

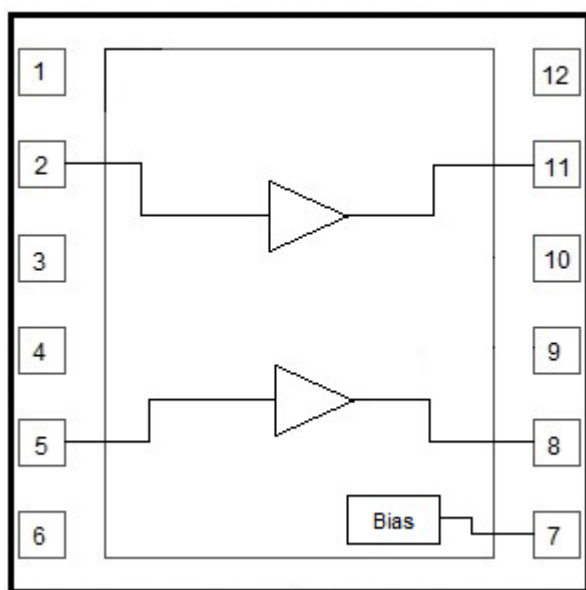
Product Overview

The QPL1823 is an ultra-linear, GaAs pHEMT, differential RF amplifier. The device features a cascode design which provides 26dB of flat 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 can operate from 5V to 8V and current can be set from 260 mA to 350 mA. At 5V and 260 mA the QPL1823 provides an output of 63dBmV TCP with a MER of 45dB. When driven with 8V and 350mA the output is 66.5 dBmV TCP with a MER of 45dB. The QPL1823 is packaged in a 12-pin 5x5 mm² Laminate Module.



5 x 5 12-pin Laminate MCM Package

Functional Block Diagram



5 x 5 12-pin Laminate MCM Package

Key Features

- 50 MHz to 1800 MHz Operation
- 5 V & 8V Operation
- Gain: 26dB Typical
- TCP: 63dBmV @ 5V
- TCP: 66.5dBmV @ 8V
- Noise Figure: 1.6/3.6dB @ 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
QPL1823EVB-01	Evaluation Board
QPL1823SB	Sample bag with 5 pieces
QPL1823SR	7" Reel with 100 pieces
QPL1823TR13	13" Reel with 2500 pieces

Absolute Maximum Ratings

Parameter	Rating
Supply Voltage (V_{DD})	+10 V
Supply Current (I_{DD})	400 mA
Maximum Input Level	+61 dBmV
Operating Temperature Range	-40 to +100 °C
Storage Temperature Range	-65 to +150 °C
Maximum Junction Temperature	+150 °C

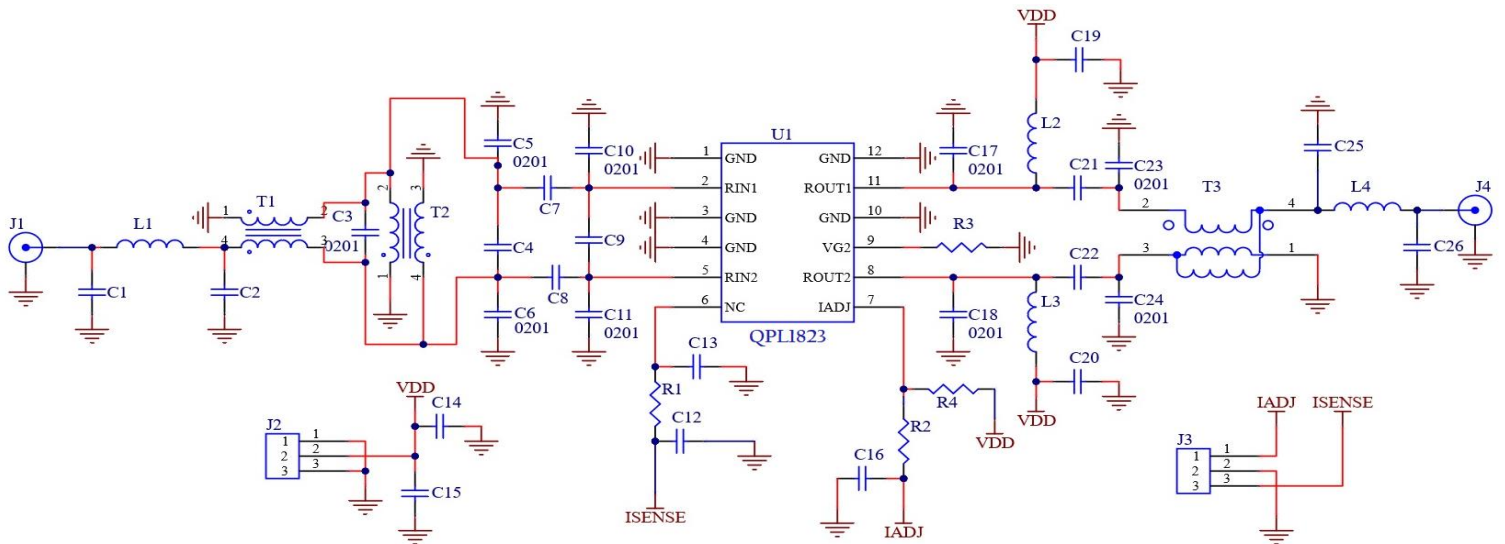
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Electrical Specifications

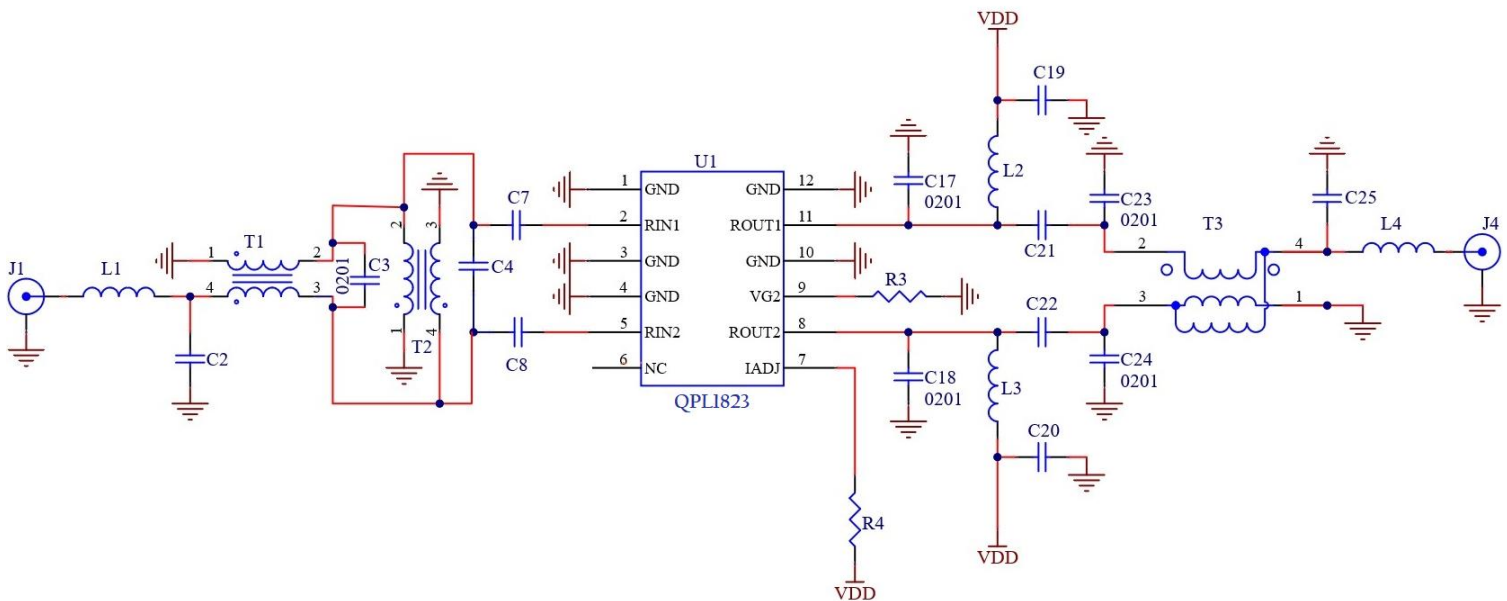
Parameter	Condition ⁽¹⁾	Min	Typ	Max	Unit
Supply Voltage (V_{DD})			5/8		V
Supply Current (I_{DD})			260/350	380	mA
Frequency Range		50		1800	MHz
Gain at 50 MHz			23.2		dB
Gain at 1800 MHz			26		dB
Gain Slope			2.8		dB
Reverse Isolation			27		dB
Input Return Loss	50 – 1200MHz 1200 – 1800 MHz		-20 -18		dB
Output Return Loss	50 – 1200MHz 1200 – 1800MHz		-19 -18		dB
MER	At +63dBmV @ 5V and +66.5dBmV @ 8V Total Composite Output power. 108MHz to 1791MHz, 280 Ch, SC-QAM, 10dB tilt, 0dB Offset (Source corrected)		45		dB
Noise Figure	50/1800MHz		1.6/3.6		dB
OIP2L	+12 dBm / tone output, $\Delta f=53$ MHz, Full Band		85		dBm
OIP2U	+12 dBm / tone output, $\Delta f=53$ MHz, Full Band		65		dBm
OIP3	+12 dBm / tone output, $\Delta f=6$ MHz, Full Band		40		dBm
OP1dB	@ 1800MHz		24.2		dBm
Thermal Resistance	Θ_{JC}		12		°C/W

Note: Typical performance at these conditions: Temp = +25 °C, V_{DD} = +5 V, 75 Ω system, Full band unless otherwise noted

Evaluation Board Schematic 50 MHz – 1800 MHz



Typical Application Schematic 50 MHz – 1800 MHz



**QPL1823****75 Ω 26 dB CATV Amplifier (50 – 1800MHz)**

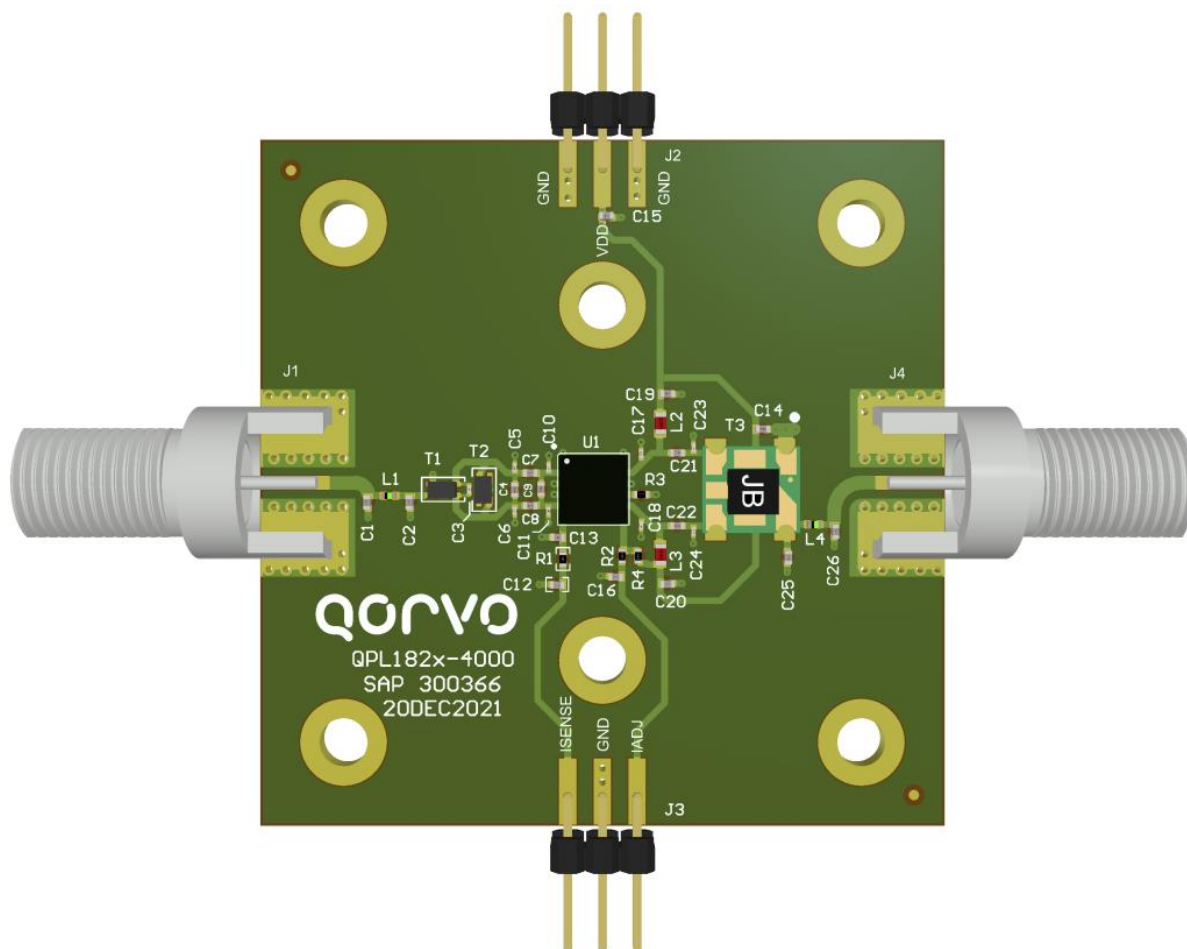
Evaluation Board Bill of Materials: 5V

Ref Des	Description	Manufacturer	Part Number
U1	1800MHz, Ultra-Linear Amp	Qorvo	QPL1823
PCB	EVb PCB, QPL182x-4000	Qorvo	SAP 300366
C2	CAP, 0.6pF, +/-0.1pF, 50V, HI-Q, 0402	Murata	GJM1555C1HR60BB01D
C3	CAP, 0.8pF, +/-0.1pF, 50V, C0G, 0201	Murata	GRM0335C1HR80BA01D
C14,C15,C16,C19,C20	CAP, 0.01uF, 10%, 0402	Murata	GCM155R71H103KA55D
C7,C8,C21,C22	CAP, 470pF, 5%, 50V, C0G, 0402	Murata	GRM1555C1H471JA01D
C17, C18	CAP, 1.3pF, +/-0.1pF, 25V, C0G, 0201	Murata	GRM0335C1E1R3BA01D
C23, C24	CAP, 0.2pF, +/-0.1pF, 25V, HI-Q, 0201	Murata	GJM0335C1ER20BB01D
C25	CAP, 0.2pF, +/-0.1pF, 50V, HI-Q, 0402	Murata	GJM1555C1HR20BB01D
L1	IND, 3nH, $\pm$ 0.1nH, W/W, HI-Q, 0402	Murata	LQW15AN3N0B00D
L2, L3	IND, 470nH, 5%, 1.4A, W/W, 0603	Coilcraft	0603AF-471XJRW
L4	RES, 0 Ω , 5%, 0402	Panasonic	ERJ-2GE0R00X
R3	RES, 3K, 5%, 1/16W, 0402	Kamaya	RMC1/16S-302JTH
R4	Res, 1.1K, 1%, 1/10W, 0402	Kamaya	RMC1/16SK1001FTH
T1, T2	BALUN, 1GHz ~ 1.5GHz, 75 / 75 OHM, 0805	Murata	DXW21BN7511SL-07
T3	XFMR, 1:1, 10 - 1800 MHz, 75 OHM, SMD	Mini-Circuits	TRS-1-182-75-4+
J1, J2	CONN, F FEM, 75 OHMS	Millimeter Wave	MW-846-C-DD-75
J3, J4	CONN, HDR, ST, 3-PIN, 0.100"	Samtec	TSW-103-07-G-S
Heatsink	HEATSINK, 50 x 50 x10, ALUMINUM	Alpha Nova Tech	S08EFV05-A
R1, R2, C1, C4, C5, C6, C9, C10, C11, C12, C13, C26	DNI		

BOM Changes for 8V Operation

R4	RES, 1.8K OHM, 1%, 1/10W, 0402	Panasonic	ERJ-2RKF1801X
C17, C18	CAP, 1.2pF, +/-0.1pF, 25V, C0G, 0201	Murata	GRM0335C1E1R2BA01D
R3	RES, 2.2K, 1%, 1/10W, 0402	Panasonic	ERJ-2RKF2201X
C1	CAP, 0.2pF, +/-0.1pF, 50V, HI-Q, 0402	Murata	GJM1555C1HR20BB01D
C23, C24	DNI		

Evaluation Board Assembly Drawing



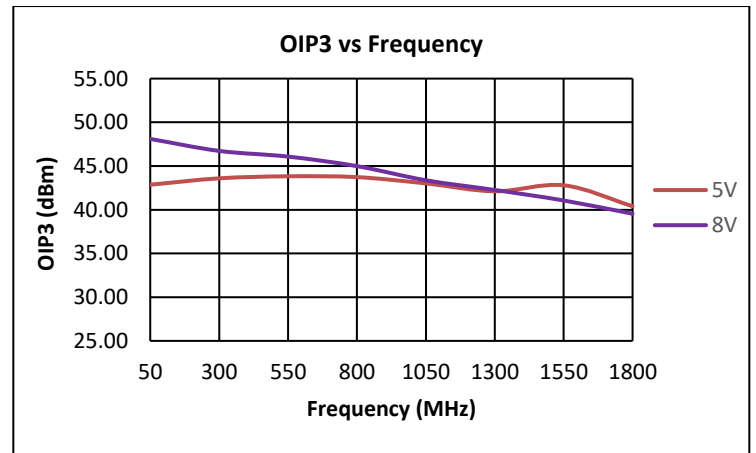
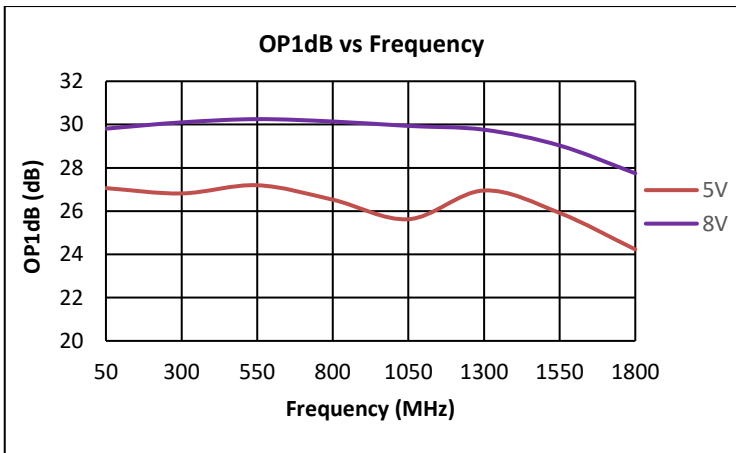
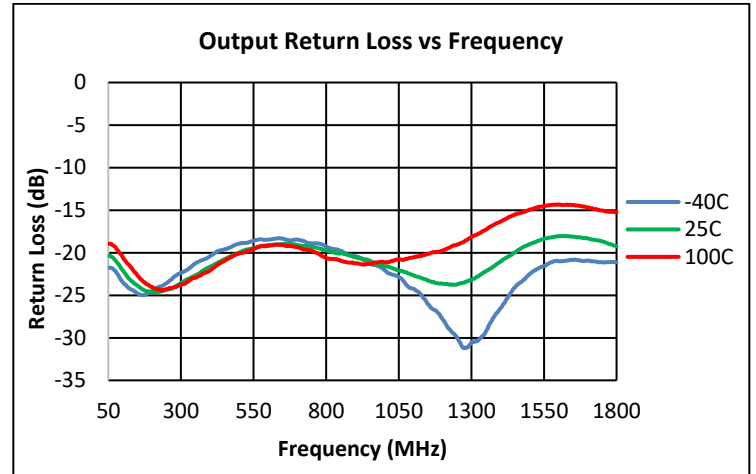
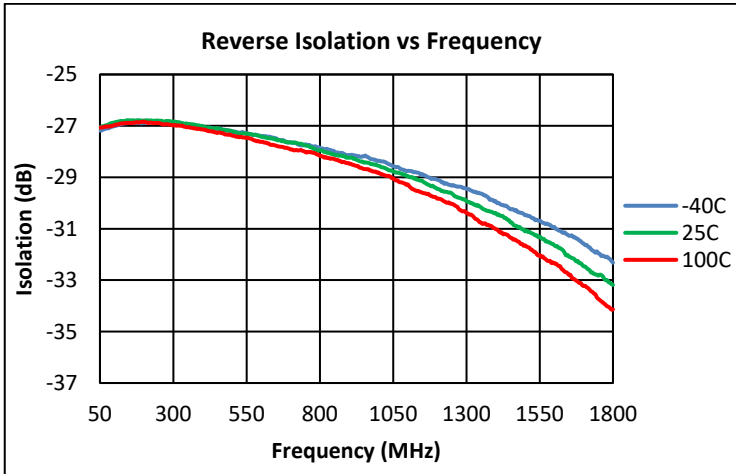
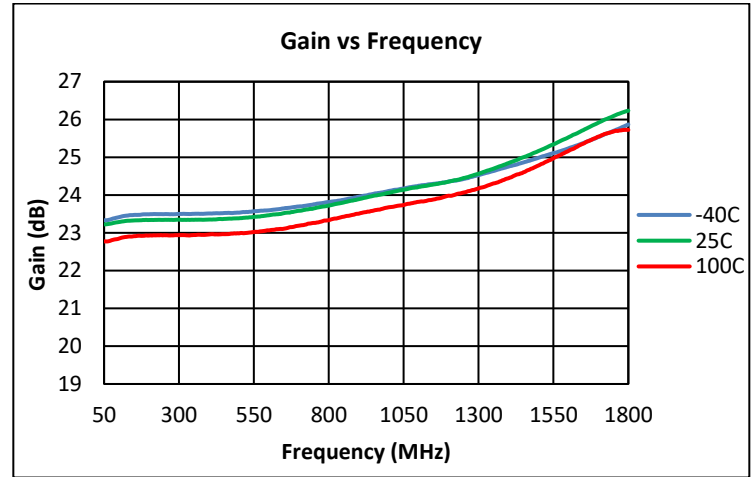
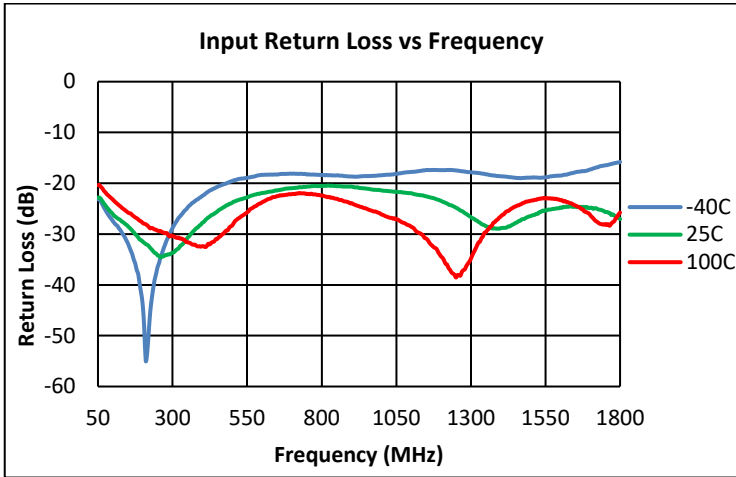
QPL1823 Evaluation Board

Layer Stack Legend

Material	Layer	Thickness	Dielectric Material	Type
	Top Overlay			Legend
	Surface Material	0.0004	SM-001	Solder Mask
CF-004	Top Layer	0.0007		Signal
Core		0.0600	RO4003	Dielectric
CF-004	Bottom Layer	0.0007		Signal
Total thickness: 0.0618				

Performance Data

Test conditions unless otherwise noted: Vdd = +5V, Temp = +25C, Zo = 75 Ω

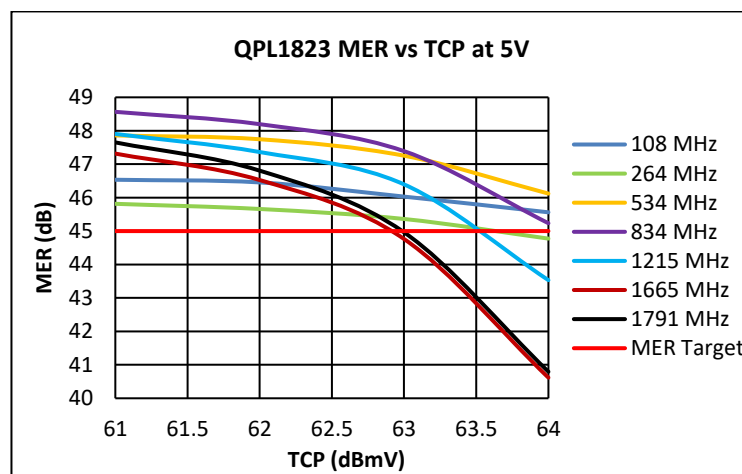
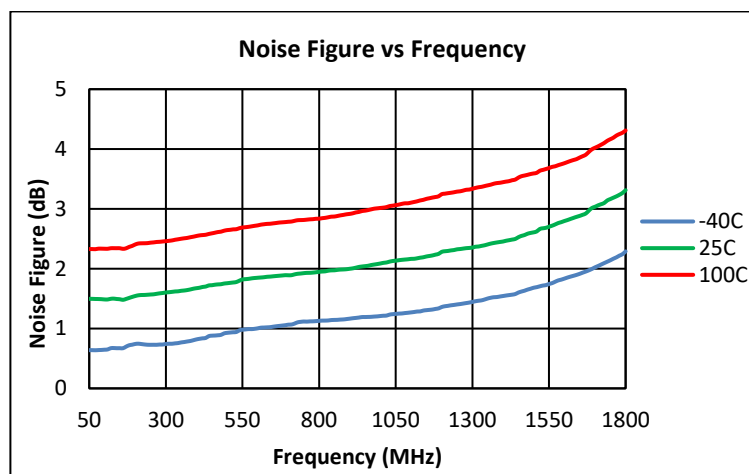
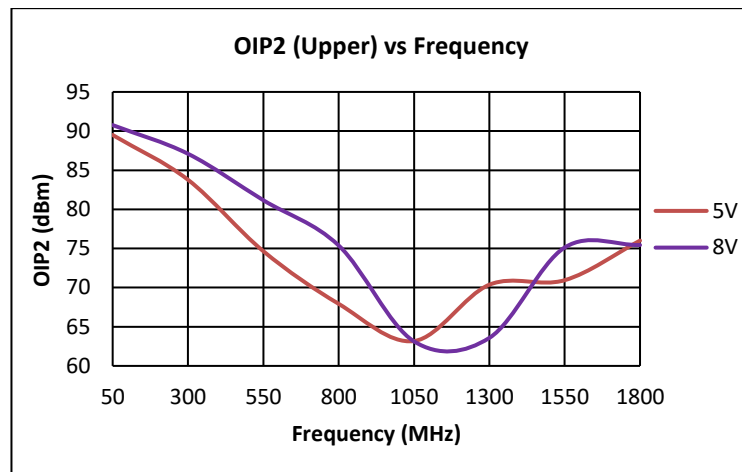
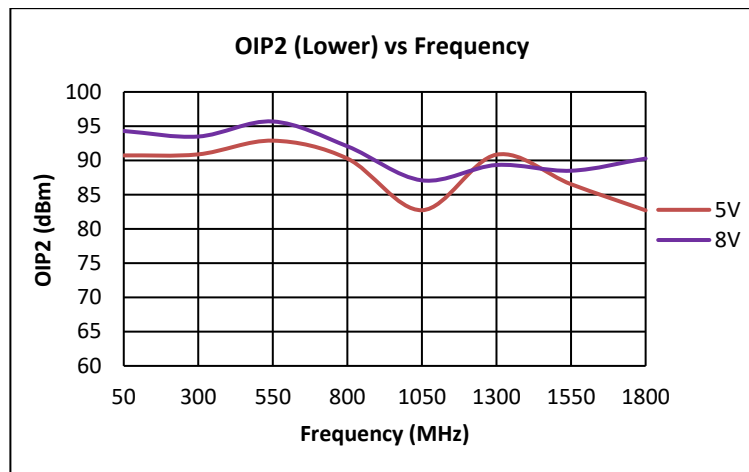


Notes:

- (1) 5V OIP3: +12dBm / tone output @ $\Delta f = 6\text{MHz}$
- (2) 8V OIP3: +15dBm / tone output @ $\Delta f = 6\text{MHz}$

Performance Data (cont'd)

Test conditions unless otherwise noted: Vdd = +5V, Temp = +25C, Zo = 75 Ω

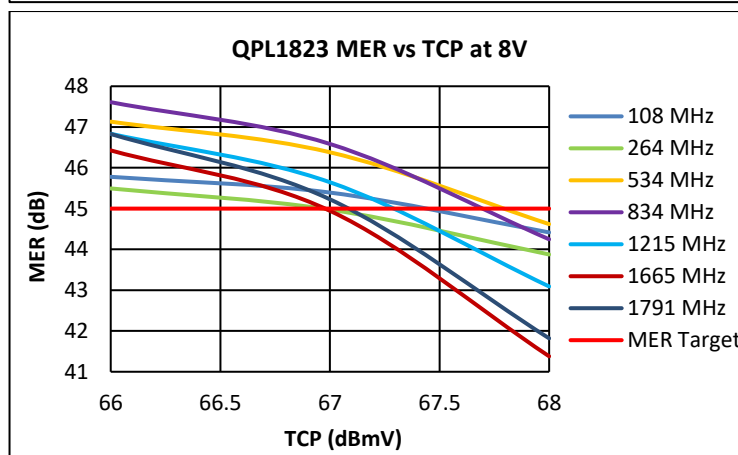
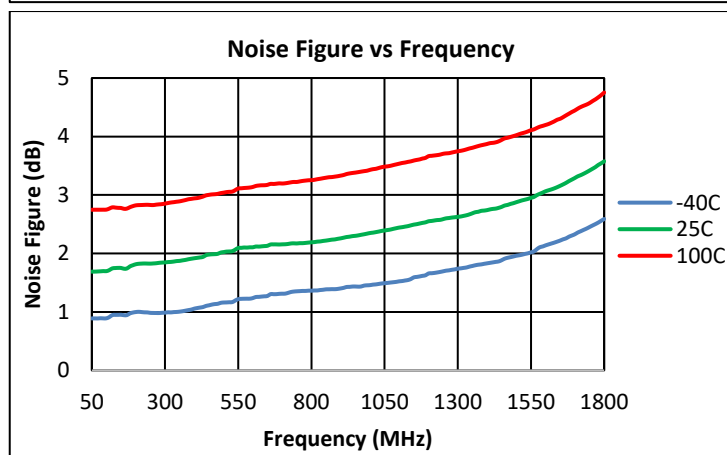
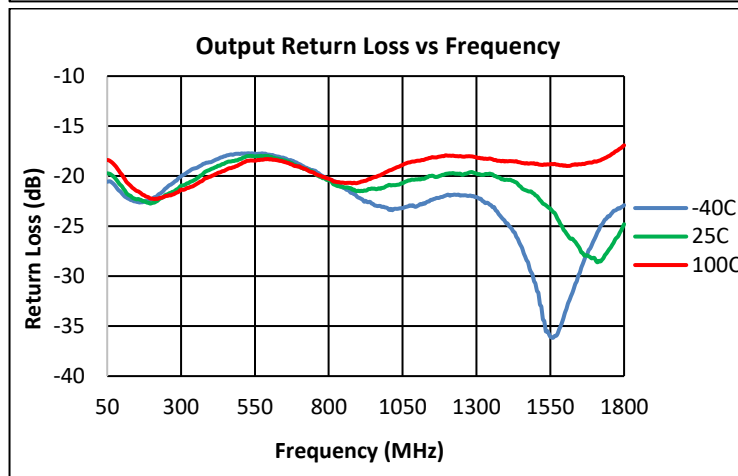
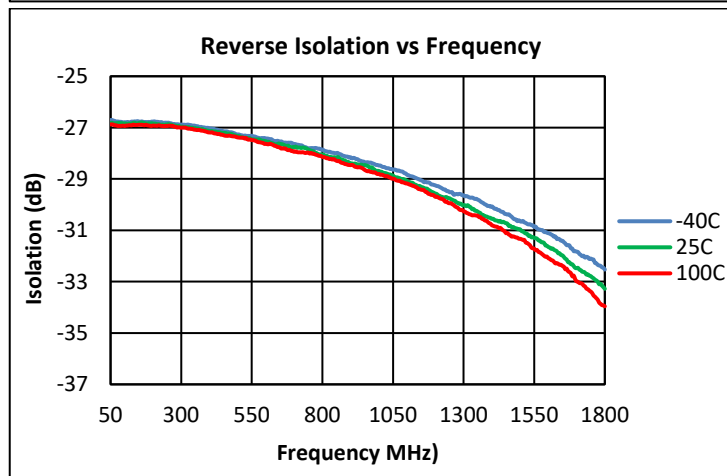
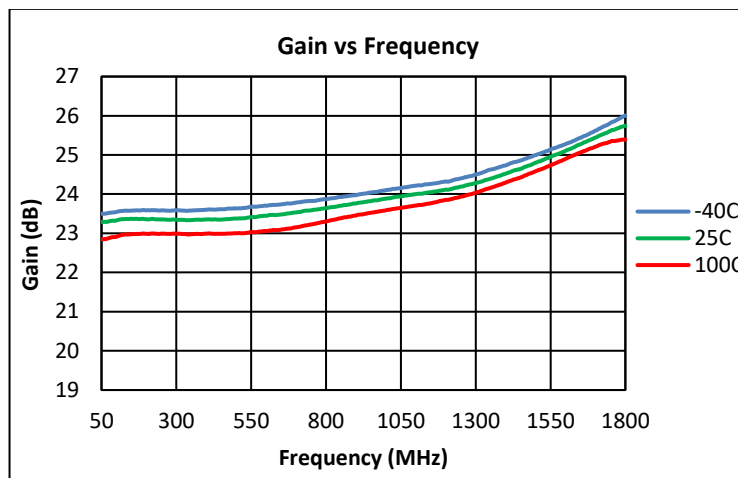
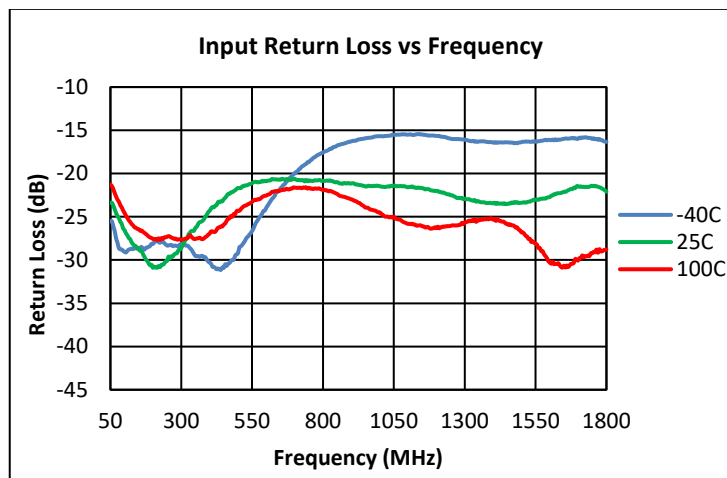


Notes:

- (1) 5V OIP2: +12dBm / tone output @ $\Delta f = 53\text{MHz}$
- (2) 8V OIP2: +15dBm/tone output @ $\Delta f = 53\text{MHz}$
- (3) MER Test Conditions: (108 – 1791 MHz, 280 Ch SC-QAM, 10dB tilt, 0dB offset)
- (4) MER is uncorrected

Performance Data (cont'd) Vdd = 8V

Test conditions unless otherwise noted: Vdd = +8V, Temp = +25C, Zo = 75 Ω

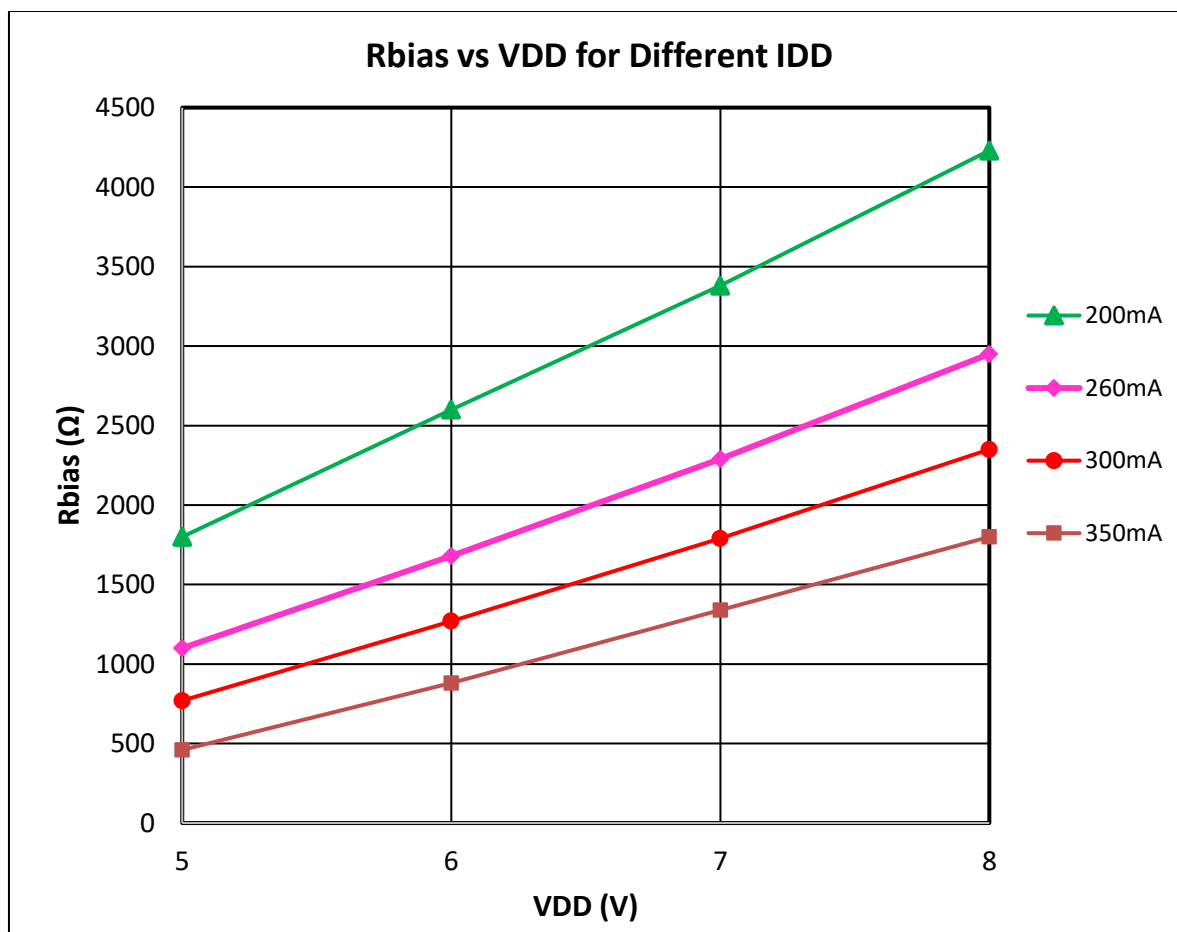


Notes:

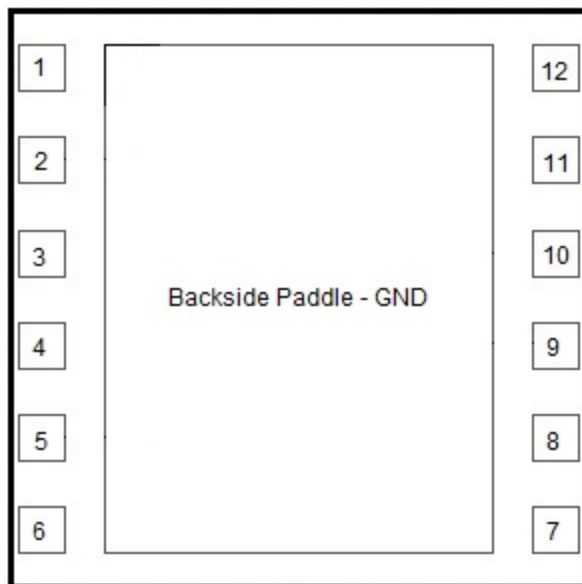
- (1) MER Test Conditions: (108 – 1791 MHz, 280 Ch SC-QAM, 10dB tilt, 0dB offset)
- (2) MER is uncorrected

IADJ Resistor Value

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



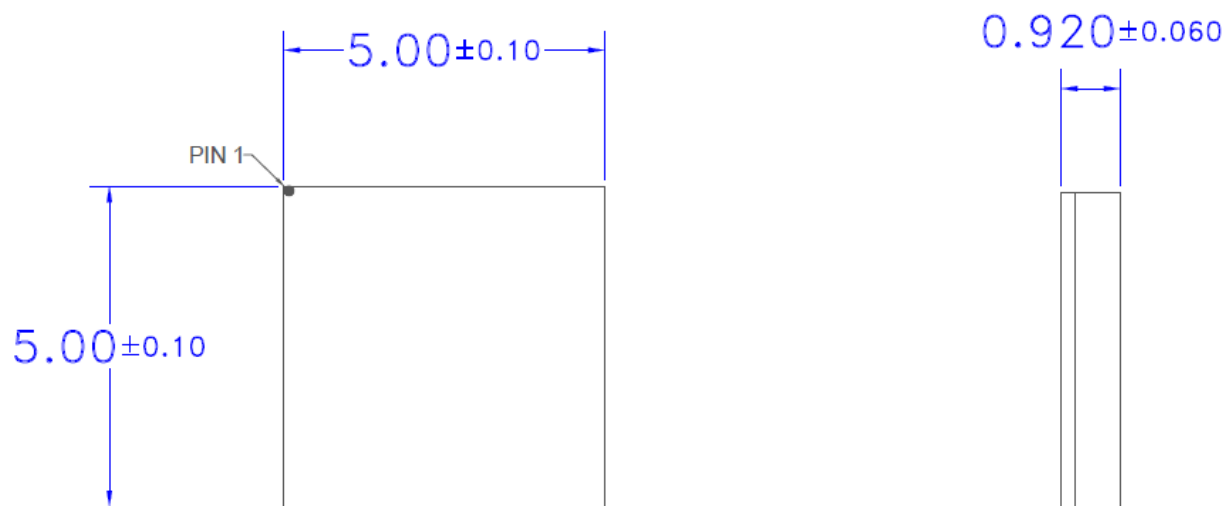
Pin Configuration and Description



5 x 5 12-pin Laminate MCM

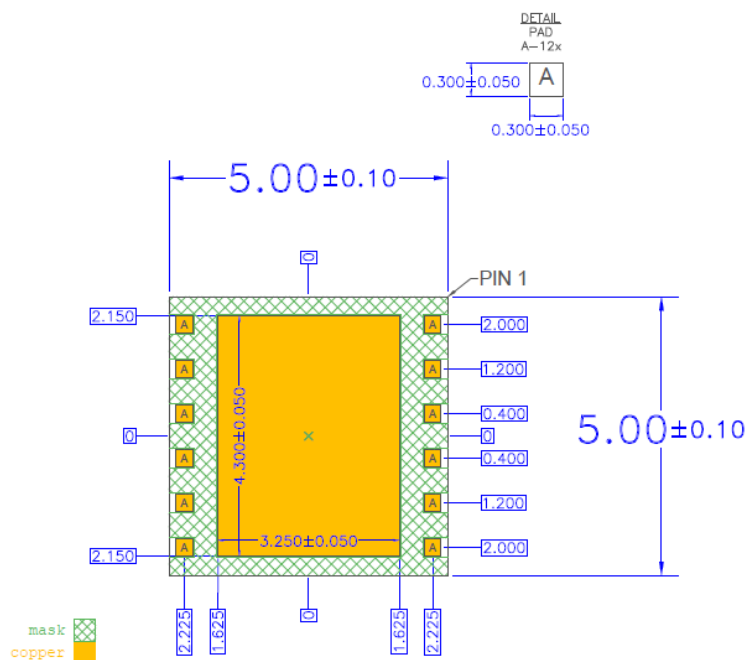
Pin Number	Label	Description
1	NC	No internal connection, recommend connecting to EVB GND
2	RFIN+	RF Input +
3	GND	Must be connected to EVB GND
4	GND	Must be connected to EVB GND
5	RFIN-	RF input -
6	NC	No connect pin. Leave it open. Do not connect to GND.
7	IADJ	IDD current set
8	RFOUT-/VDD2	RF output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

Package Outline



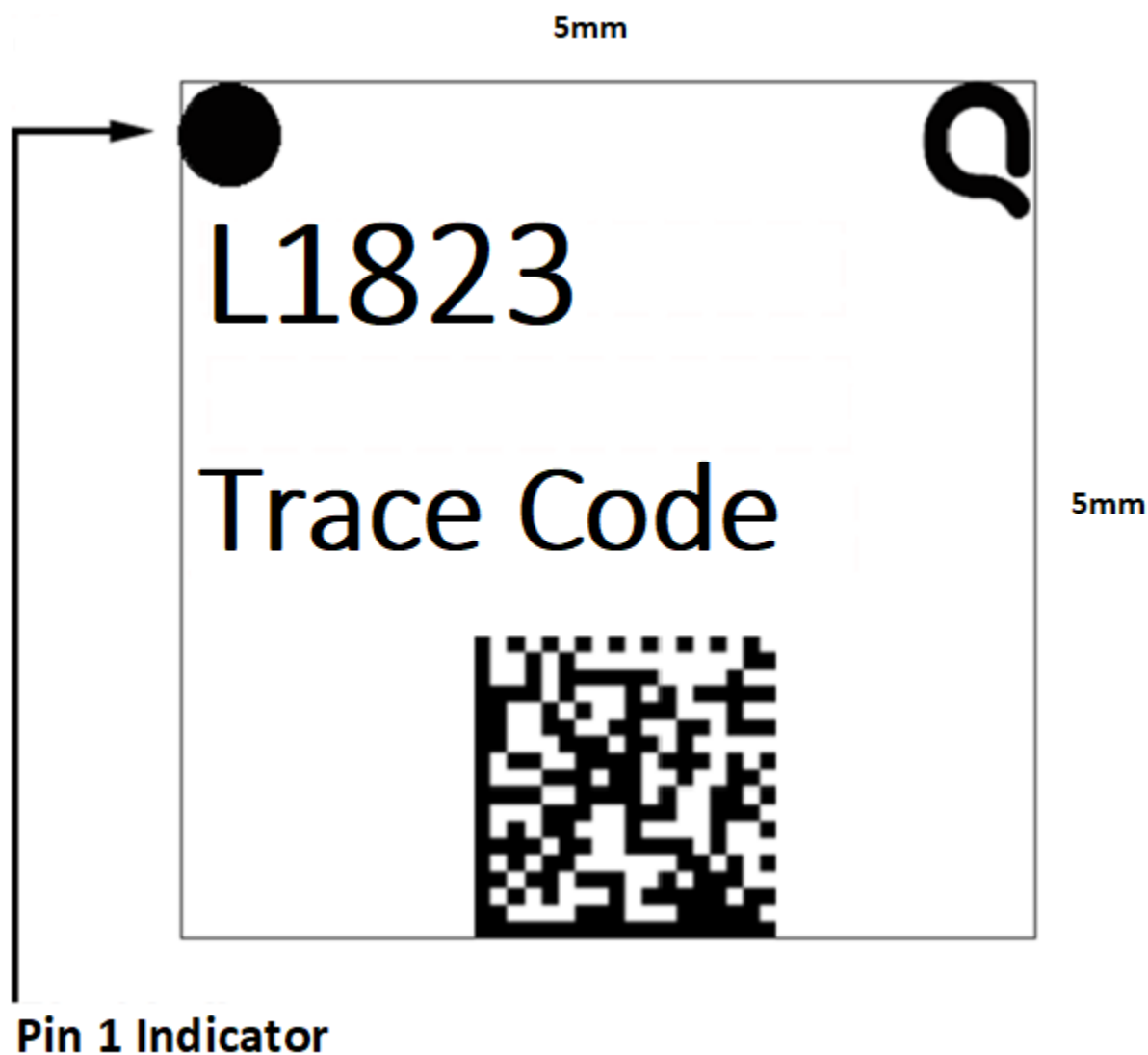
TOP
VIEW

SIDE
VIEW



BOTTOM
VIEW

Package Marking



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	500V, 1B	ANSI / ESDA / JEDEC JS-001
ESD – Charged Device Model (CDM)	1000V, C3	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 (C₁₅H₁₂Br₄O₂) 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



QPL1823

75 Ω 26 dB CATV Amplifier (50 – 1800MHz)

Important Notice

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information. **THIS INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Without limiting the generality of the foregoing, Qorvo products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.

Copyright 2021 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.