

RTC6619SP

0.5 GHz – 6.0 GHz SPDT Switch

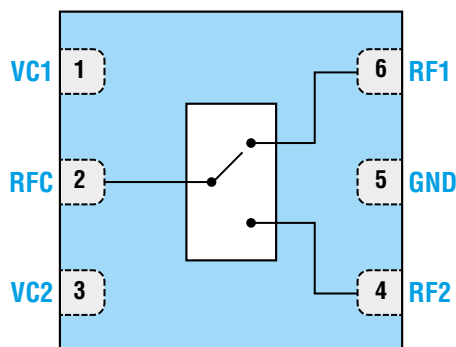


AUG 2017 - Ver. 1.7

Description

RTC6619SP is a single pole double throw (SPDT) RF antenna switch designed for the frequency range from 0.5 GHz up to 6.0 GHz. RTC6619SP is processed in advanced CMOS technology featuring low insertion loss, high isolation, and sustain high linearity at low supply voltage of 1.8 V or 3.3 V. The excellent performance of RTC6619SP makes it ideal to be applied in wireless applications for WLAN, Bluetooth® and IEEE 802.11a/b/g/n/ac transmit/receive function. RTC6619SP is housed in a compact 6L QFN1.5mm x 1.5mm x 0.6mm (max) plastic package.

Functional Block Diagram



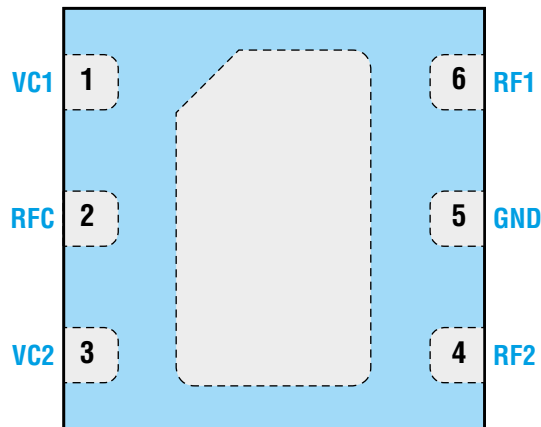
Features

- Frequency Range : 0.5 – 6.0 GHz
- 1.8 V or 3.3 V Single Supply Voltage
- Low Control Voltage : 2.4 ~ 3.6 V
- Low Insertion Loss:
 - 0.65 dB @ 2.4 GHz, 3.3 V
 - 0.95 dB @ 5 GHz, 3.3 V
- High Isolation :
 - 38 dB @ 2.4 GHz, 3.3 V
 - 27 dB @ 5 GHz, 3.3 V
- High P0.1dB:
 - +37 dBm @ 2.4 GHz, 3.3 V
 - +34 dBm @ 5.8 GHz, 3.3 V
- Package in 6L QFN 1.5mm x 1.5mm x 0.6mm (max)
- RoHS Compliant, Pb-free, Halogen Free
- Moisture Sensitivity Level: MSL 1

Applications

- IEEE 802.11a/b/g/n/ac WLAN Networks
- Mobile Devices

Pin Assignments



Top View Through Package

Pin No.	Pin Name	Description
1	VC1	DC control voltage 1
2	RFC	RF Signal, DC blocking capacitor is needed
3	VC2	DC control voltage 2
4	RF2	RF Signal, DC blocking capacitor is needed
5	GND	Ground
6	RF1	RF Signal, DC blocking capacitor is needed
	Exposed Paddle	It must be connected to a ground through PCB via for best performance

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Control Voltage	VC1, VC2	+5	V
Maximum Input Power (CW)	P_{IN}	+37	dBm
Operating Temperature	T_A	-40 ~ +85	°C
Storage Temperature	T_{ST}	-40 ~ +150	°C
ESD (HBM, JESD22-A114, All pins)	ESD_{HBM}	1000	V

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
Operation Frequency	f1	0.5		6.0	GHz
Control Voltage (High)	VC(H)	1.6	1.8 or 3.3	3.6	V
Control Voltage (Low)	VC(L)	-0.2	0	0.3	V

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

Truth Table

Low Insertion Loss Path	VC1	VC2
RFC – RF1	H	L
RFC – RF2	L	H

3.3 V Electrical Specifications

$T_A = +25^\circ\text{C}$, 50Ω system with control voltage $V_C = 0\text{ V}/3.3\text{ V}$, $P_{IN} = 0\text{ dBm}$, unless otherwise noted

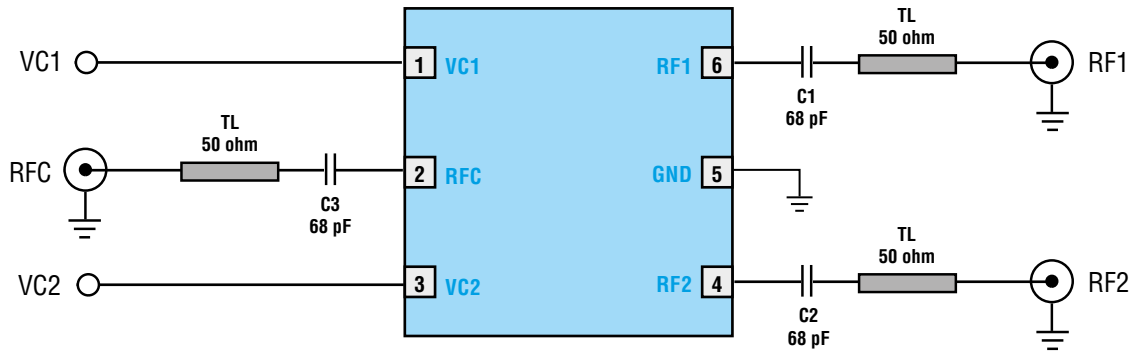
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Insertion Loss	IL_1	2.4 – 2.5 GHz		0.65	0.8	dB
	IL_2	4.9 – 6.0 GHz		0.95	1.2	dB
Isolation (RF1,2 to RFC)	ISO_1	2.4 – 2.5 GHz	35	38		dB
	ISO_2	4.9 – 6.0 GHz	23	27		dB
Isolation (RF1 to RF2)	ISO_3	2.4 – 2.5 GHz	39	43		dB
	ISO_4	4.9 – 6.0 GHz	24	28		dB
Return Loss (Insertion loss state)	RL_1	2.4 – 2.5 GHz	15	22		dB
	RL_2	4.9 – 6.0 GHz	15	20		dB
Input Power for 0.1dB Compression	P0.1dB_1	2.4 GHz, CW	+35	+37		dBm
	P0.1dB_2	5.8 GHz, CW	+32	+34		dBm
2nd Harmonic	2fo	f = 2.45 GHz		-57	-50	dBm/ MHz
		f = 5.1 GHz		-72	-64	
		f = 5.8 GHz		-70	-60	
$P_{IN} = +25\text{ dBm}$, CW (No external harmonic filter)						
3rd Harmonic	3fo	f = 2.45 GHz		-57	-50	dBm/ MHz
		f = 5.1 GHz		-72	-62	
		f = 5.8 GHz		-73	-63	
$P_{IN} = +25\text{ dBm}$, CW (No external harmonic filter)						
Linear Power	P _{IN-2G}	f = 2.45 GHz, 802.11g, OFDM, 54Mbps, 64QAM, P _{IN} for 2.5% EVM	+30	+32		dBm
	P _{IN-5G}	f = 5.925 GHz, 802.11ac, MCS9, HT80, P _{IN} for 1.8% EVM	+27	+29		dBm
Switching Rise/Fall Time	tr	10/90% to 90/10% RF		90	160	ns
Switching On/Off Time	tc	50% Vc to 90/10% RF		280	360	ns
Control Current	Ictl	V _C = 3.3 V, No RF		6	30	μA

1.8 V Electrical Specifications

$T_A = +25^\circ\text{C}$, 50Ω system with control voltage $VC = 0\text{ V}/1.8\text{ V}$, $P_{IN} = 0\text{ dBm}$, unless otherwise noted

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Insertion Loss	IL_1	2.4 – 2.5 GHz		0.85	1.0	dB
	IL_2	4.9 – 6.0 GHz		1.10	1.25	dB
Isolation (RF1,2 to RFC)	ISO_1	2.4 – 2.5 GHz	33	36		dB
	ISO_2	4.9 – 6.0 GHz	23	26		dB
Isolation (RF1 to RF2)	ISO_3	2.4 – 2.5 GHz	36	40		dB
	ISO_4	4.9 – 6.0 GHz	24	28		dB
Return Loss (Insertion loss state)	RL_1	2.4 – 2.5 GHz	18	29		dB
	RL_2	4.9 – 6.0 GHz	18	28		dB
Input Power for 0.1dB Compression	P0.1dB_1	2.4 GHz, CW	+27	+29		dBm
	P0.1dB_2	5.8 GHz, CW	+26	+28		dBm
2nd Harmonic	2fo	f = 2.45 GHz		-60	-53	dBm/ MHz
		f = 5.1 GHz		-57	-50	
		f = 5.8 GHz		-54	-47	
			$P_{IN} = +25\text{ dBm}$, CW (No external harmonic filter)			
3rd Harmonic	3fo	f = 2.45 GHz		-60	-53	dBm/ MHz
		f = 5.1 GHz		-61	-53	
		f = 5.8 GHz		-64	-56	
			$P_{IN} = +25\text{ dBm}$, CW (No external harmonic filter)			
Linear Power	P _{IN-2G}	f = 2.45 GHz, 802.11g, OFDM, 54Mbps, 64QAM, P _{IN} for 2.5% EVM	+26	+28		dBm
	P _{IN-5G}	f = 5.925 GHz, 802.11ac, MCS9, HT80, P _{IN} for 1.8% EVM	+25	+27		dBm
Switching Rise/Fall Time	tr	10/90% to 90/10% RF		90	160	ns
Switching On/Off Time	tc	50% Vc to 90/10% RF		280	360	ns
Control Current	Ictl	VC = 1.8 V, No RF		3	25	μA

Application Circuits

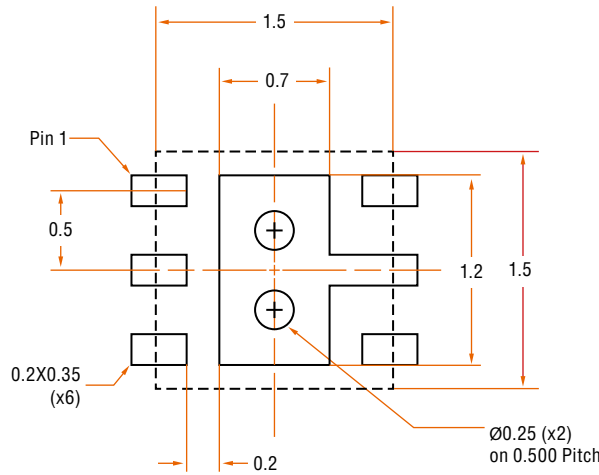


NOTE: Information in the above application is for reference only, and does not guarantee the mass production design of the device.

Evaluation Board Bill of Material

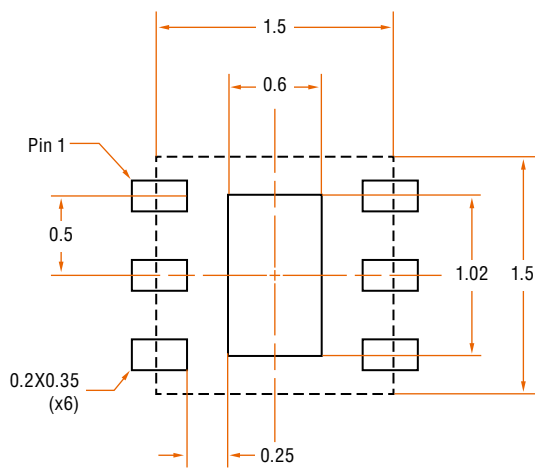
Component	Value	Description	Supplier	Part Number
IC		RTC6619SP	RichWave	
C1, C2, C3	68 pF	DC blocking capacitor	Walsin	0402N680J500LT

Recommended Footprint Patterns



PCB Board Metal & Via Pattern

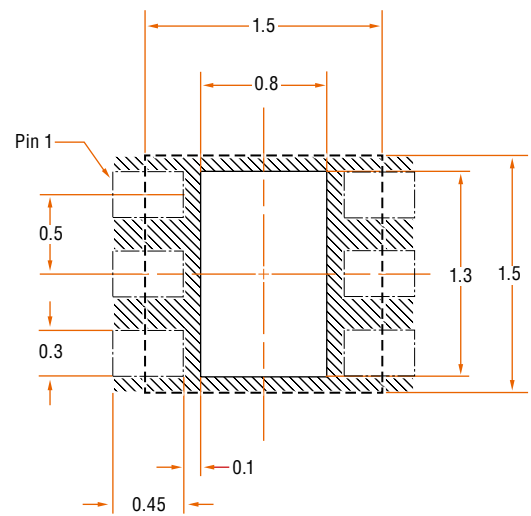
Top View



PCB Stencil Pattern

Top View

72% Solder Coverage on Pad



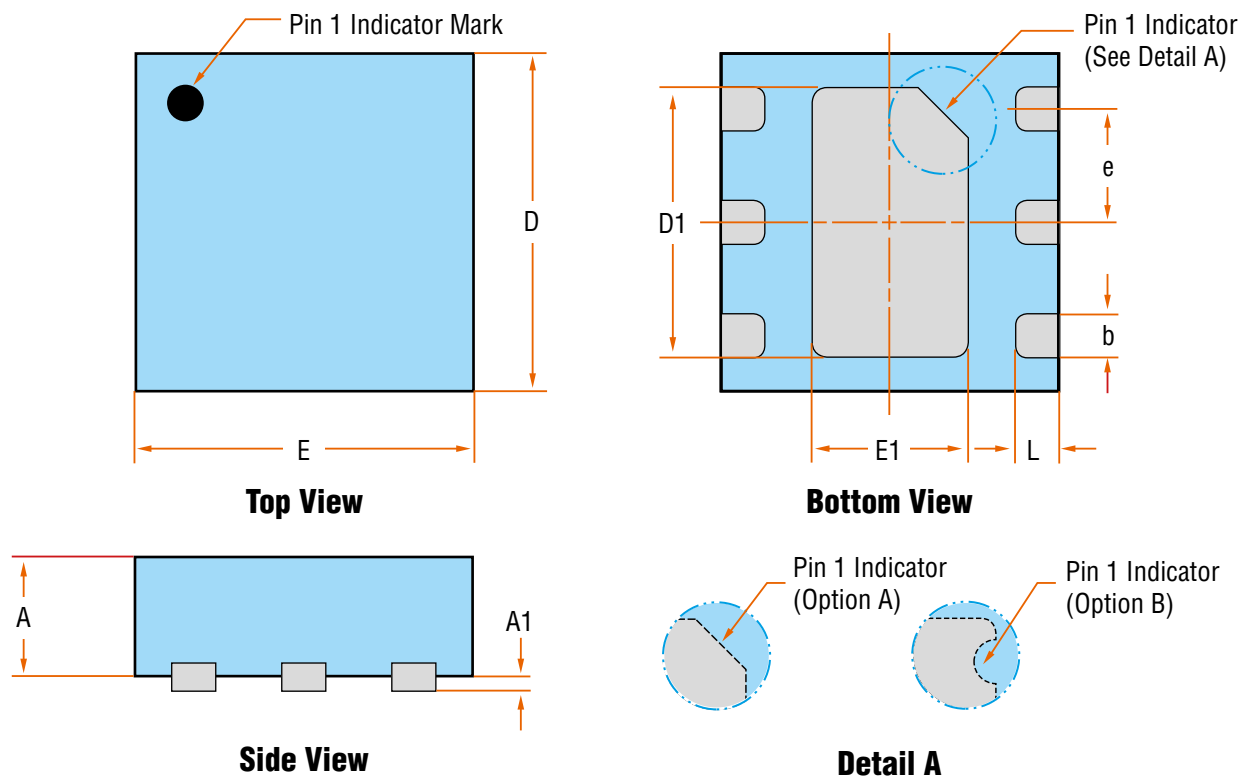
PCB Solder Mask Pattern

Top View

NOTE :

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

Package Dimensions



6L QFN 1.5 X 1.5 X 0.6 - A		
SYMBOL	MIN	MAX
A	0.500	0.600
A1	0.000	0.050
b	0.150	0.250
D	1.400	1.600
D1	1.100	1.300
e	0.500BSC	
E	1.400	1.600
E1	0.600	0.800
L	0.150	0.250

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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