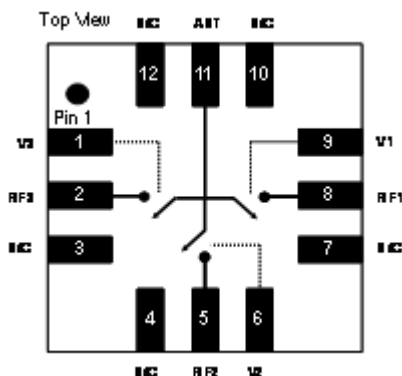## SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Functional Block Diagram

Product Description

TriQuint's TQP4M3019 is a high power antenna switch in a single pole three throw (SP3T) configuration. The die utilizes TriQuint's PHEMT MMIC switch process to provide optimized cross-modulation performance for use in CDMA applications. PHEMT Switches are a very low DC current replacement for classic PIN diode based switches. This product is ideally suited to applications where the antenna of a CDMA handset is to be routed to the Cellular duplexer, the PCS duplexer, AWS duplexer and the GPS receiver input. The design is symmetric and broadband allowing the user to assign cellular, PCS, AWS and GPS to ports RF1, RF2 or RF3 as desired.

Electrical Specifications

Parameter	Typ	Units
Cellular Insertion Loss	0.50	dB
GPS Insertion Loss	0.52	dB
AWS Insertion Loss	0.58	dB
PCS Insertion Loss	0.60	dB
Cellular Isolation	27	dB
GPS Isolation	24	dB
AWS Isolation	23	dB
PCS Isolation	22	dB
Cellular Cross Modulation[2]	-108	dBm
AWS Cross Modulation	-106	dBm
PCS Cross Modulation	-105	dBm

Note 1: Test Conditions Zo=50ohms: Vcontrol = 0V/2.6V, Tc=25°C
Note 2: Cross-Modulation Test Conditions:
Cellular: PTx1 = 23 dBm @ 836 MHz, PTx2= 23dBm @837 MHz, P_{nt} =-23 dBm @ 881.5 MHz
AWS:PTx1 = 23 dBM @ 1710 MHz, PTx2 = 23dBm @ 1755 MHz, P_{nt} =-23 dBm @ 1759.5 MHz
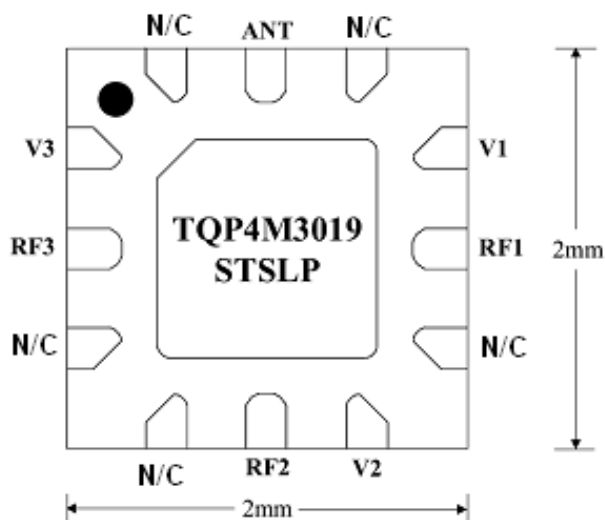
Features

- pHEMT GaAs MMIC Die
- Excellent Cross-Modulation Performance
- 108 dBm Typ @Cellular
- 106 dBm @AWS
- 105 dBm @ PCS
- Excellent ESD Rating
    300V HBM, 2000V CDM
- Low Control Voltage Operation to =2.6V
- High Isolation: 23dB typ at AWS and 22dB typ at PCS
- Very Low Control Current: 10µA typical
- Low Insertion Loss: 0.58 dB typ at AWS and 0.6dB typ at PCS Band
- Small Footprint 2.0 x 2.0 mm 12 lead STSLP Package

Applications

- CDMA Handset Antenna Switch for Cellular, PCS, AWS and GPS Operation

Package Style
12ld STSLP

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SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Absolute Maximum Ratings

Symbol	Parameter	Absolute Maximum Value	Units
$P_{IN\ MAX}$	Maximum Input Power	+38	dBm
V_{CTRL}	Control Voltage	+/-6	VDC
T_C	Case Temperature, Survival	-40 to +85	°C
T_{STG}	Storage Temperature	-40 to +150	°C

Note: The part may not survive all maximums applied simultaneously

Electrical Characteristics [1,2]

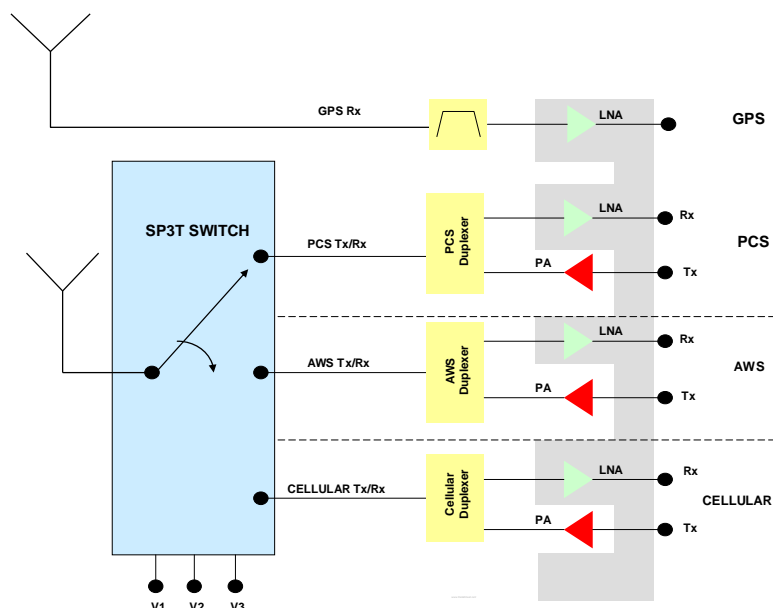| Parameter (all paths)	Test Conditions	Units	Min	Typ	Max
Cellular Insertion Loss	Antenna to Selected RF Port (824 – 894 MHz)	dB		0.50	
GPS Insertion Loss	Antenna to Selected RF Port (1574 – 1577 MHz)	dB		0.52	
AWS Insertion Loss	Antenna to Selected RF Port (1710 – 1755 MHz)	dB		0.58	
PCS Insertion Loss	Antenna to Selected RF Port (1850 – 1990 MHz)	dB		0.60	
Cellular Isolation	RF Off Port to Selected RF Port (824 – 894 MHz)	dB	25	27	
GPS Isolation	RF Off Port to Selected RF Port (1574 – 1577 MHz)	dB	20	24	
AWS Isolation	RF Off Port to Selected RF Port (1710 – 1755 MHz)	dB	20	23	
PCS Isolation	RF Off Port to Selected RF Port (1850 – 1990 MHz)	dB	20	22	
Cellular Cross-Modulation	PTx1=23 dBm,@836 MHz, PTx2=23dBm@837MHz, Pint=-23 dBm@881.5 Mz	dBm		-108	-100
AWS Cross-Modulation	PTx1=23dBm,@1725.5 MHz, PTx2=23dBm@1727MHz, Pint=-23 dBm@1759.5 Mz	dBm		-106	-100
PCS Cross-Modulation	PTx1=23 dBm,@1879.5 MHz, PTx2=23dBm@1880.5MHz, Pint=-23 dBm@1960 Mz	dBm		-105	-100
Cellular IIP3	Tow tones; +23 dBm each; 837 MHz and 838 MHz	dBm		+66	
AWS IIP3	Tow tones; +23 dBm each; 1727 MHz and 1760 MHz	dBm		+66	
PCS IIP3	Tow tones; +23 dBm each; 1880 MHz and 1881 MHz	dBm		+66	
2nd Harmonic	Cellular; @ +25.5 dBm input	dBc		-93	
2nd Harmonic	AWS; @ +25 dBm input	dBc		-93	
2nd Harmonic	PCS; @ +24 dBm input	dBc		-93	
3rd Harmonic	Cellular; @ +25.5 dBm input	dBc		-93	
3rd Harmonic	AWS; @ +25 dBm input	dBc		-93	
3rd Harmonic	PCS; @ +24 dBm input	dBc		-95	
P-0.1 dB	Cellular	dBm		+34	
P-01 dB	AWS	dBm		+34	
P-01 dB	PCS	dBm		+34.5	
Return Loss	0.5 to 2.0 GHz	dB		-25	
Leakage Current	-	µA		10	
Trise, Tfall	10% to 90% RF, 90% to 10% RF	µS			1
Ton, Toff	50% control to 90% RF, and 50% control to 10% RF	µS			1

Note 1: External DC Blocking capacitors are required at all RF ports.
Note 2: Test Conditions Zo = 50 ohms,; Vcontrol = 0V/2.6V, Tc=25 °C.

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SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Application Example

AWS/PCS/CDMA with GPS

Truth Table [1,2,3,4,5]

V1	V2	V3	ANT RF1	ANT RF2	ANT RF3
1	0	0	On	Off	Off
0	1	0	Off	On	Off
0	0	1	Off	Off	On

PIN Descriptions [1,2,3,4,5]

PAD Number	PAD Name	Description
1	V3	Control RF Port 3
2	RF3	RF Port 3
3	N/C	No Connection
4	N/C	No Connection
5	RF2	RF Port 2
6	V2	Control RF Port 2
7	N/C	No Connection
8	RF1	RF Port 1 Port
9	V1	Control RF Port 1
10	N/C	No Connection
11	ANT	Antenna
12	N/C	No Connection

Note 1:State f = +26V,state 0=0V, Note2:Differential Voltage from State to State 0 must be a minimum of 26V; Note 3:DC grounding is not required. Control voltages applied to pins 1,6 and 9 are differential being 0 volts and 26 volts nominally. Note 4: The package center paddle is n/c = no connection and not grounded as the preferred user configuration. RF performance figures are quoted with n/c; Note 5:
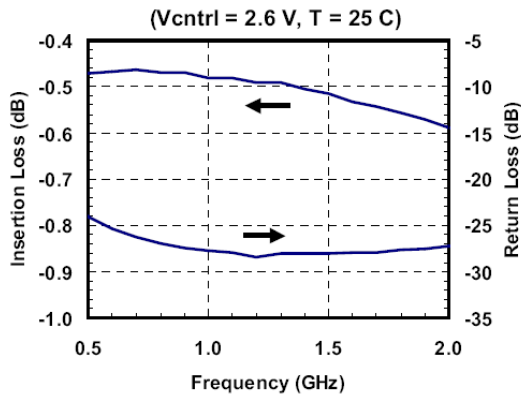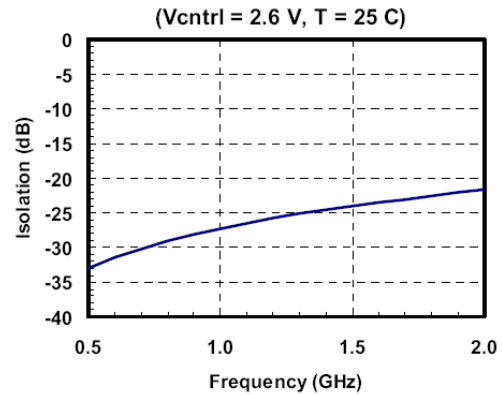
All pins including the package center paddle are n/c = no connection and not grounded as the preferred user configuration. Grounding an n/c will not prevent the switch operation but may give a small degradation in RF performance depending on board layout. There are no internal connections between these pads and the die.

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SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Typical Example

Insertion Loss and Match

(Vcntrl = 2.6 V, T = 25 C)

Isolation

(Vcntrl = 2.6 V, T = 25 C)

Low Band Cross Modulation

TQP4M3019 at Vcontrol = 2.6 V
RF to Antenna PCS Band (T = 25 C)
CW interferer = -23 dBm at 881.5 MHz
Pin = 23 dBm each at 836 and 837 MHz

High Band Cross Modulation

TQP4M3019 at Vcontrol = 2.6 V
RF to Antenna PCS Band (T = 25 C)
CW interferer = -23 dBm at 1960 MHz
Pin = 23 dBm each at 1879.5 and 1880.5 MHz

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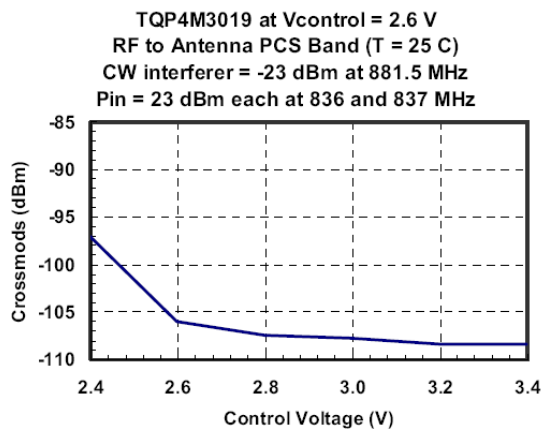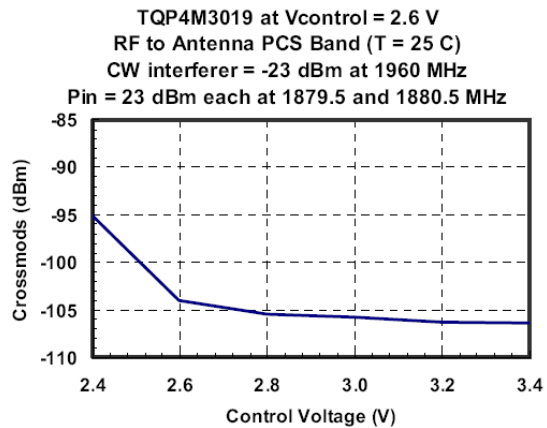
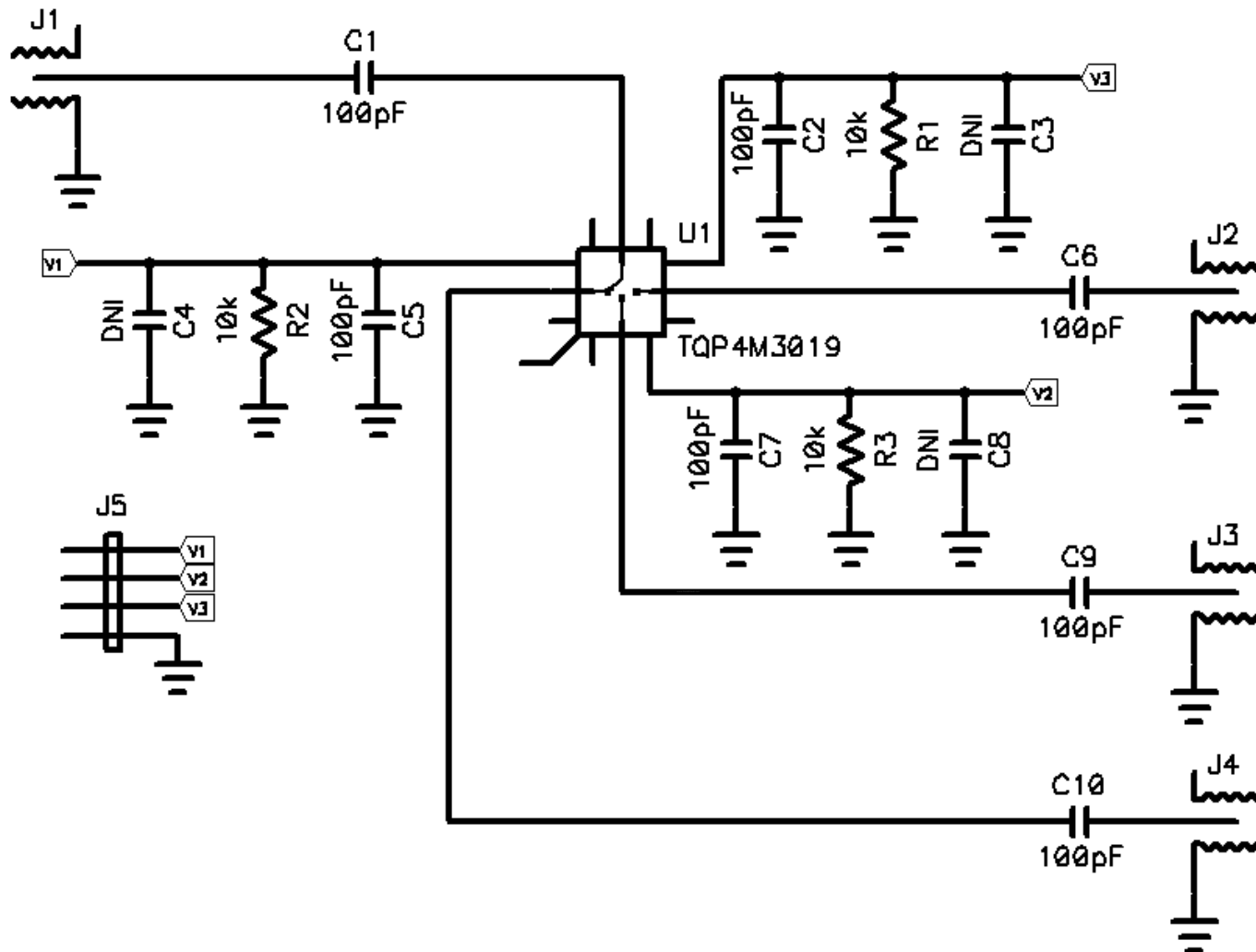## SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch
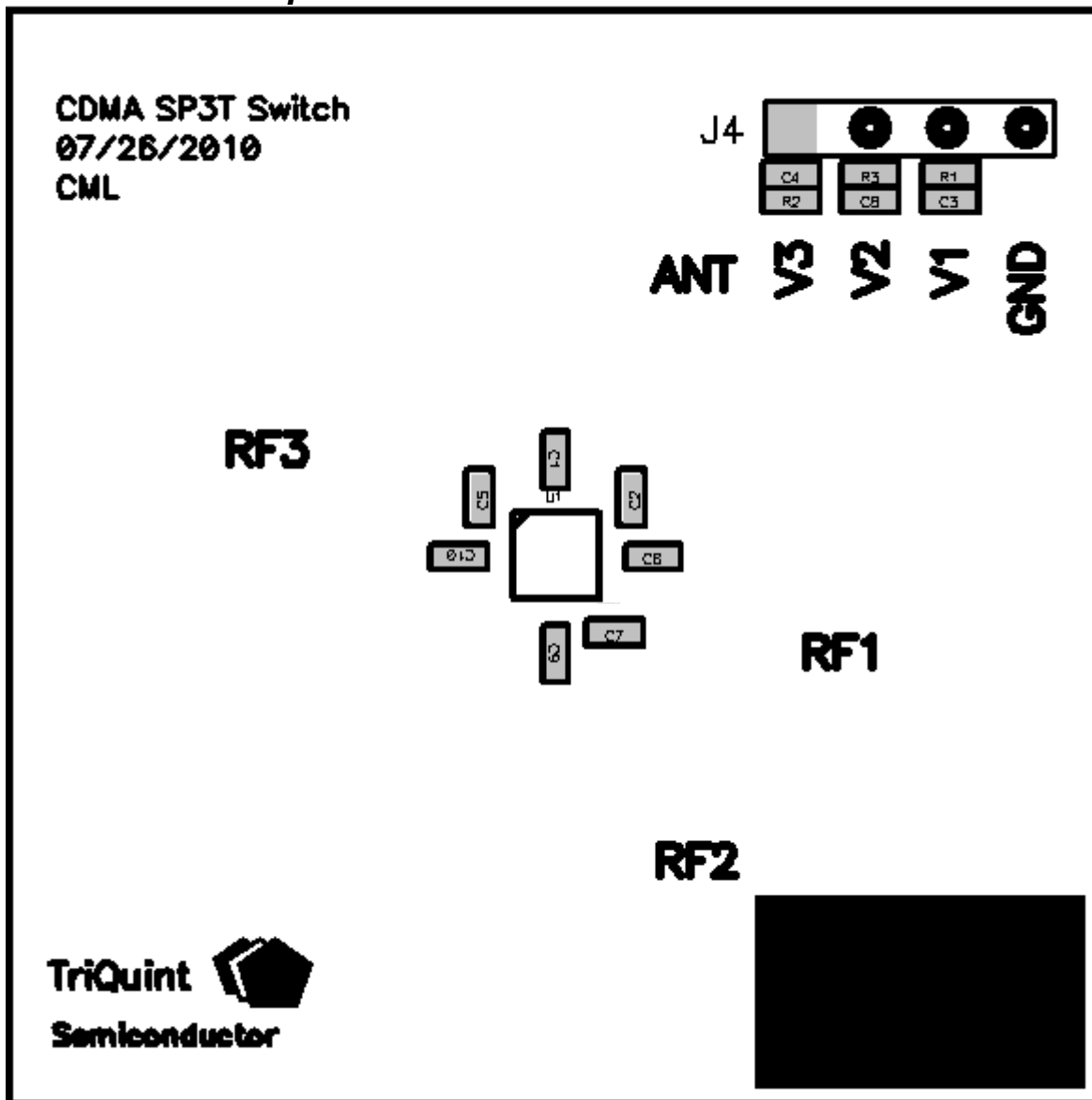
Demonstration Board Circuit

Notes:

1. Package Paddle should not be grounded for the best performance. See Application Note for details.
2. RF and DC ground are through pins 1, 6, and 9
3. Control line bypass caps, C2, C5 and C7 should be at least 5pF and may be larger if needed, depending on the switching time required in the application. See Application Note for details.
4. R1, R2 and R3 are optional pull down resistors to ensure the "Off" legs of the switch are held to a low enough voltage in circuits using "open collector" style control lines. These lines must be held close to zero volts when the corresponding switch leg is "off" for proper operation of the switch. A nominal control voltage of +2.6V is applied to V1, V2 or V3 corresponding to the "On" leg of the switch, with the other two pins held at nominally 0V. Only one switch leg maybe "On" at any time.

SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Application Board Component Locations:

CDMA SP3T Switch
07/26/2010
CML

J4

ANT V3 V2 V1 GND

RF3

RF1

RF2

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Semiconductor

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SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Recommended PCB Footprint for 12ld STSLP 2x2x0.57mm Package

- Solder mask opening
- PCB traces
- Solder stencil apertures
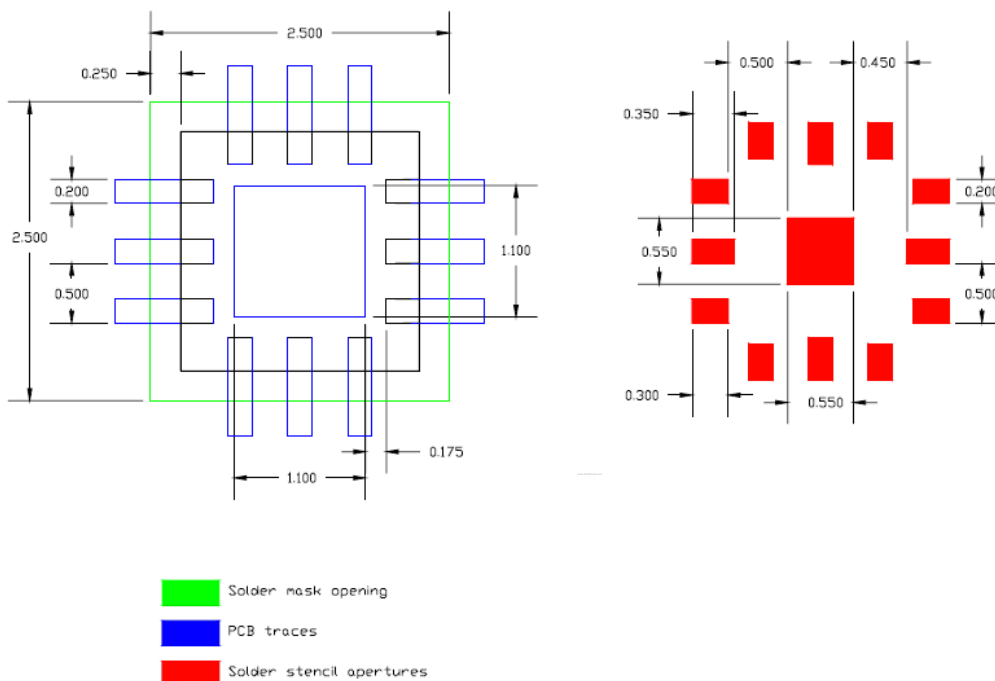
Procedure:
PCB Layout:
Leads are to extend away from the pads – these should be the same shape and size to ensure equal solder coverage.
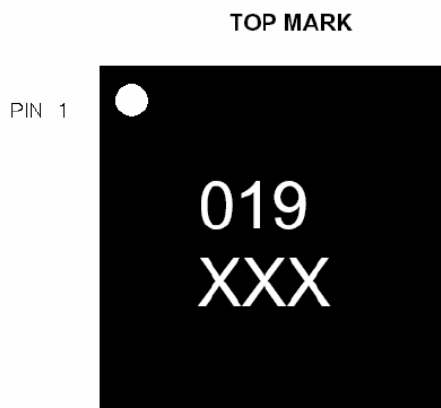
Solder Mask:
The solder mask opening should be offset from the package edges by 250µm.

Solder Stencil:
Center pad opening is about 30% of PCB pad size.

TriQuint SEMICONDUCTOR

SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Part Marking Information:

TOP MARK

PIN 1

019
XXX

WHITE INK OR LASER MARK
Line 1: 019 – Product Code
Line 2: XXX – Last 3 Char of TriQuint assembly lot number

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SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Tape and Reel Information:

Material will be delivered in packaged form on tape and reel.

Standard Carrier Tape Dimensions
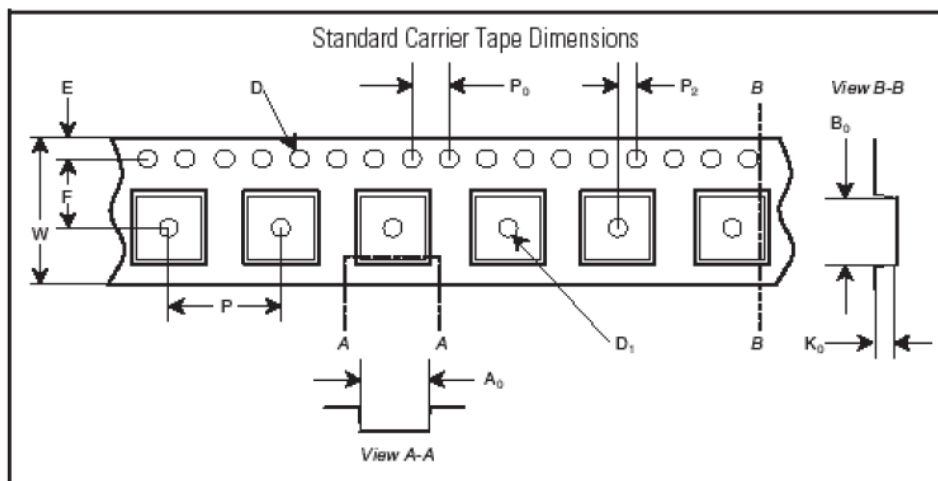
PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
CAVITY	LENGTH	A0	0.091	2.30
	WIDTH	B0	0.091	2.30
	DEPTH	K0	0.030	0.75
	PITCH	P1	0.157	4.00
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION LENGTH DIRECTION	P2	0.079	2.00
	CAVITY TO PERFORATION WIDTH DIRECTION	F	0.138	3.50
COVER TAPE	WIDTH	C	0.213	5.40
CARRIER TAPE	WIDTH	W	0.315	8.00
CAVITY	BOTTOM HOLE DIAMETER	D1	0.059	1.50
PERFORATION	DIAMETER	D0	0.059	1.50
	PITCH	P0	0.157	4.00
	POSITION	E1	0.069	1.75

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SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch
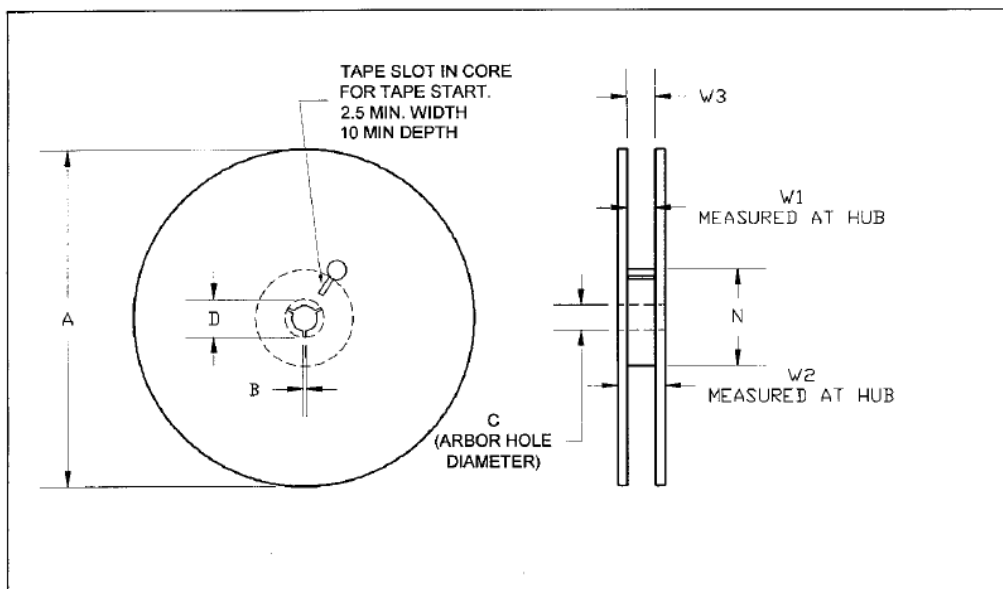
STSLP-12			7" Reel	
PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
FLANGE	DIAMETER	A	6.969	177.0
	THICKNESS	W2	0.559	14.2
	SPACE BETWEEN FLANGE	W1	0.346	8.8
HUB	OUTER DIAMETER	N	2.283	58.0
	ARBOR HOLE DIAMETER	C	0.512	13.0
	KEY SLIT WIDTH	B	0.079	2.0
	KEY SLIT DIAMETER	D	0.787	20.0

Each reel shall be marked as specified in TriQuint specification 12M05019A73, Section 7.

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SP3T High Power 2.6V 2x2 mm CDMA Antenna Switch

Packaging and Ordering Information:

12 lead STSLP 2 x 2 x 0.57 mm
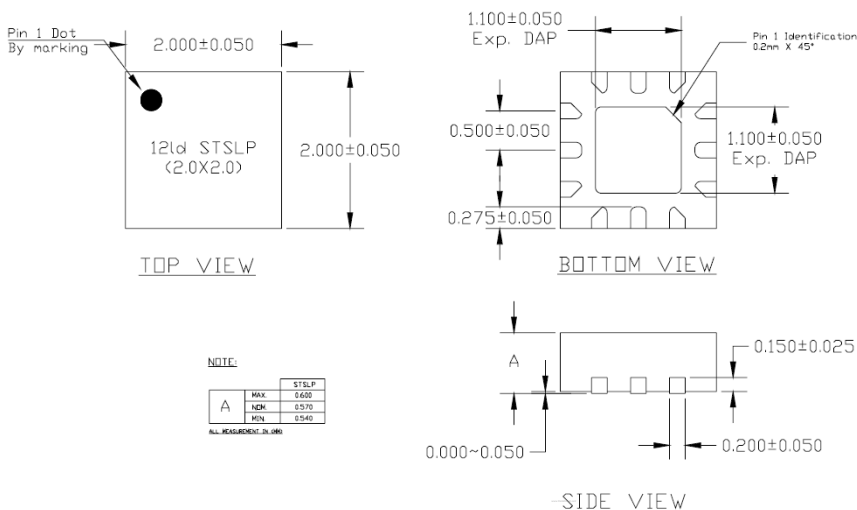
Additional Information [1]

This part is compliant with RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).
The part is rated Moisture Sensitivity Level at 260°C per JEDEC standard IPC/JEDEC J-STD-020.
_____

1. For the latest specifications, additional product information, worldwide sales and distribution locations and information about TriQuint:

      Web: www.triquint.com   Tel: (503) 615-9000

      Email: info_wireless@tqs.com   Fax: (503) 615-8902

For Technical questions and additional information on specific applications:
      Email: info_wireless@tqs.com

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