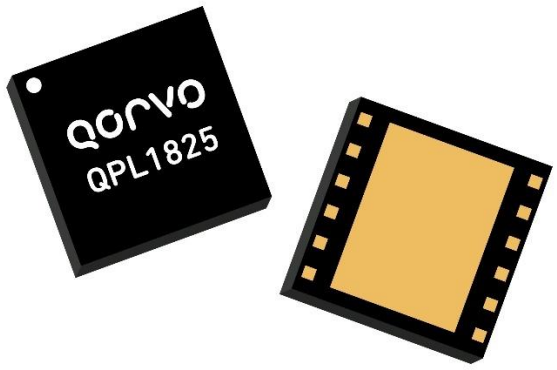
QPL1825

75 Ω 25.5 dB CATV Amplifier (50 – 1800MHz)

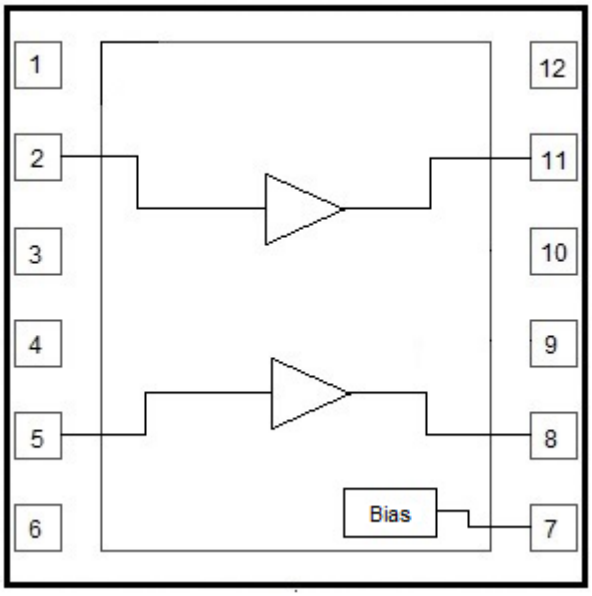
Product Overview

The QPL1825 is an ultra-linear, GaAs pHEMT, differential RF amplifier. The device features a cascode design which provides 25.5dB of gain along with very low distortion from 50MHz to 1.8GHz. This ultra-linear IC is designed to support Broadband CATV DOCSIS 4.0 applications, such as Nodes, Amplifiers, and Remote PHY Devices, as well as Fiber to The Home (FTTH), Home Gateways, and Cable Modems. The device is powered by a single supply that operates at 8V and current can be set from 260mA to 350mA. When driven with 8V and 350mA the output is 66dBmV TCP with a CCN of 50dB. The QPL1825 is packaged in a 12-pin 5x5 mm^2 Laminate Module.



5 x 5 12–pin Laminate MCM Package

Functional Block Diagram



Key Features

- 50 MHz to 1800 MHz Operation
- 8V Operation
- Gain: 25.5dB Typical @ 1800MHz
- TCP: 66dBmV @ 8V
- Noise Figure: 1.6/4dB @ 50/1800MHz
- Adjustable Bias Using External Resistors
- RoHS Compliant

Applications

- DOCSIS 4.0 Amplifiers
- DOCSIS 4.0 Optical Nodes
- DOCSIS 4.0 Remote PHY Devices
- FTTH GPON and GEPON
- DOCSIS 4.0 Cable Modem and Home Gateways

Ordering Information

Part Number	Description	Part Number	Description
QPL1825EVB-03	8V Downstream Evaluation Board	QPL1825SB	Sample bag with 5 pieces
		QPL1825SR	7” Reel with 100 pieces
		QPL1825TR13	13” Reel with 2500 pieces

Contents

Absolute Maximum Ratings

Parameter	Rating
Supply Voltage (V_{DD})	+10 V
Supply Current (I_{DD})	400 mA
Maximum Input Level	+65 dBmV
Operating Temperature Range (Operating Device Heat Slug Temperature)	-40 to +100 °C
Storage Temperature Range	−65 to +150 °C
Maximum Junction Temperature	+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.

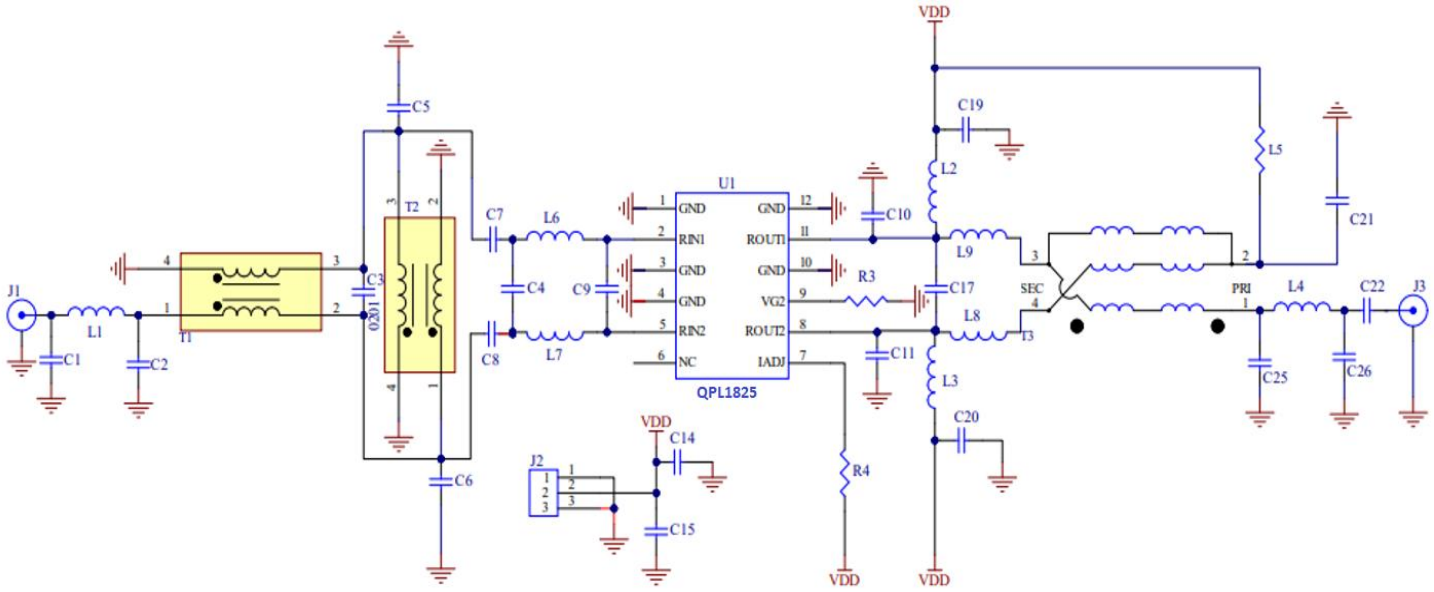
Electrical Specifications

Parameter	Test Condition	Min	Typ	Max	Unit
Supply Voltage (VDD)			8		V
Supply Current (IDD)			350		mA
Frequency Range		50		1800	MHz
Gain at 50 MHz			23.5		dB
Gain at 1800 MHz			25.5		dB
Gain Slope	105 – 1800MHz		2.0		dB
Gain Flatness	100 – 1800MHz (See note 2)		±0.25		dB
Reverse Isolation			28		dB
Input Return Loss	100 – 1200MHz		-20		dB
	1200 – 1800 MHz		-18		dB
Output Return Loss	100 – 1200MHz		-19		dB
	1200 – 1800MHz		-18		dB
CCN	+66dBmV @ 8V Total Composite Output power 261MHz to 1791MHz, 280 Ch, SC-QAM, 10dB tilt, 6dB Offset at 1026MHz		50		dB
Noise Figure	50MHz		1.5		dB
	1800MHz		3.8		dB
OIP2L	+12 dBm / tone output, Δf=53MHz, Full Band		85		dBm
OIP2U	+12 dBm / tone output, Δf=53MHz, Full Band		65		dBm
OIP3	+12 dBm / tone output, Δf=6MHz, Full Band		43		dBm
OP1dB	50-1800MHz		29.5		dBm
Thermal Resistance	ΘJC (Junction to Device Heat Slug)		12		˚C/W

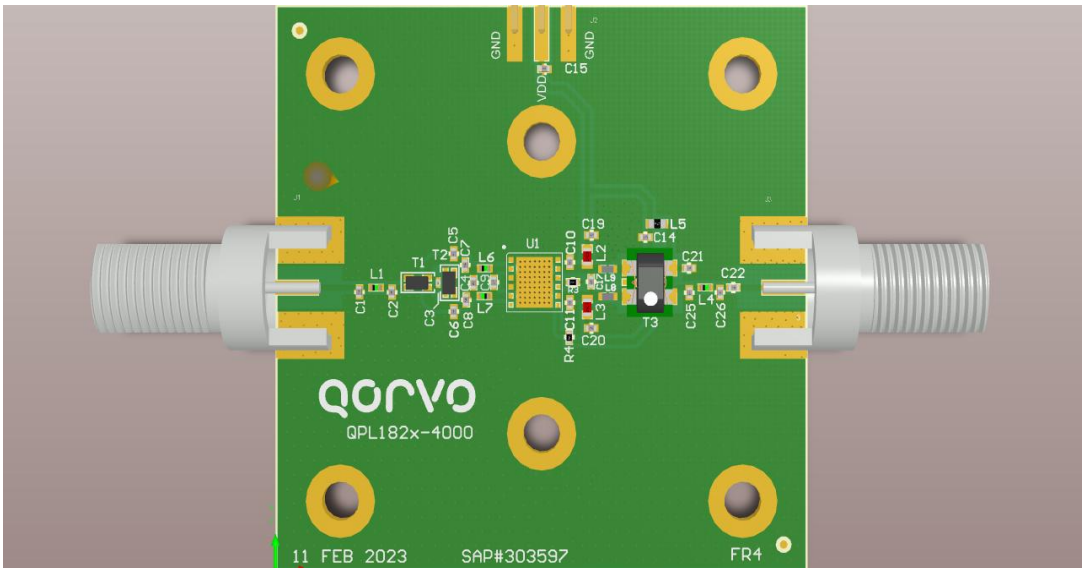
Notes:

(1) Typical performance at these conditions: Temp = +25 °C, V_{DD} = +8 V, 75 Ω system, Full band unless otherwise noted.
(2) Flatness is defined as sum of positive and negative deviation from a least squares fit straight line.

Evaluation Board Schematic 50 MHz – 1800 MHz



Evaluation Board Assembly Drawing



LAYER STACK LEGEND

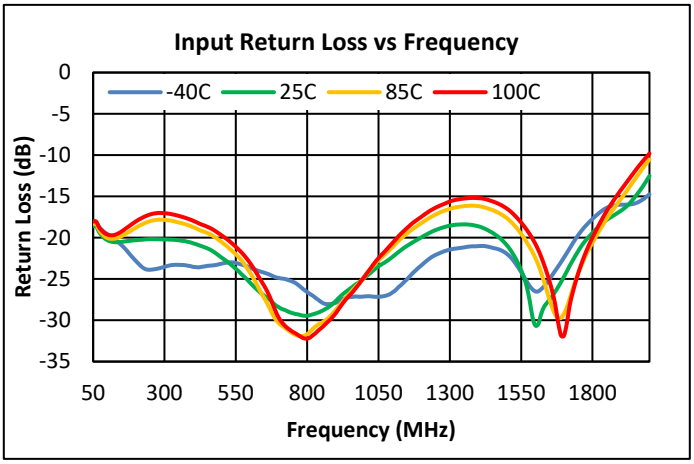
Material	Layer	Thickness	Dielectric Material
	Top Overlay		
Surface Material	Top Solder	0.0004in	Solder Resist
Copper	Top Layer	0.0014in	
Core		*0.0590in*	*Core-043*
Copper	Bottom Layer	0.0014in	

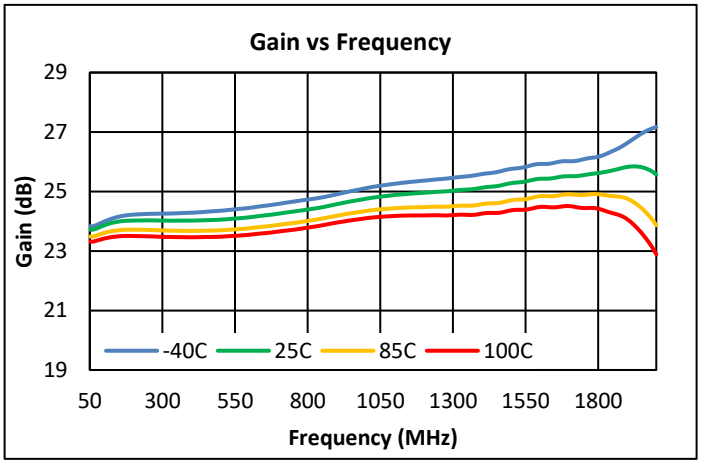
Total thickness: 0.0622in

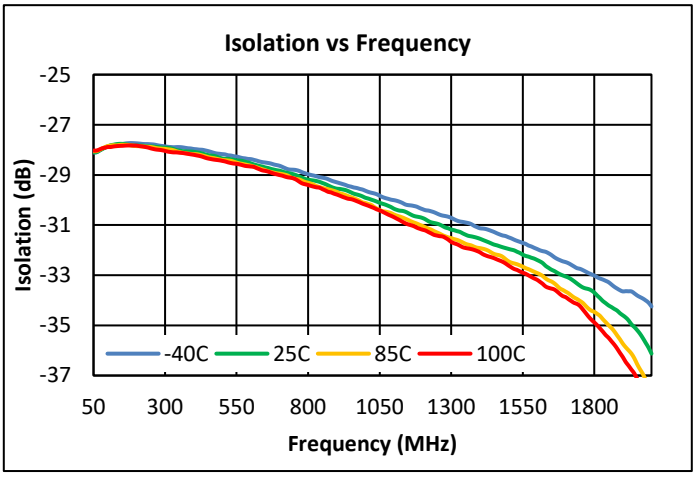
Evaluation Board Bill of Materials for 8V

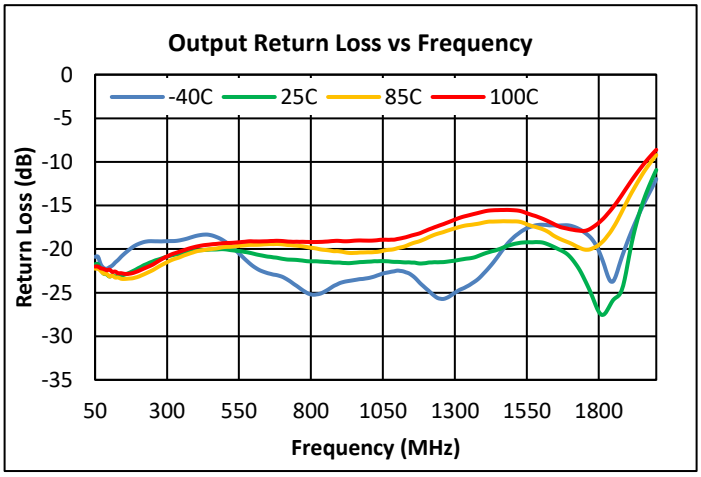
Ref. Designator	Part Value	Manufacturer	Manufacturer Part #
PCB	303597	Qorvo	QPL182x-4000
U1	1800MHz, Ultra-Linear Amp	Qorvo	QPL1825
C1	CAP,0.4pF, +/-0.1pF, 50V, HI-Q, 0402	Murata	GJM1555C1HR40BB01D
C3	CAP, 0.9pF, +/-0.1pF, 25V, HI-Q, 0201	Murata	GJM0335C1ER90BB01D
C7, C8	CAP, 1000pF, 5%, 50V, C0G, 0402	Murata	GRM1555C1H102JA01D
C10, C11	CAP, 1.2pF, +/-0.25pF, 50V, HI-Q, 0402	Murata	GJM1555C1H1R2CB01D
C17	CAP, 0.2pF, +/-0.1pF, 50V, HI-Q, 0402	Murata	GJM1555C1HR20BB01D
C22	CAP, 220pF, 5%, 50V, C0G, 0402	Kyocera	04025A221JAT2A
C14, C15, C19, C20, C21	CAP, 10,000pF, 10%, 50V, X7R, 0402	Murata	GCM155R71H103KA55D
L1, L6, L7	IND, 1.8nH, ±0.2nH, W/W, HI-Q, 0402	Murata	LQW15AN1N8C00D
L4	IND, 1.6nH, ±0.2nH, W/W,HI-Q, 0402	Murata	LQW15AN1N6C80D
L8, L9	IND, 3nH, ±0.1nH, W/W, HI-Q, 0402	Murata	LQW15AN3N0B00D
L2, L3	FER, BEAD, 1500 OHM, 500mA, 0603	Murata	BLM18HE152SN1D
R3	RES, 3K OHM, 5%, 1/10W, 0402	Kamaya	RMC1/16S-302JTH
R4	RES, 1.8K OHM, 1%, 1/10W, 0402	Panasonic	ERJ-2RKF1801X
T1, T2	1:1 Balun	Murata	DXW21BN7511SL07
T3	1:1 Balun	MiniRF	MRFXF0090
J1, J3	CONN, F	Millimeter Wave	MW-846-C-DD-75
J2	CONN, 3-PIN, 0.100"	Samtec	TSW-103-07-G-S
C2, C4, C5, C6, C9, C17, C25, C26, L5	Not Populated Item	-	-
Heatsink	Heatsink 50mm x 50mm	Alpha Novatek	S08EFV05-A

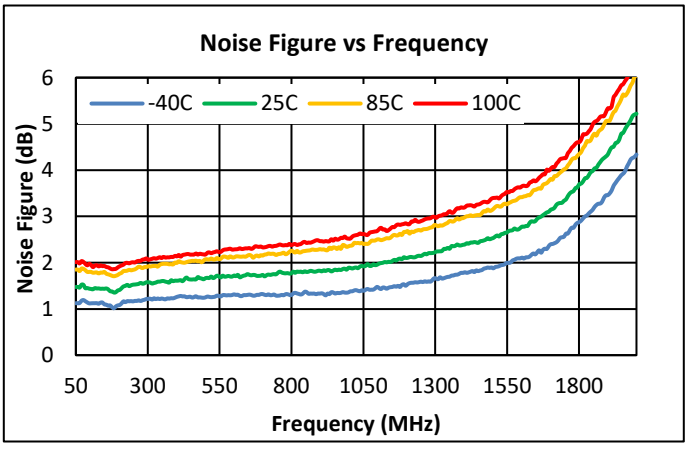
Performance Data, 8V



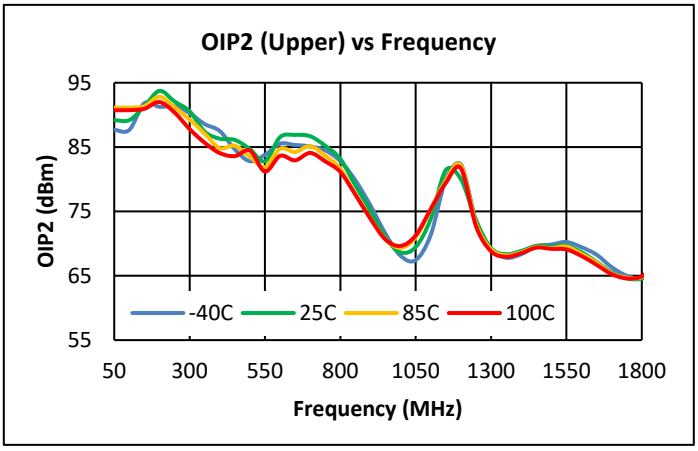


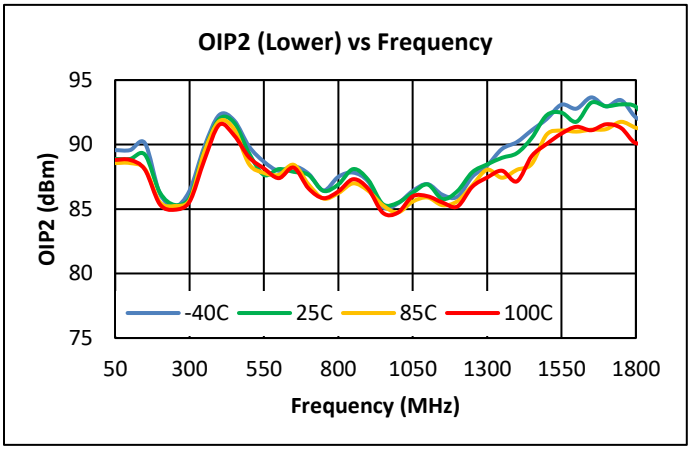


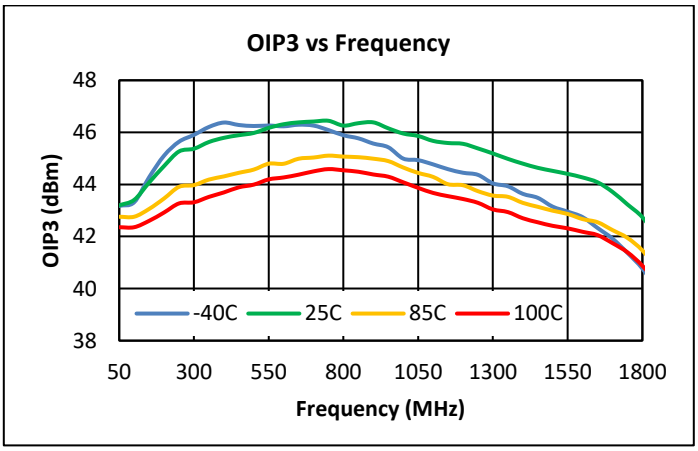


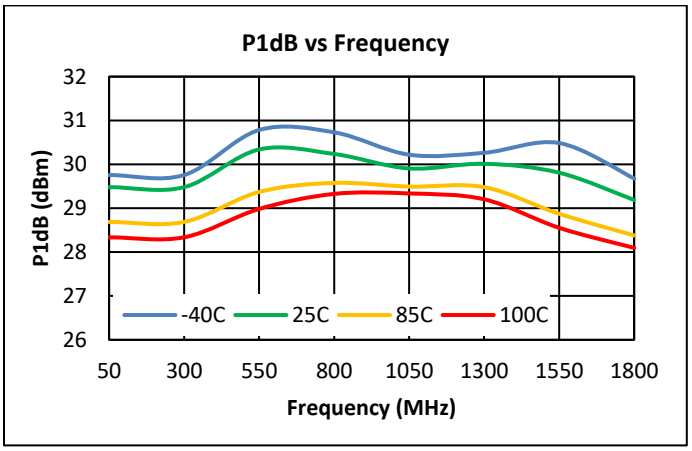


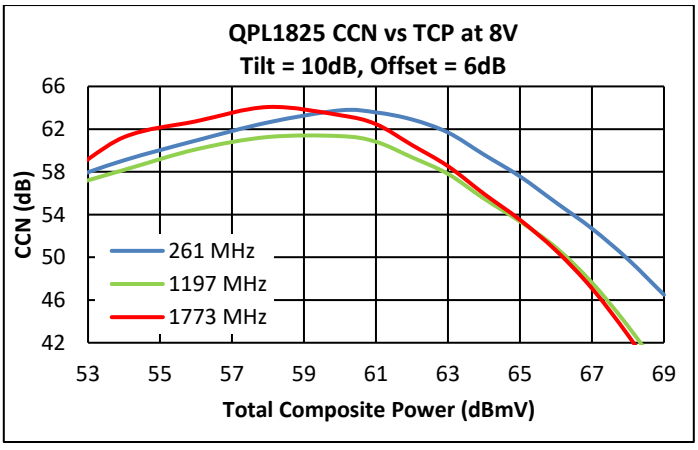
Performance Data, 8V (cont'd)

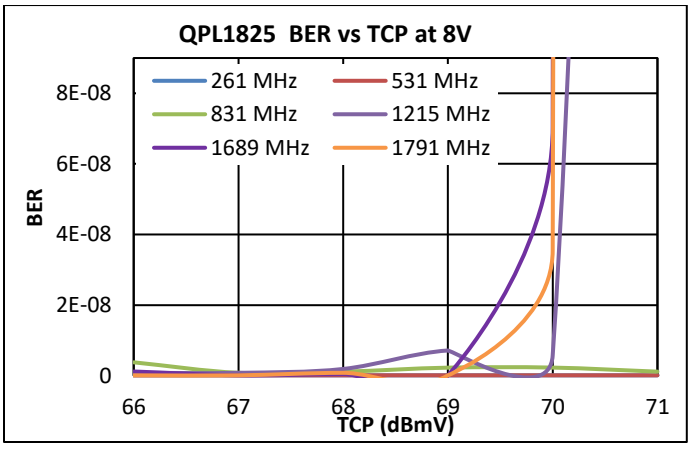










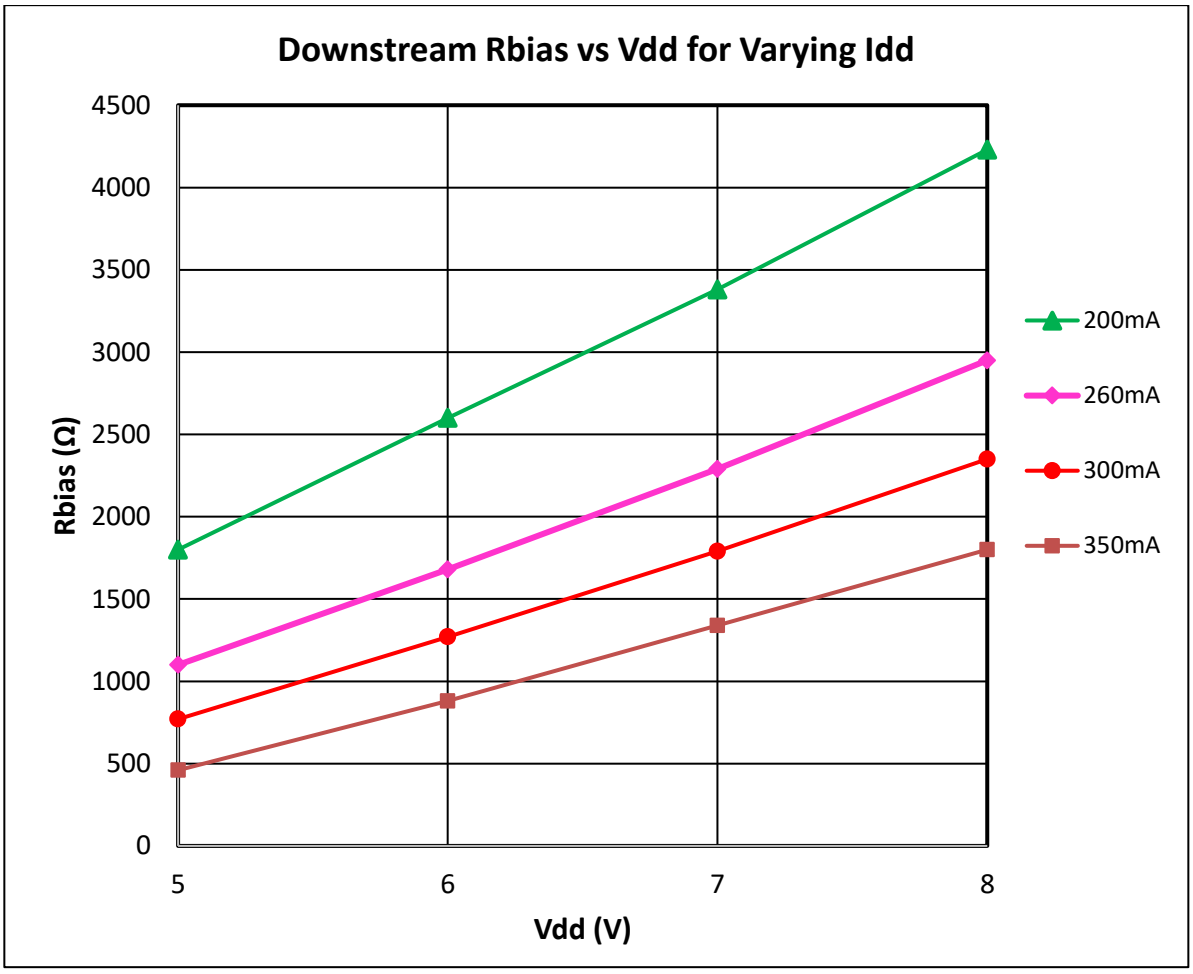


Notes:

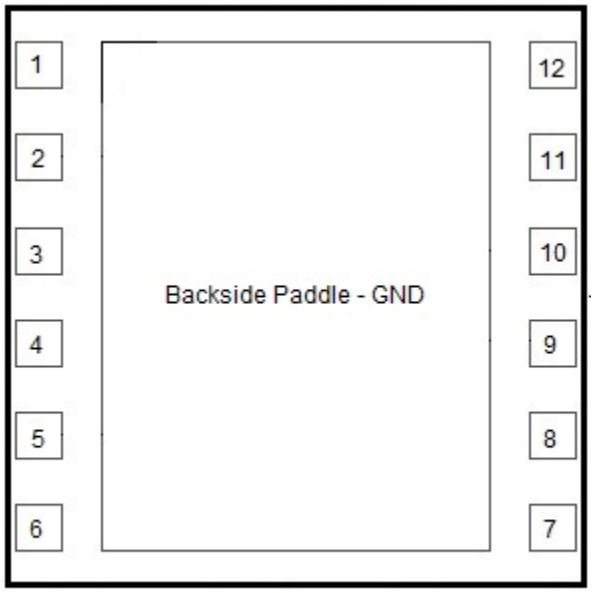
(1) 8V OIP2: +12dBm / tone output @ Δf = 53MHz
(2) 8V OIP3: +12dBm/tone output @ Δf = 6MHz
(3) CCN Test Conditions: 261-1791MHz, 10dB Tilt, 6dB offset at 1026MHz
(4) BER Test Conditions: 261–1791MHz, 280 Ch SC-QAM, 10dB tilt, 0dB offset

IADJ Resistor Value

The Resistor Rbias (R4) is used to set the device current. In the application circuit, the value of Rbias is set to get an IDD of 260mA which is optimal for linearity at 5V. In applications where higher linearity is required, or higher supply rail is present, the IDD can be adjusted by varying the value of Rbias. (See graph below for downstream application)



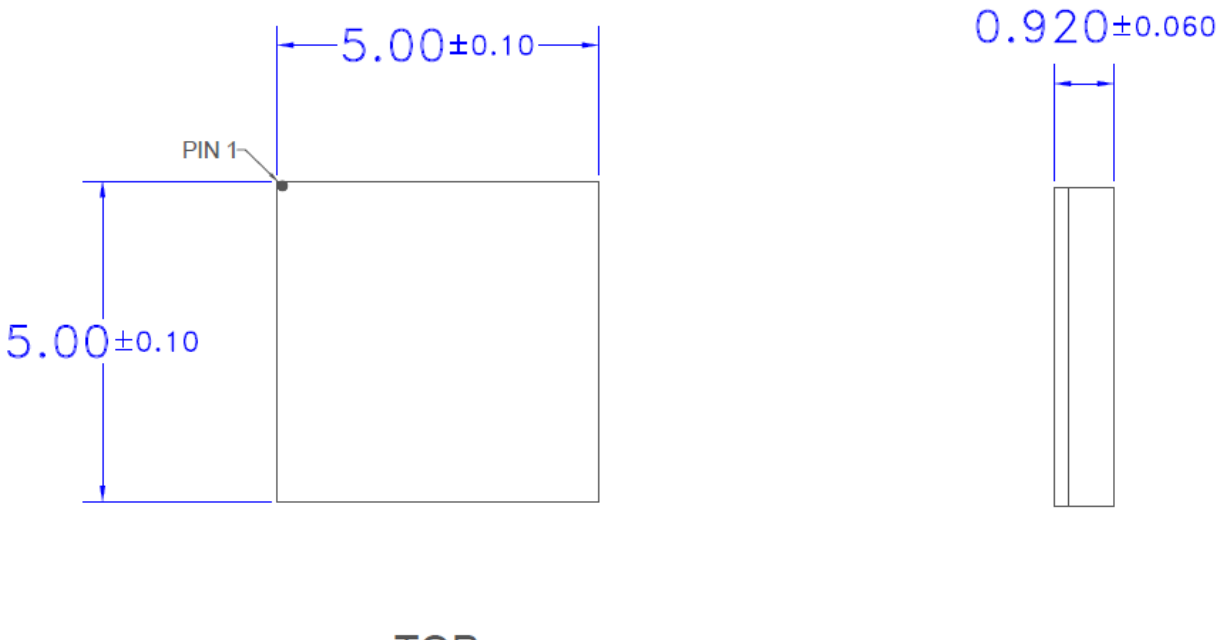
Pin Configuration and Description



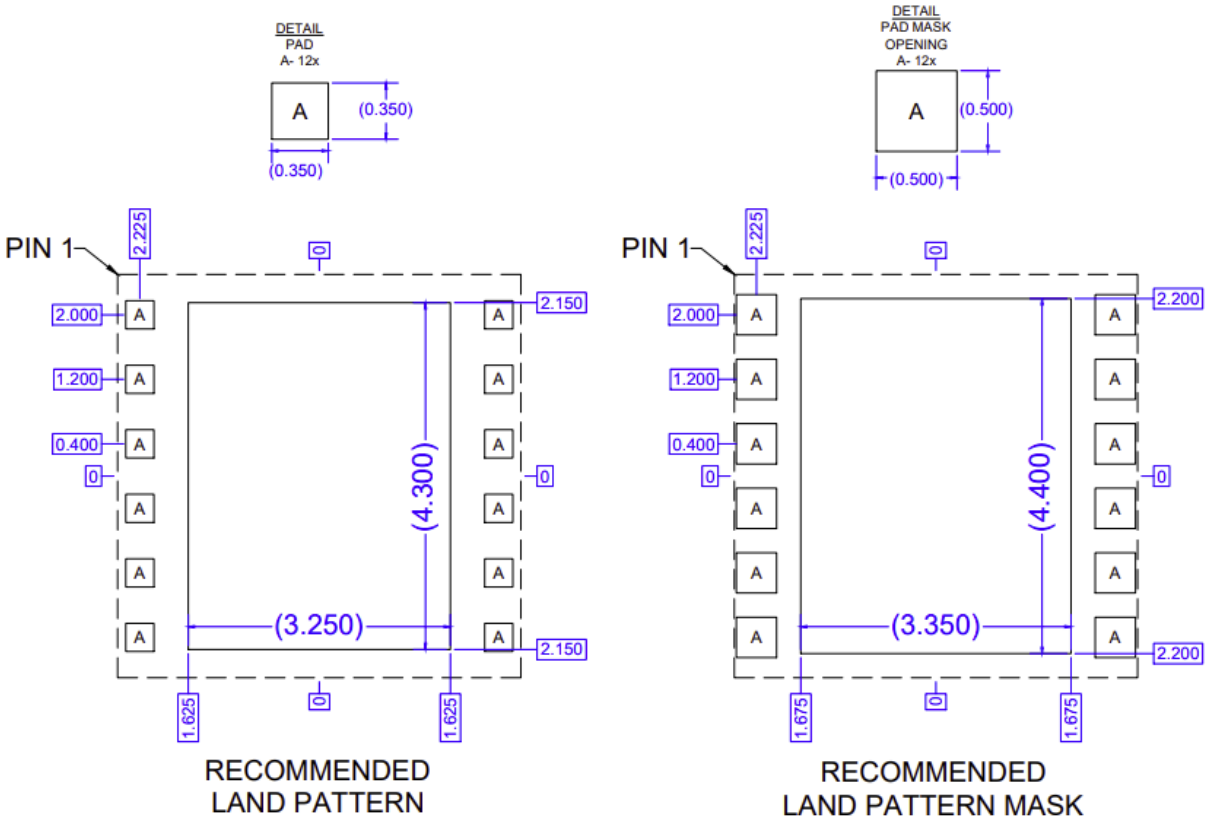
5 x 5 12-pin Laminate MCM

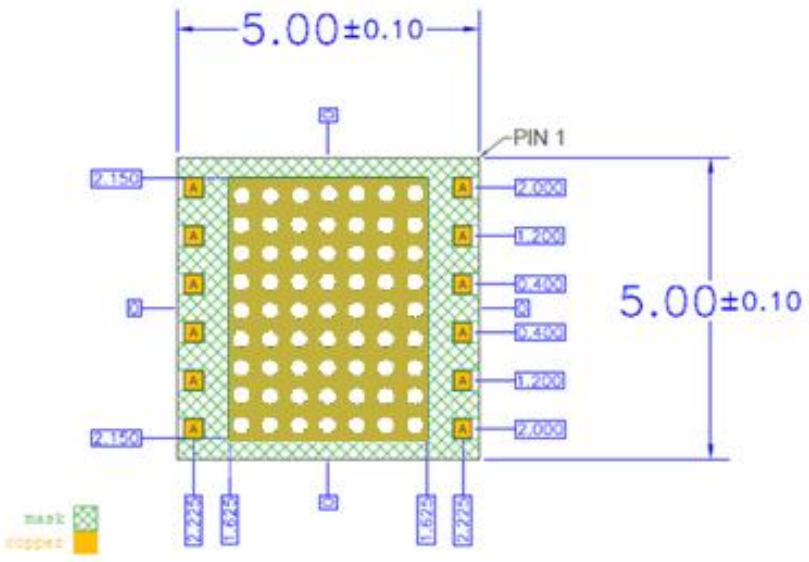
Pin Number	Label	Description
1	NC	No internal connection, recommended to leave open
2	RFIN+	RF Input +
3	GND	Must be connected to EVB GND
4	GND	Must be connected to EVB GND
5	RFIN-	RF input -
6	NC	No connect pin. Leave it open. Do not connect to GND.
7	IADJ	IDD current set
8	RFOUT-/VDD2	RF output - and VDD through RF Choke
9	VG2	Cascode device bias resistor divider
10	NC	No internal connection, recommended to leave open
11	RFOUT+/VDD	RF output + and VDD through RF Choke
12	NC	No internal connection, recommended to leave open
Paddle	GND	DC/RF/Thermal/GND. (Maximize vias in this area)

Package Outline



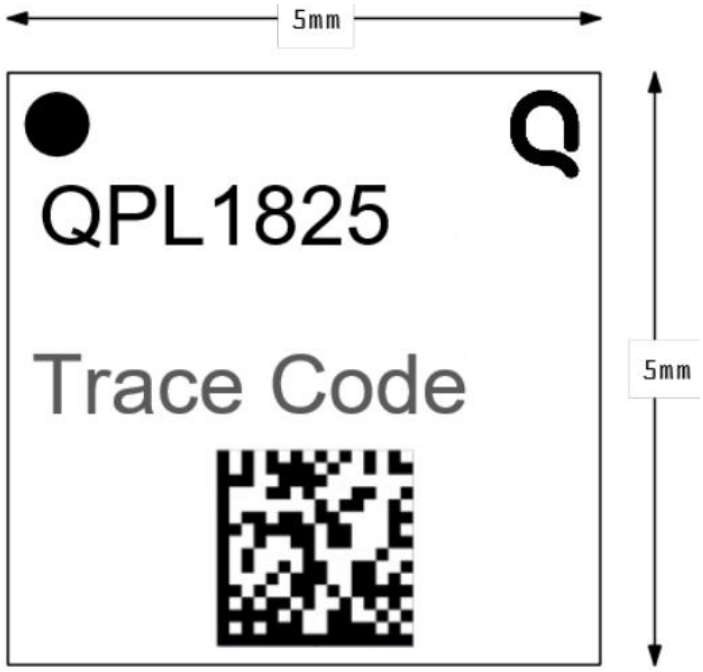
Landing Pattern





Recommended Via Pattern (63 Vias at 10mil Diameter)

Package Marking



- Pin 1 Indicator
  Qorvo Logo – Use Q5D
  Trace Code to be assigned by SubCon
  2D Matrix

Tape and Reel

Qorvo Part Number	Reel Diameter Inch (mm)	Hub Diameter Inch (mm)	Width (mm)	Pocket Pitch (mm)	Feed	Units Per Reel
QPL1825 TR13	13 (330)	4 (102)	12	8	Single	2500

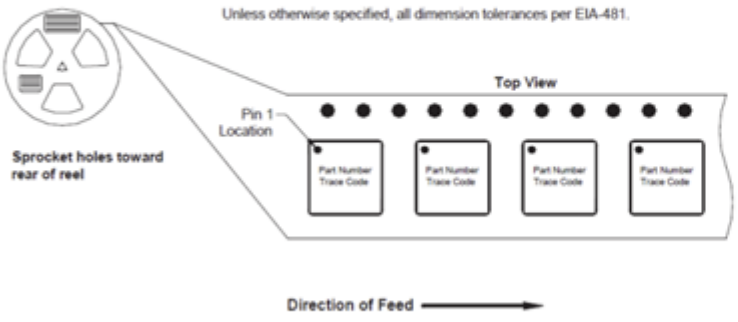


Figure 1: 5.000 mm x 5.000 mm (Carrier Tape Drawing with Part Orientation)

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1B (500V to <1000V)	ANSI / ESDA / JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C3 (≥ 1000V)	ANSI / ESDA / JEDEC JS-002
MSL – Moisture Sensitivity Level	MSL3	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

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:

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

Contact Information

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

Tel: 1-844-890-8163

Web: www.qorvo.com

Email: customer.support@qorvo.com

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