General Description

The ETM1001 is manufactured on Gallium Arsenide Heterojunction Bipolar Transistor (GaAs HBT) process. The device is a low cost, high linearity, medium power, high efficiency amplifier IC designed for IEEE 802.11b/g, *Bluetooth* Class 1, and other application in the 2.4GHz ISM band. The device also features analog power control to optimize transmit power while maximizing battery life in portable equipment. The device includes an integrated power detector circuit for closed loop control of output power. The TM1001 is packaged in a compact 3mm by 3mm QFN package with a backside ground.

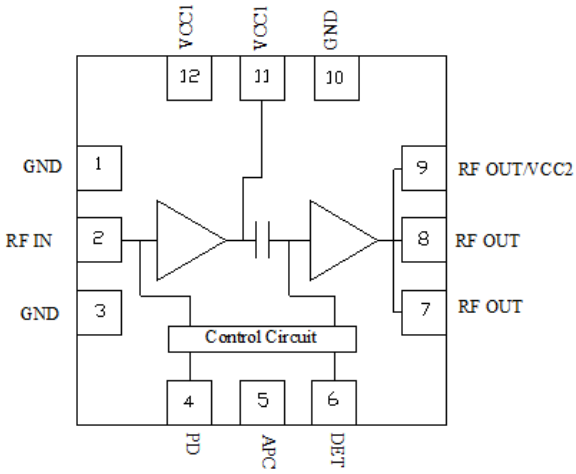
Features

- Integrated Power Detector Circuit.
- Analog Gain Control and Power control.
- QFN-12L 3x3 mm with thermal ground.
- RoHS compliant.
- MSL 1

Applications

- Bluetooth™ PA (Class 1)
- WLAN 802.11 b/g
- Wireless Data Terminal
- Cordless Handset
- Portable Battery Powered Equipment

Functional Block diagram



Absolute Maximum Ratings

Parameter	Maximum Rating	Unit
VCC Supply Voltage	0 to 6	V
APC Control Voltage	0 to 6	V
RF Input Power	+ 5	dBm
Operating Temperature	-40 to +85	°C
Storage Temperature	-55 to +150	°C

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.

Specification Summary

1. WLAN 802.11 b/g Application:

(ETM1001 Evaluation Board for 802.11b application, Vcc1=Vcc2=Vapc=Vpd=+5V, RFin=-1dBm TA=+25℃, unless otherwise noted)

Parameter	Min.	Typical	Max.	Unit	Conditions
Operating Frequency Range	2.4		2.5	GHz	
Linear Output Power (802.11b 11Mbps CCK)		+24.5		dBm	meeting 802.11b spectral mask Vcc1=Vcc2=Vapc=Vpd=+5V
Linear Output Power (802.11b 11Mbps CCK)		+21		dBm	Vcc1=Vcc2=Vapc=Vpd=+3.3V
Linear Output Power (802.11g 54Mbps OFDM)		+18		dBm	EVM<3%
Linear Efficiency		22		%	RFout=24.5dBm
802.11b Adjacent Channel Power, 1st side lobe		35		dBc	RFout=+24.5dBm
802.11b Adjacent Channel Power, 2nd side lobe		55		dBc	RFout=+24.5dBm
Harmonics: 2Fo, 3Fo		-45, -40		dBc	
Gain	23	25		dB	RFin= -30dBm
Gain Control Voltage	0		5	V	
Current Consumption		260		mA	RFout=+24.5dBm, Vcc=+5V
		175		mA	RFout=+21dBm, Vcc1=Vcc2=Vapc=Vpd=+3.3V
		50		mA	Idle current, No RFin
		10		uA	Shutdown Mode, Vapc=Vpd=0V

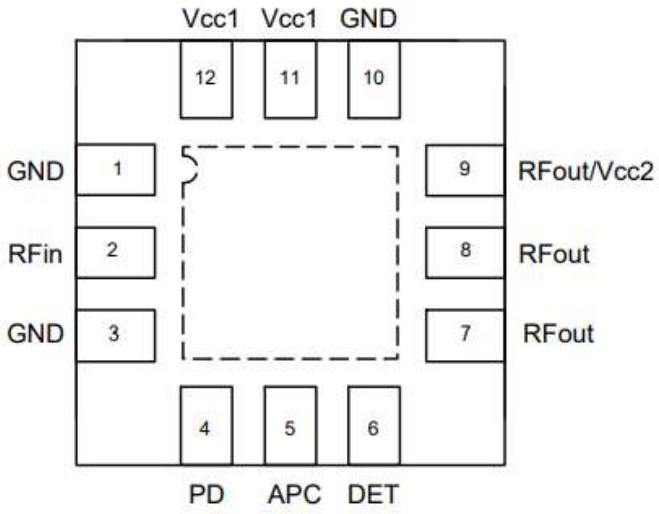
2. Bluetooth Class 1 Application:

(ETM1001 Evaluation Board for Bluetooth Class 1 Application, Vcc1=Vcc2=Vapc=Vpd=+3V, RFin=-3dBm TA=+25℃, unless otherwise noted)

Parameter	Min.	Typical	Max.	Unit	Conditions
Operating Frequency Range	2.4		2.5	GHz	
Maximum Output Power		+24		dBm	
Power Added Efficiency		40		%	RFout=+22dBm
Harmonics: 2Fo, 3Fo		-35, -35		dBc	RFout=+22dBm
Gain	23	25		dB	
Gain Control Voltage	0		3	V	
Current Consumption		133		mA	RFout=+22dBm
		40		mA	Idle current, No RFin
		10		uA	Shutdown Mode, Vapc=Vpd=0V

Pin Configuration

(Top View)



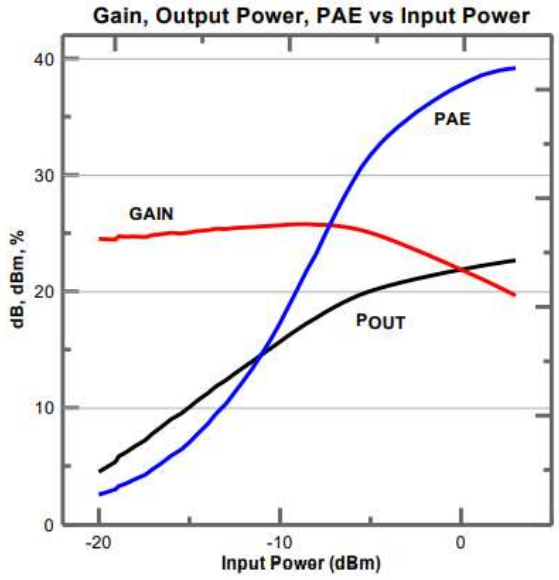
Functional Pin Description

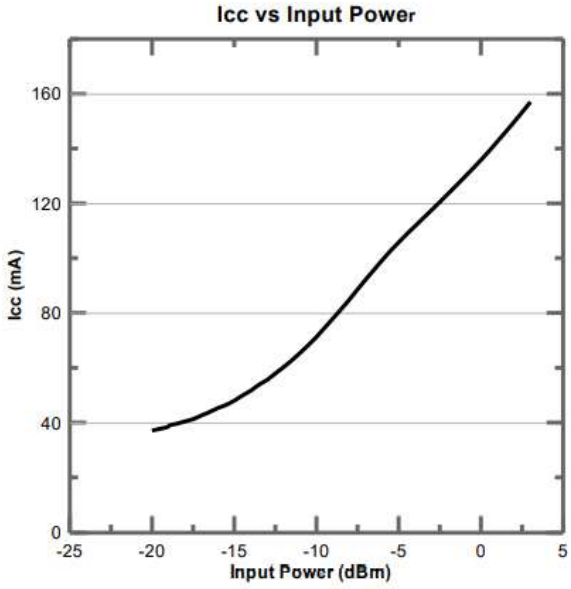
Name	Pin #	Description
RF IN	2	RF input for the power amplifier. This pin requires a DC-blocking capacitor.
PD	4	Bias control about output power and gain.
APC	5	Bias control about output power.
DET	6	Detector output voltage for PA output power.
RF OUT	7,8,9	RF output for the power amplifier. This pin requires a DC-blocking capacitor.
Vcc2	9	DC supply voltage for second stage amplifier.
Vcc1	11,12	DC supply voltage for first stage
GND	1, 3, 10	Connect to ground
Die Pad	-	This pad should be connected to the ground plane by vias directly under this pad.

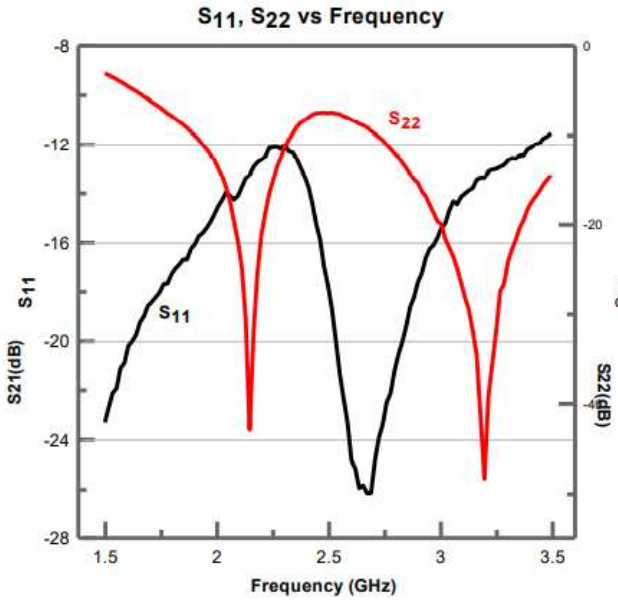
Performance Data

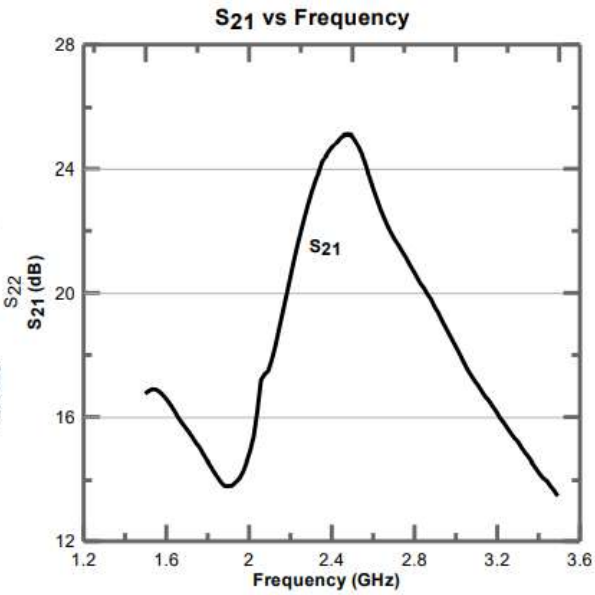
Bluetooth Performance Data

Test conditions: Vcc1=Vcc2=Vapc=Vpd=+3V, RFin=-30dBm, R3=560 ohm (refer to application circuit 1), Idle current=31mA



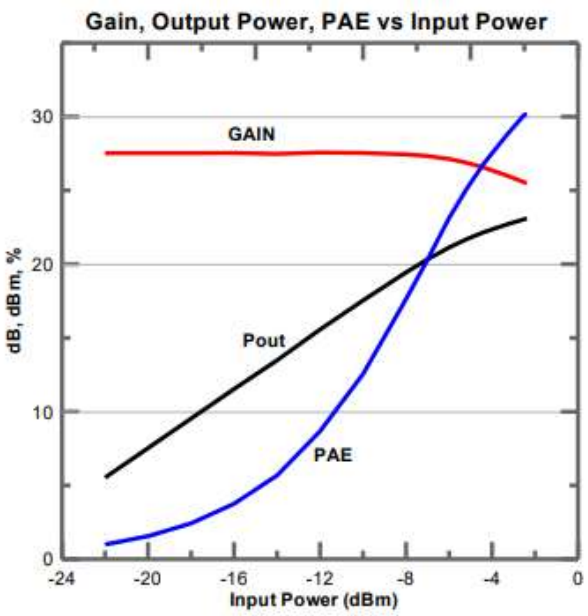


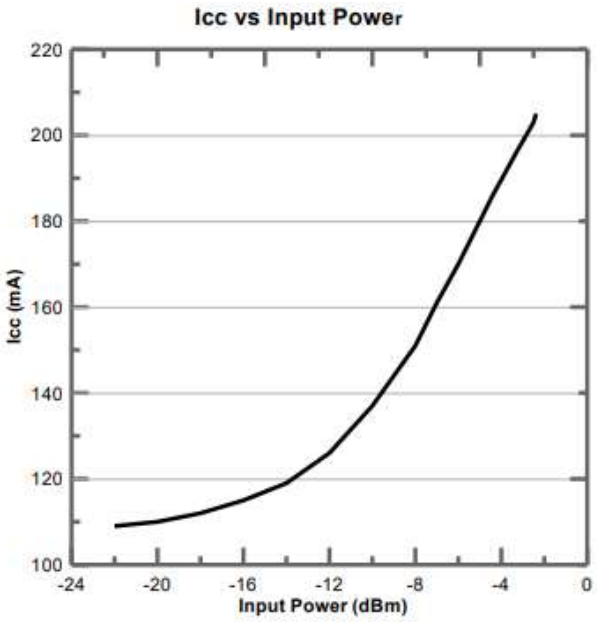


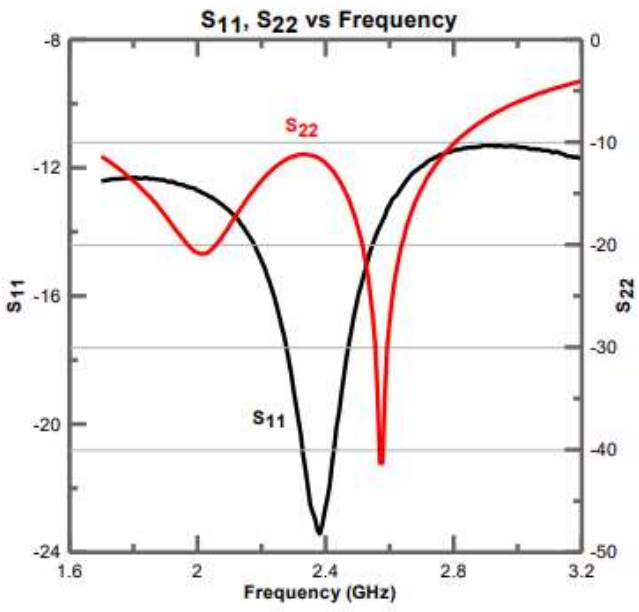


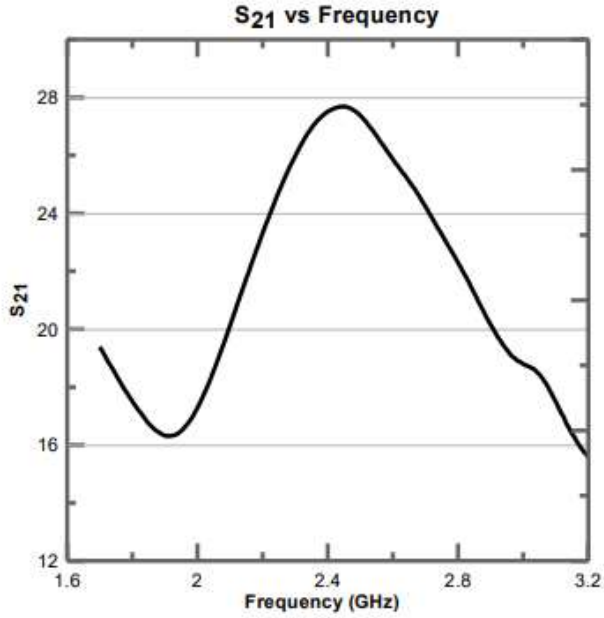
802.11b Performance Data

Test conditions: Vcc1=Vcc2=Vapc=Vpd=+3.3V, RFin=-20dBm, R3=200ohm (refer to application circuit 2)

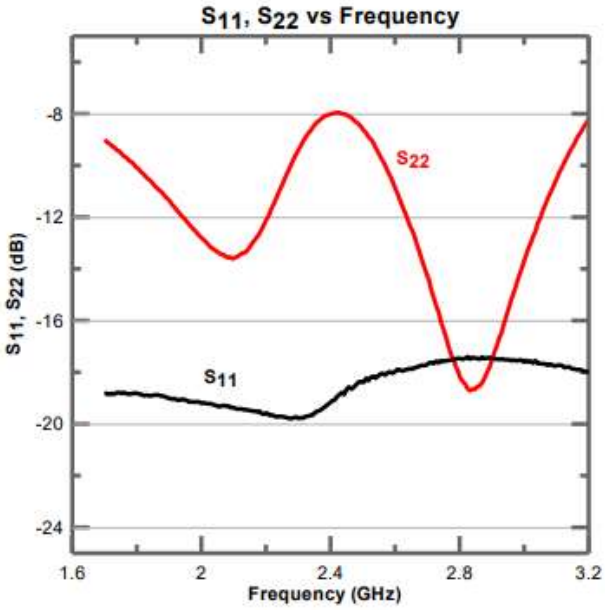


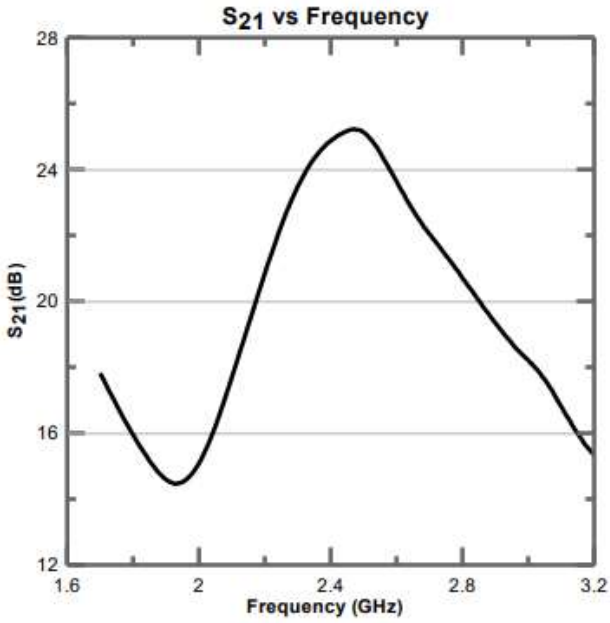


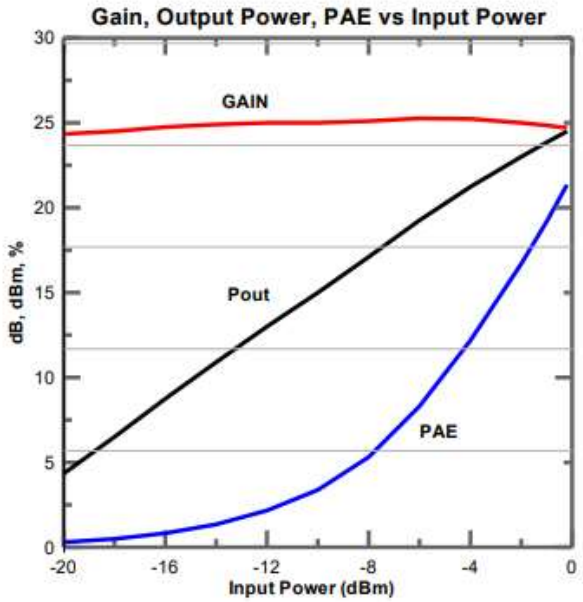


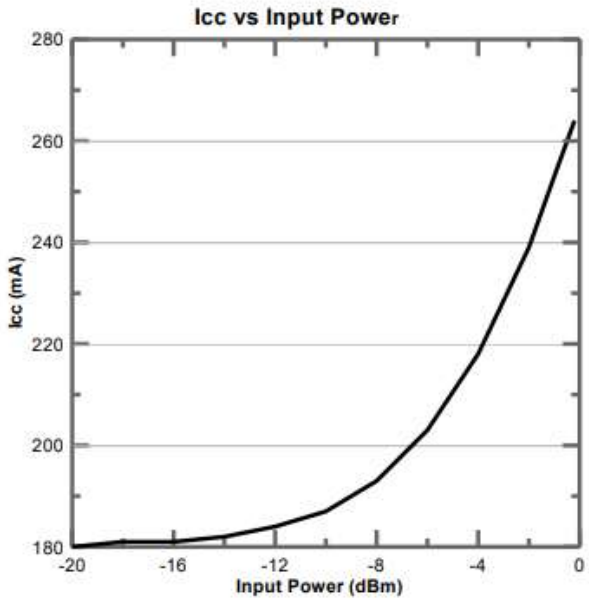


Test conditions: Vcc1=Vcc2=Vapc=Vpd=+5V, RFin=-30dBm, R3=560ohm (refer to application circuit 3)



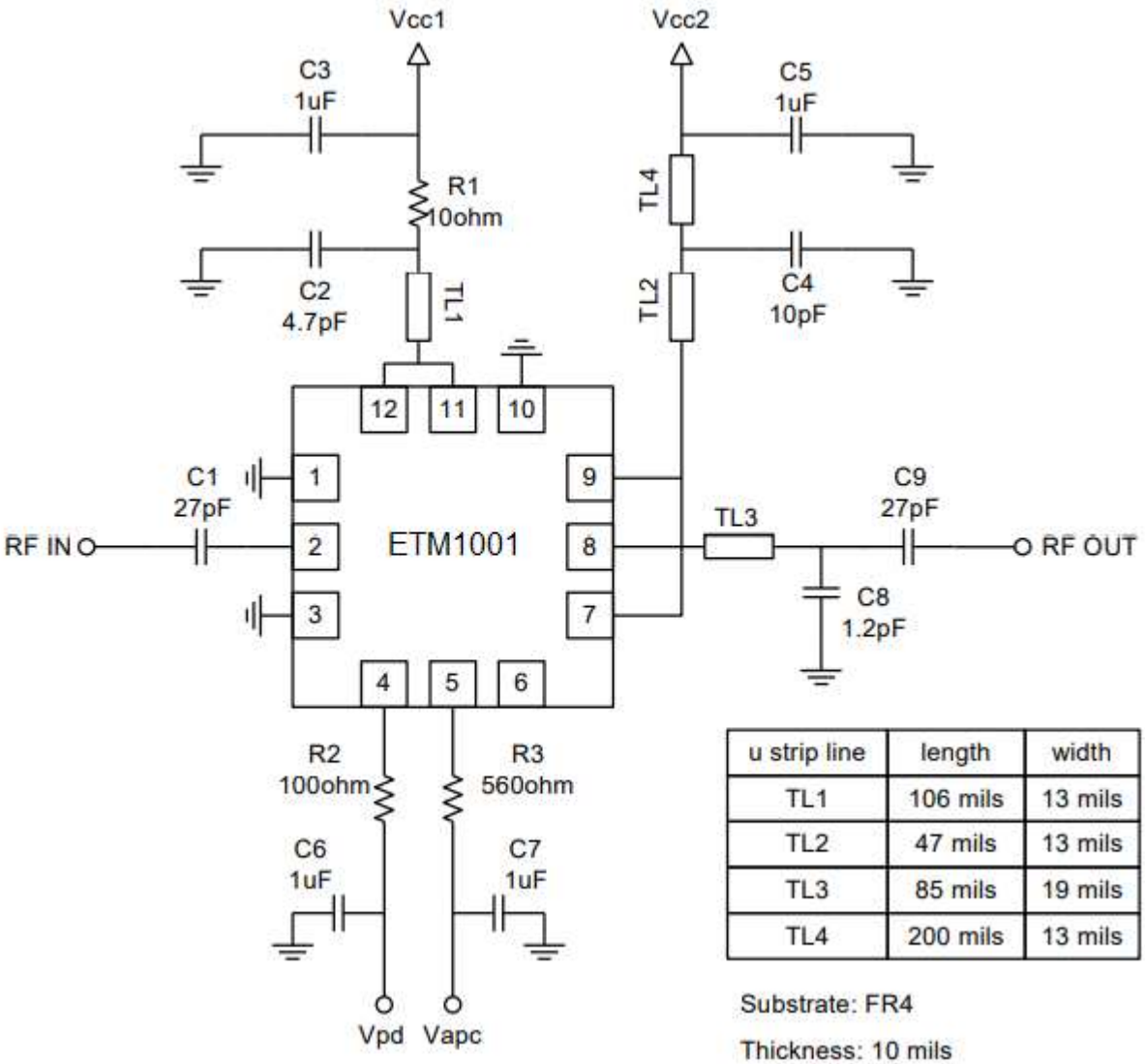






Application Circuits

1. Bluetooth Class 1 application, V_{CC}=3 V



u strip line	length	width
TL1	106 mils	13 mils
TL2	47 mils	13 mils
TL3	85 mils	19 mils
TL4	200 mils	13 mils

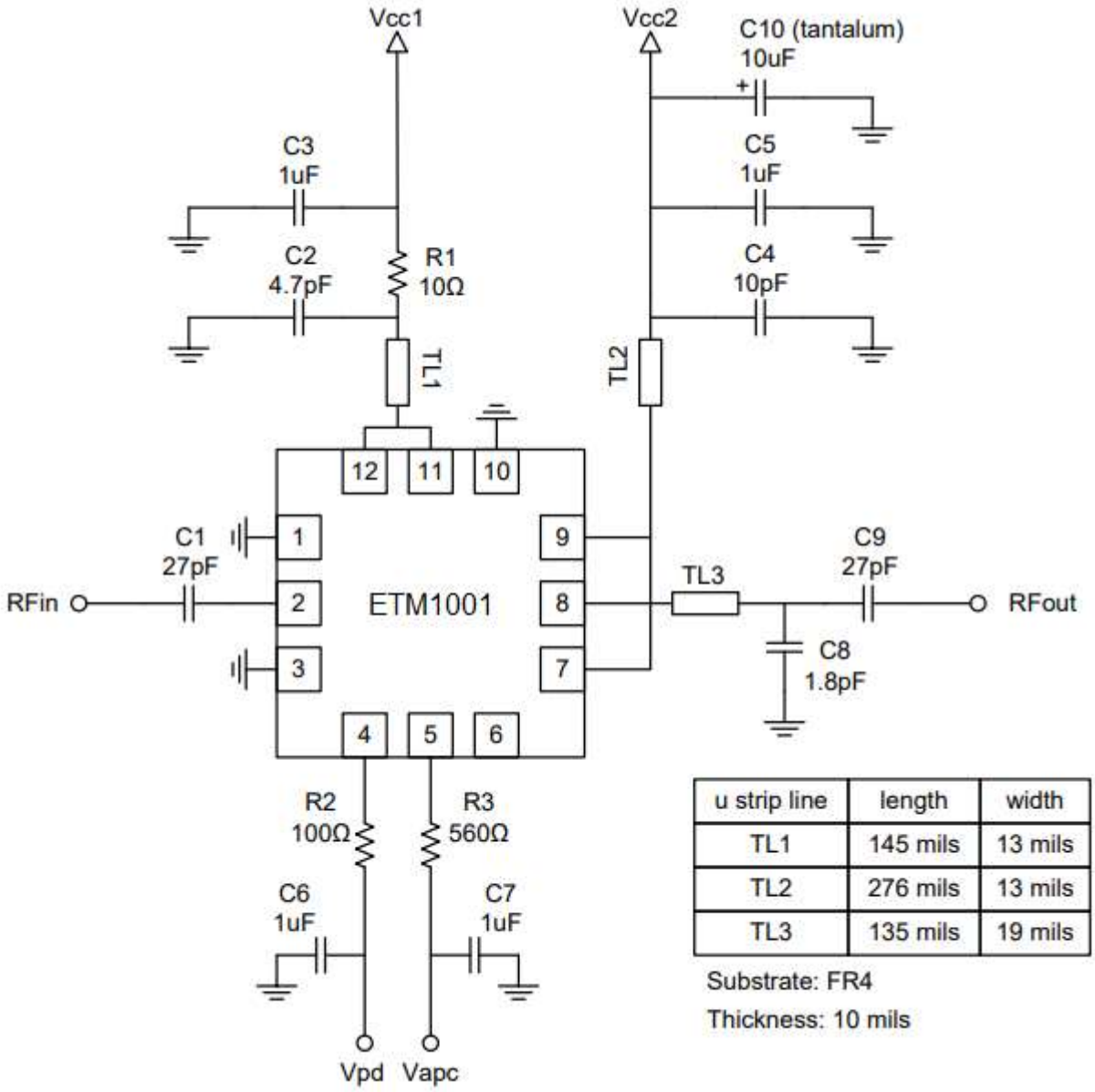
Substrate: FR4

Thickness: 10 mils

Note:

1. The location or value of C2 will affect the performance of Gain.
2. The location of C8 will affect the performance of harmonic.
3. The value of C8 will affect the performance of P1dB.
4. The location of C4 will affect the performance of harmonic.

2. 802.11b, biased on 3.3V application

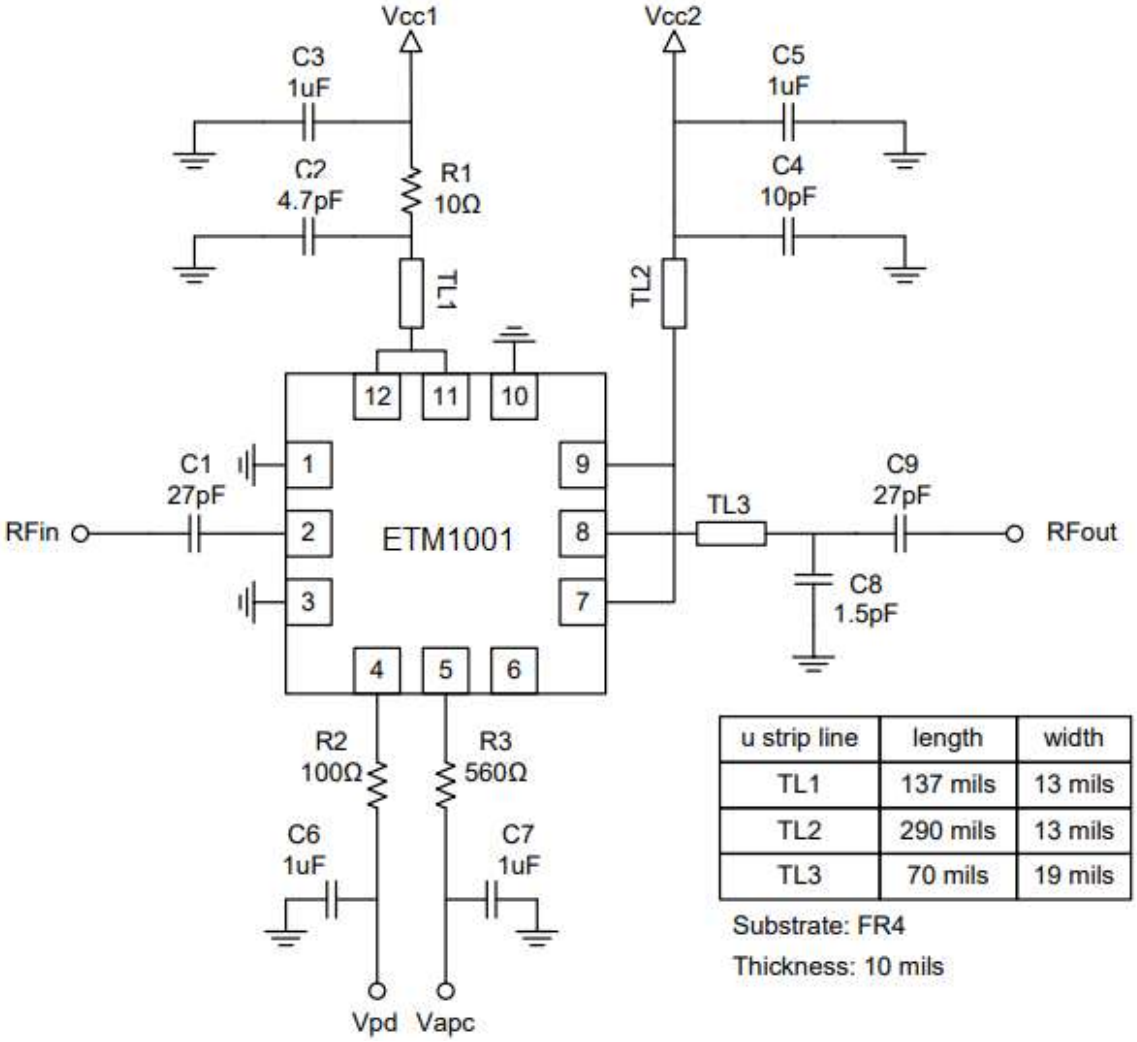


u strip line	length	width
TL1	145 mils	13 mils
TL2	276 mils	13 mils
TL3	135 mils	19 mils

Substrate: FR4

Thickness: 10 mils

3. 802.11b, biased on 5V application

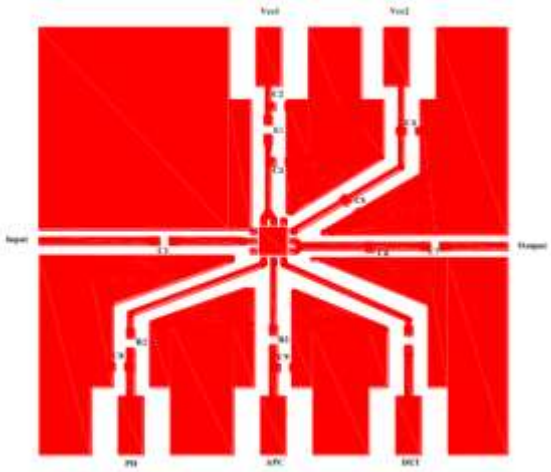


u strip line	length	width
TL1	137 mils	13 mils
TL2	290 mils	13 mils
TL3	70 mils	19 mils

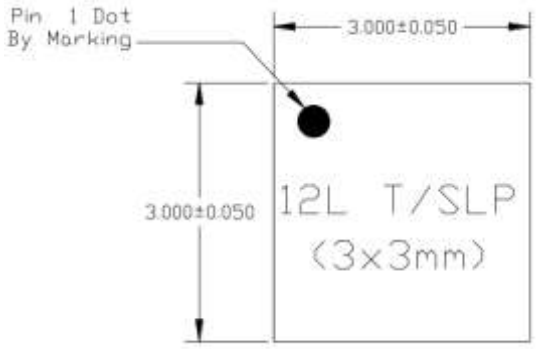
Substrate: FR4

Thickness: 10 mils

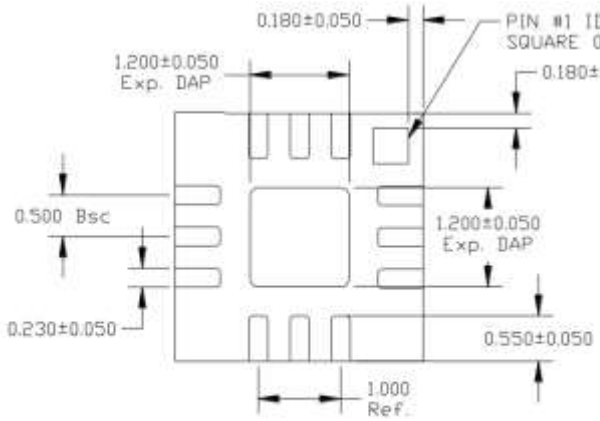
Evaluation Board Layout



Package Information



TOP VIEW

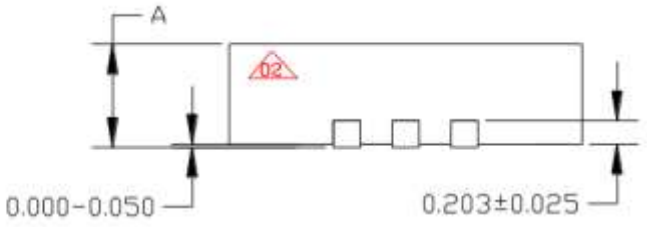


BOTTOM VIEW

NOTE:
1) TSLP AND SLP SHARE THE SAME EXPOSE OUTLINE
BUT WITH DIFFERENT THICKNESS.

			SLP
A	MAX.		0.900
	NOM.		0.850
	MIN.		0.800

ALL MEASUREMENT IN (MM)

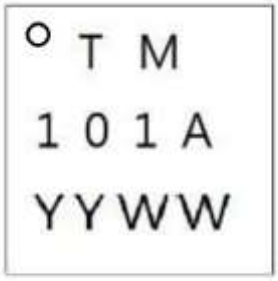


SIDE VIEW

Ordering Information

ETM1001□R
└ Q1 = QFN-12

Product Marking



YYWW means date code. YY: year, WW: week

SMT Reflow Profile