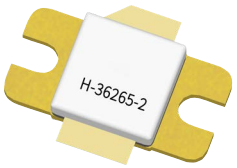
PTVA120251EA

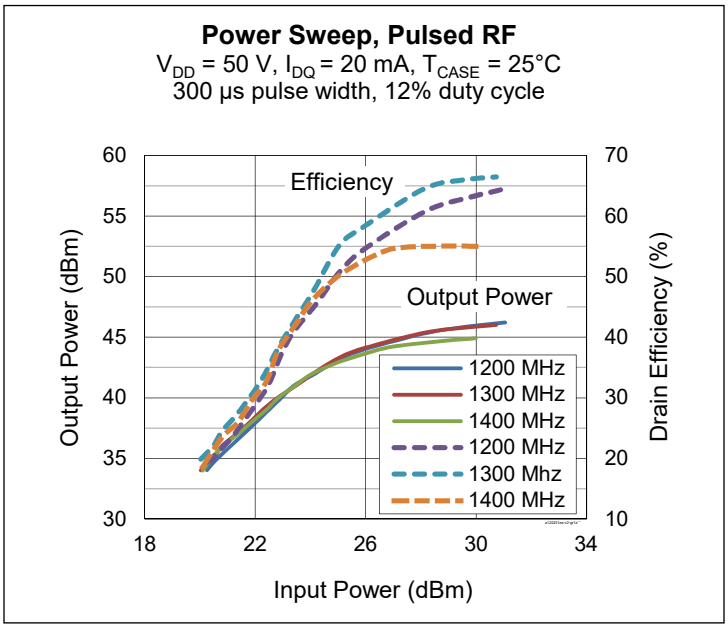
Thermally-Enhanced High Power RF LDMOS FET
25 W, 50 V, 500 – 1400 MHz

Description

The PTVA120251EA LDMOS FET is designed for use in power amplifier applications in the 500 MHz to 1400 MHz frequency band. Features include high gain and a thermally-enhanced package with bolt-down flange. Manufactured with an advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PTVA120251EA
Package H-36265-2



Features

- Unmatched input and output
- High gain and efficiency
- Integrated ESD protection
- ESD HBM Class 2, per ANSI/ESDA/JEDEC JS-001
- Low thermal resistance
- Excellent ruggedness
- Pb-free and RoHS-compliant
- Capable of withstanding a 10:1 load mismatch (all phase angles) at P_{OUT} = 25 W, under CW conditions

RF Characteristics

Typical RF Performance (not subject to production test, verified by design/characterization in the test fixture)
V_{DD} = 50 V, I_{DQ} = 0.02 A, Input signal (t_r = 5 ns, t_f = 6.5 ns), 300 µs pulse width, 12% duty cycle, class AB test

Mode of operation	f (MHz)	IRL (dB)	P_{1dB} Gain (dB)	P_{1dB} Eff (%)	P_{1dB} P_{OUT} (W)	P_{3dB} Gain (dB)	P_{3dB} Eff (%)	P_{3dB} P_{OUT} (W)	$P_{droop(pulse)}$ dB @ 30 W	t_r (ns)	t_f (ns)
Pulsed RF	1200	12	16.4	52	31	14.4	56	41	0.27	6	8
Pulsed RF	1300	11	16.0	56	32	14.0	59	40	0.20	6	8
Pulsed RF	1400	14	15.8	53	34	13.8	56	38	0.24	6	8

All published data at T_{CASE} = 25°C unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RoHS compliant

Rev. 06, 2023-07-10

RF Characteristics

Pulsed RF Performance (tested in the test fixture)

V_{DD} = 50 V, I_{DQ} = 0.02 A, P_{OUT} = 25 W, f_1 = 1200 MHz, f_2 = 1300 MHz, f_3 = 1400 M Hz, 300 µs pulse width, 10% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17	18	—	dB
Drain Efficiency	η_D	47	54	—	%
Return Loss	IRL	—	–13	–9	dB

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_{DS} = 10 mA	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	V_{DS} = 50 V, V_{GS} = 0 V	I_{DSS}	—	—	1.0	µA
	V_{DS} = 105 V, V_{GS} = 0 V	I_{DSS}	—	—	10.0	µA
On-State Resistance	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	1.4	—	Ω
Operating Gate Voltage	V_{DS} = 50 V, I_{DQ} = 150 mA	V_{GS}	3	3.35	4	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1.0	µA

Maximum Ratings

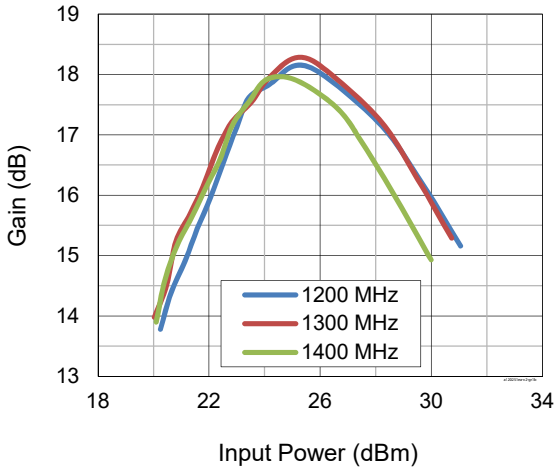
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	105	V
Gate-Source Voltage	V_{GS}	–6 to +12	V
Operating Voltage	V_{DD}	0 to +55	V
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, V_{DD} = 50 V, 25 W CW)	$R_{\theta JC}$	3.7	°C/W

Ordering Information

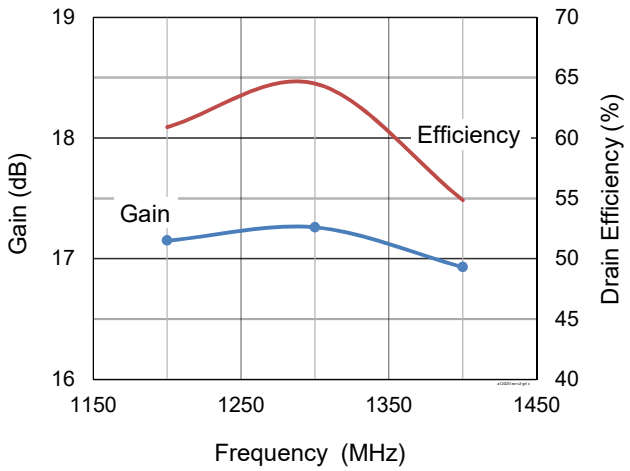
Type and Version	Order Code	Package and Description	Shipping
PTVA120251EA V2 R0	PTVA120251EA-V2-R0	H-36265-2, bolt-down	Tape & Reel, 50 pcs
PTVA120251EA V2 R250	PTVA120251EA-V2-R250	H-36265-2, bolt-down	Tape & Reel, 250 pcs

Typical RF Performance (data taken in production test fixture)

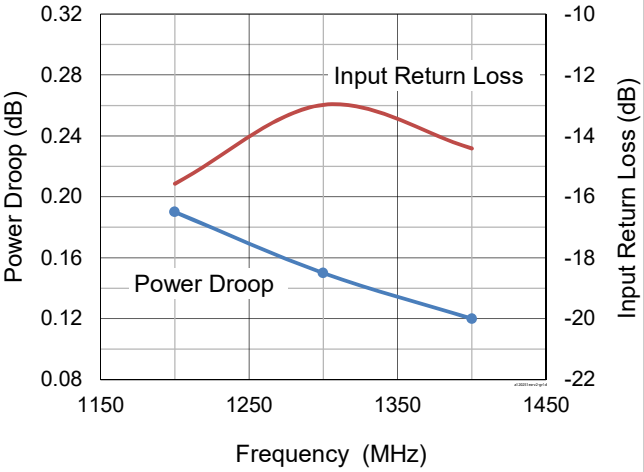
Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA, T_{CASE} = 25°C
300 µs pulse width, 12% duty cycle



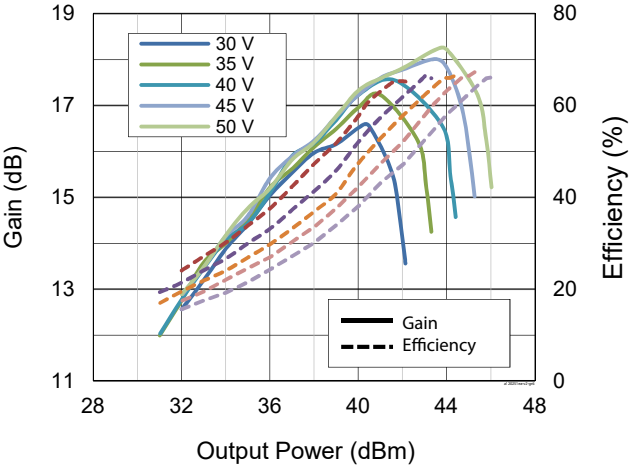
Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA, P_{OUT} = 25 W
300 µs pulse width, 12% duty cycle



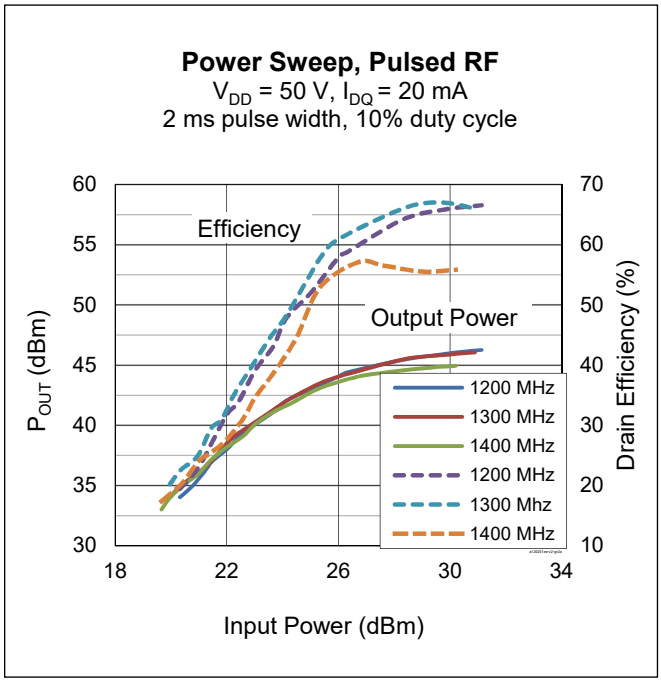
Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA at P1dB
300 µs pulse width, 12% duty cycle

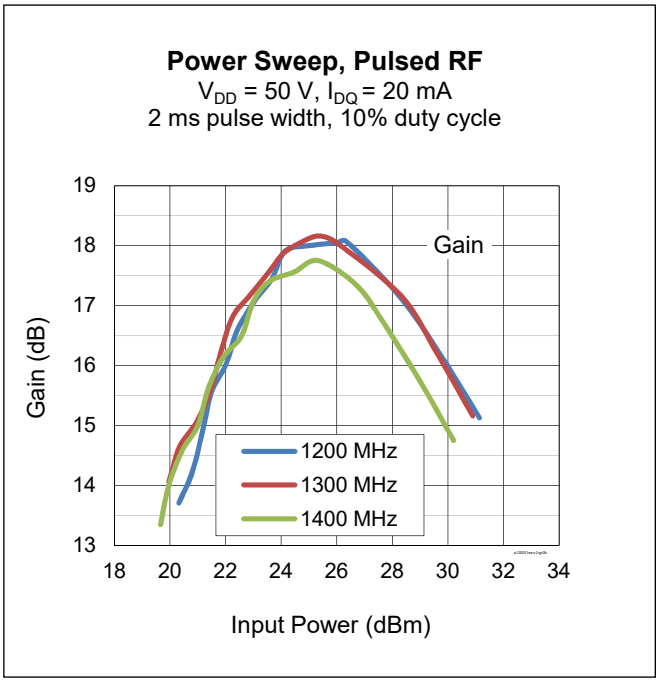


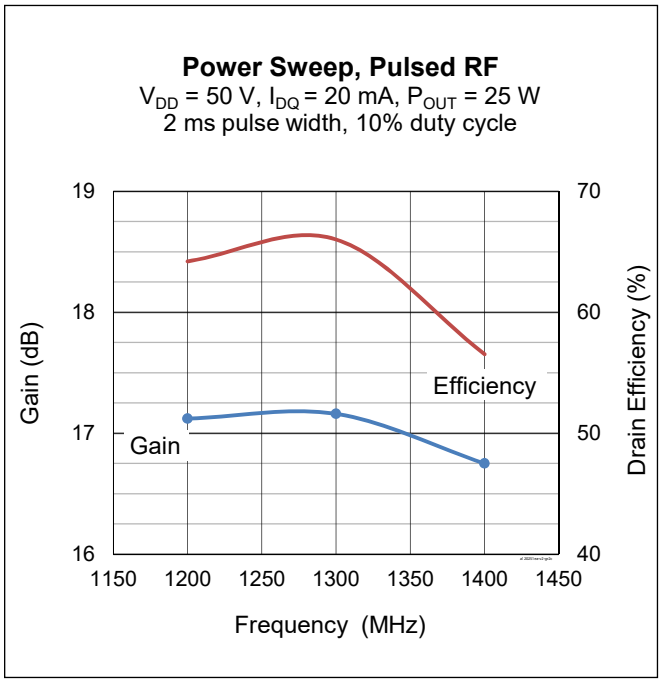
Pulsed CW Performance at Selected V_{DD}
I_{DQ} = 20 mA, f = 1300 MHz
300 µs, 12% duty cycle

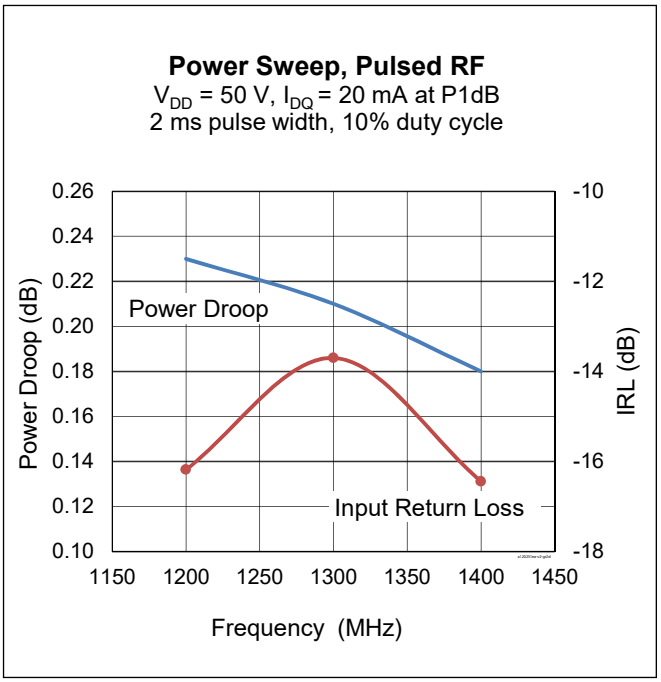


Typical RF Performance (cont.)



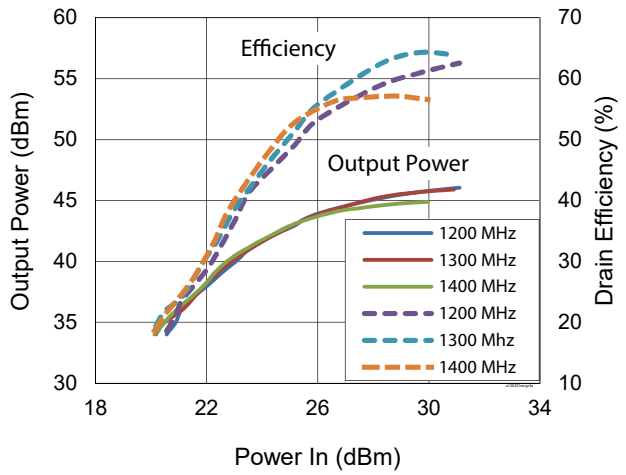




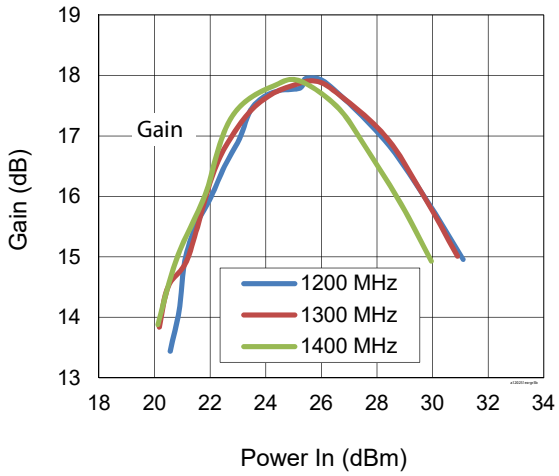


Typical RF Performance (cont.)

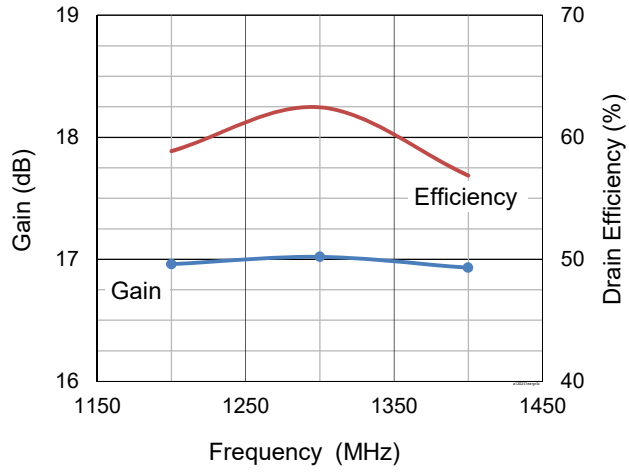
Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA
128 µs pulse width, 10% duty cycle



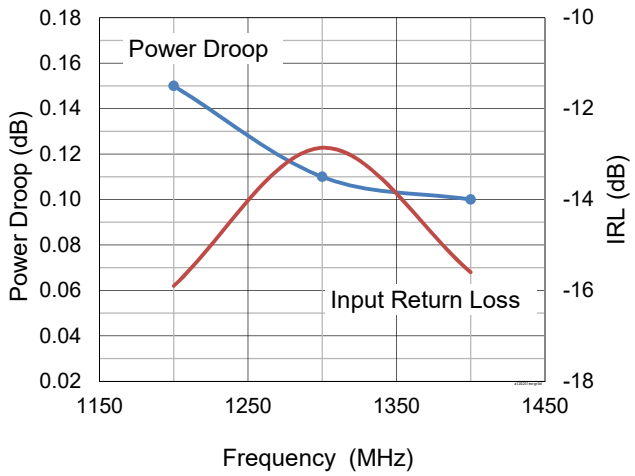
Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA
128 µs pulse width, 10% duty cycle



Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA, P_{OUT} = 25 W
128 µs pulse width, 10% duty cycle

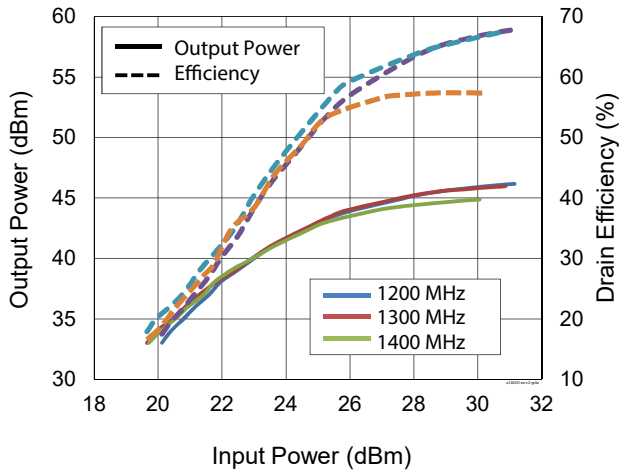


Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA at P1dB
128 µs pulse width, 10% duty cycle

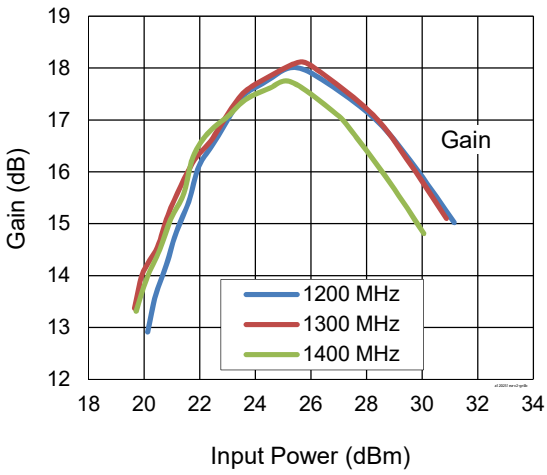


Typical RF Performance (cont.)

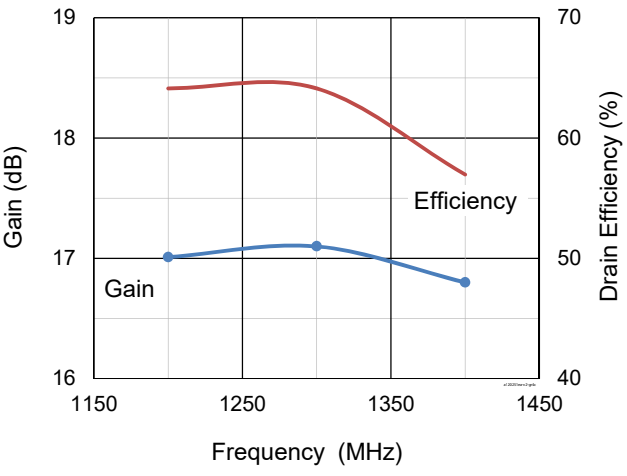
Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA
16 ms pulse width, 50% duty cycle



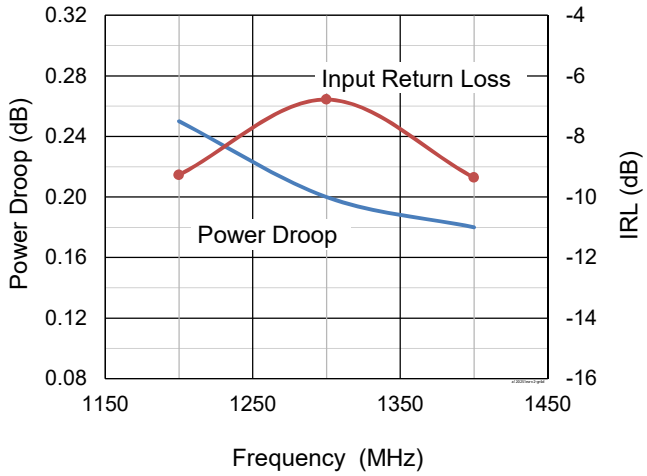
Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA, T_{CASE} = 25°C
16 ms pulse width, 50% duty cycle



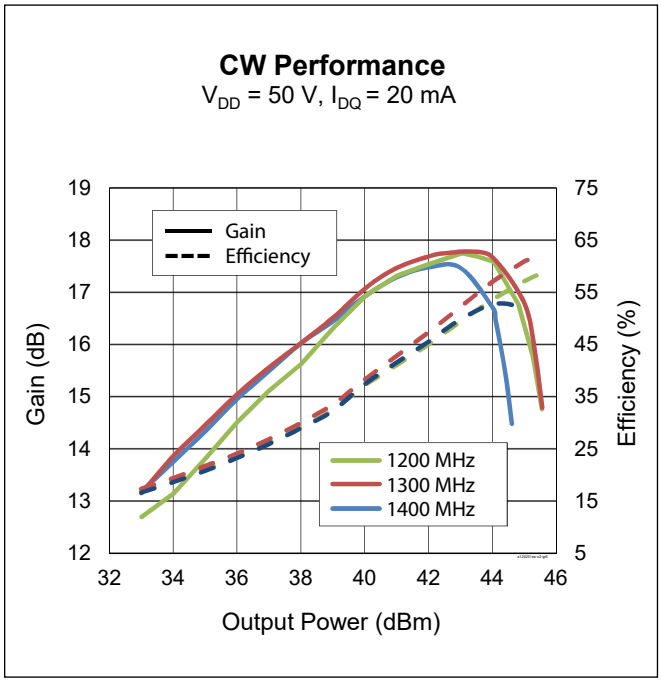
Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA, P_{OUT} = 25 W
16 ms pulse width, 50% duty cycle

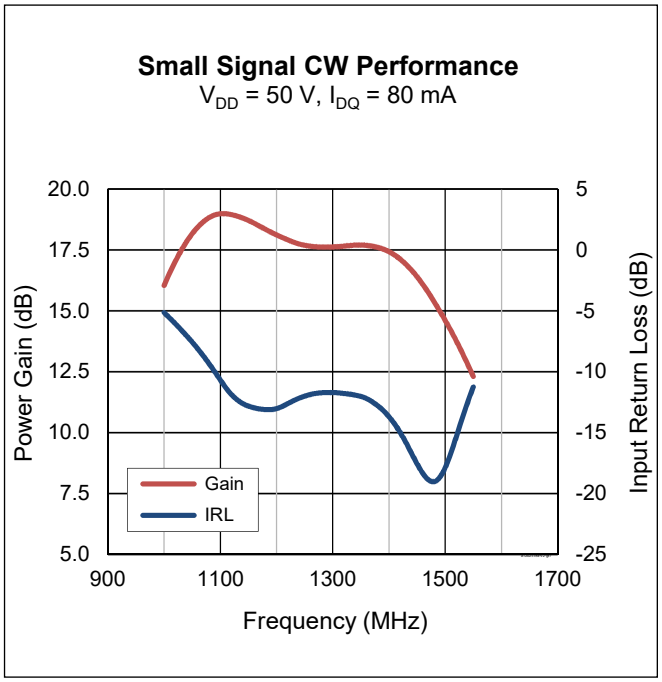


Power Sweep, Pulsed RF
V_{DD} = 50 V, I_{DQ} = 20 mA at P1dB
16 ms pulse width, 50% duty cycle



Typical RF Performance (tested with LTN/PTVA120251EA E4 test fixture, 960 MHz – 1215 MHz)

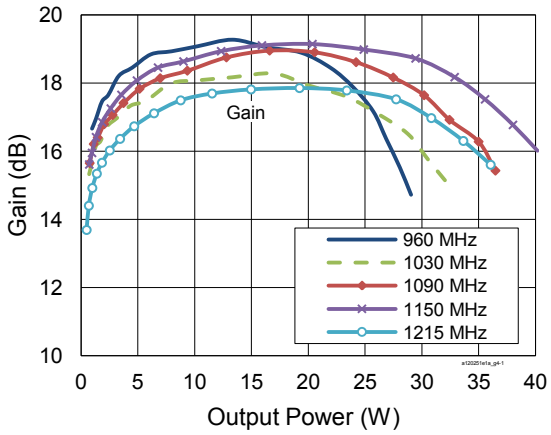




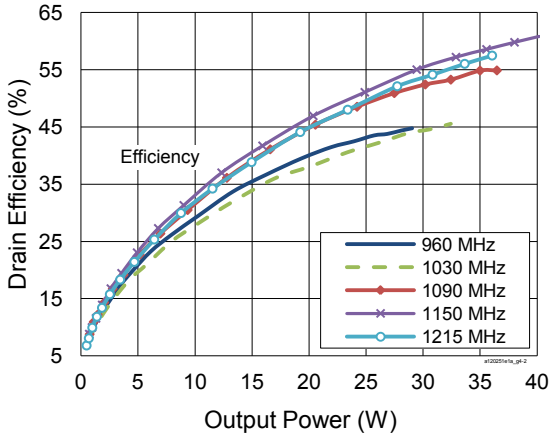
See next page for further performance characterization

Typical RF Performance (cont.) (tested with LTN/PTVA120251EA E4 test fixture, 960 MHz – 1215 MHz)

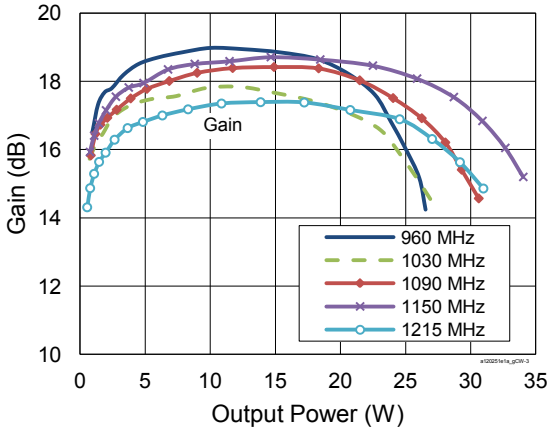
Power Sweep, Pulsed RF
I_{DQ} = 20 mA, V_{DD} = 50 V, T_{CASE} = 25°C,
128 µs pulse width, 10% duty cycle



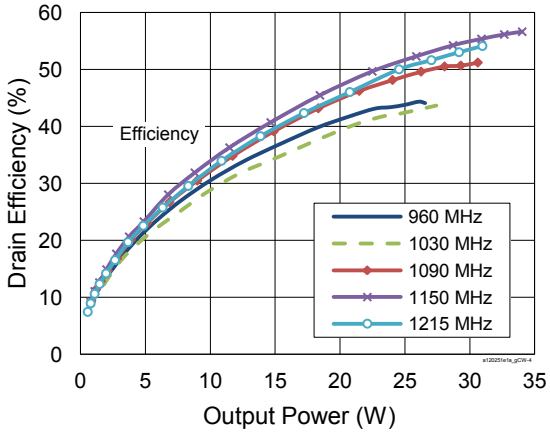
Power Sweep, Pulsed RF
I_{DQ} = 20 mA, V_{DD} = 50 V, T_{CASE} = 25°C,
128 µs pulse width, 10% duty cycle



CW Performance
V_{DD} = 50 V, I_{DQ} = 20 mA

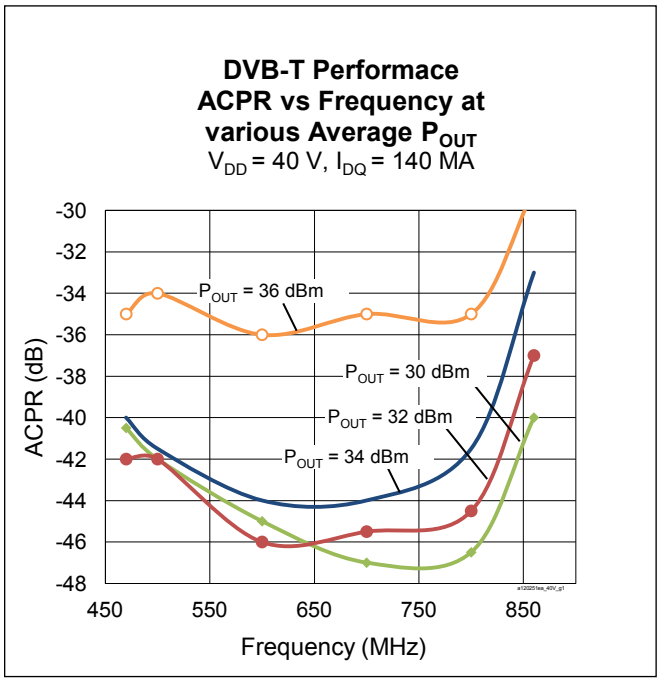


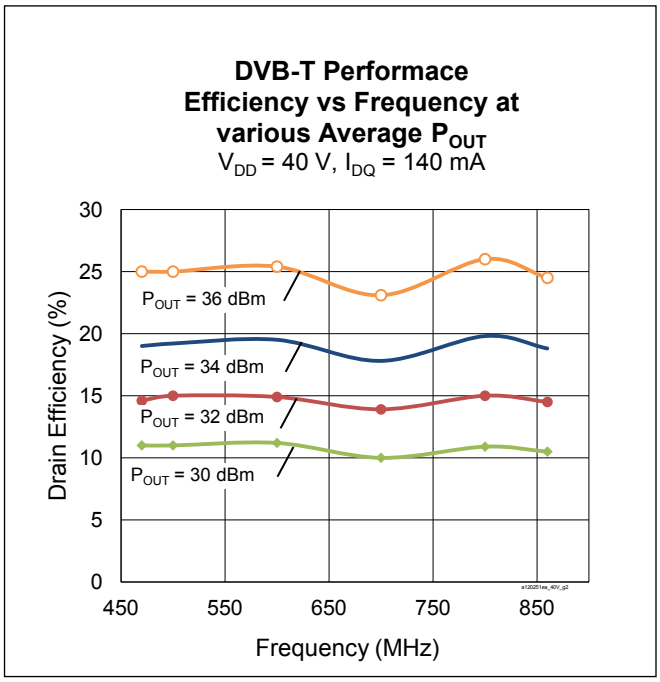
CW Performance
V_{DD} = 50 V, I_{DQ} = 20 mA

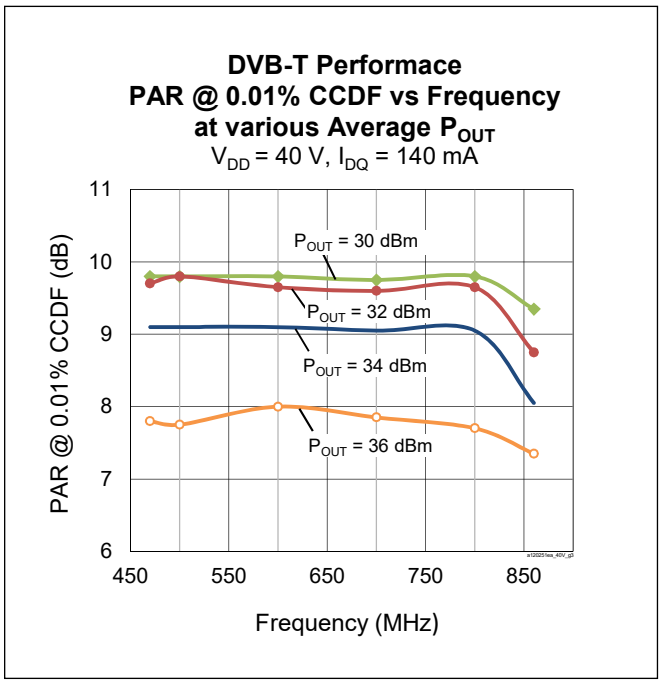


Typical RF Performance (cont.) (tested with LTN/PTVA120251EA E3 test fixture, 470 MHz – 860 MHz)

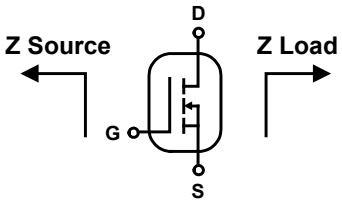
Test Conditions: DVB-T 8 MHz unclipped input signal, output PAR measured at 0.01% point of CCDF curve, ACPR measured over 200 KHz BW at 4.1 MHz offset from carrier center frequency.







Broadband Circuit Impedance



Freq [MHz]	Z Source Ω		Z Load Ω	
	R	jX	R	jX
1200	4.31	–0.22	6.46	7.63
1300	5.06	–0.79	6.29	7.27
1400	4.94	–1.96	6.14	8.72

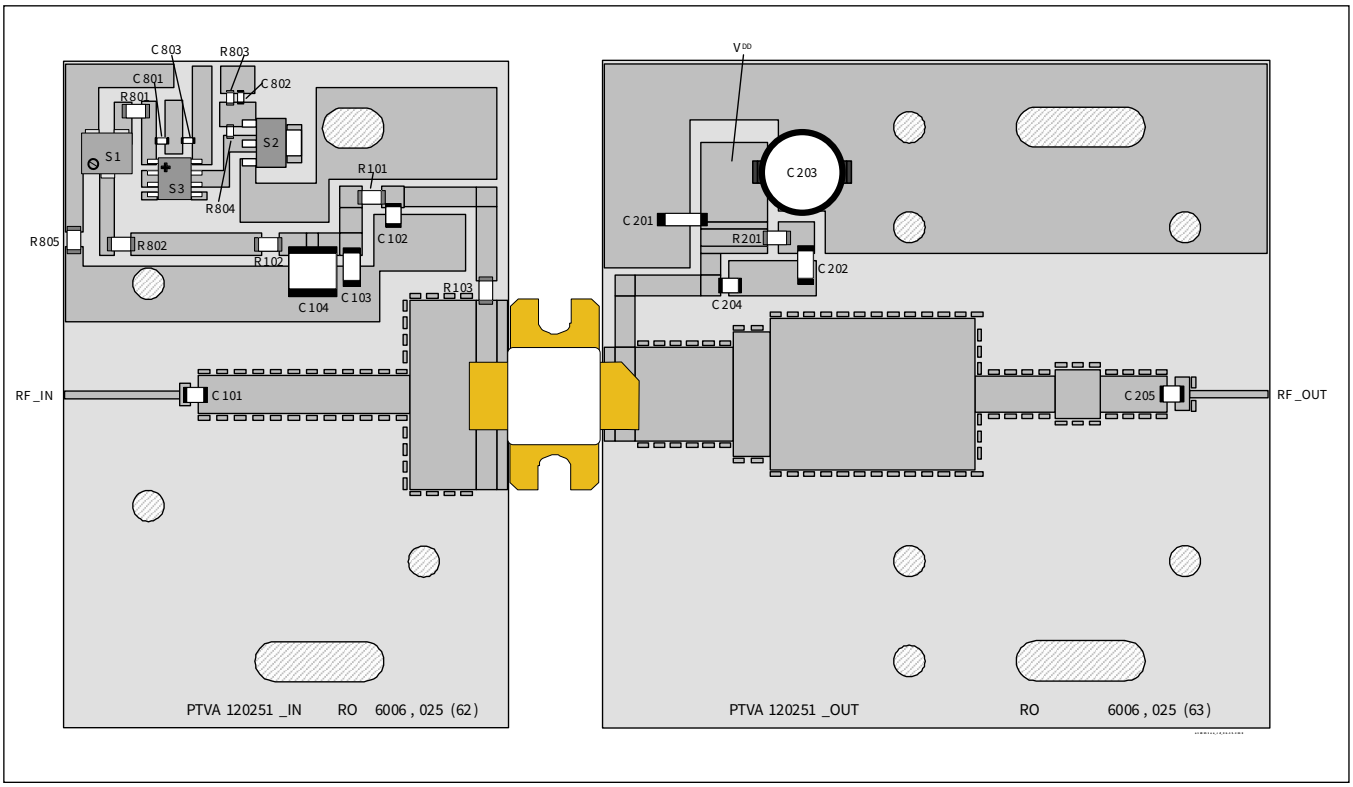
See next page for reference circuit information

Reference Circuits

DUT	Test Fixture Part No.	PCB	Frequency (MHz)
PTVA120251EA	LTN/PTVA120251EA V2 *	Rogers 6006, 0.635 mm [0.025”] thick, 2 oz. copper, ε_r = 6.15	1200 – 1400
PTVA120251EA	LTN/PTVA120251EA E2 †	Rogers 3010, 0.635 mm [0.025”] thick, 2 oz. copper, ε_r = 10.2	1200 – 1400
PTVA120251EA	LTN/PTVA120251EA E3 †	Rogers 4350B, 0.762mm [.030"] thick, 2 oz. copper, ε_r = 3.48	470 – 860
PTVA120251EA	LTN/PTVA120251EA E4 †	Rogers 3010, 0.635 mm [0.025”] thick, 2 oz. copper, ε_r = 10.2	960 – 1215

* See pages 11 – 12 for assembly information.

† Gerber files for this reference circuit are available on request.



Assembly diagram for reference circuit LTN/PTVA120251EA V2, 1200 MHz to 1400 MHz (not to scale)

Reference Circuit (cont.)

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C102	Capacitor, 56 pF	ATC	ATC100B560JW500XB
C103	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C104	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C801, C802, C803	Capacitor, 1000 pF	Kemet	C1812C560KHGACTU
R101	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R102	Resistor, 0 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R103, R801	Resistor, 10 ohms	Panasonic – ECG	ERJ-3GEYJ100V
R802, R805	Resistor, 2K ohms	Panasonic Electronic Components	ERJ-8GEYJ202V
R803	Chip resistor, 1.3K ohms	Panasonic Electronic Components	ERJ-3GEYJ132V
R804	Chip resistor, 1.2K ohms	Panasonic Electronic Components	ERJ-3GEYJ122V
S1	Potentiometer 2K ohms	Bourns Inc.	3224W-1-202E
S2	Voltage regulator	Fairchild Semiconductor	LM7805
S3	Transistor	Fairchild Semiconductor	BCP56
Output			
C201	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C202	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C203	Capacitor, 100 µF	Cornell Dubilier Electronics	SK101M100ST
C204, C205	Capacitor, 56 pF	ATC	ATC100B560JW500XB
C206	Capacitor, 6800 µF	Panasonic Electronic Components	ECO-S2AP682EA
R101	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8GEYJ5R6V

Package Outline Specifications

Package H-36265-2

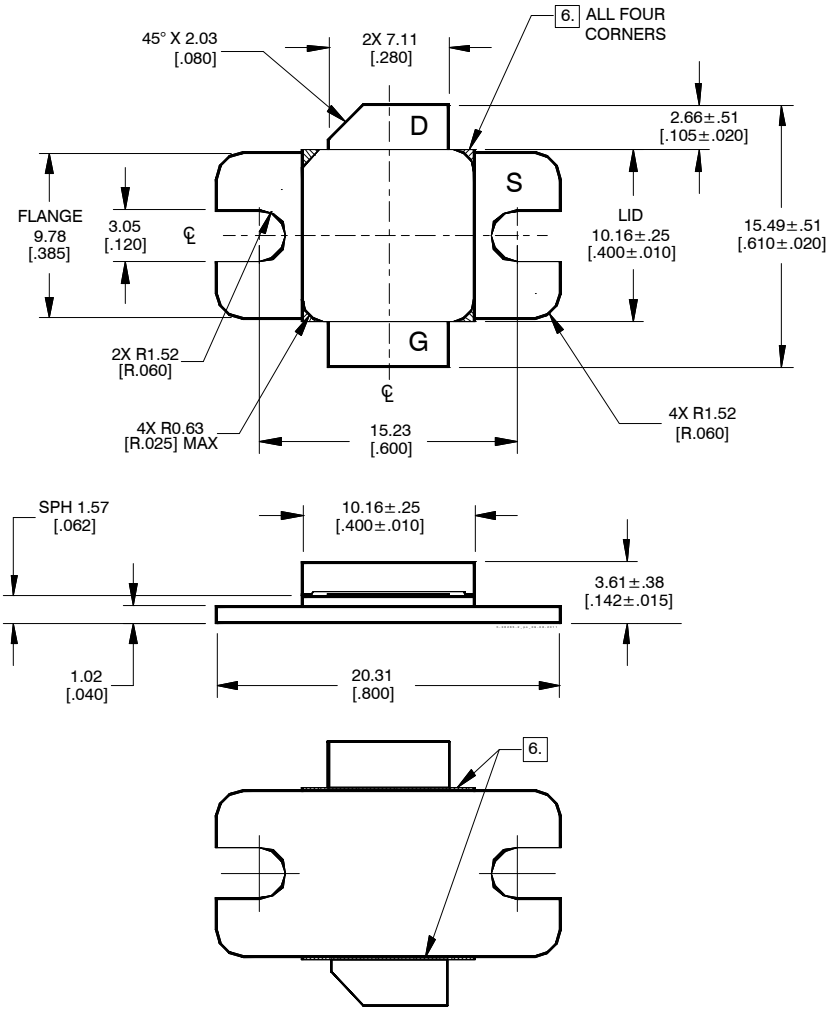


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ±0.127 [0.005] unless specified otherwise.
4. Pins: D – drain; G – gate; S – source
5. Lead thickness: 0.10 + 0.051/–0.025 mm [0.004 + 0.002/–0.001 inch].
6. Exposed metal plane on top and bottom of ceramic insulator.
7. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Notes & Disclaimer

These materials are provided in connection with MACOM’s products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

MACOM:

PTVA120251EA-V2-R250 PTVA120251EA-V2-R0