



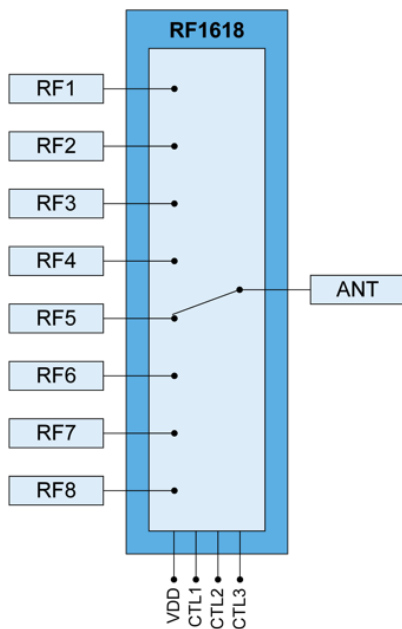
RF1618

SP8T Switch for Receive Diversity

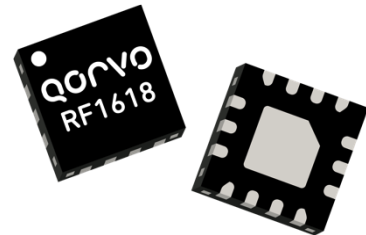
Product Overview

The RF1618 is a low loss, high isolation SP8T switch with performance optimized for receive diversity routing applications. The RF1618 is compatible with +1.3 V control logic, which is a key requirement for most cellular transceivers. This part is packaged in a compact 2 mm x 2 mm, 14-pin, QFN package 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



Functional Block Diagram



Package: 14 pin, 2 mm x 2 mm x 0.55 mm

Key Features

- Excellent insertion loss and isolation performance
 - 0.40 dB Typ IL, Band 5
 - 31 dB Typ Isolation, Band 5
- Multi-Band operation 700 MHz to 2700 MHz
- GPIO compatible to 1.8 V typ (1.3 V min)
- Power handling +26 dBm
- Compact 2 mm x 2 mm, QFN package
- No DC blocking capacitors required (unless external DC is applied to the RF ports)

Applications

- Cellular Handset Applications
- Cellular modems and USB devices
- Multi-Mode GSM, EDGE, WCDMA Applications
- LTE Applications

Ordering Information

Part Number	Description
RF1618SB	5-pc Sample Bag
RF1618SR	100-pc Sample Bag
RF1618TR7	2500-pc 7" Reel
RF1618PCK-410	RF1618 Evaluation Board and 5-pc Sample Bag

Absolute Maximum Ratings

Parameter	Rating	Unit
V _{DD}	6.0	V
CTL1, CTL2, CTL3	3.0	V
Maximum Input Power	+28	dBm
Operating Temperature	-30 to +90	°C
Storage Temperature	-40 to +125	°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.

Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
					Nominal conditions unless otherwise stated. V _{DD} = 2.85 V, V _{HIGH} /V _{LOW} = 1.8 V/0 V, Temp = 25 °C, 50 Ω.
Insertion Loss					
Insertion Loss TRx - ANT		0.40	0.55	dB	704 MHz to 787 MHz
Insertion Loss TRx - ANT		0.40	0.55	dB	815 MHz to 960 MHz
Insertion Loss TRx - ANT		0.50	0.70	dB	1710 MHz to 1980 MHz
Insertion Loss TRx - ANT		0.66	0.79	dB	2110 MHz to 2170 MHz
Insertion Loss TRx - ANT		0.76	0.90	dB	2300 MHz to 2690 MHz
Isolation					
Isolation in the 704 MHz to 960 MHz band					
RF1 to RF2	35	43		dB	704 MHz to 960 MHz
RF1 to RF3	36	44		dB	704 MHz to 960 MHz
RF1 to RF4	36	48		dB	704 MHz to 960 MHz
RF1 to RF5	39	42		dB	704 MHz to 960 MHz
RF1 to RF6	38	46		dB	704 MHz to 960 MHz
RF1 to RF7	37	44		dB	704 MHz to 960 MHz
RF1 to RF8	37	43		dB	704 MHz to 960 MHz
RF2 to RF3	30	33		dB	704 MHz to 960 MHz
RF2 to RF4	38	43		dB	704 MHz to 960 MHz
RF2 to RF5	37	46		dB	704 MHz to 960 MHz
RF2 to RF6	43	46		dB	704 MHz to 960 MHz
RF2 to RF7	41	46		dB	704 MHz to 960 MHz
RF2 to RF8	40	46		dB	704 MHz to 960 MHz
RF3 to RF4	30	32		dB	704 MHz to 960 MHz
RF3 to RF5	36	40		dB	704 MHz to 960 MHz
RF3 to RF6	41	47		dB	704 MHz to 960 MHz
RF3 to RF7	41	43		dB	704 MHz to 960 MHz
RF3 to RF8	40	43		dB	704 MHz to 960 MHz
RF4 to RF5	36	43		dB	704 MHz to 960 MHz

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
					Nominal conditions unless otherwise stated. $V_{DD} = 2.85 \text{ V}$, $V_{HIGH}/V_{LOW} = 1.8 \text{ V}/0 \text{ V}$, Temp = 25 °C, 50 Ω .
RF4 to RF6	40	47		dB	704 MHz to 960 MHz
RF4 to RF7	39	43		dB	704 MHz to 960 MHz
RF4 to RF8	39	41		dB	704 MHz to 960 MHz
RF5 to RF6	34	43		dB	704 MHz to 960 MHz
RF5 to RF7	36	48		dB	704 MHz to 960 MHz
RF5 to RF8	36	45		dB	704 MHz to 960 MHz
RF6 to RF7	31	33		dB	704 MHz to 960 MHz
RF6 to RF8	38	40		dB	704 MHz to 960 MHz
RF7 to RF8	29	31		dB	704 MHz to 960 MHz
RF1 to ANT	31	34		dB	704 MHz to 960 MHz, when RF1 path not selected
RF2 to ANT	31	44		dB	704 MHz to 960 MHz, when RF2 path not selected
RF3 to ANT	31	43		dB	704 MHz to 960 MHz, when RF3 path not selected
RF4 to ANT	30	42		dB	704 MHz to 960 MHz, when RF4 path not selected
RF5 to ANT	30	33		dB	704 MHz to 960 MHz, when RF5 path not selected
RF6 to ANT	35	44		dB	704 MHz to 960 MHz, when RF6 path not selected
RF7 to ANT	33	41		dB	704 MHz to 960 MHz, when RF7 path not selected
RF8 to ANT	33	42		dB	704 MHz to 960 MHz, when RF8 path not selected
Isolation in the 1710 MHz to 2170 MHz band					
RF1 to RF2	27	31		dB	1710 MHz to 2170 MHz
RF1 to RF3	29	31		dB	1710 MHz to 2170 MHz
RF1 to RF4	29	35		dB	1710 MHz to 2170 MHz
RF1 to RF5	28	30		dB	1710 MHz to 2170 MHz
RF1 to RF6	29	32		dB	1710 MHz to 2170 MHz
RF1 to RF7	29	31		dB	1710 MHz to 2170 MHz
RF1 to RF8	29	31		dB	1710 MHz to 2170 MHz
RF2 to RF3	21	23		dB	1710 MHz to 2170 MHz
RF2 to RF4	27	30		dB	1710 MHz to 2170 MHz
RF2 to RF5	29	30		dB	1710 MHz to 2170 MHz
RF2 to RF6	30	33		dB	1710 MHz to 2170 MHz
RF2 to RF7	29	33		dB	1710 MHz to 2170 MHz
RF2 to RF8	28	31		dB	1710 MHz to 2170 MHz
RF3 to RF4	21	23		dB	1710 MHz to 2170 MHz
RF3 to RF5	29	31		dB	1710 MHz to 2170 MHz

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
					Nominal conditions unless otherwise stated. $V_{DD} = 2.85 \text{ V}$, $V_{HIGH}/V_{LOW} = 1.8 \text{ V}/0 \text{ V}$, Temp = 25 °C, 50 Ω .
RF3 to RF6	29	33		dB	1710 MHz to 2170 MHz
RF3 to RF7	29	31		dB	1710 MHz to 2170 MHz
RF3 to RF8	28	31		dB	1710 MHz to 2170 MHz
RF4 to RF5	29	31		dB	1710 MHz to 2170 MHz
RF4 to RF6	28	33		dB	1710 MHz to 2170 MHz
RF4 to RF7	26	31		dB	1710 MHz to 2170 MHz
RF4 to RF8	27	29		dB	1710 MHz to 2170 MHz
RF5 to RF6	27	31		dB	1710 MHz to 2170 MHz
RF5 to RF7	29	34		dB	1710 MHz to 2170 MHz
RF5 to RF8	29	35		dB	1710 MHz to 2170 MHz
RF6 to RF7	22	24		dB	1710 MHz to 2170 MHz
RF6 to RF8	27	31		dB	1710 MHz to 2170 MHz
RF7 to RF8	20	22		dB	1710 MHz to 2170 MHz
RF1 to ANT	21	25		dB	1710 MHz to 2170 MHz, when RF1 path not selected
RF2 to ANT	26	32		dB	1710 MHz to 2170 MHz, when RF2 path not selected
RF3 to ANT	26	32		dB	1710 MHz to 2170 MHz, when RF3 path not selected
RF4 to ANT	26	31		dB	1710 MHz to 2170 MHz, when RF4 path not selected
RF5 to ANT	21	25		dB	1710 MHz to 2170 MHz, when RF5 path not selected
RF6 to ANT	27	31		dB	1710 MHz to 2170 MHz, when RF6 path not selected
RF7 to ANT	26	32		dB	1710 MHz to 2170 MHz, when RF7 path not selected
RF8 to ANT	25	31		dB	1710 MHz to 2170 MHz, when RF8 path not selected
Isolation in the 2300 MHz to 2690 MHz band					
RF1 to RF2	25	27		dB	2300 MHz to 2690 MHz
RF1 to RF3	27	30		dB	2300 MHz to 2690 MHz
RF1 to RF4	27	31		dB	2300 MHz to 2690 MHz
RF1 to RF5	25	27		dB	2300 MHz to 2690 MHz
RF1 to RF6	27	29		dB	2300 MHz to 2690 MHz
RF1 to RF7	26	28		dB	2300 MHz to 2690 MHz
RF1 to RF8	26	28		dB	2300 MHz to 2690 MHz
RF2 to RF3	18	20		dB	2300 MHz to 2690 MHz
RF2 to RF4	24	27		dB	2300 MHz to 2690 MHz
RF2 to RF5	26	29		dB	2300 MHz to 2690 MHz
RF2 to RF6	28	29		dB	2300 MHz to 2690 MHz

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
					Nominal conditions unless otherwise stated. $V_{DD} = 2.85\text{ V}$, $V_{HIGH}/V_{LOW} = 1.8\text{ V}/0\text{ V}$, Temp = 25 °C, 50 Ω .
RF2 to RF7	26	29		dB	2300 MHz to 2690 MHz
RF2 to RF8	25	28		dB	2300 MHz to 2690 MHz
RF3 to RF4	18	20		dB	2300 MHz to 2690 MHz
RF3 to RF5	26	28		dB	2300 MHz to 2690 MHz
RF3 to RF6	29	29		dB	2300 MHz to 2690 MHz
RF3 to RF7	26	25		dB	2300 MHz to 2690 MHz
RF3 to RF8	25	27		dB	2300 MHz to 2690 MHz
RF4 to RF5	26	28		dB	2300 MHz to 2690 MHz
RF4 to RF6	25	29		dB	2300 MHz to 2690 MHz
RF4 to RF7	25	27		dB	2300 MHz to 2690 MHz
RF4 to RF8	25	27		dB	2300 MHz to 2690 MHz
RF5 to RF6	25	27		dB	2300 MHz to 2690 MHz
RF5 to RF7	27	30		dB	2300 MHz to 2690 MHz
RF5 to RF8	27	30		dB	2300 MHz to 2690 MHz
RF6 to RF7	20	21		dB	2300 MHz to 2690 MHz
RF6 to RF8	24	27		dB	2300 MHz to 2690 MHz
RF7 to RF8	18	19		dB	2300 MHz to 2690 MHz
RF1 to ANT	18	20		dB	2300 MHz to 2690 MHz, when RF1 path not selected
RF2to ANT	24	29		dB	2300 MHz to 2690 MHz, when RF2 path not selected
RF3 to ANT	24	28		dB	2300 MHz to 2690 MHz, when RF3 path not selected
RF4 to ANT	24	28		dB	2300 MHz to 2690 MHz, when RF4 path not selected
RF5 to ANT	19	21		dB	2300 MHz to 2690 MHz, when RF5 path not selected
RF6 to ANT	24	29		dB	2300 MHz to 2690 MHz, when RF6 path not selected
RF7 to ANT	24	28		dB	2300 MHz to 2690 MHz, when RF7 path not selected
RF8 to ANT	23	28		dB	2300 MHz to 2690 MHz, when RF8 path not selected
Harmonics (Pin = +16 dBm)					
Low Band, 2 f_o		-121		dBc	Pin = +16 dBm, 50 ohms, f_o =824 MHz
Low Band, 3 f_o		-102		dBc	Pin = +16 dBm, 50 ohms, f_o =824 MHz
High Band, 2 f_o		-105		dBc	Pin = +16 dBm, 50 ohms, f_o =1980 MHz
High Band, 3 f_o		-100		dBc	Pin = +16 dBm, 50 ohms, f_o =1980 MHz
High Band, 2 f_o		-98		dBc	Pin = +16 dBm, 50 ohms, f_o =2570 MHz
High Band, 3 f_o		-97		dBc	Pin = +16 dBm, 50 ohms, f_o =2570 MHz

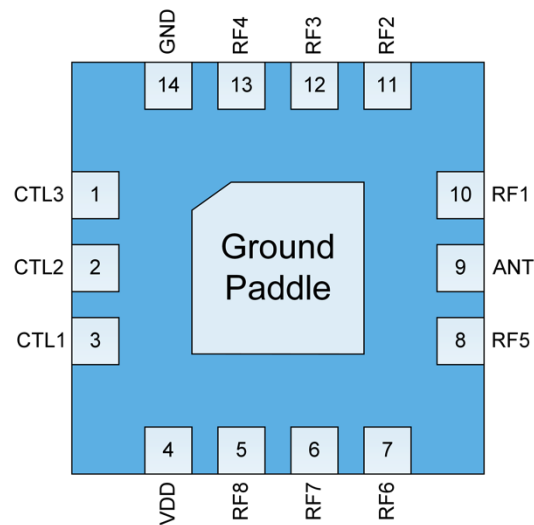
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
					Nominal conditions unless otherwise stated. $V_{DD} = 2.85\text{ V}$, $V_{HIGH}/V_{LOW} = 1.8\text{ V}/0\text{ V}$, Temp = 25 °C, 50 Ω .
VSWR		1.1	1.5		704 – 2690 MHz
DC Control and Electrical Specifications					
V_{DD} – Switch Supply Voltage	2.4	2.85	4.5	V	
V_{DD} Supply Current		80	120	μA	Active Mode
CTL1, CTL2, CTL3 – Control Voltage HIGH	1.3		2.7*	V	* V_{DD} must be $>V_{CTL}$ at all times
CTL1, CTL2, CTL3 – Control Voltage LOW	0		0.45	V	
Control Current			5	μA	
Switching Speed, one RF port to another			2	μS	10% to 90% RF
Turn On time		4		μS	Time from $V_{DD} = 0\text{ V}$ to part ON and RF at 90%

CONTROL LOGIC for all ports

The SP8T switch is controlled by CTL1, CTL2, and CTL3

Mode	CTL1	CTL2	CTL3
RF1 - ANT	High	Low	Low
RF2 - ANT	Low	High	Low
RF3 - ANT	High	High	Low
RF4 - ANT	Low	Low	High
RF5 - ANT	High	Low	High
RF6 - ANT	Low	High	High
RF7 - ANT	High	High	High
RF8 - ANT	Low	Low	Low

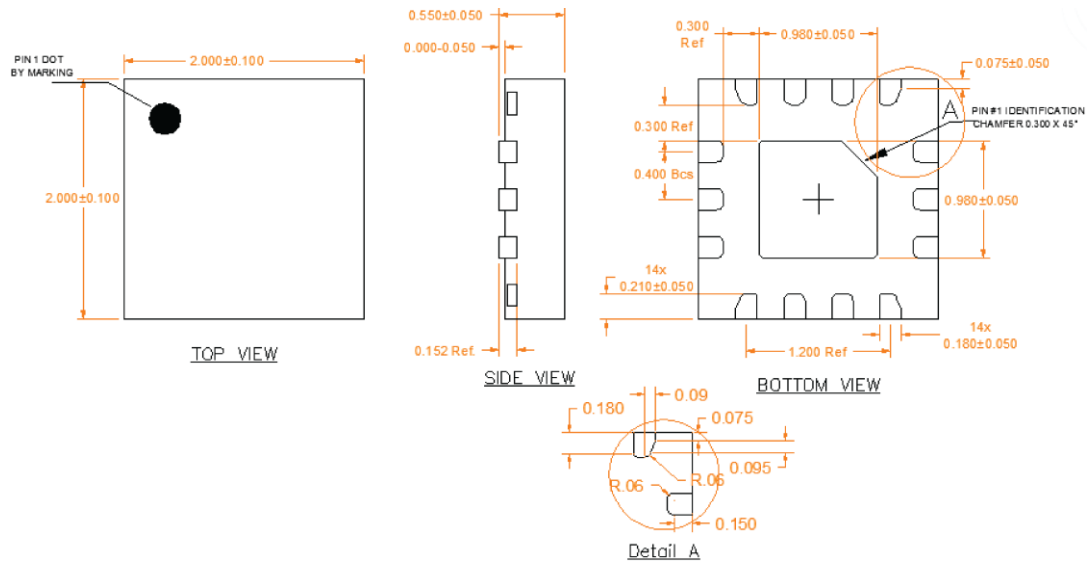
Pin Out (Top View)



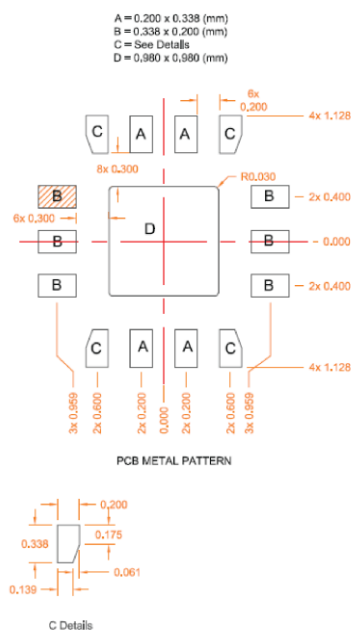
Pin Out Description

Pin	Function	Description
1	CTL3	Control Logic #3
2	CTL2	Control Logic #2
3	CTL1	Control Logic #1
4	V _{DD}	Power Supply
5	RF8	RF output
6	RF7	RF output
7	RF6	RF output
8	RF5	RF output
9	ANT	RF signal in Antenna
10	RF1	RF output
11	RF2	RF output
12	RF3	RF output
13	RF4	RF output
14	GND	RF and DC Ground
Ground Paddle	GND	RF and DC Ground

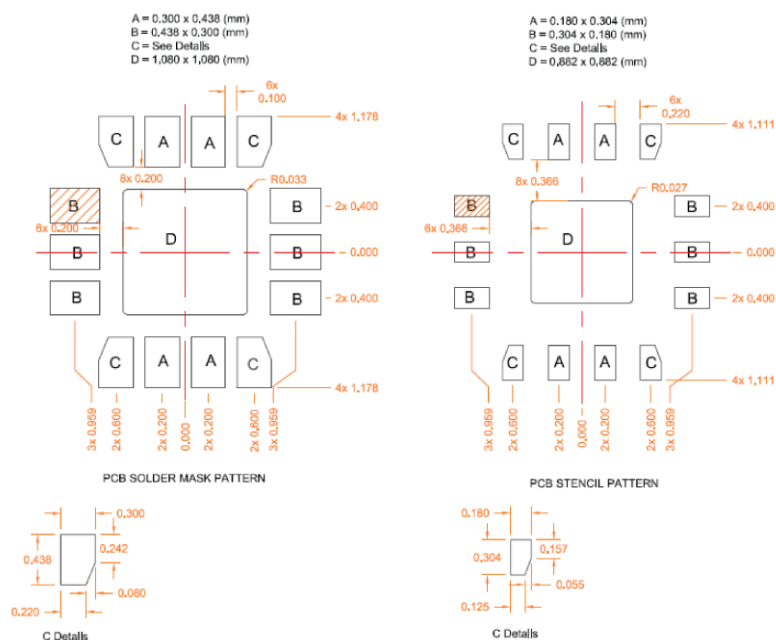
Package Drawing



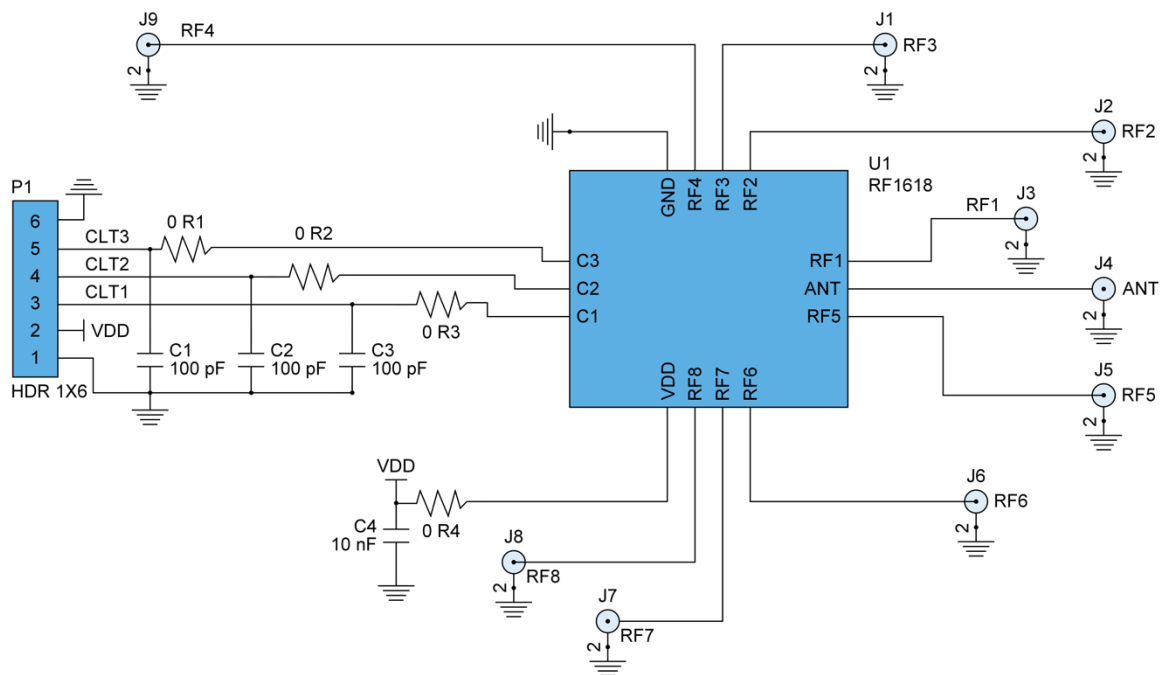
PCB Metal Pattern



PCB Solder Mask and Stencil Pattern



Evaluation Board Schematic



Application Notes

The RF1618 is intended for receive diversity applications in the 700 MHz to 2700 MHz frequency range. The maximum power handling capability of +26 dBm allows this diversity switch to be co-located in a handset where GSM transmitters are active with limited isolation between the Tx and Rx diversity paths.

Unused RF ports of the RF1618 should be grounded.

Power-Up/Down Sequence

It is very important that the user adhere to the correct power-up/down sequence in order to avoid damaging the device. If V_{DD} is not supplied at any time the control lines must all be set to 0 V (or ground).

ON Sequence: First turn ON V_{DD} , then to apply control signals.

OFF Sequence: First turn OFF the control signals, then to turn OFF V_{DD} .

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



REVISION HISTORY

Revision	Description
DS20130410	Initial release of datasheet version for mass production.
DS20130422	Removed NDA Required watermark.
DS20130612	Updated EU Directive, added corner detail to package drawing.
DS20161101	Updated to Qorvo template. Removed SQ item from ordering information.

Contact Information

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

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