

RTC6670P

802.11a 19 dBm/802.11ac 14dBm Power Amplifier Module

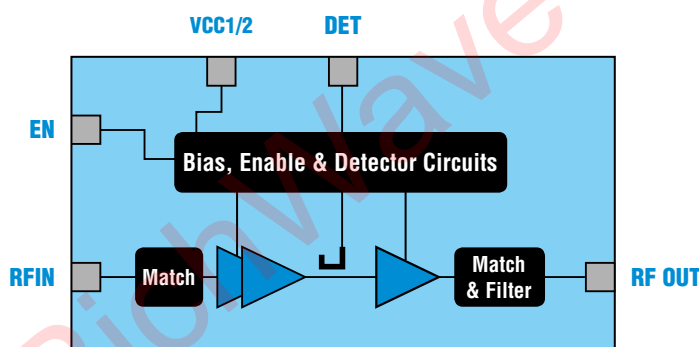


MAY 2018 - Ver. 1.3

Description

The RTC6670P power amplifier module (PAM) is designed to operate in 5GHz ISM band, compatible with 802.11a and 802.11ac wireless LAN system with large output power and high small signal gain. The device consists of three-stage power amplifier (PA) with a power detector for close loop power control operation and a low-pass filter (LPF) for harmonic suppression. A CMOS compatible digital enable/disable function is also included that allows power savings during off mode. All the input and output ports are internally matched to 50Ω, no external RF matching component is required. The PAM has a typical gain of 29 dB from 5.1 to 5.8 GHz, and delivers 19dBm linear output power under 3% EVM OFDM 54Mbps modulation. The RTC6670P is packaged in a tiny industry-standard 16-lead surface mount package QFN 3mm x 3mm x 1mm (max) with lead-free RoHS compliant.

Functional Block Diagram



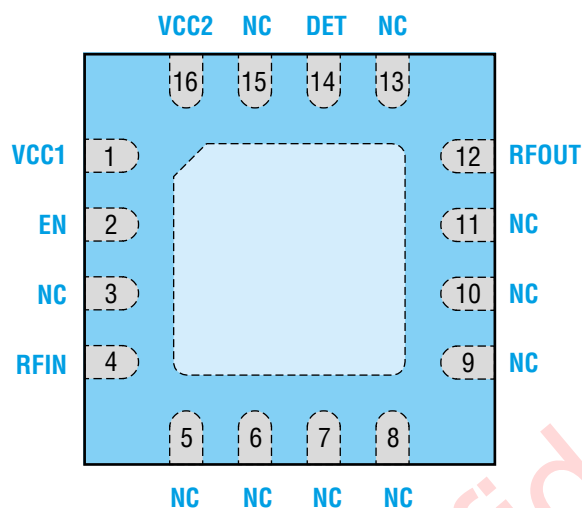
Features

- 3.3 V Power Supply
- 19 dBm @ 3% EVM, 802.11a, 64QAM
- 14 dBm @ 1.8% EVM, 802.11ac, 256QAM
- Small signal gain : 29 dB
- On-chip input matching
- Digital Enable/Disable control
- Packaged in 16L QFN-3mm x 3mm x 1mm (max)
- RoHS Compliant, Pb-free, Halogen Free
- Moisture Sensitivity Level : MSL 3

Applications

- IEEE 802.11a Wireless LAN System
- 5 GHz ISM Band Applications
- High Power WLAN applications

Pin Assignments



Pin No.	Pin Name	Description
1	VCC1	Supply Voltage
2	EN	Digital PA ON
4	RFIN	RF input pin
12	RFOUT	RF out pin
14	DET	PA detector output
16	VCC2	Supply Voltage
3, 5–11, 13, 15	NC	Not connected inside the package
Exposed Paddle		It must be connected to a ground through PCB via for best performance

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Supply Voltage	VCC	4.5	V
PA Enable Voltage	EN	3.6	V
Input RF Level	RF _{IN}	+12	dBm
Operating Ambient Temperature	T _A	-30 to +85	°C
Storage Temperature	T _{STG}	-40 to +150	°C

NOTE: Stresses above those conditions listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only. Functional operation of the device above those conditions indicated in the Absolute Maximum Ratings is not implied. The functional operation of the device at the conditions in between Recommended Operating Ranges and Absolute Maximum Ratings for extended periods may affect device reliability.

Recommended Operating Ranges

Parameter	Symbol	Min	Typ	Max	Unit
Operating Frequency	f	5.1		5.8	GHz
Supply Voltage	VCC1, VCC2, VCC3	3.0	3.3	3.6	V
PA Enable Voltage	EN	1.8		3.3	V

NOTE: Recommended Operating Ranges indicate conditions for which the device is intended to be functional, but does not guarantee specific performance limits.

Electrical Specification

$T_A = +25^{\circ}\text{C}$, $V_{CC1} = V_{CC2} = 3.3\text{ V}$, $EN = 2.9\text{ V}$, unless otherwise noted

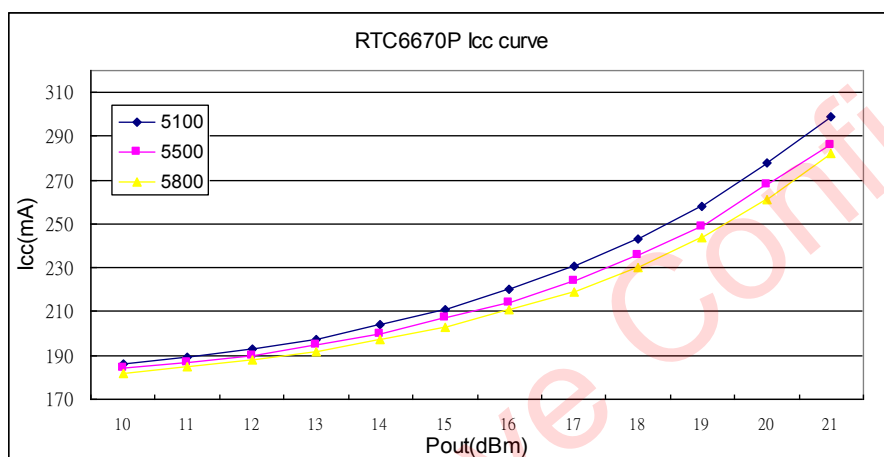
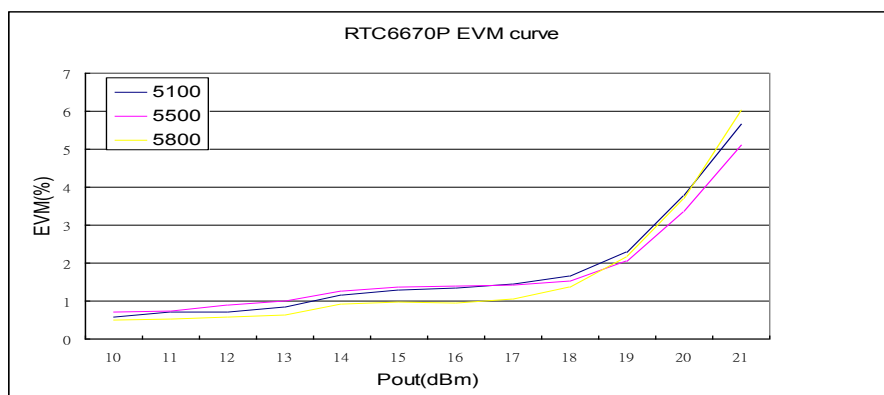
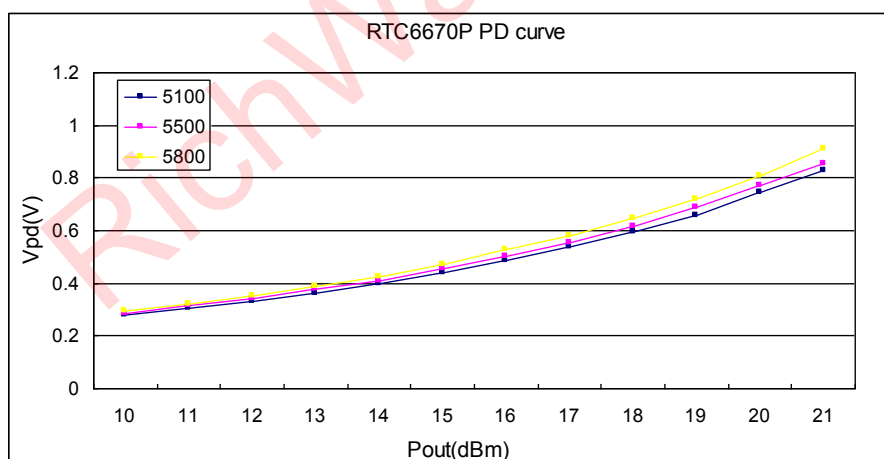
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Frequency	f		5.1		5.8	GHz
Output Power	P _{out}	64QAM/54Mbps, EVM = 3%		19		dBm
		802.11ac, 256QAM, EVM = 1.8%		14		dBm
		802.11a mask compliant power, OFDM 6Mbps		21		dBm
Small Signal Gain		P _{in} = -30dBm		29		dB
Gain Flatness	ΔG	Gain Variation over band		1		dB
1 dB Output Compression Point	P1dB	1dB Gain compression		25		dBm
Input return loss	S ₁₁			9		dB
Output return loss	S ₂₂			22		dB
2nd/3rd Harmonics	2fo/3fo	CW signal, P _{out} = 20 dBm		-42		dBm/MHz
Supply Current	I _{CO}	Quiescent (no RF)		181		mA
	I _{CC}	P _{out} = 19 dBm, 802.11a, 64QAM		250		mA
	I _{CC}	P _{out} = 14 dBm, 802.11ac, 256QAM		200		mA
	I _{OFF}	EN = 0 V (no RF)		3		μA
PA Enable Current	I _{EN}	Quiescent (no RF)		1		μA
Stability	S	P _{out} = 18 dBm, 54 Mbps, 64 QAM, VSWR = 6:1, all phases	All non-harmonically related outputs less than -50 dBc/100 kHz			
Ruggedness	R _u	P _{in} =12 dBm (CW), VSWR=6:1, all phases	No permanent damage			

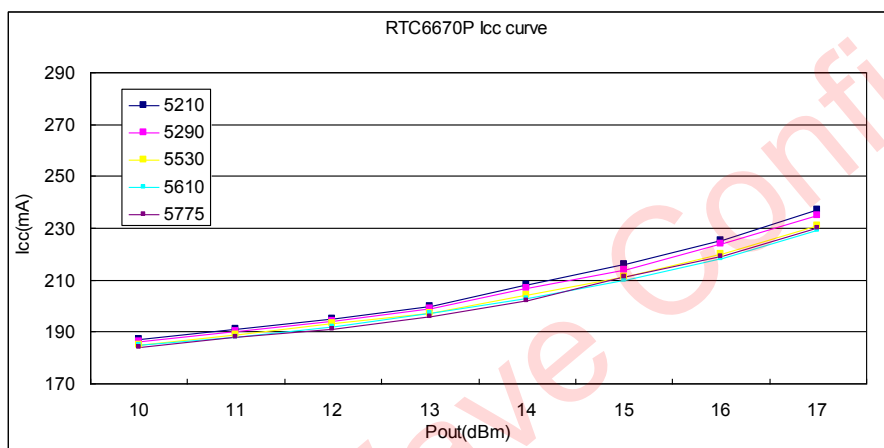
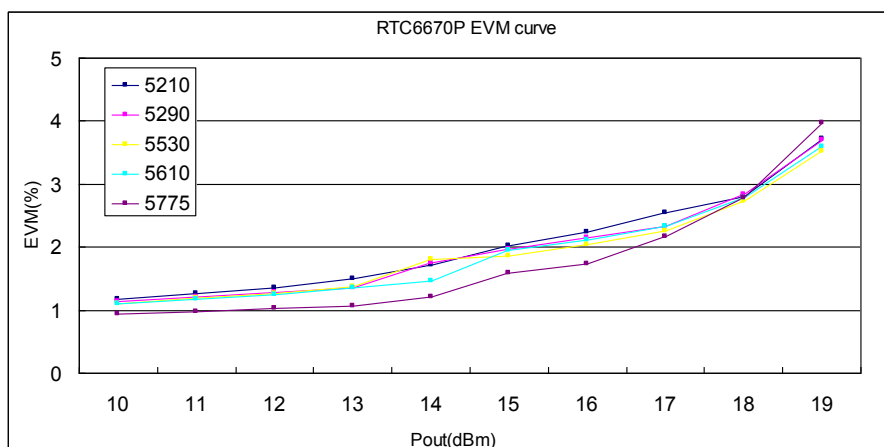
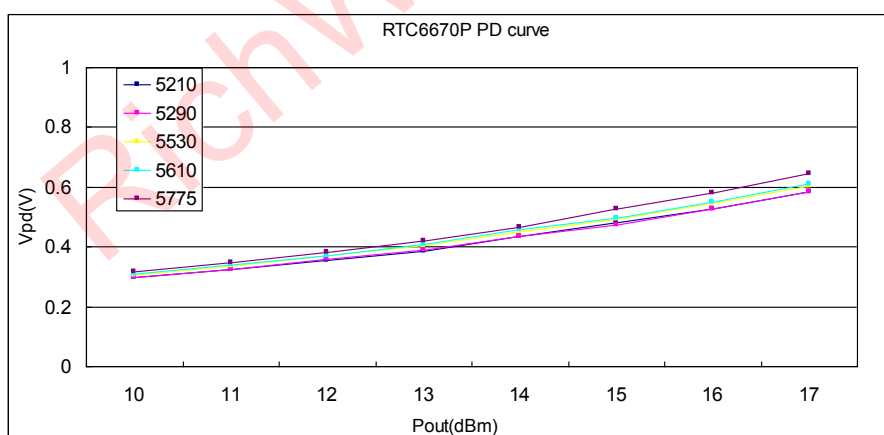
Typical Performance Characteristics

$T_A = +25^{\circ}\text{C}$, $V_{CC1} = V_{CC2} = 3.3\text{ V}$, $EN = 2.9\text{ V}$

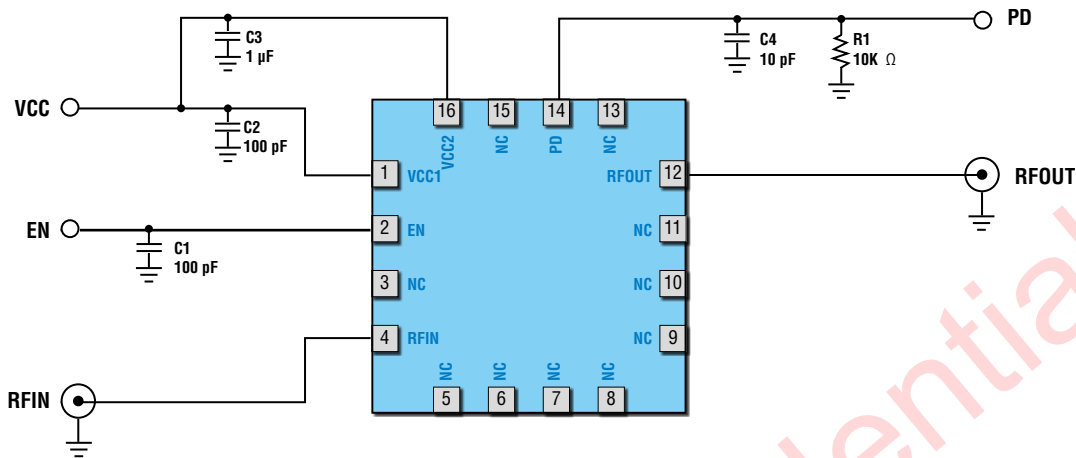
S-Parameters



EVM and ICC vs. Pout with 802.11a, OFDM/54Mbps (@100% duty cycle)**Power Detector with 802.11a, OFDM/54Mbps**

EVM and ICC vs. Pout with 802.11ac, 256QAM (@100% duty cycle)**Power Detector with 802.11ac, 256QAM**

Application Circuits

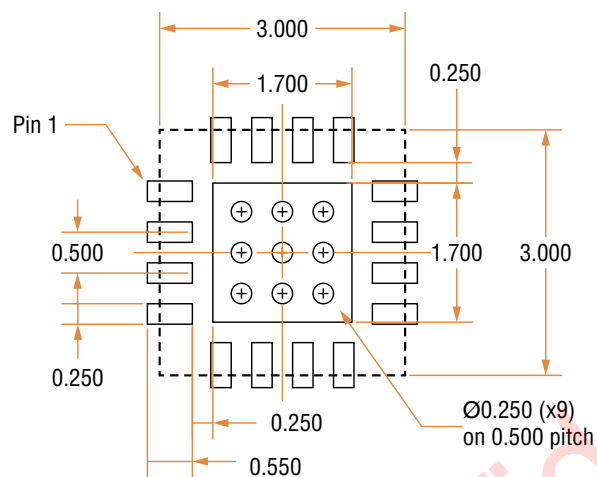


NOTE : Information in the above application is for reference only, and does not guarantee the mass production design of the device.

Evaluation Board Bill of Material

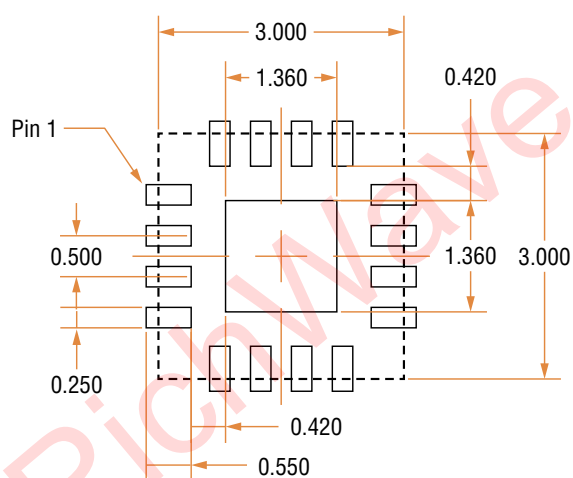
Component	Value	Description	Supplier	Part Number
IC		RTC6670P	RichWave	
C1, C2	100 pF	De-coupling capacitor	Walsin	0402N101J500LT
C4	10 pF	De-coupling capacitor	Walsin	0402N100J500LT
C3	1 μF	De-coupling capacitor	Walsin	0402X105K6R3CT
R1	10K Ω		Walsin	WR04X1002FTL

Recommended Footprint Patterns



PCB Board Metal & Via Pattern

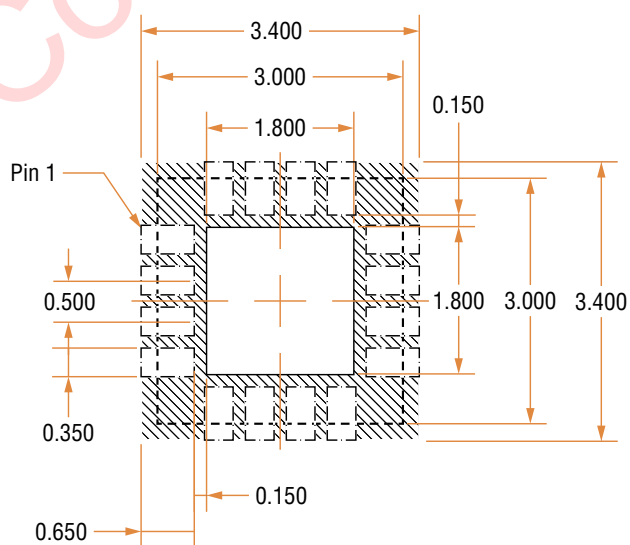
Top View



PCB Stencil Pattern

Top View

64% Solder Coverage on Pad



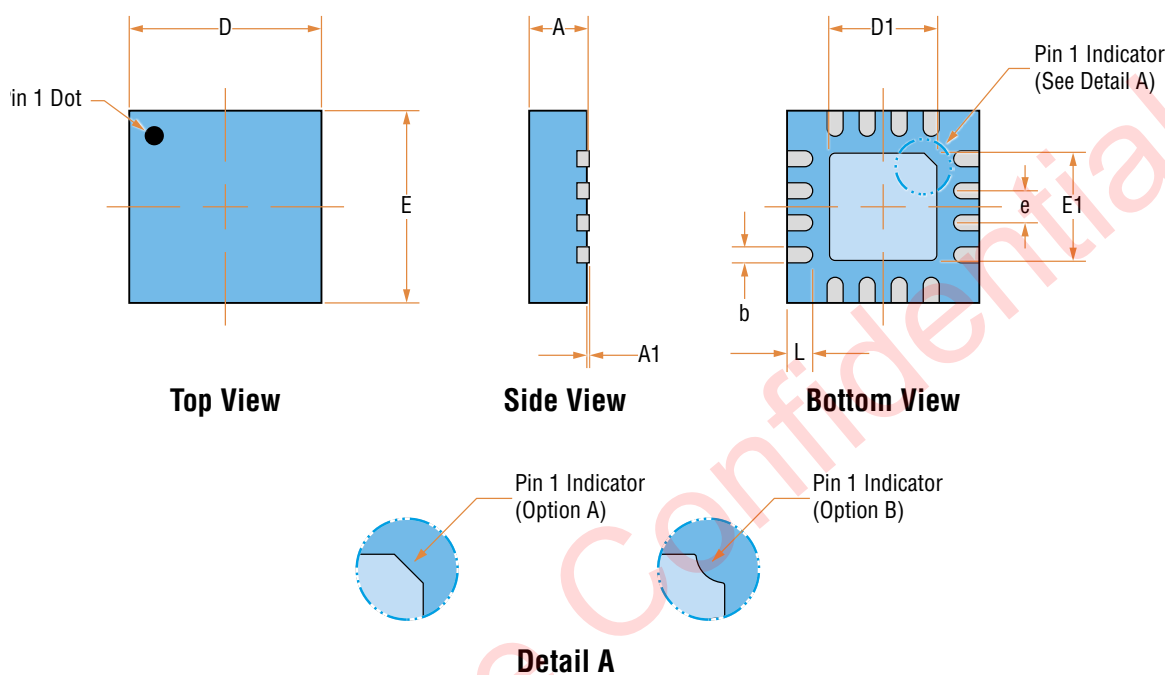
PCB Solder Mask Pattern

Top View

NOTE :

1. All dimensions are measured in millimeters.
2. Drawing is not to scale.

Package Dimensions



16L QFN 3 X 3 X 1 - C		
SYMBOL	MIN	MAX
A	0.800	1.000
A1	0.000	0.050
b	0.180	0.320
D	2.900	3.100
D1	1.550	1.850
e	0.500 BSC	
E	2.900	3.100
E1	1.550	1.850
L	0.300	0.500

NOTE :

1. All dimensions are measured in millimeters.
2. Drawing is not to scale.
3. The shape of the Pin 1 Indicator can be either Option A or Option B, but it must be located within the zone indicated.

Customer Service

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