



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.

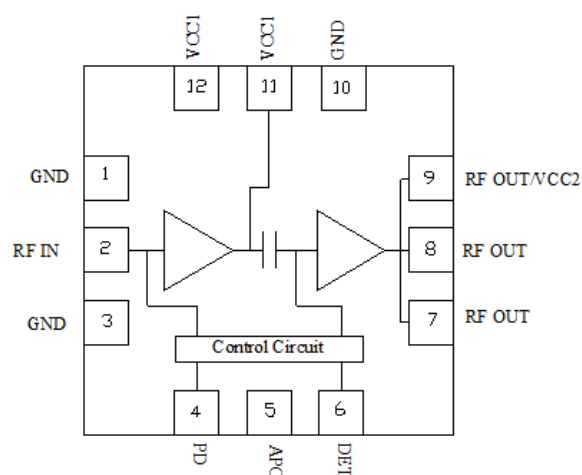
Features

- 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, $V_{cc1}=V_{cc2}=V_{apc}=V_{pd}=+5V$, $R_{Fin}=-1dBm$ $T_A=+25^{\circ}C$, unless otherwise noted)

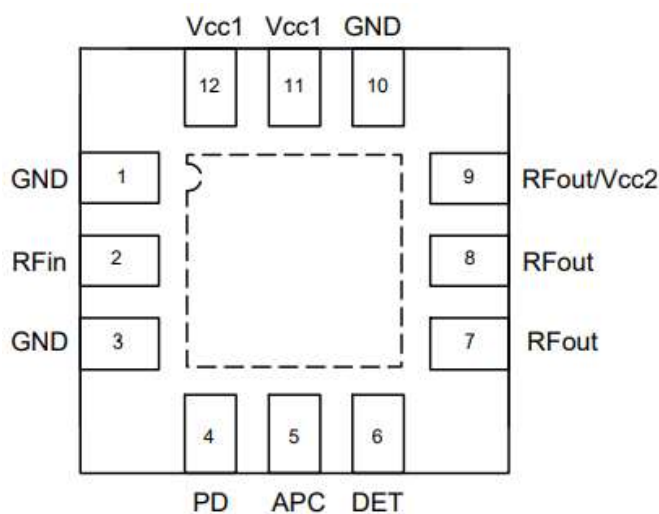
Parameter	Min.	Typical	Max.	Unit	Conditions
Operating Frequency Range	2.4		2.5	GHz	
Linear Output Power (802.11b 11Mbps CCK)		+24.5		dBm	meeting 802.11b spectral mask $V_{cc1}=V_{cc2}=V_{apc}=V_{pd}=+5V$
Linear Output Power (802.11b 11Mbps CCK)		+21		dBm	$V_{cc1}=V_{cc2}=V_{apc}=V_{pd}=+3.3V$
Linear Output Power (802.11g 54Mbps OFDM)		+18		dBm	EVM<3%
Linear Efficiency		22		%	$RF_{out}=24.5dBm$
802.11b Adjacent Channel Power, 1 st side lobe		35		dBc	$RF_{out}=+24.5dBm$
802.11b Adjacent Channel Power, 2 nd side lobe		55		dBc	$RF_{out}=+24.5dBm$
Harmonics: 2Fo, 3Fo		-45, -40		dBc	
Gain	23	25		dB	$RF_{in}=-30dBm$
Gain Control Voltage	0		5	V	
Current Consumption		260		mA	$RF_{out}=+24.5dBm$, $V_{cc}=+5V$
		175		mA	$RF_{out}=+21dBm$, $V_{cc1}=V_{cc2}=V_{apc}=V_{pd}=+3.3V$
		50		mA	Idle current, No RF_{in}
		10		uA	Shutdown Mode, $V_{apc}=V_{pd}=0V$

2. Bluetooth Class 1 Application:

(ETM1001 Evaluation Board for Bluetooth Class 1 Application, $V_{cc1}=V_{cc2}=V_{apc}=V_{pd}=+3V$, $RF_{in}=-3dBm$ $T_A=+25^{\circ}C$, 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		%	$RF_{out}=+22dBm$
Harmonics: 2Fo, 3Fo		-35, -35		dBc	$RF_{out}=+22dBm$
Gain	23	25		dB	
Gain Control Voltage	0		3	V	
Current Consumption		133		mA	$RF_{out}=+22dBm$
		40		mA	Idle current, No RF_{in}
		10		uA	Shutdown Mode, $V_{apc}=V_{pd}=0V$

Pin Configuration (Top View)



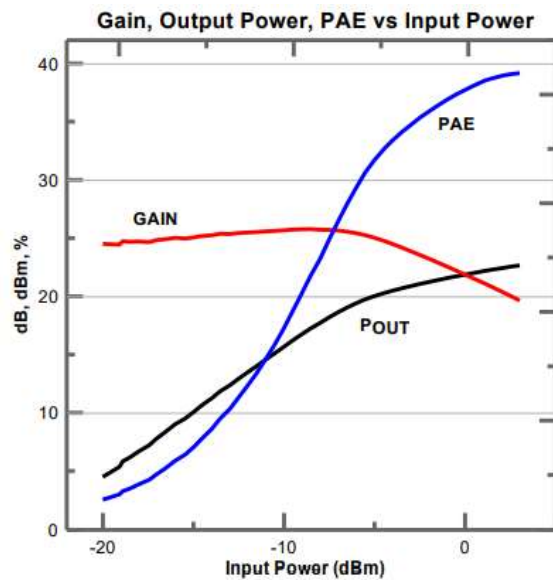
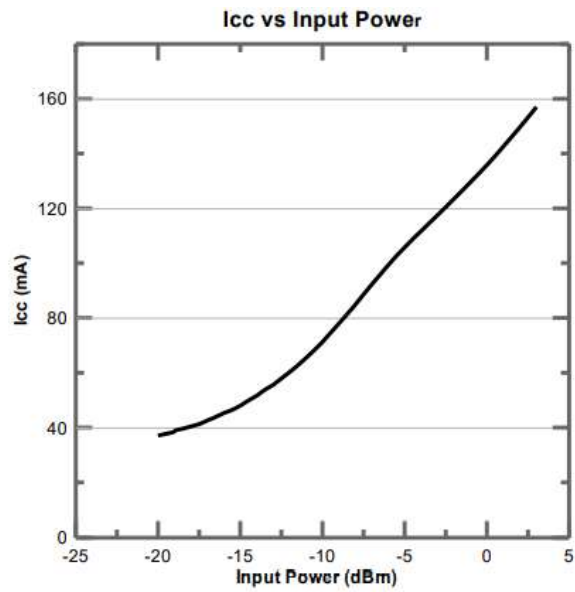
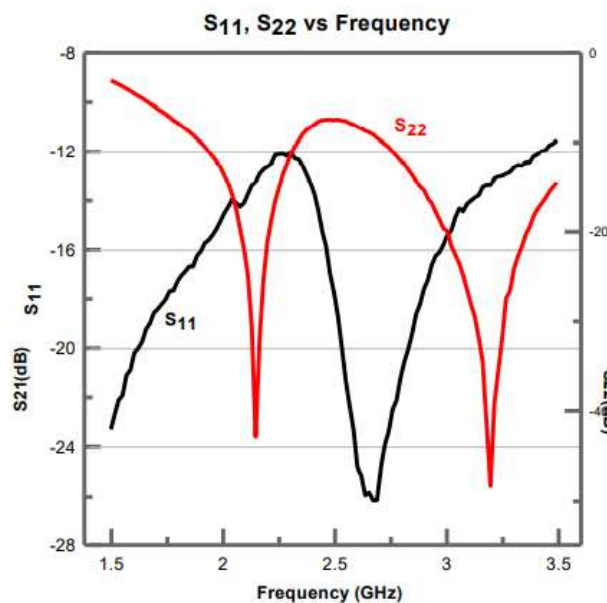
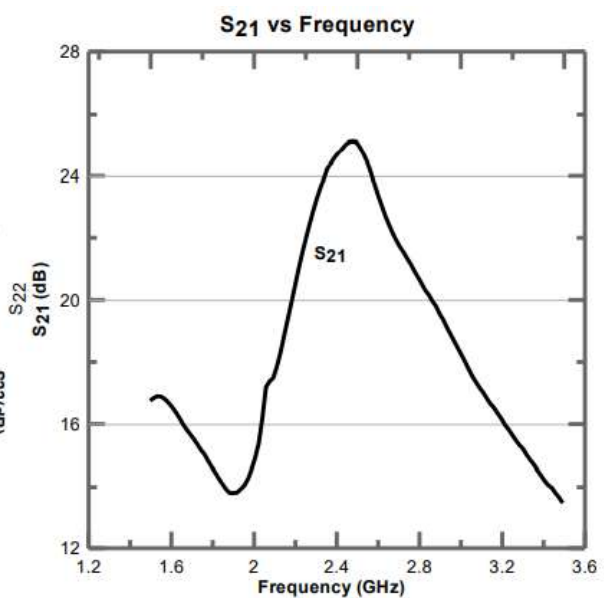
Functional Pin Description

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

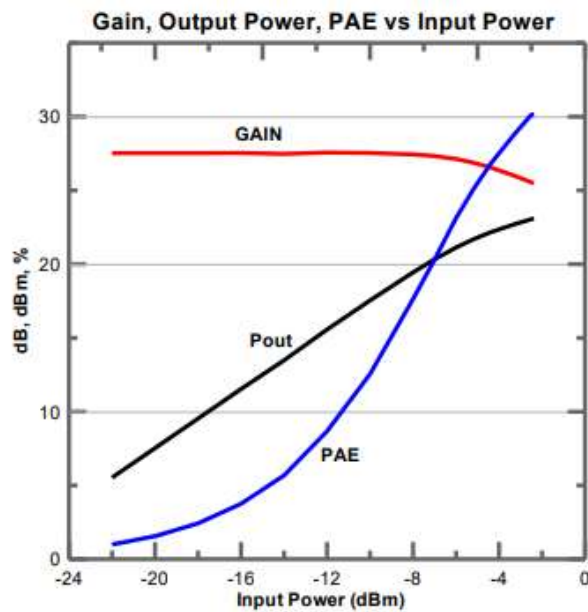
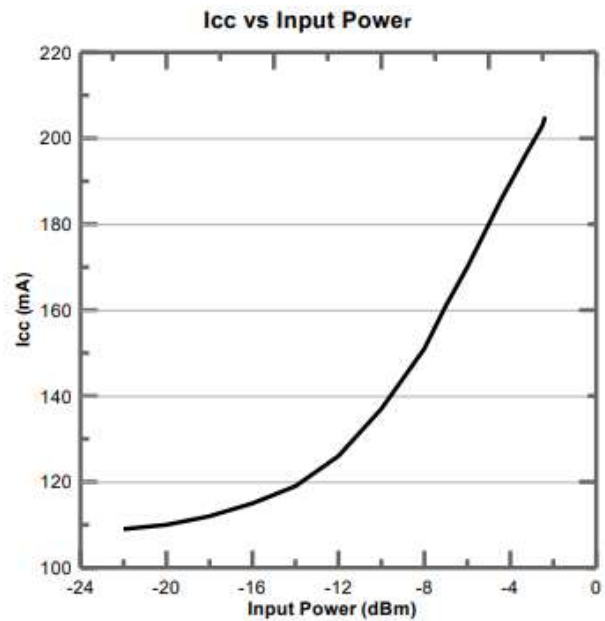
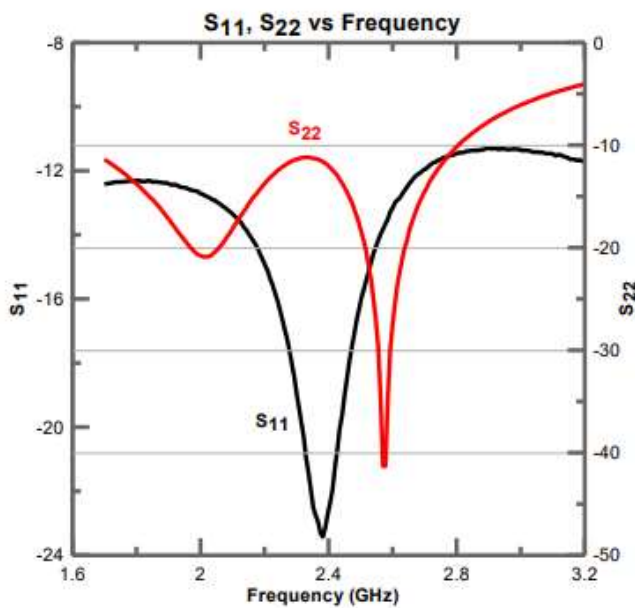
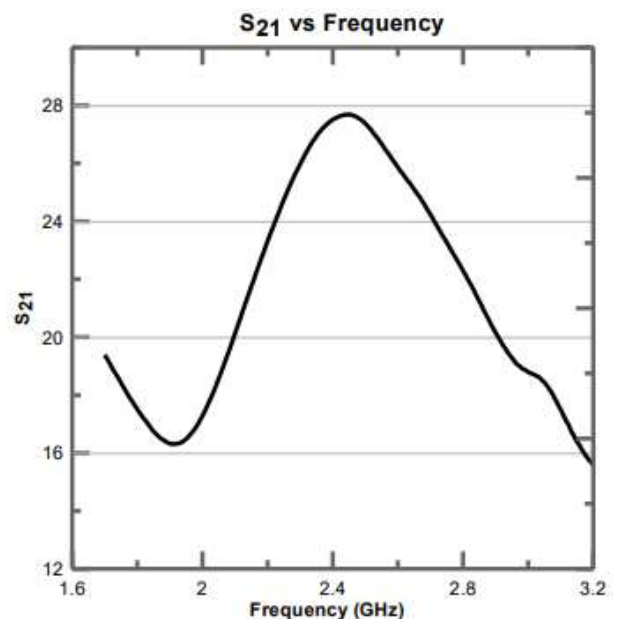
Bluetooth Performance Data

Test conditions: $V_{cc1}=V_{cc2}=V_{apc}=V_{pd}=+3V$, $R_{Fin}=-30dBm$, $R3=560\ \Omega$ (refer to application circuit 1), Idle current=31mA

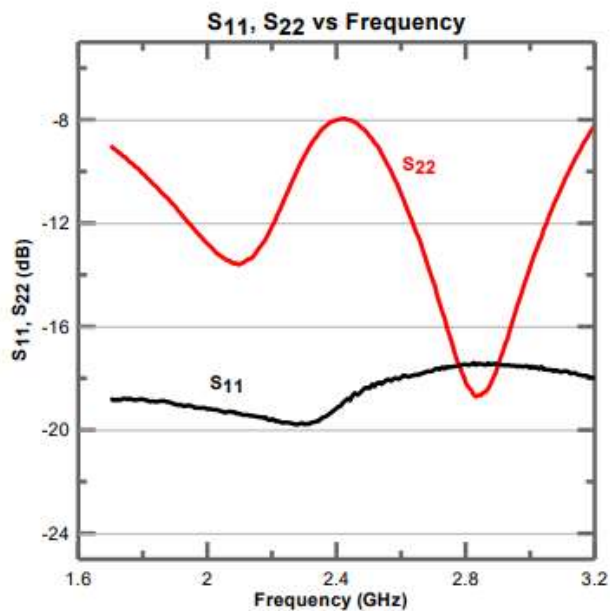
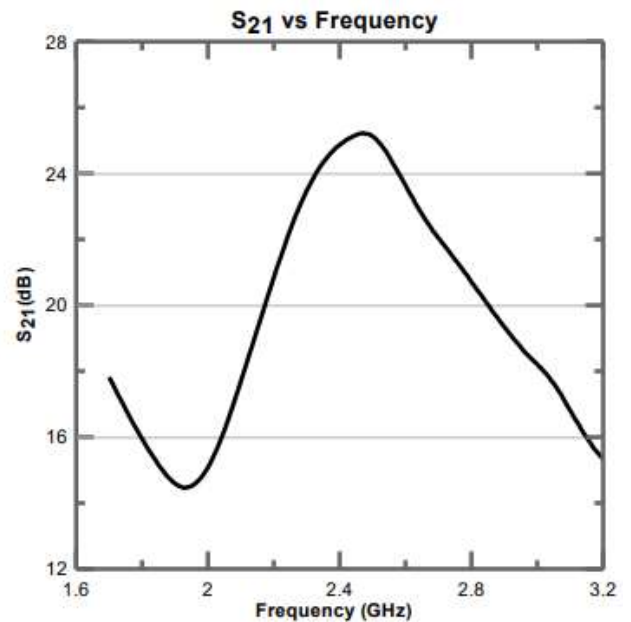
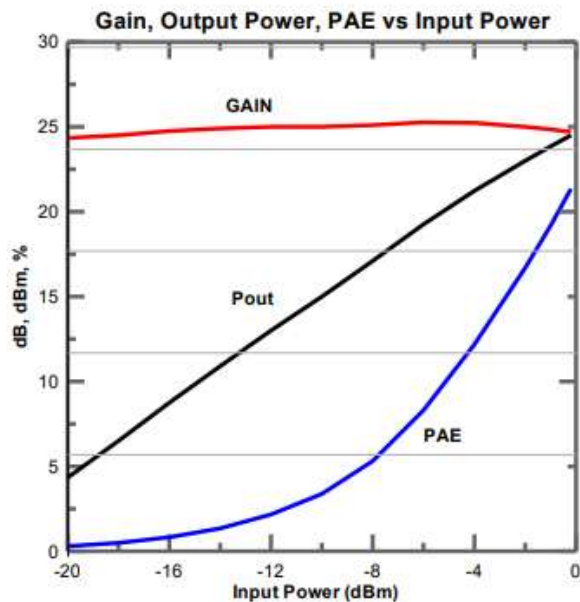
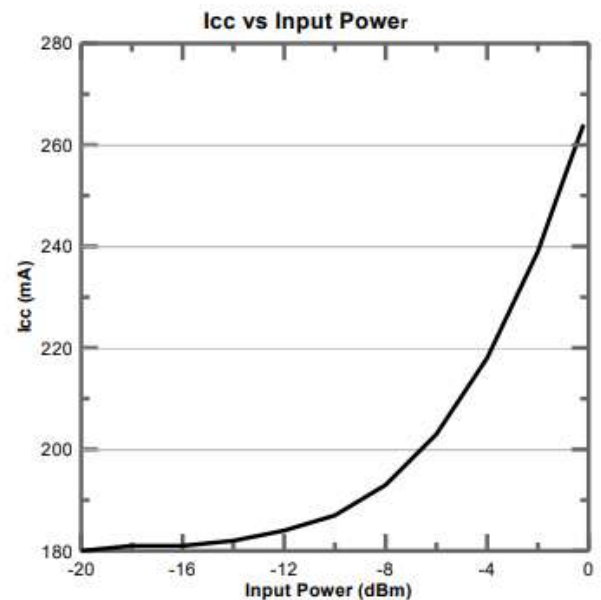


802.11b Performance Data

Test conditions: $V_{cc1}=V_{cc2}=V_{apc}=V_{pd}=+3.3V$, $R_{Fin}=-20dBm$, $R_3=200\Omega$
(refer to application circuit 2)

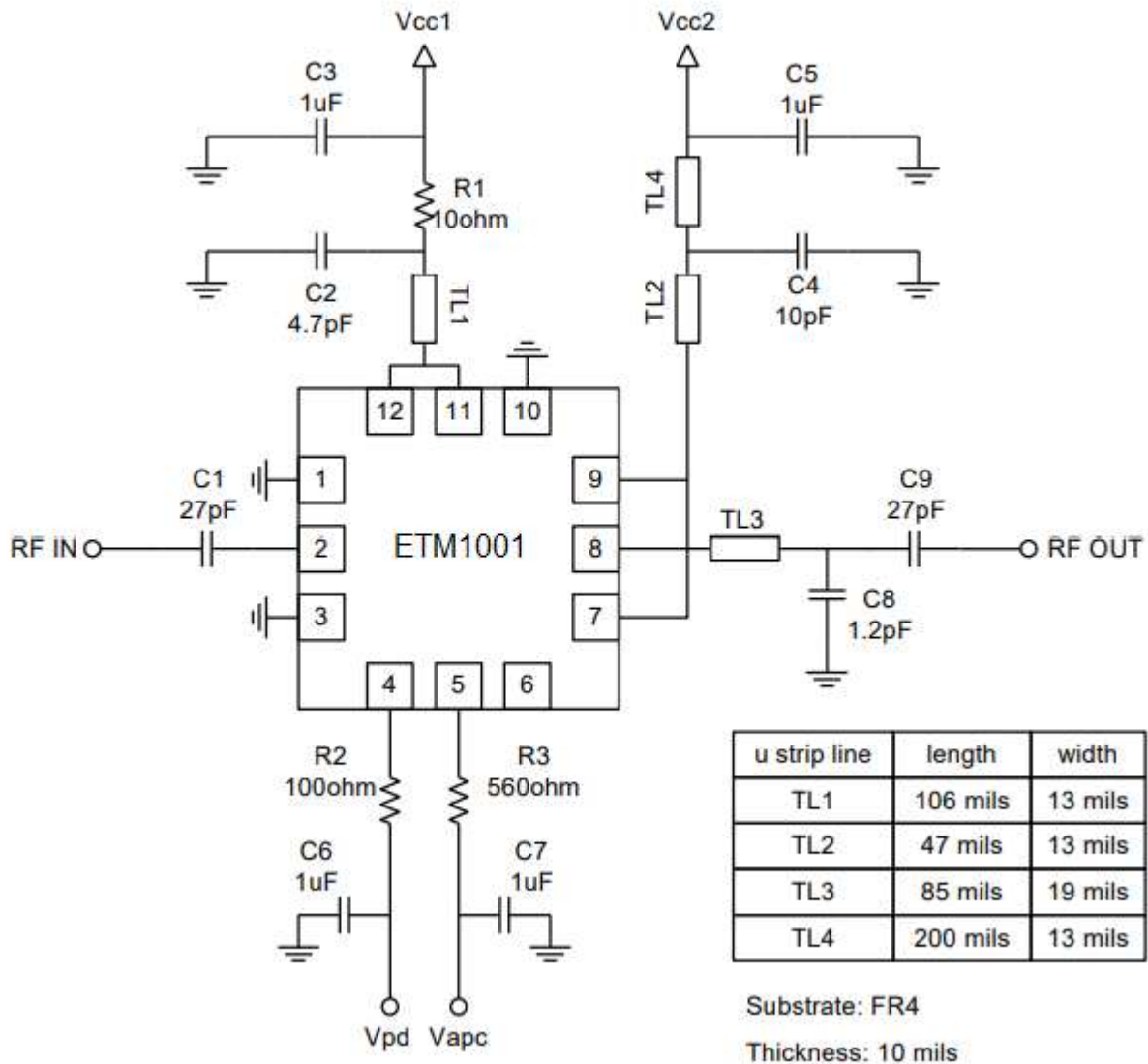


Test conditions: $V_{cc1}=V_{cc2}=V_{apc}=V_{pd}=+5V$, $R_{Fin}=-30dBm$, $R_3=560\Omega$
(refer to application circuit 3)



Application Circuits

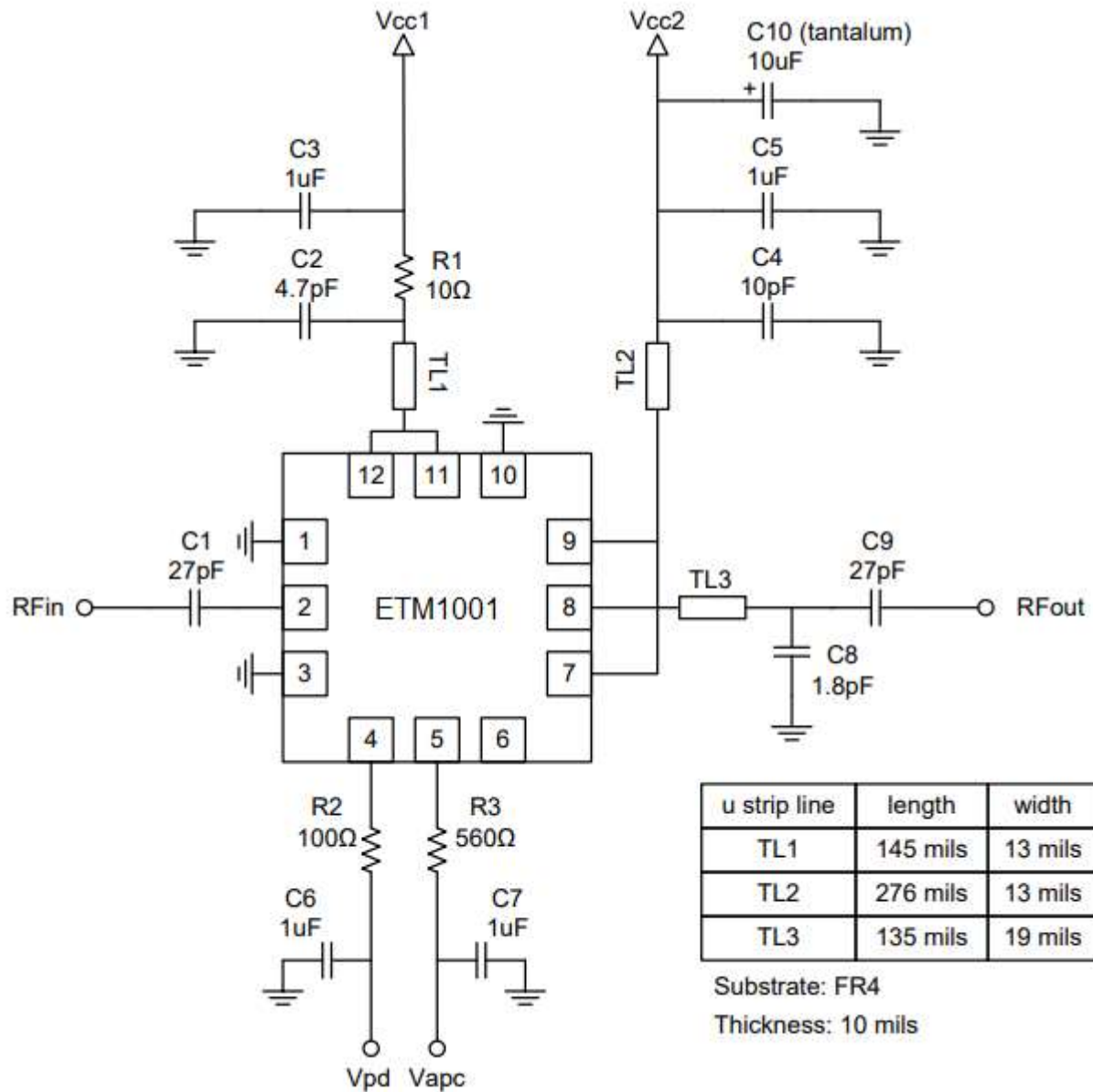
1. Bluetooth Class 1 application, $V_{CC}=3\text{ V}$



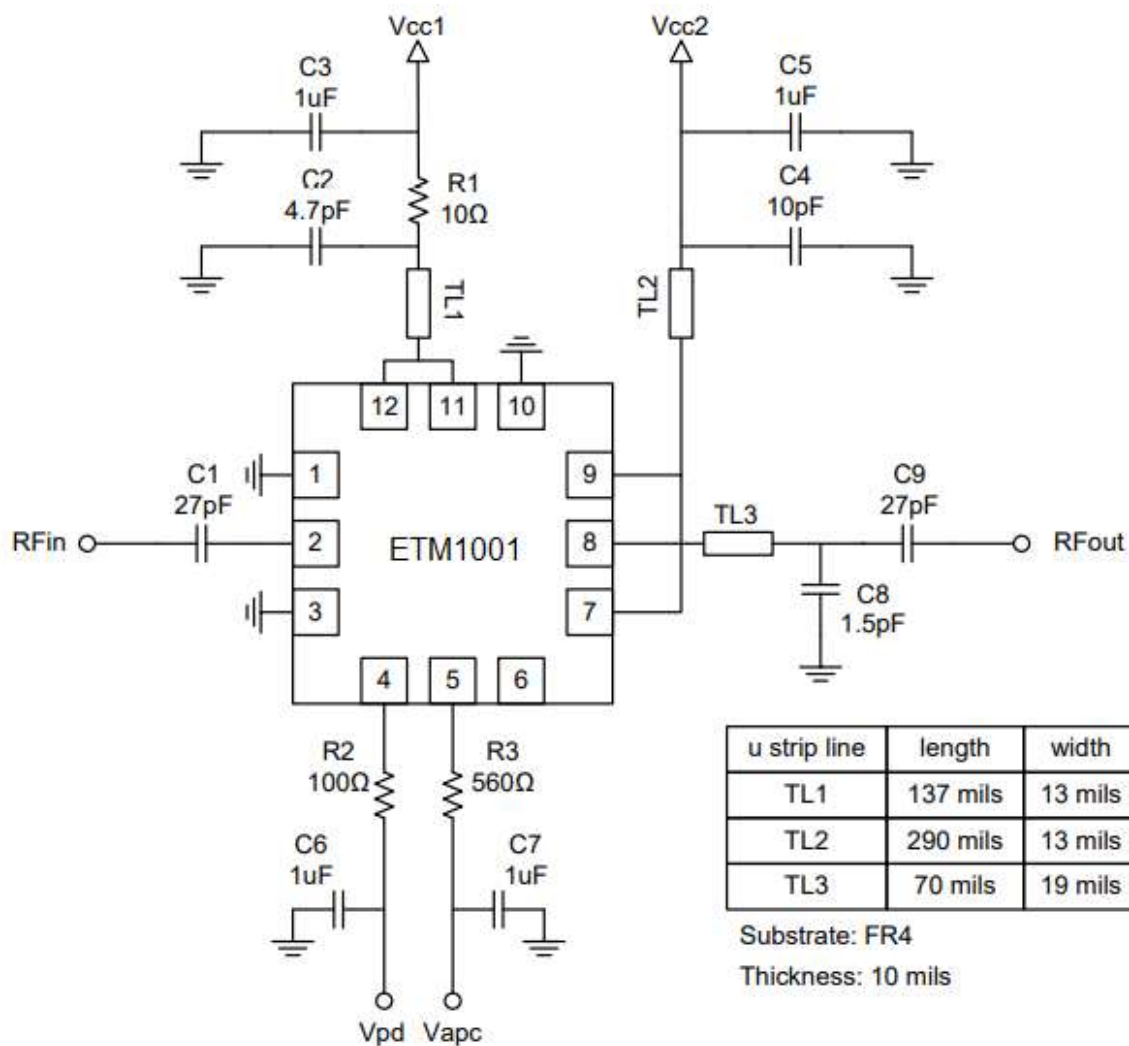
Note:

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.

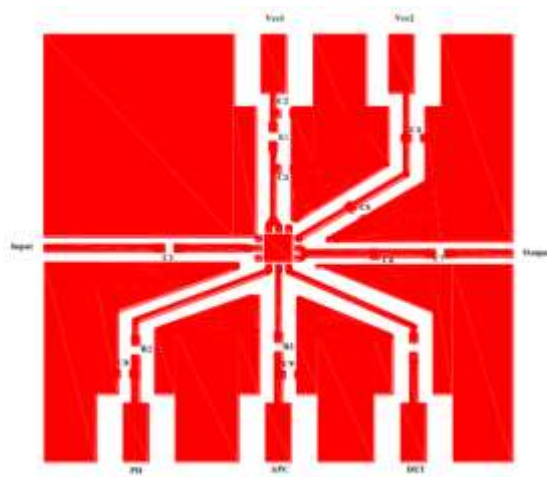
2. 802.11b, biased on 3.3V application



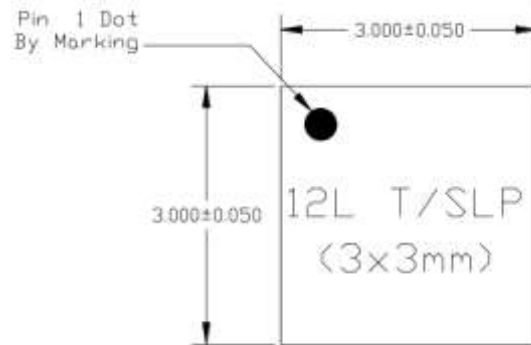
3. 802.11b, biased on 5V application



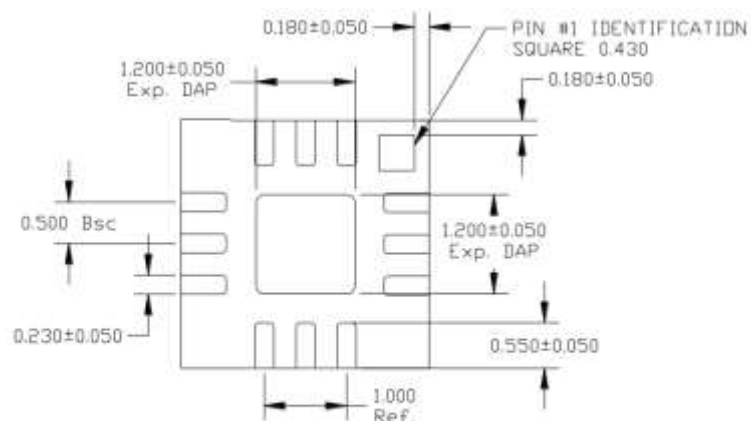
Evaluation Board Layout



Package Information



TOP VIEW



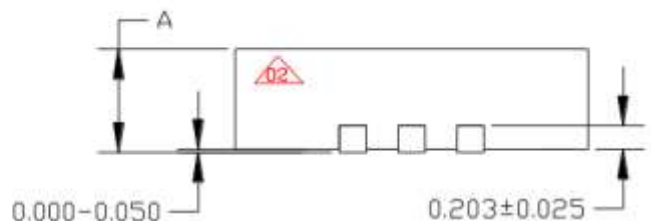
BOTTOM VIEW

NOTE:

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

A			SLP
	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

