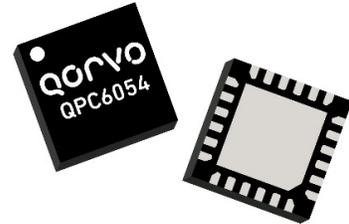


QPC6054

QPC6054

Absorptive High Isolation SP5T Switch
 5 MHz to 6000 MHz

The QPC6054 is a Silicon on Insulator (SOI) single-pole, 5-throw (SP5T) switch design for use in cellular, 3G, LTE and other high performance communications systems. It offers High isolation symmetric topology with excellent linearity and power handling capability. No blocking capacitors are necessary on the RF ports. The design is non-reflective such that the RFX ports are terminated into 50 Ω in the off state. The QPC6054 is +1.8 V positive logic compatible and has a single pin solution to disable the Negative Voltage Generator (NVG) and supply a negative voltage from off-chip, if necessary.

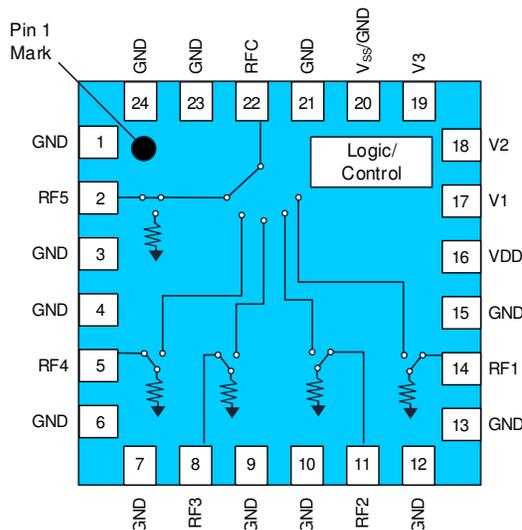


Package: QFN, 24-pin,
 4.0 mm x 4.0 mm

Features

- 5 MHz to 6000 MHz Operation
- Symmetrical SP5T.
- Non-Reflective (RFX ports)
- Terminated All-Off State mode
- No Blocking Caps Necessary unless voltage is on RF Line
- High Isolation: 60 dB at 2 GHz
- High Input IP3: +59 dBm
- 2 kV ESD
- +1.8 V Logic Compatible

Functional Block Diagram



Ordering Information

QPC6054SQ	Sample bag with 25 pieces
QPC6054SR	7" Reel with 100 pieces
QPC6054TR13	13" Reel with 2500 pieces
QPC6054PCK401	5 MHz to 6000 MHz PCBA with 5-piece sample bag

Applications

- Cellular, 3G, LTE Infrastructure
- WiBro, WiMAX, LTE
- High Performance Communications Systems
- Test Equipment

Absolute Maximum Ratings

Parameter	Rating	Units
Supply Voltage	+6	V
Control Voltage	-0.2 to +6	V
V _{SS} Supply	-6	V
Max RF Input Power, non-terminated	+37.5	dBm
Max RF Input Power, RFX terminated	+29	dBm
Operating Temperature	-40 to +105	°C
Storage Temperature	-40 to +150	°C
Maximum Junction Temperature	+125	°C
ESD Rating	Human Body Model (HBM)	2000
	Charge Device Model (CDM)	1000
Moisture Sensitivity Level	2	-



Caution! ESD sensitive device.



RFMD Green: RoHS status based on EU Directive 2011/65/EU (at time of this document revision), halogen free per IEC 61249-2-21, < 1000 ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

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. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

Recommended Operating Conditions

Parameter	Specifications			Units
	Min	Typ	Max	
Operating Temperature Range	-40	+25	+105	°C
Operating Junction Temperature			+125	°C
Supply Voltage	+2.7	+5	+5.5	V
V _{SS} Supply (Applicable for off-chip negative supply, otherwise 0V (zero) for internal NVG operation)	-5.5	-5	-2.7	V

Electrical Specifications

Parameter	Specification			Units	Conditions
	Min	Typ	Max		
Test conditions unless otherwise noted: T _A = +25 °C, V _{CTRL} = 0/+5 V, V _{DD} = +5 V, 50 Ω system					
Operating Frequency Range	5		6000	MHz	
Insertion Loss		0.95	1.15	dB	450 MHz
		1.00	1.2	dB	900 MHz
		1.10	1.3	dB	2100 MHz
		1.17	1.4	dB	2600 MHz
		1.40	1.7	dB	4000 MHz
		1.90	2.2	dB	6000 MHz
Isolation (RFC – RFX)	61	70		dB	450 MHz
	57	63		dB	900 MHz
	48	56		dB	2100 MHz
	48	54		dB	2600 MHz
	45	50		dB	4000 MHz
	40	50		dB	6000 MHz

Isolation is based on an optimized evaluation board

Electrical Specifications (contd.)

Parameter	Specification			Units	Conditions
	Min	Typ	Max		
Test conditions unless otherwise noted: $T_A = +25\text{ }^\circ\text{C}$, $V_{CTRL} = 0/+5\text{ V}$, $V_{DD} = +5\text{ V}$, 50 Ω system					
Isolation (RFX – RFX)	61	70		dB	450 MHz
	56	66		dB	900 MHz
	50	59		dB	2100 MHz
	48	56		dB	2600 MHz
	43	50		dB	4000 MHz
	38	44		dB	6000 MHz
Isolation is based on an optimized evaluation board					
Return Loss (RFX On-State)		30		dB	450 MHz
		31		dB	900 MHz
		31		dB	2100 MHz
		30		dB	2600 MHz
		20		dB	4000 MHz
		12		dB	6000 MHz
Return Loss (RFX Off-State)		37		dB	450 MHz
		30		dB	900 MHz
		24		dB	2100 MHz
		23		dB	2600 MHz
		22		dB	4000 MHz
		14		dB	6000 MHz
Input IP2		117		dBm	1000 MHz
Input IP3	+55	+59		dBm	1000 MHz, 17 dBm/ tone, 1MHz tone spacing
Input P1dB	36			dBm	
Settling Time		1	4	μs	50% V_{CTRL} to optimum functionality
Start-up Time		5	25	μs	90% V_{DD} to full functionality
Switching Speed		150	350	ns	50 % control to 10/90 % RF
NVG Spur		-104		dBm	Internal NVG on.

Electrical Specifications – Power Supply

Parameter	Specification			Units	Conditions
	Min	Typ	Max		
Test conditions unless otherwise noted: $T_A = +25\text{ }^\circ\text{C}$, $V_{DD} = +5.0\text{ V}$, Standard Application Circuit					
Supply Current (I_{DD})		100		μA	$V_{DD} = +5\text{ V}$
Control Current (V_1, V_2, V_3)		2		μA	$V_{CTRL} = +5\text{ V}$
V_{SS} Current		100		μA	$V_{SS} = -5\text{ V}$, NVG is shut down.
Low Control Voltage(V_1, V_2, V_3)	0		+0.63	V	+1.8 V Logic Compatible
High Control Voltage(V_1, V_2, V_3)	+1.1		V_{DD}	V	+1.8 V Logic Compatible

Maximum Operating Power at High Temperature, CW, ≥ 50 MHz, 50 Ω System

Input	Power (dBm) at each port		Theta-J (°C/W)
	85 °C	105 °C	
RFC/ RFX – Active ¹	35.5	32.3	53
RFX – Terminated (1 path)	28.1	25.1	61
RFX – Terminated (2 adjacent paths)	26.6	23.6	86
RFX – Terminated (all paths)	26.2	23.1	96

Notes:

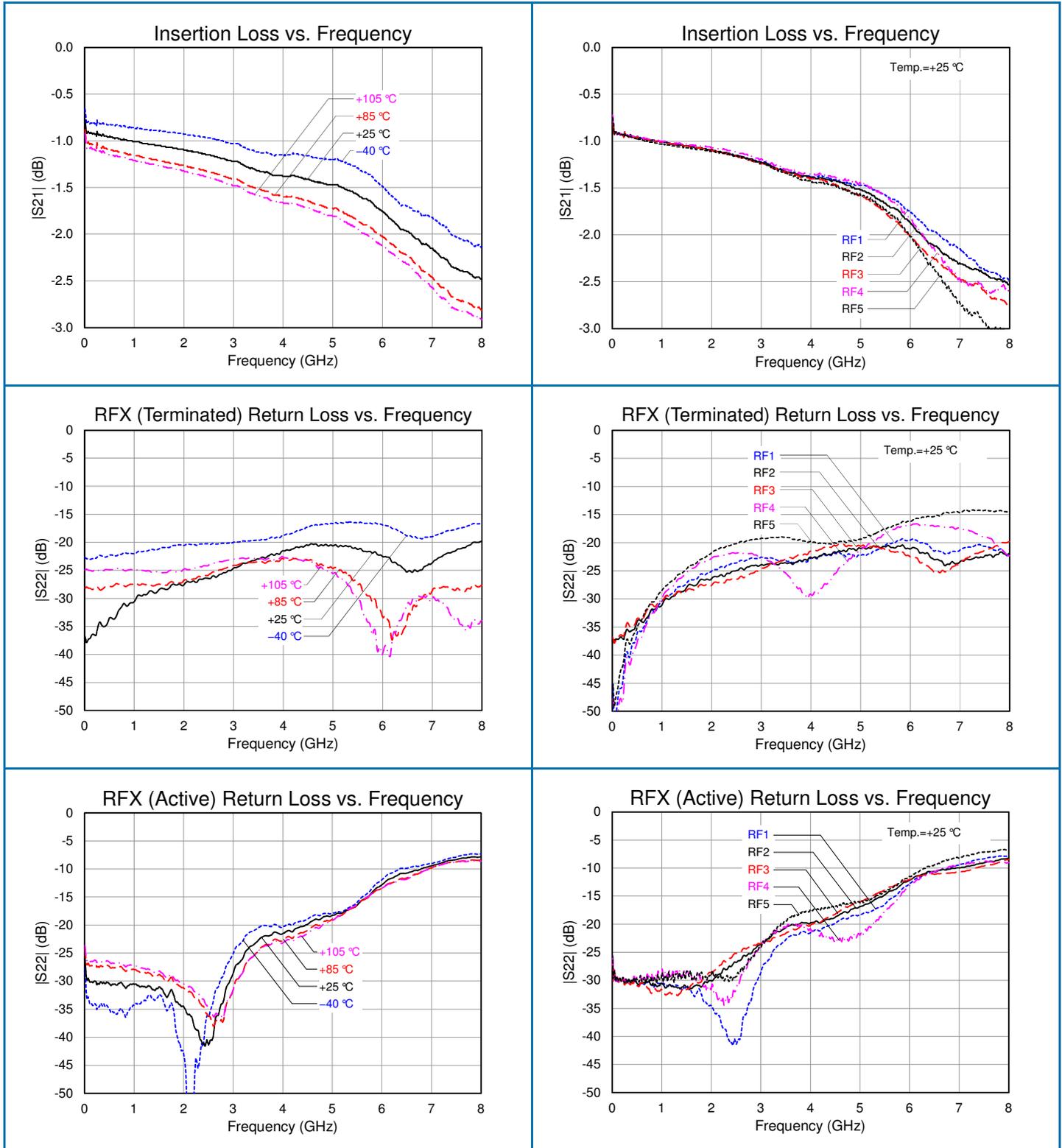
- For frequencies <50 MHz, maximum operating power at all temperatures should be at least 2 dB less than P1dB compression from plot.

Truth Table

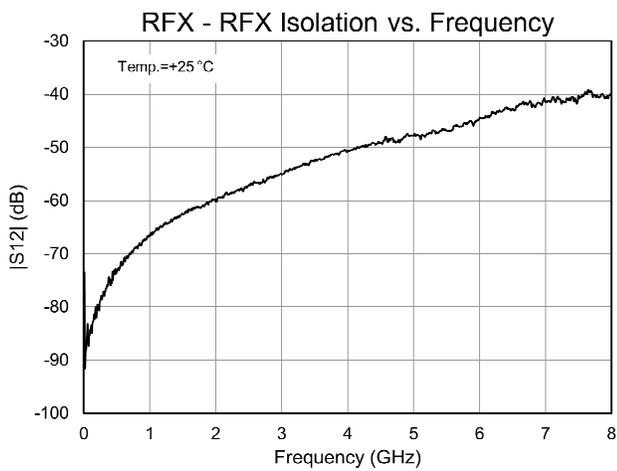
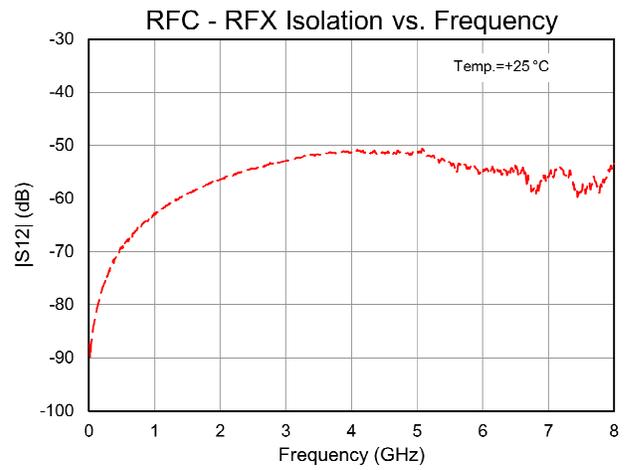
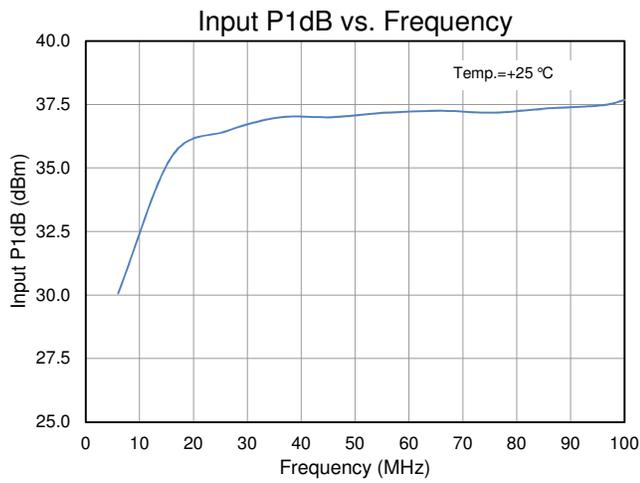
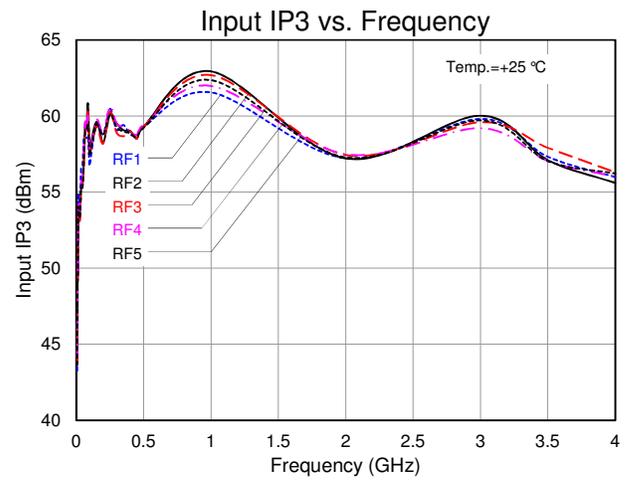
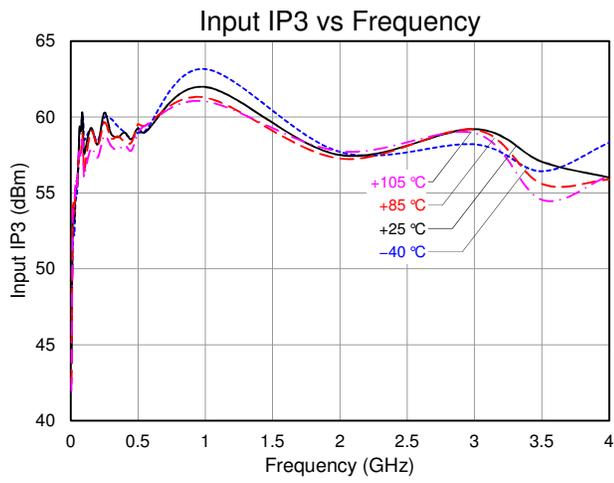
MODE	V1	V2	V3
All off	0	0	0
RFC-RF1 active	1	0	0
RFC-RF2 active	0	1	0
RFC-RF3 active	1	1	0
RFC-RF4 active	0	0	1
RFC-RF5 active	1	0	1
All off	0	1	1
All off	1	1	1

QPC6054

Typical Performance



Typical Performance (contd.)



QPC6054

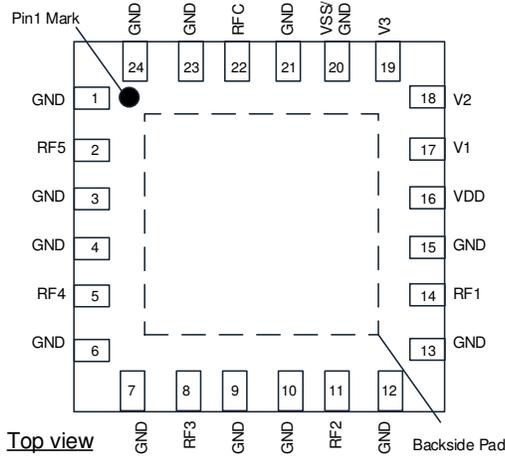
Evaluation Board Schematic and PCB – 5MHz to 6000 MHz Application Circuit

Note:
The QPC6064-410 PCB is used within the family of QPC60x4 products based on the individual BOM per product.

Evaluation Board Bill of Materials (BOM) - 5 MHz to 6000 MHz Application Circuit

Description	Reference Designator	Manufacturer	Manufacturer's P/N
Evaluation Board	–	Viasystems Technologies Corp.	QPC6064-410(B)
CAP, 100 pF, 5%, 50 V, COG, 0402	C1-C5	Taiyo Yuden	RM UMK105CG101JV-F
CONN, SMA EL FLT VIPER, MAT-21-1038	J1 – J6	Amphenol RF Asia Corp	901-10425
CONN, HDR, ST, PLRZD, 6-PIN	P1	AMP	640454-6
QPC6044	U1	RFMD / Qorvo	QPC6054

Pin Configuration and Description



Pin	Label	Description
1, 3, 4, 5, 7, 9, 10, 12, 13, 15, 21, 23, 24	GND	Connect to Low inductive Path to Ground
2	RF5	RF Port 5
5	RF4	RF Port 4
8	RF3	RF Port 3
11	RF2	RF Port 2
14	RF1	RF Port 1
16	V _{DD}	Supply Voltage
17	V1	Control Pin
18	V2	Control Pin
19	V3	Control Pin
20	V _{SS} /GND	Negative Voltage Generator (NVG) control pin. Supply GND (Low inductive path to ground) to enable internal NVG or supply -2.7 V to -5 V to disable internal NVG. Once disabled, internal NVG cannot be enabled without cycling VDD.
22	RFC	RF common Port

