0.1GHz-6GHz SPDT switch

Main features

- Frequency range: 0.1GHz -6GHz
- Wide power supply voltage: 2.3V -5V
- IP1dB=+38.5dBm
- Low insertion loss:

  --0.3dB@2GHz

  --0.6dB@6GHz
- Ultra low DC power consumption: 35uA
- Small package, low cost
- No external DC blocking capacitors.

Chip application

- Conventional medium power switching applications
- Industrial radio
- Smart home
- Applications with transceiver system and need to be switched
- Antenna switch for multimode systems

Chip packaging

QFN2 × 2, 12 pin

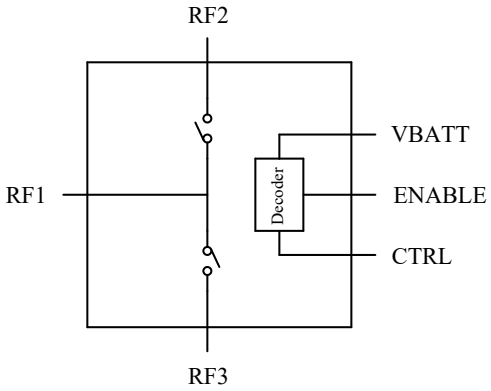


Figure 1.1 Block Diagram

Pin diagram

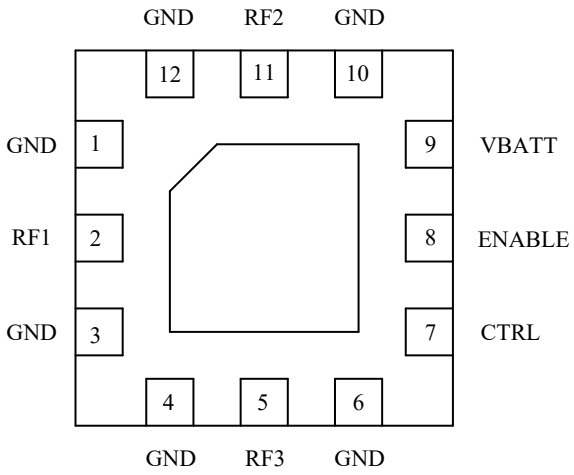


Figure 2.1 Pin Diagram

Pin description

Pin number	Pin name	Pin description
1, 3, 4, 6, 10, 12	GND	Ground potential, good grounding required
2	RF1	RF port 1
5	RF3	RF port 3
7	CTRL	Control voltage input port
8	ENABLE	Enable input port
9	VBATT	Power input port
11	RF2	RF port 2

Electrical characteristics

Absolute maximum ratings

parameter	unit	minimum value	Maximum	condition
DC control voltage	V	-1.2	+5.5	

RF port power	dBm		+40	
Chip operating temperature	℃	-40	+85	
Chip storage temperature range	℃	-40	+125	

Note: Exceeding one or more of the above absolute maximum ratings may cause permanent damage to the device. It is recommended to use it within the range listed in the table.The maximum value of RF input signal strength corresponds to 50 Ohm of RF input impedance.

Typical performance characteristics

Power supply voltage: VBATT=2.3V-5V, control voltage: CTRL=0/1.6-2.7V, operating temperature: 25 ℃, Pin=0dBm。

parameter	unit	Min	Typ	Max	Test conditions
RF characteristics					
Insertion loss (IL)	dB		0.25	0.35	0.1-1.0GHz
			0.3	0.45	1.0-2.0GHz
			0.35	0.5	2.0-3.0GHz
			0.45	0.6	3.0-5.0GHz
			0.6	0.8	5.0-6.0GHz
Isolation (ISO)	dB	38	40		0.1-1.0GHz
		30	32		1.0-2.0GHz
		28	30		2.0-3.0GHz
		22	25		3.0-5.0GHz
		16	20		5.0-6.0GHz
Input return loss (RL)	dB		-25		0.1-1.0GHz
			-20		1.0-2.0GHz
			-18		2.0-3.0GHz
			-15		3.0-5.0GHz
			-12		5.0-6.0GHz

Switching time Up/down On/Off	 us us		 0.5 1.5		 10% to 90% or 90% to 10% 50% CTRL to 90% or 10%
Input 0.1dB compression point (IP0.1dB)	dBm		+38.5		f_{in}=2GHz
Input third-order intercept point (IIP3)	dBm	+55	+60		f_{in}=2GHz 10dBm/tone，Δf=1MHz
DC characteristic					
Control voltage Low High	 V V	 0 1.6		 0.4 2.7	 CTRL_L CTRL_H
Supply voltage	V	2.3		5	
Supply current	uA		35		
Control current	uA		1		CTRL=1.8V
Shutdown mode supply current	uA		6		ENABLE=0 VBATT=2.3V - 5V

Logic truth table

CTRL	**ENABLE**	RF1-RF2	RF1-RF3
1	1	ON	OFF
0	1	OFF	ON
X	0	OFF	OFF

"1" indicates the high level status of control pin (1.6-2.7V)

"0" indicates low level state of control pin (0-0.4V)

"X" indicates that the status is "0" or "1"

The logic state not listed will make the switch work abnormally, but will not damage the device

Chip application

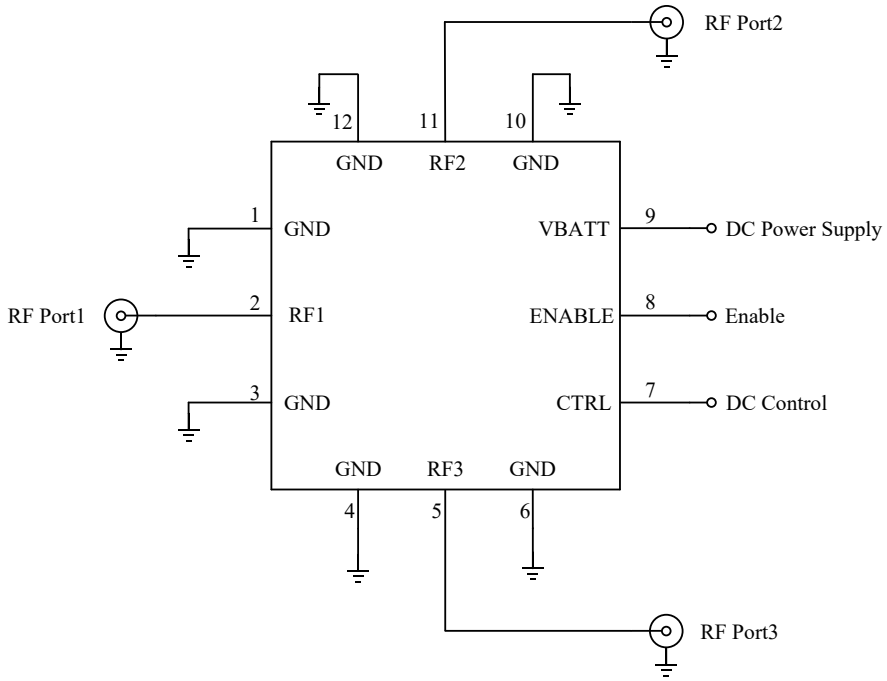
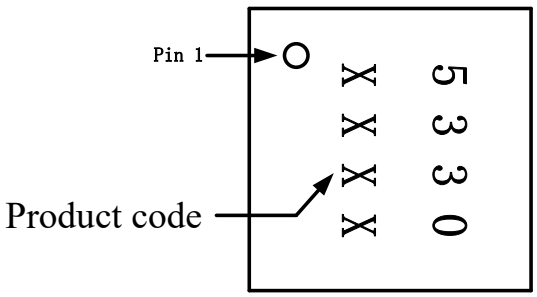


Figure 4.1 chip application

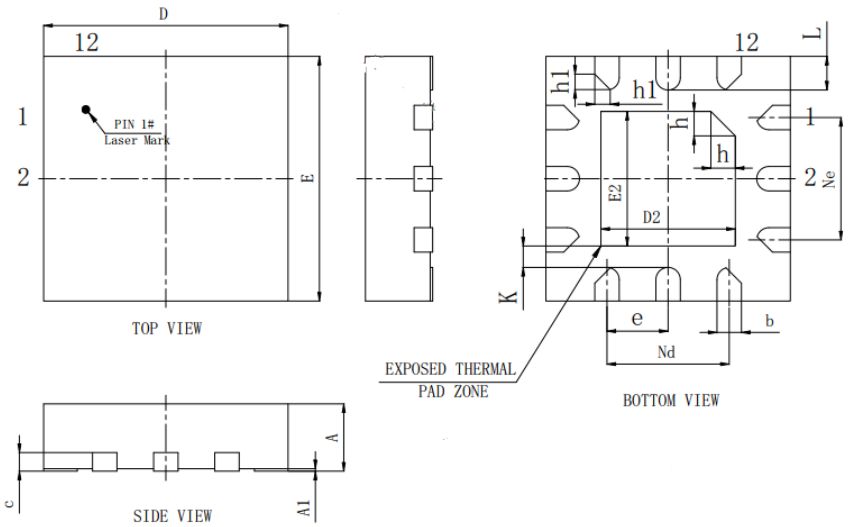
Package information

Chip marking



Packaging dimensions

The chip is packaged with QFN, QFN2 × 2, 12 pin. The following is the package size information.



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.50	0.55	0.60
	0.45	0.50	0.55
A1	0	0.02	0.05
b	0.15	0.20	0.25
c	0.152REF		
D	1.90	2.00	2.10
D2	1.00	1.10	1.20
Ne	1.00BSC		
Nd	1.00BSC		
e	0.50BSC		
E	1.90	2.00	2.10
E2	1.00	1.10	1.20
L	0.225	0.275	0.325
h	0.15	0.20	0.25
h1	0.09	0.14	0.19
K	0.175REF		

Chip soldering and storage

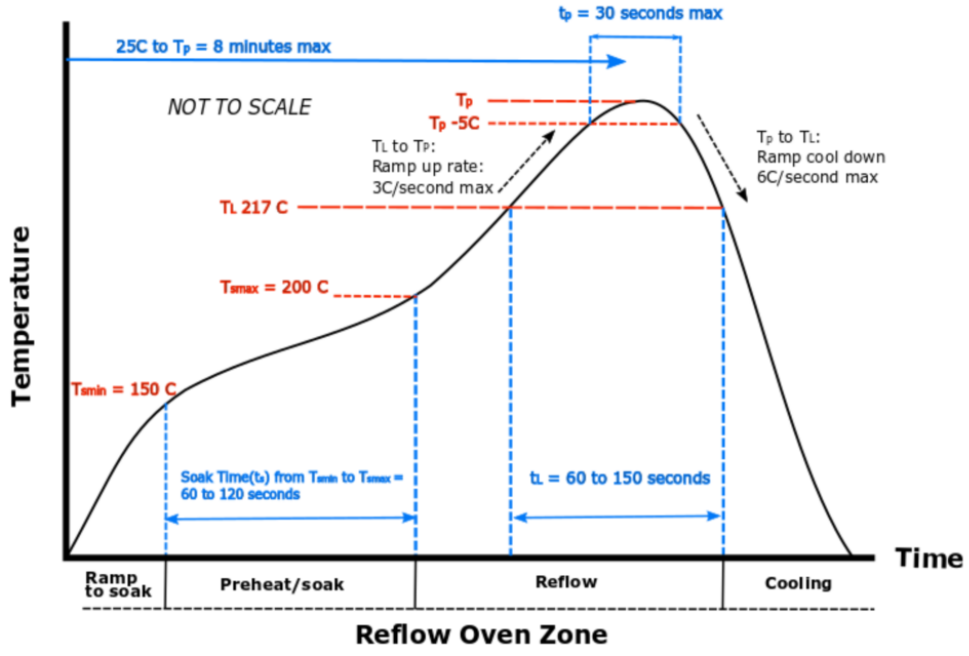
Moisture ensitivity level:

Moisture Sensitivity Level (MSL): Level 3

MSL, please refer to the IPC/JEDEC J-STD-020 standard.

Reflow soldering curve:

Refer to IPC/JEDEC J-STD-020 standard



Lead-free soldering process:

1. Preheat the temperature zone to 150℃-200℃ and maintain it for 60s-120s;

2. Reflow temperature > 217℃, duration 60s-150s;

Temperature rise slope: from the reflux temperature (217℃) to the peak temperature range, the temperature rise slope is ≤3℃/S;

Cooling rate: Within the range from peak temperature to reflow temperature of 217℃, the cooling rate is ≤6℃/S;

3. The peak set temperature should not exceed 260℃, and the actual temperature should also not exceed 260℃. The total time from the highest temperature to a decrease of 5℃ should not exceed 30 seconds

4. Time from normal temperature (25℃) to peak temperature: ≤8 minutes;

5. The number of reflow soldering cycles for the chip shall be no more than 3;

The reflow soldering time can be set based on various factors such as equipment model, equipment lifespan, number of temperature zones, heating method, PCB board thickness, solder paste model, heat resistance of electronic components, solder paste glossiness after soldering, and stencil condition. Proper adjustments to temperature and chain speed can be made within the conditions specified in Table 5-2 of J-STD-020. The temperature process parameters set for each product and its corresponding equipment should be unique.

- Furnace temperature testing frequency: Furnace temperature testing is required when switching products, and it should be conducted at least every 24 hours during continuous production;
- The reflow oven should undergo a temperature stability verification assessment at least once a year;
- The lifespan of the temperature measurement board is recommended to be 50-100 uses;
- The temperature measuring instrument needs to be calibrated regularly;
- When considering the slope of temperature rise and fall, it is important to ensure that the chain speed and statistical time interval are reasonable.

Key points of temperature measurement:

1. Perform operations at 3-7 locations on the substrate;

2. In areas with high/low component loading density;

3. At or near the location of components with large heat capacity;

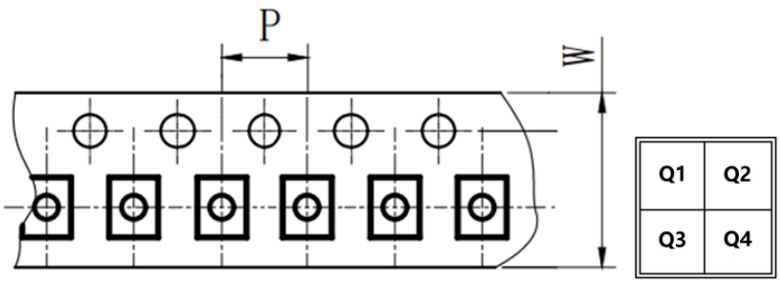
4. For component leads and physical surfaces with weaker heat resistance (IC/electrolytic capacitors);

5. To accurately measure the peak temperature of the package, refer to the thermocouples recommended in JEP140.

Packaging and transportation

Packaging

The chip is packed with vacuum tape, which is moisture-proof and anti-static.The use process is compatible with the main mounters in the industry.The minimum package is 3000 pieces/plate.



W=8.0mm, P=4.0mm, PIN1 orientation: Q1

ESD protection

Please take precautions against static electricity and moisture during the transportation and production of chips.