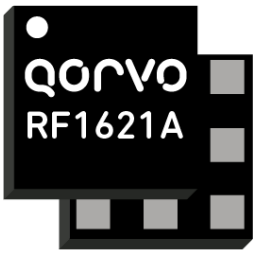
RF1621A

SPDT Switch for Low Power & Diversity Applications

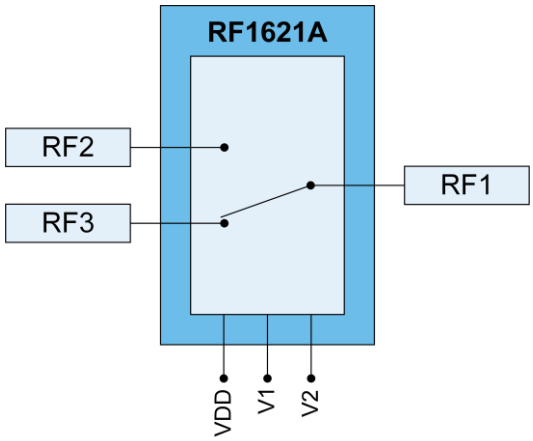
Product Overview

The RF1621A is a low loss; high isolation SPDT switch with performance optimized for low power and diversity applications. The RF1621A is compatible with +1.35 V control logic, which is a key requirement for most cellular transceivers. The part is packaged in a compact 1.1 mm x 1.1 mm, 9-pin package, which allows for a small solution size and no need for external DC blocking capacitors unless DC is applied externally.



Package: 9 pin, 1.1 mm x 1.1 mm x 0.775 mm

Functional Block Diagram



Key Features

- Broadband performance suitable for all cellular modulation schemes up to 2.7 GHz
- Excellent insertion loss and isolation performance
- 0.5 dB Typ IL @ 2.7 GHz
- Exceptional linearity performance ideal for CDMA, WCDMA applications
- Very low current consumption
- Very compact 1.1 mm x 1.1 mm module
- No external DC blocking capacitors required on RF Paths unless DC is applied externally

Applications

- Low Power and Diversity applications

Ordering Information

Part Number	Description
RF1621ASB	Sample Bag with 5 pcs
RF1621ASR	Sample Reel with 100 pcs
RF1621ATR13	Standard 13” Reel with 5,000 pcs
RF1621APCK-410	Evaluation Board Kit

Absolute Maximum Ratings

Parameter	Rating	Unit
Power Supply (V_{DD})	4.5	V
Control Voltage (V_{C1}, V_{C2})	3.0	V
Maximum Input Power		
Momentary Infrequent Occurrence	+27 in 50 Ω, 25 °C	dBm
	+26 in 50 Ω, 90 °C	
	+24 in 6:1, 90 °C	
Continuous Operation (CW/Peak)	+26 in 50 Ω, 25 °C	dBm
	+25 in 50 Ω, 90 °C	
	+23 in 6:1, 90 °C	
Operating Temperature	-30 to +90	°C
Storage Temperature	-30 to +150	°C

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.

Notes:
1. No operation above 6.0 volts.
2. Average power + PAR combined, 50 Ω, 25 °C.
3. Defined as measured at ground plane under or adjacent to chip.

Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					Nominal conditions unless otherwise stated. V_{DD} = 2.65 V, V_{CTL} High = 1.8 V, V_{CTL} Low = 0 V, Temp = 25 °C, 50 Ω. All unused ports = 50 Ω terminated
UMTS – Low Band					
Frequency Range					
	824		960	MHz	
Insertion Loss					
RF2 to RF1		0.30	0.42	dB	Frequency 815 MHz to 960 MHz
RF3 to RF1		0.30	0.42	dB	Frequency 815 MHz to 960 MHz
Isolation					
RF2 to RF3	28	38		dB	Frequency 824 MHz to 960 MHz; RF1 to RF3 active
RF2 to RF3	31	38		dB	Frequency 824 MHz to 960 MHz; RF1 to RF2 active
Harmonics					
RF2, RF3 – RF1, $2F_o$		-78	-65	dBm	Pin = +26 dBm, CW; Frequency 824 MHz to 915 MHz
RF2, RF3 – RF1, $3F_o$		-73	-60	dBm	Pin = +26 dBm, CW; Frequency 824 MHz to 915 MHz

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max		
Overall					Nominal conditions unless otherwise stated. V_{DD} = 2.65 V, V_{CTL} High = 1.8 V, V_{CTL} Low = 0 V, Temp = 25 °C, 50 Ω. All unused ports = 50 Ω terminated
UMTS – Low Band (Continued)					
RF2, RF3 – RF1, up to 12.75 GHz		-78	-69	dBm	Pin = +26 dBm, CW; Frequency 824 MHz to 915 MHz
VSWR					
RF2, RF3		1.3	1.5		Frequency 824 MHz to 960 MHz
RF1		1.3	1.5		Frequency 824 MHz to 960 MHz
UMTS – High Band					
Frequency Range					
	1710		2170	MHz	
Insertion Loss					
RF2 to RF1		0.45	0.57	dB	Frequency 1710 MHz to 2170 MHz
RF3 to RF1		0.45	0.57	dB	Frequency 1710 MHz to 2170 MHz
Isolation					
RF2 to RF3	21	29		dB	Frequency 1710 MHz to 2170 MHz; RF1 to RF3 active
RF2 to RF3	24	29		dB	Frequency 1710 MHz to 2170 MHz; RF1 to RF2 active
Harmonics					
RF2, RF3 – RF1, $2F_o$		-77	-63	dBm	Pin = +26 dBm, CW; Frequency 1710 MHz to 1980 MHz
RF2, RF3 – RF1, $3F_o$		-67	-55	dBm	Pin = +26 dBm, CW; Frequency 1710 MHz to 1980 MHz
RF2, RF3 – RF1, up to 12.75 GHz		-81	-72	dBm	Pin = +26 dBm, CW; Frequency 1710 MHz to 1980 MHz
VSWR					
RF2, RF3		1.3	1.5		Frequency 1710 MHz to 2170 MHz
RF1		1.3	1.5		Frequency 1710 MHz to 2170 MHz
LTE – Low Band					
Frequency Range					
	704		787	MHz	B13/17
Insertion Loss					
RF2 to RF1		0.30	0.40	dB	Frequency 704 MHz to 787 MHz
RF3 to RF1		0.30	0.40	dB	Frequency 704 MHz to 787 MHz

Paramete	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					Nominal conditions unless otherwise stated. V_{DD} = 2.65 V, V_{CTL} High = 1.8 V, V_{CTL} Low = 0 V, Temp = 25 °C, 50 Ω. All unused ports = 50 Ω terminated
LTE – Low Band (Continued)					
Isolation					
RF2 to RF3	29	39		dB	Frequency 704 MHz to 787 MHz; RF3 to RF1 active
RF2 to RF3	33	39		dB	Frequency 704 MHz to 787 MHz; RF2 to RF1 active
Harmonics					
RF2, RF3 – RF1, $2F_O$		-78	-66	dBm	Frequency 704 MHz to 787 MHz
RF2, RF3 – RF1, $3F_O$		-73	-62	dBm	Frequency 704 MHz to 787 MHz
RF2, RF3 – RF1, up to 12.75 GHz		-78	-70	dBm	Frequency 704 MHz to 787 MHz
VSWR					
RF2, RF3		1.2	1.4		Frequency 704 MHz to 787 MHz
RF1		1.2	1.4		Frequency 704 MHz to 787 MHz
LTE – High Band					
Frequency Range					
	2300		2690	MHz	
Insertion Loss					
RF2 to RF1		0.50	0.70	dB	Frequency 2300 MHz to 2690 MHz
RF3 to RF1		0.50	0.70	dB	Frequency 2300 MHz to 2690 MHz
Isolation					
RF2 to RF3	18	24		dB	Frequency 2300 MHz to 2690 MHz; RF3 to RF1 active
RF2 to RF3	22	26		dB	Frequency 2300 MHz to 2690 MHz; RF2 to RF1 active
Harmonics					
RF2, RF3 – RF1, $2F_O$		-78	-64	dBm	Pin = +26 dBm, CW, 2570 MHz
RF2, RF3 – RF1, $3F_O$		-67	-54	dBm	Pin = +26 dBm, CW, 2570 MHz
RF2, RF3 – RF1, up to 12.75 GHz		-78	-67	dBm	Pin = +26 dBm, CW, 2570 MHz
VSWR					
RF2, RF3		1.5	1.6		2300 MHz to 2690 MHz
RF1		1.5	1.6		2300 MHz to 2690 MHz

Paramete	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					Nominal conditions unless otherwise stated. V_{DD} = 2.65 V, V_{CTL} High = 1.8 V, V_{CTL} Low = 0 V, Temp = 25 °C, 50 Ω. All unused ports = 50 Ω terminated
IMD2 (ANT to RF1/2/3)					
Low Band (B8)		-120	-116	dBm	F1 = 897.5 MHz at +21 dBm, F2 = 1840 MHz at -15 dBm, Rx = 942.5 MHz
High Band (B2)		-120	-116	dBm	F1 = 1880 MHz at +21 dBm, F2 = 3840 MHz at -15 dBm, Rx = 1960 MHz
Low Band (C2K, B5)		-118	-115	dBm	F1 = 824 MHz at +21 dBm, F2 = 1693 MHz at -15 dBm, Rx = 869 MHz
High Band (C2K)		-120	-116	dBm	F1 = 1850 MHz at +21 dBm, F2 = 3780 MHz at -15 dBm, Rx = 1930 MHz
IMD3 (ANT to RF1/2/3)					
Low Band (B8)		-120	-115	dBm	F1 = 897.5 MHz at +21 dBm, F2 = 852.5 MHz at -15 dBm, Rx = 942.5 MHz
High Band (B2)		-118	-113	dBm	F1 = 1880 MHz at +21 dBm, F2 = 1800 MHz at -15 dBm, Rx = 1960 MHz
DC Control and Electrical Spec					
V_{DD} – Switch Supply Voltage	2.5	2.65	4.0	V	
V_{DD} Supply Current			130	µA	Active Mode
V_{C1}, V_{C2} (Control Voltage) High	1.35	1.8	2.8	V	
V_{C1},V_{C2} (Control Voltage) Low	0	0	0.45	V	
V_{C1}, V_{C2} Current		0.5	1.0	µA	
Switching Speed		2	5	µs	10% to 90% RF

Control Logic

Mode	V_{C1}	V_{C2}
RF1 – RF2	1	0
RF1 – RF3	1	1

Power-Up, Power-Down Sequence

Power-Up Sequence –

1. Apply V_{DD}
2. Apply V_{C1}, V_{C2}
3. Apply RF

Power-Down Sequence – The Power-down sequence is in the opposite order of the Power-up sequence.

Not Following the power ON/OFF sequence could cause damage to the switch and may affect the long-term reliability of the device.

Application Note: Using Only One Control Signal

The RF1621A may be configured so that only one control signal needs to be applied.

To set the part up in this configuration, V_{C1} will be connected indirectly to the V_{DD} supply voltage. Care must be taken to not exceed the maximum allowable voltage on the control line of V_{C1}(MAX) = 2.8 V.

Note the following constraints:

Signal	Min.	Max.
V_{DD}	2.5 V	4.5 V
V_{C1}, V_{C2} – High Condition	1.35 V	2.8 V
V_{C1} Input Current		200 nA

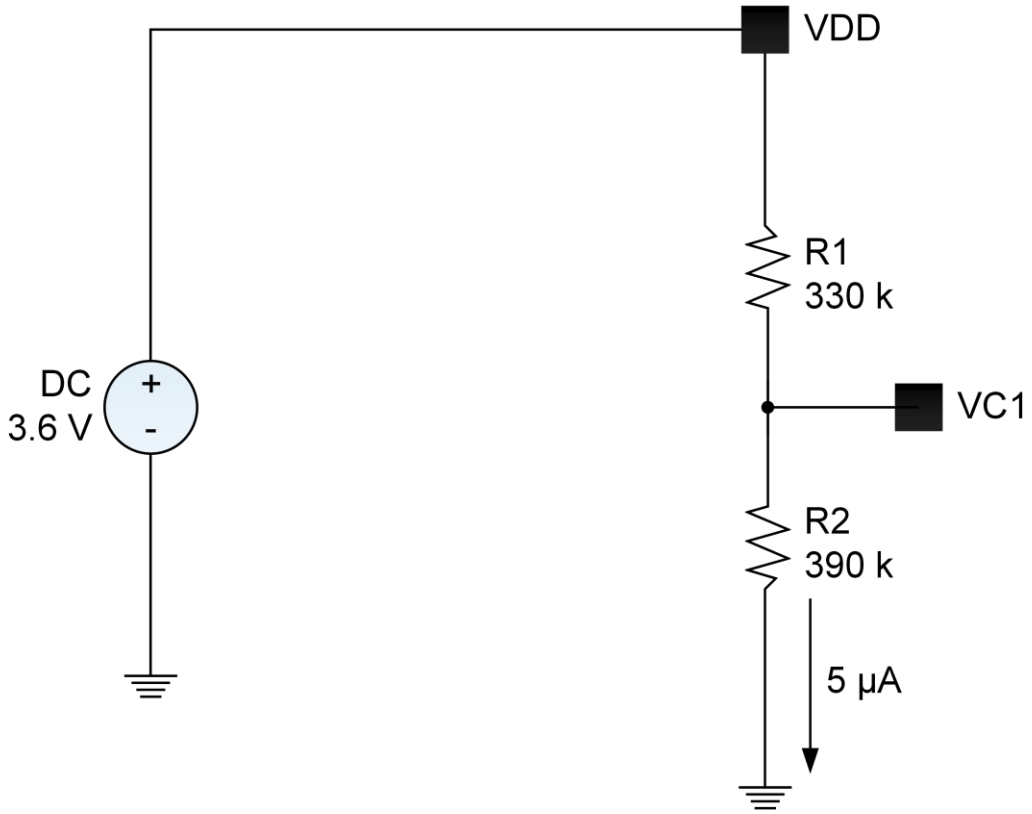
If V_{DD} will always be 2.8 V or less (but at least 2.5 V), no resistor divider is needed.

If V_{DD} may rise above 2.8 V, a resistor divider circuit must be used to ensure that the V_{C1} pin will never see more than 2.8 V but will always see more than 1.35 V.

An example of how to develop this resistor divider circuit will follow:

Example – consider a V_{DD} of 3.6 V. To ensure plenty of current drive, we choose to set up a current of approximately 5 µA in the resistor divider. This would lead to a total of 3.6 V/5 µA = 720 k ohms resistance. Using standard resistor values, we could connect a 390 k ohm resistor from V_{C1} to ground and a 330 k ohm resistor from V_{C1} to V_{DD}. This would set a nominal bias point of approximately 1.95 V at the V_{C1} pin.

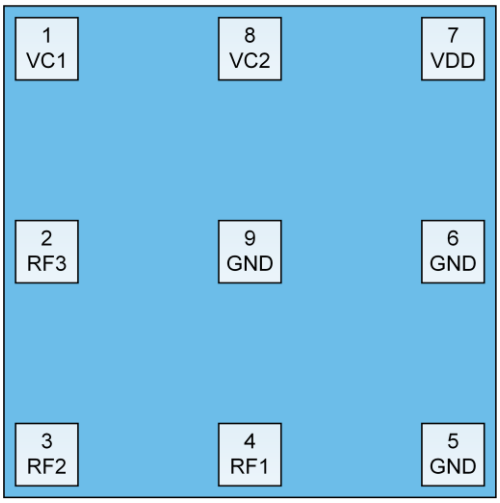
Note the results in the figure below.



Use similar logic for other supply voltages as needed.

Pin Out

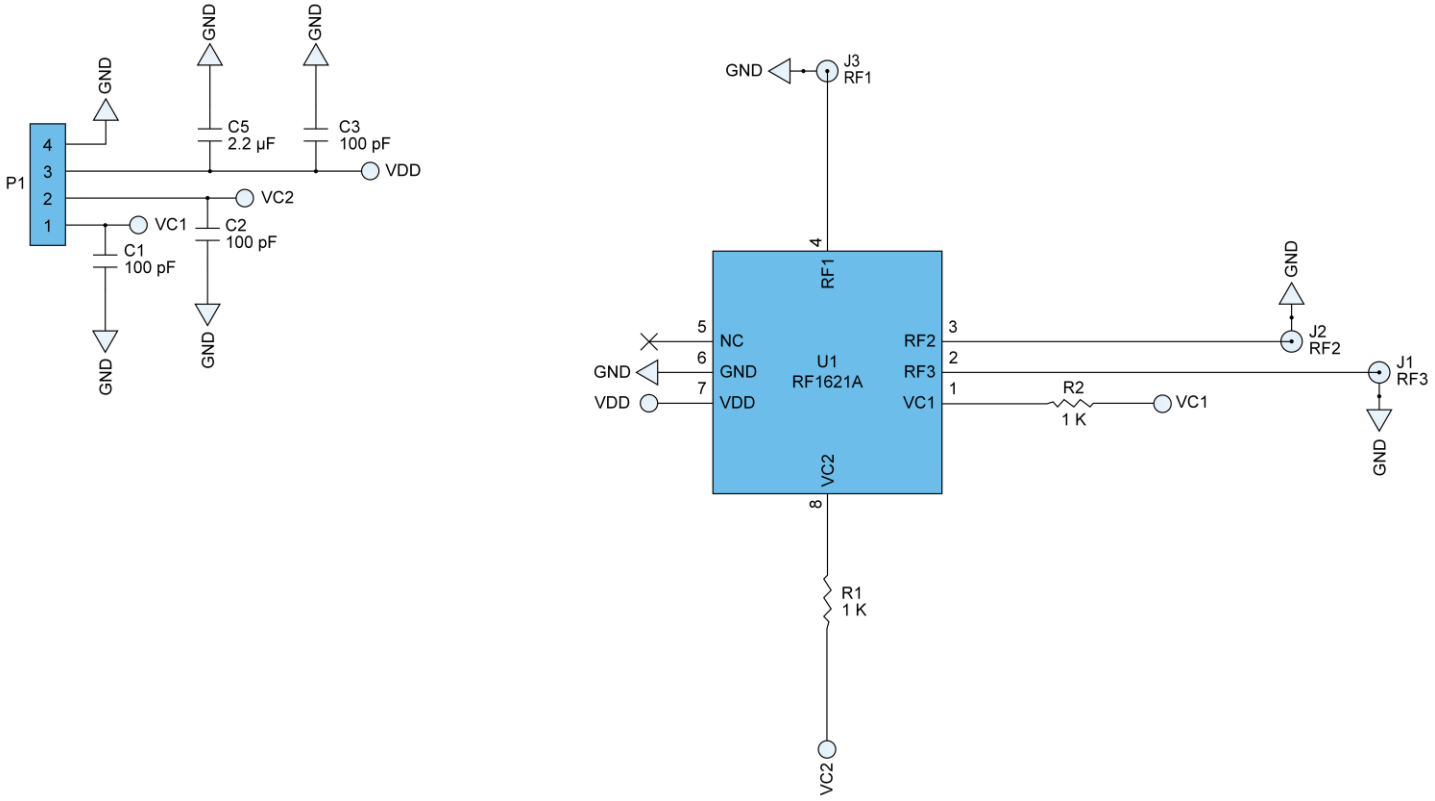
Top View



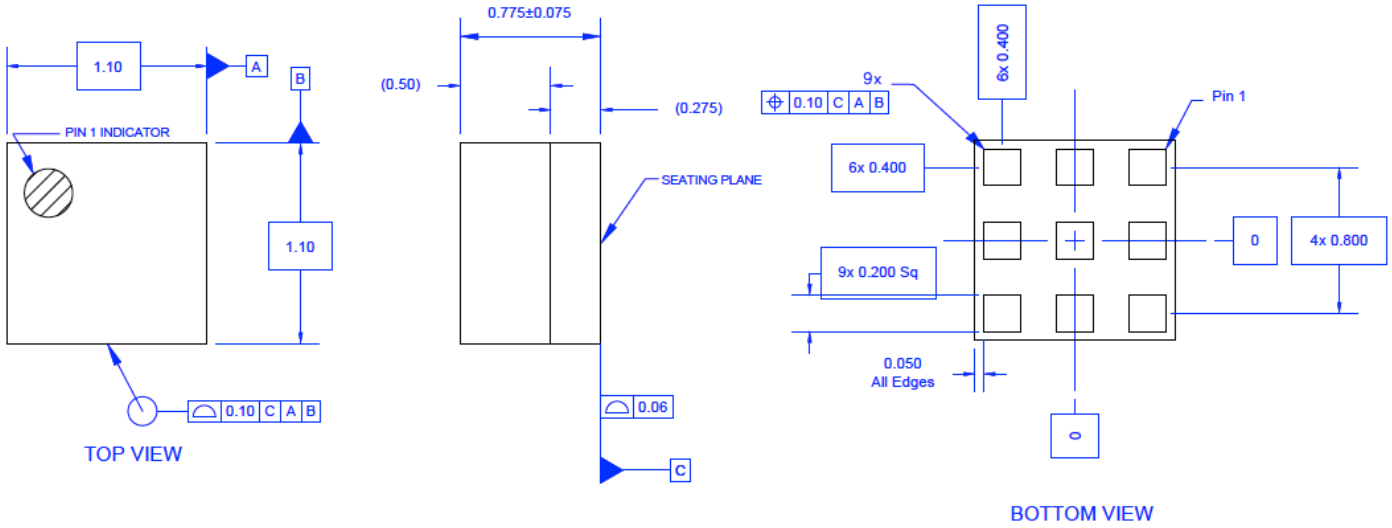
Pin-Out Description

Pin	Function	Description
1	V_{C1}	Switch logic control input
2	RF3	RF port
3	RF2	RF port
4	RF1	Antenna (Common port)
5	GND	Ground
6	GND	Ground
7	V_{DD}	Supply voltage
8	V_{C2}	Switch logic control input
9	GND	Ground

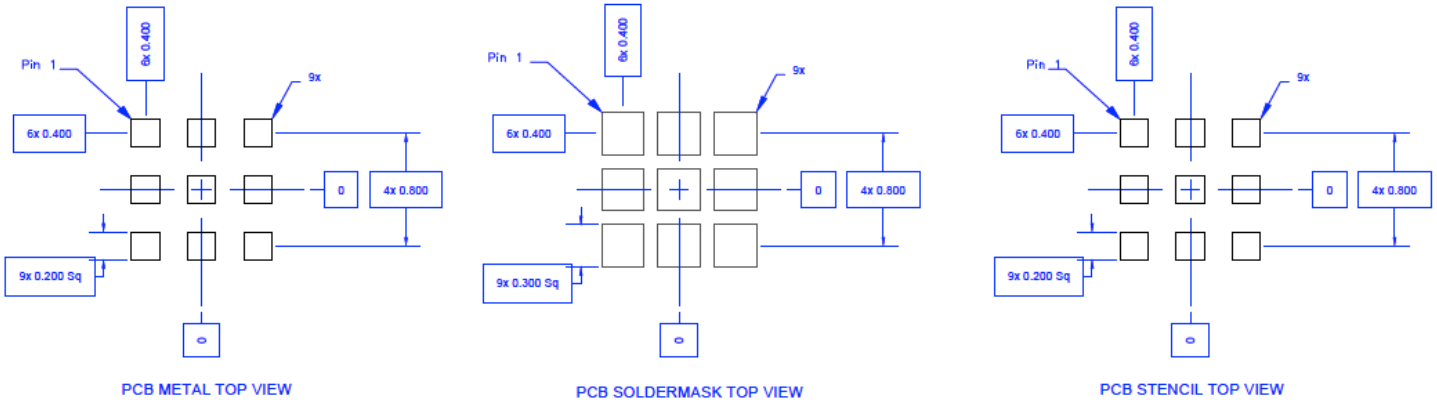
Evaluation Board Schematic



Package Outline



PCB Metal, Solder, and Stencil Patterns



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	Description
DS20140709	Initial release.
DS20161102	Change to Qorvo template

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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