QPB3238J

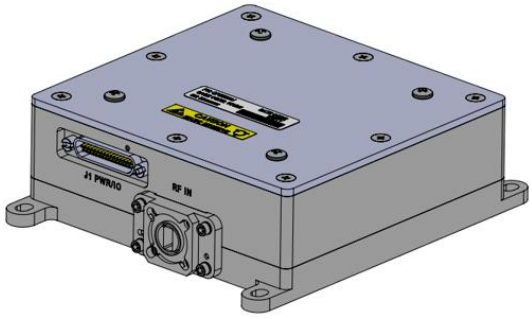
32 – 38 GHz GaN Driver Amplifier

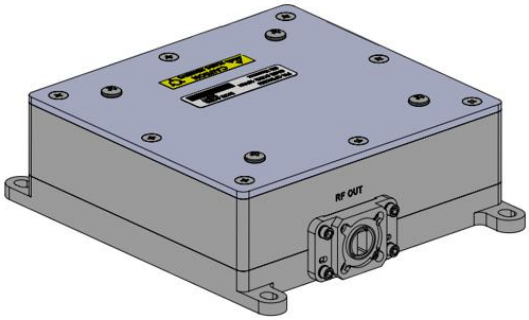
Product Description

The QPB3238J is a solid state driver amplifier with an operating range of 32 – 38 GHz while achieving 42 dBm (15 Watts) of saturated output power. Its compact size and weight make it ideally suited to drive Qorvo's Spatium SSPAs in the 32 – 38 GHz band targeting Electronic Warfare, Radar, and Military Communications applications.

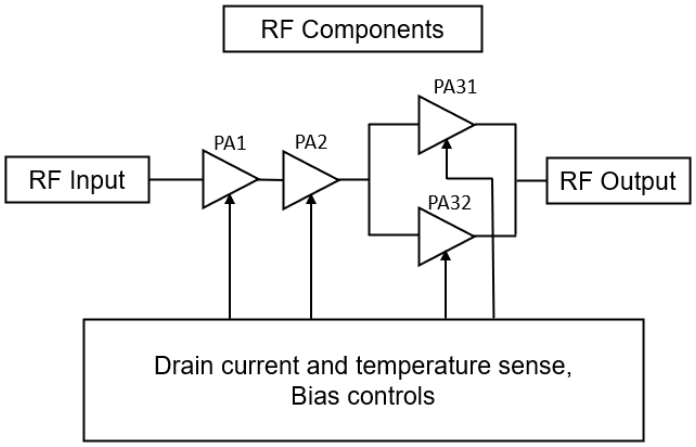
The QPB3238J includes a DC enable function that can be used to pulse / modulate the RF output of the amplifier. In BLANK (disabled) mode, the amplifier's current is reduced to nearly 0A, resulting in reduced noise and power dissipation.

RF input and output are via WR28 waveguide connections. DC power and control / monitoring interface is provided via a Micro D-Sub connector..





Functional Block Diagram



Product Features

- Frequency Range: 32 – 38 GHz
- Saturated Output Power: 43 dBm (P_{IN} = 5 dBm, Pulse)
- Saturated Output Power: 42 dBm (P_{IN} = 5 dBm, CW)
- Solid State MMIC Reliability
- Instant On (no warm-up)
- BLANK Mode
- Fast DC Pulsing

Performance is typical across frequency. Please reference electrical specification table and data plots for more details.

Applications

- TWTA Replacement
- Electronic Warfare
- Radar
- Communications

Ordering Information

Part No.	Description
QPB3238J	32 – 38 GHz GaN Driver Amplifier

Absolute Maximum Ratings

Parameter	Min/Values	Max/Values	Units
Prime Power (V_{DC}, also named V_SUPPLY)*	-	26	V
Drain Current	-	7	A
RF Input Power, Max.	-	10	dBm
Storage Temperature	−55	85	°C
Maximum Load VSWR		3:1	-

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied.

* Rating for thermal reliability

Recommended Operating Conditions

Parameter [1]	Min	Typ	Max	Units
Drain Voltage (V_{DC}, also named V_SUPPLY)	18	24		V
Quiescent Current or Small Signal Applications (@24V)		1.8		A
Operating Current		See data plots		A
CW Mode Operating Temperature [2]	-40		43	°C
Pulse Mode Operating Temperature [2, 4] Pulse Width Max 1 uS, (Duty Cycle 70%)	-40		71	°C
Pulse Mode Operating Temperature [2, 4] Pulse Width Max 50 uS, (Duty Cycle 60%)	-40		71	°C
Pulse Mode Operating Temperature [2, 4] Pulse Width Max 500 uS, (Duty Cycle 50%)	-40		71	°C
DC Pulse Width [3]	1		See note 4	us
DC Pulse Period [3]	2			us

1. Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.
2. Refers to mounting surface temperature.
3. Unit can be DC or RF pulsed, these limits are applicable to DC pulse only.
4. The maximum pulse width and duty cycle are limited by operating temperature.

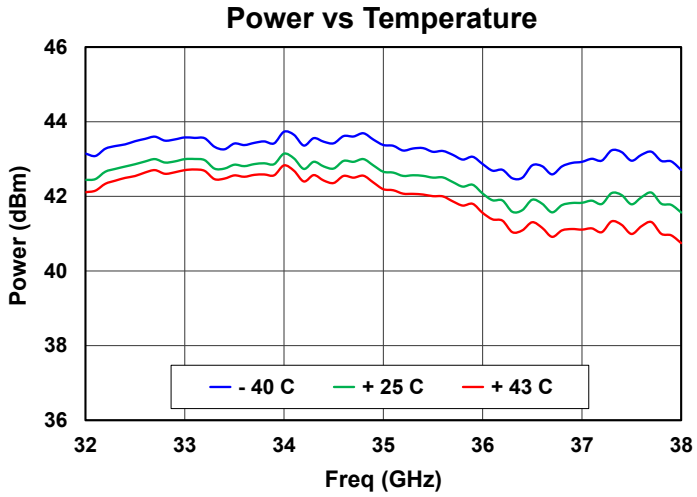
Specifications

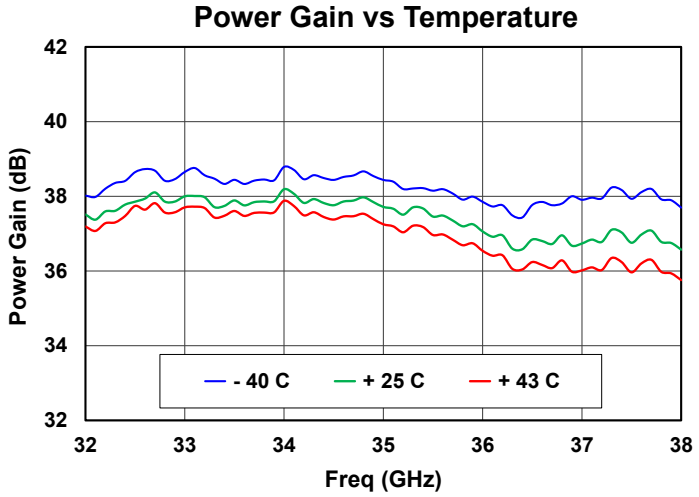
Parameter [1]	Min	Typ	Max	Units
Frequency	32		38	GHz
Saturated Output Power (CW, P_{IN} = 5 dBm)		42		dBm
Power Gain (CW, P_{IN} = 5 dBm)		37.5		dB
Power Added Efficiency (CW, P_{IN} = 5 dBm)		14		%
Power Dissipation (CW, P_{IN} = 5 dBm)		100		W
Saturated Output Power (DC Pulse, P_{IN} = 5 dBm) [2]		43		dBm
Power Gain (DC Pulse, P_{IN} = 5 dBm) [2]		38		dB
Power Added Efficiency (DC Pulse, P_{IN} = 5 dBm) [2]		15		%
Power Dissipation (DC Pulse, P_{IN} = 5 dBm) [2]		100		W
Small Signal Gain		50		dB
Input Return Loss		10		dB
RF Pulse Power Rise/Fall Time			30	ns
DC Pulse, System Rise Time (Enable > 2.5V to 90% RF (ON))		175	200	ns
DC Pulse, System Fall Time (Enable < 2.5V to 10% RF (OFF))		135	200	ns
Input and Output RF Interfaces	WR28 Waveguide			-
Weight	2.7 (1.22)			lb. (kg)
Dimensions – Amplifier Unit (L) x (W) x (H) (est.)	4.7 (119.38) x 4.0 (101.6) x 1.4 (35.56)			inch (mm)

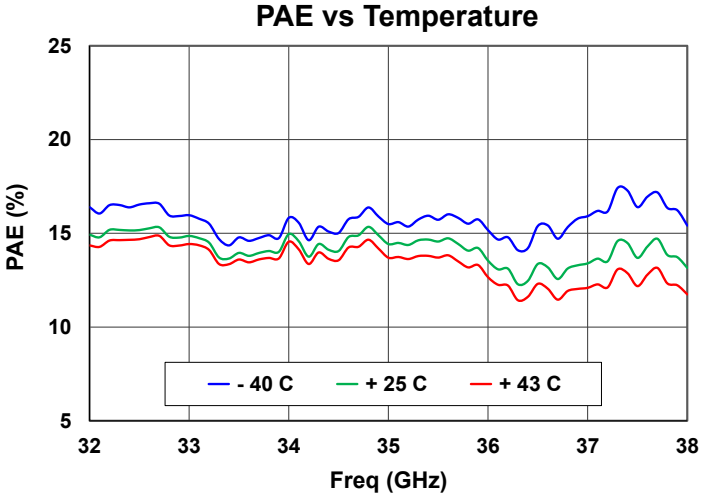
1 Test conditions unless otherwise noted: V_D = 24 V, T_{BASE} = 25 °C
2 DC Pulse mode, Pulse Width = 1 us, Duty Cycle = 50%

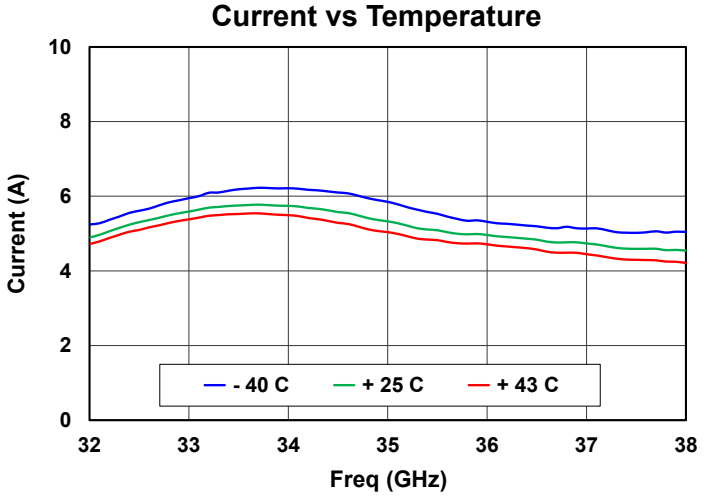
Typical Performance – Large Signal (CW)

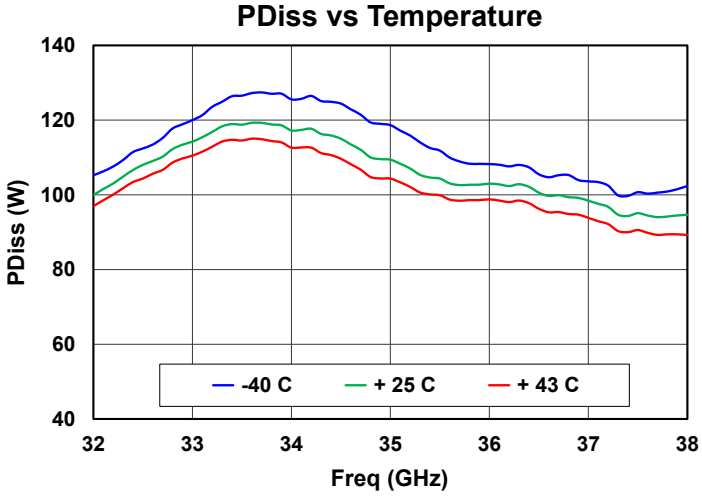
Test conditions unless otherwise noted: V_D = 24 V, Pin = 5 dBm





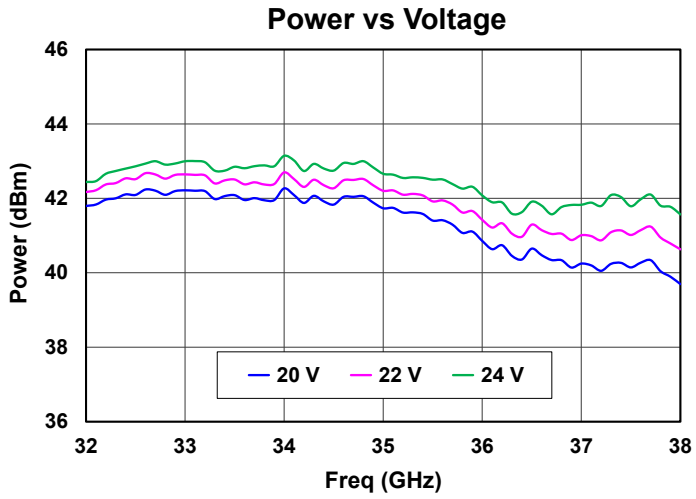


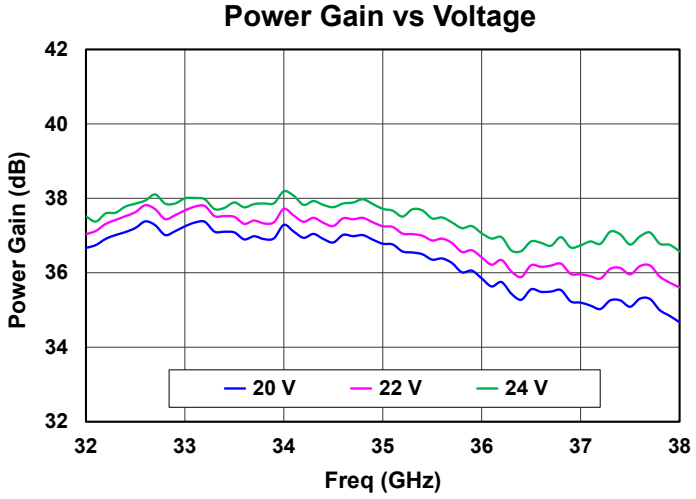


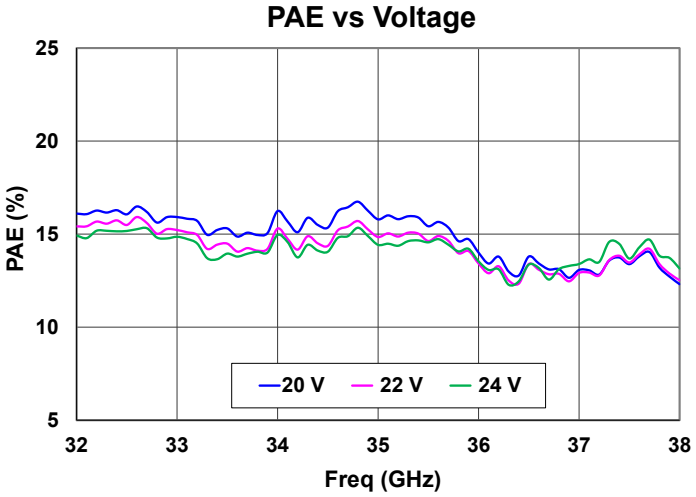


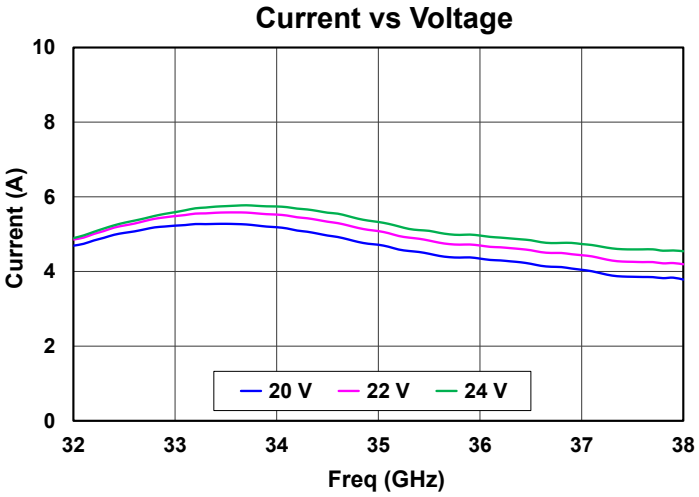
Typical Performance – Large Signal (CW)

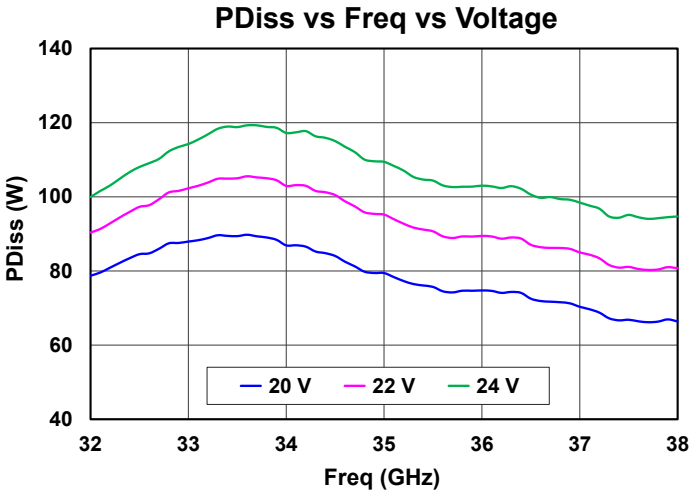
Test conditions unless otherwise noted: V_{DC} = 24 V, Pin = 5 dBm, T_{BASE} = 25 °C







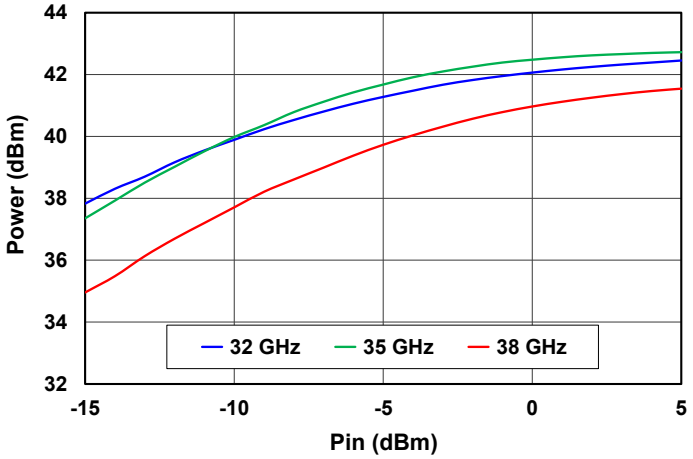




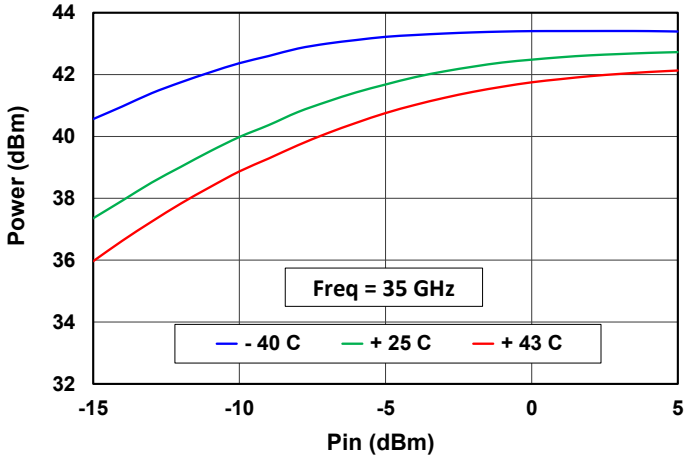
Typical Performance – Large Signal (CW)

Test conditions unless otherwise noted: V_{DC} = 24 V, T_{BASE} = 25 °C

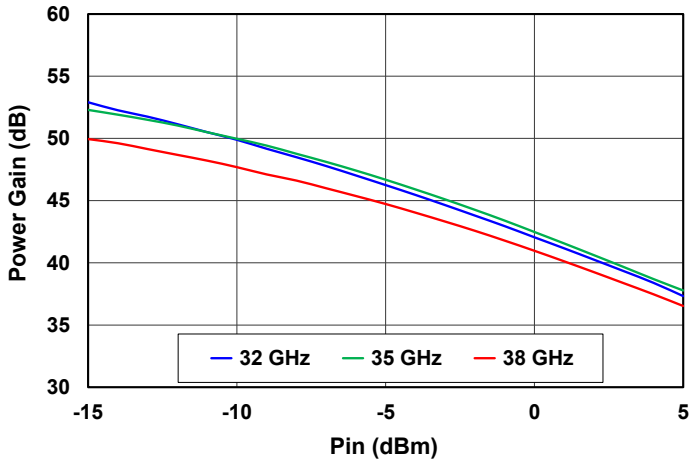
Power vs Pin vs Freq



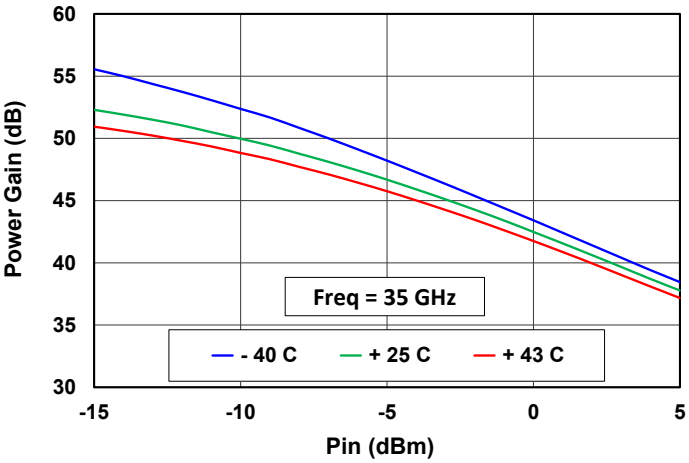
Power vs Pin vs Temp



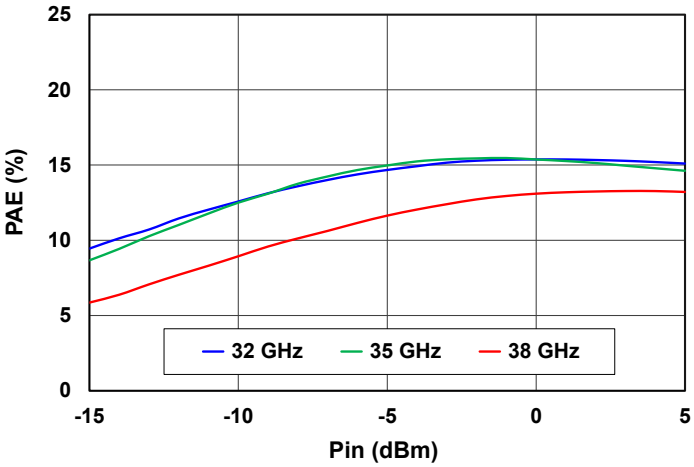
Power Gain vs Pin vs Freq



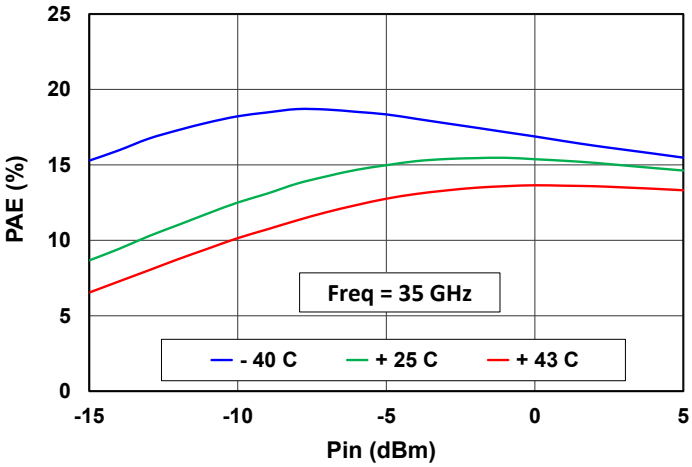
Power Gain vs Pin vs Temp



PAE vs Pin vs Freq

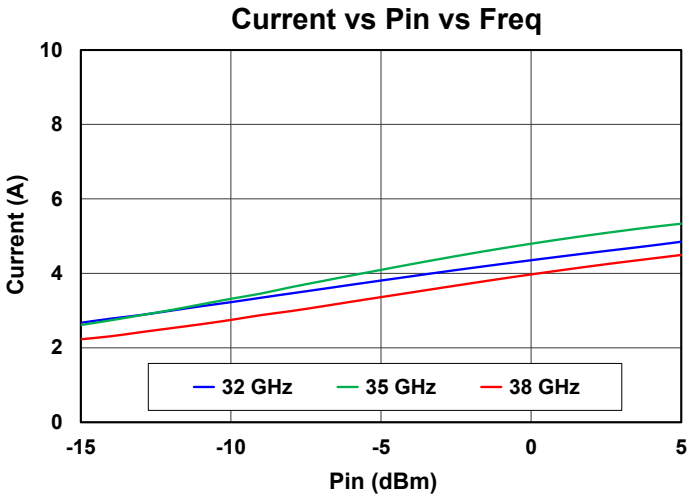


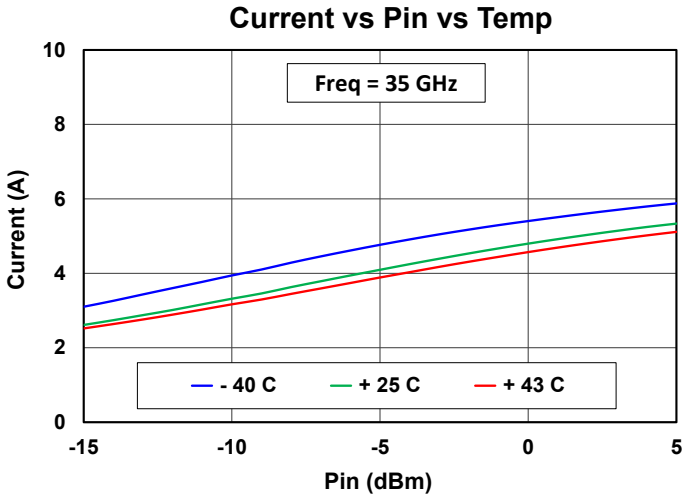
PAE vs Pin vs Temp

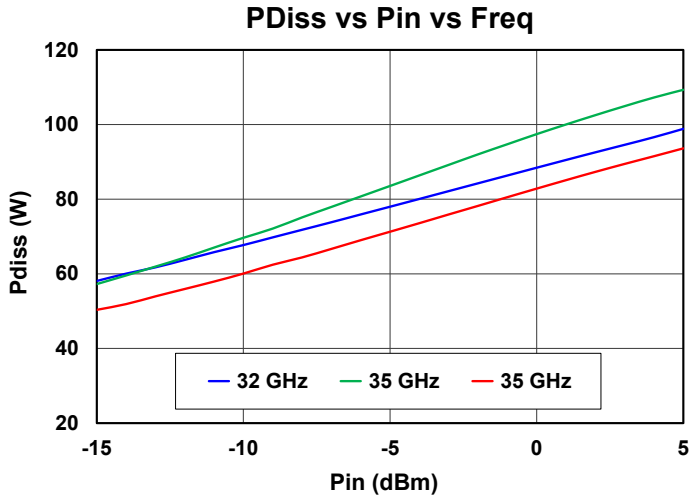


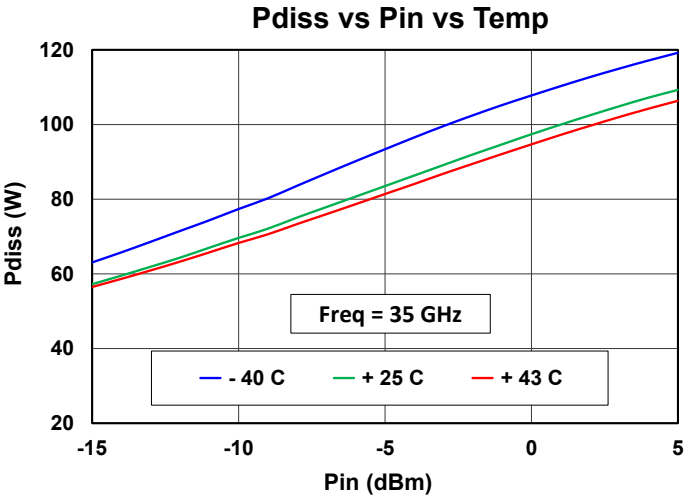
Typical Performance – Large Signal (CW)

Test conditions unless otherwise noted: V_{DC} = 24 V, T_{BASE} = 25 °C





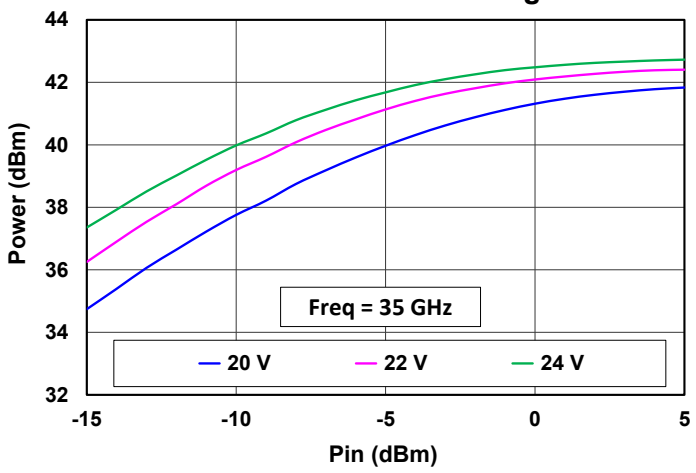




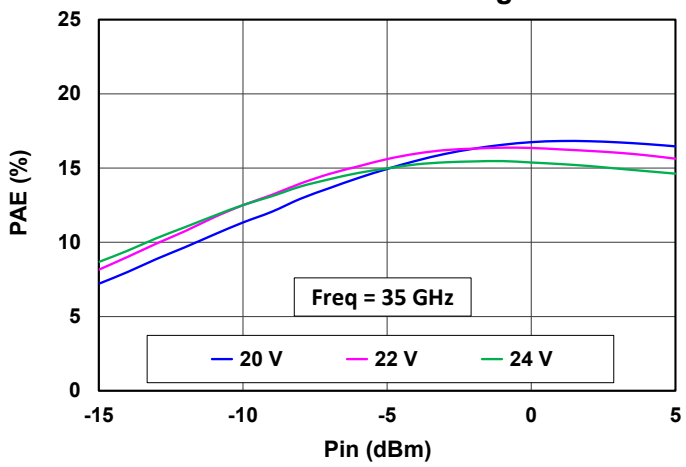
Typical Performance – Large Signal (CW)

Test conditions unless otherwise noted: T_{BASE} = 25 °C

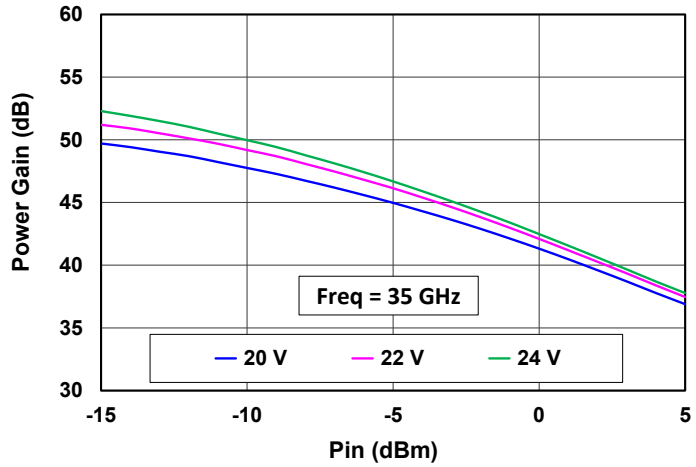
Power vs Pin vs Voltage



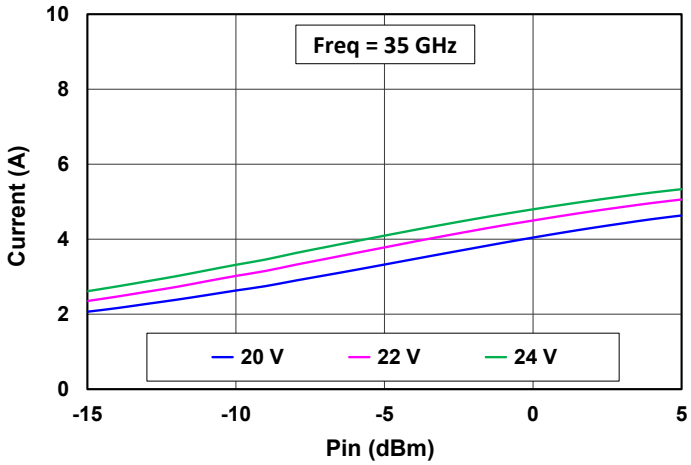
PAE vs Pin v Voltage



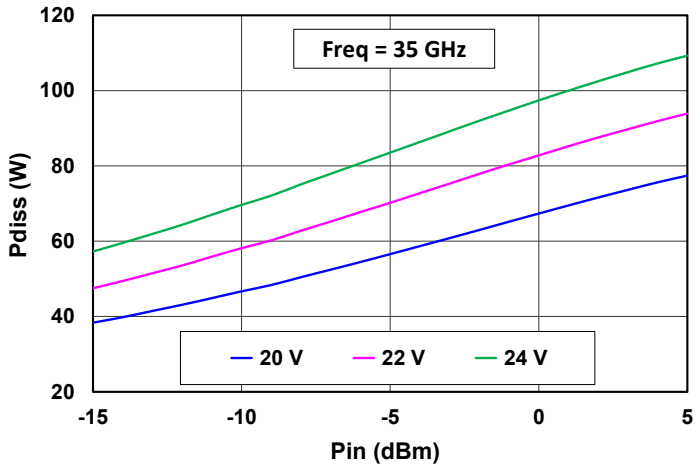
Power Gain vs Pin v Voltage



Current vs Pin v Voltage



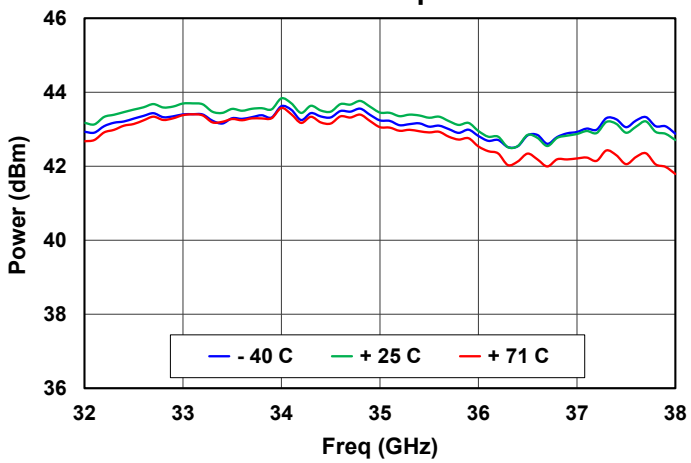
Pdiss vs Pin vs Voltage



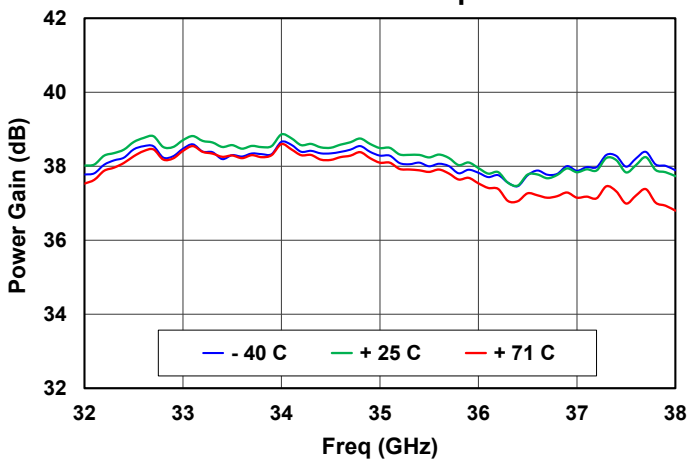
Typical Performance – Large Signal (Pulse)

Test conditions unless otherwise noted: V_{DC} = 24 V, T_{BASE} = 25 °C
DC pulse mode, Pin = 5 dBm, PW = 1 us, Duty Cycle = 50 %, plots data are peak values

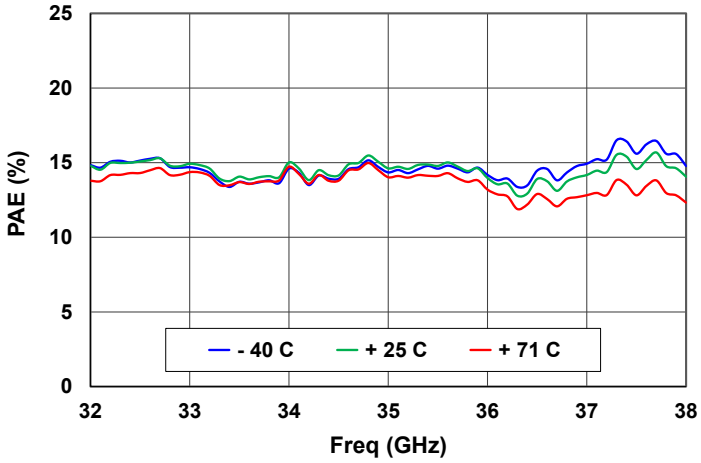
Power vs Temperature



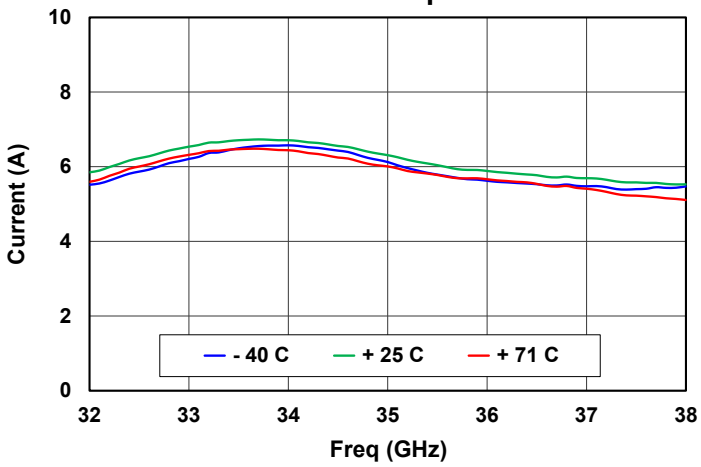
Power Gain vs Temperature



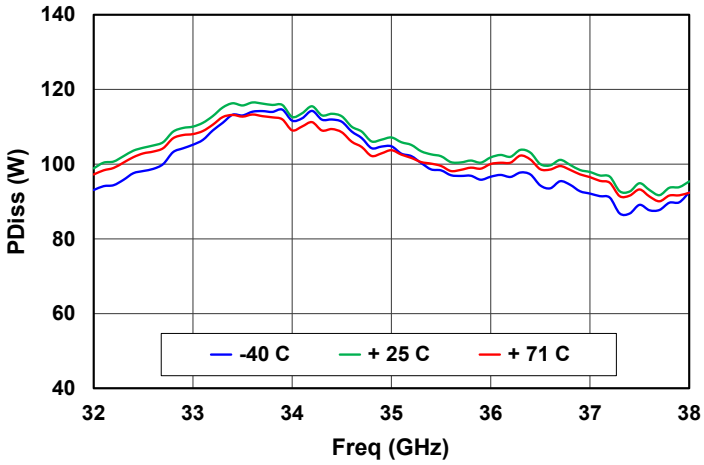
PAE vs Temperature



Current vs Temperature



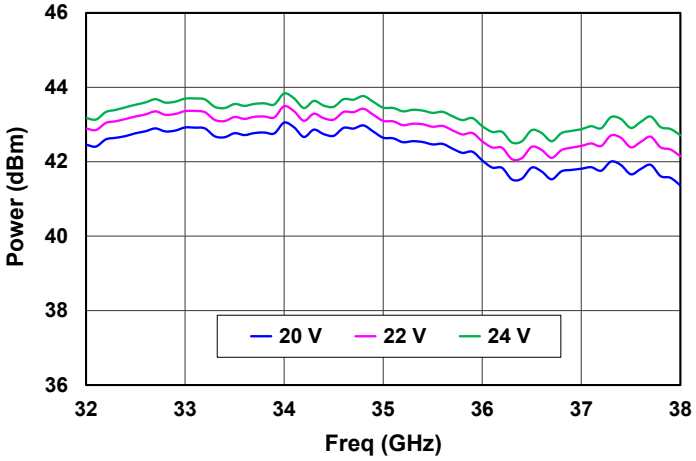
PDiss vs Freq vs Temperature



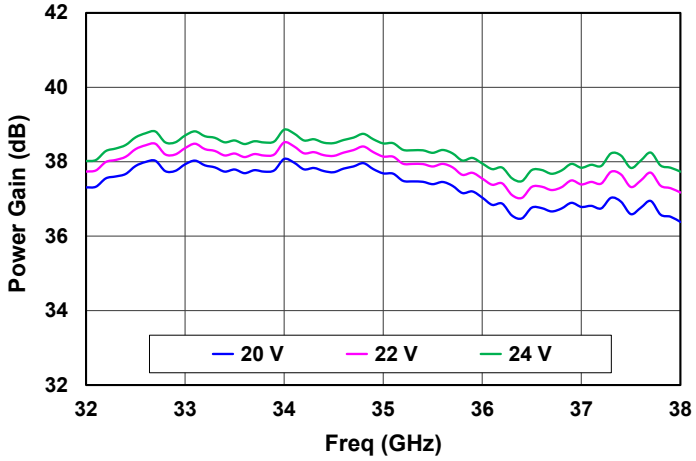
Typical Performance – Large Signal (Pulse)

Test conditions unless otherwise noted: V_{DC} = 24 V, T_{BASE} = 25 °C
DC pulse mode, Pin = 5 dBm, PW = 1 us, Duty Cycle = 50 %, plots data are peak values

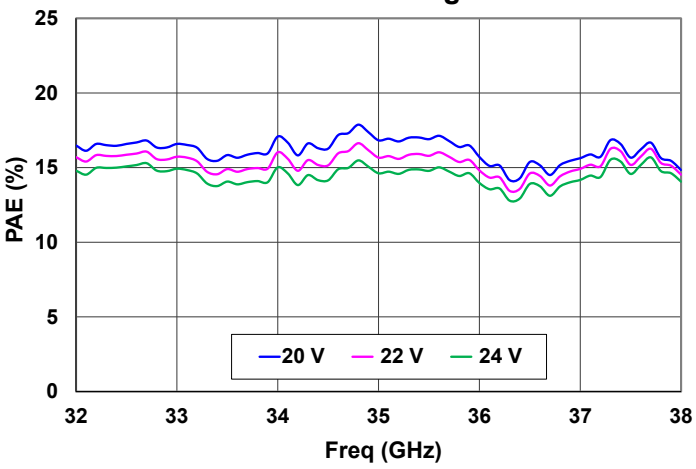
Power vs Voltage



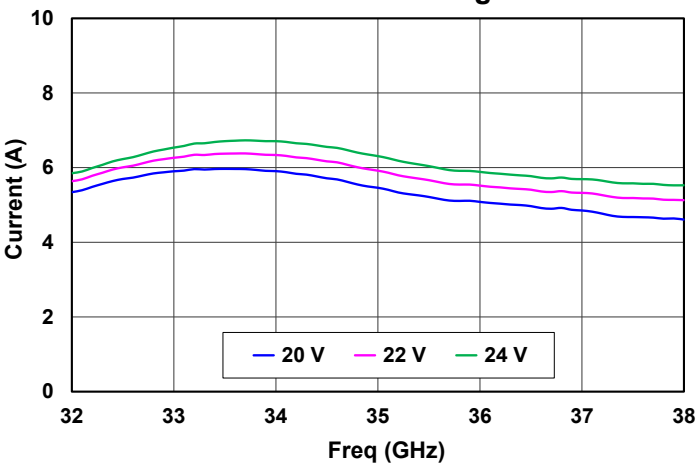
Power Gain vs Voltage



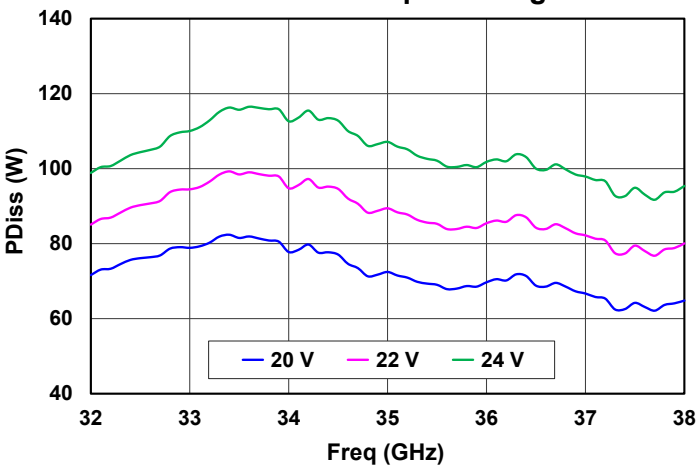
PAE vs Voltage



Current vs Voltage



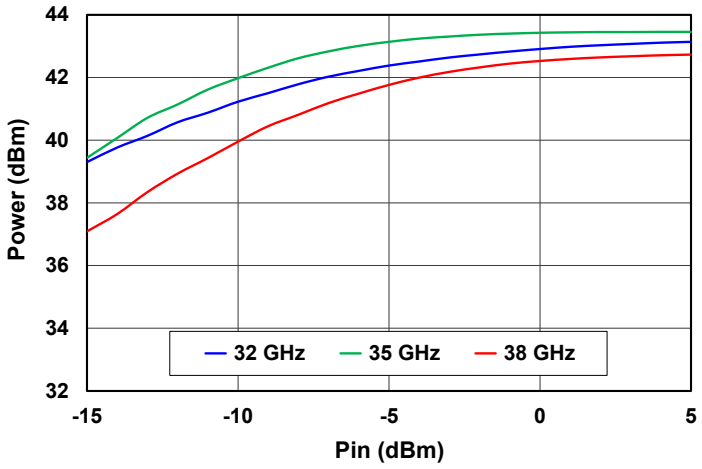
PDiss vs Freq vs Voltage



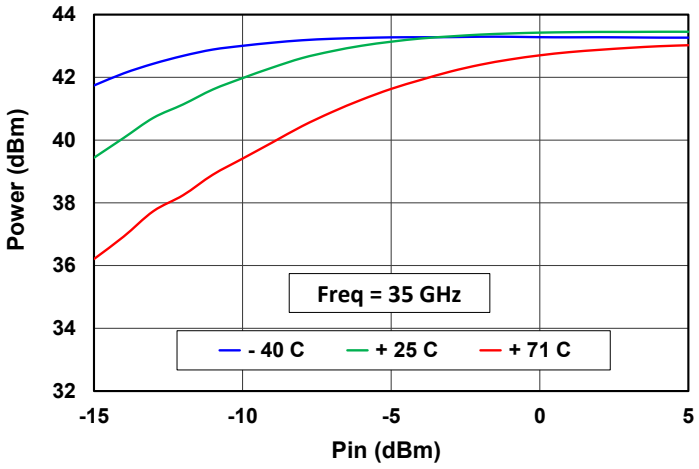
Typical Performance – Large Signal (Pulse)

Test conditions unless otherwise noted: V_{DC} = 24 V, T_{BASE} = 25 °C
DC pulse mode, PW = 1 us, Duty Cycle = 50 %, plots data are peak values

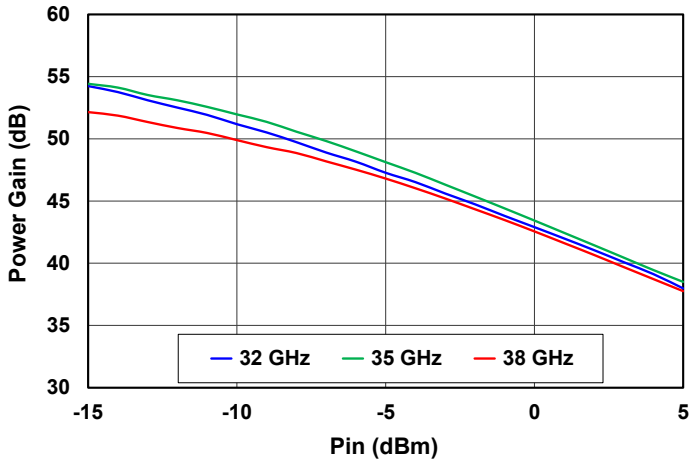
Power vs Pin vs Freq



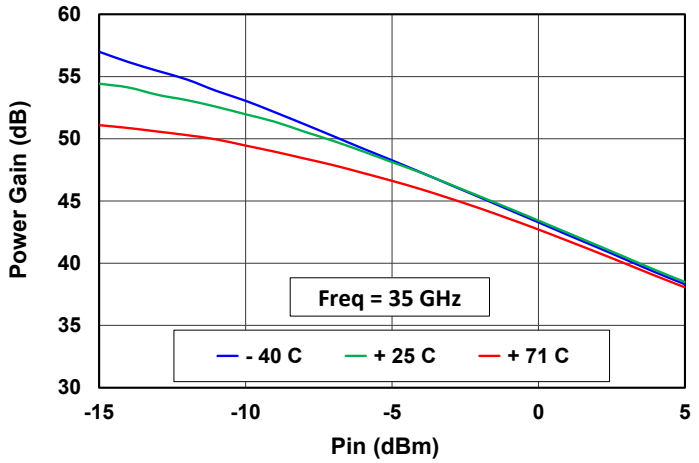
Power vs Pin vs Temp



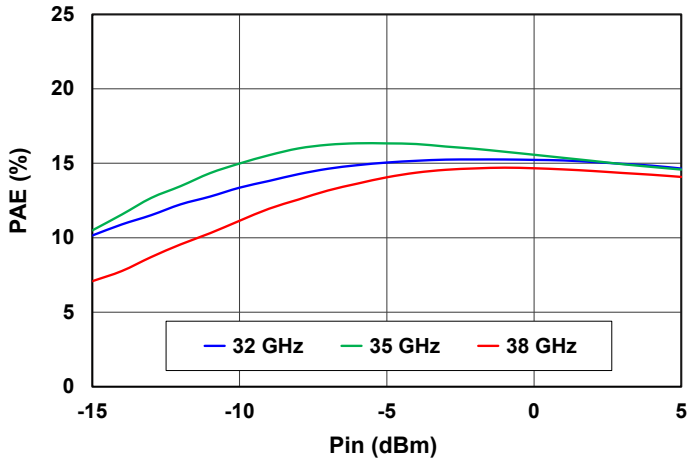
Power Gain vs Pin vs Freq



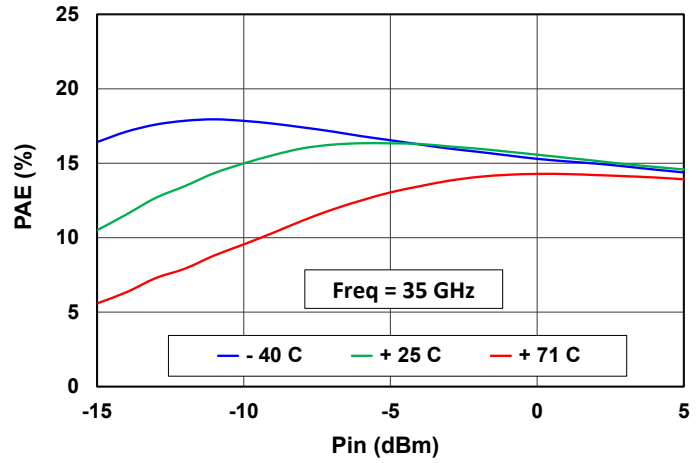
Power Gain vs Pin vs Temp



PAE vs Pin vs Freq



PAE vs Pin vs Temp



Typical Performance – Large Signal (Pulse)

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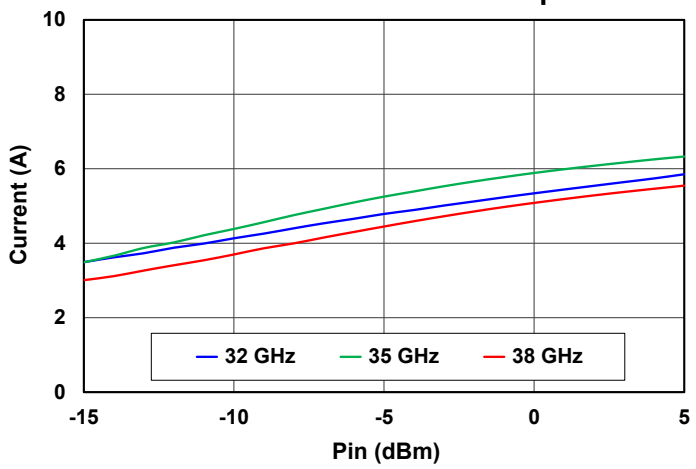
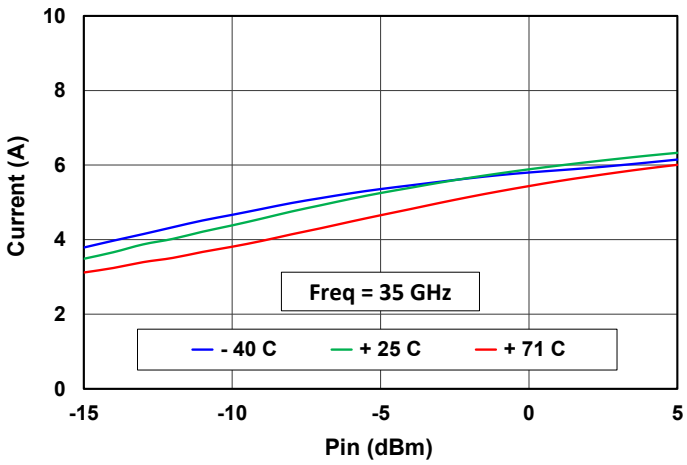
DC pulse mode, PW = 1 us, Duty Cycle = 50 %, plots data are peak values

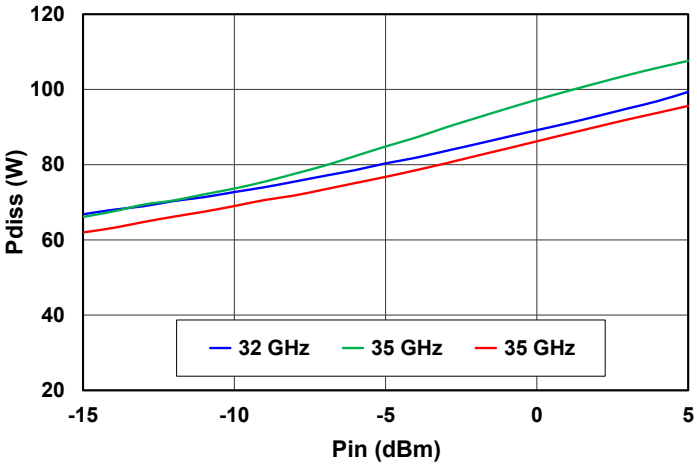
Current vs Pin vs Freq



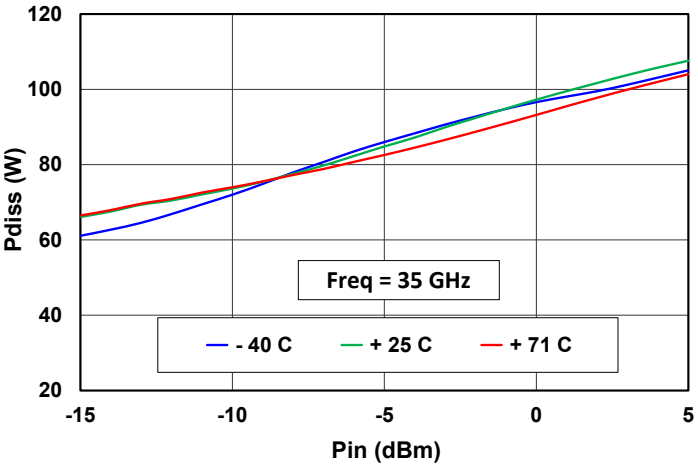
Current vs Pin vs Temp



PDiss vs Pin vs Freq



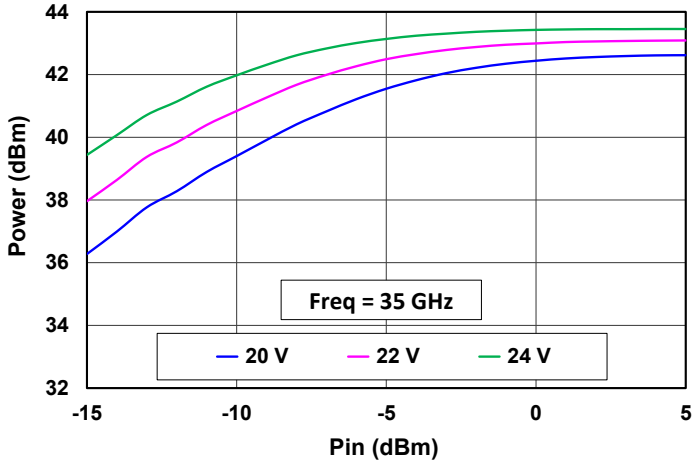
Pdiss vs Pin vs Temp



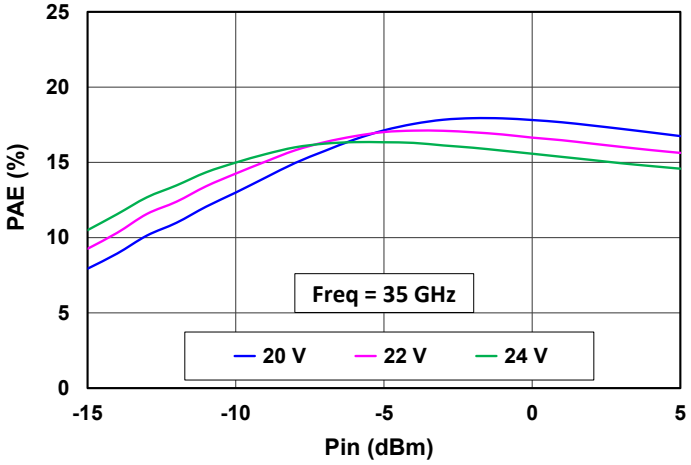
Typical Performance – Large Signal (Pulse)

Test conditions unless otherwise noted: V_{DC} = 24 V, T_{BASE} = 25 °C
DC pulse mode, PW = 1 us, Duty Cycle = 50 %, plots data are peak values

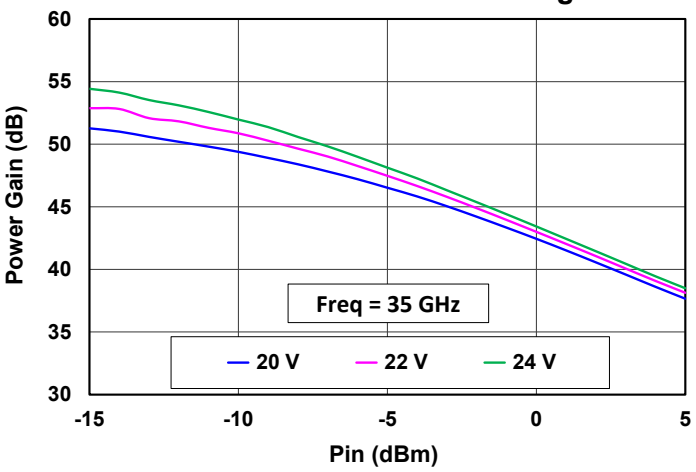
Power vs Pin vs Voltage



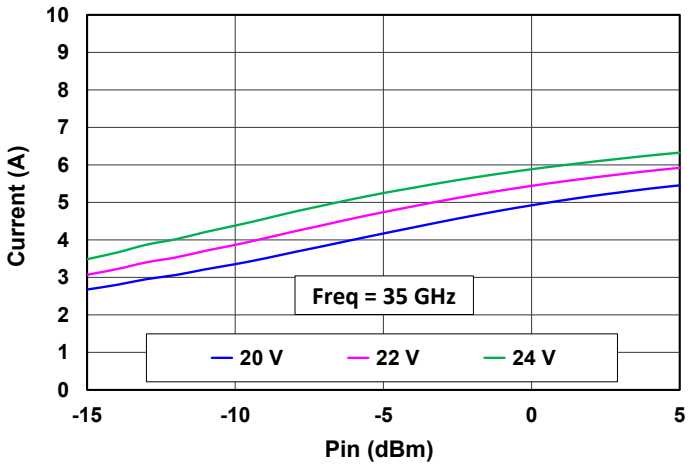
PAE vs Pin v Voltage



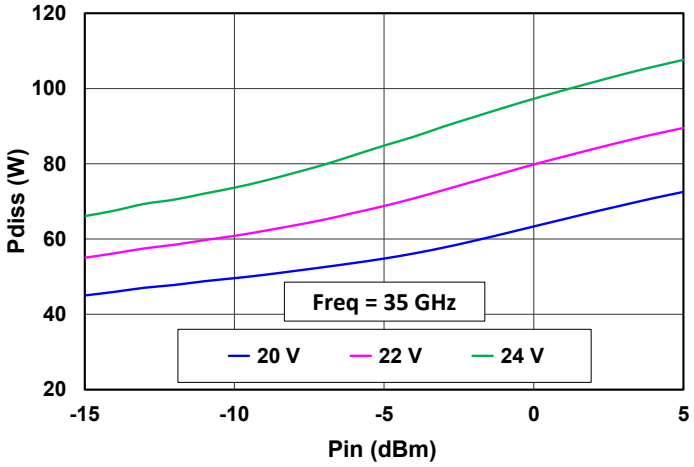
Power Gain vs Pin vs Voltage



Current vs Pin v Voltage



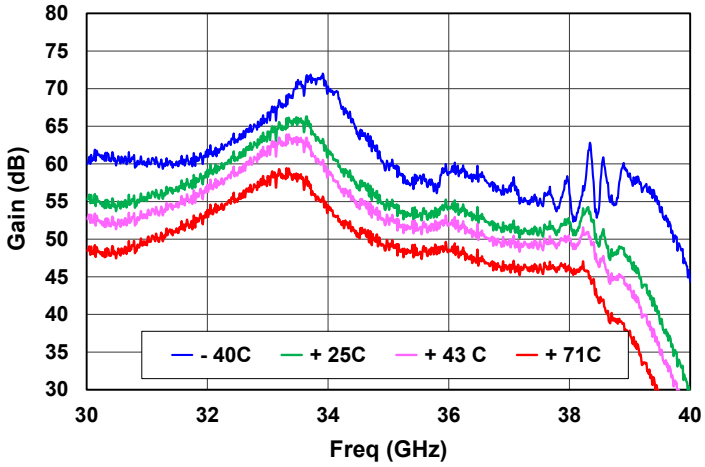
Pdiss vs Pin vs Voltage



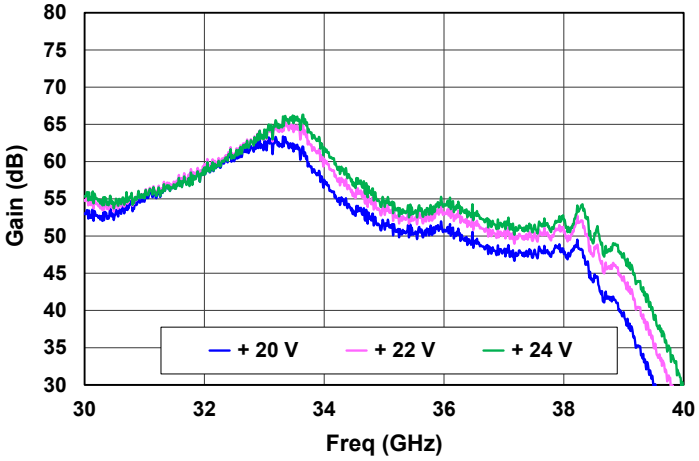
Typical Performance – Small Signal (CW)

Test conditions unless otherwise noted: V_D = 24 V, T_{BASE} = 25 °C

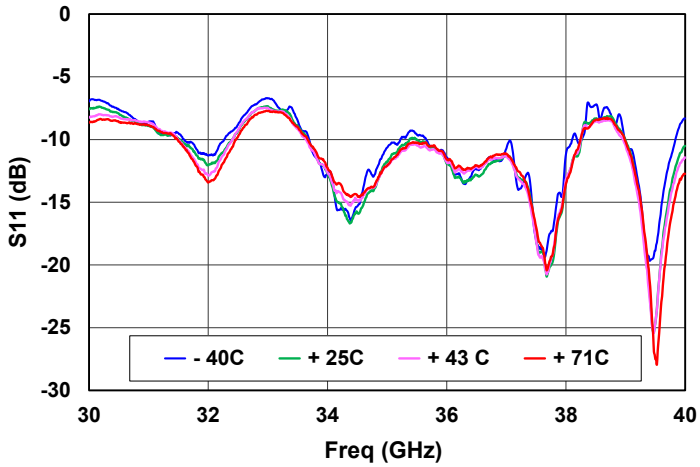
Small Signal Gain vs Temp



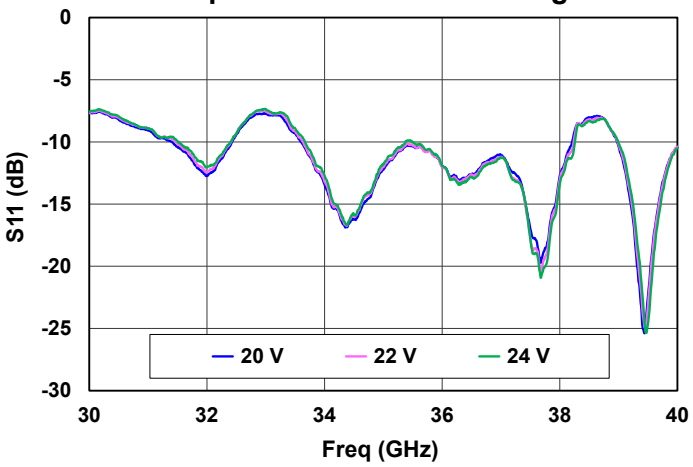
Small Signal Gain vs Voltage



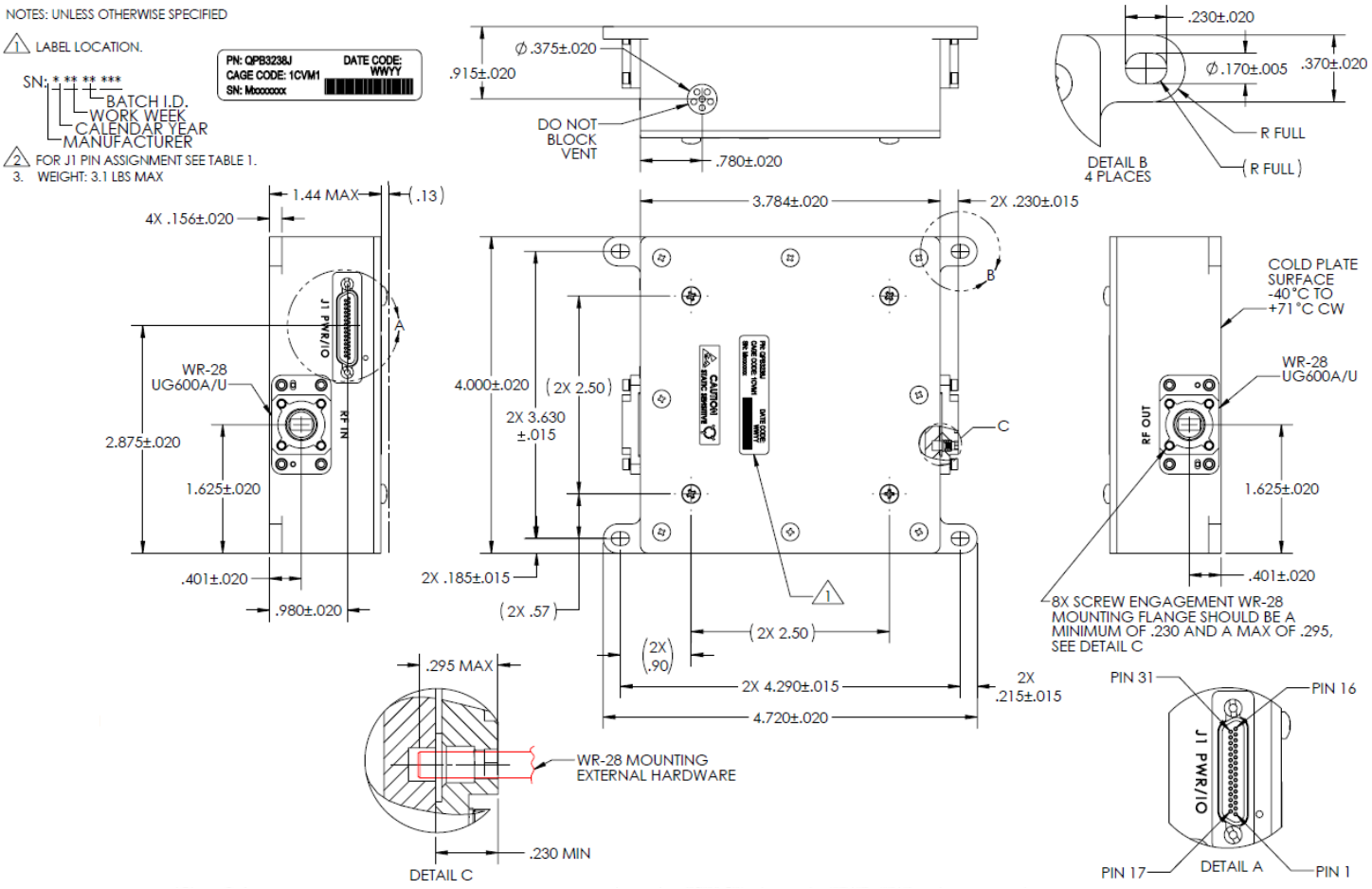
Input Return Loss vs Temp



Input Return Loss vs Voltage



Mechanical Information – Amplifier Outline Drawing



Dimensions are in INCHES

RF Ports and Connector Interface

Pin No.	Label	Description
RF Input	RF IN	WR28 Waveguide RF Input
RF Output	RF OUT	WR28 Waveguide RF Output
Power I/O	J1	MIL-DTL-83513, M83513/04-Exx D-Sub connector. Mates with M83513/03-Exx D-sub

J1 Connector Pin Labels and Function Descriptions

Pin No.	Labels	Descriptions
1	SDA	I2C bus used to program amplifier (Factory use only)
2	RESET	I2C bus used to program amplifier (Factory use only)
3	GND [1]	Ground
4, 5	ID_PA31, ID_PA32	Amplifier bias monitoring, voltage of these pins follows 0.5V/A times the current flowing through amplifiers PA31 and PA32, can be used for diagnostics / status of amplifier; otherwise leave open
6	ID_PA2	Amplifier bias monitoring, voltage of these pins follows 0.5V/A times the current flowing through amplifier PA2, can be used for diagnostics / status of amplifier; otherwise leave open
7	ID_PA1	Amplifier bias monitoring, voltage of these pins follows 5V/A times the current flowing through amplifier PA1, can be used for diagnostics / status of amplifier; otherwise leave open
8	GND	Ground
9	GATE_EN	5V CMOS logic command bit to set the amplifier stages to either low power or normal mode of operations. 0V puts the unit into a low-power state while 5V will allow normal operation, in the absence of an external logic signal (open), the amplifier will power on as normal operation with the application of supply voltage. This pin does not support fast DC pulsing
10	GND	Ground
11 - 13	V_{DC} or V_SUPPLY [1]	Prime power supply voltage for amplifier
14 - 16	N/C	No connections
17	SCL	I2C bus used to program amplifier (Factory use only)
18 - 22	N/C	No connections
23, 24	GND	Ground
25	DRAIN_EN	5V CMOS logic command bit to turn ON/OFF the drain voltage to each amplifier. 0V puts the unit into a low-power stage while 5V will allow normal operation, in the absence of an external logic signal (open), the amplifier will power on with the application of supply voltage. This pin supports fast DC pulsing
26	VTEMP [2]	Temperature monitor (-40C -> 3.2V, 25C -> 2.3V, 71C -> 1.7V)
27	GND	Ground
28, 29	V_SUPPLY [1]	Primary power supply voltage for amplifier
30, 31	N/C	No connections

1. All V_{DC} (V_SUPPLY) pins must to be connected to Prime Power Supply, all GND pins must to be connected to power supply ground.
2. Connects to Texas Instruments LMT87 temperature sensor. Refer to LMT87 datasheet for more details.

Handling Precautions

Caution!
ESD-Sensitive Device

RF VOLTAGE HAZARD: Contact with RF fields at the output connector can cause burns or electric shock. High levels of RF/Microwave energy may be present when the unit is operating.

HIGH DC CURRENT HAZARD: High levels of DC current are present when the unit is operating.

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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