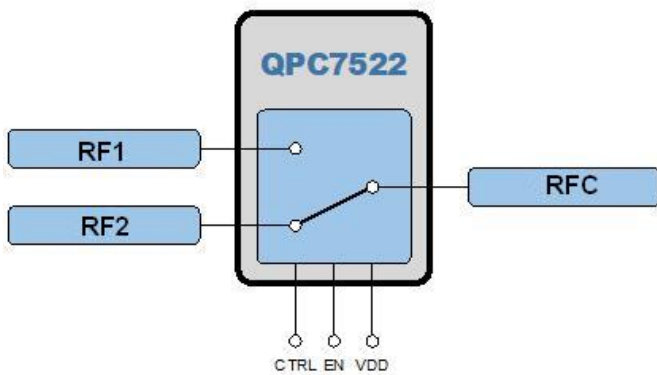


### General Description

The QPC7522 is a high isolation Silicon on Insulator (SOI) single pole double throw (SPDT) reflective switch designed for use in CATV, satellite set top and other high-performance communications systems.

Featuring a single supply with a single CMOS/TTL compatible control line, QPC7522 features low insertion loss and high isolation throughout its bandwidth making it an optimal choice for operation from 5MHz to 3.3GHz. QPC7522 offers excellent linearity and power handling capability thanks to its SOI process and does not require blocking caps on the RF ports if DC is not present on the RF ports. QPC7522 is packaged in a very compact 1.1mm x 1.5mm 9-pin LGA package.

### Functional Block Diagram



9 Pin 1.1 x 1.5 mm LGA Package

### Product Features

- 5MHz to 3300MHz Operation
- Optimized for 75Ω Applications (can be also be used in 50Ω applications).
- Low Insertion Loss: 0.28dB at 1GHz
- High Isolation: 44dB at 1GHz
- High IP3: 75dBm at 1GHz
- Compatible with Low Voltage Logic ( $V_{HIGH}$  Minimum = 1.3V)
- No External DC Blocking Capacitors Required on RF Paths Unless DC is Applied Externally
- 2000V HBM ESD Rating on All Ports

### Applications

- Extended Spectrum DOCSIS
- CATV Amplifiers
- CATV Head End
- Fiber Deep Nodes
- Cable Set Top Box
- Satellite Set Top Box

### Ordering Information

Part Number	Description
QPC7522SB	Sample Bag with 5 pieces
QPC7522SR	Short Reel with 100 pieces
QPC7522TR7	Standard Reel with 2,500 pieces
QPC7522EVB-01	75 Ω PCBA



# QPC7522

## CATV SPDT Reflective Switch (5 – 3300 MHz)

### Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-40 to +150°C
Operating Temperature	-40 to +105°C
Maximum $V_{DD}$	6.0V
Maximum $V_{EN}$ , $V_{CTRL}$	3.0V
PIN Max (CW)	+32dBm(5MHz) +36dBm (>20MHz)

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

### Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Device Voltage ( $V_{DD}$ )	+2.4	+5.0	+5.8	V
$V_{EN}$ , $V_{CTRL}$ High	1.3	1.8	2.75	V
$V_{EN}$ , $V_{CTRL}$ Low	0		0.45	V

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

### Electrical Specifications

Parameter	Conditions <sup>(1)</sup>	Min	Typ	Max	Units
Operational Frequency Range <sup>(1)</sup>		5		3300	MHz
Insertion Loss	5 – 50MHz		0.15		dB
	50-1000MHz		0.22		dB
	1000-2000MHz		0.28		dB
	2000-3000MHz		0.30		dB
	3300MHz		0.31		dB
Isolation, RFC - RFx	5 – 50MHz		78		dB
	50-1000MHz		44		dB
	1000-2000MHz		35		dB
	2000-3000MHz		31		dB
	3300MHz		30		dB
Isolation, RF1 – RF2	5 – 50MHz		76		dB
	50-1000MHz		46		dB
	1000-2000MHz		41		dB
	2000-3000MHz		33		dB
	3300MHz		32		dB
Input Return Loss; RFC	5 – 50MHz		40		dB
	50-1000MHz		23		dB
	1000-2000MHz		22		dB
	2000-3000MHz		25		dB
	3300MHz		29		dB
Output Return Loss; RFx	5 – 50MHz		40		dB
	50-1000MHz		25		dB
	1000-2000MHz		22		dB
	2000-3000MHz		24		dB
	3300MHz		30		dB

Notes:

1. Test conditions unless otherwise noted:  $V_{DD}$  = +3.3V, Temp = +25°C, 75Ω test system.



# QPC7522

## CATV SPDT Reflective Switch (5 – 3300 MHz)

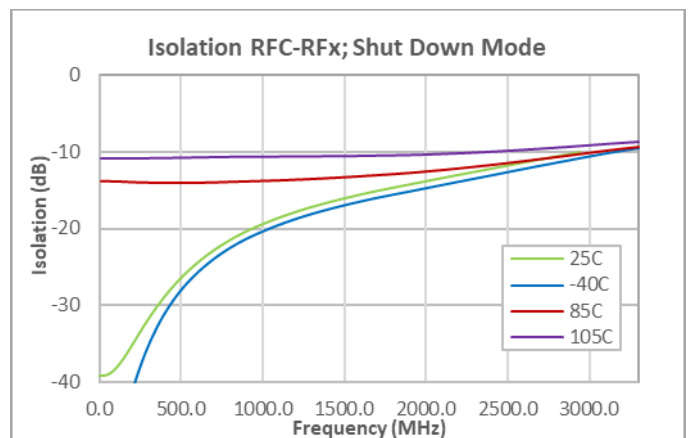
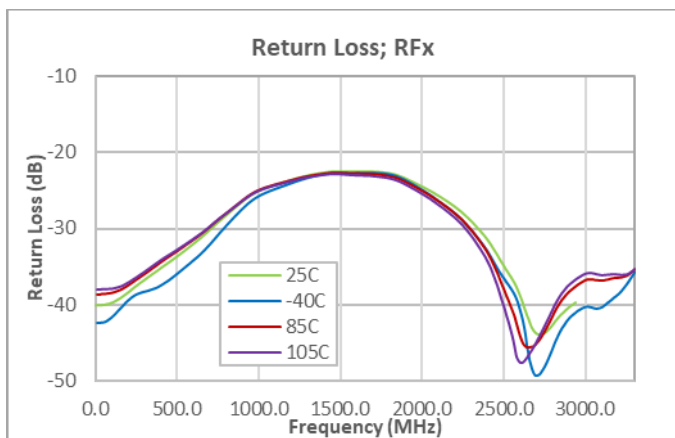
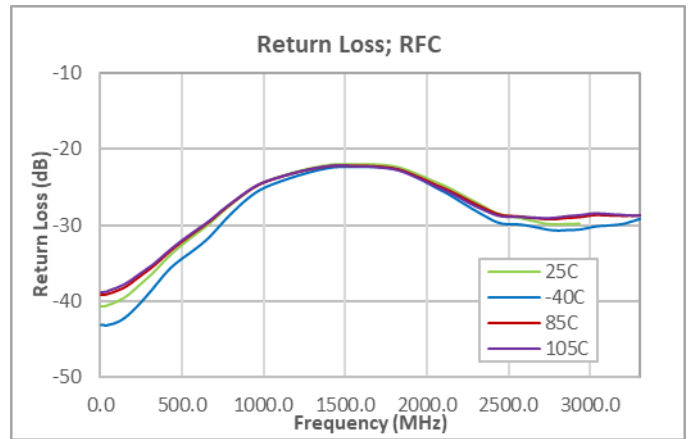
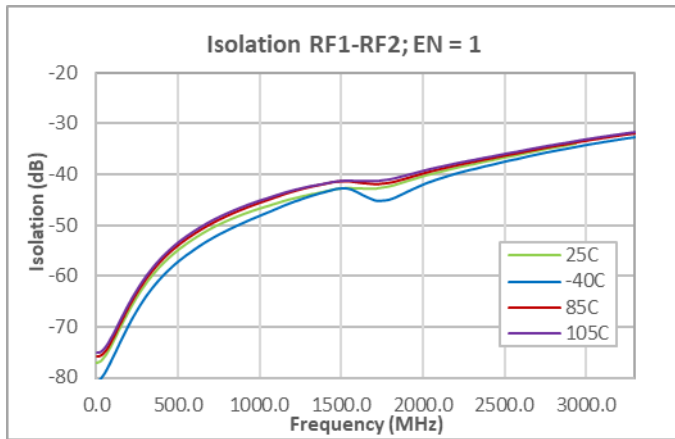
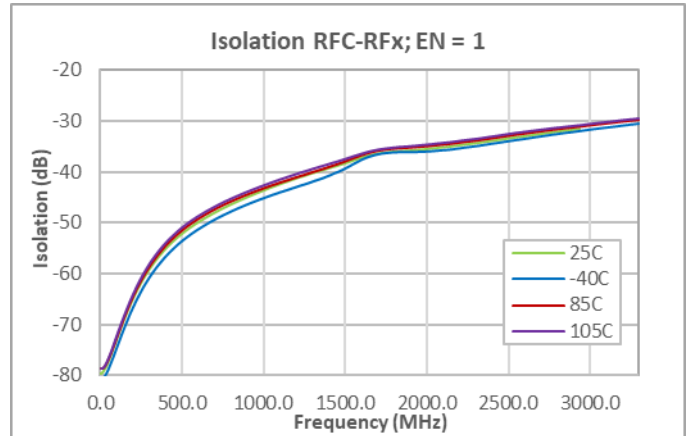
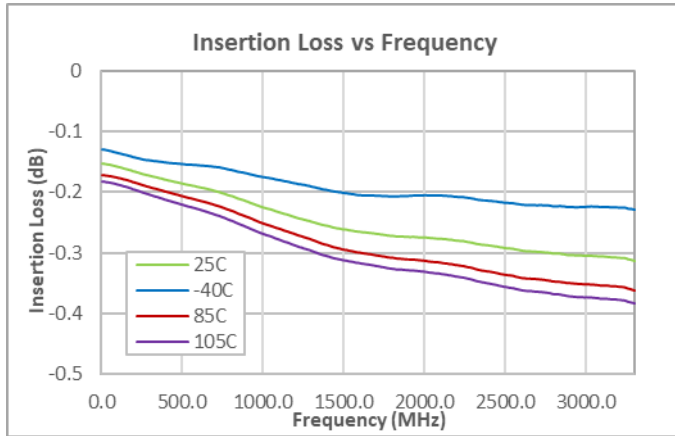
### Electrical Specifications (cont'd.)

Parameter	Conditions <sup>(1)</sup>	Min	Typ	Max	Units
P0.1 dB Compression <sup>(2, 3)</sup>	5MHz		38		dBm
	10MHz – 25MHz		41		
	25MHz – 3300MHz		42		
2 <sup>nd</sup> Harmonic	17MHz, 12dBm tone		-120		dBc
3 <sup>rd</sup> Harmonic	17MHz, 12dBm tone		-143		dBc
Output IP2	1000MHz, 12dBm per tone		124		dBm
Output IP3	1000MHz, 12dBm per tone		75		dBm
Supply Current I <sub>DD</sub>	EN = High		52	100	μA
	EN = Low		2	5	μA
Control Current (EN, CTRL)	I <sub>HIGH</sub>		2.5	5	μA
	I <sub>LOW</sub>		0.1	3	μA
Switching Time	50% Control to 10% / 90% RF		2.6		μS
Thermal Resistance (θ <sub>JC</sub> ) <sup>(4)</sup>			156		°C/W

Notes:

1. Test conditions unless otherwise noted: V<sub>DD</sub> = +3.3V, Temp = +25°C, 75Ω test system.
2. Measured in a 50Ω system.
3. Exceeds maximum operating input power. Not recommended for operation.
4. Thermal Resistance is referenced to back of EVB.

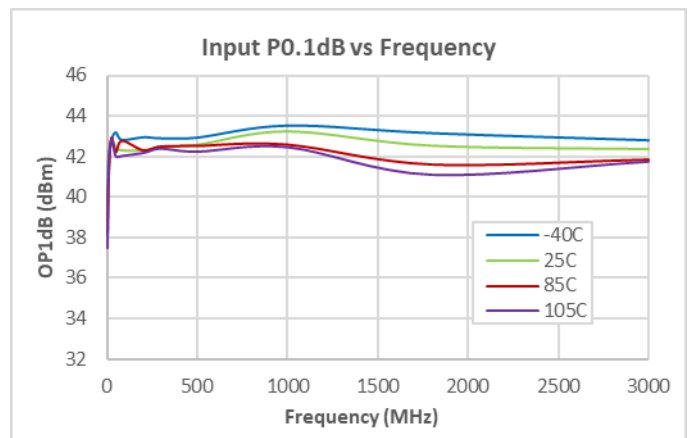
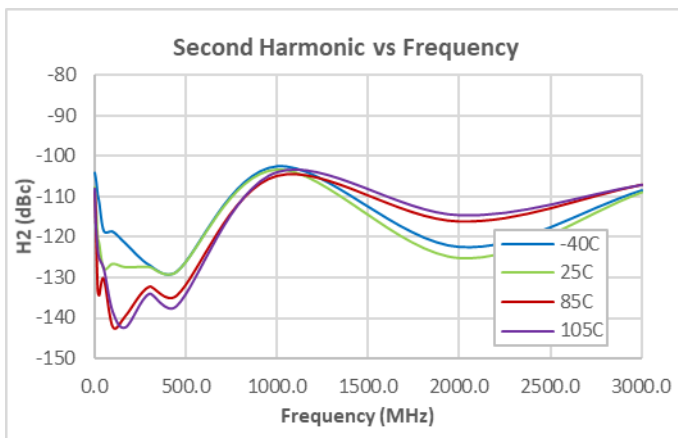
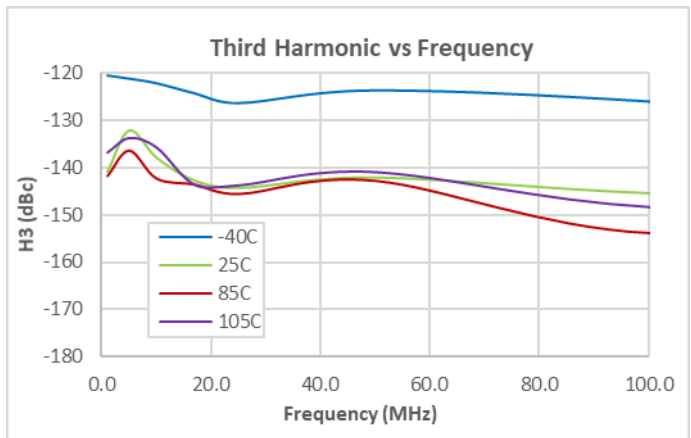
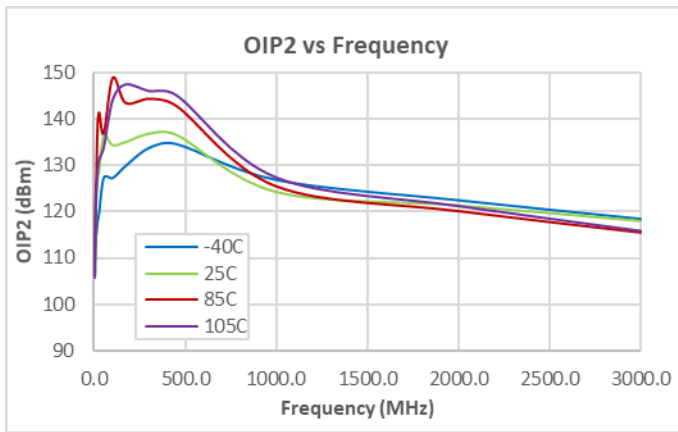
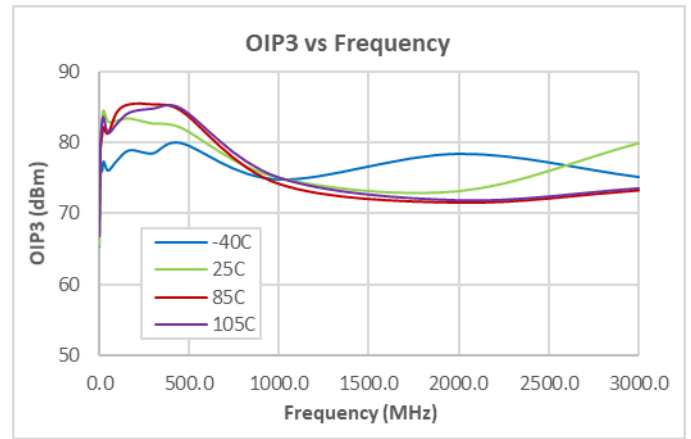
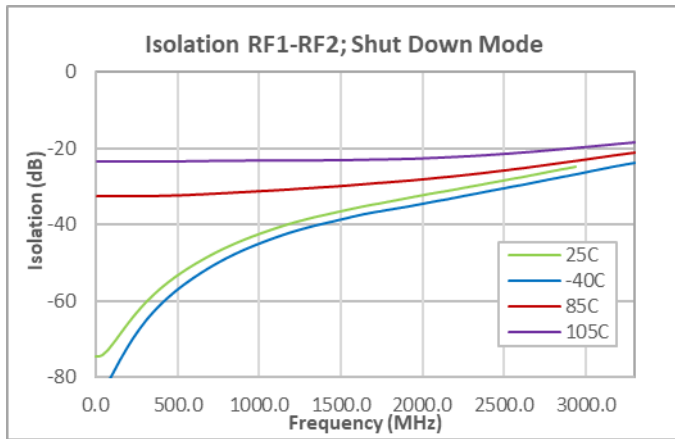
### Performance Plots



**Test Conditions:**

1. Test conditions unless otherwise noted:  $V_{DD} = +3.3V$ ,  $Z_0 = 75\Omega$

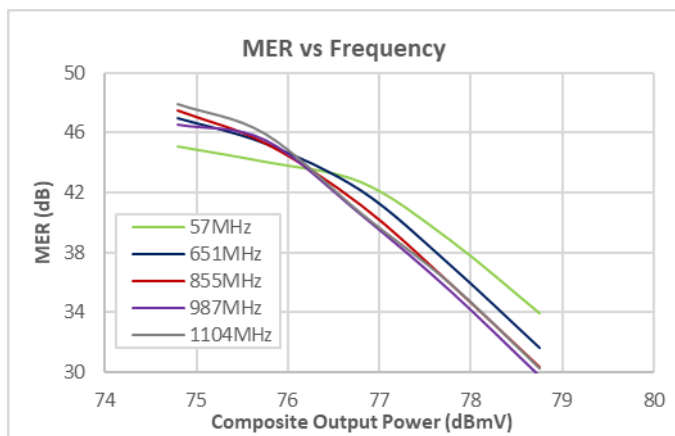
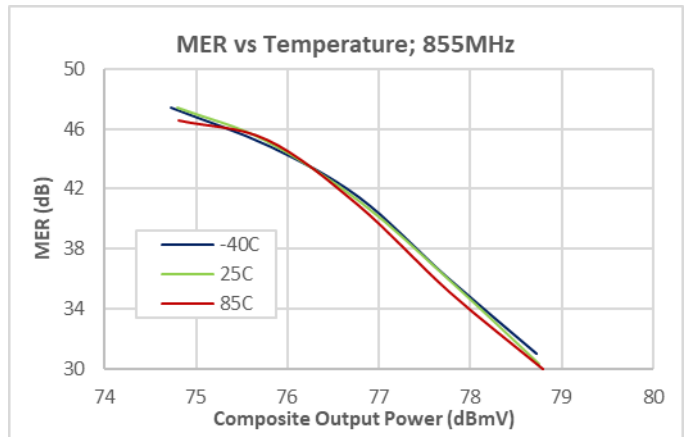
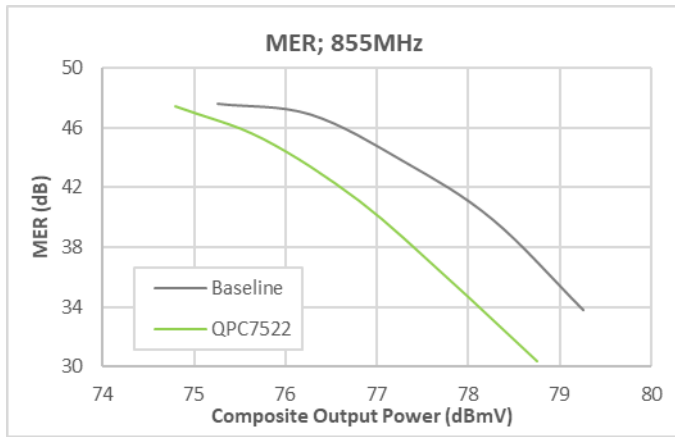
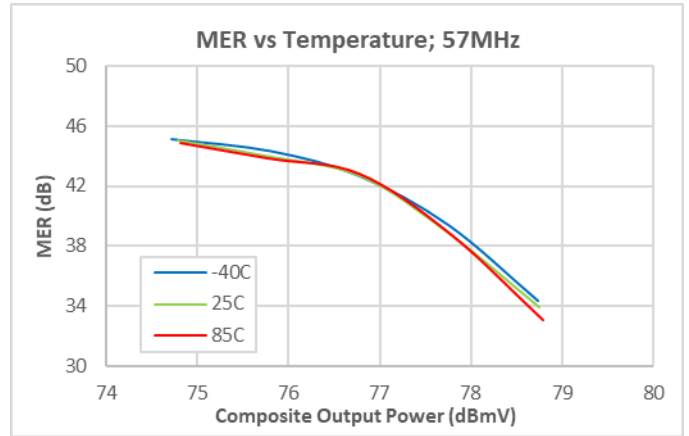
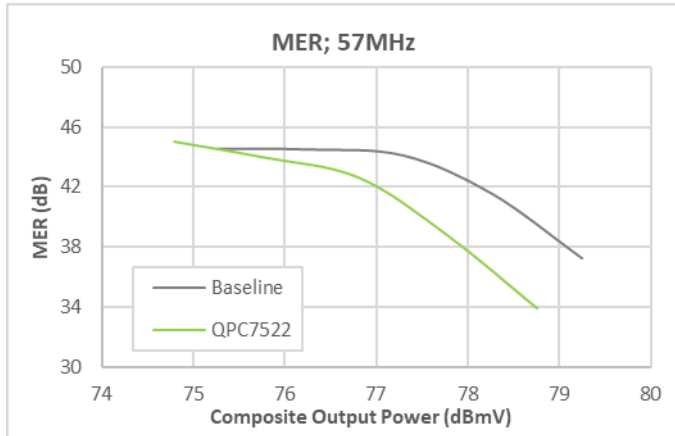
### Performance Plots (cont'd.)



**Test Conditions:**

1. Test conditions unless otherwise noted:  $V_{DD} = +3.3V$ ,  $Z_0 = 75\Omega$
2. IIP3, IP2: 75 $\Omega$ , +12dBm per tone.
3. Input P0.1dB exceeds maximum operating input power. Not recommended for operation.

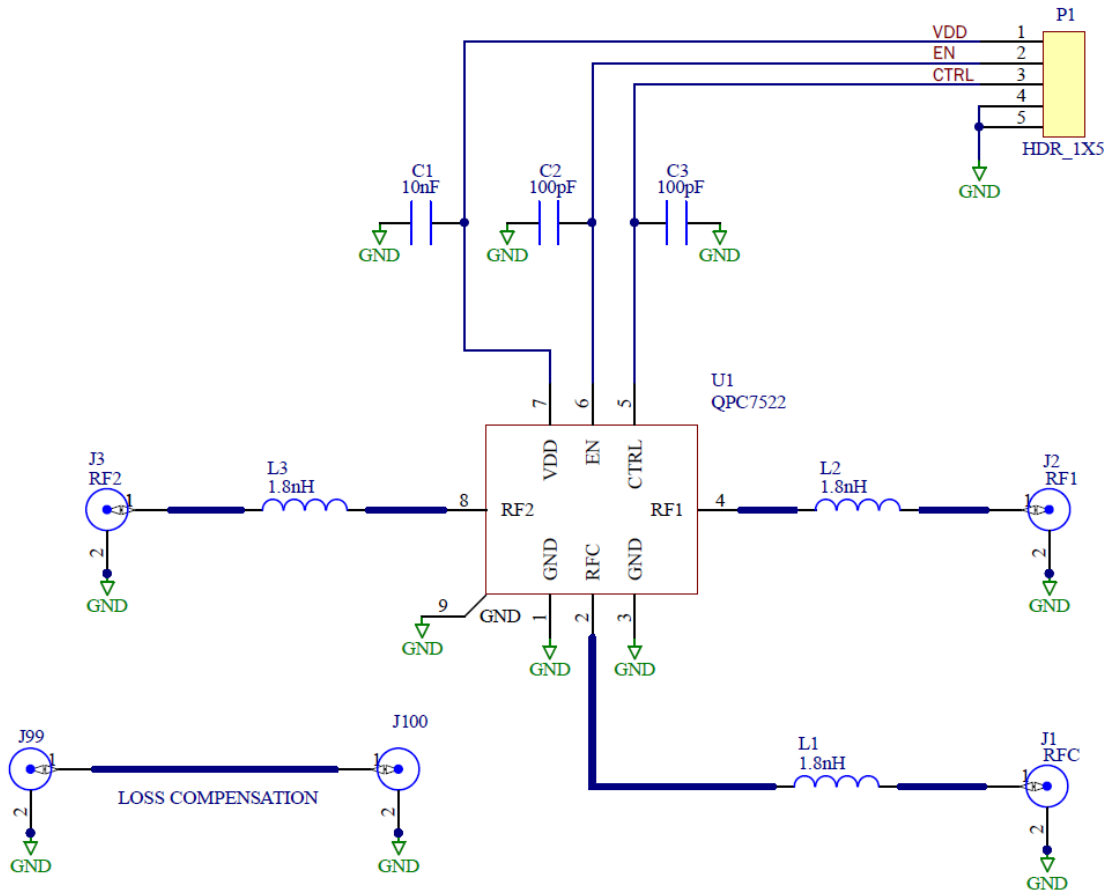
### Performance Plots (cont'd.)



**Test Conditions:**

1. Test conditions unless otherwise noted:  $V_{DD} = +3.3V$ ,  $Z_o = 75\Omega$
2. MER: 190 QAM Ch; 57-1215MHz; 10dB Tilt; ITU-T J.83, Annex B; Baseline represents RFPD3580 output.

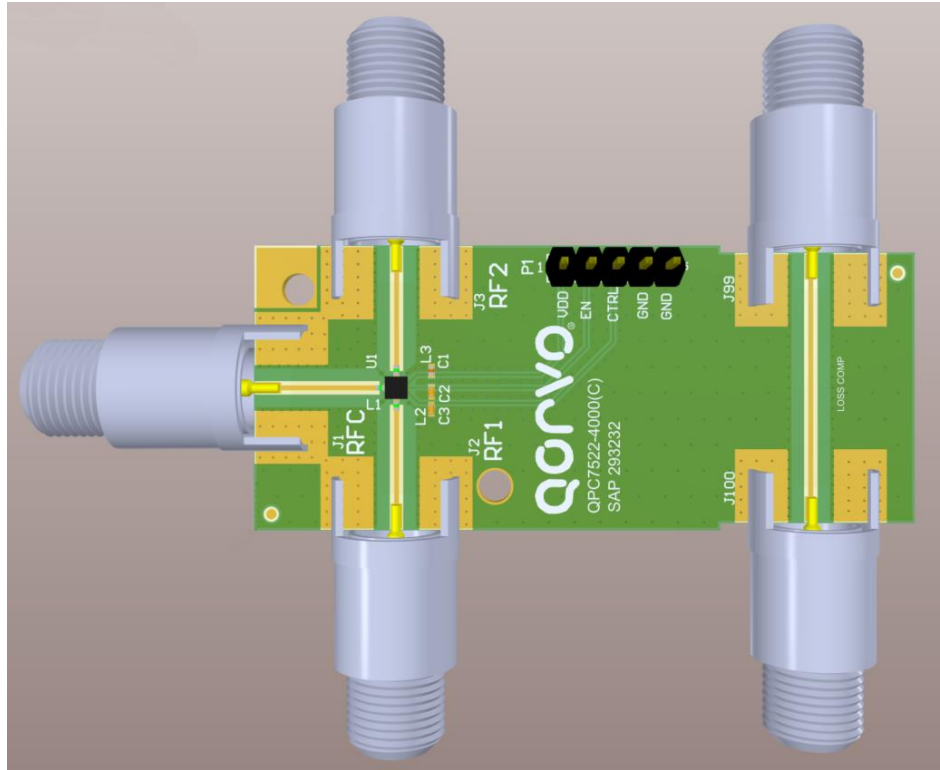
### Evaluation Board Schematic



### Evaluation Board Bill of Materials

Ref Designator	Description	Manufacturer	Part Number
PCB	PCB, QPC7522	Qorvo	QPC7522-4000(C)
U1	QPC7522 Switch	Qorvo	QPC7522
C1	CAP, 0.01uF, 10%, 25V, X8R, 0402	TDK	C1005X8R1E103K050BA
C2, C3	CAP, 100pF, 1%, 50V, C0G, 0402	AVX Asia. Ltd.	04025A101FAT2A
L1, L2, L3	IND, 1.8nH, +/-0.1nH, T/F, 0402	Murata Electronics	LQP15MN1N8B02D
P1	CONN, HDR, ST, PLRZD, 5-PIN, 0.100"	AMP	640454-5
J1, J2, J3, J99, J100	CONN, F FEM EDGE MOUNT, 75 OHMS, 0.065"	Genesis Technology USA	GT20-300204

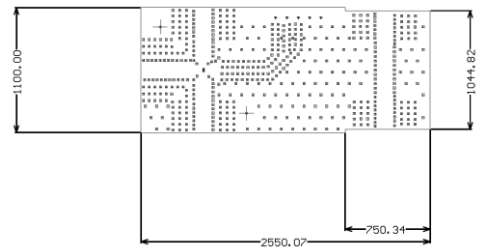
### Evaluation Board Layout



#### EVB PCB Material and Stack-up

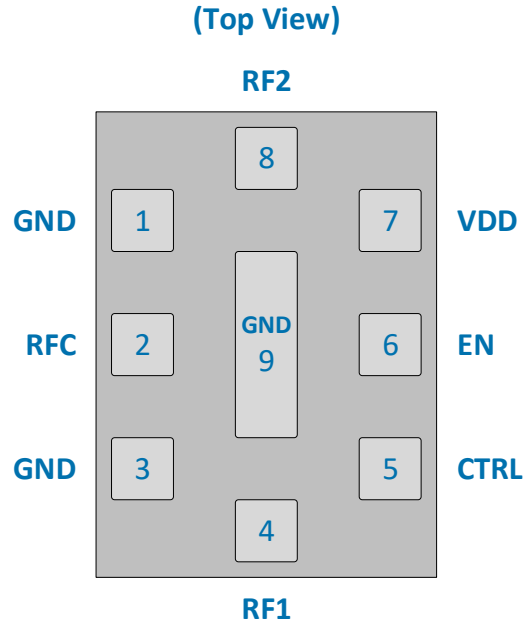
Board Material: 0.020" RO4003C,  $\epsilon_r=3.38$   
 Final Plating: 0.5oz Copper  
 Board Dimension: 1.1" x 2.55"  
 Total Thickness: 50.2 mils

Layer	Name	Material	Thickness	Constant
1	Top Overlay			
2	Top Solder	Solder Resist	0.40mil	3.5
3	Top Layer	Copper	0.70mil	
4	Dielectric1	RO4003C	20.00mil	3.38
5	MidLayer1	Copper	1.40mil	
6	Dielectric2	370HR	4.22mil	3.7
7	MidLayer2	Copper	1.40mil	
8	Dielectric3	370HR	21.00mil	4.34
9	Bottom Layer	Copper	0.70mil	
10	Bottom Solder	Solder Resist	0.40mil	3.5





### Pin Configuration and Description



Pin Number	Label	Description
1, 3, 9	GND	Connect with low inductive path to ground
2	ANT	Single-Ended RF port
4	RF1	Single-Ended RF port
5	CTRL	Switch Logic control input
6	EN	Shutdown logic control input
7	V <sub>DD</sub>	Supply Voltage
8	RF2	Single-Ended RF port

- Notes:
- Both RF pins must be held at 0V<sub>DC</sub> or require external DC blocking capacitors.
  - The ground paddle must be soldered to the ground plane for proper switch performance.



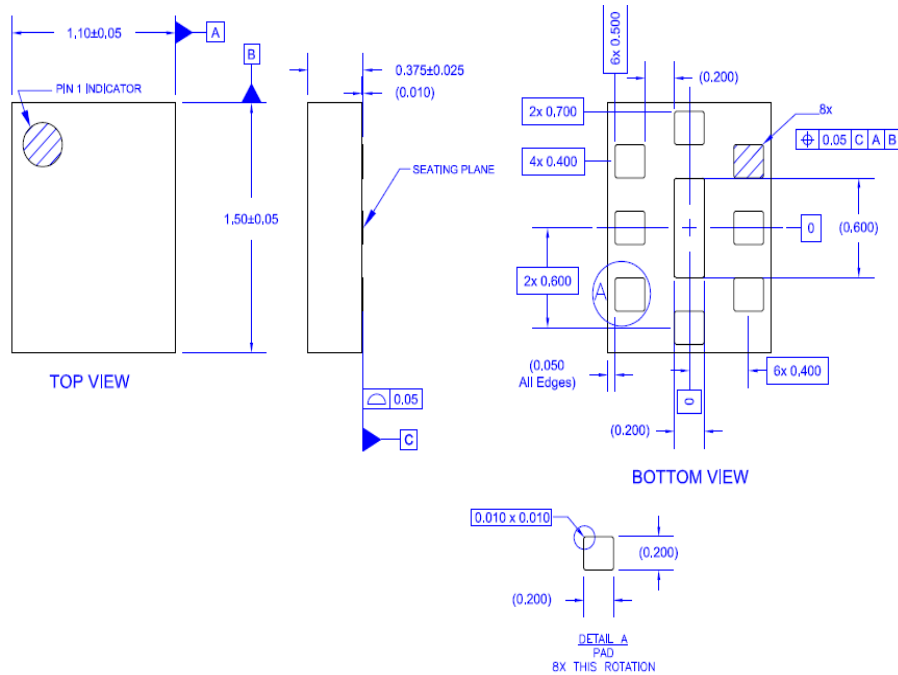
## Power Up/Down and Operational Controls

Scenario 1	Sequence for power up and power down from the supply that is connected to QPC7522 VDD Pin.
Power Up	Turn on VDD (supply), then EN, then CTRL. Then (20 mS or greater), apply RF signal
Power Down	Turn off RF signal, then CTRL, then EN, turn off VDD (supply)
Scenario 2	Sequence for going in and out of shutdown mode, keeping the VDD supply on, but disabling/enabling QPC7522 by the EN pin
Power Up	Turn on EN (enable), then CTRL, then (5 mS or greater), turn on RF Signal
Power Down	Turn off RF signal, then CTRL, then EN (disable)
Scenario 3	When changing switch positions between RF1 and RF2, no RF signal should be applied to any RF port while the CTRL is changing states
Switching Ports	Turn off RF signal, then change CTRL state, then wait (5 mS or greater), then turn on RF signal

## Control Logic for Valid Operational States

State	V <sub>DD</sub>	CTRL	EN	RF Path
1	2.4 V to 5.8 V	V <sub>HIGH</sub>	V <sub>HIGH</sub>	RFC – RF1
2	2.4 V to 5.8 V	V <sub>LOW</sub>	V <sub>HIGH</sub>	RFC – RF2
Shutdown	2.4 V to 5.8 V	X	V <sub>LOW</sub>	Shutdown

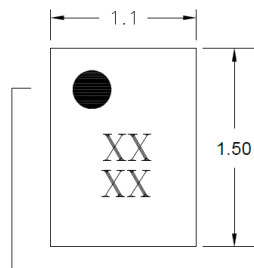
### Package Dimensions



**Notes:**

1. All dimensions are in millimeters. Angles are in degrees.
2. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

### Package Marking



Pin 1 Indicator  
XXXX  
is the 4 digit Trace Code  
assigned by sub-con

Unit: mm

### Solderability

Compatible with both lead-free (260°C max. reflow temp.) soldering process.  
Solder profiles available upon request.

Contact plating: Au plating 0.5  $\mu$ m, over a 2  $\mu$ m Ni Plating