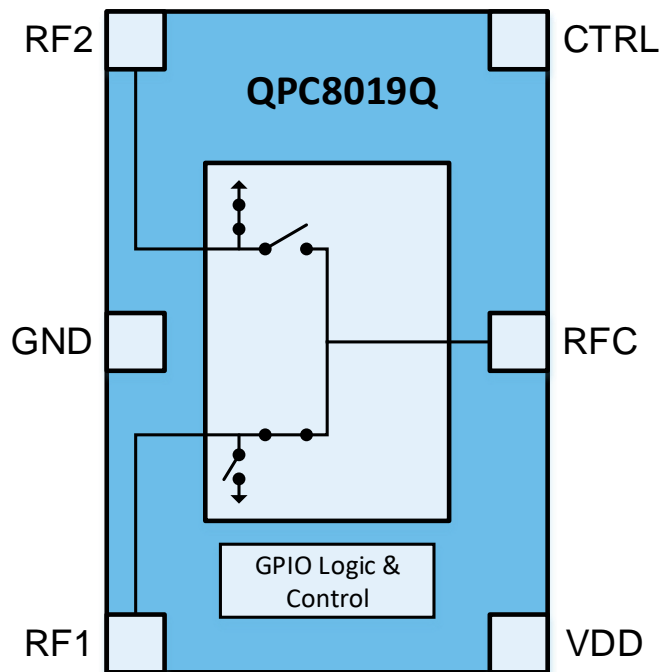


Product Description

The QPC8019Q is a low loss, high isolation SPDT switch with performance optimized for LTE, WiFi Tx/Rx applications up to 8 GHz and general switching applications. The QPC8019Q is controlled by 1 bit GPIO in a compact 0.7mm x 1.1mm, 6-pin module, which allows for a small solution size with no need for external DC blocking capacitors (when no external DC is applied to the device ports).

Functional Block Diagram



6 Pin 0.7 x 1.1 x 0.44 mm Package

Feature Overview

- Qualified to AEC-Q100 Grade 2
- Broadband performance suitable for all cellular and WiFi application up to 8GHz
- Extra low insertion loss
- High isolation
- One Bit GPIO Control
- Capable of 1.8V operation
- HBM Rating > 1kV on all ports
- Compact size: 0.7mm x 1.1mm x 0.44mm

Applications

- Telematics Control Unit Modules
- LTE & Diversity Applications
- WiFi Tx and Rx Applications

Ordering Information

PART NO.	DESCRIPTION
QPC8019QSB	5-pc Sample Bag
QPC8019QSR	100-pc, 7" Reel
QPC8019QTR13	10,000-pc, 13" Reel
QPC8019QPCK	Fully Assembled EVB + Sample Bag with 5 pieces

Absolute Maximum Ratings

PARAMETER	RATING
Storage Temperature	-40 to +125 °C
V _{DD} Supply Voltage	3.5 V
CTRL Voltage	3.0 V
Maximum Input Power - Electrical	+33dBm, CW, 100% Duty Cycle
Maximum Input Power - Thermal	+33dBm, CW, 100% Duty Cycle, +125C Junction Temp

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	MIN.	TYP.	MAX.	UNITS
Operating Ambient Temperature	-40	+25	+105	°C
V _{DD} Supply Voltage	1.65	1.8	3.1	V
V _{DD} Supply Current		35	60	μA
CTRL Logic High Voltage	1.3	1.8	2.8	V
CTRL Logic Low Voltage	0.00	0.00	0.45	V
CTRL Logic High Current		200	300	nA
Switching Speed – Measured 10% CTRL to 90% RF		80	300	ns

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

Electrical Specifications⁽¹⁾

Test conditions unless otherwise stated: all unused RF ports terminated in 50Ω, Input and Output = 50Ω, T = 25°C.

V_{DD} = 1.8V, CTRL = 1.8 V / 0 V

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Frequency Range		617		8000	MHz
Insertion Loss					
RFx to RFC	617 MHz to 960 MHz		0.2	0.4	dB
RFx to RFC	1710 MHz to 2200 MHz		0.25	0.5	dB
RFx to RFC	2300 MHz to 2690 MHz		0.25	0.6	dB
RFx to RFC	3300 MHz to 4200 MHz		0.45	0.95	dB
RFx to RFC	4400 MHz to 5000 MHz		0.55	1.1	dB
RFx to RFC	5100 MHz to 6000 MHz		0.6	1.1	dB
RFx to RFC	6000 MHz to 8000 MHz		0.6	1.1	dB
Isolation					
RF1 to RF2	617 MHz to 960 MHz	41.5	50		dB
RFx to RFC		36	42.5		dB
RF1 to RF2	1710 MHz to 2200 MHz	33	41.5		dB
RFx to RFC		28	35		dB
RF1 to RF2	2300 MHz to 2690 MHz	30	37.5		dB
RFx to RFC		27	32		dB
RF1 to RF2	3300 MHz to 4200 MHz	31	34.5		dB
RFx to RFC		25	29.0		dB
RF1 to RF2	4400 MHz to 5000 MHz	27	31		dB
RFx to RFC		21.5	25		dB
RF1 to RF2	5100 MHz to 6000 MHz	22	28		dB
RFx to RFC		18.5	22.5		dB
RF1 to RF2	6000 MHz to 7000 MHz	18.5	24		dB
RFx to RFC		16	20		dB
RF1 to RF2	7000 MHz to 8000 MHz	17.5	21.5		dB
RFx to RFC		14.5	18		dB
Harmonics					
2Fo Low Band	fo = 611 – 970MHz; Pin = 26dBm; CW		-70		dBm
3Fo Low Band	fo = 611 – 970MHz; Pin = 26dBm; CW		-65		dBm
2Fo Mid Band	fo = 1980MHz; Pin = 25dBm; CW		-66	-50	dBm
3Fo Mid Band	fo = 1980MHz; Pin = 25dBm; CW		-64	-50	dBm
2Fo Low Band	fo = 2300 – 2690MHz; Pin = 26dBm; CW		-64.5		dBm
3Fo Low Band	fo = 2300 – 2690MHz; Pin = 26dBm; CW		-59.5		dBm
2Fo Low Band	fo = 3800 – 4200MHz; Pin = 26dBm; CW		-59		dBm
3Fo Low Band	fo = 3800 – 4200MHz; Pin = 26dBm; CW		-54.5		dBm
2Fo Low Band	fo = 5150 – 5925MHz; Pin = 26dBm; CW		-55		dBm
3Fo Low Band	fo = 5150 – 5925MHz; Pin = 26dBm; CW		-61		dBm

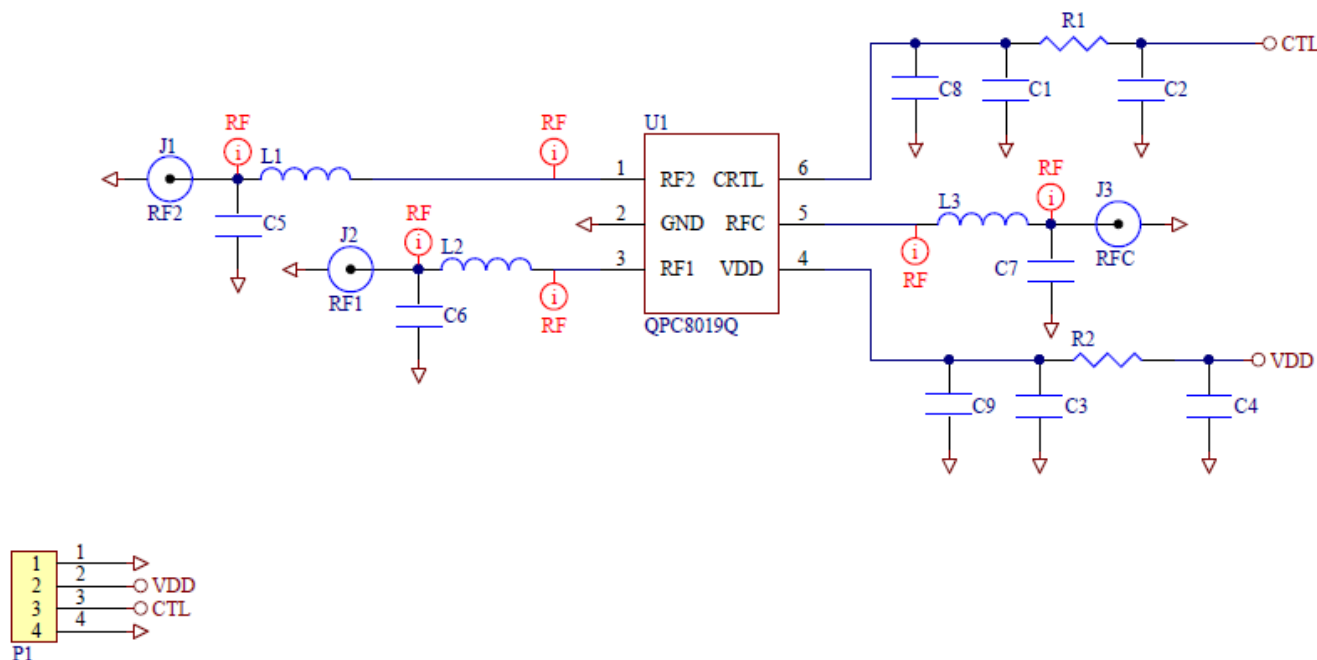
⁽¹⁾ Recommended EVB schematic/BOM/layout/PCB should be followed in order to achieve specified performance.

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
IMD2	Ftx = 23dBm; Fint = -20dBm				
Band V	Ftx = 836.5 MHz, Fint = 1718 MHz, Fmeas = 881.5 MHz, Measure on all Pins		-107		dBm
Band I	Ftx = 1950 MHz, Fint = 4090 MHz, Fmeas = 2140 MHz, Measure on all Pins		-107		dBm
IMD3	Ftx = 20dBm; Fint = -15dBm				
Band V	Ftx = 836.5 MHz, Fint = 791.5 MHz, Fmeas = 881.5 MHz, Measure on all Pins		-103.5		dBm
Band I	Ftx = 1950 MHz, Fint = 1760 MHz, Fmeas = 2140 MHz, Measure on all Pins		-109.5		dBm

VSWR					
Any RF Port	617 MHz to 960 MHz		1.05		:1
Any RF Port	1710 MHz to 2200 MHz		1.15		:1
Any RF Port	2300 MHz to 2690 MHz		1.2		:1
Any RF Port	3300 MHz to 4200 MHz		1.6		:1
Any RF Port	4400 MHz to 5000 MHz		1.75		:1
Any RF Port	5100 MHz to 6000 MHz		1.75		:1
Any RF Port	6000 MHz to 8000 MHz		1.75		:1

⁽¹⁾ Recommended EVB schematic/BOM/layout/PCB should be followed in order to achieve specified performance.

EVB Application Circuit Schematic



Evaluation Board BOM – Non-matched EVB

C1,C3	2	CAP, 100pF, 5%, 50V, C0G, 0402	GRM1555C1H101JA01D	MURATA ELECTRONICS SINGAPORE PTE LT
U1	1	Automotive Broadband High Frequency SPDT		
L1,L2,L3	3	RES, 0 OHM, 1/32W, 01005	PFR02S-000-XNH-87	DELTA ELECTRONICS INT'L (SINGAPORE)
PCB	1	PCB, QPC8019Q	QPC8019Q-4000[1]	TTM TECHNOLOGIES INC
C2,C4	2	CAP, 2200pF, 10%, 50V, X7R, 0402	RM UMK105BJ222KV-F	TAIYO YUDEN (SINGAPORE) PTE LTD
R1,R2	2	RES, 0 OHM, 5%, 1/10W, 0402	RMC1/16SJPTH	Kamaya, Inc
P1	1	CONN, HDR, ST, FRCTN LOCK, 4-PIN	22-23-2041	MOLEX
RF1,RF2,RFC	3	CONN, SMA, EL MINI FLT 0.068" SPE-000303	20-001CF-T	Aliner Industries, Inc.
C5,C6,C7,C8,C9	5	NOT POPULATED ITEM-1	DUMMY PART	

Evaluation Board BOM – Matched EVB for 6 to 8GHz UHB Operation

An insertion loss improvement of up to 0.15dB may be obtained at 8 GHz with additional inductors placed on RF ports.

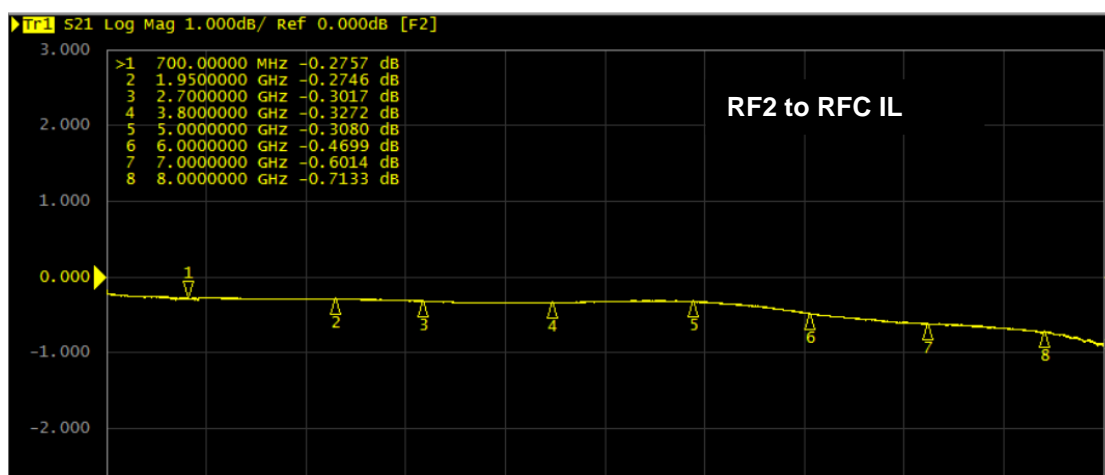
The added inductors will increase the insertion loss at lower frequencies.

High-Q inductors L1,L2,L3 are populated for 6 to 8GHz operation.

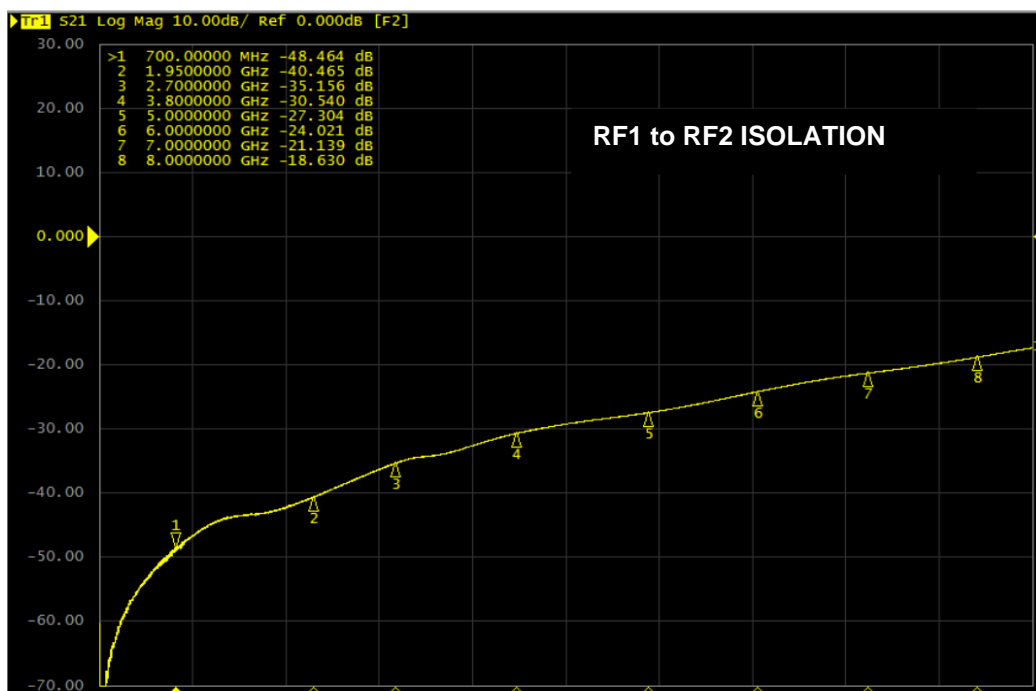
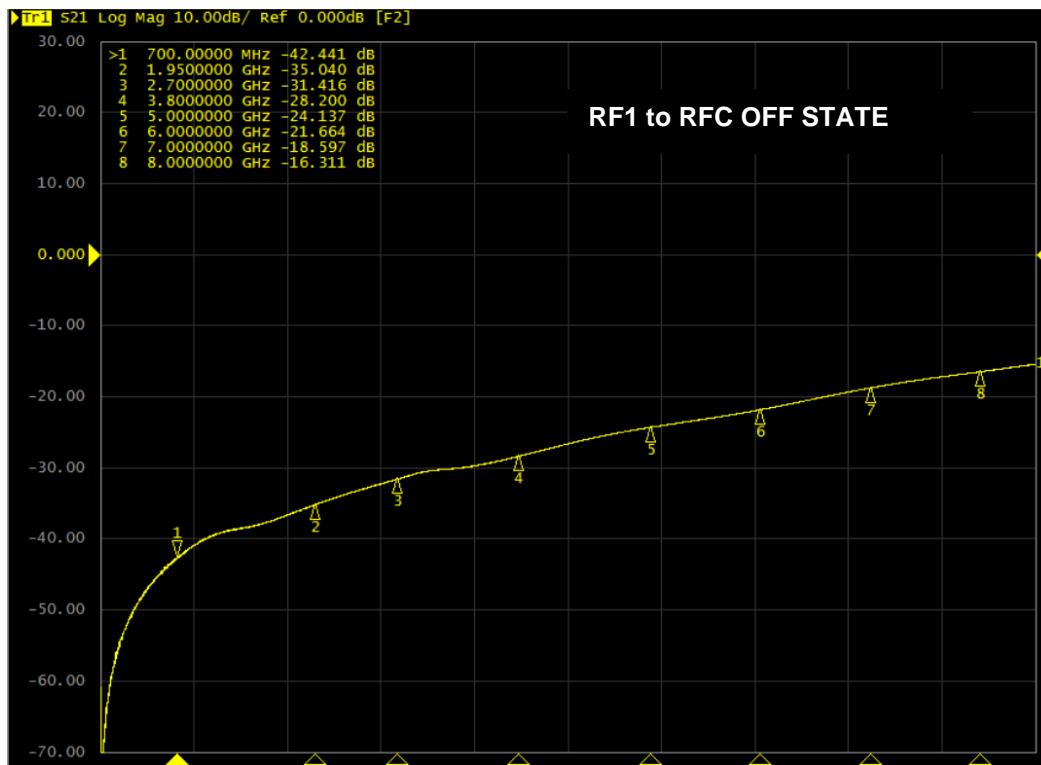
L1,L2,L3 = Murata part # LQP02HQ0N5B02L11

Unused RF ports should be terminated in 50 ohms.

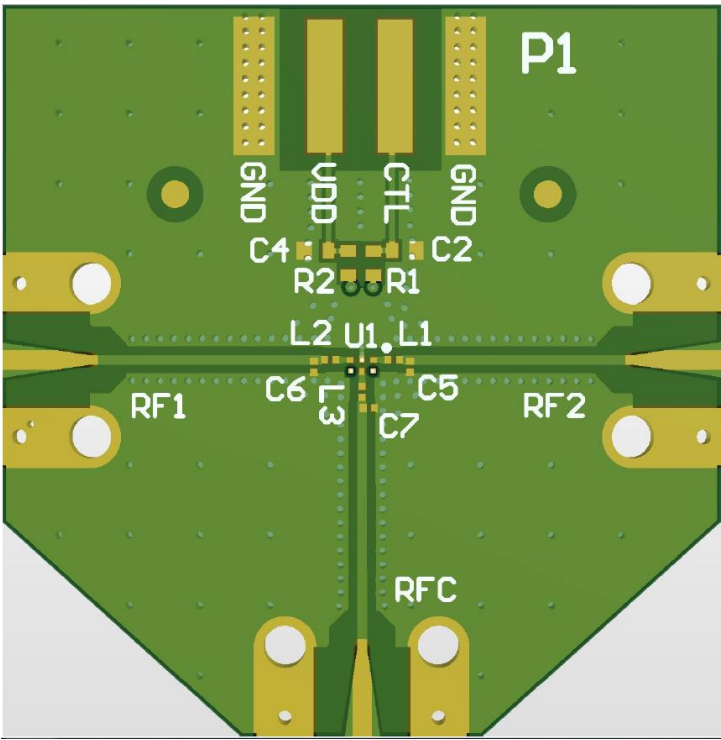
Ref Des	Qty	Description	Mfg Part #	Mfg Name
U1	1	Automotive Broadband High Frequency SPDT		
PCB	1	PCB, QPC8019Q	QPC8019Q-4000[1]	TTM TECHNOLOGIES INC
C2,C4	2	CAP, 2200pF, 10%, 50V, X7R, 0402	RM UMK105BJ222KV-F	TAIYO YUDEN (SINGAPORE) PTE LTD
C1,C3	2	CAP, 100pF, 5%, 50V, C0G, 0402	GRM1555C1H101JA01D	MURATA ELECTRONICS SINGAPORE PTE LT
R1,R2	2	RES, 0 OHM, 5%, 1/10W, 0402	RMC1/16SJPTH	Kamaya, Inc
L1,L2,L3	3	IND, 0.5nH, ±0.1nH, T/F, ULTRA-Q, 01005	LQP02HQ0N5B02L11	MURATA ELECTRONICS SINGAPORE PTE LT
RF1,RF2,RFC	3	CONN, SMA, EL MINI FLT 0.068" SPE-000303	20-001CF-T	Aliner Industries, Inc.
P1	1	CONN, HDR, ST, FRCTN LOCK, 4-PIN	22-23-2041	MOLEX
C5,C6,C7,C8,C9	5	NOT POPULATED ITEM-1	DUMMY PART	



Evaluation Board BOM – Matched EVB for 6 to 8GHz UHB Operation



Evaluation Board Layout



Evaluation Board Information

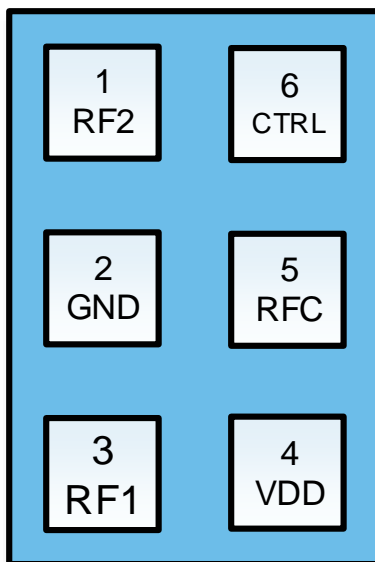
Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	0.40mil	3.5	
3	L1	Copper	0.70mil		
4	Dielectric1	Rogers 4003	8.00mil	4.8	
5	L2	Copper	0.70mil		
6	Dielectric2	FR-4	8.00mil	4.2	
7	L3	Copper	0.70mil		
8	Dielectric3	FR-4	24.00mil	4.2	
9	L4	Copper	0.70mil		
10	Dielectric 5	FR-4	8.00mil	4.2	
11	L5	Copper	0.70mil		
12	Dielectric 4	FR-4	8.00mil	4.2	
13	L6	Copper	0.70mil		
14	Bottom Solder	Solder Resist	0.40mil	3.5	
15	Bottom Overlay				

Total Thickness: 62mil +/-10%

0.5 oz. BASE COPPER + PLATING

0.5 oz. BASE COPPER + PLATING

Pin Configuration and Description



Top View

PIN NO.	LABEL	DESCRIPTION
1	RF2	RF Port
2	GND	Ground
3	RF1	RF Port
4	VDD	Power Supply Pin
5	RFC	RF Common Port
6	CTRL	Logic Control Pin

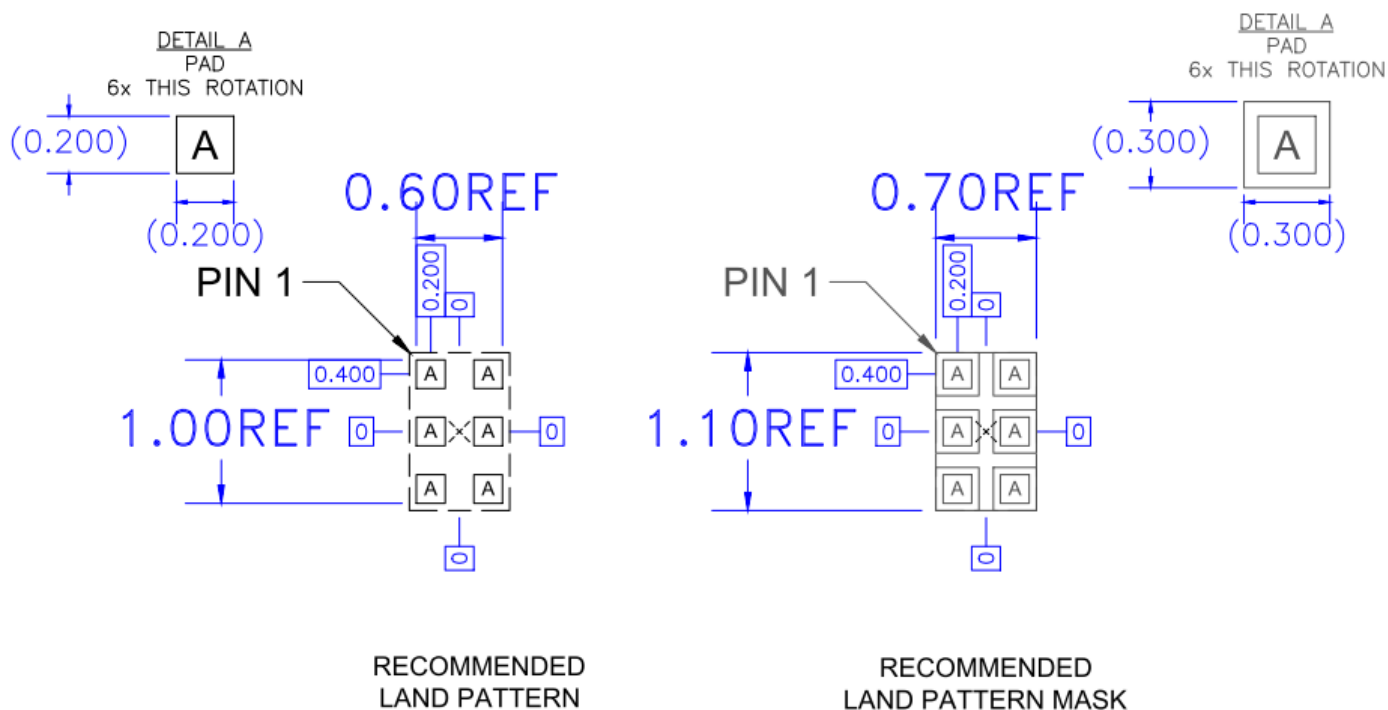
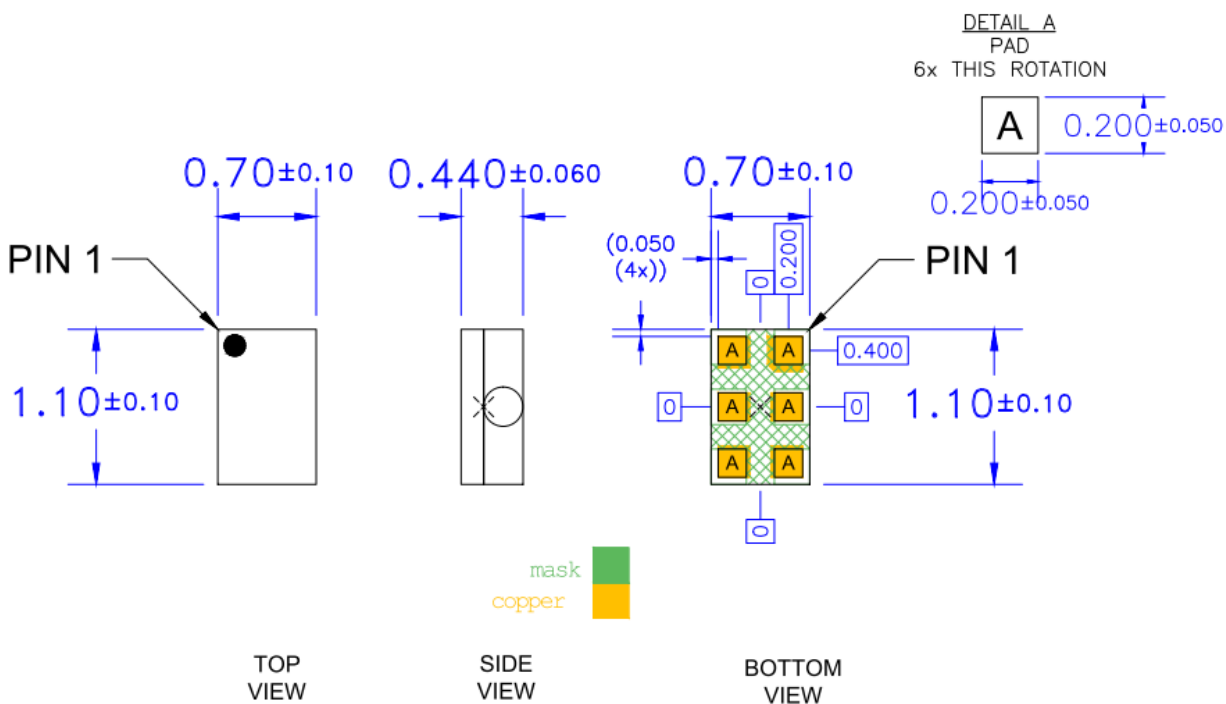
Control Logic

LOGIC STATE	V _{DD}	CTRL	DESCRIPTION
RF1 to RFC	"V _{DD} "	Low	RF1 to RFC active path, RF2 low impedance/reflective
RF2 to RFC	"V _{DD} "	High	RF2 to RFC active path, RF1 low impedance/reflective

Sequence of Events

LOGIC STATE	1 ST	2 ND	3 RD	DESCRIPTION
Turn ON	"V _{DD} "	CTRL	RF	Always have VDD "ON" prior to Control. Failure to do this will damage the DUT.
Turn OFF	RF	CTRL	"V _{DD} "	Never have Control "ON" without VDD "ON". Failure to do this will damage the DUT.

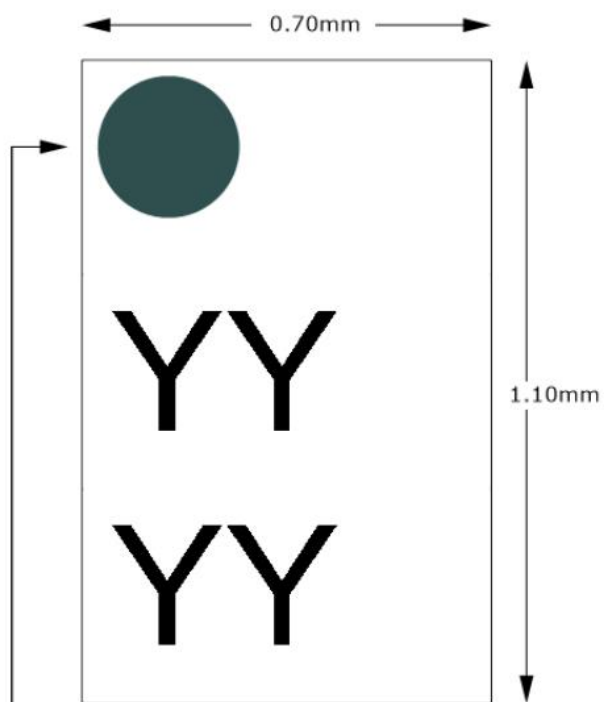
Mechanical Information



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

Branding Diagram



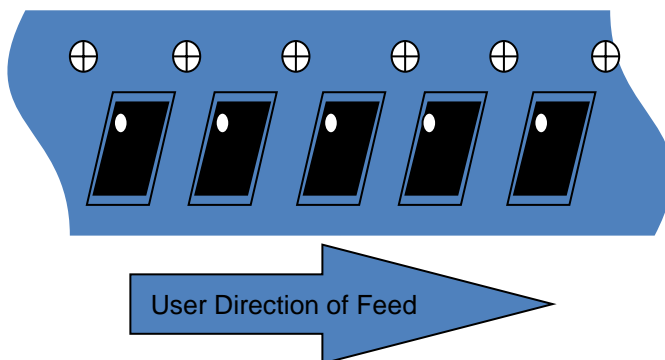
Pin 1 Indicator

Trace Code to be assigned by SubCon
(where YYYY indicates the Trace Code)

Tape and Reel Information – Carrier and Cover tape Dimensions

Tape and reel specifications for this part are also available on the Qorvo website.

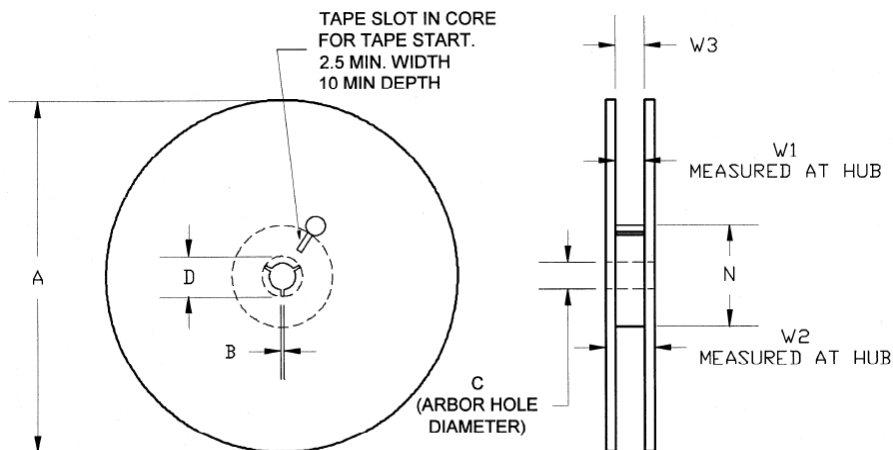
Standard T/R size = 10,000 pieces on a 13" reel.



Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.033	.85
	Width	B0	0.051	1.30
	Depth	K0	0.022	.55
	Pitch	P1	0.157	4.0
Centerline Distance	Cavity to Perforation - Length Direction	P2	0.079	2.0
	Cavity to Perforation - Width Direction	F	0.138	3.50
Cover Tape	Width	C	0.213	5.40
Carrier Tape	Width	W	0.315	8.0

Tape and Reel Information – Reel Dimensions

Packaging reels are used to prevent damage to devices during shipping and storage, loaded carrier tape is typically wound onto a plastic take-up reel. The reel size is 13" diameter. The reels are made from high-impact injection-molded polystyrene (HIPS), which offers mechanical and ESD protection to packaged devices.

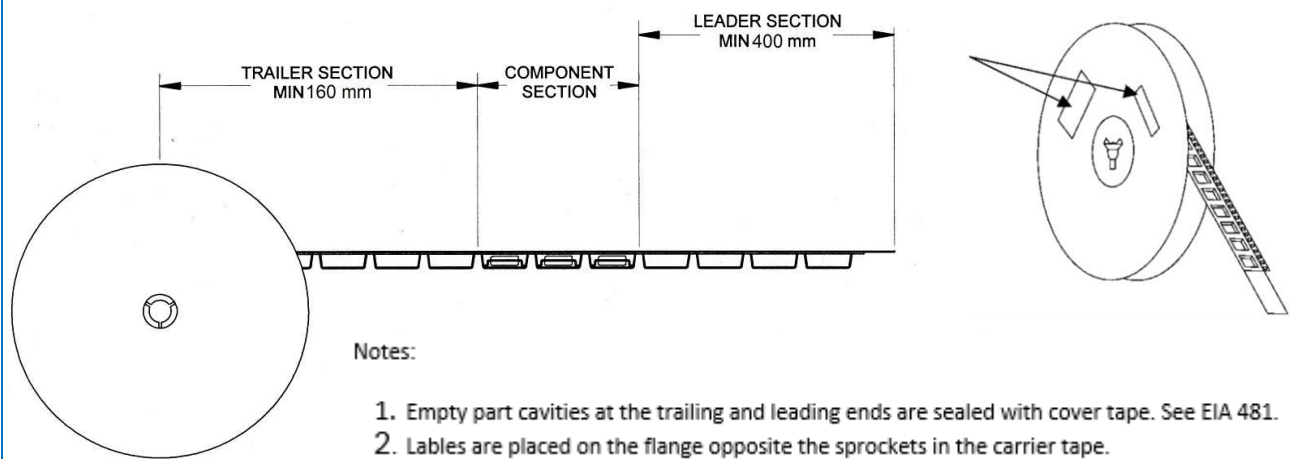


Feature	Measure	Symbol	Size (in)	Size (mm)
Flange	Diameter	A	12.992	330.0
	Thickness	W2	0.559	14.2
	Space Between Flange	W1	0.346	8.8
Hub	Outer Diameter	N	4.016	102.0
	Arbor Hole Diameter	C	0.512	13.0
	Key Slit Width	B	0.079	2.0
	Key Slit Diameter	D	0.795	20.2

Tape and Reel Information – Tape Length and Label Placement

Tape and reel specifications for this part are also available on the Qorvo website.

Standard T/R size = 10,000 pieces on a 13" reel.



Handling Precautions

PARAMETER	RATING	STANDARD
ESD – Human Body Model (HBM)	Class 2 (2000V)	ANSI/ESDA/JEDEC JS-001-2017
ESD – Charged Device Model (CDM)	Class C3 (1000V)	ANSI/ESDA/JEDEC JS-002-2018
MSL – Moisture Sensitivity Level	MSL3	IPC/JEDEC J-STD-020



Caution!

ESD sensitive device

Solderability

Compatible with both lead-free (260 °C max. reflow temperature) and tin/lead (245 °C max. reflow temperature) soldering processes.

Package lead plating: Electrolytic plated Au over Ni

RoHS Compliance

This part is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- SVHC Free
- PFOS Free





QPC8019Q BROADBAND HIGH FREQUENCY SPDT SWITCH

Revision History

REVISION	DATE	DESCRIPTION
Rev A	2-8-2018	Initial Release
B	12/04/19	Updated for 6 to 8 GHz operation and plot. Updated Preliminary Notes
C	3/13/20	Updated per RVTM data
D	11/25/20	Updated ESD/MSL, Increased Max IL by 0.05dB up to 4GHz, Increased Max IL by 0.1dB from 4 to 6GHz, Improved Min Iso from 2.3 to 4.2 GHz, Rounded typ Iso to within 0.5dB increments. Rounded typ Harmonics to within 0.5dB increments.
E	12/7/20	Increased max VDD current from 50 to 60uA; Changed EVB BOM to latest for production; changed reel size from 20K down to 10K for TR13; Added PFOS Free
F	12/23/20	Updated MSL rating to MSL3
G	8/10/22	Added Sequence of Events to help prevent damage; Increased AMR from 30 to 33 dBm
H	2/23/24	Updated ESD HBM and CDM.

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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