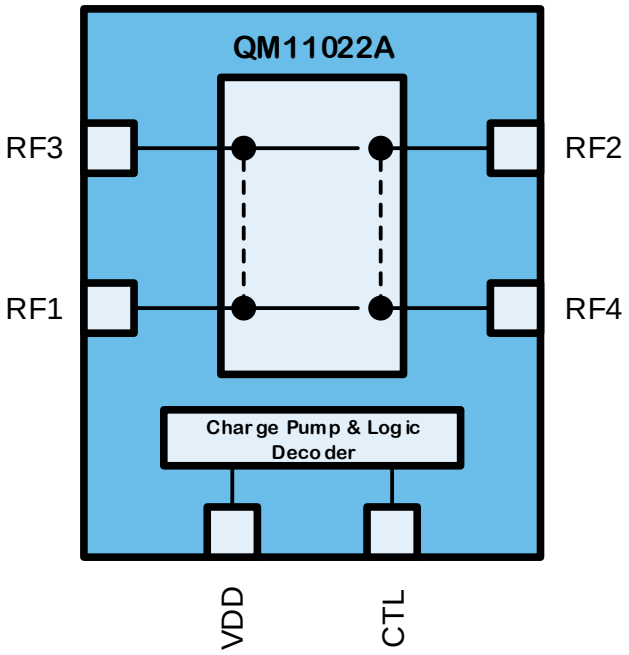
QM11022A

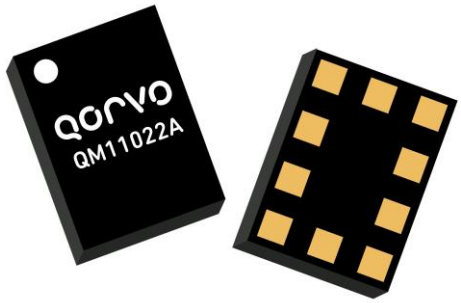
High Isolation DPDT Transfer Switch

Product Description

The QM11022A is a dual-pole double-throw transfer switch designed for general purpose switching applications where RF port transfer (port swapping) control is needed. The low insertion loss along with excellent linearity performance makes the QM11022A ideal for multi-mode GSM, EDGE, UMTS, and LTE handset applications. The RF ports can be directly connected in 50Ω systems and control logic is compatible with 1.3V to 2.7V systems. The supply voltage is intended for connection to 2.8V systems but the device is operable from 2.4V to 5.5V. The compact 1.1mm x 1.5mm size offers mobile handset designers an easy-to-use switch component for quick integration into multimode, multi-band systems.

Functional Block Diagram





10 Pin 1.1 x 1.5 x 0.59 mm Package

Feature Overview

- Low Insertion Loss
- High Port-to-Port Isolation
- GPIO Interface for 1.3V to 2.7V Control Logic
- Broadband Performance Suitable for All Cellular Modulation Schemes up to 8.25GHz
- Very Low Current Consumption
- Linearity and Harmonic Performance Ideally Suited for LTE Applications
- DC blocking capacitors are not required in typical applications

Applications

- Cellular Handset Applications
- Cellular Modems and USB Devices
- Multi-Mode GSM, EDGE, WCDMA, and LTE Applications

Ordering Information

PART NO.	DESCRIPTION
QM11022ASB	5-pc Sample Bag
QM11022ASR	100-pc, 7” Reel
QM11022ATR13-10K	10,000-pc, 13” Reel
QM11022APCK	Fully Assembled EVB

Absolute Maximum Ratings

PARAMETER	RATING
Storage Temperature	-65 to +150 °C
Operating Temperature	-30 to +90°C
V_{DD}	-0.5 to 6.0 V
C_{TL}	-0.5 to 3.0 V
Maximum Input Power	39dBm, 1:1 VSWR, +90°C, 12.5% DC 36dBm, 6:1 VSWR, +90°C, 12.5% DC

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

PARAMETER	MIN.	TYP.	MAX.	UNITS
V_{DD} Supply Voltage	2.4	2.8	5.5	V
V_{DD} Supply Current	-	57	80	µA
C_{TL} Logic Low Voltage	0.00	0.00	0.45	V
C_{TL} Logic High Voltage	1.3	1.8	2.7	V
C_{TL} Logic High Current	-	0.1	5	µA
Turn On Time – 50% Vdd to 90% RF	-	-	20	µs
Switching Speed - 10% to 90% RF	-	3.4	8	µs

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

Electrical Specifications

Test conditions unless otherwise stated: all unused RF ports terminated in 50Ω, Input and Output = 50Ω, T = 25°C, V_{DD} = 2.8V, Logic State = RF1-RF4; RF2-RF3 and RF1-RF3; RF2-RF4

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Frequency Range		698		960	MHz
Insertion Loss					
RF1 to RF3	Logic State = RF1-RF3, RF2-RF4	-	0.30	0.48	dB
RF1 to RF4	Logic State = RF1-RF4, RF2-RF3	-	0.31	0.48	dB
RF2 to RF3	Logic State = RF1-RF4, RF2-RF3	-	0.29	0.48	dB
RF2 to RF4	Logic State = RF1-RF3, RF2-RF4	-	0.30	0.48	dB
Insertion Loss Over Temperature					
RF1 to RF3	Temp= -30°C to +85°C	-	0.31	0.6	dB
RF1 to RF4	Temp= -30°C to +85°C	-	0.32	0.6	dB
RF2 to RF3	Temp= -30°C to +85°C	-	0.31	0.6	dB
RF2 to RF4	Temp= -30°C to +85°C	-	0.32	0.6	dB
Isolation					
RF1 to RF3, RF2 to RF4	Logic State = RF1-RF4, RF2-RF3	40	42	-	dB
RF1 to RF4, RF2 to RF3	Logic State = RF1-RF3, RF2-RF4	44	48	-	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF4, RF2-RF3	44	47	-	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF3, RF2-RF4	40	44	-	dB
Harmonics					
2nd Harmonic	Frequency = 824MHz to 915MHz; Pin = 25dBm; CW	-	-85	-65	dBm
3nd Harmonic		-	-87	-65	dBm
Up to 12.75GHz		-	-130	-80	dBm
2nd Harmonic (B13)	Frequency = 786.5MHz; Pin = 25dBm; CW	-	-85	-65	dBm
2nd Harmonic	Frequency = 824MHz; Pin = 35dBm; CW	-	-63	-50	dBm
3rd Harmonic		-	-57	-45	dBm
IIP2	F1 = 26dBm; F2 = -20dBm				
Band 5 & 6	F1 = 836.5MHz; F2 = 1718MHz; Rx Freq = 881.5MHz	110	130	-	dBm
IIP3	F1 = 20dBm; F2 = -15dBm				
Band 5 & 6	F1 = 836.5MHz; F2 = 791.5MHz; Rx Freq = 881.5MHz	65	77	-	dBm
VSWR					
RF1, RF2, RF3, RF4	698MHz to 960MHz	-	1.11	1.3	:1

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Frequency Range		1425		2200	MHz
Insertion Loss					
RF1 to RF3	Logic State = RF1-RF3, RF2-RF4	-	0.39	0.59	dB
RF1 to RF4	Logic State = RF1-RF4, RF2-RF3	-	0.38	0.59	dB
RF2 to RF3	Logic State = RF1-RF4, RF2-RF3	-	0.38	0.59	dB
RF2 to RF4	Logic State = RF1-RF3, RF2-RF4	-	0.37	0.59	dB
Insertion Loss Over Temperature					
RF1 to RF3	Temp= -30°C to +85°C	-	0.43	0.72	dB
RF1 to RF4	Temp= -30°C to +85°C	-	0.42	0.72	dB
RF2 to RF3	Temp= -30°C to +85°C	-	0.42	0.72	dB
RF2 to RF4	Temp= -30°C to +85°C	-	0.42	0.72	dB
Isolation					
RF1 to RF3, RF2-RF4	Logic State = RF1-RF4, RF2-RF3	34	37	-	dB
RF1 to RF4, RF2-RF3	Logic State = RF1-RF3, RF2-RF4	38	42	-	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF4, RF2-RF3	38	41	-	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF3, RF2-RF4	34	38	-	dB
Harmonics					
2nd Harmonic	Frequency = 1710MHz to 1910MHz; P_{in} = 25dBm; CW	-	-77	-65	dBm
3nd Harmonic		-	-81	-65	dBm
Up to 12.75GHz		-	-115	-80	dBm
2nd Harmonic	Frequency = 1910MHz; P_{in} = 33dBm; CW	-	-59	-50	dBm
3nd Harmonic		-	-56	-45	dBm
IIP2	F1 = 26dBm; F2 = -20dBm				
Band II (PCS)	F1 = 1880MHz; F2 = 3840MHz; Rx Freq = 1960MHz	110	122	-	dBm
IIP3	F1 = 20dBm; F2 = -15dBm				
Band 2 (PCS)	F1 = 1880MHz; F2 = 1800MHz; Rx Freq = 1960MHz	65	76	-	dBm
Band 1 (IMT)	F1 = 1950; F2 = 1760MHz; Rx Freq = 2140MHz	65	75	-	dBm
VSWR					
RF1, RF2, RF3, RF4	1425MHz to 2200MHz	-	1.30	1.5	:1

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Frequency Range		2300		2690	MHz
Insertion Loss					
RF1 to RF3	Logic State = RF1-RF3, RF2-RF4	-	0.47	0.67	dB
RF1 to RF4	Logic State = RF1-RF4, RF2-RF3	-	0.45	0.67	dB
RF2 to RF3	Logic State = RF1-RF4, RF2-RF3	-	0.46	0.67	dB
RF2 to RF4	Logic State = RF1-RF3, RF2-RF4	-	0.46	0.67	dB
Insertion Loss Over Temperature					
RF1 to RF3	Temp= -30°C to +85°C	-	0.51	0.87	dB
RF1 to RF4	Temp= -30°C to +85°C	-	0.49	0.87	dB
RF2 to RF3	Temp= -30°C to +85°C	-	0.50	0.87	dB
RF2 to RF4	Temp= -30°C to +85°C	-	0.50	0.87	dB
Isolation					
RF1 to RF3, RF2 to RF4	Logic State = RF1-RF4, RF2-RF3	30	35	-	dB
RF1 to RF4, RF2 to RF3	Logic State = RF1-RF3, RF2-RF4	35	40	-	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF4, RF2-RF3	35	40	-	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF3, RF2-RF4	30	36	-	dB
Harmonics					
2nd Harmonic	Frequency = 2500MHz to 2570MHz; P_{in} = 25dBm; CW	-	-72	-60	dBm
3nd Harmonic		-	-78	-60	dBm
IIP2	F1 = 20dBm; F2 = -15dBm				
Band 7	F1 = 2535MHz; F2 = 120MHz; Rx Freq = 2655MHz	110	120	-	dBm
IIP3	F1 = 20dBm; F2 = -15dBm				
Band 7	F1 = 2535MHz; F2 = 2415MHz; Rx Freq = 2655MHz	65	74	-	dBm
VSWR					
RF1, RF2, RF3, RF4	2300MHz to 2690MHz	-	1.33	1.5	:1

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Frequency Range		3400		3800	MHz
Insertion Loss					
RF1 to RF3	Logic State = RF1-RF3, RF2-RF4	-	0.61	0.88	dB
RF1 to RF4	Logic State = RF1-RF4, RF2-RF3	-	0.58	0.88	dB
RF2 to RF3	Logic State = RF1-RF4, RF2-RF3	-	0.59	0.88	dB
RF2 to RF4	Logic State = RF1-RF3, RF2-RF4	-	0.58	0.88	dB
Insertion Loss Over Temperature					
RF1 to RF3	Temp= -30°C to +85°C	-	0.68	1.2	dB
RF1 to RF4	Temp= -30°C to +85°C	-	0.64	1.2	dB
RF2 to RF3	Temp= -30°C to +85°C	-	0.65	1.2	dB
RF2 to RF4	Temp= -30°C to +85°C	-	0.65	1.2	dB
Isolation					
RF1 to RF3, RF2 to RF4	Logic State = RF1-RF4, RF2-RF3	29	33	-	dB
RF1 to RF4, RF2 to RF3	Logic State = RF1-RF3, RF2-RF4	35	39	-	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF4, RF2-RF3	35	39	-	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF3, RF2-RF4	29	34	-	dB
VSWR					
RF1, RF2, RF3, RF4	3400MHz to 3800MHz	-	1.5	1.7	:1

Frequency Range		4000		6000	MHz
Insertion Loss					
RF1 to RF3	Logic State = RF1-RF3, RF2-RF4	---	1.1	1.7	dB
RF1 to RF4	Logic State = RF1-RF4, RF2-RF3	---	1.0	1.7	dB
RF2 to RF3	Logic State = RF1-RF4, RF2-RF3	---	1.1	1.7	dB
RF2 to RF4	Logic State = RF1-RF3, RF2-RF4	---	1.0	1.7	dB
Isolation					
RF1 to RF3, RF2 to RF4	Logic State = RF1-RF4, RF2-RF3	25	32	---	dB
RF1 to RF4, RF2 to RF3	Logic State = RF1-RF3, RF2-RF4	31	38	---	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF4, RF2-RF3	31	38	---	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF3, RF2-RF4	25	32	---	dB
VSWR					
RF1, RF2, RF3, RF4	5000MHz to 6000MHz	---	1.9	2.7	:1

Frequency Range *		5925		6425	MHz
Insertion Loss					
RF1 to RF3	Logic State = RF1-RF3, RF2-RF4	---	1.15	---	dB
RF1 to RF4	Logic State = RF1-RF4, RF2-RF3	---	1.20	---	dB
RF2 to RF3	Logic State = RF1-RF4, RF2-RF3	---	1.14	---	dB
RF2 to RF4	Logic State = RF1-RF3, RF2-RF4	---	1.29	---	dB
Isolation					
RF1 to RF3, RF2 to RF4	Logic State = RF1-RF4, RF2-RF3	---	38	---	dB
RF1 to RF4, RF2 to RF3	Logic State = RF1-RF3, RF2-RF4	---	35	---	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF4, RF2-RF3	---	37	---	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF3, RF2-RF4	---	33	---	dB
VSWR					
RF1, RF2, RF3, RF4	5925MHz to 6425MHz	---	2.0	---	:1

* See UWB Matching Schematic on next page

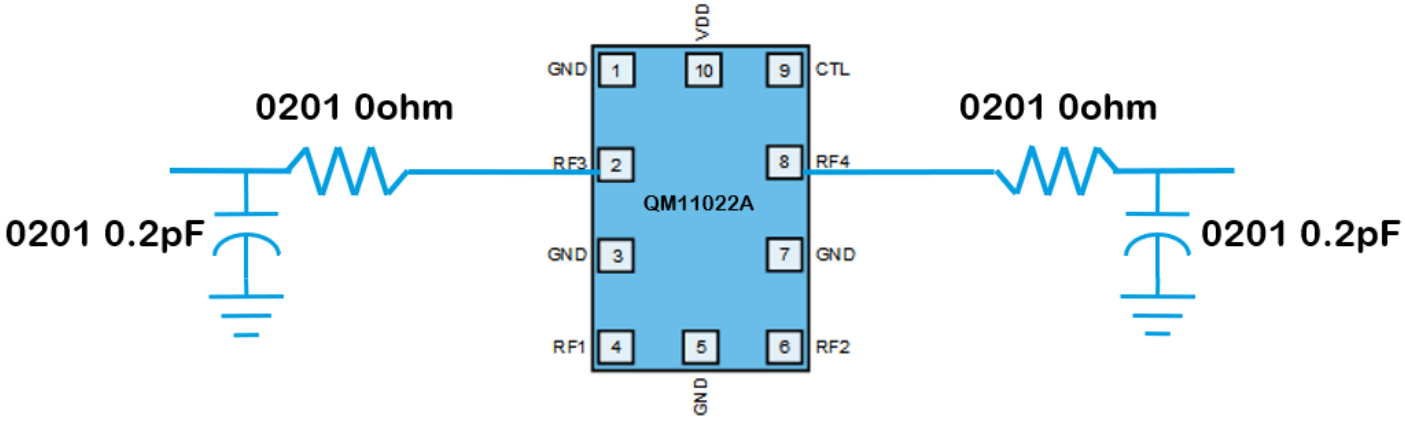
Frequency Range *		6420		6920	MHz
Insertion Loss					
RF1 to RF3	Logic State = RF1-RF3, RF2-RF4	---	1.18	---	dB
RF1 to RF4	Logic State = RF1-RF4, RF2-RF3	---	1.19	---	dB
RF2 to RF3	Logic State = RF1-RF4, RF2-RF3	---	1.18	---	dB
RF2 to RF4	Logic State = RF1-RF3, RF2-RF4	---	1.20	---	dB
Isolation					
RF1 to RF3, RF2 to RF4	Logic State = RF1-RF4, RF2-RF3	---	30	---	dB
RF1 to RF4, RF2 to RF3	Logic State = RF1-RF3, RF2-RF4	---	35	---	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF4, RF2-RF3	---	33	---	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF3, RF2-RF4	---	32	---	dB
VSWR					
RF1, RF2, RF3, RF4	6420MHz to 6920MHz	---	1.8	---	:1

* See UWB Matching Schematic on next page

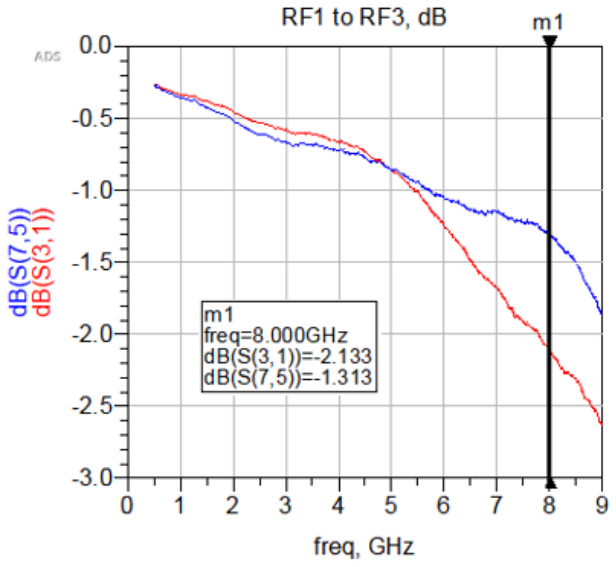
Frequency Range *		7740		8250	MHz
Insertion Loss					
RF1 to RF3	Logic State = RF1-RF3, RF2-RF4	---	1.46	---	dB
RF1 to RF4	Logic State = RF1-RF4, RF2-RF3	---	1.26	---	dB
RF2 to RF3	Logic State = RF1-RF4, RF2-RF3	---	1.48	---	dB
RF2 to RF4	Logic State = RF1-RF3, RF2-RF4	---	1.07	---	dB
Isolation					
RF1 to RF3, RF2 to RF4	Logic State = RF1-RF4, RF2-RF3	---	27	---	dB
RF1 to RF4, RF2 to RF3	Logic State = RF1-RF3, RF2-RF4	---	28	---	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF4, RF2-RF3	---	25	---	dB
RF1 to RF2, RF3 to RF4	Logic State = RF1-RF3, RF2-RF4	---	28	---	dB
VSWR					
RF1, RF2, RF3, RF4	7740MHz to 8250MHz	---	1.7	---	:1

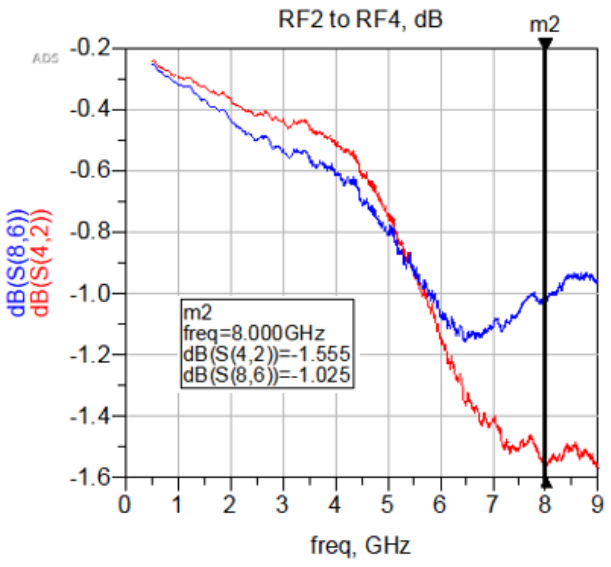
* See UWB Matching Schematic on next page

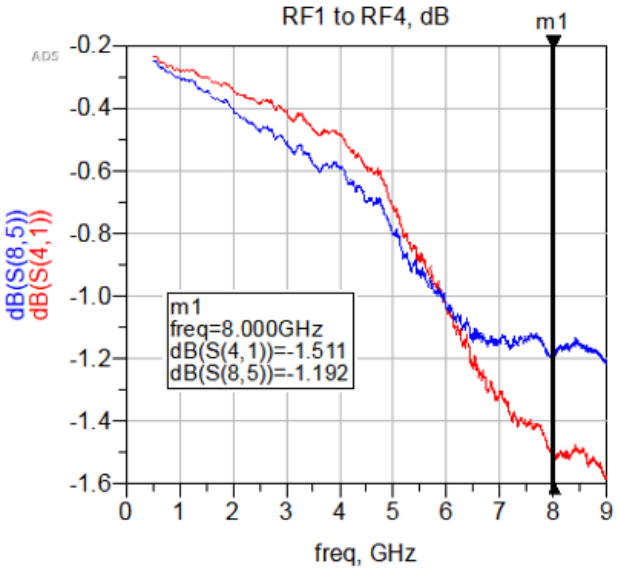
Matching Schematic for 6GHz to 8.25GHz Performance

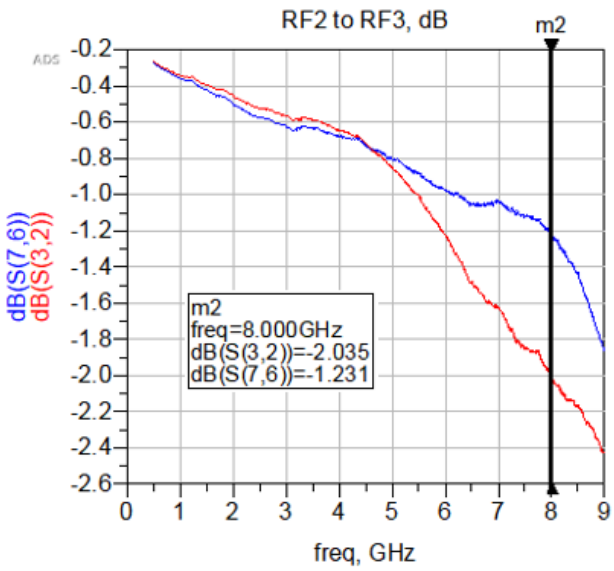


Red Trace = without matching Blue Trace = with matching

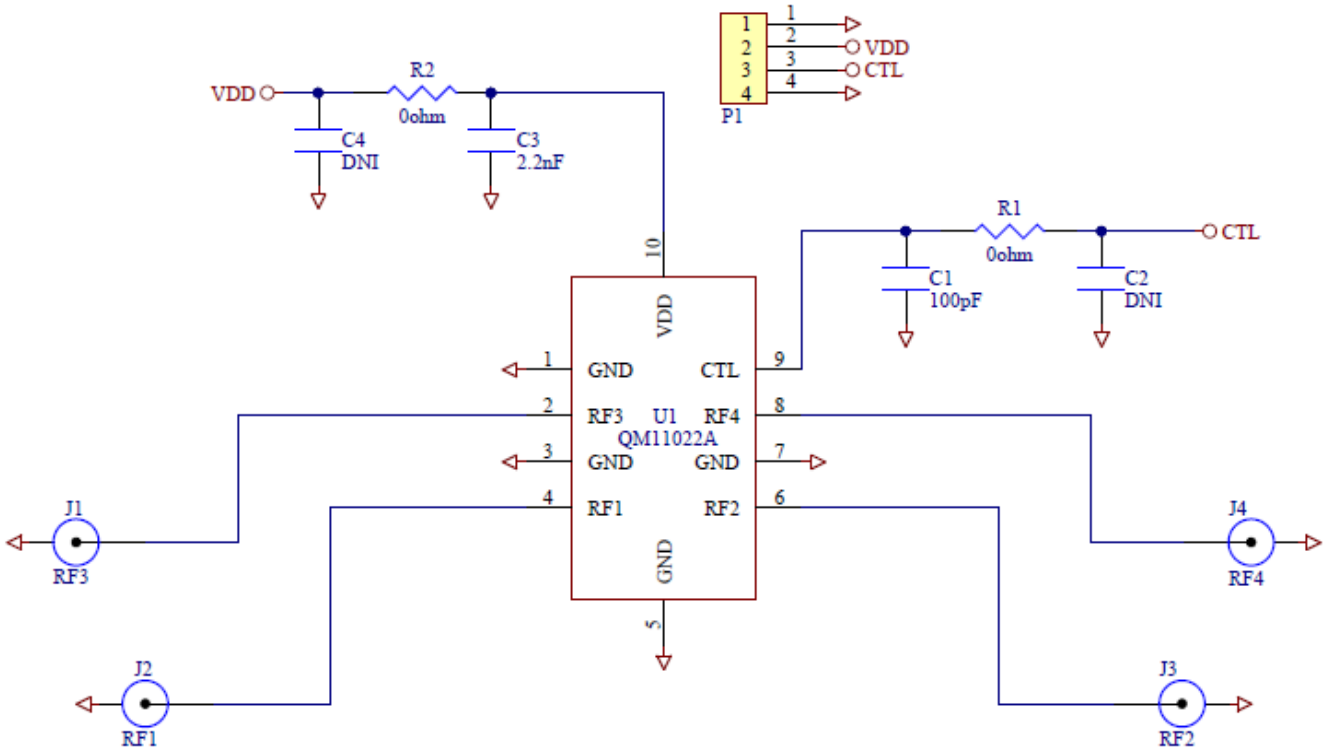








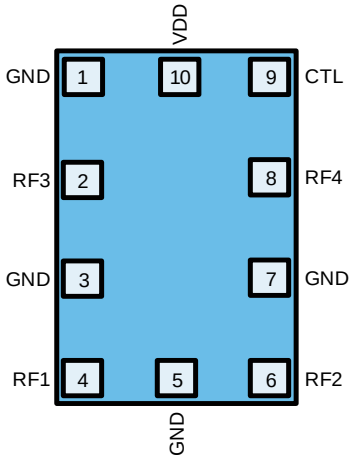
Application Circuit Schematic



NOTES:

1. C1 & C3 placement recommended as close to the device as possible
2. C2 & C4 optional

Pin Configuration and Description



Top View

PIN NO.	LABEL	DESCRIPTION
1	GND	Ground
2	RF3	RF Port connecting to either RF1 or RF2. Avoid applying DC voltage
3	GND	Ground
4	RF1	RF Port connecting to either RF3 or RF4. Avoid applying DC voltage
5	GND	Ground
6	RF2	RF Port connecting to either RF3 or RF4. Avoid applying DC voltage
7	GND	Ground
8	RF4	RF Port connecting to either RF1 or RF2. Avoid applying DC voltage
9	C_{TL}	Logic Control pin
10	V_{DD}	Power Supply pin

Control Logic

The Switch is controlled by V_{DD} and C_{TL}.

LOGIC STATE	V_{DD}	C_{TL}	DESCRIPTION
RF1-RF3;RF2-RF4	"V_{DD}"	Low	RF1 connected to RF3 and RF2 connected to RF4
RF1-RF4;RF2-RF3	"V_{DD}"	High	RF1 connected to RF4 and RF2 connected to RF3

Power On and Off Sequence

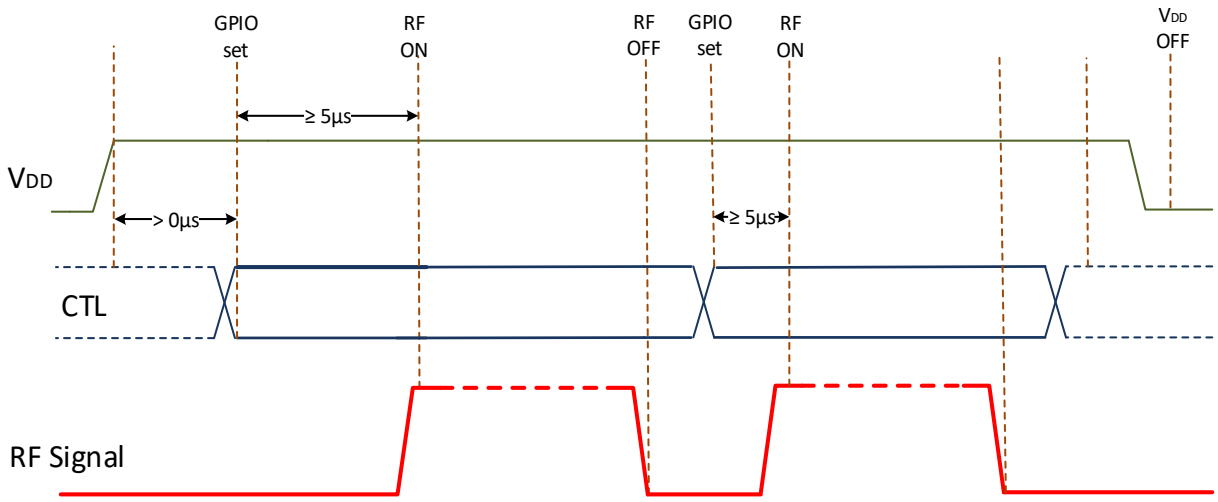
It is very important that the user adheres to the correct power-on/off sequence in order to avoid damaging the part. First apply V_{DD} before applying a high to C_{TL}.

Power On –

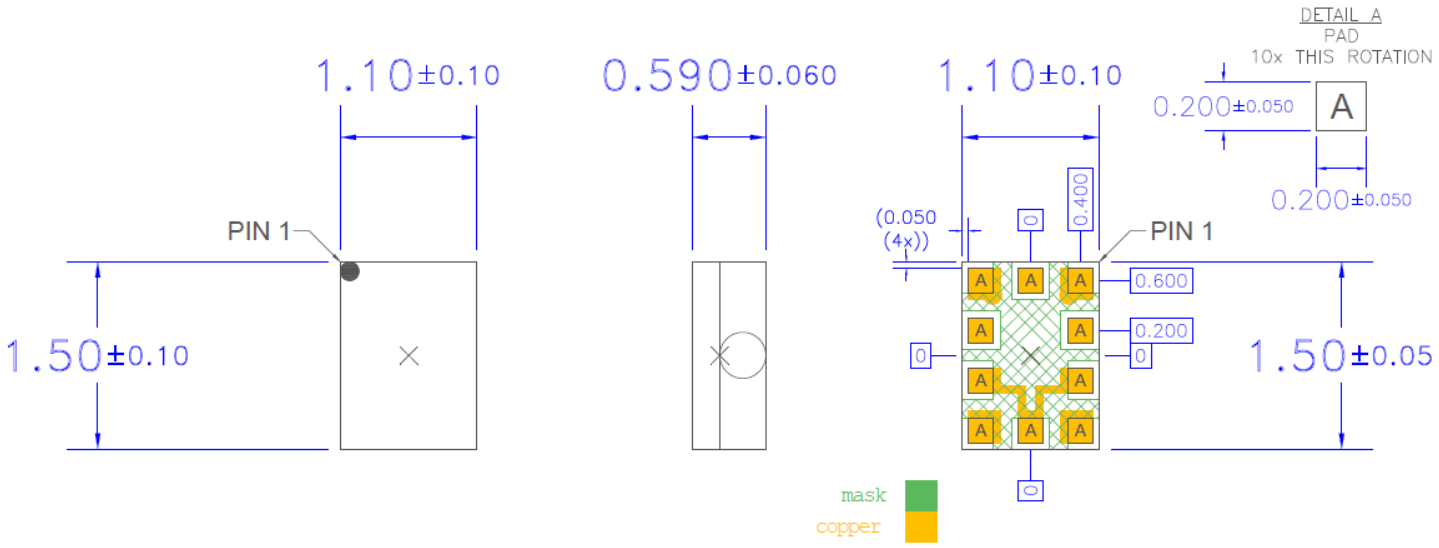
1. Apply voltage supply – V_{DD}
2. Apply Logic signal – C_{TL}
3. Wait 5µs or greater after C_{TL} is stable and then apply the RF signal

Power Off –

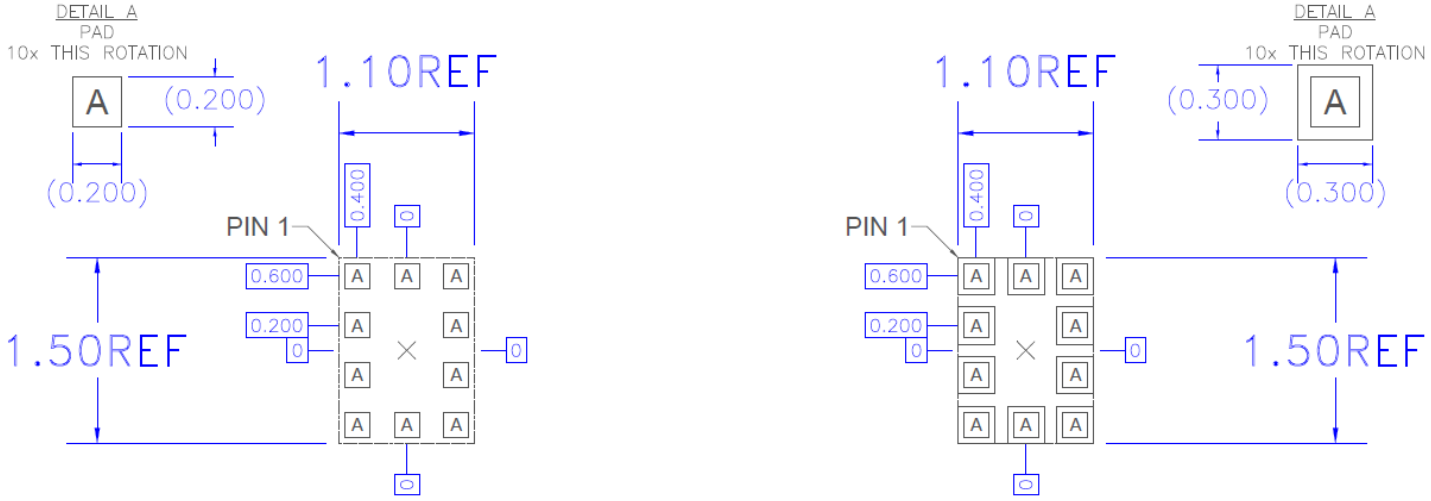
1. Remove the RF signal
2. Remove the logic signal – C_{TL}
3. Remove the voltage supply – V_{DD}



Mechanical Information



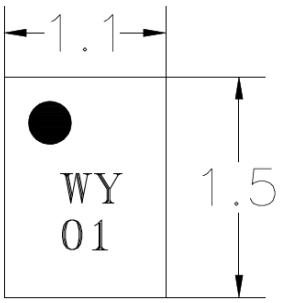
TOP VIEW | SIDE VIEW | BOTTOM VIEW



RECOMMENDED LAND PATTERN | RECOMMENDED LAND PATTERN MASK

Notes:
1. All dimensions are in milimeters. 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



If included on branding diagram, YY indicates year; WW indicates work week; and Trace Code is a sequential number assigned at device assembly.

Example:
Four digit trace code: WY01
Marking on the device: WY
01

Tape and Reel Information

Qorvo Part Number	Reel Diameter Inch (mm)	Hub Diameter Inch (mm)	Width (mm)	Pocket Pitch (mm)	Feed	Units Per Reel
QM11022ATR13-10K	13 (330)	4 (102)	8	4	Single	10,000
QM11022ASR	7 (178)	2.5 (63)	8	4	Single	100

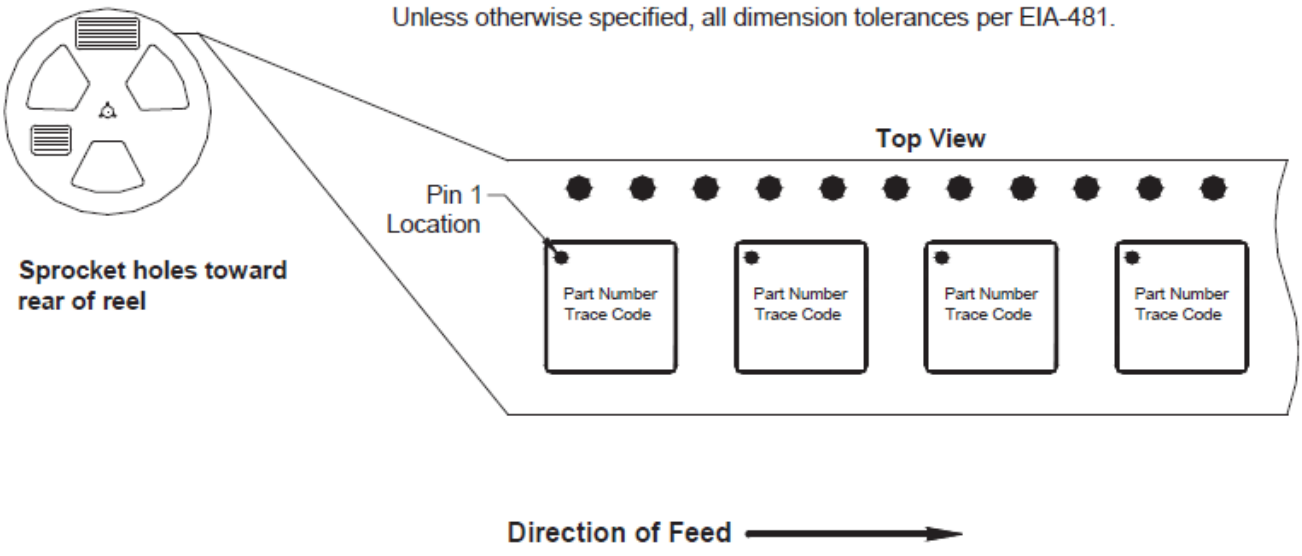


Figure 1. 1.10 mm x 1.50 mm (Carrier Tape Drawing with Part Orientation).

Handling Precautions

PARAMETER	RATING	STANDARD
ESD – Human Body Model (HBM)	Class 2	ESDA/JEDEC JS-001-2012
MSL – Moisture Sensitivity Level	Level 3	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 ($C_{15}H_{12}Br_4O_2$) Free
- SVHC Free

Revision History

Revision Code	Date	Comments
Rev D	11/20/2017	Initial Release
Rev E	11/30/2017	Updated LB Frequency Range
Rev F	7/18/2018	Updated EVB Part Number
Rev G	8/18/2020	Updated with higher frequency data and matching schematic
Rev H	7/31/2023	Updated UWB frequency specs

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

Important Notice

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