

CMOS Very Small 1 bit Control SPDT Switch for 0.01~6.0GHz

■ **Applications**

SPDT Switch for TRx portion.

■ **Features**

- Small Package6 pin CSP Package
(0.7mm×1.1mm×0.52mm max, RoHS Compliant)
- MSL1
- HBM.....1kV

■ **Absolute Maximum Ratings**

Symbol	Parameter	Conditions	Rating	Unit
Vdd	Supply Voltage	Ta = 25°C	5.5	V
CTL	Control Voltage	Ta = 25°C	4.0	V
Pin	RF Input Power	Ta = 25°C, Vdd=1.8V 50ohm, Duty Cycle = 50% CTL(H) =1.8V,CTL(L) =0V Correspond RF path is ON	37	dBm
Top	Operating Temperature	-	-40 to 85	°C
Tstg	Storage Temperature	-	-55 to 150	°C

■ **DC Electrical Specifications**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Vdd	Supply Voltage		1.68	1.8	5.0	V
Idd	Supply Current	Ta = -40~85°C	-	65	100	uA
CTL(H)	Control Voltage (High)	Ta = -40~85°C	1.2	1.8	3.6	V
CTL(L)	Control Voltage (Low)	Ta = -40~85°C	-0.2	0	0.5	V
Ictl	Control Current	Ta = -40~85°C	-	0.01	5	uA

■ **Electrical Specifications (Ta=25°C, VDD=1.8V, VCTL(H)=1.8V, VCTL(L)=0V, Pin=0dBm)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
IL	Common port to RF Port1 Common port to RF Port2	400 – 1000MHz	-	0.17	0.37	dB
		1000 – 2200MHz	-	0.24	0.45	dB
		2200 – 2700MHz	-	0.25	0.47	dB
		2700 – 3800MHz	-	0.35	0.60	dB
		3800 – 6000MHz	-	0.45	0.85	dB
ISO	Common port to RF Port1 Common port to RF Port2	400 – 1000MHz	36	41	-	dB
		1000 – 2200MHz	27	32	-	dB
		2200 – 2700MHz	26.5	32	-	dB
		2700 – 3800MHz	23	29	-	dB
		3800 – 6000MHz	16	23	-	dB

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Tsw	Switching Time	Vctl 50% ~ RF 90% or Vctl 50% ~ RF 10%	-	2.8	5	us

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
HD2	2nd Harmonics (Pin=26dBm)	698 – 960MHz	-	-81	-65	dBm
		1400 – 3800MHz	-	-78	-60	dBm
	2nd Harmonics (Pin=35dBm)	824 – 915MHz	-	-63	-50	dBm
	2nd Harmonics (Pin=33dBm)	1710 – 1910MHz	-	-65	-50	dBm
HD3	3rd Harmonics (Pin=26dBm)	698 – 960MHz	-	-93	-70	dBm
		1400 – 3800MHz	-	-88	-65	dBm
	3rd Harmonics (Pin=35dBm)	824 – 915MHz	-	-65	-55	dBm
	3rd Harmonics (Pin=33dBm)	1710 – 1910MHz	-	-68	-55	dBm

- Reference : IMD performance
(Ta=25°C, Vdd=1.8 V, CTL=0 / 1.8 V)

•B1

Power [dBm]		Frequency [MHz]		IMD2 [dBm]	IMD3 [dBm]
Tx	Jammer	Tx	Jammer		
20	-15	1950	1760	-	-135.9 at 2140 MHz
20	0	1950	1760	-	-120.2 at 2140 MHz
20	-15	1950	190	-128.9 at 2140 MHz	-
20	0	1950	190	-115.7 at 2140 MHz	-

•B2

Power [dBm]		Frequency [MHz]		IMD2 [dBm]	IMD3 [dBm]
Tx	Jammer	Tx	Jammer		
20	-15	1850	1755	-	-135.6 at 1945 MHz
20	0	1850	1755	-	-121.9 at 1945 MHz

•B5

Power [dBm]		Frequency [MHz]		IMD2 [dBm]	IMD3 [dBm]
Tx	Jammer	Tx	Jammer		
20	-15	836.5	791.5	-	-135.5 at 881.5 MHz
20	0	836.5	791.5	-	-121.3 at 881.5 MHz
20	-15	836.5	45	-120 at 881.5 MHz	-
20	0	836.5	45	-105.1 at 881.5 MHz	-

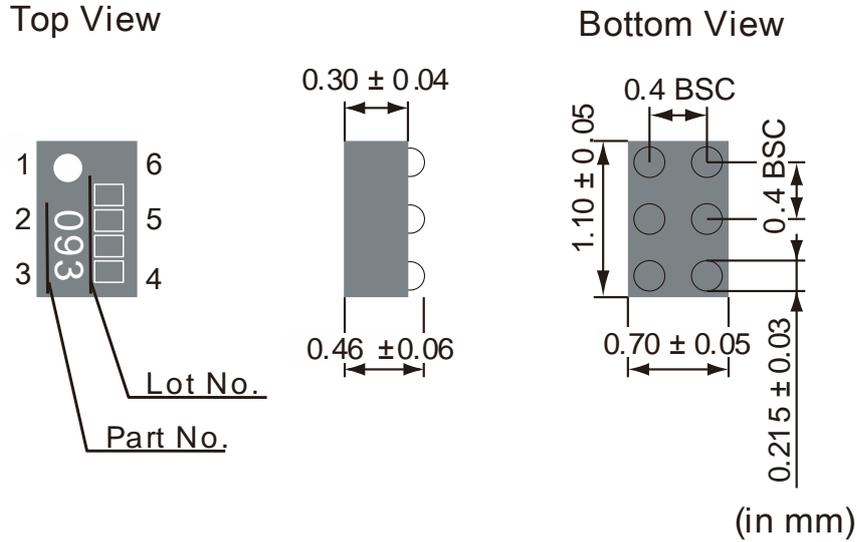
•B1+B3 uplink CA

Power [dBm]		Frequency [MHz]		IMD2 [dBm]	IMD3 [dBm]
Tx	Jammer	Tx	Jammer		
22	0	1950	1747.5	-	-117.1 at 2152.5 MHz
22	10	1950	1747.5	-	-107.1 at 2152.5 MHz

•B2+B4 uplink CA

Power [dBm]		Frequency [MHz]		IMD2 [dBm]	IMD3 [dBm]
Tx	Jammer	Tx	Jammer		
22	0	1910	1710	-	-115.6 at 2110 MHz
22	10	1910	1710	-	-106.2 at 2110 MHz

■ Package Outline and Pin Connections

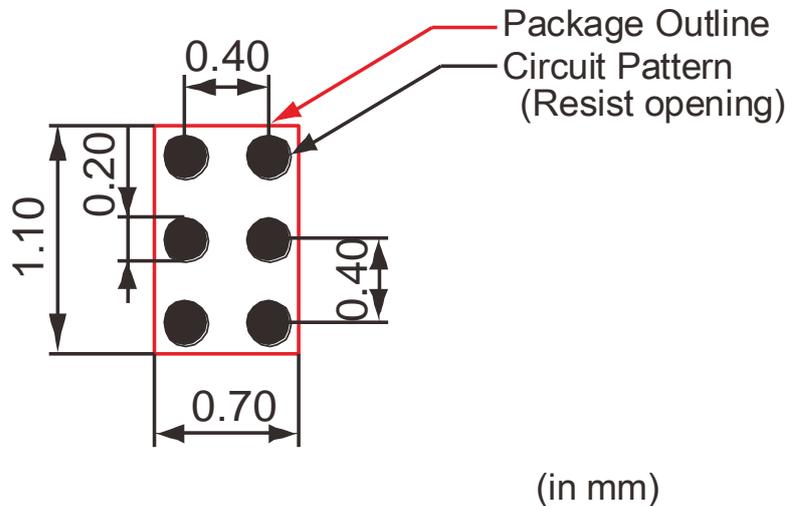


Top View



■ Land Pattern

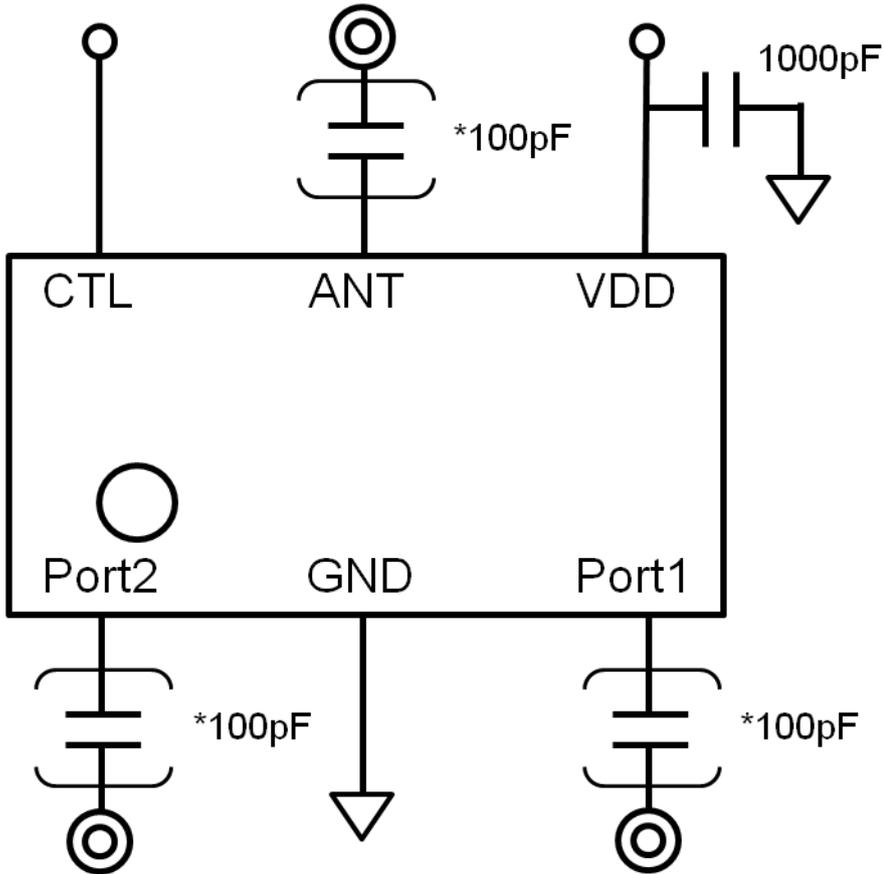
- land size (Resist opening area) : $\phi 200\mu\text{m}$
- ※Over resist



■ Truth Table

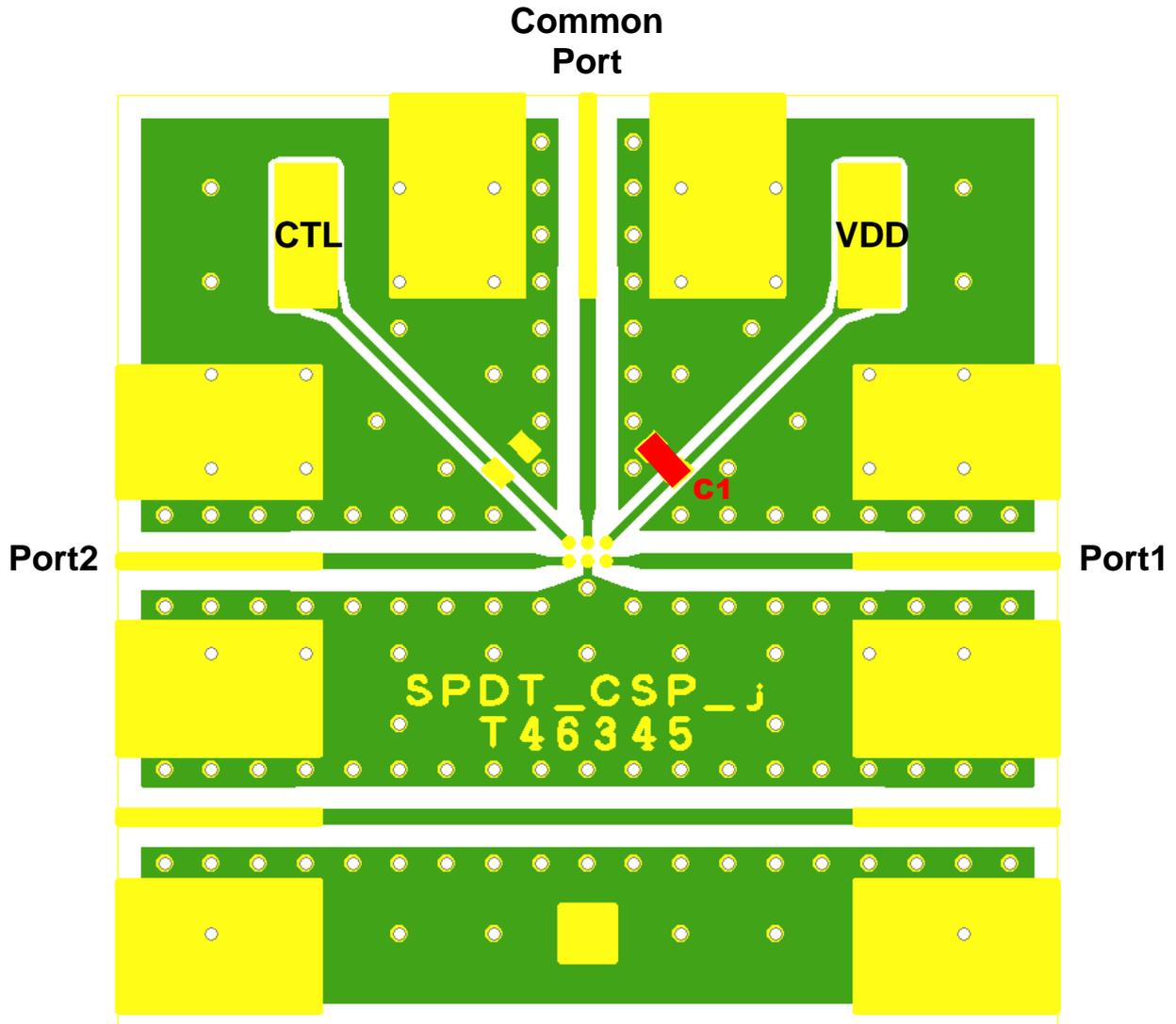
Mode	RF1	RF2
CTL Low	ON	OFF
CTL High	OFF	ON

■ Evaluation Circuit



*DC blocking capacitors on RF ports can be removed if DC Voltage from external = 0V.

■ Evaluation Board



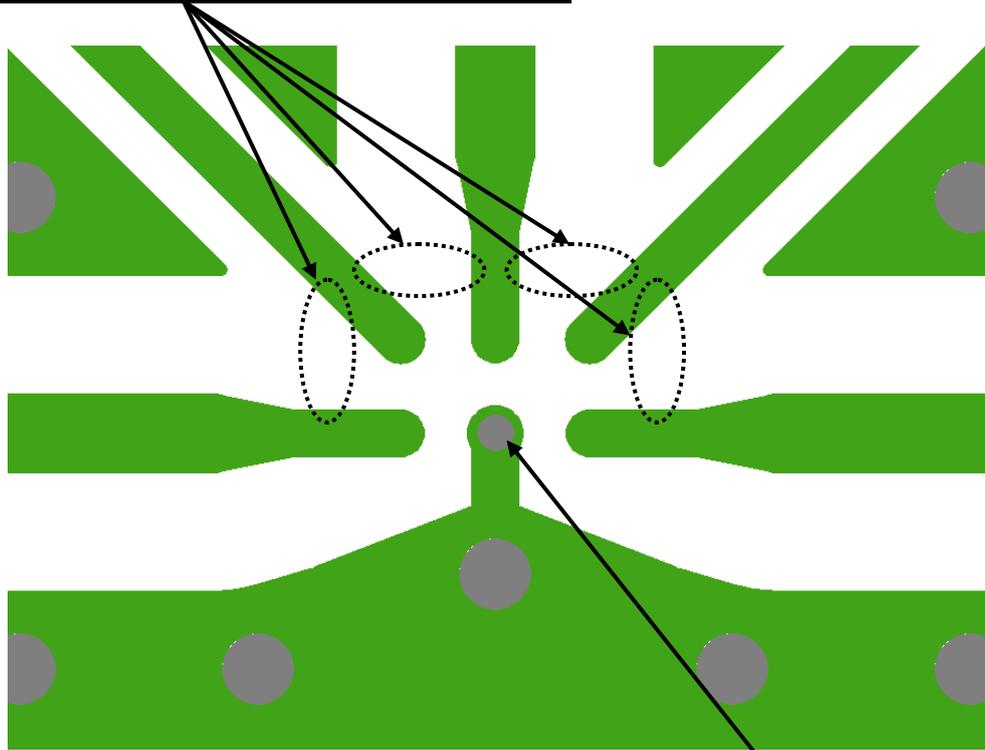
Parts List

Part No.	Products	Value
C1	GRM155 (Murata)	1000pF

Substrate

FR4, $\epsilon_r=4.4$
 Thickness = 0.2mm + 0.8mm(dummy)
 Metal Thickness:18um
 Size=20mm x 20mm

Control signals should be wired far away from RF signal. The poor isolation between RF and control signal causes degradation of RF performance.



Vias on ground pad as well as the electrode pattern have to connect to RF main ground layer. The poor ground causes the degradation of RF performance.



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