WINSOURCE ELECTRONICS

THE DATASHEET OF

QPC7333TR7

QPC7333

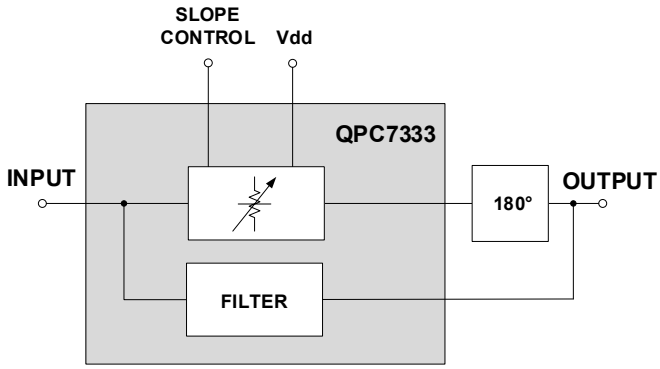
5MHz to 684MHz Variable Cable Slope Equalizer

Product Description

The QPC7333 is a cable compensated voltage controlled variable equalizer employing SOI attenuator with operation bandwidth from 5MHz to 684MHz, optimized for operation between 15MHz and 684MHz.

14 pin, 6.0 mm x 6.0 mm x 1.375 mm package

Functional Block Diagram



Product Features

- 5 – 684 MHz Operational Bandwidth
- Optional inverse cable loss frequency response
- 18dB slope range
- Low insertion loss
- High linearity
- 75Ohm impedance for CATV applications
- 5V single-supply voltage
- Low power consumption

Applications

CATV amplifier and transmission systems

Ordering Information

Part No.	Description
QPC7333SB	Sample bag 5 pcs
QPC7333SR	7” Reel with 100 pcs
QPC7333TR7	7” Reel with 500 pcs
QPC7333PCBA-410	Fully assembled Evaluation Board

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Absolute Maximum Ratings

Parameter	Value / Range
Supply Voltage (Vdd)	-0.5 to +6V
Control Voltage (Vc)	-0.5 to +6V
Control Voltage 2 (Vc2)	-2 to +24V
MODE	-0.5 to +6V
Storage Temperature	−40 to 100 °C
RF Input Power	+30 dBm

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.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Supply Voltage (Vdd)		+5		V
Junction Temperature			+125	°C
Operating Mounting Base Temperature	-40		+100	°C

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

Electrical Specifications – Tested in Evaluation Circuit

Parameter	Conditions (Vdd=5V, T_{MB}=25°C, Z_S=Z_L=75Ω)	Min	Typ	Max	Units
General Performance					
Supply Current (I_{dd})			3		mA
Thermal Resistance			70		K/W
RF Input Power	T ≤ +85°C			27	dBm
	+85°C < T ≤ +100°C			24	
Input IP3	P_{IN} + ($IM3_{dBc}$/2) 6MHz tone spacing at 15dBm/tone		50		dBm
Input IP2	P_{IN} + $IM2_{dBc}$, IM2 is F1 + F2 6MHz tone spacing at 15dBm/tone		80		dBm
Frequency Range 5 to 684MHz					
Minimum Slope [1]			0.5		dB
Maximum Slope [1]			18		dB
RF Performance, slope set between 4dB (5.9dB/GHz) and 14dB (20.6dB/GHz)					
Insertion Loss (S21)			1.5	1.9	dB
Flatness [2]			0.5	0.8	dB
Input Return Loss (S11)			-17		dB
Output Return Loss (S22)			-17		dB
RF Performance, slope set between 0.5dB (0.7dB/GHz) and 18dB (26.5dB/GHz)					
Insertion Loss (S21)			2		dB
Flatness [2]			1		dB
Input Return Loss (S11)			-16		dB
Output Return Loss (S22)			-16		dB

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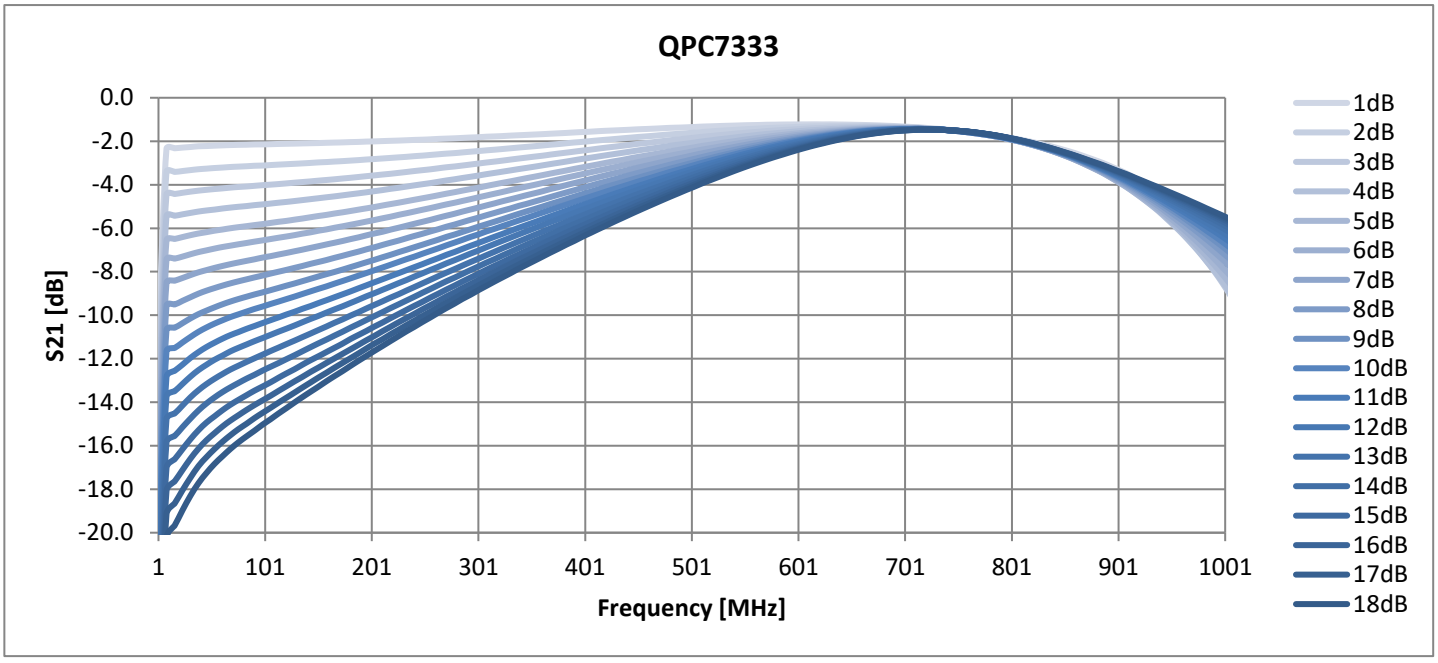
Parameter	Conditions (Vdd=5V, T_{MB}=25°C, Z_S=Z_L=75Ω)	Min	Typ	Max	Units
Control					
Control Voltage (Vc) [3], positive slope control gradient	MODE = 0V, minimum slope at Vc = 0V	0	1 to 3	5	V
Control Voltage (Vc) [3], negative slope control gradient	MODE = 5V, minimum slope at Vc = 5V	0	2 to 4	5	V
Control Voltage 2 (Vc2) [3], positive slope control gradient	MODE = 0V, minimum slope at Vc2 = 0V	0	4 to 12	20	V
Control Voltage 2 (Vc2) [3], negative slope control gradient	MODE = 5V, minimum slope at Vc2 = 20V	0	8 to 16	20	V
MODE Pin Logic Low				0.4	V
MODE Pin Logic High		1			V

Notes:
1. Slope is defined as the difference between the gain at the start frequency and the gain at the stop frequency.
2. Flatness is defined as sum of positive and negative deviation from a straight line between gain at start frequency and gain at stop frequency.
3. Either Vc or Vc2 can be used to set slope, internal 1:4 voltage divider between Vc and Vc2.

QPC7333 Slope vs. Frequency, (25°C)



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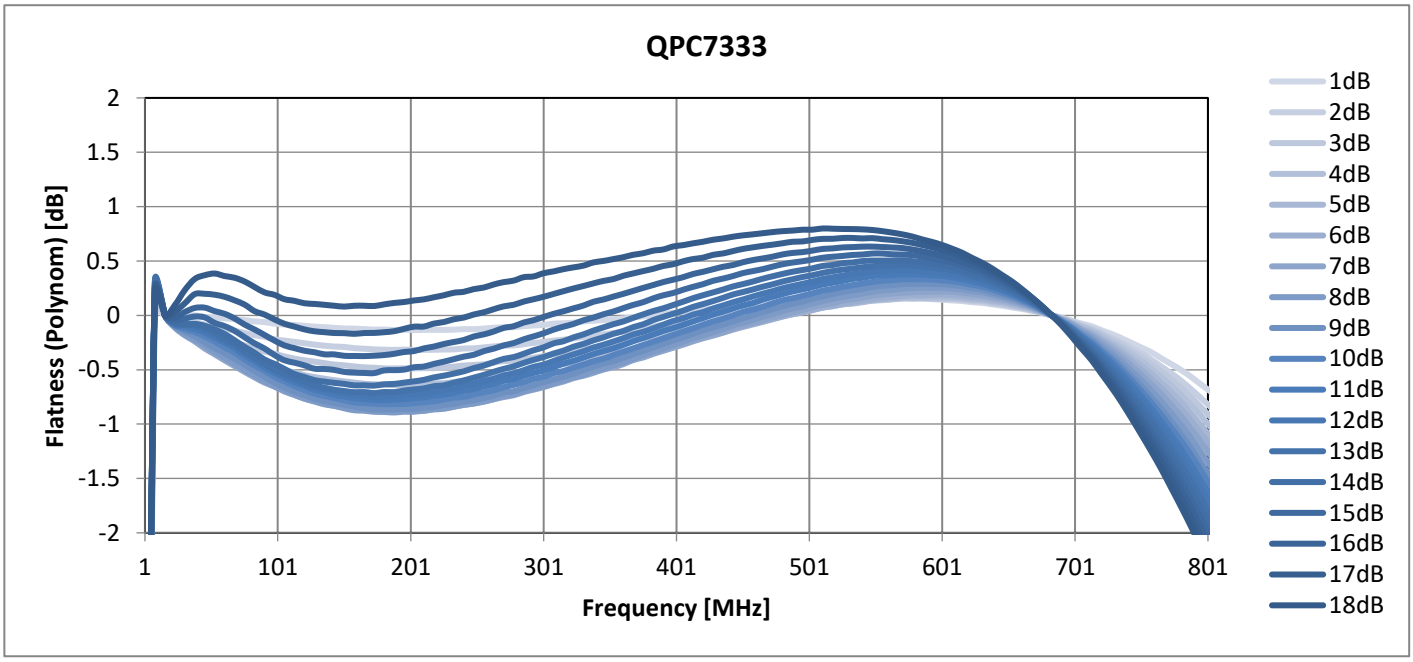
QPC7333 Flatness vs. Slope, (25°C)



Flatness is measured against a polynomial inverse to the typical cable loss/100ft of -(0.175*$\sqrt{f[MHz]}$+0.001*f[MHz])

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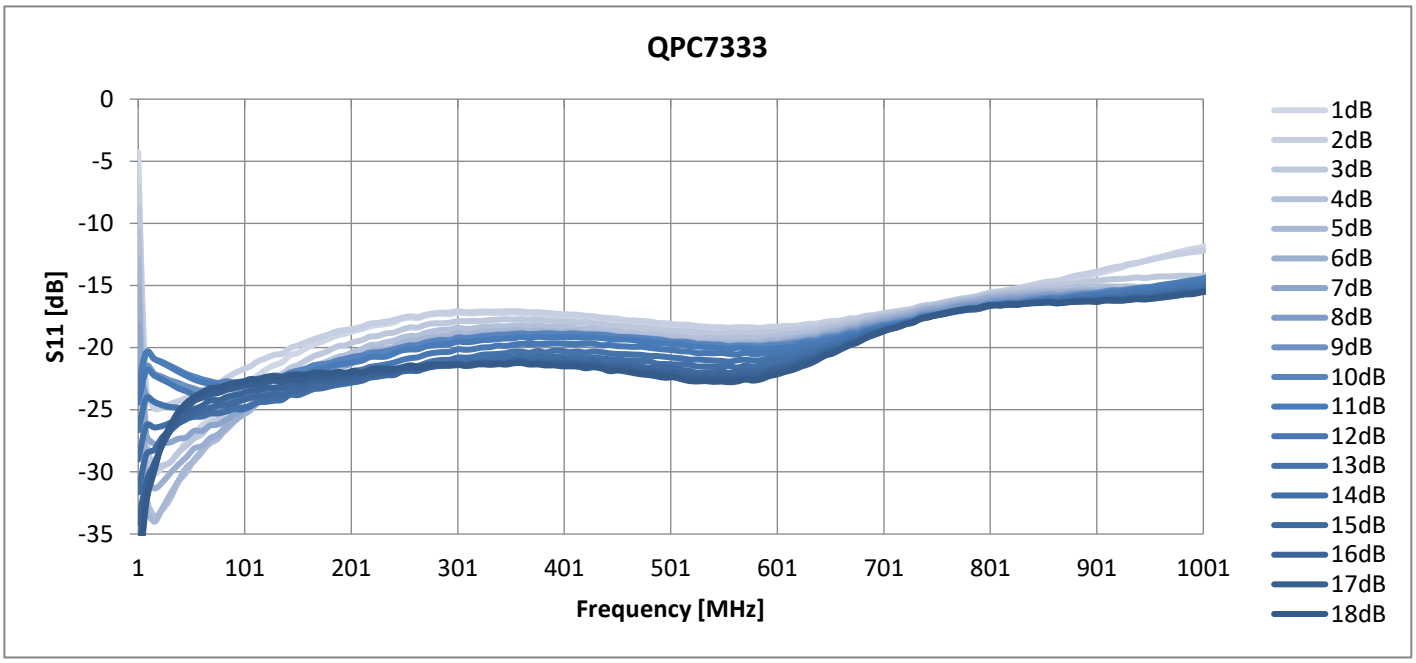
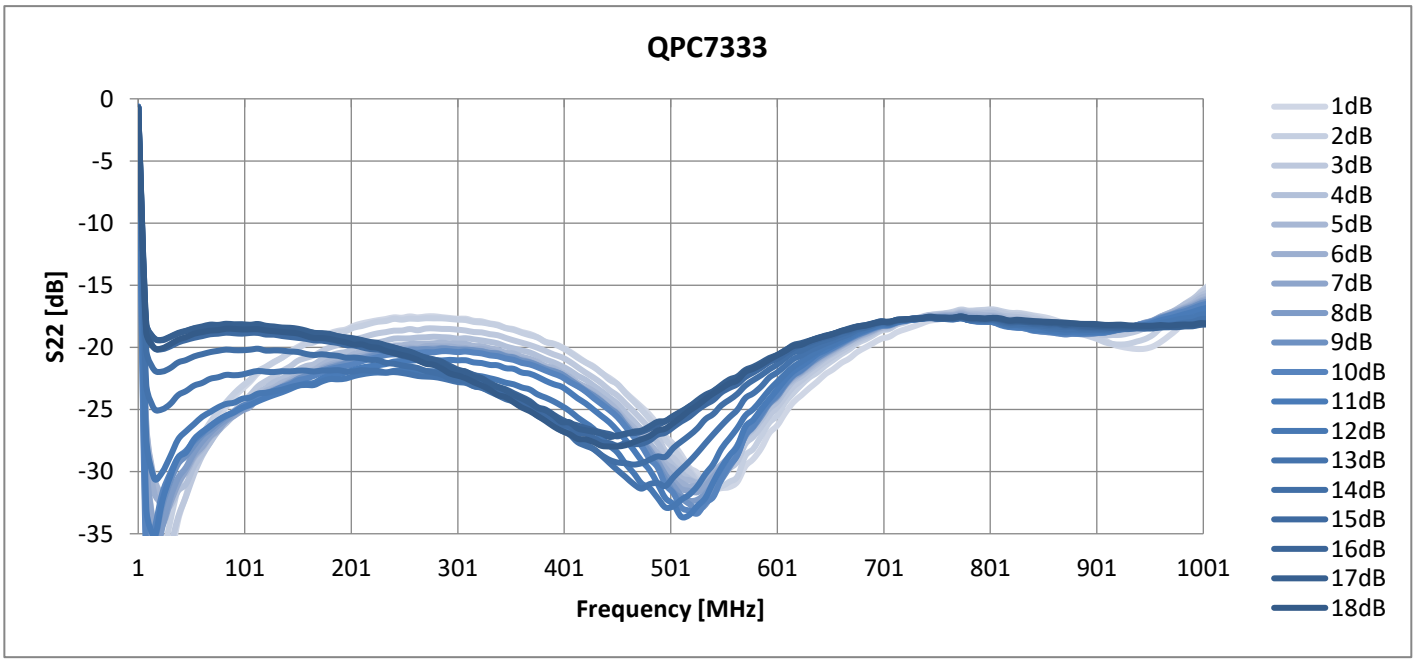
QPC7333 S11 vs. Slope, (25°C)



QPC7333 S22 vs. Slope, (25°C)



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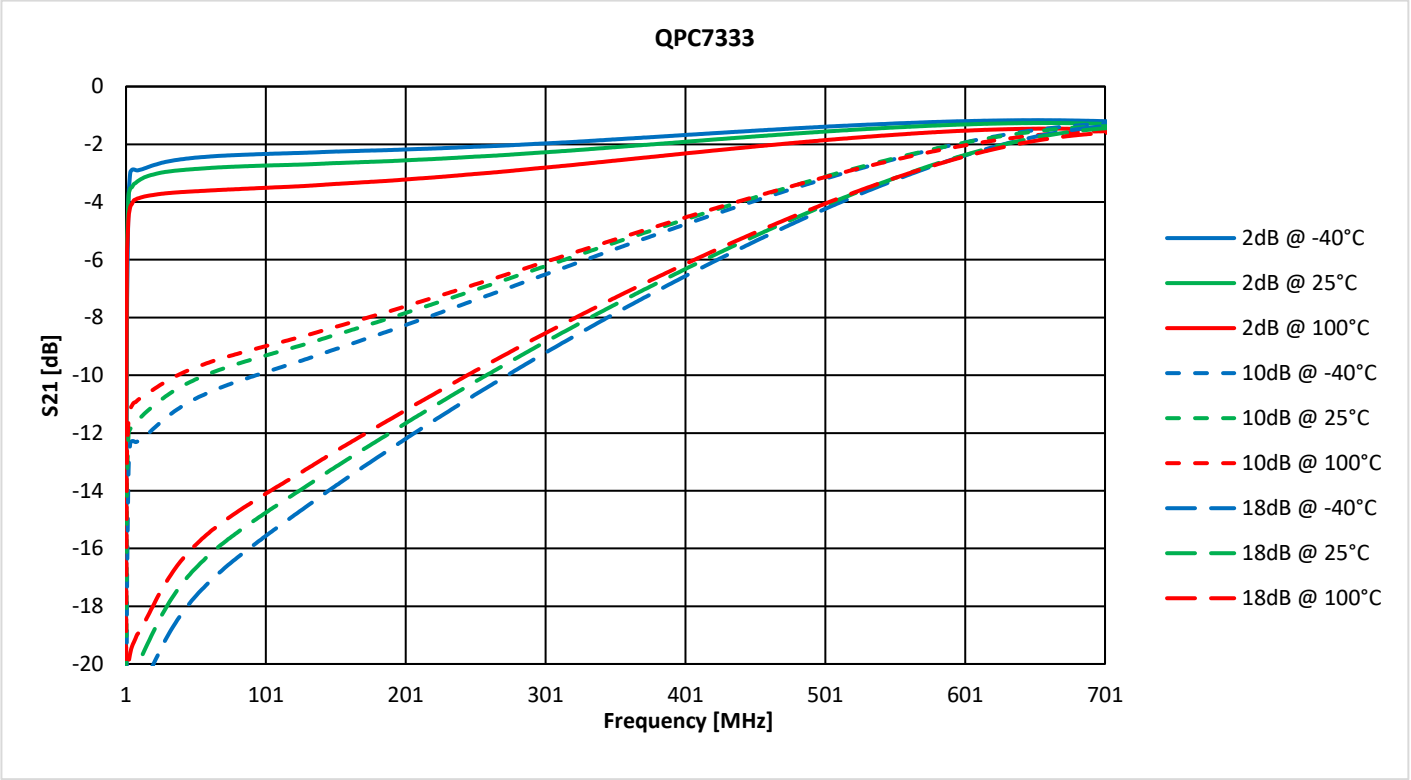
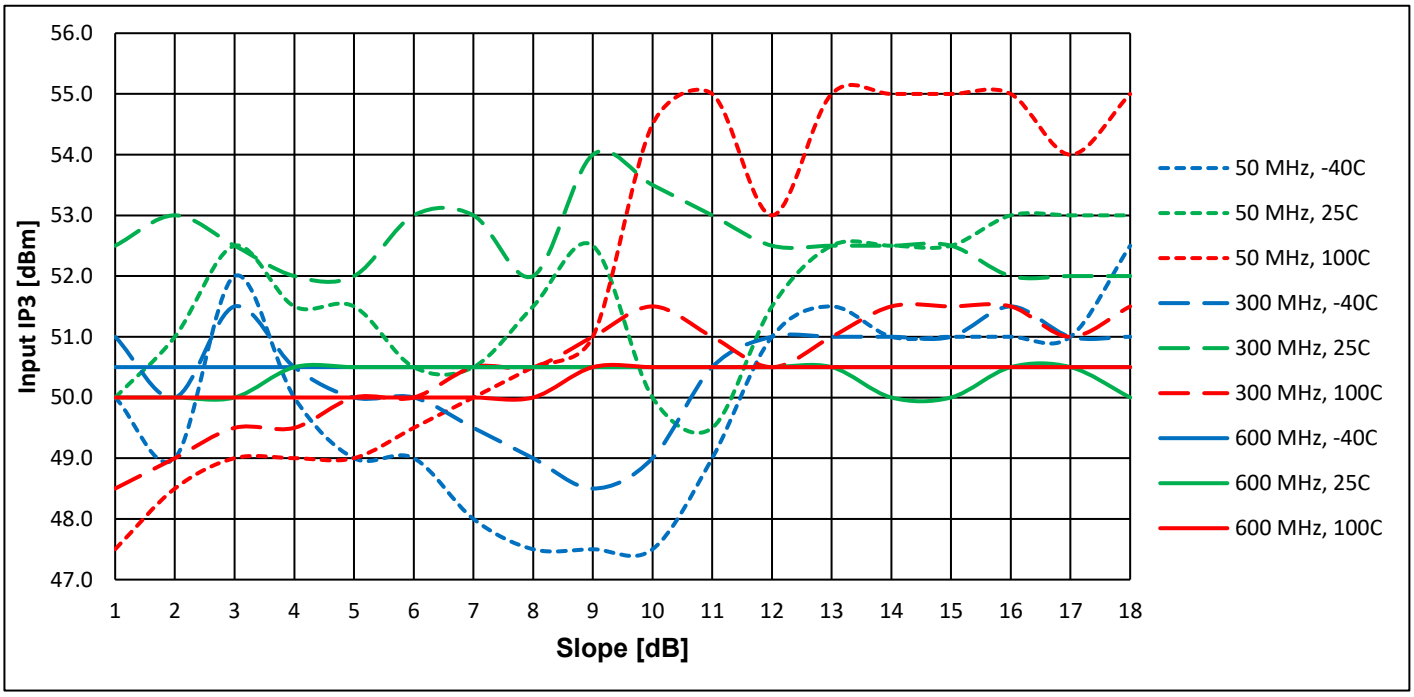
QPC7333 Slope vs. Temperature



QPC7333 Input IP3 vs. Temperature



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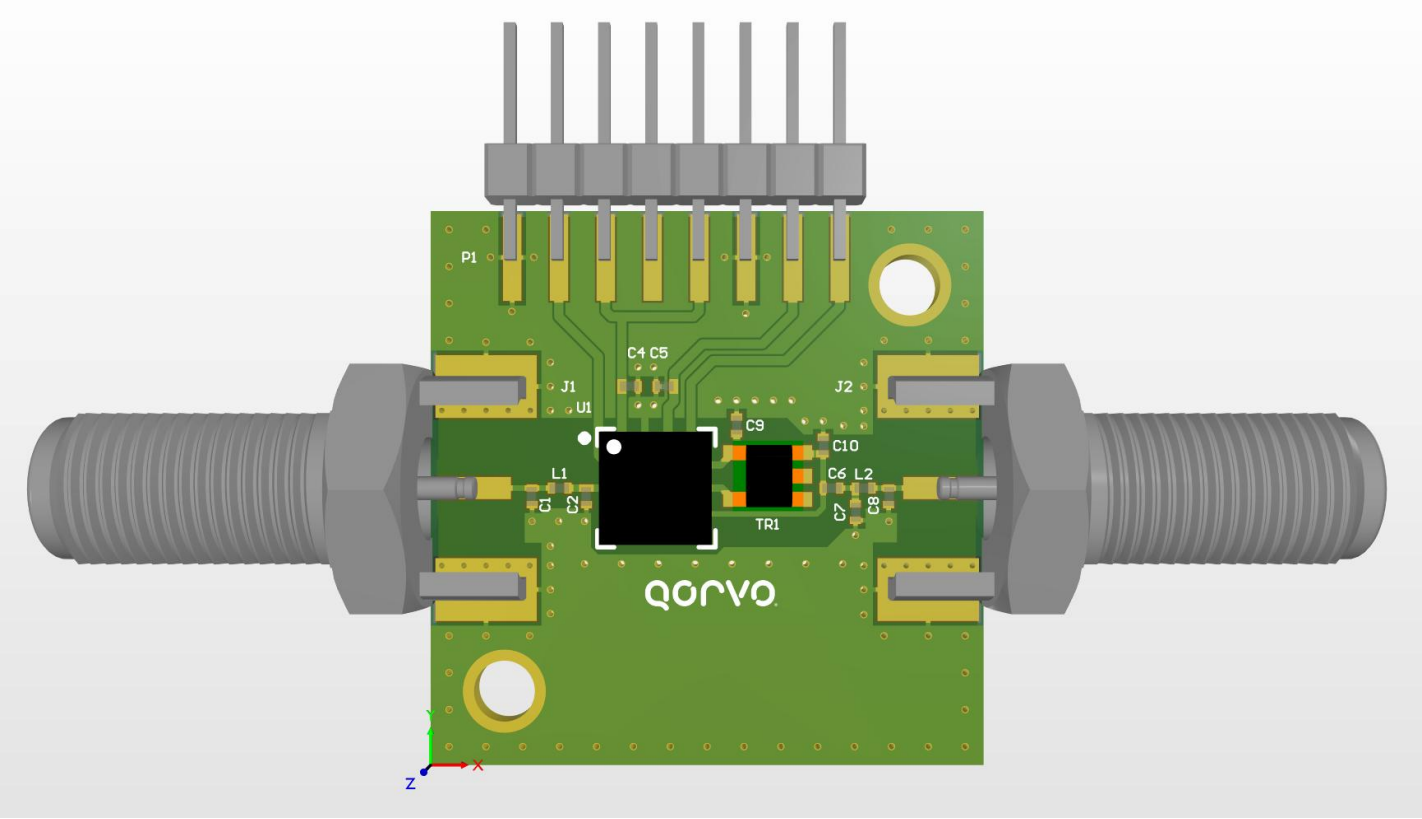
Evaluation Board Assembly Drawing



Evaluation board PCB: FR4, double sided, 1.5mm, 35um Cu

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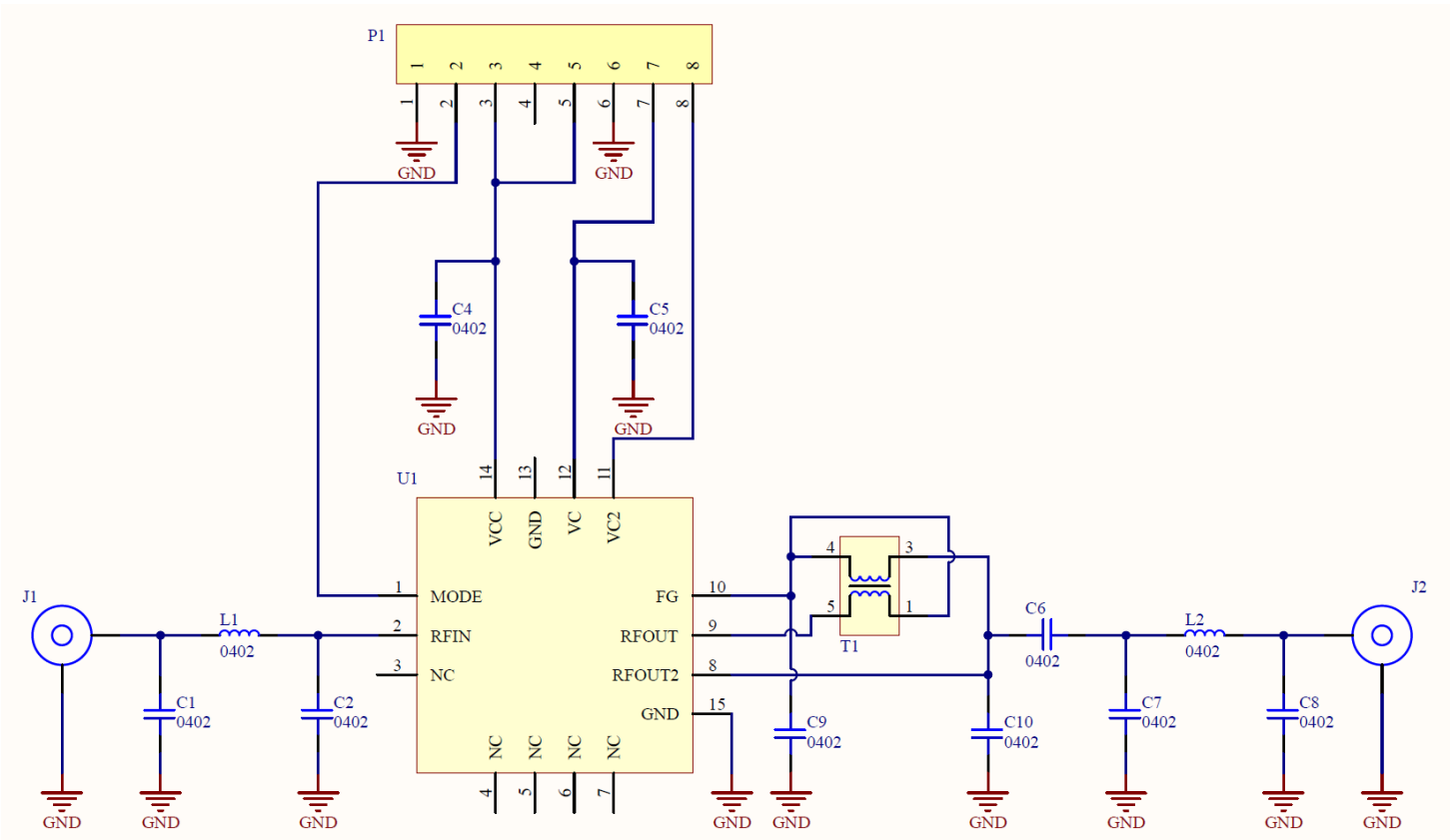
Evaluation Board Schematic



Evaluation Board Bill of Materials (BOM)

Ref. Designator	Value, package	Description	Manufacturer	Part Number
C1	1pF, C0G, 0402	Chip capacitor	MURATA, TAIYO YUDEN	
C2, C9, C10, C7	DNI			
C4, C5	4.7nF, X7R, 0402	Chip capacitor	MURATA, TAIYO YUDEN	
C6	1nF, X7R, 0402	Chip capacitor	MURATA, TAIYO YUDEN	
C8	0.7pF, X7R, 0402	Chip capacitor	MURATA, TAIYO YUDEN	
L1, L2	4.7nH, 0402	Chip inductor	MURATA, TAIYO YUDEN	
T1		Transformer	Minntronix	4813040R
J1, J2		Connector F-type, female	Amphenol	222181
P1		Connector, 2.54mm pin spacing, optional	Various	
U1		Variable equalizer	QORVO	QPC7333

Notes: C1, C7, C8, L1 and L2 may be modified in target application circuit for S11 and S22 optimization

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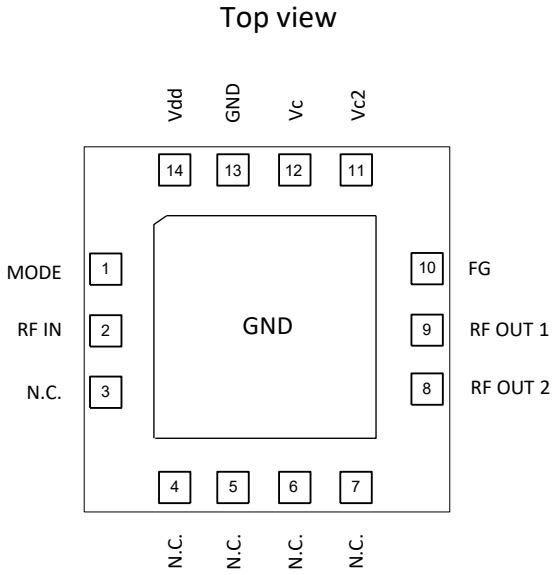
Pin Configuration



Pin Description

Pin No.	Label	Description
1	MODE	Slope control gradient (0V: positive slope control gradient or 5V: negative slope control gradient)
2	RF IN	RF input signal, AC coupled
8	RF OUT 2	Connection to balun and circuit output
9	RF OUT 1	Connection to balun
10	FG	Floating ground, connection to balun
11	Vc2	Control voltage 2
12	Vc	Control voltage
13	GND	Ground connection.
14	Vdd	+5V supply voltage
Pkg Base		Ground connection. The back side of the package should be connected to the ground plane though as short of a connection as possible. PCB vias under the device are recommended
3, 4, 5, 6, 7	N.C.	Not connected

Notes: Either Pin11 or Pin12 can be used to set slope, internal 1:4 voltage divider between Pin11 and Pin12

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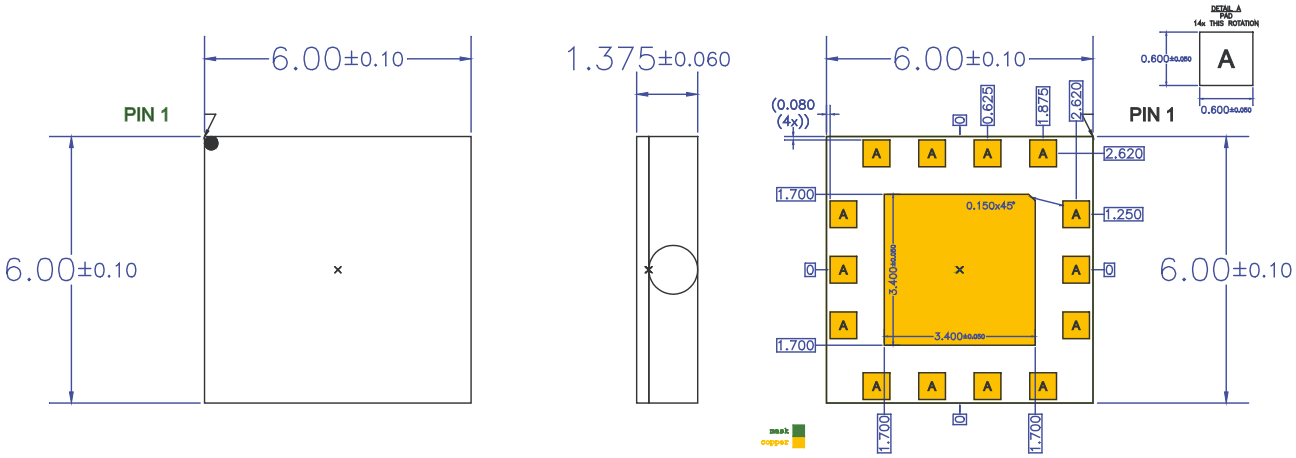
Package Outline Drawing (Dimensions in millimeters)



TOP VIEW SIDE VIEW BOTTOM VIEW

Notes:
1. Dimension and tolerance formats conform to ASME Y14.5M-1994.
2. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.
3. Co-planarity applies to the exposed ground/thermal pad as well as the contact pins.
4. Package body length/width does not include plastic flash protrusion across mold parting line.

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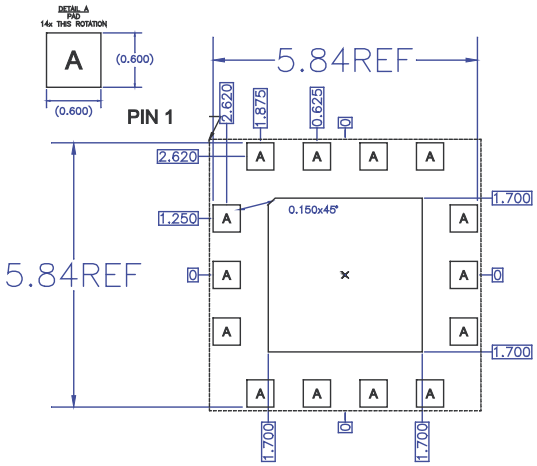
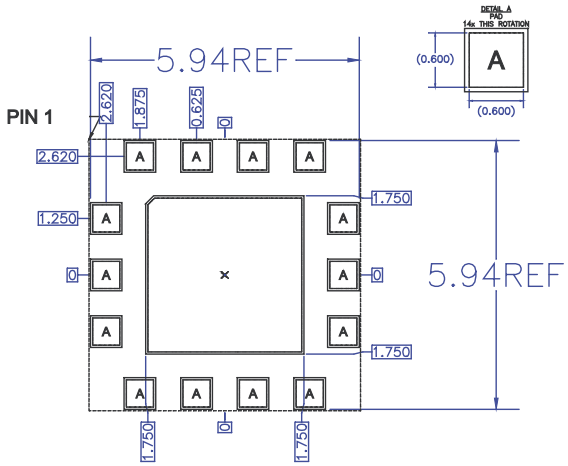
PCB Metal Land Pattern (Dimensions in millimeters)



RECOMMENDED
LAND PATTERN



RECOMMENDED
LAND PATTERN MASK

All dimensions are in millimeters. Angles are in degrees.

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Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	2	ANSI/ESD/JEDEC JS-001-2012
ESD – Charged Device Model (CDM)	C3	JEDEC JESD22-C101F
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 temp.) and tin/lead (245°C max. reflow temp.) soldering processes.
Solder profiles available upon request.

Contact plating: ENEPIG (NiPdAu)

RoHS Compliance

This part is compliant with 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:

- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

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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