MXD8015LC

Low Noise Amplifier for LTE Low Band

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)

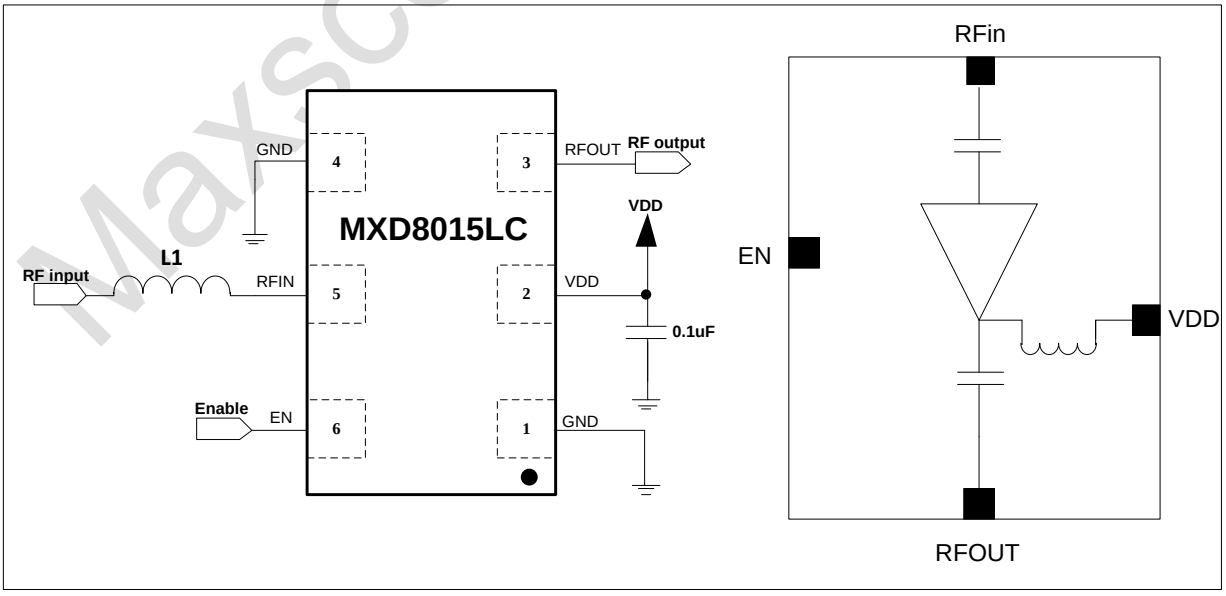


Figure 1 MXD8015LC application circuit

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_{DD}	1.6	2.8	3.3	V
Control Voltage High	V_{CTL_H}	1.0	1.8	VDD	V
Control Voltage Low	V_{CTL_L}	0	0	0.3	V

Absolute Maximum Ratings

Table 4 Maximum ratings

Parameters	Symbol	Minimum	Maximum	Units
Supply voltage	V_{DD}	-0.3	+3.6	V
Digital control voltage	V_{CTL}	-0.3	VDD+0.3, Max: 3.6	V
RF input power	P_{IN}		+20	dBm
Operating temperature	T_{OP}	-35	+90	℃
Storage temperature	T_{STG}	-55	+150	℃
Electrostatic Discharge Human body model (HBM), Class 2[Note1]	ESD_HBM	-	2000	V
Machine Model (MM), Class B[Note2]	ESD_MM		200	
Charged device model (CDM), Class III[Note3]	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℃ VDD=2.8V, 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.		
DC Specifications						
Supply voltage	V_{DD}	1.6	2.8	3.3	V	
Supply current	I_{DD}	4.0 0	5.5 0.05	8.0 1	mA uA	VDD = 2.8 V, VEN=high VDD = 2.8 V, VEN=low
RF Specifications						
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 -1	2 3	-	dBm	Note1 Note2
Startup time		-	-	1	us	Shutdown state to power on state

Note1: Pin=Pin2=-25dBm, F1=770MHz, F2=771MHz

Note2: Pin=Pin2=-25dBm, F1=900MHz, F2=901MHz

Specifications

Typically T_A=25℃ VDD=1.8V, All data measured on Maxscend's EVB, unless otherwise noted

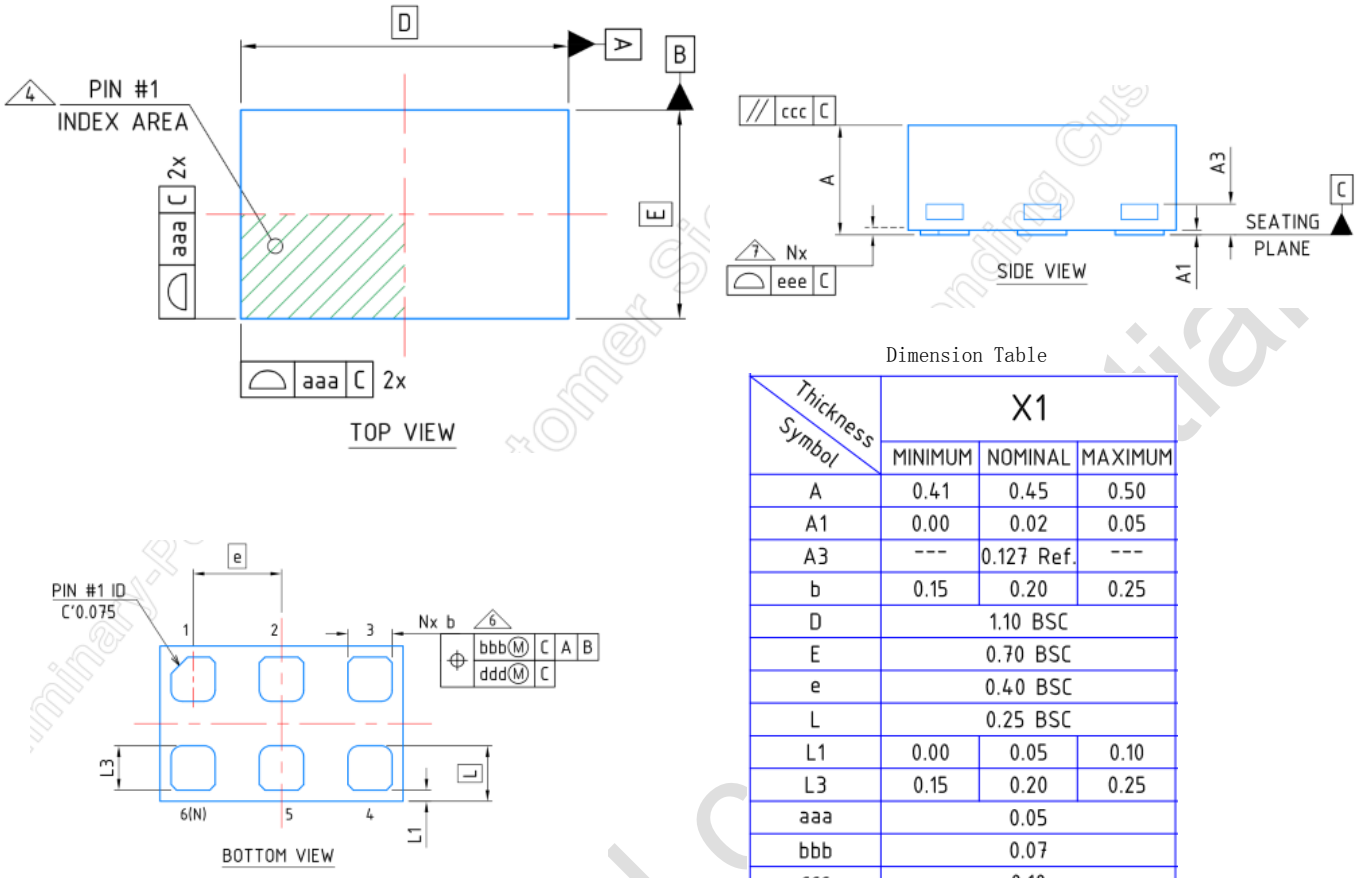
Table 6 High Gain mode Electrical Specifications

Parameter	Symbol	Specification			Units	Test Condition
		Min.	Typical	Max.		
DC Specifications						
Supply voltage	V_{DD}	1.6	1.8	3.3	V	
Supply current	I_{DD}	2.5 0	3.0 0.05	5.0 1	mA uA	VDD = 1.8 V, VEN=high VDD = 1.8 V, VEN=low
RF Specifications						
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 -7	-4 -3	-	dBm	716 to 821MHz 850 to 960MHz
Input IP3	IIP3	-3 -2	1 2	-	dBm	Note1 Note2
Startup time		-	-	1	us	Shutdown state to power on state

Note1: Pin=Pin2=-25dBm, F1=770MHz, F2=771MHz

Note2: Pin=Pin2=-25dBm, F1=900MHz, F2=901MHz

Package Outline Dimensions



Dimension Table

Thickness / Symbol	X1		
	MINIMUM	NOMINAL	MAXIMUM
A	0.41	0.45	0.50
A1	0.00	0.02	0.05
A3	---	0.127 Ref.	---
b	0.15	0.20	0.25
D		1.10 BSC	
E		0.70 BSC	
e		0.40 BSC	
L		0.25 BSC	
L1	0.00	0.05	0.10
L3	0.15	0.20	0.25
aaa		0.05	
bbb		0.07	
ccc		0.10	
ddd		0.05	
eee		0.08	
N		6	
ND		3	

Figure 2 MXD8015LC outline dimension

Marking Specification

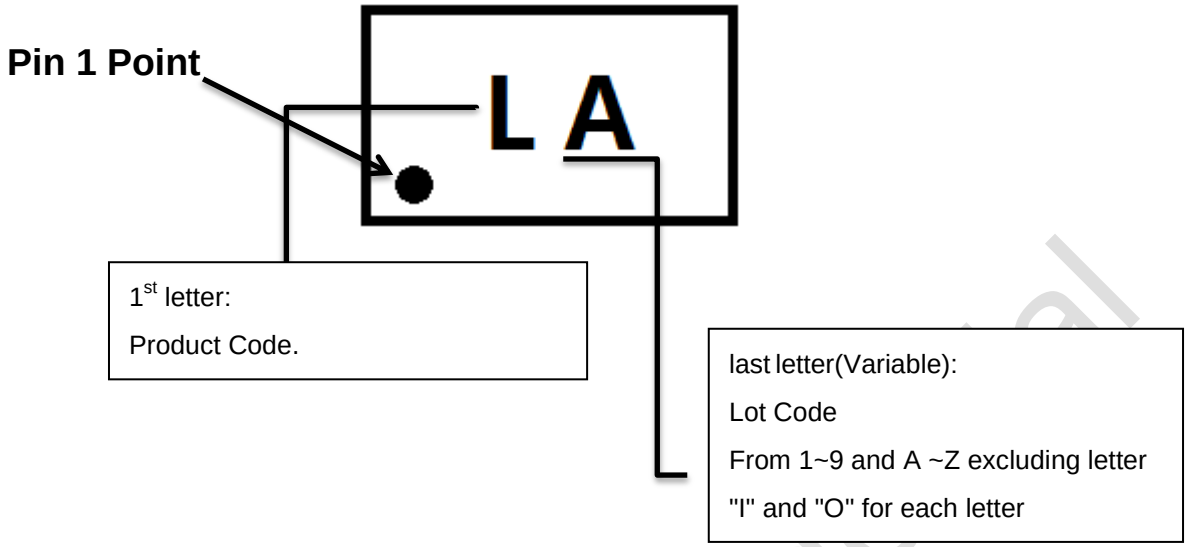
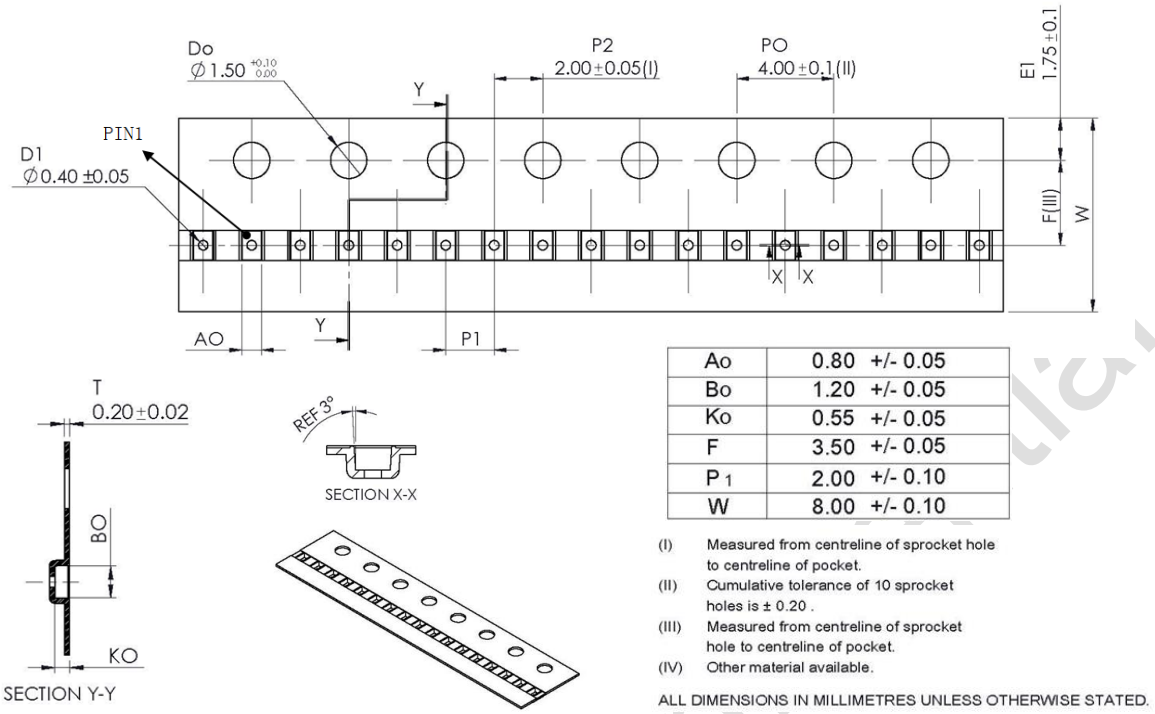


Figure 3 Marking specification (Top View)

Tape and Reel Dimensions



Ao	0.80 +/- 0.05
Bo	1.20 +/- 0.05
Ko	0.55 +/- 0.05
F	3.50 +/- 0.05
P_1	2.00 +/- 0.10
W	8.00 +/- 0.10

(I) Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
(III) Measured from centreline of sprocket hole to centreline of pocket.
(IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

Figure 4 Tape and reel dimensions

Reflow Chart

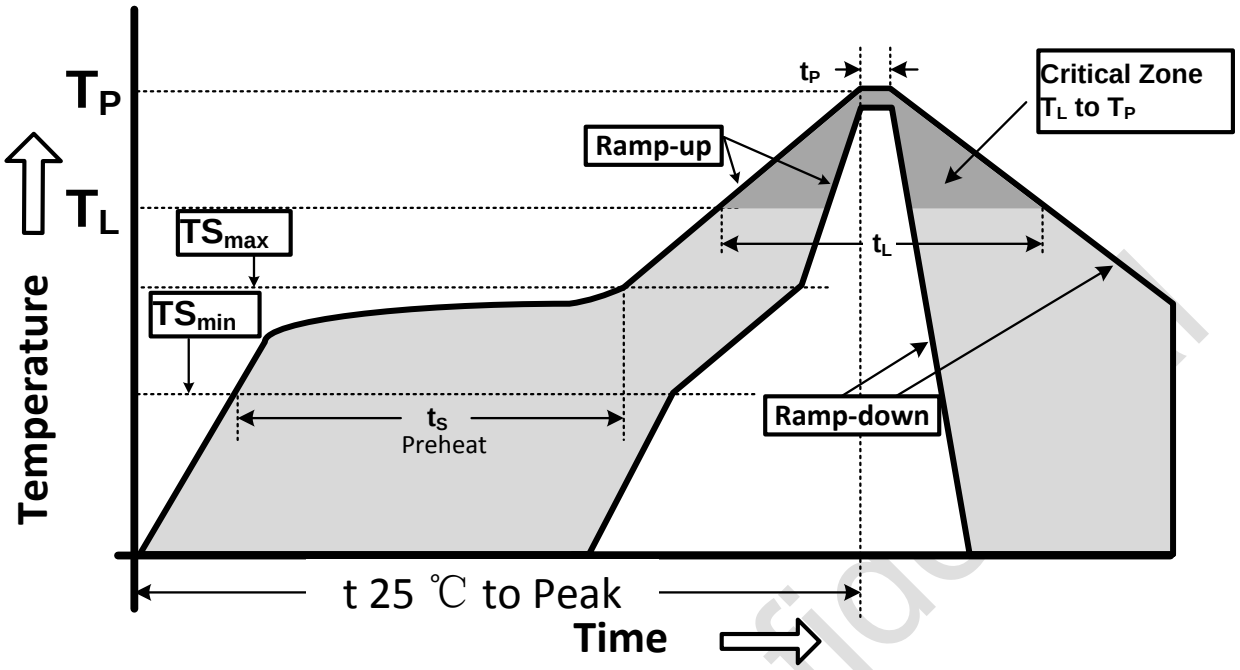


Figure 5 Recommended Lead-Free Reflow Profile

Table 6 Reflow condition

Profile Parameter	Lead-Free Assembly, Convection, IR/Convection
Ramp-up rate（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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