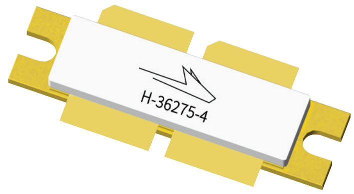
PTVA127002EV

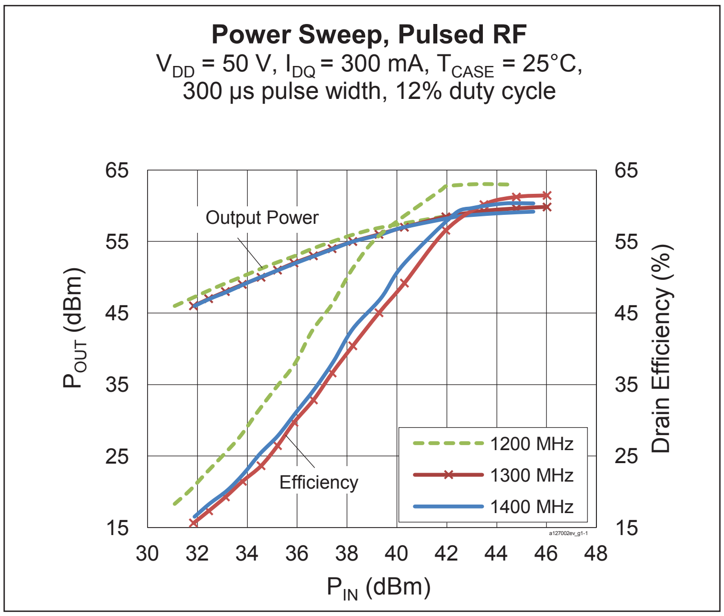
Thermally-Enhanced High Power RF LDMOS FET
700 W, 50 V, 1200 – 1400 MHz

Description

The PTVA127002EV LDMOS FET is designed for use in power amplifier applications in the 1200 to 1400 MHz frequency band. Features include high gain and thermally-enhanced package with bolt-down flange. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTVA127002EV
Package H-36275-4





Features

- Broadband input and output matching
- High gain and efficiency
- Integrated ESD protection
- Human Body Model 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 700 W peak under RF pulse, 300 µS, 10% duty cycle.

RF Characteristics

Pulsed RF Performance (tested in Wolfspeed test fixture)

V_{DD} = 50 V, I_{DQ} = 150 mA per side, P_{OUT} = 700 W, f_1 = 1200 MHz, f_2 = 1300 MHz, f_3 = 1400 MHz, 300 µs pulse width, 12% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	15.5	16	—	dB
Drain Efficiency	η_D	50	56	—	%
Gain Flatness	ΔG	—	1.0	1.3	dB
Return Loss	IRL	—	–20	–11	dB

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics

Typical RF Performance (not subject to production test, verified by design/characterization in Wolfspeed test fixture)
V_{DD} = 50 V, I_{DQ} = 150 mA per side, Input signal (t_r = 7 ns, t_f = 5 ns), 300 µs pulse width, 12% duty cycle, class AB test

Mode of Operation	ƒ (MHz)	IRL (dB)	P_{1dB}			P_{3dB}			Max P_{droop} (pulse) @ P_{1dB}	t_r (ns) @P_{1dB}	t_f (ns) @P_{1dB}
			Gain (dB)	Eff (%)	P_{OUT} (W)	Gain (dB)	Eff (%)	P_{OUT} (W)			
300 µs, 12% Duty Cycle	1200	–20	16.6	57	710	14.6	57	810	0.2	5	<2
	1300	–16	15.8	54	840	13.8	55	950	0.3	5	<2
	1400	–20	15.7	54	730	13.7	53	820	0.2	5	<2

Typical RF Performance (tested on LTN/PTVA127002EV E5 Wolfspeed test fixture)
V_{DD} = 50 V, I_{DQ} = 150 mA per side, Input signal (t_r = 7 ns, t_f = 5 ns), 32 ms pulse width, 50% duty cycle, class AB test

Mode of Operation	Compression	ƒ (MHz)	P_{IN} (dBm)	Gain (dB)	IRL (dB)	I (A)	Eff (%)	P_{OUT} (dBm)	P_{OUT} (W)
32 ms, 50% Duty Cycle	P_{1dB}	1300	42.0	16.1	22.6	22.7	56.6	58.1	641
	P_{3dB}	1300	44.4	14.1	19.0	25.2	55.8	58.5	703

DC Characteristics (single side)

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	$R_{DS(on)}$	—	0.1	—	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

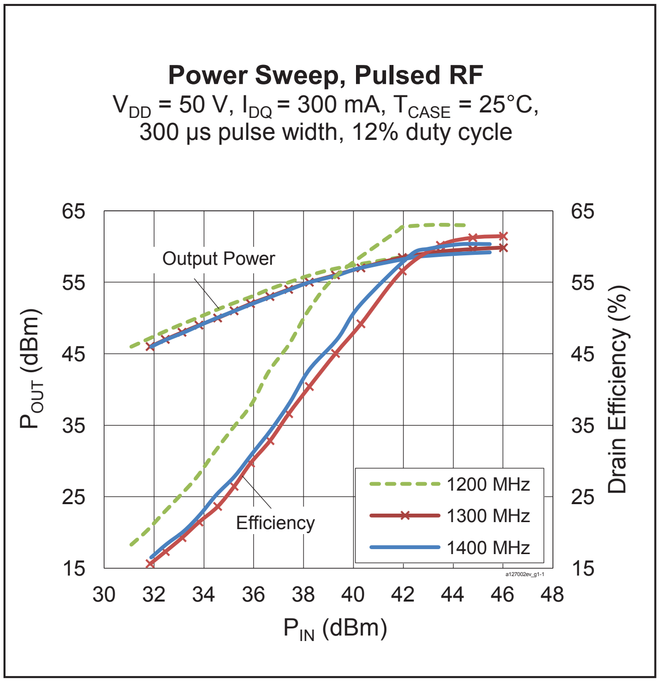
Maximum Ratings

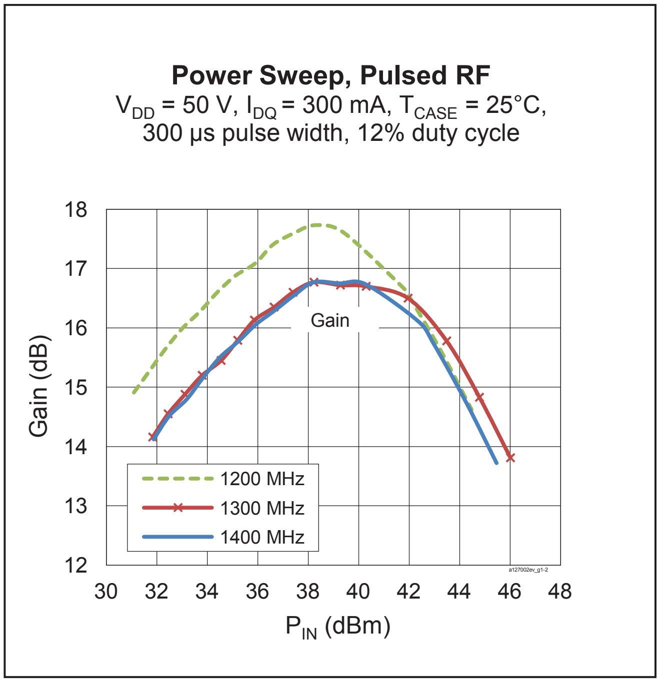
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	105	V
Gate-Source Voltage	V_{GS}	–6 to +12	V
Operating Voltage	V_{DD}	0 to +55	V
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 700 W CW)	$R_{\theta JC}$	~0.36	°C/W

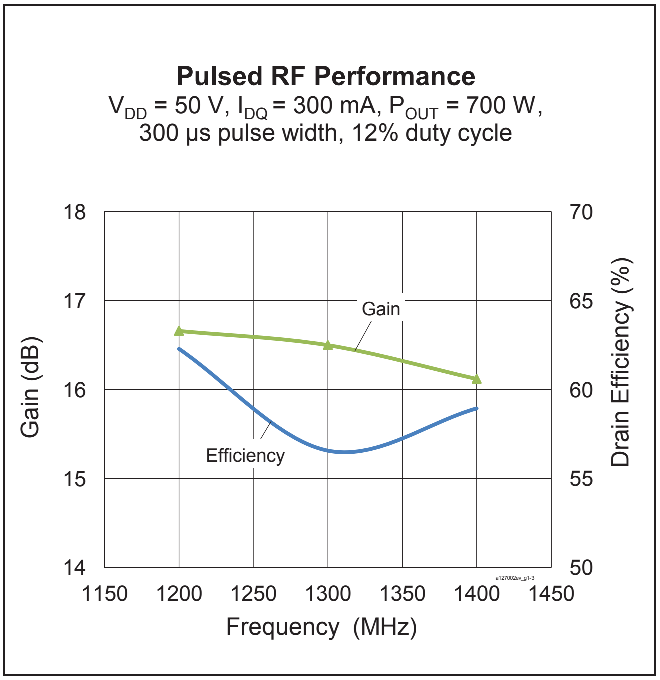
Ordering Information

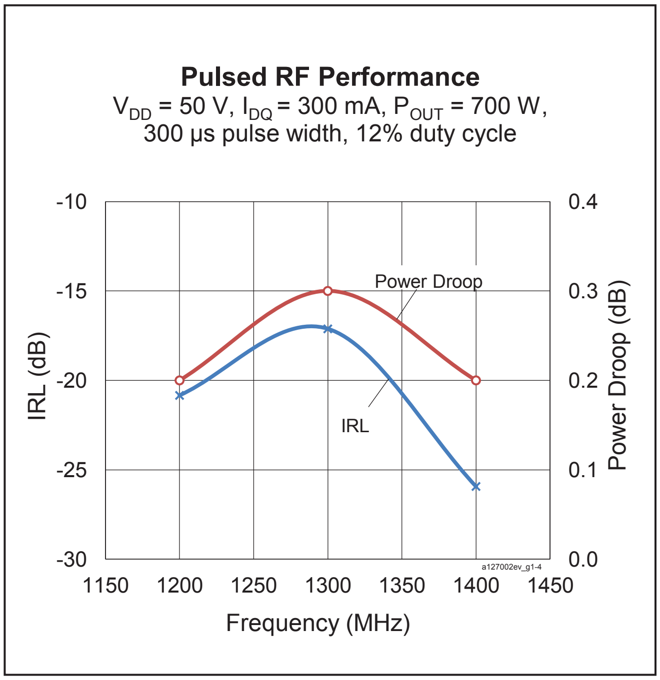
Type and Version	Order Code	Package Description	Shipping
PTVA127002EV V1 R0	PTVA127002EV-V1-R0	H-36275-4, bolt-down	Tape & Reel, 50 pcs
PTVA127002EV V1 R250	PTVA127002EV-V1-R250	H-36275-4, bolt-down	Tape & Reel, 250 pcs

Typical RF Performance (data taken in production test fixture)

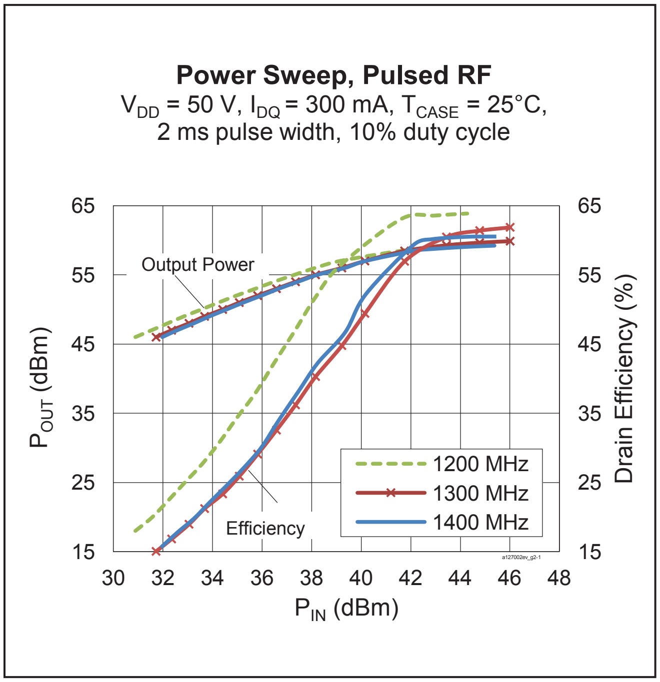


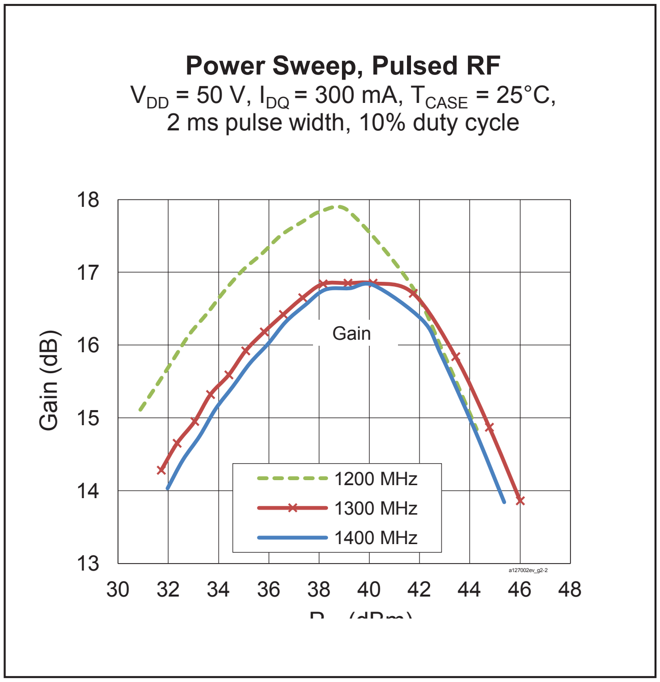


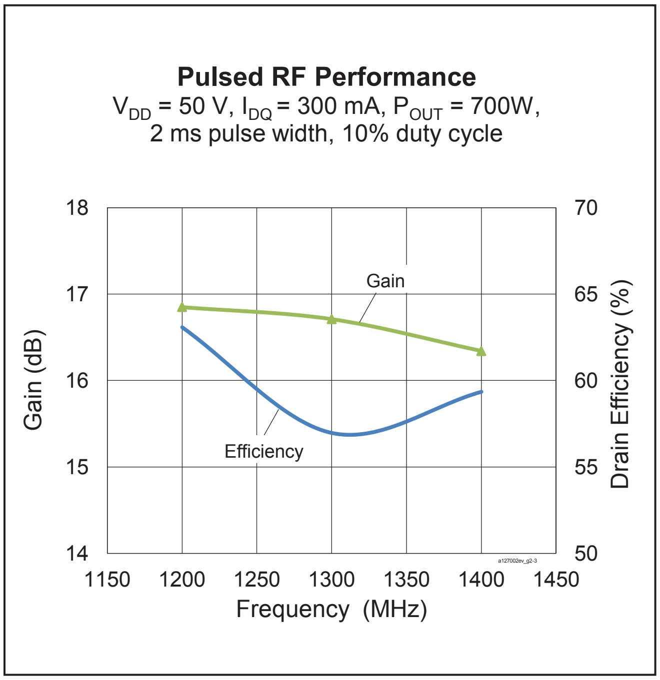


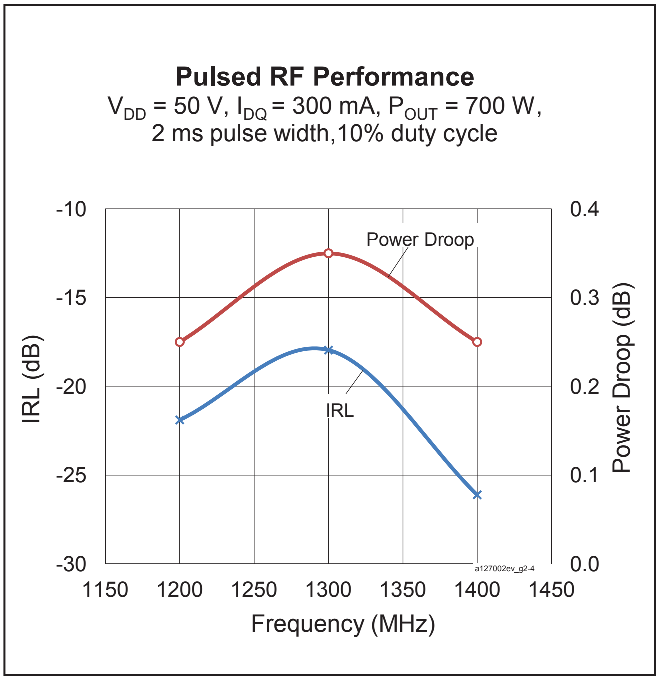


Typical RF Performance (cont.)

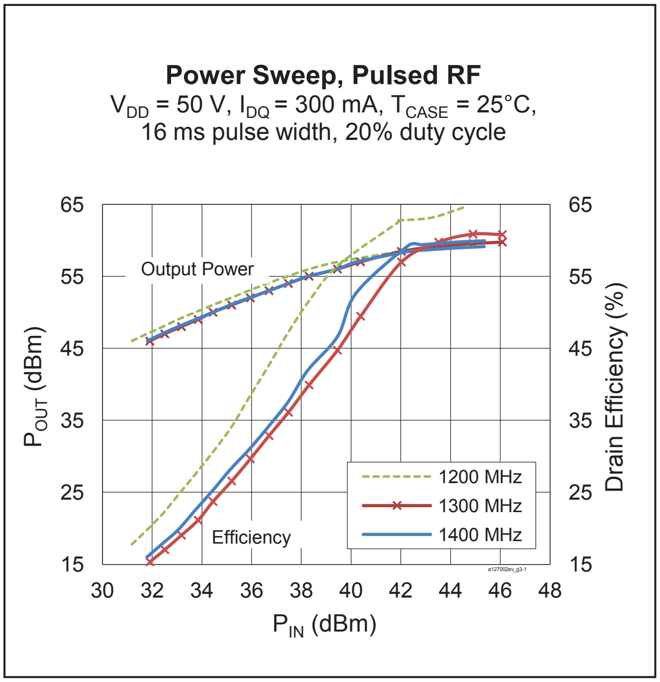


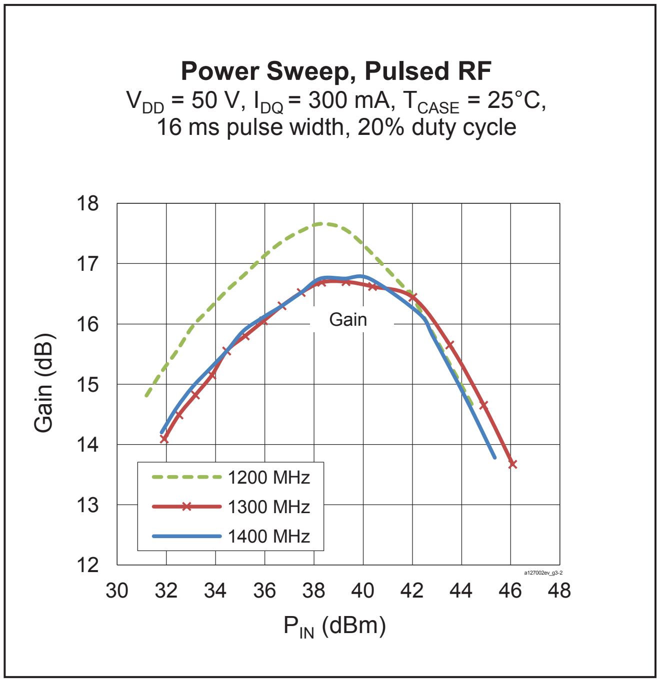


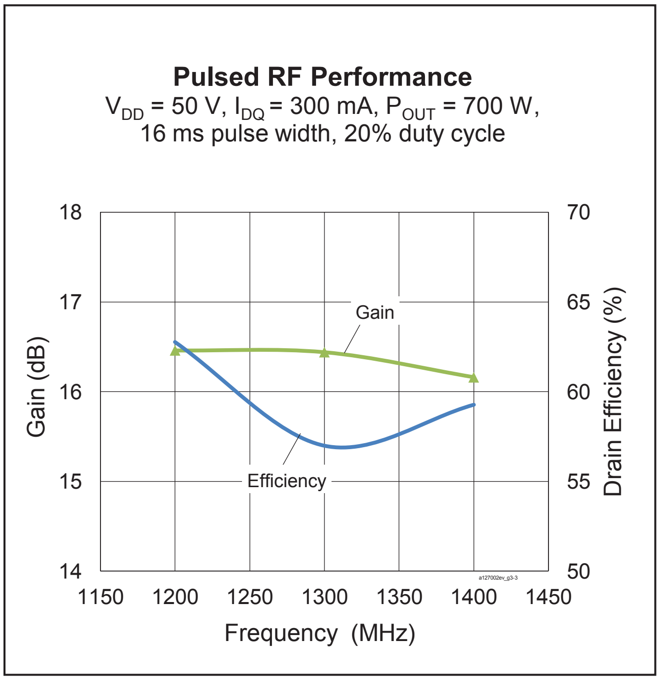


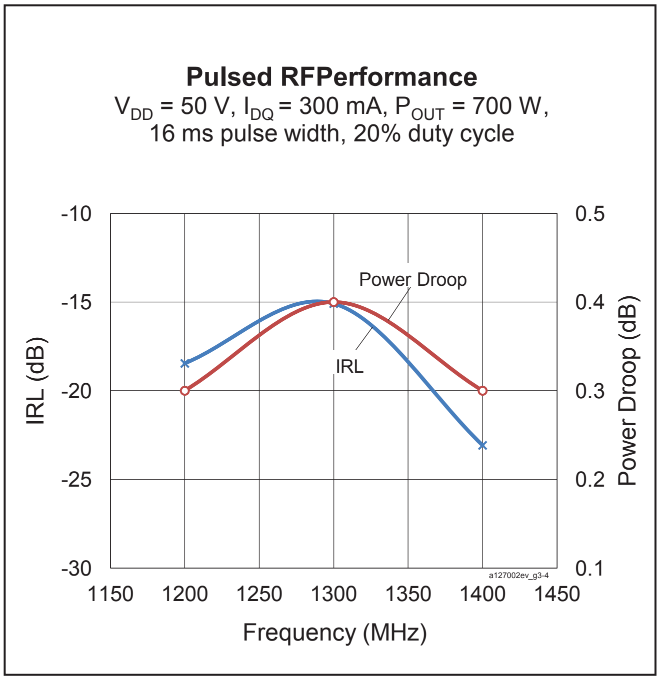


Typical RF Performance (cont.)



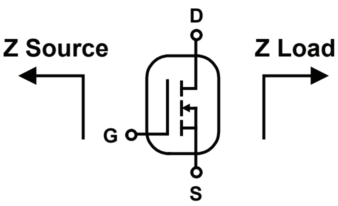






Broadband Circuit Impedance

Freq [MHz]	Z Source Ω		Z Load Ω	
	R	jX	R	jX
1200	0.84	–1.27	0.90	–0.97
1300	0.97	–1.06	0.72	–0.47
1400	1.35	–1.12	0.63	0.03



Load Pull Performance (single side)

Load Pull at Max P_{OUT} Point – 16 µs pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, 150 mA

Freq [MHz]	ZI [Ω]	P_{IN} [dBm]	P_{OUT} [dBm]	P_{OUT} [W]	P_G [dB]	PAE Eff [%]	Z_{OUT} [Ω]
1200	1.91 – j2.04	41.40	56.40	436.52	15.00	53.80	1.30 – j2.03
1300	2.72 – j3.13	42.24	56.54	450.82	14.30	54.48	1.25 – j1.94
1400	4.83 – j1.46	41.66	56.31	427.56	14.65	53.27	1.03 – j1.94

Load Pull at Max G_T Point – 16 µs pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, 150 mA

Freq [MHz]	ZI [Ω]	P_{IN} [dBm]	P_{OUT} [dBm]	P_{OUT} [W]	P_G [dB]	PAE Eff [%]	Z_{OUT} [Ω]
1200	1.91 – j2.04	38.10	54.72	296.48	16.62	57.89	3.03 – j3.11
1300	2.72 – j3.13	38.84	54.83	304.09	15.99	62.54	3.22 – j1.63
1400	4.83 – j1.46	37.21	53.42	219.79	16.21	57.25	2.30 – j0.09

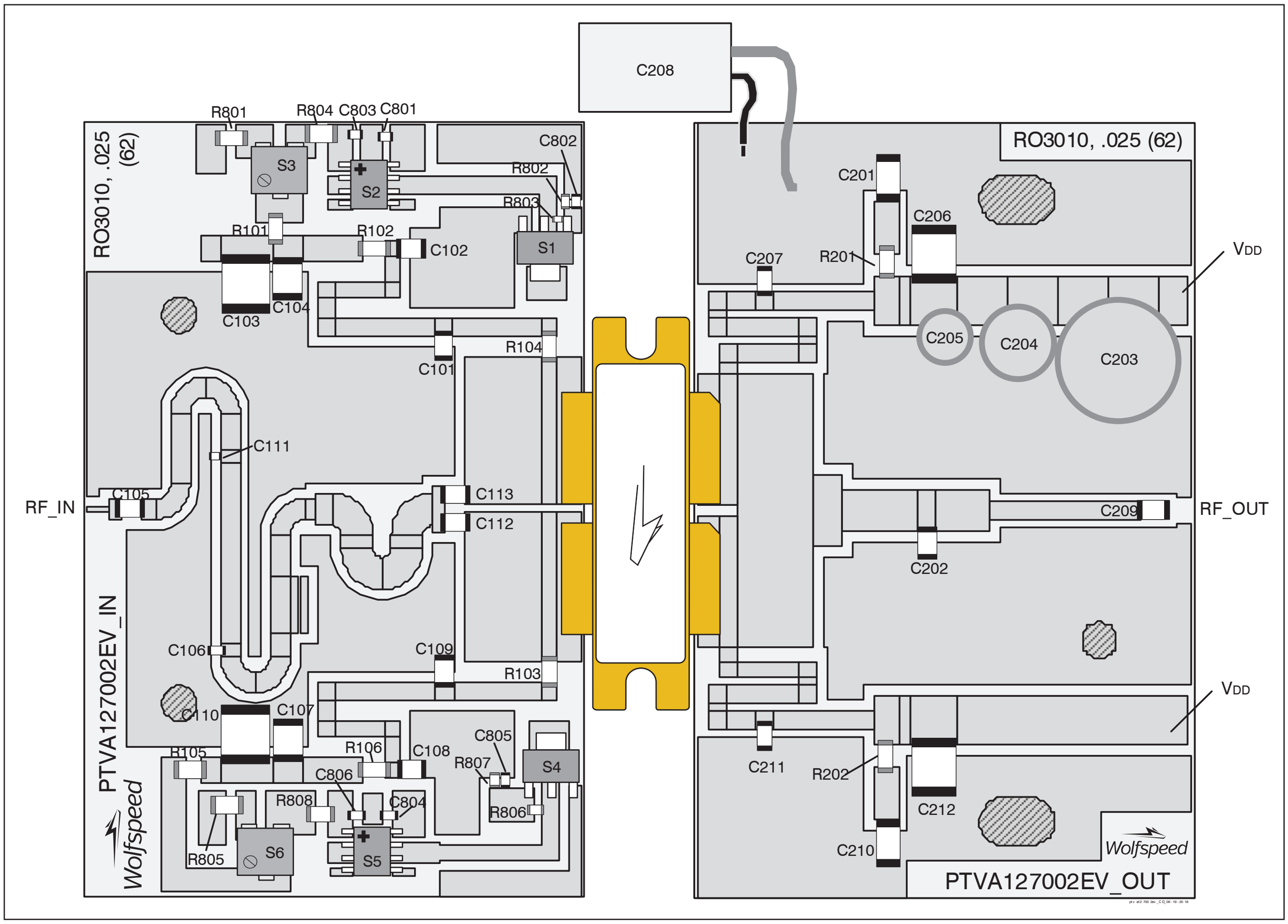
Load Pull at Max Efficiency Point – 16 µs pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, 150 mA

Freq [MHz]	ZI [Ω]	P_{IN} [dBm]	P_{OUT} [dBm]	P_{OUT} [W]	P_G [dB]	PAE Eff [%]	Z_{OUT} [Ω]
1200	1.91 – j2.04	39.60	55.80	380.19	16.20	60.71	2.22 – j2.43
1300	2.72 – j3.13	39.44	55.23	333.43	15.79	63.71	2.81 – j1.90
1400	4.83 – j1.46	39.39	55.19	330.37	15.80	62.26	2.40 – j1.45

Z Optimum – 16 µs pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, 150 mA

Freq [MHz]	ZI [Ω]	P_{IN} [dBm]	P_{OUT} [dBm]	P_{OUT} [W]	P_G [dB]	PAE Eff [%]	Z_{OUT} [Ω]
1200	1.91 – j2.04	39.18	55.58	361.41	16.40	60.50	2.41 – j2.50
1300	2.72 – j3.13	39.50	55.30	338.84	15.80	62.60	2.73 – j1.51
1400	4.83 – j1.46	40.00	55.60	363.08	15.60	60.70	1.86 – j1.37

Reference Circuit , 1200 – 1400 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit (cont.)

Reference Circuit Assembly

DUT	PTVA27002EV V1
Test Fixture Part No.	LTN/PTVA127002EV V1
PCB	Rogers 3010, 0.635mm [0.025”] thick, 2 oz. copper, ε_r = 10.2, f = 1930 – 1990 MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF	

Components Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C102, C108, C109	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C103, C110	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C104, C107	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C105, C112, C113	Capacitor, 56 pF	ATC	ATC100B560JW500XB
C106	Capacitor, 3.9 pF	ATC	ATC800A3R9CW250
C111	Capacitor, 6.2 pF	ATC	ATC100A6R2CW150XB
C801, C802, C803, C804, C805, C806	Capacitor, 1000 pF	Panasonic Electronic Components	ECJ-1VB1H102K
R101, R105	Resistor, 1000 Ω	Panasonic Electronic Components	ERJ-8GEYJ102V
R102, R106	Resistor, 5.6 Ω	Panasonic Electronic Components	ERJ-8GEYJ5R6V
R103, R104, R804, R808	Resistor, 10 Ω	Panasonic Electronic Components	ERJ-8GEYJ100V
R801, R805	Resistor, 2000 Ω	Panasonic Electronic Components	ERJ-8GEYJ202V
R802, R807	Resistor, 1300 Ω	Panasonic Electronic Components	ERJ-3GEYJ132V
R803, R806	Resistor, 1200 Ω	Panasonic Electronic Components	ERJ-3GEYJ122V
S1, S4	Transistor	Infineon Technologies	BCP56
S2, S5	Voltage Regulator	National Semiconductor	LM7805
S3, S6	Potentiometer, 2k Ω	Bourns Inc.	3224W-1-202E
Output			
C201, C210	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C202	Capacitor, 2.2 µF	ATC	ATC100B2R2CW500
C203	Capacitor, 100 µF	Cornell Dubilier Electronics (CDE)	SK101M100ST
C204	Capacitor, 22 µF	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C205	Capacitor, 10 µF	Cornell Dubilier Electronics (CDE)	SEK100M100ST
C206, C212	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C207, C211	Capacitor, 39 pF	ATC	ATC100B390KW500
C208	Capacitor, 6800 µF	Panasonic Electronic Components	ECO-S2AP682EA
C209	Capacitor, 56 pF	ATC	ATC100B560JW500
R201, R202	Resistor, 5.6 Ω	Panasonic Electronic Components	ERJ-8RQJ5R6V

Package Outline Specifications

Package H-36275-4

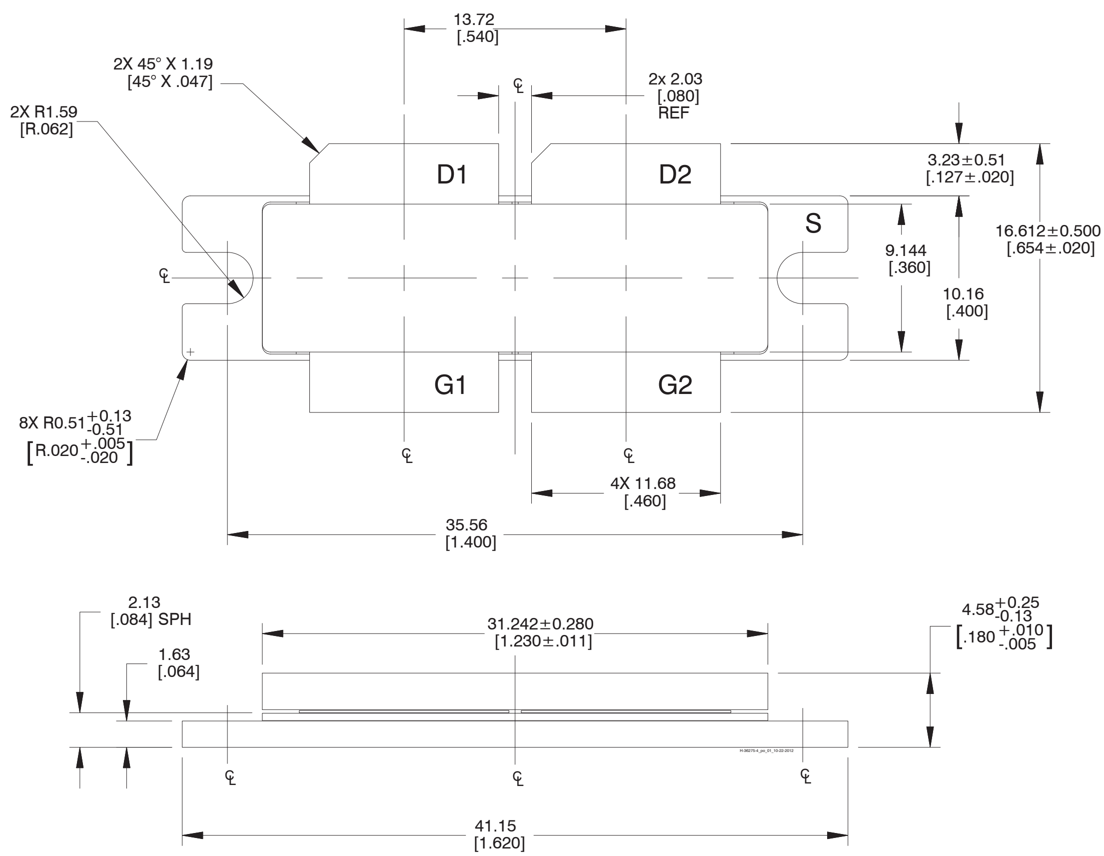


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.005] unless specified otherwise.
4. Pins: D1, D2 – drains; G1, G2 – gates; S – source.
5. Lead thickness: 0.127 ±0.051 mm [0.005 ±0.002 inch].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2013-10-01	Advance	All	Data Sheet reflects advance specification for product development
02	2014-03-04	Preliminary	All	Data Sheet reflects preliminary specification
02.1	2014-09-30	Preliminary	2	Added LTN/PTVA127002EV E5 test fixture
03	2014-11-11	Production	All	Data Sheet reflects released product specifications Includes Reference Circuit
03.1	2015-06-18	Production	8	Corrected frequency range
03.2	2016-04-19	Production	1, 3	Added ESD rating, updated ordering information
03.3	2017-02-06	Production	2	Updated operating voltage and junction temperature
04	2018-06-19	Production	All	Converted to Wolfspeed Data Sheet

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Notes

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