CAN1114 SP4T Switch

Product Datasheet

Rev 1.2, July, 2018

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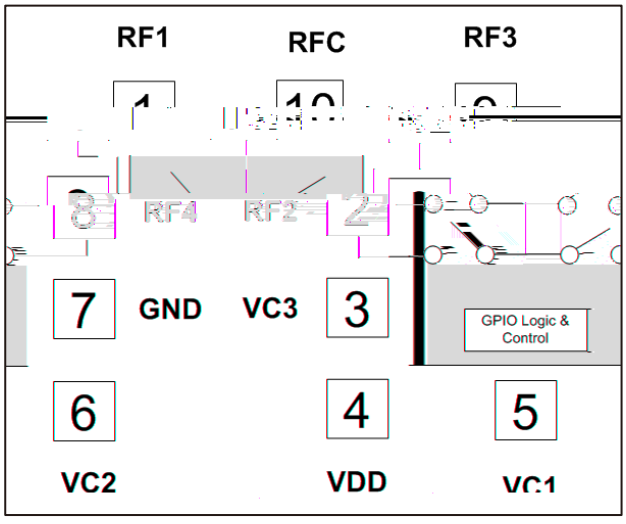
CAN1114

Single Pole Four Throw Switch

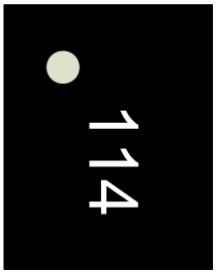
General Description

The CAN1114 is a very low insertion loss SP4T antenna switch specifically designed for high performance antenna tuning application. All RF path performances are enhanced with an ultra-low on state resistance and low off state capacitance. It allows the creation of advanced tuning topologies to maximize TRP and TIS performance in space constrained applications.

The antenna switching is controlled by GPIO configuration, namely three logic control voltage inputs (VC1, VC2 and VC3). Depending on the logic voltage level applied to the control pins, the RFC pin is connected to one of four switched RF outputs (RF1 to RF4). The negative voltage generator enables less parasitic switch capacitance, therefore yielding better isolation and less insertion loss.



Functional Block Diagram



Package

- Standard QFN Package
- 10-pin
- 1.1mmx1.5mm x0.5mm

Features

- Broadband Frequency Range: 0.1 to 3.0 GHz
- Low On-resistance 1.1
- Low Coff 0.18pF
- Off Ports with Open Type Configuration
- 2.5 to 4.8V Supply Voltage Range
- Integrated Logic

Applications

- Antenna Tuning
- Band Switching
- Impedance Tuning

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{DD}	5.0	V
Control voltage	V_C	3.3	V
RF Input power, 25% duty cycle VDD = 2.85V, VC = 0/1.8V, Temp=25	P_{IN}	43	dBm
Max voltage between any combination of RF ports or ground	Vp	45	V
Operating temperature	T_{OP}	-40 to +85	
Storage temperature	T		

Note: *Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.*

CAUTION: *Although this device is designed to be as robust as possible, Electrostatic Discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.*

Nominal Operating Parameters

Parameter	Symbol	Specification			Unit	Conditions
		Min	Typ	Max		
General Performance						Active Mode. V_{DD} = 2.85V, V_C = 0/+1.8V.
Operating Frequency		100		3000	MHz	
Supply Voltage	V_{DD}	2.4	2.85	4.8	V	
Supply Current	I_{DD}		30			
Control Voltage High	VC1 VC2 VC3	1.45	1.80		V	
Control Voltage Low	VC1 VC2 VC3		0	0.45	V	
Control Current	I_{VC}		1			V_C = 1.8V.

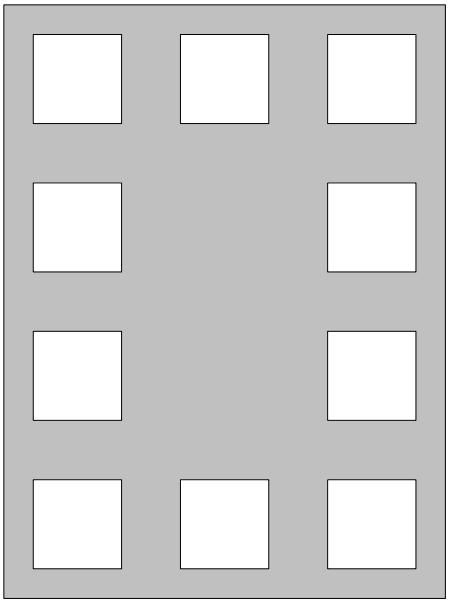
Electrical Specifications

Parameter	Specification			Unit	Conditions
	Min	Typ	Max		
RF Performance					V_{DD} = 2.85V, V_C = 0/+1.8V.
Insertion loss (RFC pin to RF1/2/3/4 pins)		0.22		dB	700 915 MHz
		0.37		dB	915 1910 MHz
		0.59		dB	1910 2700 MHz
Isolation (RFC pin to RF1/2/3/4 pins)		22		dB	700 915 MHz
		17		dB	915 1910 MHz
		15		dB	1910 2700 MHz
Input return loss (RFC pin to RF1/2/3/4 pins)		21		dB	700 915 MHz
		15		dB	915 1910 MHz
		13		dB	1910 2700 MHz
R_{ON}		1.1			@100MHz
Coff		0.18		pF	@100MHz
Start-up Time		10		µs	V_{DD} from 0V to 90% final value
ON Switching speed		10		µs	90% final value
OFF Switching speed		10		µs	90% final value
Second Harmonic		-68		dBm	915 MHz, Pin = 26dBm
Third Harmonic		-86		dBm	
Second Harmonic		-77		dBm	1910 MHz, Pin = 26dBm
Third Harmonic		-86		dBm	

Control Logic Table

	Logic State	VC1	

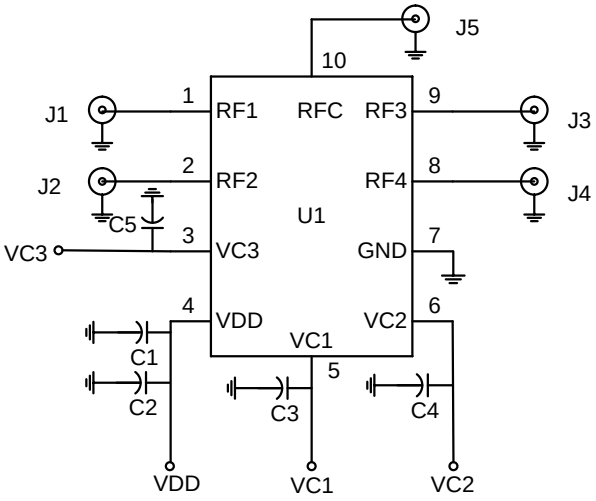
Pin Out



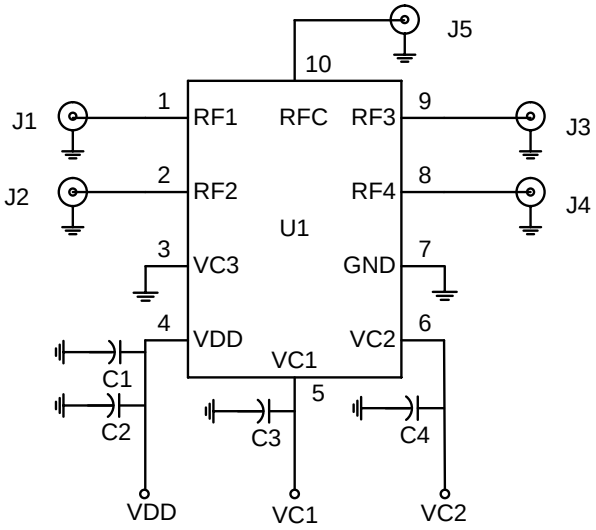
Pin Names and Descriptions

Pin	Name	Description
1	RF1	RF port 1.
2	RF2	RF port 2.
3	VC3	Control Voltage 3.
4	VDD	Voltage Supply.
5	VC1	Control Voltage 1.
6	VC2	Control Voltage 2.
7	GND	Ground.
8	RF4	RF port 4.
9	RF3	RF port 3.
10	RFC	RF common port.

Evaluation Board Schematic



Application diagram with 8 modes



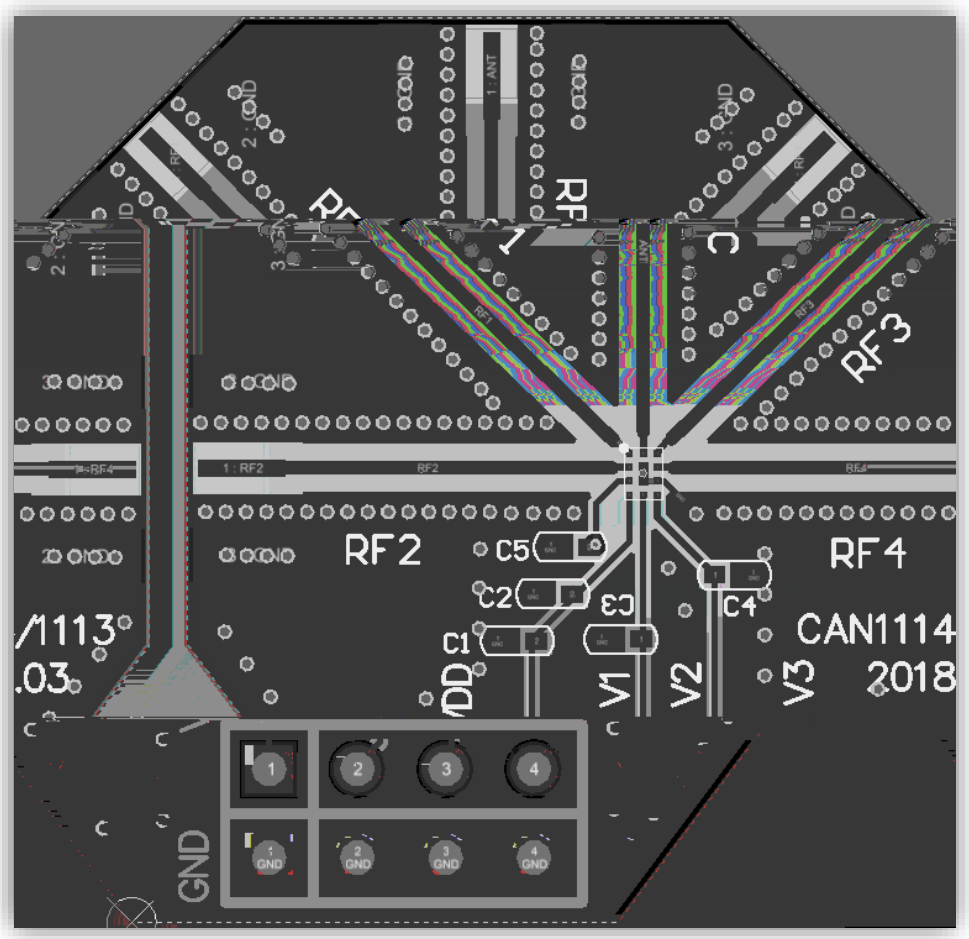
Application diagram with 4 modes

EVB BOM List

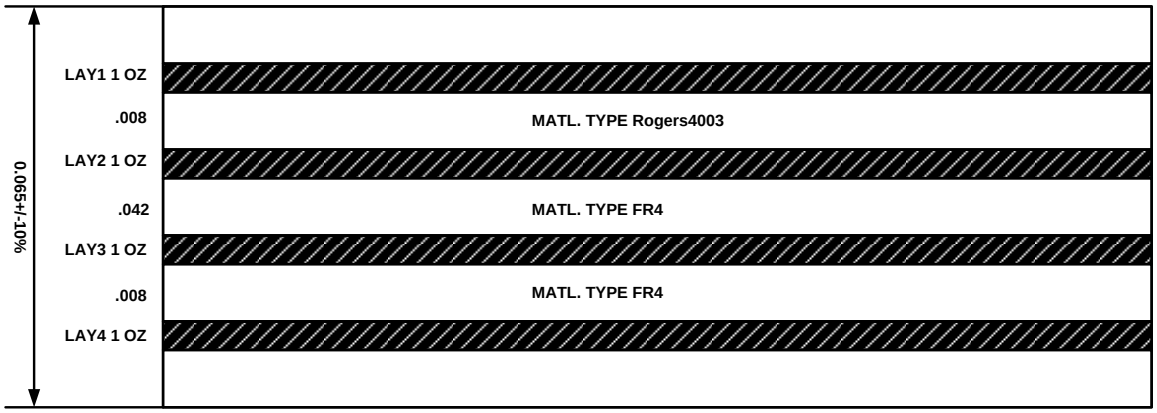
Part Number	Part	Part Description
U1	CAN1114	CAN1114,SP4T switch
J1,J2,J3,J4&J5	SMA connector	
C1,C2,C3,C4,C5	0.1u F capacitor	Size:0402

Note:*DNP components not listed in BOM.*

Evaluation Board Layout



EVB Layer Information



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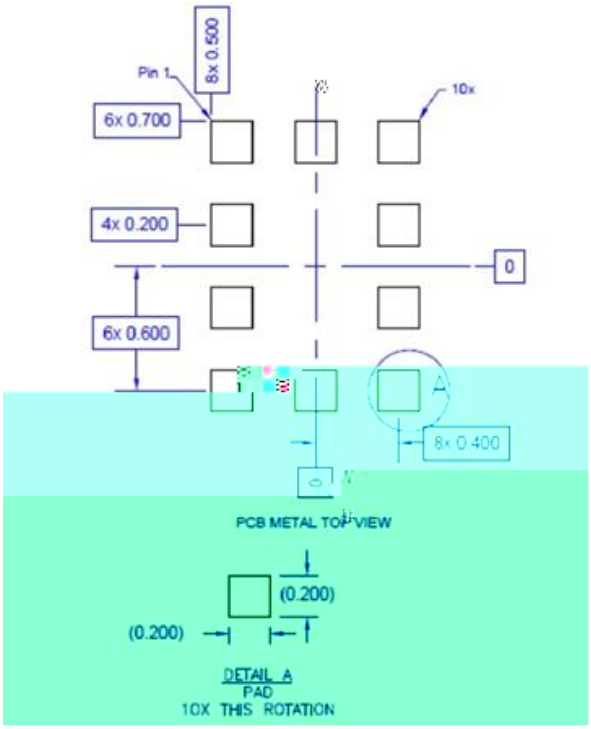
randing Drawing(Dimensions in millimeters)

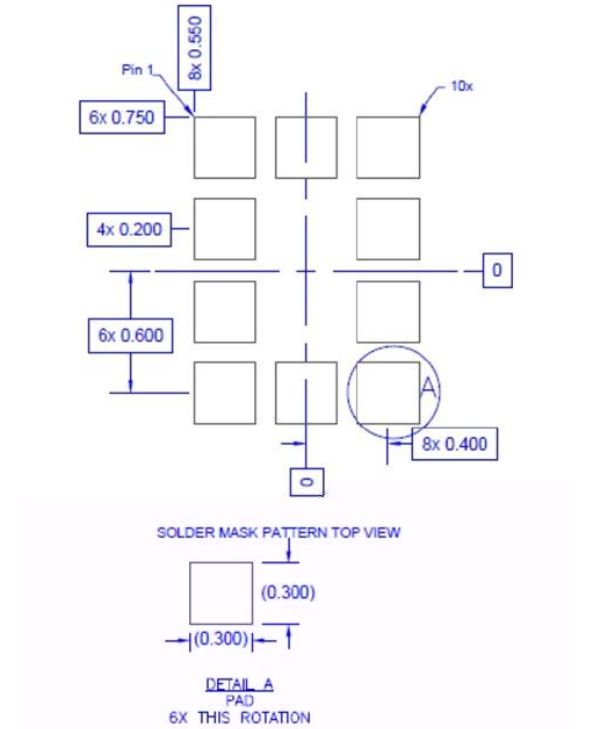
MILLMETER		
MIN	NOR	MAX
0.45	0.5	0.55
0	0.02	0.05
0.15	0.2	0.25
0.40BSC		
1.50BSC		
1.10BSC		
0.15	0.25	0.25
0.05		
0.05		
0.07		
0.1		
0.05		
0.08		

PCB Design Requirements

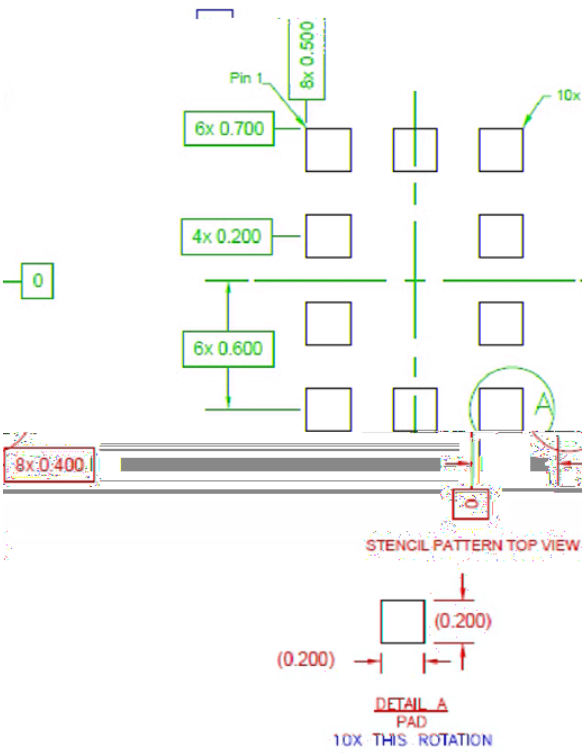
PCB Metal Land Pattern



PCB Solder mask Pattern



PCB Stencil Pattern



Timing Diagram

Power ON and OFF sequence

It is very important that the user adheres to the correct power-on/off sequence in order to avoid damaging the device. The control signals VC1, VC2 and VC3 should be set to 0V unless VDD is set in the operating voltage range.

Power ON

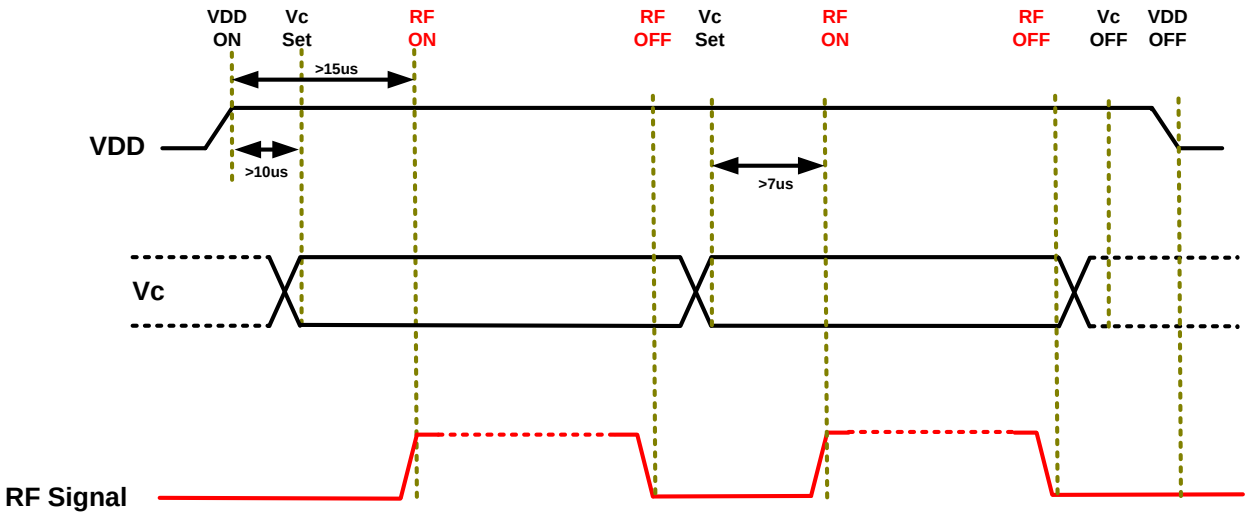
1) Apply voltage supply VDD
2) Set Controls - VC1 , VC2 and VC3
3) Wait 15

Change switch position from one RF port to another

1) Remove RF
2) Change control voltages VC1, VC2 and VC3 to set the switch to desired RF port
3) Wait 7

Power OFF

1) Remove RF
2) Remove control voltages VC1, VC2 and VC3
3) Remove VDD



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