Data Sheet

RTC6608OSP

0.03 GHz – 6.0 GHz SPDT Switch

**RichWave**

RoHS Compliant

Pb Lead-Free

HF Halogen FREE

MAY 2021 - Ver. 1.9

Description

The RTC6608OSP is a SPDT antenna switch designed for frequency range from 0.03 GHz up to 6.0 GHz range. The RTC6608OSP is processed in advanced CMOS SOI (silicon-on-insulator) technology featuring low insertion loss, high isolation and sustain high linearity at low supply voltage. The excellent performance of RTC6608OSP make it ideal to be applied in wireless applications for WLAN, Bluetooth® and IEEE 802.11a/b/g/n/ac transmit/receive function. The RTC6608OSP is housed in a compact 6L QFN1.0mm x 1.0mm plastic package.
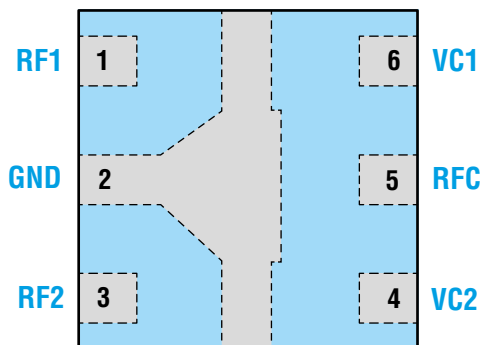
Functional Block Diagram
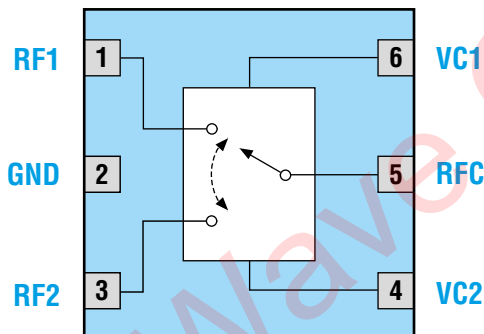
Features

- Frequency Range : 0.03 – 6.0 GHz
- Low Control Voltage : 1.6 ~ 3.6 V
- Low Insertion Loss
- High Isolation
- High P1dB
- Small and Low Profile Package : 6L QFN 1.0mm x 1.0mm x 0.4mm (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	RF1	RF Signal 1. DC blocking capacitor is needed
2	GND	Ground
3	RF2	RF Signal 2. DC blocking capacitor is needed
4	VC2	DC control voltage 2
5	RFC	Antenna port. DC blocking capacitor is needed
6	VC1	DC control voltage 1
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
Input power	P_{IN}	+33	dBm
Operating Ambient Temperature	T_A	-40 ~ +105	°C
Storage Temperature	T_{STG}	-40 ~ +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	0.03		6.0	GHz
Control Voltage High	VC1(H), VC2(H)	1.6	3.3 or 1.8	3.6	V
Control Voltage Low	VC1(L), VC2(L)	0	0	0.4	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	0	1
RFC – RF2	1	0

NOTE: "1" = 1.6 ~ 3.6 V, "0" = 0 ~ 0.4 V

Electrical Specifications (I)

T_A = +25°C, 50Ω system with control voltage VC = 0/3.3 V, P_{IN} = 0 dBm, unless otherwise noted

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Insertion Loss	IL_1	30 – 100 MHz		0.32	0.55	dB
	IL_2	100 – 1000 MHz		0.39	0.60	dB
	IL_3	2.4 – 2.5 GHz		0.40	0.60	dB
	IL_4	4.9 – 6.0 GHz		0.75	0.95	dB
Isolation (RF1,2 to RFC)	Iso_1	30 – 100 MHz	41	46		dB
	Iso_2	100 – 1000 MHz	23	28		dB
	Iso_3	2.4 – 2.5 GHz	22	25		dB
	Iso_4	4.9 – 6.0 GHz	23	27		dB
Isolation (RF1 to RF2)	Iso_5	30 – 100 MHz	41	46		dB
	Iso_6	100 – 1000 MHz	24	28		dB
	Iso_7	2.4 – 2.5 GHz	22	25		dB
	Iso_8	4.9 – 6.0 GHz	27	31		dB
Return Loss (Insertion Loss State)	RL_1	30 – 100 MHz	20	32		dB
	RL_2	100 – 1000 MHz	20	26		dB
	RL_3	2.4 – 2.5 GHz	18	23		dB
	RL_4	4.9 – 6.0 GHz	14	19		dB
Input Power for 1dB Compression	P1dB_1	@ 2.4 GHz	30	33		dBm
	P1dB_2	@ 5.8 GHz	29	32		dBm
Input 3rd Order Distortion Intercept Point	IIP3	PIN = +20 dBm/tone Δf = 1 MHz, 2.45 GHz VC = 2.7 V	42	44		dBm
2nd Harmonic	2fo_1-1	f = 2.45 GHz Pin = +25 dBm, CW	70	73		dBc
3rd Harmonic	3fo_2-1		70	76		dBc
2nd Harmonic	2fo_1-2	f = 5.8 GHz Pin = +24 dBm, CW	71	74		dBc
3rd Harmonic	3fo_2-2		77	82		dBc
Linear Power for EVM	EVM_2G	f = 2.45 GHz, WLAN,802.11g,OFDM, 54Mbps, 64QAM, Pin for 2.5% error	25	27		dBm
Switching Rise/Fall Time	tr	10/90% to 90/10% RF		85	130	ns
Switching On/Off Time	tc	50% Vc to 90/10% RF		115	140	ns
Control Current	Ictl	VC = 3.3 V		5	15	µA

Electrical Specifications (II)

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Insertion Loss	IL_1	30 – 100 MHz		0.37	0.60	dB
	IL_2	100 – 1000 MHz		0.43	0.65	dB
	IL_3	2.4 – 2.5 GHz		0.57	0.80	dB
	IL_4	4.9 – 6.0 GHz		0.80	1.05	dB
Isolation (RF1,2 to RFC)	Iso_1	30 – 100 MHz	41	46		dB
	Iso_2	100 – 1000 MHz	24	28		dB
	Iso_3	2.4 – 2.5 GHz	20	23		dB
	Iso_4	4.9 – 6.0 GHz	23	27		dB
Isolation (RF1 to RF2)	Iso_5	30 – 100 MHz	41	46		dB
	Iso_6	100 – 1000 MHz	25	30		dB
	Iso_7	2.4 – 2.5 GHz	20	24		dB
	Iso_8	4.9 – 6.0 GHz	26	30		dB
Return Loss (Insertion Loss State)	RL_1	30 – 100 MHz	25	32		dB
	RL_2	100 – 1000 MHz	20	26		dB
	RL_3	2.4 – 2.5 GHz	20	23		dB
	RL_4	4.9 – 6.0 GHz	15	20		dB
Input Power for 1dB Compression	P1dB_1	@ 2.4 GHz	28	31		dBm
	P1dB_2	@ 5.8 GHz	27	30		dBm
Input 3rd Order Distortion Intercept Point	IIP3	PIN = +20 dBm/tone Δf = 1 MHz, 2.45 GHz VC = 1.8 V	39	41		dBm
2nd Harmonic	2fo_1-1	f = 2.45 GHz Pin = +25 dBm, CW	64	69		dBc
3rd Harmonic	3fo_2-1		56	62		dBc
2nd Harmonic	2fo_1-2	f = 5.8 GHz Pin = +24 dBm, CW	63	68		dBc
3rd Harmonic	3fo_2-2		53	60		dBc
Linear Power for EVM	EVM_2G	f = 2.45 GHz, WLAN,802.11g,OFDM, 54Mbps, 64QAM, Pin for 2.5% error	22	24		dBm
Switching Rise/Fall Time	tr	10/90% to 90/10% RF		200	300	ns
Switching On/Off Time	tc	50% Vc to 90/10% RF		140	250	ns
Control Current	Ictl	VC = 1.8 V		2	10	µA

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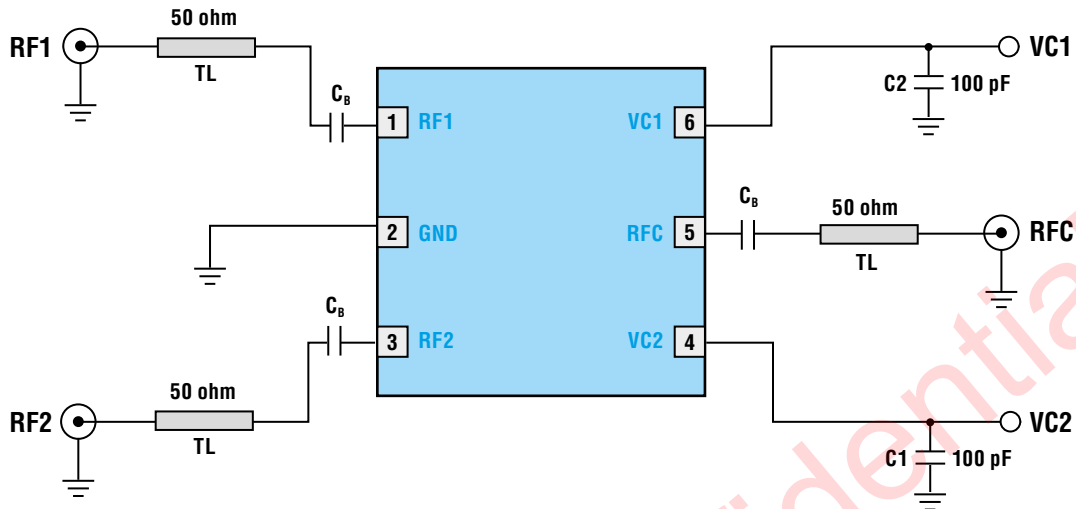
NOTE : Information in the above application is for reference only, and does not guarantee the mass production design of the device.

Evaluation Board Bill of Material

| Component	Value	Description	Supplier	Part Number
IC		RTC6608OSP	RichWave	
C_B	68 pF	DC blocking capacitor	Walsin	0402N680J500LT
C1, C2	100 pF	De-coupling capacitor	Walsin	0402N101J500LT

NOTE :

1. C_B = 68 pF for operation 0.1 ~ 6.0 GHz are required on all RF ports.

2. Larger Capacitance recommended for lower frequency operation.

3. Exposed paddle in the bottom must be grounded.

Recommended Footprint Patterns
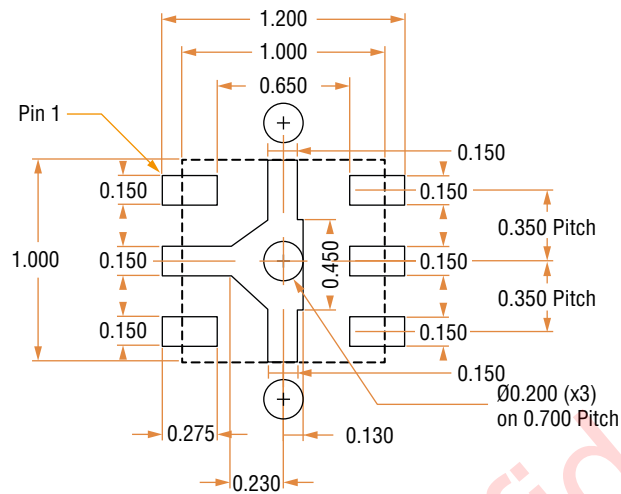
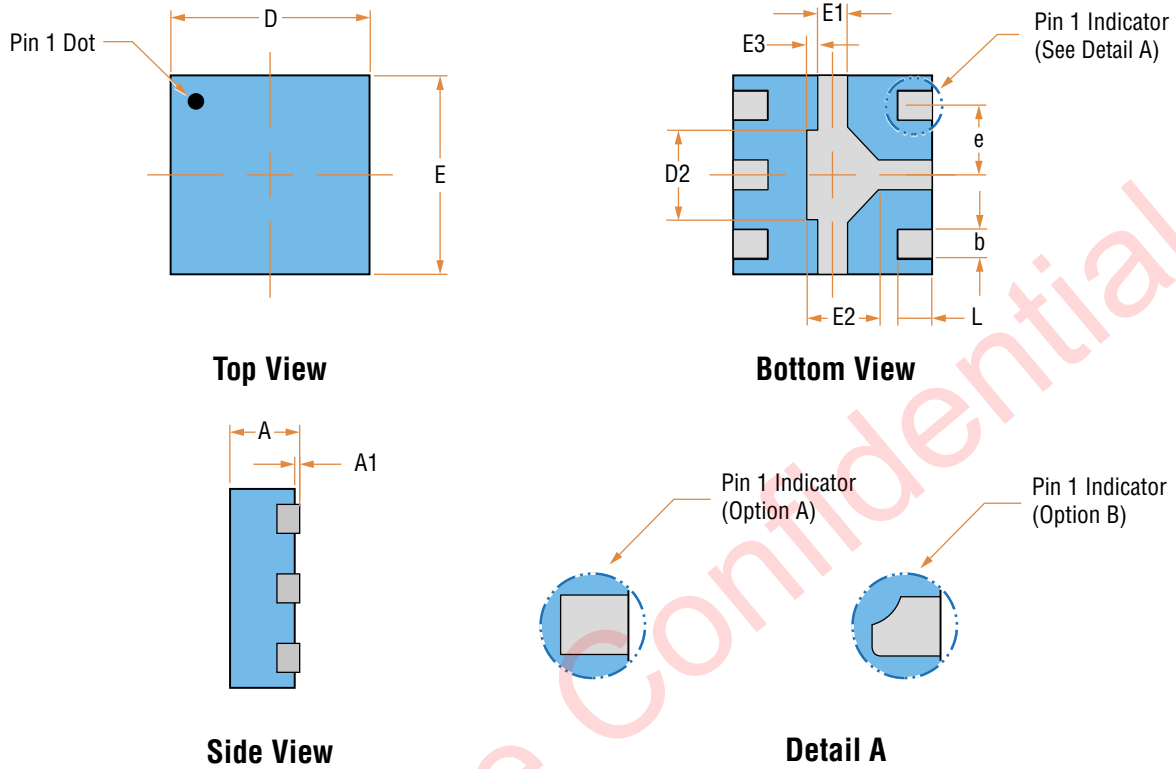**PCB Board Metal & Via Pattern (Top View)**
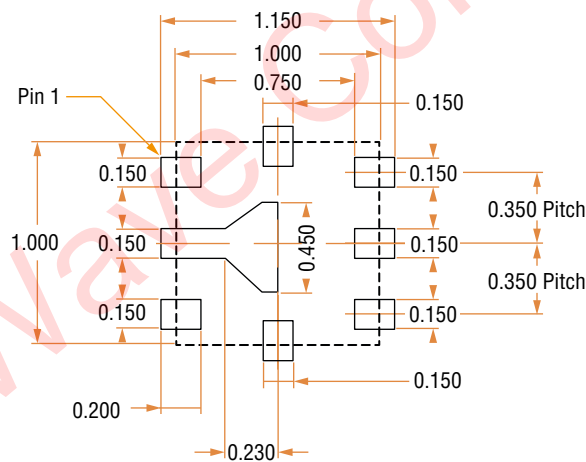
PCB Stencil Pattern (Top View)

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

Package Dimensions

Top View

Pin 1 Dot

D

E

Bottom View

E1

E3

D2

e

b

L

E2

Pin 1 Indicator
(See Detail A)

Side View

A

A1

Detail A

Pin 1 Indicator
(Option A)

Pin 1 Indicator
(Option B)

6L QFN 1 X 1 X 0.4 - B			
SYMBOL	**MIN**	**TYP**	**MAX**
A	0.300	0.375	0.400
A1	0.000	0.020	0.050
b	0.100	0.150	0.200
D	0.900	1.000	1.100
D2	0.350	0.450	0.550
e	0.350 BSC		
E	0.900	1.000	1.100
E1	0.050	0.150	0.250
E2	0.310	0.365	0.410
E3	0.005	0.055	0.105
L	0.125	0.175	0.225

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

RichWave Technology Corp.

3F, No.1, Alley 20, Lane 407. Sec.2, Tiding Bvd., Neihu Dist., Taipei City 114, Taiwan, R.O.C.
TEL +886-2-87511358   FAX +886-2-66006887

www.richwave.com.tw

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