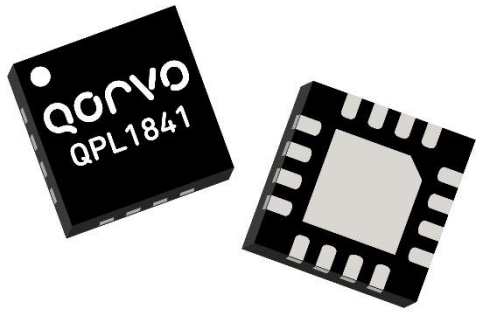
QPL1841

75 Ω 12 dB CATV Amplifier (5 – 850MHz)

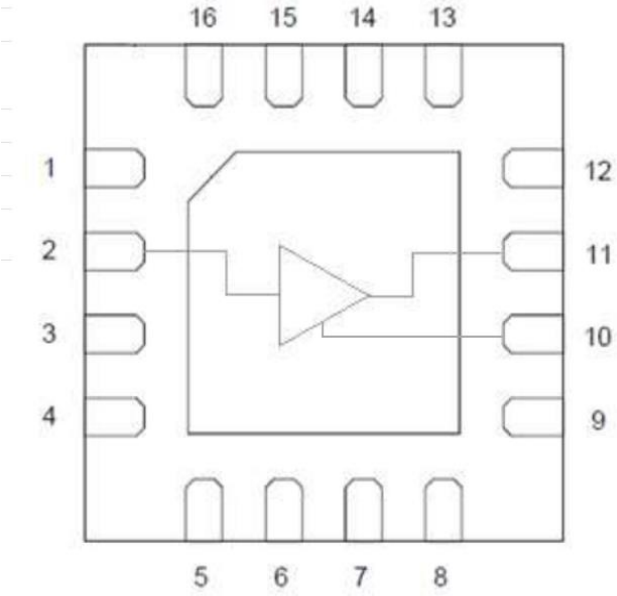
Product Overview

The QPL1841 is a GaAs pHEMT single ended MMIC RF amplifier IC featuring 12.5dB of gain and low noise from 5MHz to 850MHz. This high linearity 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 combination of low noise, excellent distortion, and low gain make this suitable for drop amps and other distribution amps. The device is powered by a single supply that can operate from 5V to 8V with current set at 115 mA. At 5V the QPL1841 provides an output of 54dBmV TCP with a CCN of 51dB. The QPL1841 is packaged in a 3 x 3 16–pin QFN.



3 x 3 16–pin QFN

Functional Block Diagram



3 x 3 16–pin QFN Package

Key Features

- 5 MHz to 850 MHz Operation
- 5V & 8V Operation
- Gain: 12.5dB Typical
- TCP: 54dBmV @ 5V
- Noise Figure: 2.6dB @ 850MHz
- 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
QPL1841EVB-02	5V Upstream Evaluation Board
QPL1841EVB-04	8V Upstream Evaluation Board

Part Number	Description
QPL1841SB	Sample bag with 5 pieces
QPL1841SR	7” Reel with 100 pieces
QPL1841TR7	7” Reel with 2500 pieces

Table of Contents

Absolute Maximum Ratings

Parameter	Rating
Supply Voltage (V_{DD})	+10 V
Supply Current (I_{DD})	160 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

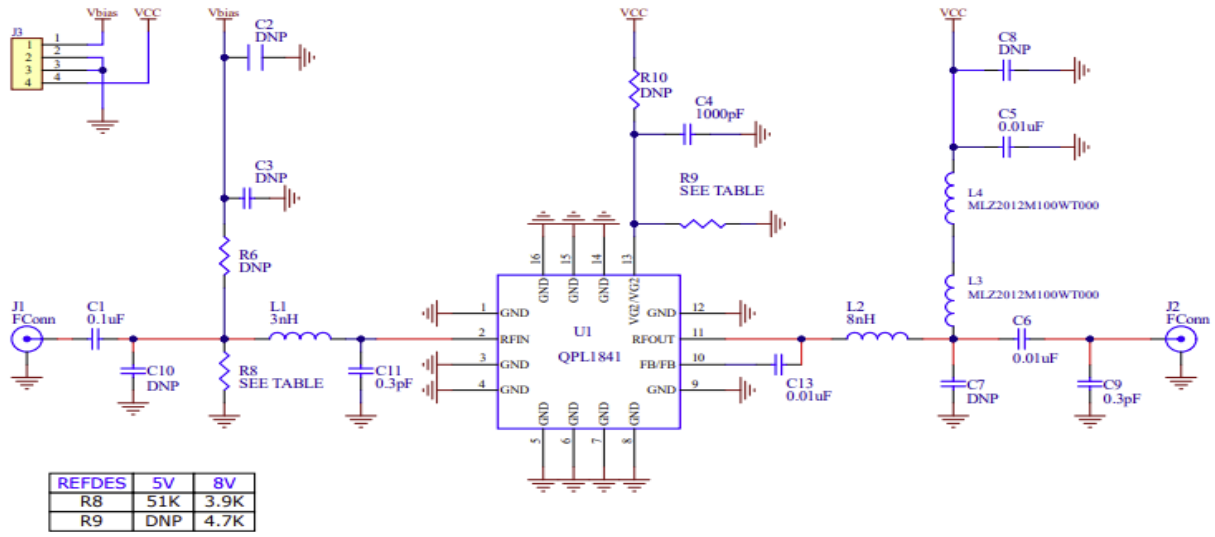
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Electrical Specifications

Parameter	Test Condition	Min	Typ	Max	Unit
Supply Voltage (VDD)			5/8		V
Supply Current (IDD)			115/115		mA
Frequency Range		5		850	MHz
Gain			12.5		dB
Reverse Isolation			17		dB
Input Return Loss	5 – 850MHz		-20		dB
Output Return Loss	5 – 850MHz		-20		dB
Noise Figure	5 – 40MHz		2.9		dB
Noise Figure	40 - 850MHz		2.6		dB
MER	At +53dBmV @ 5V and +55dBmV @ 8V Total Composite Output power. 5MHz to 850MHz, 113 Ch, SC-QAM, 0dB tilt, 0dB Offset (Source corrected)		51		dB
OIP2L	+5 dBm / tone output, Δf=6MHz, Full Band		64/62		dBm
OIP2U	+5 dBm / tone output, Δf=6MHz, Full Band		51/52		dBm
OIP3	+5 dBm / tone output, Δf=6MHz, Full Band		38/37		dBm
OP1dB	5-850MHz		19.5/21.5		dBm
Thermal Resistance	ΘJC (Junction to Device Heat Slug)		42		˚C/W

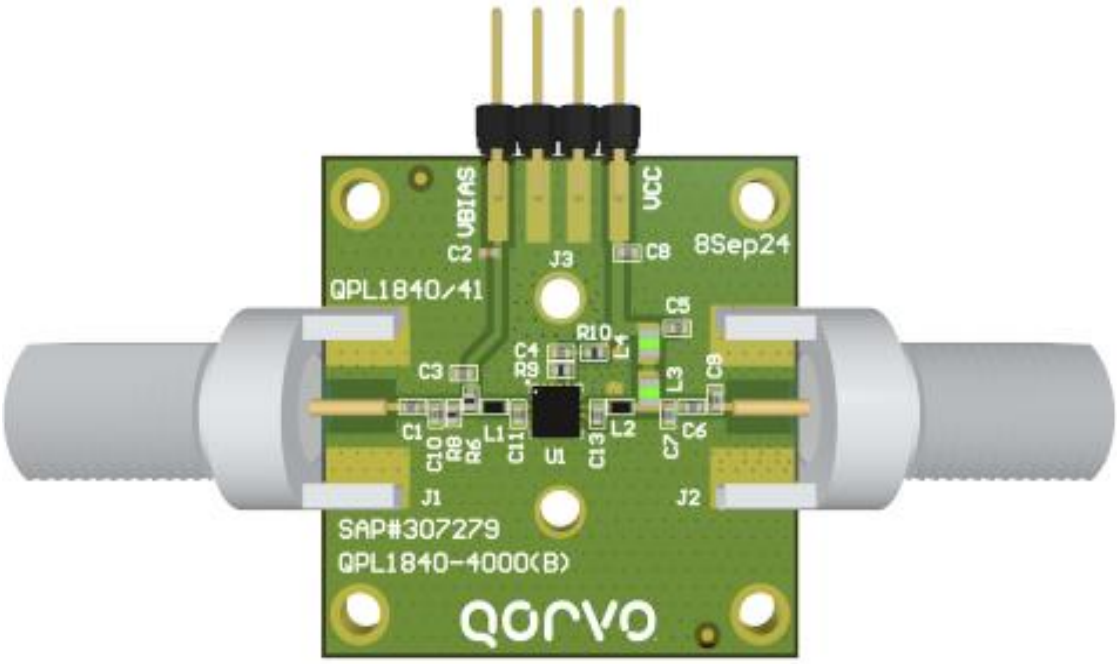
Note: Typical performance at these conditions: Temp = +25 °C, V_{DD} = +5 V, 75 Ω system, Full band unless otherwise noted

Evaluation Board Schematic 5 MHz – 850 MHz



REFDES	5V	8V
R8	51K	3.9K
R9	DNP	4.7K

Evaluation Board Assembly Drawing



LAYER STACK LEGEND

Material	Layer	Thickness	Dielectric Material	Type
	Top Overlay			Legend
Surface Material	Top Solder	0.0010in	SM-001	Solder Mask
Metal	**Top Layer**	**0.0014in**	**1Oz**	**Signal**
Core		*0.0580in*	*FR408HR*	*Dielectric*
Metal	**Bottom Layer**	**0.0014in**	**1Oz**	**Signal**

Total thickness: 0.0618

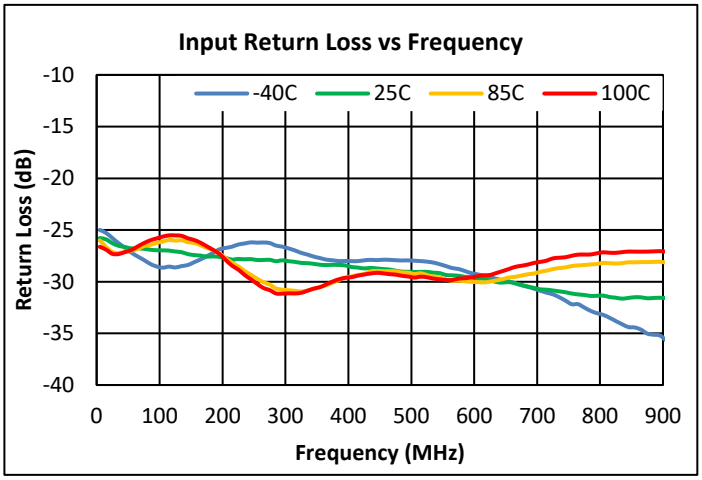
Evaluation Board Bill of Materials for 5V

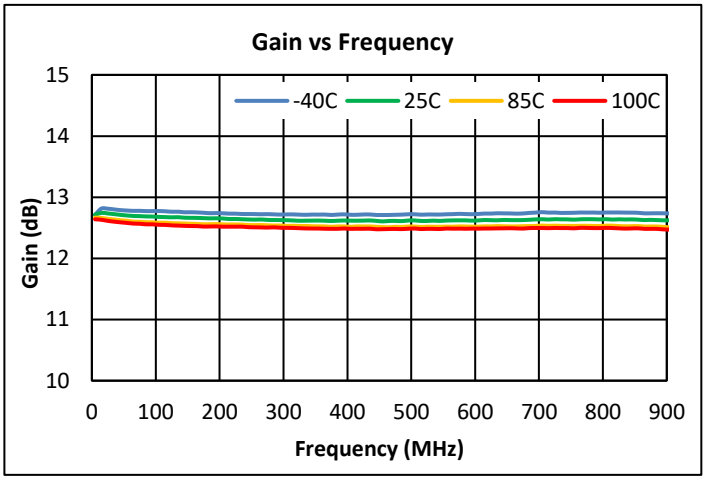
PCB	PCB, QPL1841	Qorvo	QPL1840-4000(B)
U1	900MHz 5V, 12dB gain	Qorvo	QPL1841
C1	CAP, 0.1uF, 10%, 50V, X5R, 0402	MURATA	04025D104KAT2A
C4	CAP, 1000pF, 10%, 50V, X7R, AEC200 0402	TDK	CGA2B2X7R1H102K050BA
C5,C6,C13	CAP, 0.01uF, 10%, 50V, X7R, 0402	MURATA	GCM155R71H103KA55D
C9, C11	CAP, 0.30pF, +/-0.03pF, 50V, HI-Q, 0402	MURATA	GJM1555C1HR30RB12D
R8	RES, 51K OHM, 5%, 1/10W, 0402	Panasonic	ERJ-2GEJ513X
L1	IND, 3nH, ±0.1nH, W/W, HI-Q, 0402	MURATA	LQW15AN3N0B00D
L2	IND, 8nH, 2%, W/W, HI-Q, 1700mA, 0402	MURATA	LQW15AN8N0G80D
L3,L4	IND, 10uH, 20%, 350mA, M/L, 0805	TDK	MLZ2012M100WT000
J1,J2	CONN, F FEM EDGE MOUNT, 75R, 0.068"	Millimeter Wave	MW-846-C-DD-75
J3	CONN, HDR, ST, 4-PIN, 0.100"	SAMTEC INC.	TSW-104-08-S-S
C2,C3,C7,C8,C10, R6,R9,R10	NOT POPULATED ITEM		DUMMY PART

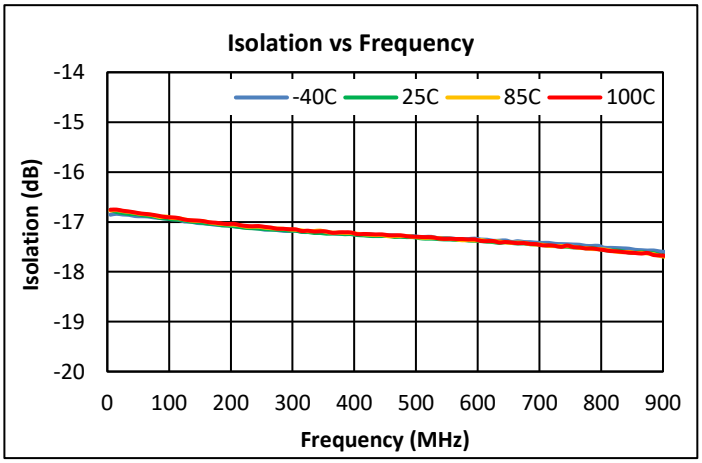
BOM Changes for 8V Operation

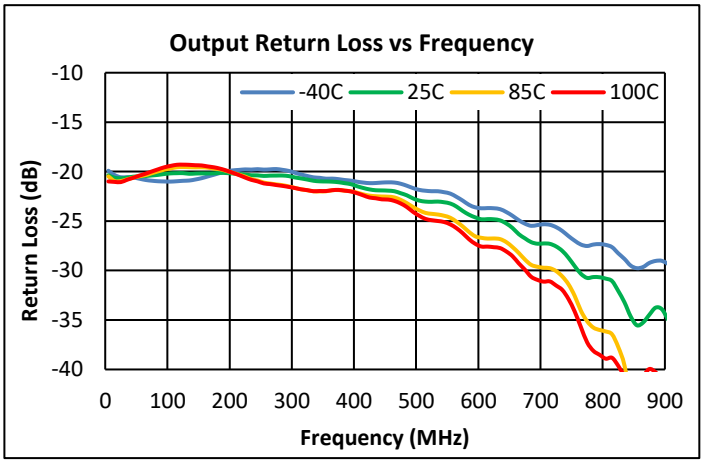
R8	RES, 3.9K OHM, 5%, 1/10W, 0402	Kamaya, Inc	RMC1/16S-392JTH
R9	RES, 4.7K OHM, 5%, 1/10W, 0402	Kamaya, Inc	RMC1/16S-472JTH

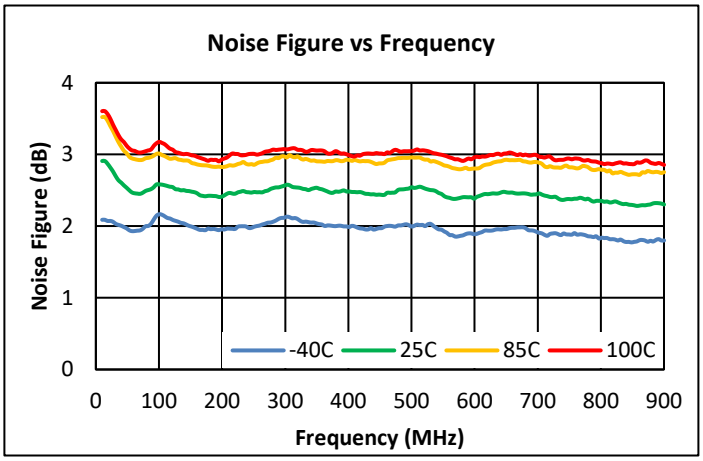
Performance Data, 5V

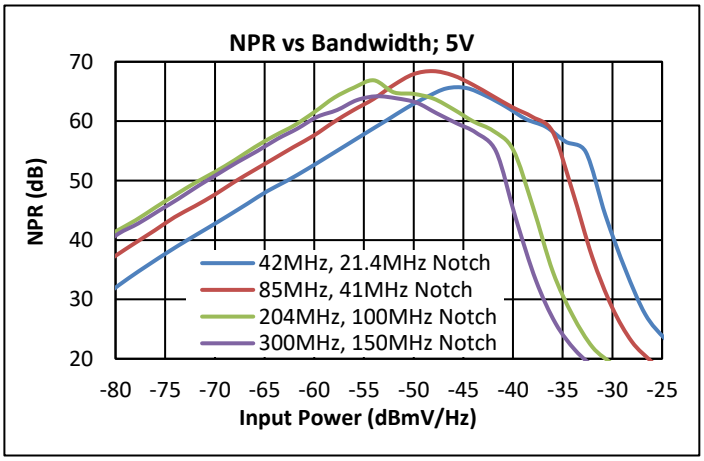




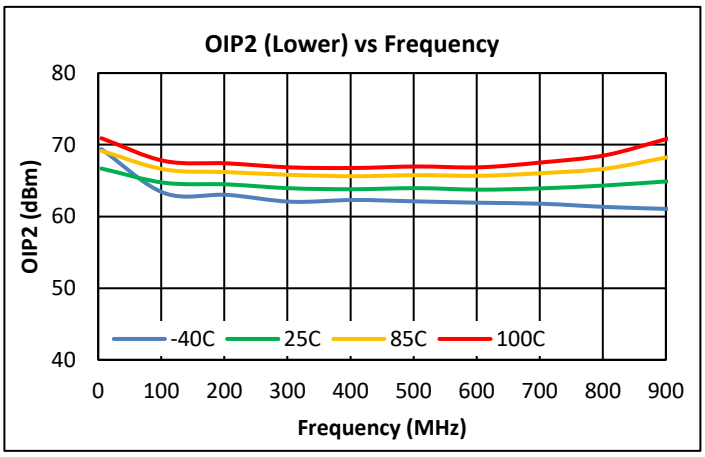


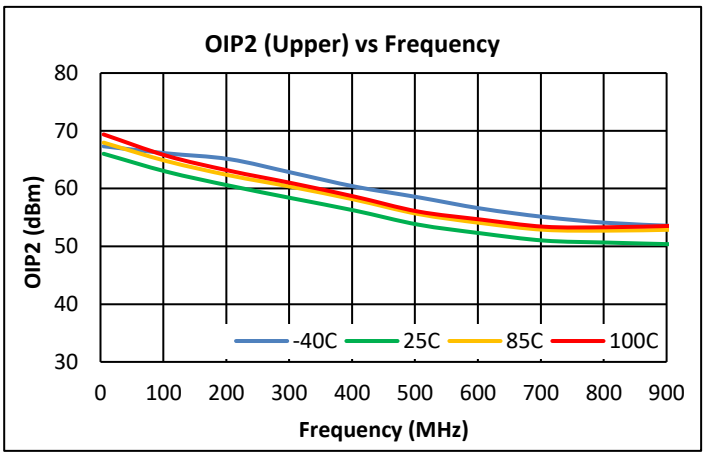


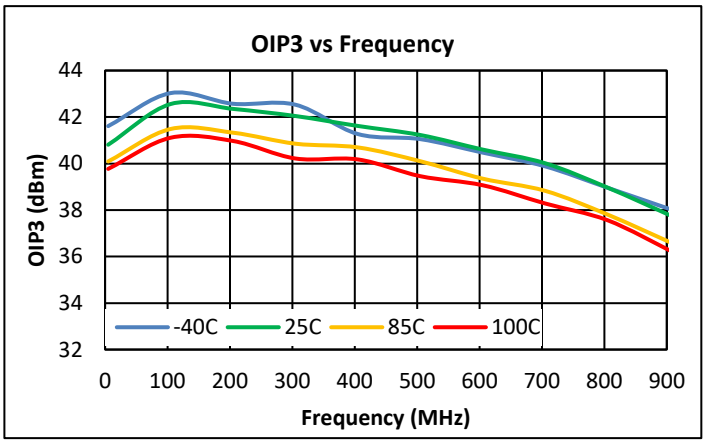


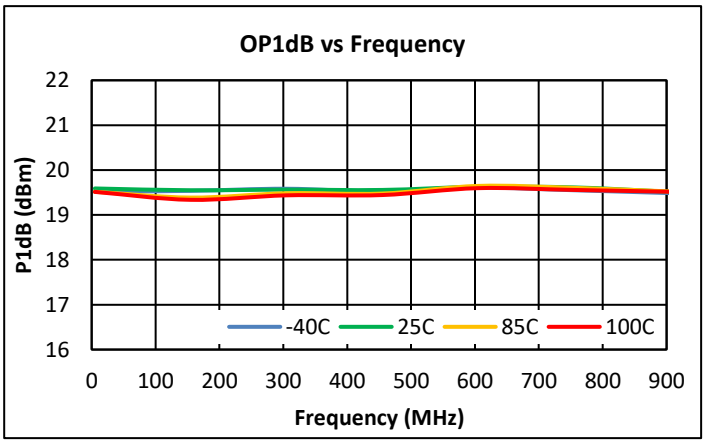


Performance Data, 5V (Cont'd)





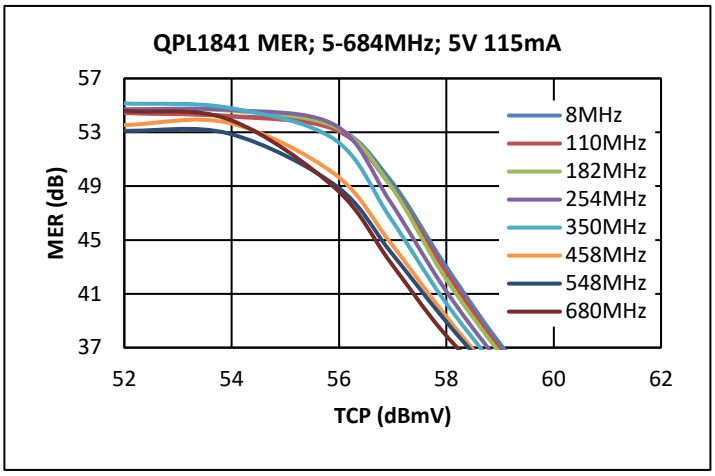


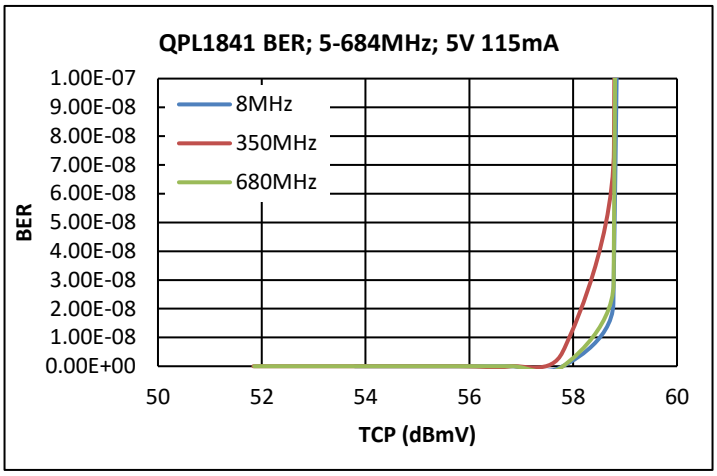


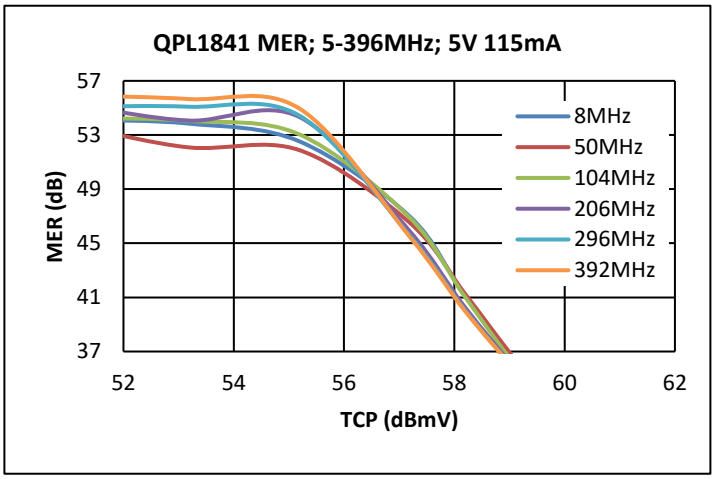
Notes:

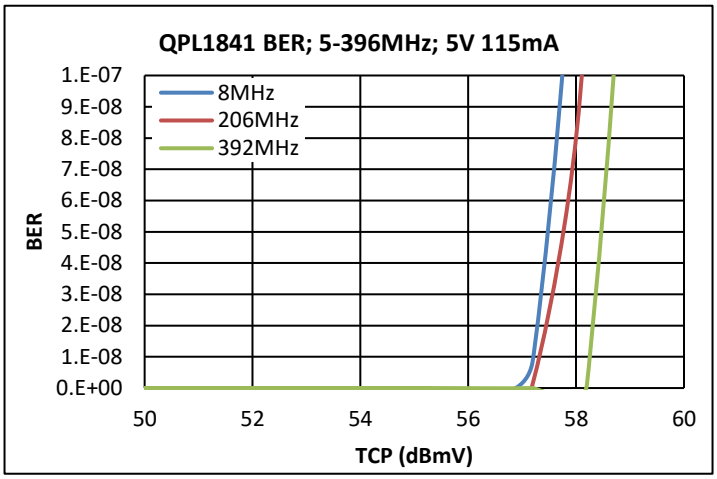
(1) 5V OIP2: +5dBm / tone output @ Δf = 6MHz
(2) 5V OIP3: +5dBm / tone output @ Δf = 6MHz

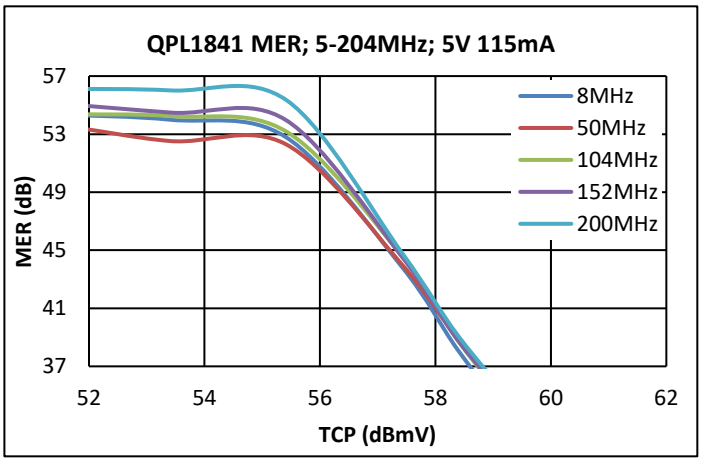
Performance Data, 5V (Cont'd)

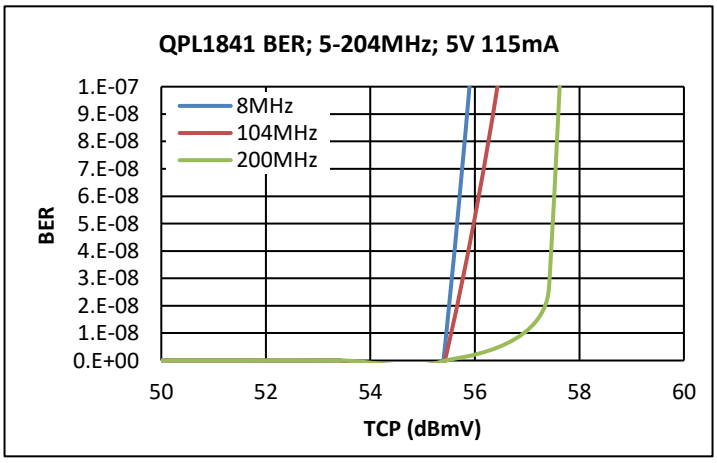








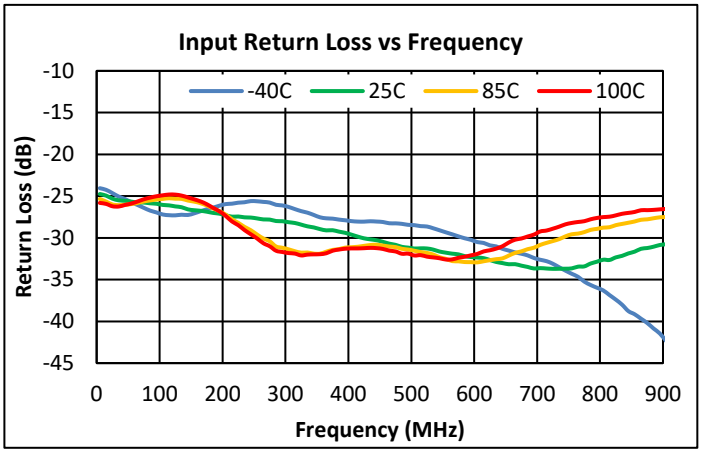


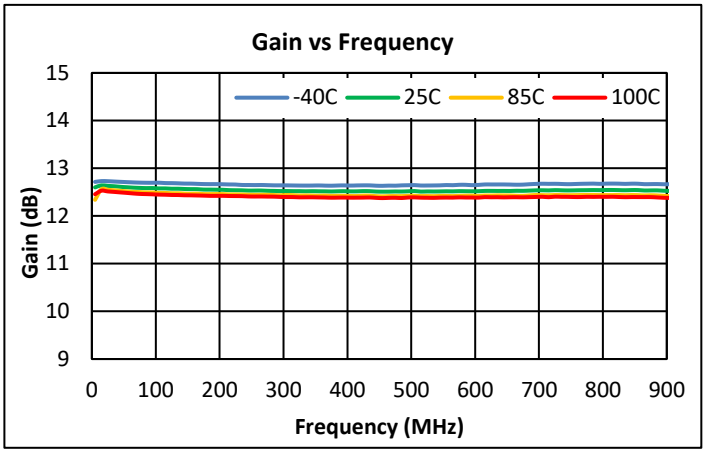


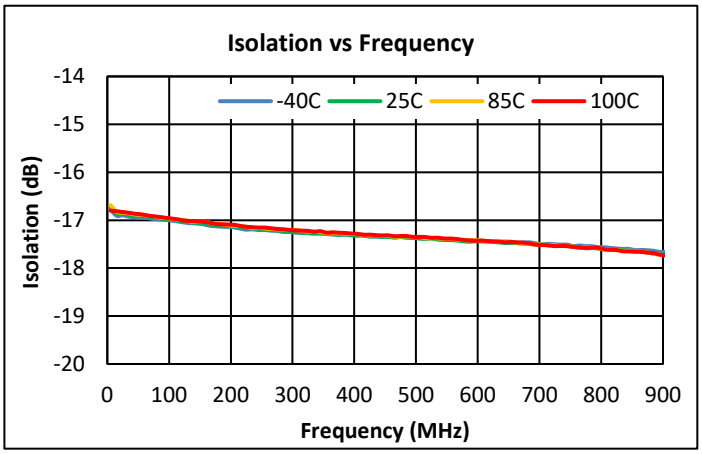
Notes:

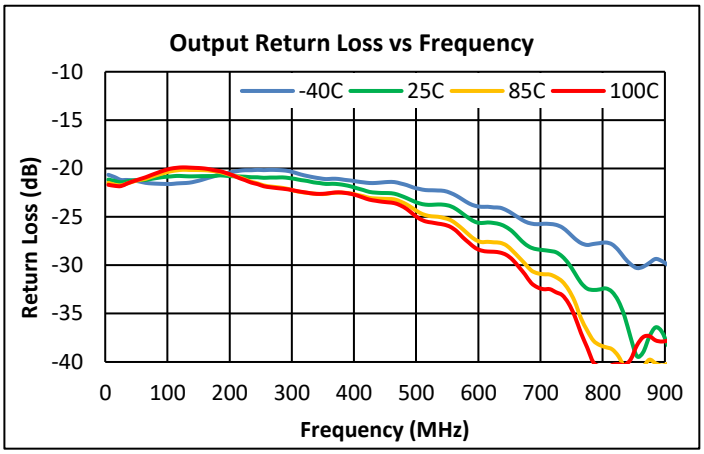
(1.) BER & MER Test Conditions: 5-684MHz, 113 Ch SC-QAM, 0dB Tilt
(2.) BER & MER Test Conditions: 5-396MHz, 65 Ch SC-QAM, 0dB Tilt
(3.) BER & MER Test Conditions: 5-204MHz, 33 Ch SC-QAM, 0dB Tilt
(4.) Source corrected

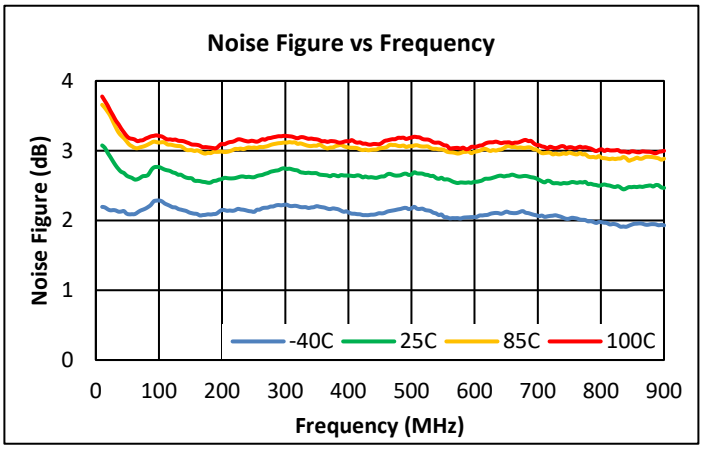
Performance Data, 8V

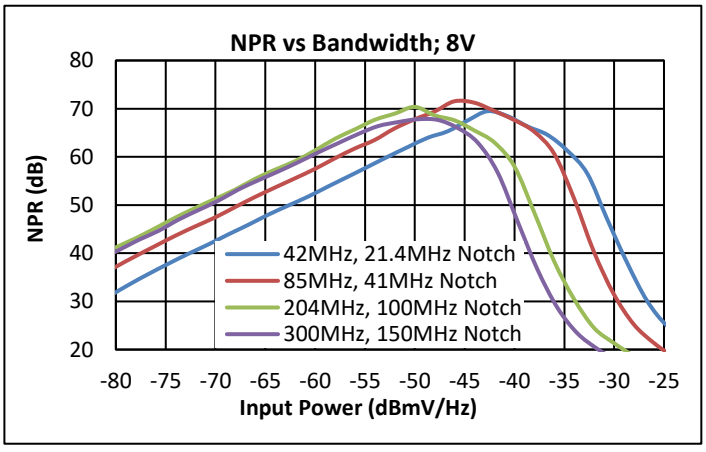




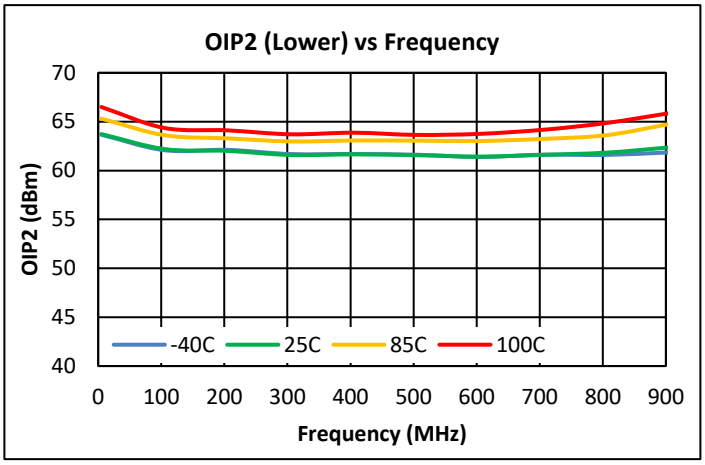


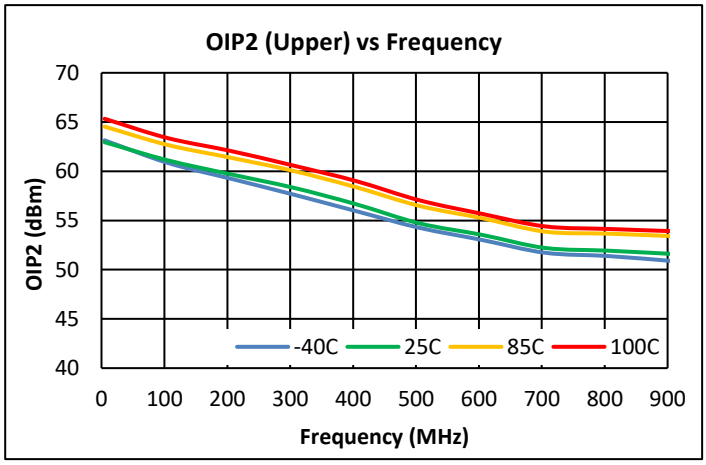


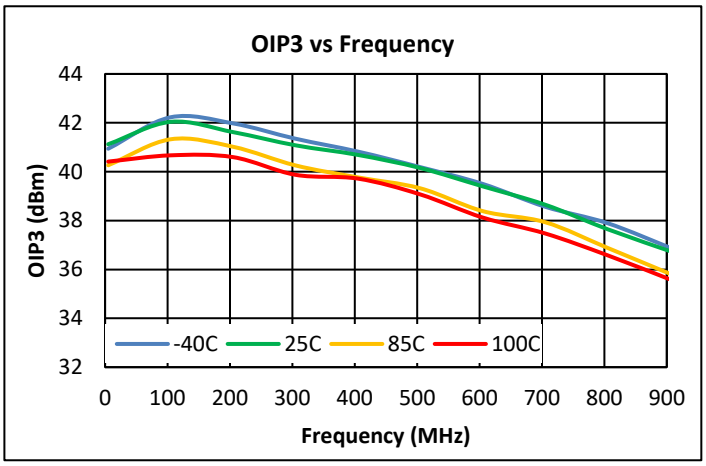


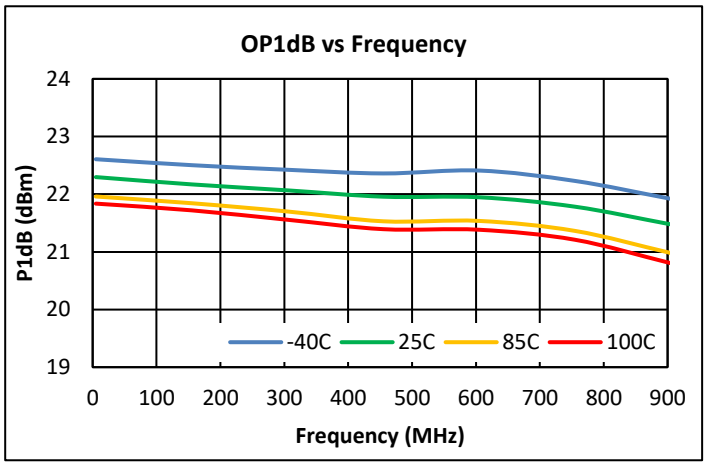


Performance Data, 8V (Cont'd)





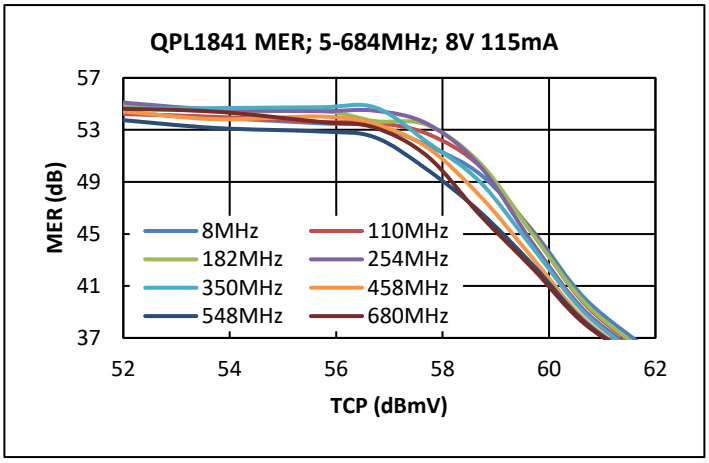


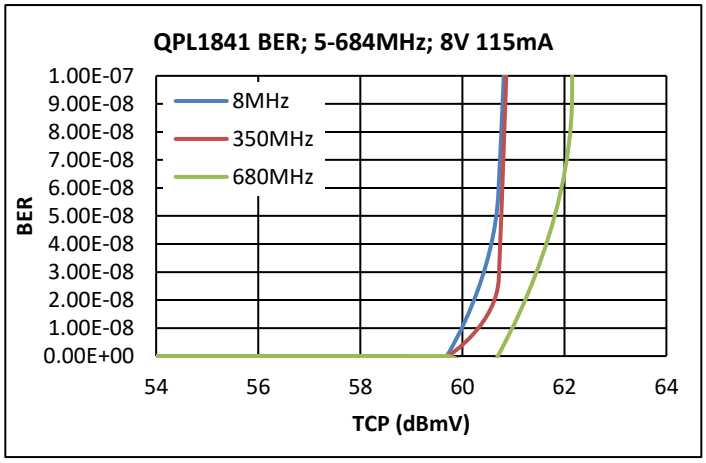


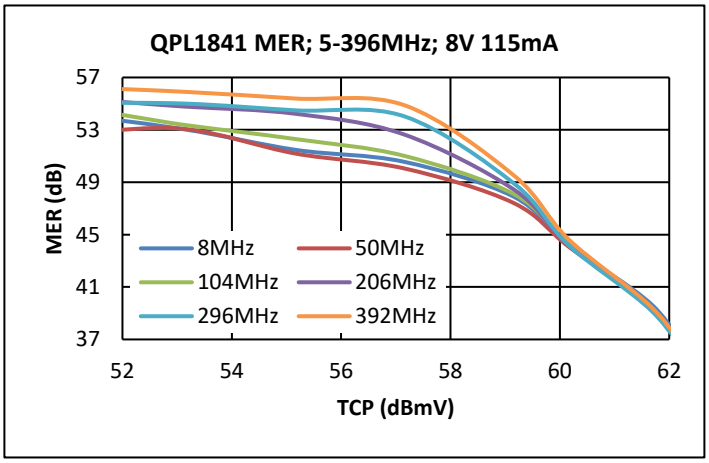
Notes:

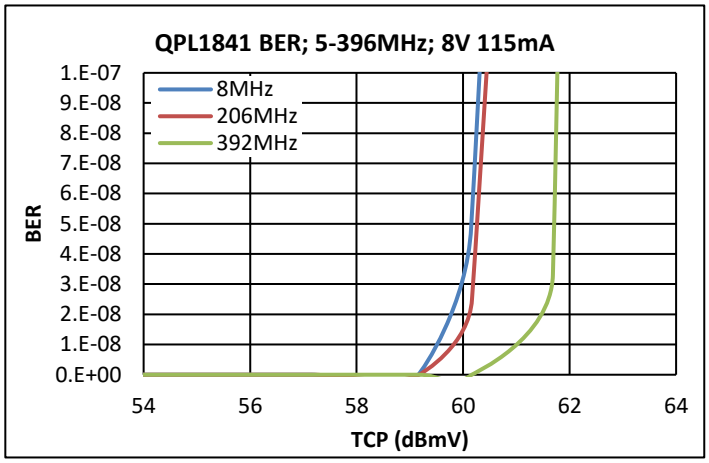
(1) 8V OIP2: +5dBm/tone output @ Δf = 6MHz
(2) 8V OIP3: +5dBm / tone output @ Δf = 6MHz

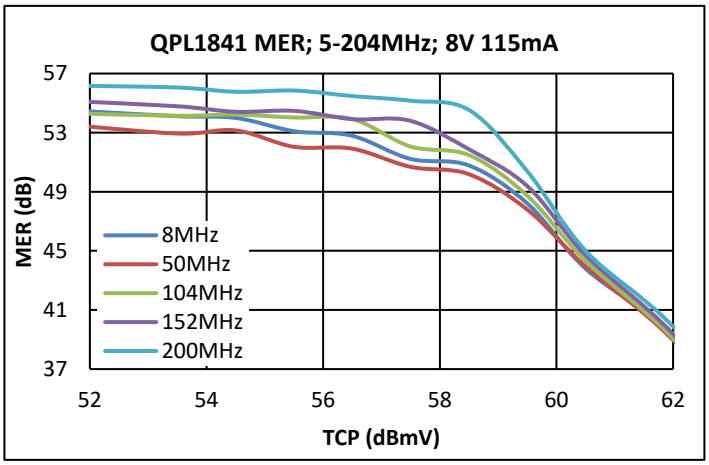
Performance Data, 8V (Cont'd)

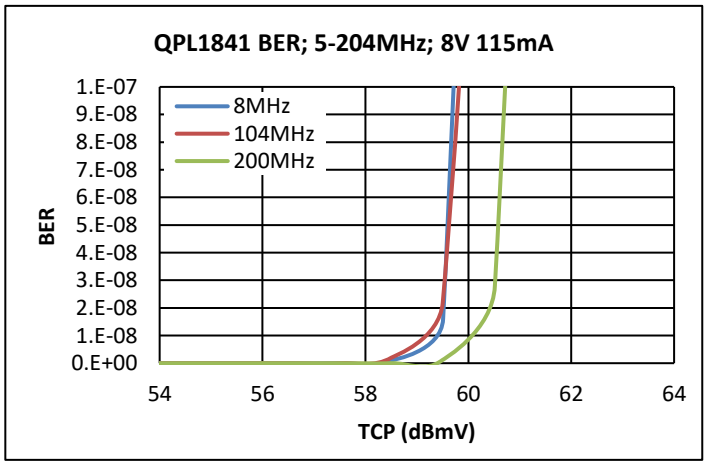








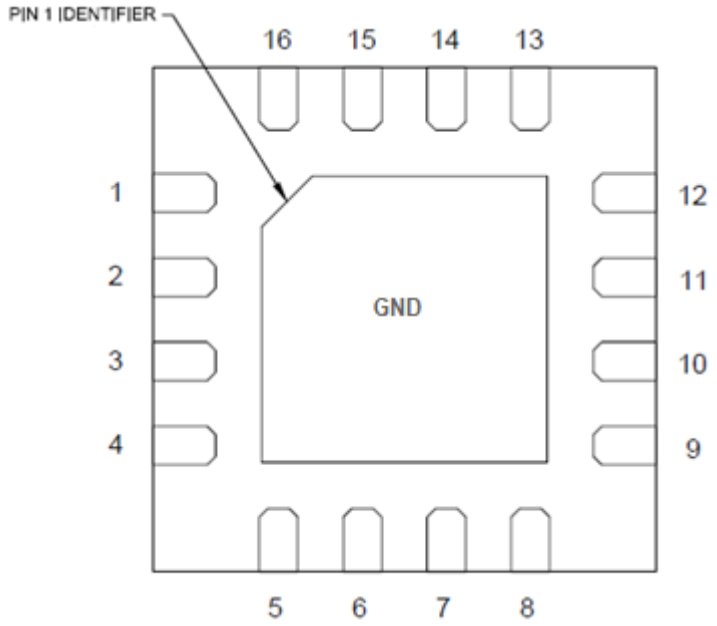




Notes:

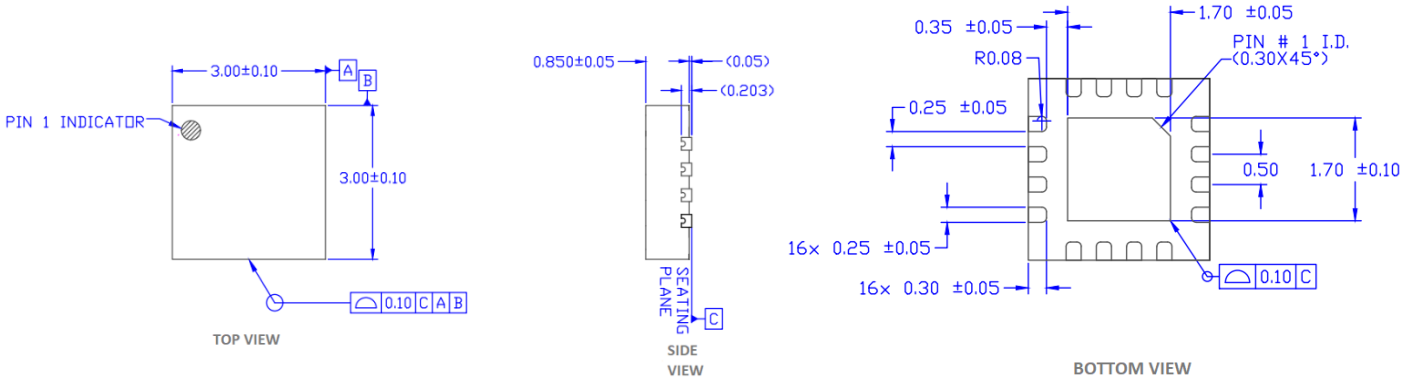
(1.) BER & MER Test Conditions: 5-684MHz, 113 Ch SC-QAM, 0dB Tilt
(2.) BER & MER Test Conditions: 5-396MHz, 65 Ch SC-QAM, 0dB Tilt
(3.) BER & MER Test Conditions: 5-204MHz, 33 Ch SC-QAM, 0dB Tilt
(4.) Source corrected

Pin Configuration and Description

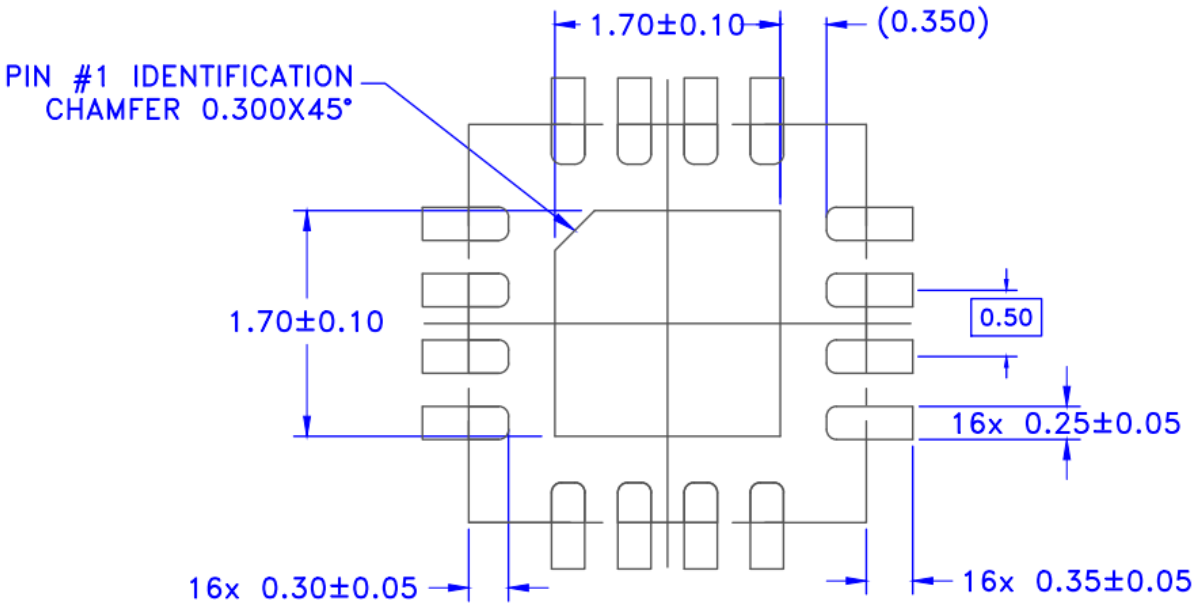


Pin Number	Label	Description
1,3,4,5,6,7,8,9,12, 14,15,16	NC	Not connected internally. It may be left floating or connected to ground (preferred).
2	RFin	RF input. External DC blocking capacitor required.
10	CFB	Feedback capacitor
11	RFout/VDD	RF output. External bias choke to VDD required. External DC blocking capacitor required.
13	VG2	VG2 bias adjust. Set by resistor (R9) to ground.
Paddle	GND	DC/RF/Thermal/GND. (Maximize vias in this area)

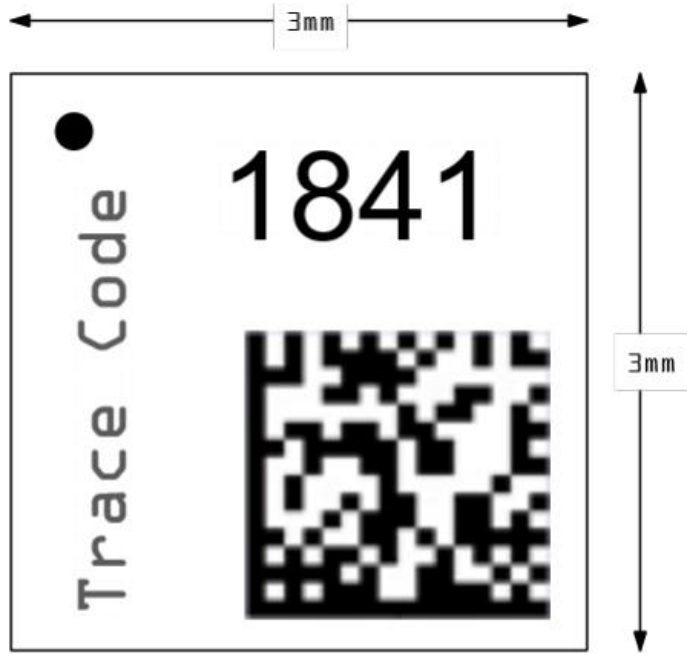
Package Outline



Recommended PCB Land Pattern



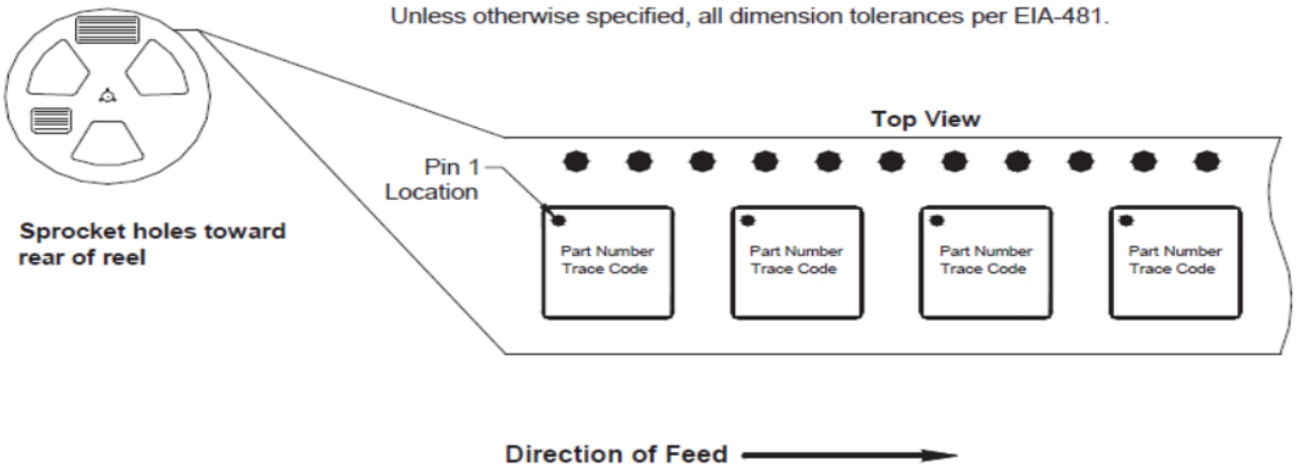
Package Marking



● Pin 1 Indicator
Trace Code to be assigned by SubCon

Tape and Reel

Qorvo Part Number	Reel Diameter Inch (mm)	Hub Diameter Inch (mm)	Width (mm)	Pocket Pitch (mm)	Feed	Units Per Reel
QPL184118TR7	7 (178)	2.4 (61)	12	4	Single	2500



Handling Precautions

Parameter	Rating	Standard	 Caution! ESD Sensitive Device
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	MSL2	IPC / JEDEC J-STD-020	

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: 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:

- 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**

Important Notice

The information contained in this Data Sheet and any associated documents ("Data Sheet Information") is believed to be reliable; however, Qorvo makes no warranties regarding the Data Sheet Information and assumes no responsibility or liability whatsoever for the use of or reliance on said information. All Data Sheet Information is subject to change without notice. Customers should obtain and verify the latest relevant Data Sheet Information before placing orders for Qorvo® products. Information concerning Qorvo's product life cycles is available at https://www.qorvo.com/support/product-lifecycle-information. Data Sheet Information or the use thereof does not grant, explicitly, implicitly or otherwise any rights or licenses with respect to patents or any other intellectual property whether with regard to such Data Sheet Information itself or anything described by such information.

Qorvo grants you permission to use this Data Sheet and any associated resources only to develop an application that uses the Qorvo products described in the Data Sheet and any associated resources. Other reproduction and display of this Data Sheet and any associated resources is prohibited.

Qorvo's products are provided subject to Qorvo's Terms of Sale or provided in conjunction with such Qorvo products. Qorvo objects to and rejects any additional or different terms customer may have proposed regarding the purchase of Qorvo products.

DATA SHEET 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. Applications described in the Data Sheet Information are for illustrative purposes only. Customers are responsible for validating that a particular product described in the Data Sheet Information is suitable for use in a particular application.

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- View QPL1841SR on WIN SOURCE
- Qorvo US Inc. Information

Optimize Your Supply Chain with WIN SOURCE Solutions

- Global Sourcing Solution
- Obsolete Management
- Cost Control Management
- Shortage Management
- Alternative Solution
- Excess Inventory Management