note2:** According to JESD22-A115C

**Note3:** According to ESDA/JEDECJS-002-2014

**Specifications**

 Typically  $T_A=25^{\circ}\text{C}$   $V_{DD}=2.8\text{V}$ , All data measured on Maxscend's EVB, unless otherwise noted

**Table 5 High Gain mode Electrical Specifications**

Parameter	Symbol	Specification			Units	Test Condition
		Min.	Typical	Max.		
<b>DC Specifications</b>						
Supply voltage	$V_{DD}$	1.6	2.8	3.3	V	
Supply current	$I_{DD}$	4.0	5.5	8.0	mA	$V_{DD} = 2.8\text{ V}$ , $V_{EN}=\text{high}$
		0	0.05	1	uA	$V_{DD} = 2.8\text{ V}$ , $V_{EN}=\text{low}$
<b>RF Specifications</b>						
Power gain	G	13.5	15	17	dB	716 to 960MHz
Noise figure	NF	-	0.8	1.3	dB	716 to 960MHz
Input Return loss	S11	-	-10	-6	dB	716 to 960MHz
Output Return loss	S22	-	-10	-6	dB	716 to 960MHz
Stability factor	Kf	1.5	-	-	-	
Input 1 dB compression point	P1dB	-9	-5	-	dBm	716 to 960MHz
Input IP3	IIP3	-2	2	-	dBm	Note1 Note2
		-1	3	-		
Startup time		-	-	1	us	Shutdown state to power on state

 Note1:  $P_{in}=P_{in2}=-25\text{dBm}$ ,  $F_1=770\text{MHz}$ ,  $F_2=771\text{MHz}$ 

 Note2:  $P_{in}=P_{in2}=-25\text{dBm}$ ,  $F_1=900\text{MHz}$ ,  $F_2=901\text{MHz}$ 

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**Specifications**

Typically  $T_A=25^{\circ}\text{C}$   $V_{DD}=1.8\text{V}$ , All data measured on Maxscend's EVB, unless otherwise noted

**Table 6 High Gain mode Electrical Specifications**

Parameter	Symbol	Specification			Units	Test Condition
		Min.	Typical	Max.		
<b>DC Specifications</b>						
Supply voltage	$V_{DD}$	1.6	1.8	3.3	V	
Supply current	$I_{DD}$	2.5	3.0	5.0	mA	$V_{DD} = 1.8\text{ V}$ , $V_{EN}=\text{high}$
		0	0.05	1	uA	$V_{DD} = 1.8\text{ V}$ , $V_{EN}=\text{low}$
<b>RF Specifications</b>						
Power gain	G	11.5	13	14.5	dB	716 to 960MHz
Noise figure	NF	-	1.0	1.5	dB	716 to 960MHz
Input Return loss	S11	-	-10	-5	dB	716 to 960MHz
Output Return loss	S22	-	-10	-6	dB	716 to 960MHz
Stability factor	Kf	1.5	-	-	-	
Input 1 dB compression point	P1dB	-8	-4	-	dBm	716 to 821MHz
		-7	-3	-		850 to 960MHz
Input IP3	IIP3	-3	1	-	dBm	Note1
		-2	2	-		Note2
Startup time		-	-	1	us	Shutdown state to power on state

Note1:  $P_{in}=P_{in2}=-25\text{dBm}$ ,  $F_1=770\text{MHz}$ ,  $F_2=771\text{MHz}$

Note2:  $P_{in}=P_{in2}=-25\text{dBm}$ ,  $F_1=900\text{MHz}$ ,  $F_2=901\text{MHz}$

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Package Outline Dimensions

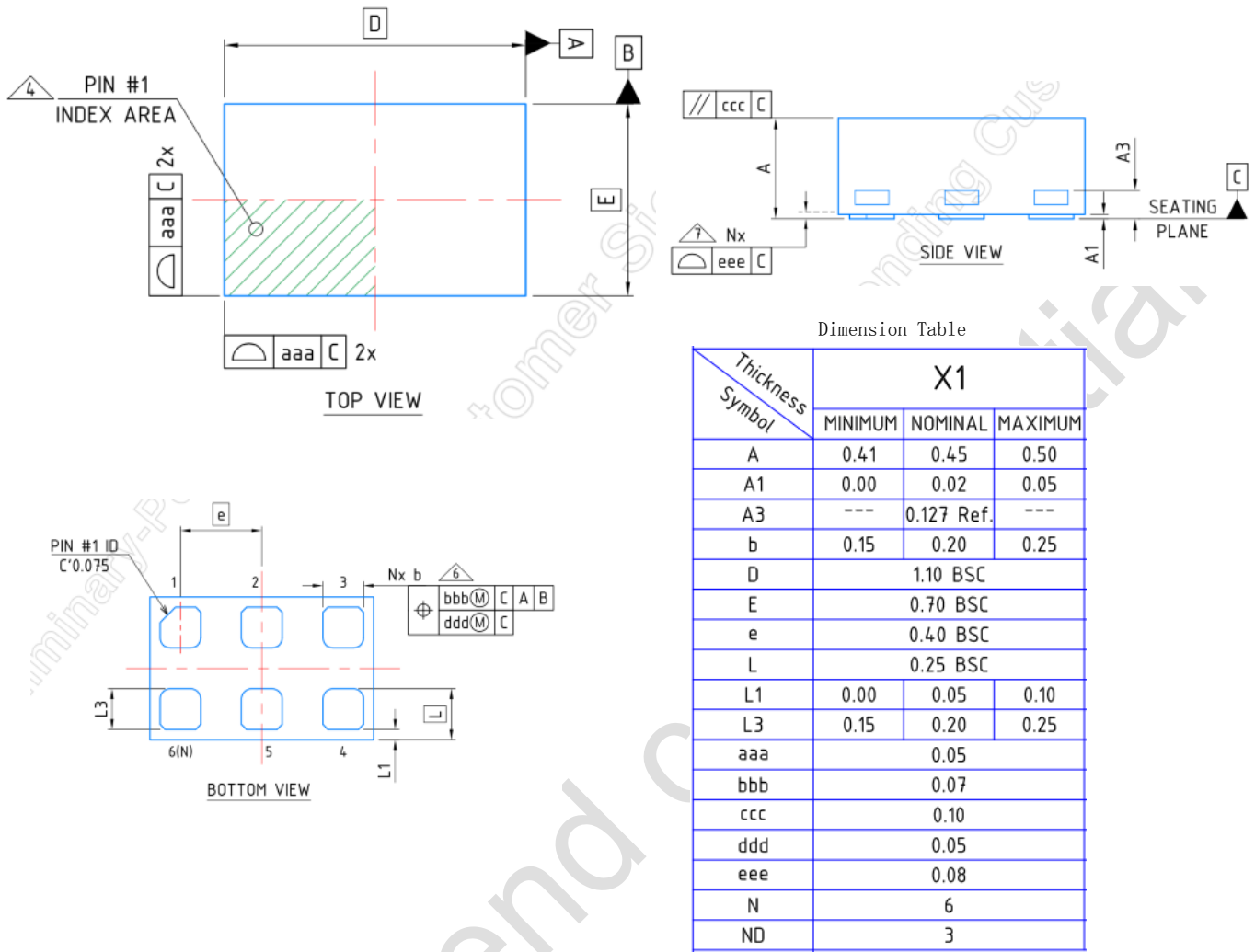


Figure 2 MXD8015LC outline dimension

**Marking Specification**

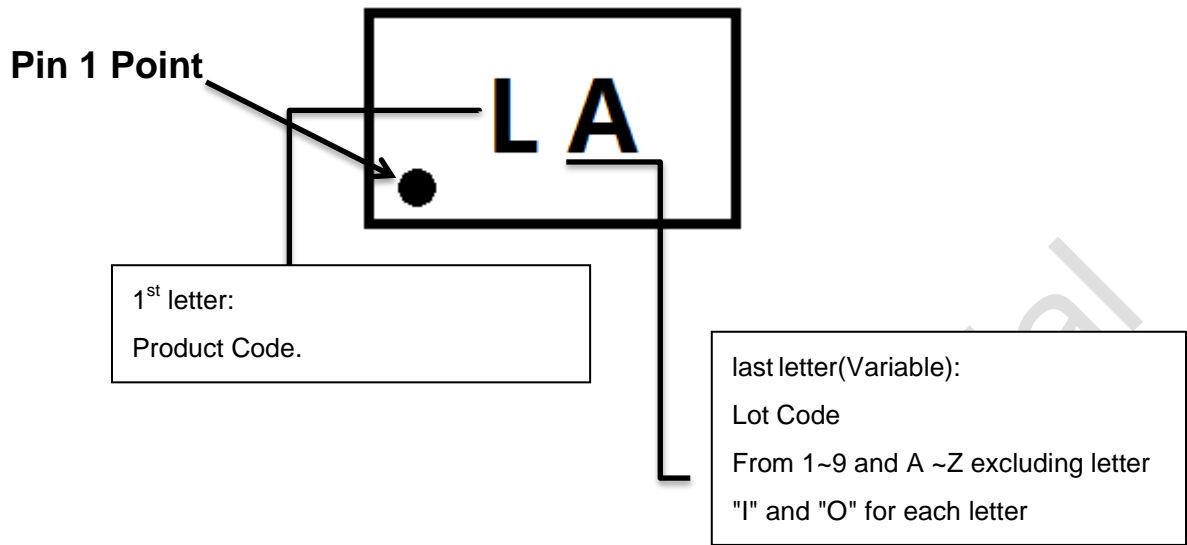
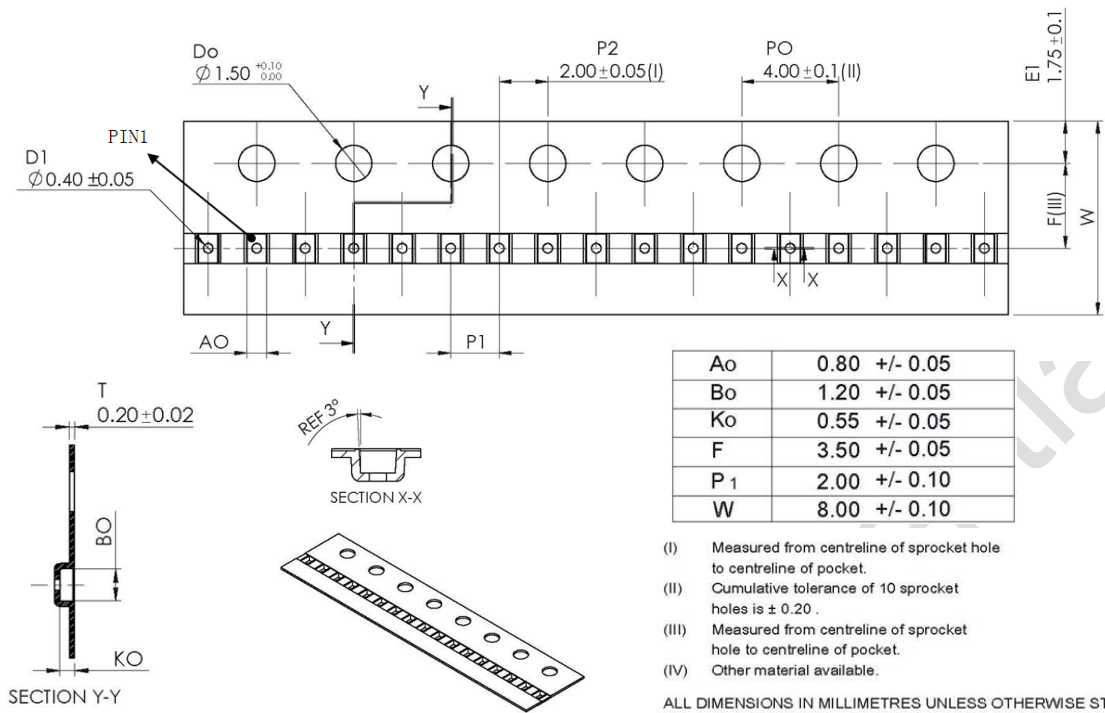


Figure 3 Marking specification (Top View)

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**Tape and Reel Dimensions**

**Figure 4 Tape and reel dimensions**



## Reflow Chart

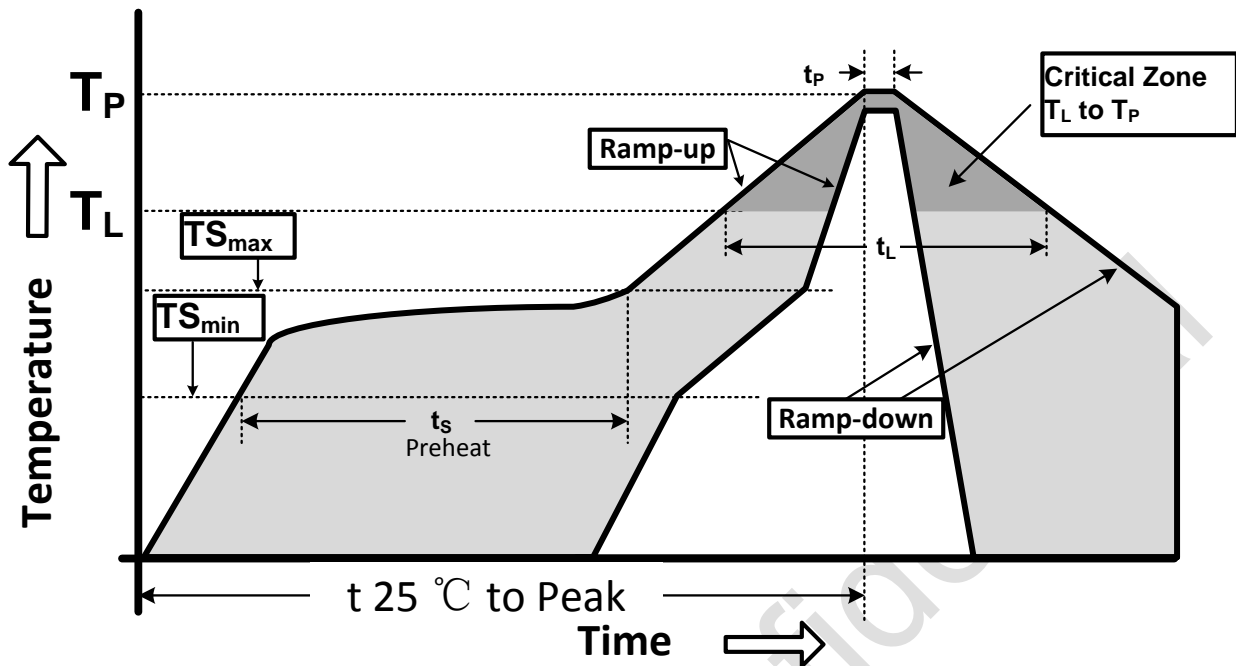


Figure 5 Recommended Lead-Free Reflow Profile

Table 6 Reflow condition

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