RTC6649EX：2.4 – 2.5 GHz Power Amplifier for 802.11b/g/n/ac

Description

The RTC6649EX is a power amplifier (PA) designed for 2.4 ~ 2.5 GHz frequency range, compatible with 802.11b/g/n/ac wireless LAN system. The device is manufactured based on advanced InGaP/GaAs HBT (Heterojunction Bipolar Transistor) process. The amplifier consists of 3 gain stages with inter-stage matching, build-in input matching network, and a power detector for close loop power control operation. The device is capable to provide +26.5 dBm linear power under 3% low EVM (Error-Vector-Magnitude) of 802.11g OFDM 64QAM 54Mbps and +23 dBm linear power under 1.8% low EVM of 802.11ac 256QAM HT40 MCS8 by single supply voltage 5V. The device is provided in a tiny industrial standard 16-lead surface mount package QFN-3.0x3.0x1.0(max) mm^3.

Feature

- Frequency Range: 2.4 – 2.5 GHz
- Voltage Supply : 5 V
- High Gain : 31 dB
- +26.5 dBm linear output power for 802.11g 64QAM, 54Mbps, 3% EVM, 5V
- +23 dBm linear output power for 802.11ac 256QAM, HT40, MCS8, 1.8% EVM, 5V
- On-chip Input Matching
- 16L QFN-3.0x3.0x1.0(max) mm^3 Package
- RoHS / Halogen Free Compliant
- Moisture Sensitivity Level : MSL 3

Application

- High Power WLAN applications
- IEEE 802.11b/g/n Wireless LAN System
- IEEE 802.11ac 256QAM Wireless LAN
- 2.4GHz ISM Band Application
- 2.4GHz Cordless Phones

Specifications subject to change without notice
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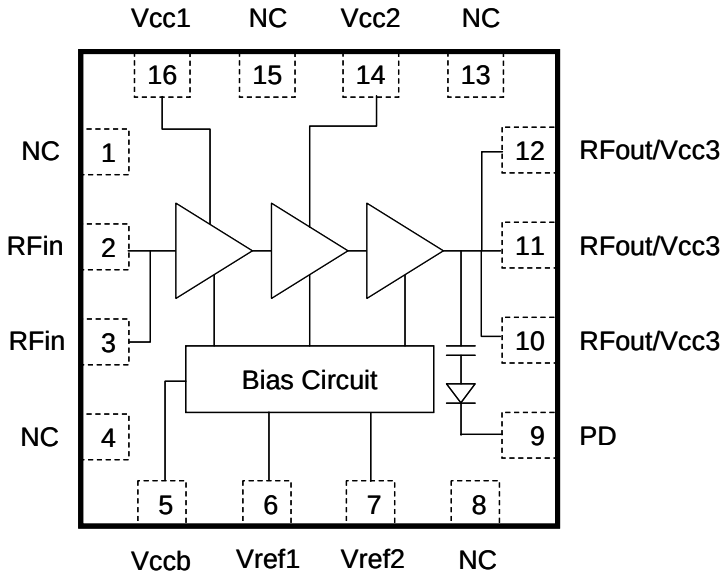
Pin Out (top view through package)



Pin Function Description

Pin	Function	Description
1	NC	Not connected
2	RFin	RF input. Input matching network is built on chip.
3	RFin	Same as pin 2
4	NC	Not connected
5	Vccb	Power supply for bias control circuit
6	Vref1	Bias control voltage for 1st & 2nd stage
7	Vref2	Bias control voltage for 3rd stage
8	NC	Not connected
9	PD	Detector output voltage for output power index
10	RFout/Vcc3	RF output & power supply for power stage-3
11	RFout/Vcc3	Same as pin 10
12	RFout/Vcc3	Same as pin 10
13	NC	Not connected
14	Vcc2	Power supply for power stage-2
15	NC	Not connected
16	Vcc1	Power supply for power stage-1
Exposed Pad		Must be connected to Ground

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Absolute Maximum Rating

Parameter	Rating	Units
Supply Voltage (Vcc)	6	V
Bias Voltage (Vref)	3.5	V
RF Input Level (RFin), under 50Ω output terminated	+15	dBm
Operating Temperature	-40 to +85	℃
Storage Temperature	-40 to +150	℃

Note : Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only, functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation between operation range maximum and absolute maximum for extended periods may affect device reliability.

Recommended Operating Condition

PARAMETER	CONDITION	MIN	TYP	MAX	UNITS
Vcc = 5 V operation					
Vcc1, Vcc2, Vcc3, Vccb		4.75	5	5.25	Volts
Vref		2.75	2.8	2.9	Volts

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Electrical Specification

Parameter	Condition	Min	Typ	Max	Unit
Frequency Range		2.4	–	2.5	GHz
T = 25℃, Vcc1 = Vcc2 = Vcc3 = Vccb = 5 V, Vref = 2.8 V					
Small Signal Gain	P_{in} = -30 dBm	29	31		dB
P1dB	1dB Gain compression	30	32		dBm
Linear Pout for 11ac usage	256QAM, HT40, MCS8 1.8% EVM	21	23		dBm
Linear Pout for 11g usage	64 QAM/54 Mbps 3% EVM	24.5	26.5		dBm
11g mask compliant power	OFDM 6Mbps	27	29		dBm
11b mask compliant power	DSSS 1Mbps	27	29		dBm
Gain Flatness	within band(2.4 ~ 2.5GHz)			1	dB
Input return loss	P_{in} = -30 dBm		-11	-8	dB
Output return loss	P_{in} = -30 dBm		-16	-12	dB
2f /3f harmonics	Pout = 26 dBm, CW without harmonic filter (note 1)		-30/-30	-25/-25	dBm
Tdr, Tdf Delay and rise/fall Time	50 % of V_{EN} edge and 90/10 % of final output power level		150		ns
Icq	Quiescent, No RF		295		mA
Icc	802.11g, 64QAM, Pout = 26 dBm		500	650	mA
Icc	802.11ac, 256QAM, HT40, Pout = 23 dBm		450	600	mA
Iref	Current at Vref, No RF		6		mA
Power Detector Output	64 QAM/54Mbps Pout = 17dBm		0.36		V
	64 QAM/54Mbps Pout = 26dBm		0.88		V

Note 1: Apply external harmonic filter can further suppress harmonics less than –50dBm/MHz

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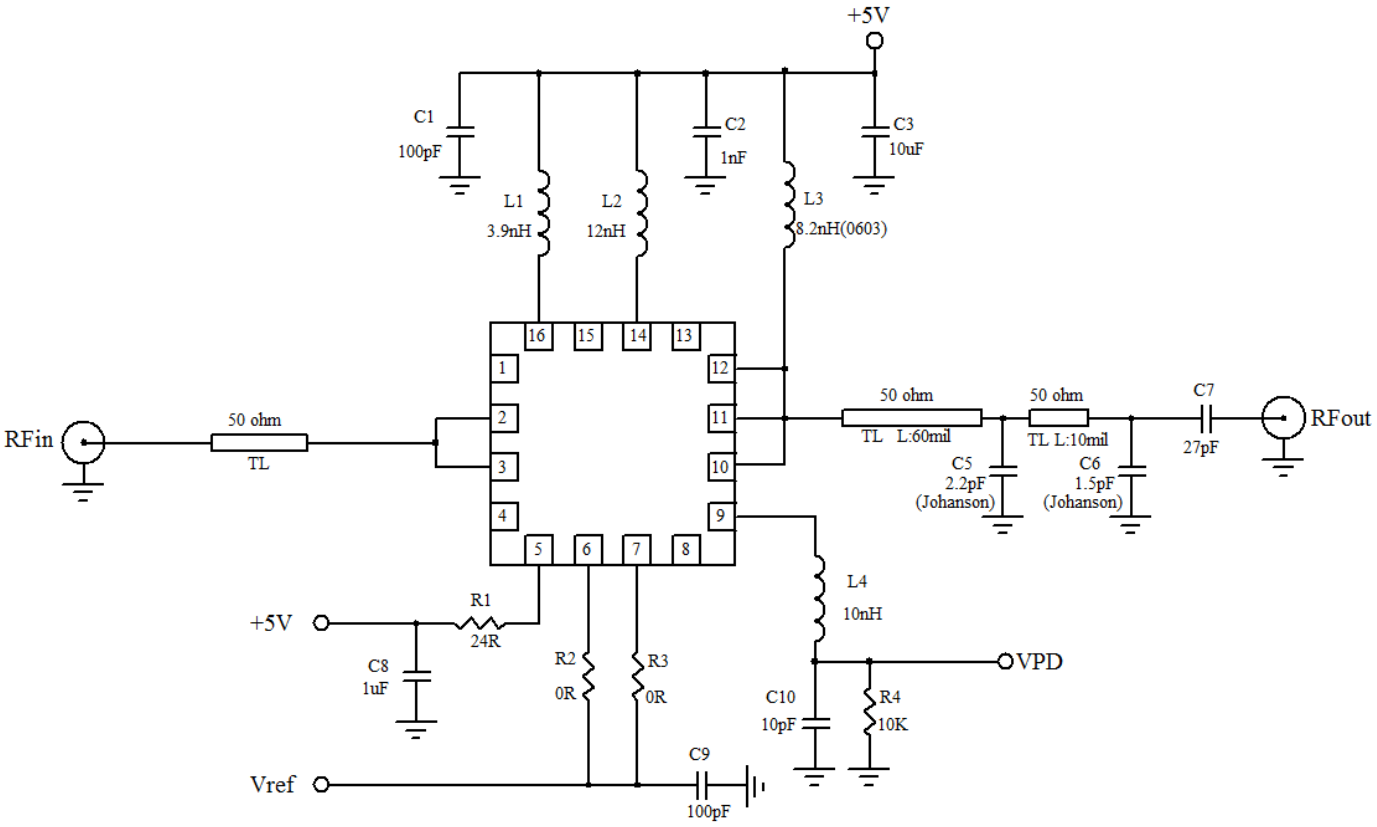
Application Circuit



Note : paddle must be connected to GND

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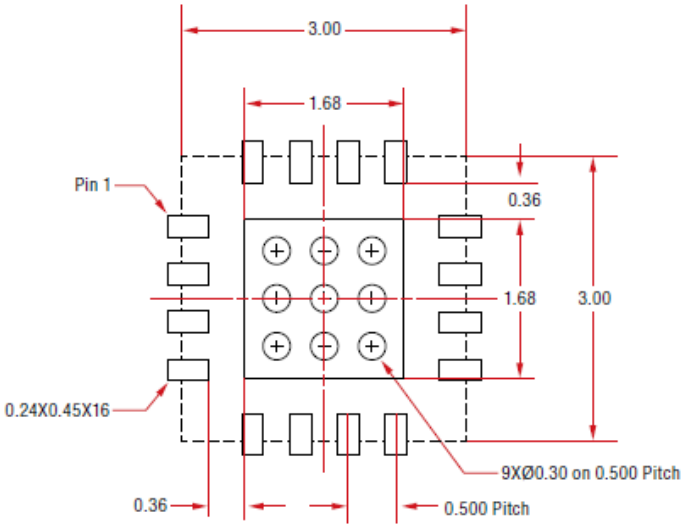
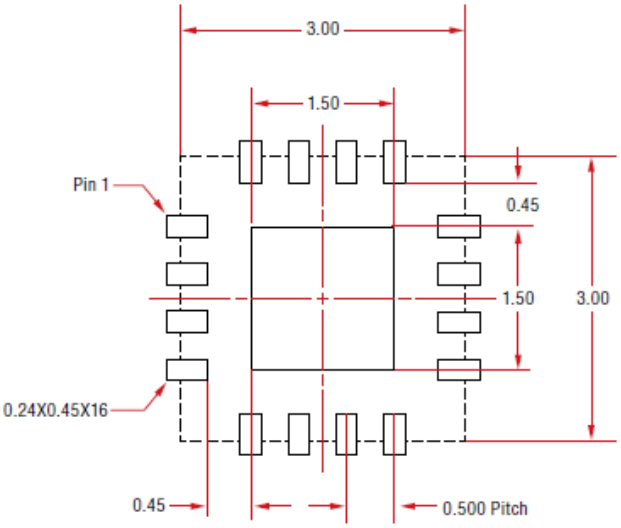
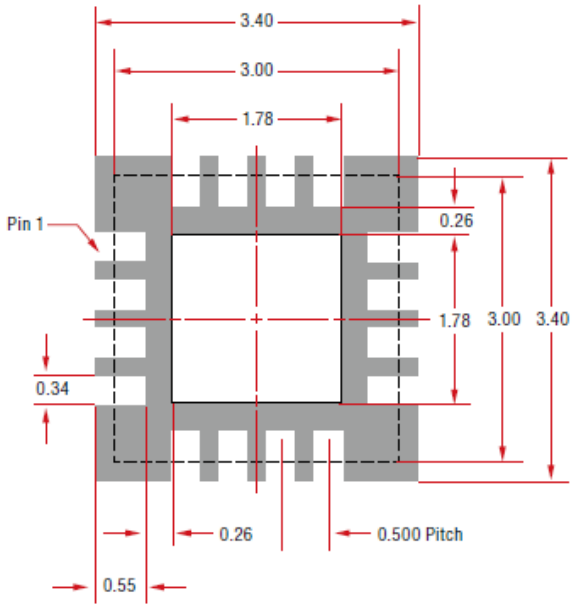
Recommended PCB Footprint



PCB Board Metal & Via Pattern
Top View



PCB Stencil Pattern
Top View
80% solder coverage on Pad



PCB Solder Mask Pattern
Top View

NOTE: All dimensions are measured in millimeters.

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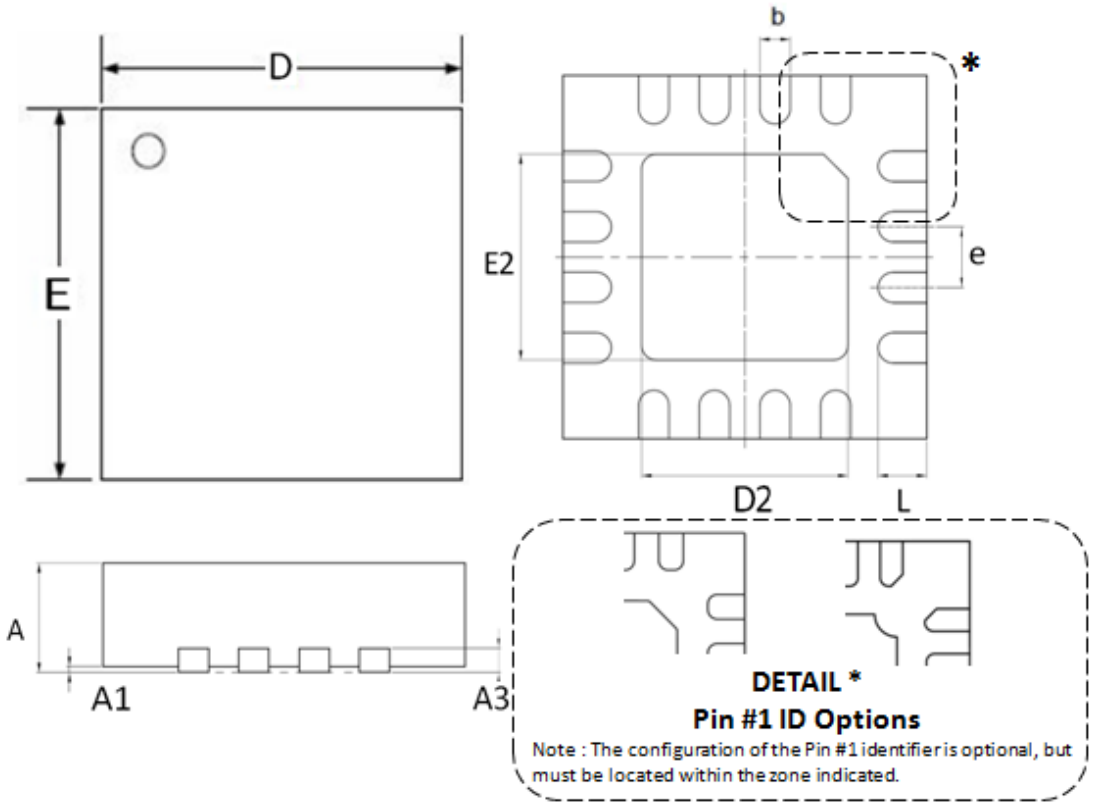
Package Outline Dimension



16L QFN 3X3X1-A		
Symbol	Dimensions in Millimeters	
	MIN	MAX
A	0.800	1.000
A1	0.000	0.050
A3	0.200REF	
b	0.180	0.300
D	2.900	3.100
D2	1.550	1.800
e	0.500TYP	
E	2.900	3.100
E2	1.550	1.800
L	0.200	0.400

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