Revision History

Rev.	History	Issue Date	Remark
0.1	Initial version	2001107	Preliminary Version created
1.0	Add Revision History	20150612	Ethan Yu
1.1	Application circuit and test results	20210929	Randall Lan

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TM1009 ~3GHz Low Noise Amplifier, LNA MMIC

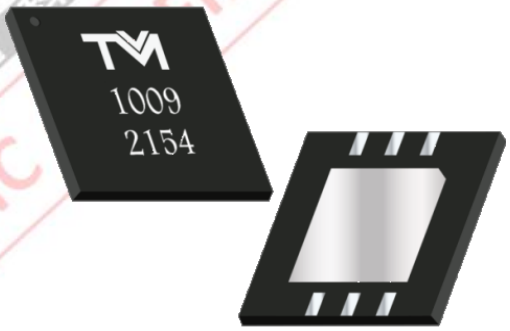
General Description

The TM1009 is a low-cost and low-noise amplifier (LNA) IC designed for GPS, DVB, PHS and DECT applications in L Band. The LNA is implemented as a two-stage monolithic microwave integrated circuit (MMIC) with current limiter on chip. The low-noise figure of the device improves the sensitivity of the system, and the very low current consumption maximizes the battery life in a portable equipment. The device is packaged in a compact 1.5mm by 1.5mm leadless package.

Features

- Single Positive Supply: +3.3V
- Gain: 28.5dB, NF: 1.1 dB at 1.57542GHz
- Gain: 20dB, NF: 1.4dB at 2.4GHz
- Gain: 18 dB, NF: 1.8dB at 3GHz
- Low Current Consumption: 10.5mA from a +5.5V supply
- QFN 1.5mm x 1.5mm ultra small leadless package.
- RoHS Compliant
- MSL 1

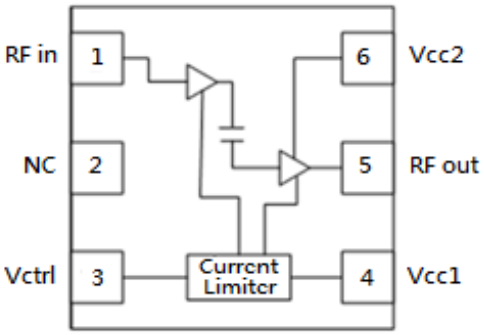
Product Photo



Applications

- Wi-Fi, GPS, DVB, PHS, DECT

Functional Block Diagram



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Absolute Maximum Ratings

Parameter	Maximum Rating	Unit
Supply Voltage	0 to 6	V
RF Input Power	-25	dBm
Operating Temperature	-40 to +85	ºC
Storage Temperature	-55 to +150	ºC

Notes:

1). Operation of this device in excess of any maximum rating as specified above may cause permanent damage to the device.

2). Caution! ESD Sensitive Device.

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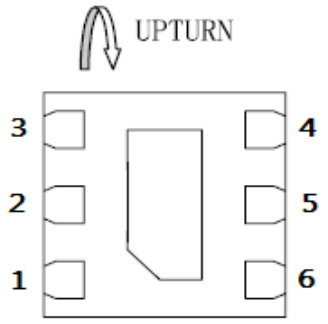
Specification Summary

Conditions: RF_{in}=-40dBm, V_{CC1}=V_{CC2}=V_{CTRL}=3.3V, as measured on TM evaluation board, unless otherwise noted.

Parameter	Min.	Typical	Max.	Unit	Condition
Operating Frequency		1.57542		GHz	
Gain	27	29		dB	1.57542GHz
		20		dB	2.45GHz
		18		dB	3GHz
Noise		1.1	1.8	dB	
S11		-8.5	-7.5	dB	
S22		-9	-8	dB	
Power Supply Current		8.5	10	mA	
Power Supply Voltage	2.5	9	5.5	V	

Pin Configuration

Bottom view:



Functional Pin Description

Name	Pin #	Description
RF_{in}	1	The RF input of low noise amplifier.
NC	2	No connection.
V_{CTRL}	3	Shutdown input. Drive low voltage (<0.2V) to place the device in shutdown mode.
V_{CC1}	4	Supply voltage of LNA.
RF_{OUT}	5	The RF output of low noise amplifier.
V_{CC2}	6	Supply voltage of LNA.
GND	Bottom /GND	The GND pin must be connected to Ground.

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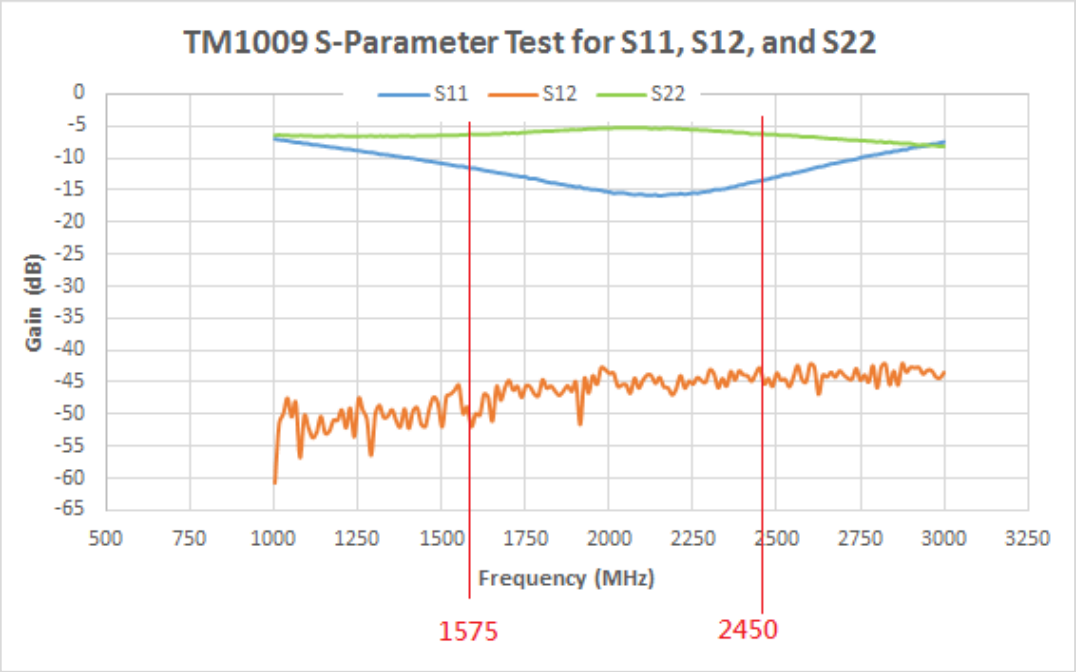
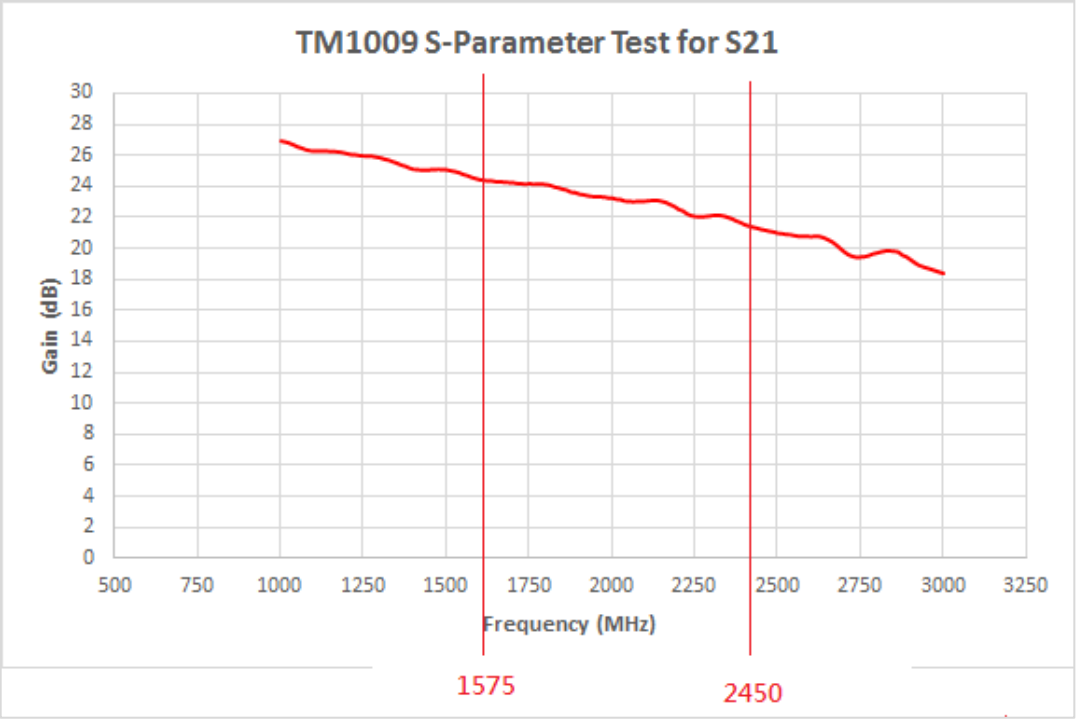
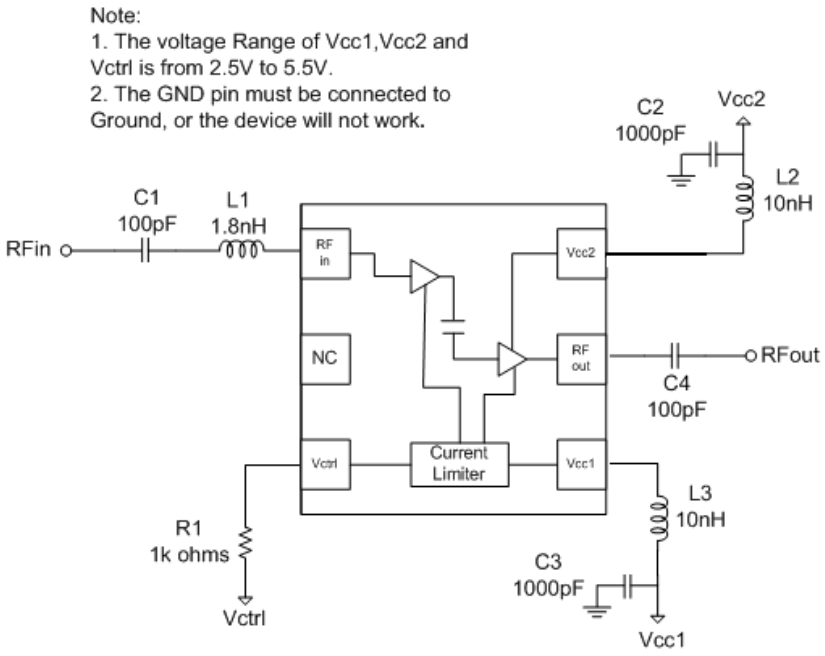
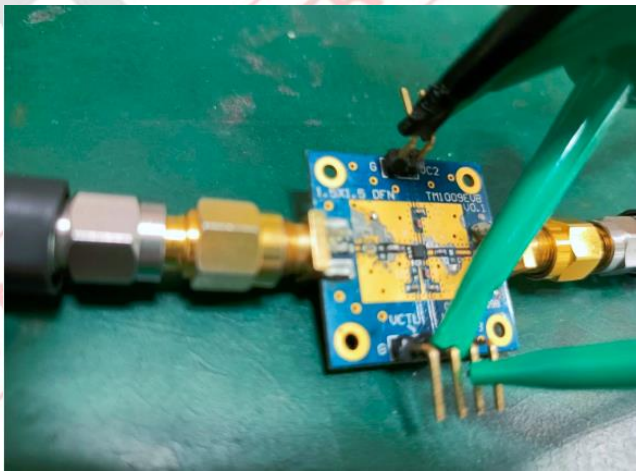
Performance Data





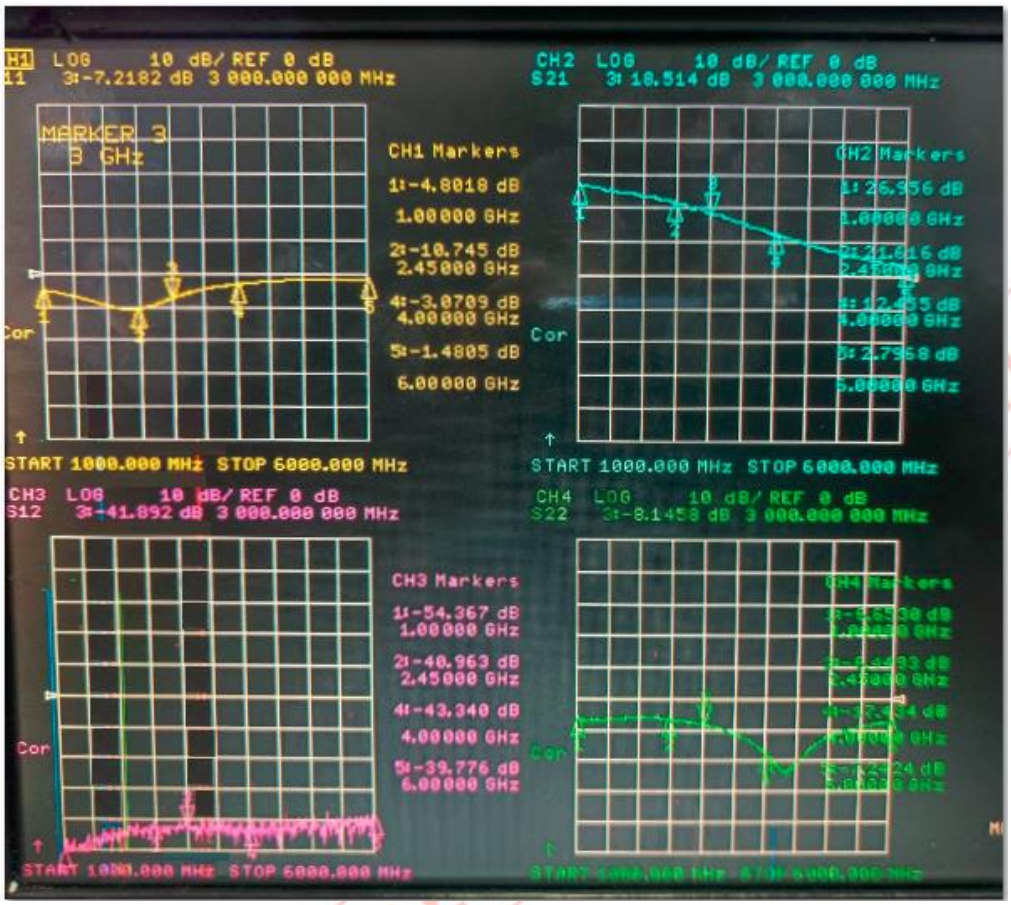
Application Circuit and Test Results





TM1009-1.5x1.5mm-6L test Spec and plan

No	Item Symbol	Rf in		LNA		RF out	ecicification	
		Power(dBm)	Freq (GHz)	Vcc	Vcntl	min	Max	Unit
	S11	-30	2.45	3.3	3.3		-12	dBm
	S21	-30	2.45	3.3	3.3	20		dBm
	S22	-30	2.45	3.3	3.3		-12	dBm
	S12	-30	2.45	3.3	3.3	-30		dBm
	Icc	-30	2.45	3.3	3.3	10	20	mA



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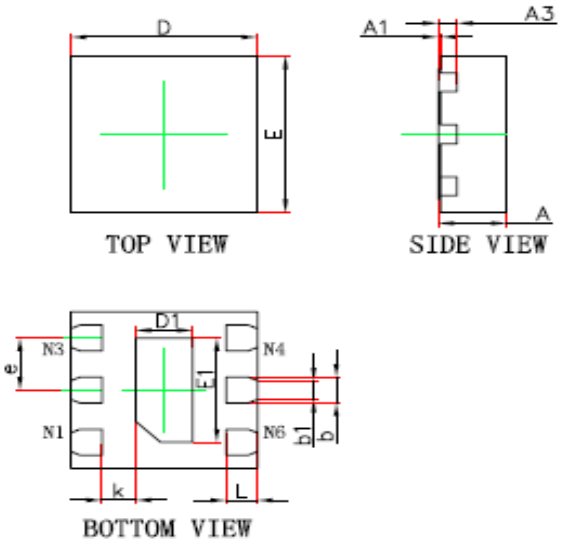
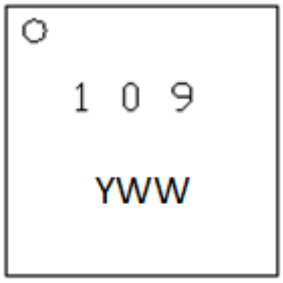
Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A3	0.152REF.		0.006REF.	
D	1.400	1.600	0.055	0.063
E	1.400	1.600	0.055	0.063
D1	0.360	0.560	0.014	0.022
E1	0.900	1.100	0.035	0.043
b	0.200	0.300	0.008	0.012
b1	0.180REF.		0.007REF.	
e	0.500BSC.		0.020BSC.	
k	0.270REF.		0.011REF.	
L	0.174	0.326	0.007	0.013

Product Marking



109: product name

YWW : production control code

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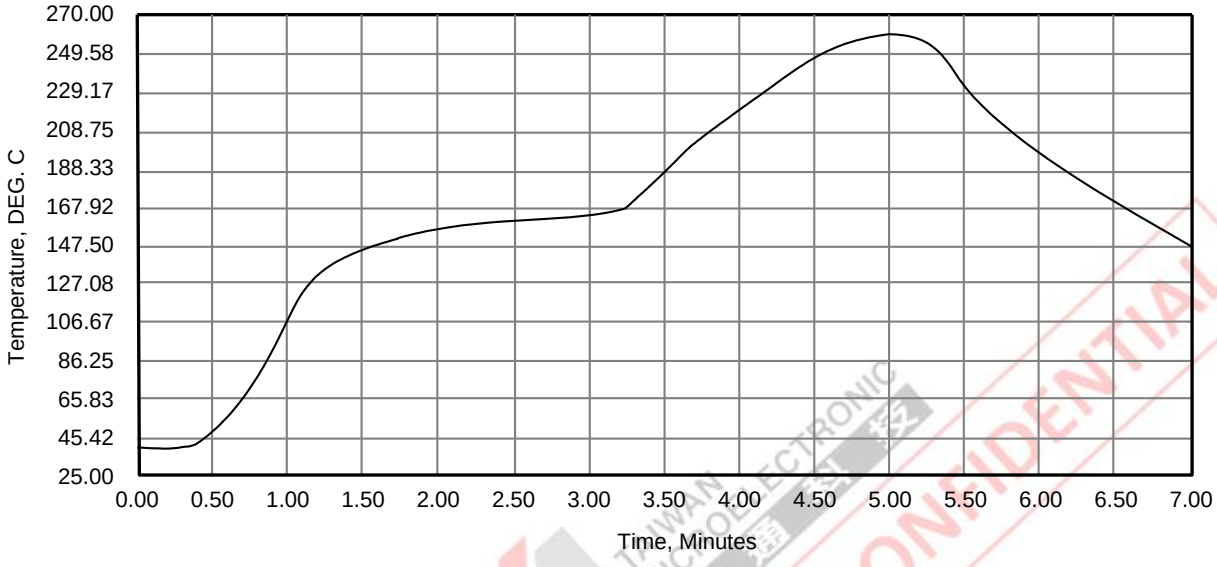
SMT Reflow Profile



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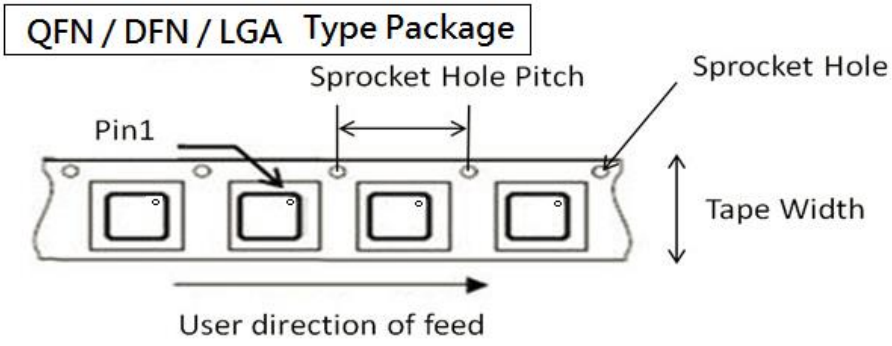
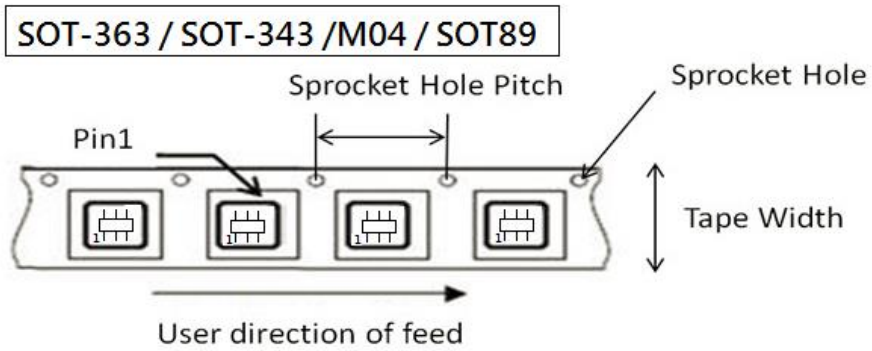
Tape and Reel





Package Type	Reel Size	Tape width (mm)	Sprocket Hole	Sprocket Hole Pitch (mm)	Leader Qty	Trailer Qty	Desiccant (g)
WLCSP 0.69x0.44mm	14"	12±0.03	Φ1.5 +0.1, -0	4.0±0.1	50	50	10
DFN 1.5x1.5mm	7"	12±0.03	Φ1.5 +0.1, -0	4.0±0.1	50	50	10
DFN 2x2mm	7"	12±0.03	Φ1.5 +0.1, -0	4.0±0.1	50	50	10
QFN 2x2mm	7"	12±0.03	Φ1.5 +0.1, -0	4.0±0.1	50	50	10
QFN 3x3mm	7"	12±0.03	Φ1.5 +0.1, -0	4.0±0.1	50	50	10
SOT 343 (M04)	7"	12±0.03	Φ1.5 +0.1, -0	4.0±0.1	50	50	10
SOT 363	7"	12±0.03	Φ1.5 +0.1, -0	4.0±0.1	50	50	10
SOT 89	7"	12±0.03	Φ1.5 +0.1, -0	4.0±0.1	50	50	10

Handling Precaution

SAFETY INFORMATION ON THIS PRODUCT

Cautions on using this product	The product contains Gallium-Arsenide (GaAs). GsAs vapor and power are hazardous to human health if inhaled or ingested. ● Do not destroy or burn the product. ● Do not cut or cleave off any part of the product. ● Do not crush or chemically dissolve the product. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.

CAUTION: This device is sensitive to Electro-Static Discharge (ESD). Observe precautions for handling electro-static sensitive devices. Such precautions are described in the ANSI/ESD S20.20,IEC/ST 61340-5, JESD625-A or equivalent standards.

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