

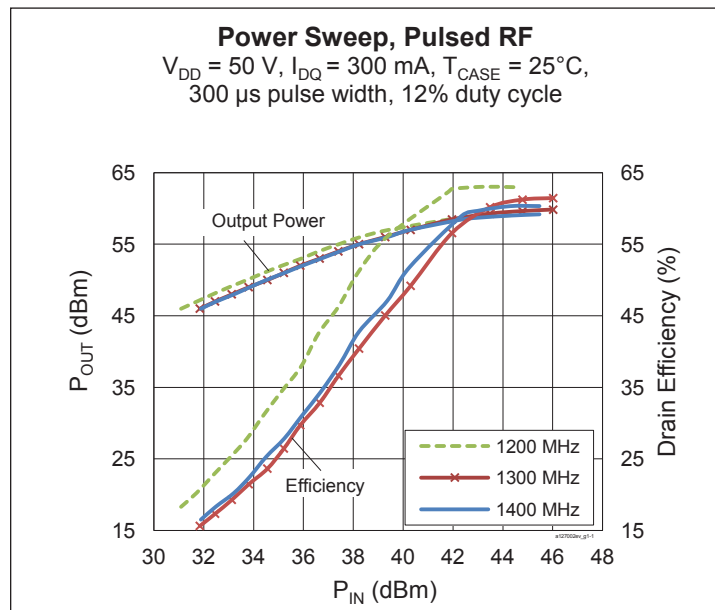
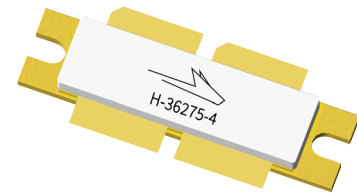
# PTVA127002EV

## 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  $\mu\text{s}$ , 10% duty cycle.

### RF Characteristics

#### Pulsed RF Performance (tested in Wolfspeed test fixture)

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

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	15.5	16	—	dB
Drain Efficiency	$\eta_D$	50	56	—	%
Gain Flatness	$\Delta G$	—	1.0	1.3	dB
Return Loss	IRL	—	-20	-11	dB

All published data at  $T_{CASE} = 25^\circ\text{C}$  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)  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$  per side, Input signal ( $t_r = 7\text{ ns}$ ,  $t_f = 5\text{ ns}$ ), 300  $\mu\text{s}$  pulse width, 12% duty cycle, class AB test

$V_{DD} =$

Mode of Operation	f (MHz)	IRL (dB)	P <sub>1dB</sub>			P <sub>3dB</sub>			Max P <sub>droop</sub> (pulse) @ P <sub>1dB</sub>	t <sub>r</sub> (ns) @P <sub>1dB</sub>	t <sub>f</sub> (ns) @P <sub>1dB</sub>
			Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)	Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)			
300 $\mu\text{s}$ , 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)

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$  per side, Input signal ( $t_r = 7\text{ ns}$ ,  $t_f = 5\text{ ns}$ ), 32 ms pulse width, 50% duty cycle, class AB test

Mode of Operation	Compression	f (MHz)	P <sub>IN</sub> (dBm)	Gain (dB)	IRL (dB)	I (A)	Eff (%)	P <sub>OUT</sub> (dBm)	P <sub>OUT</sub> (W)
32 ms, 50% Duty Cycle	P <sub>1dB</sub>	1300	42.0	16.1	22.6	22.7	56.6	58.1	641
	P <sub>3dB</sub>	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	$V_{GS} = 0\text{ V}$ , $I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	$V_{DS} = 50\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	1.0	$\mu\text{A}$
	$V_{DS} = 105\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	10.0	$\mu\text{A}$
On-State Resistance	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.1	—	$\Omega$
Operating Gate Voltage	$V_{DS} = 50\text{ V}$ , $I_{DQ} = 150\text{ mA}$	$V_{GS}$	3	3.35	4	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	—	—	1.0	$\mu\text{A}$

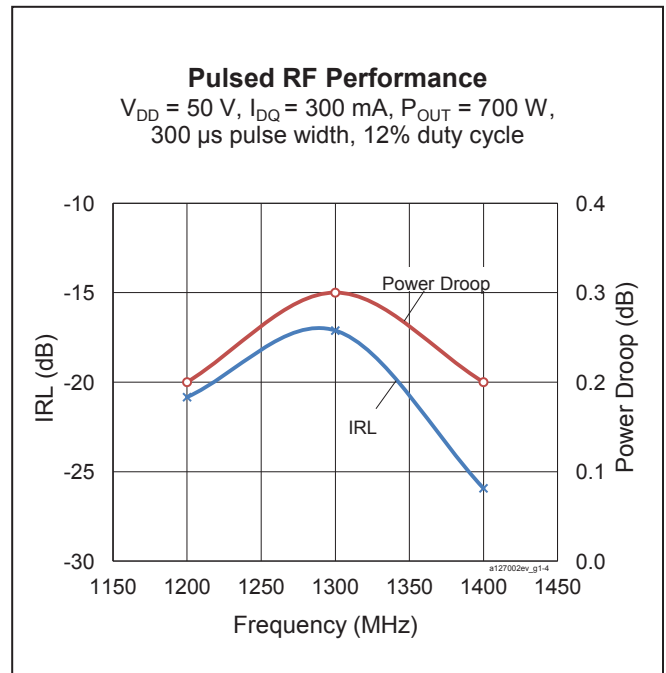
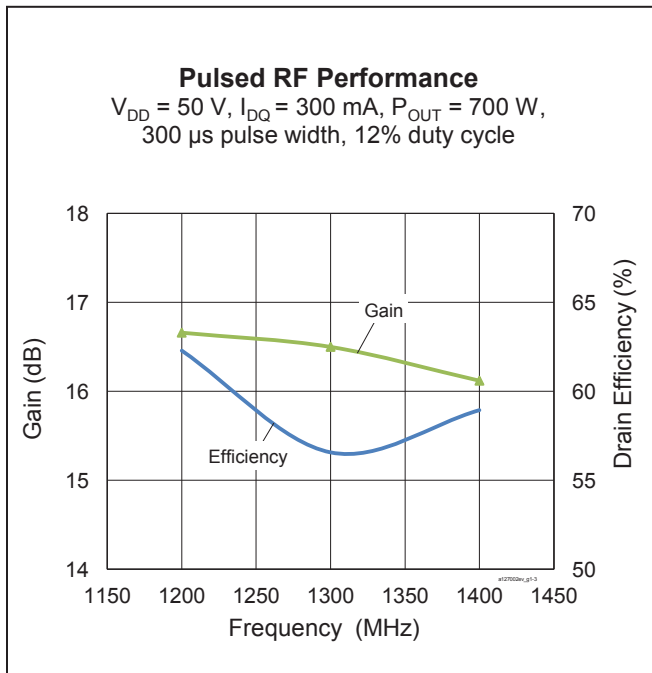
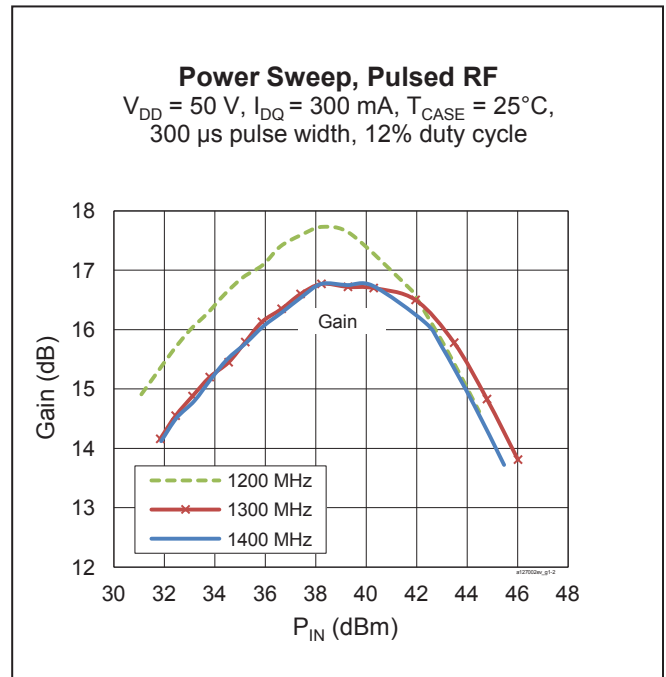
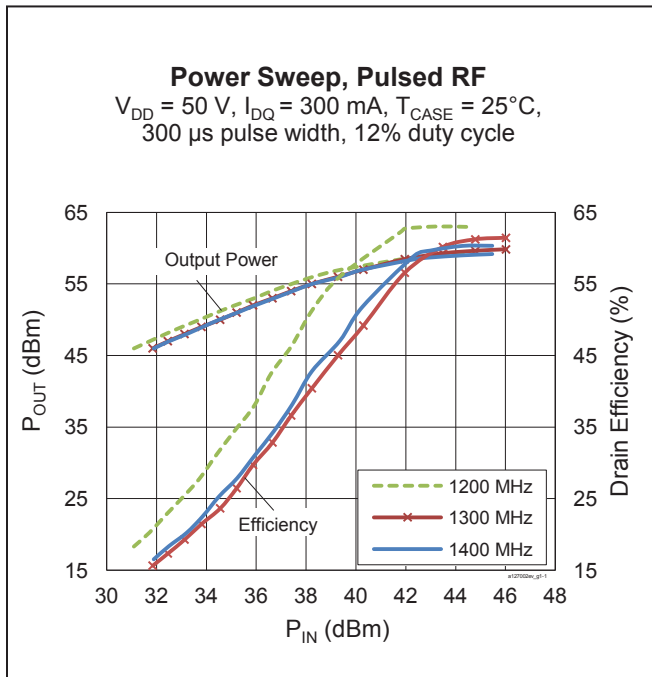
## Maximum Ratings

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	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	$^{\circ}\text{C}$
Thermal Resistance ( $T_{CASE} = 70^{\circ}\text{C}$ , 700 W CW)	$R_{\theta JC}$	~0.36	$^{\circ}\text{C}/\text{W}$

## Ordering Information

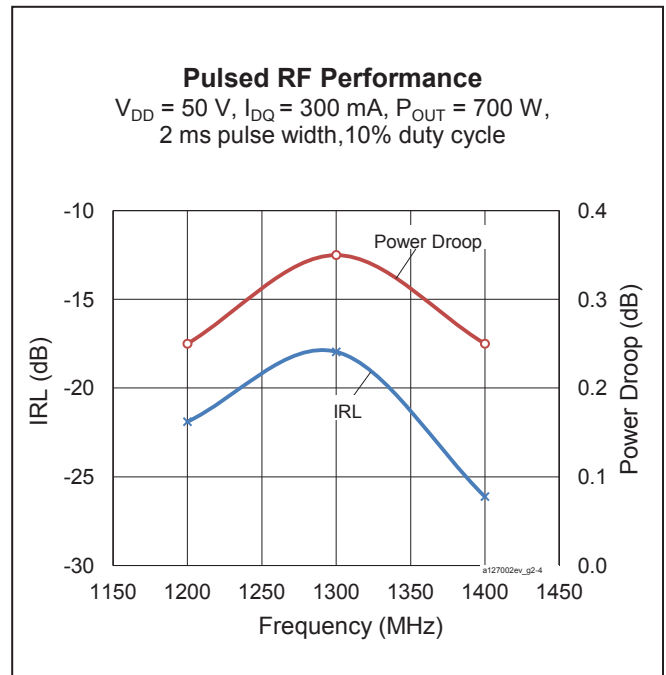
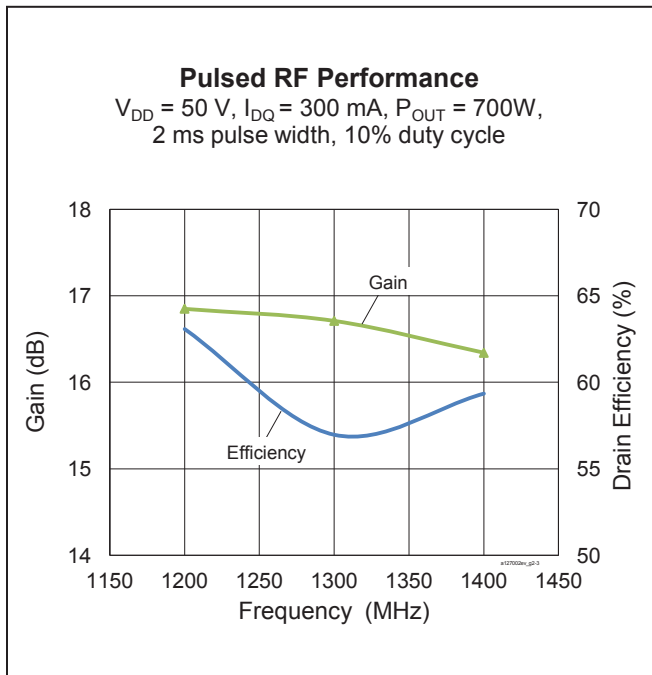
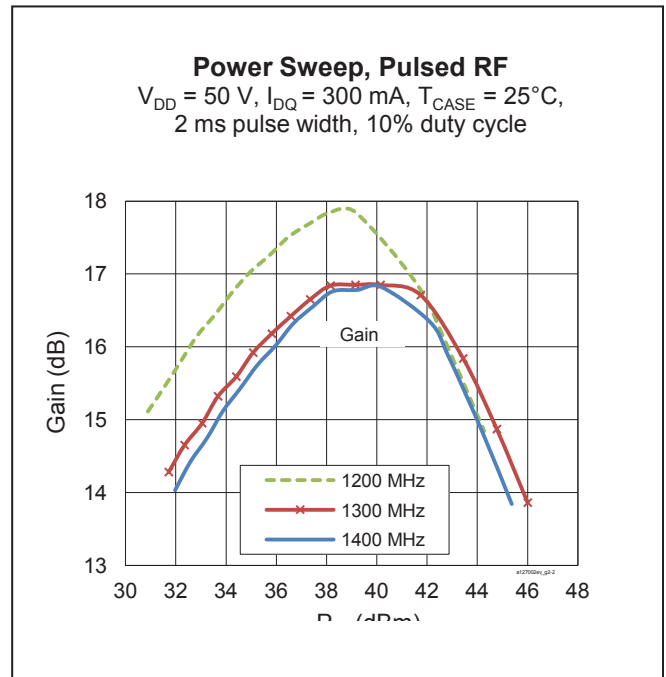
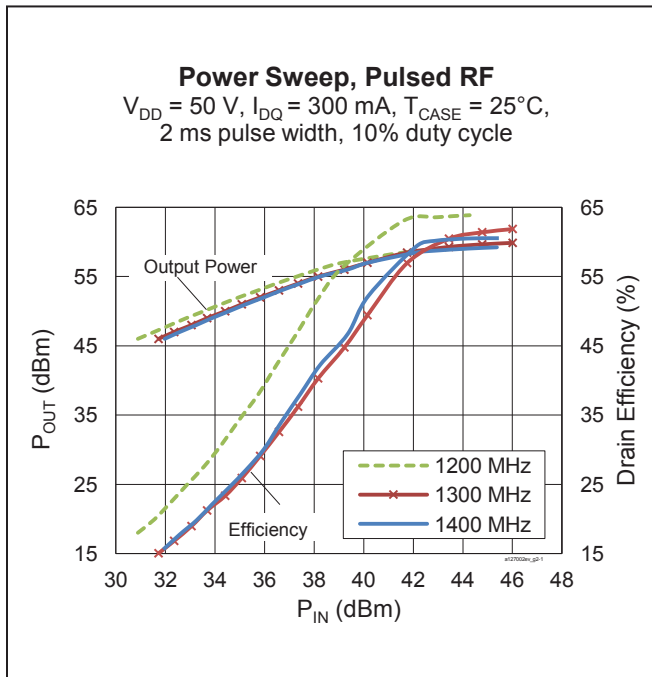
Type and Version	Order Code	Package Description	Shipping
PTVA127002EV V1 R0	PTVA127002EV-V1-R0	H-36275-4, bolt-down	Tape & Reel, 50 pcs
PTVA127002EV V1 R250	PTVA127002EV-V1-R250	H-36275-4, bolt-down	Tape & Reel, 250 pcs

**Typical RF Performance** (data taken in production test fixture)

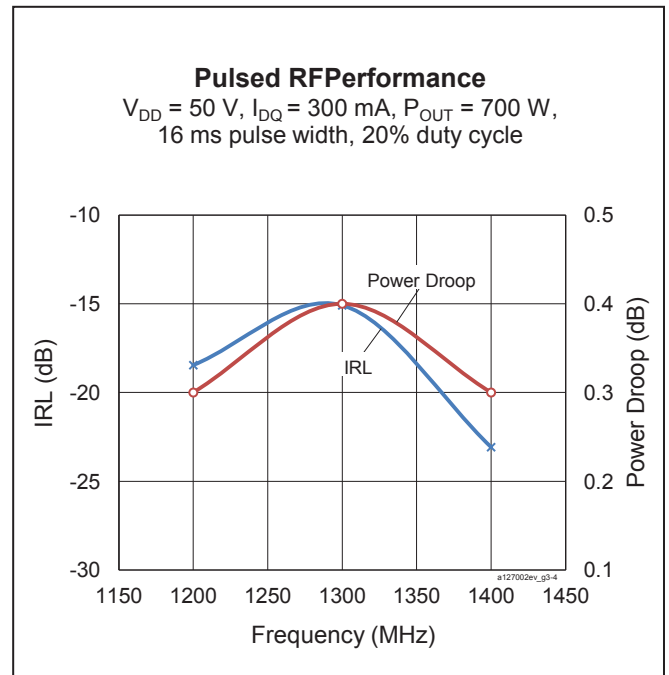
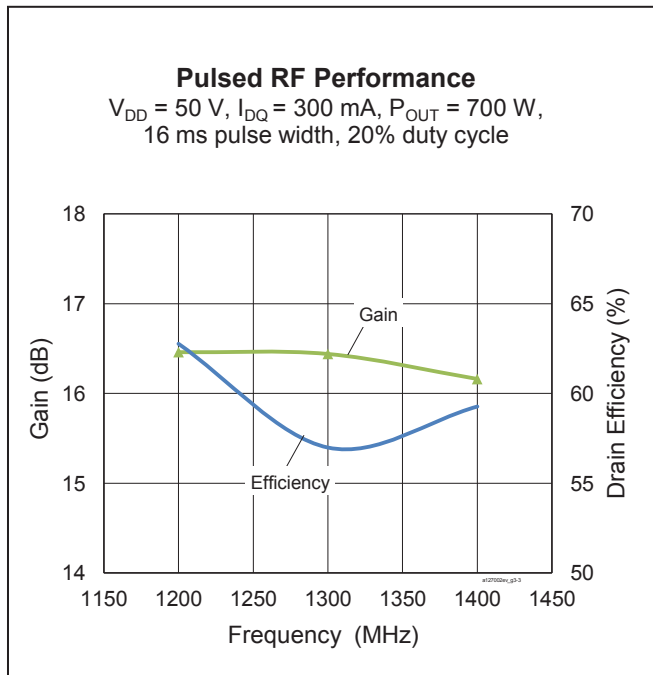
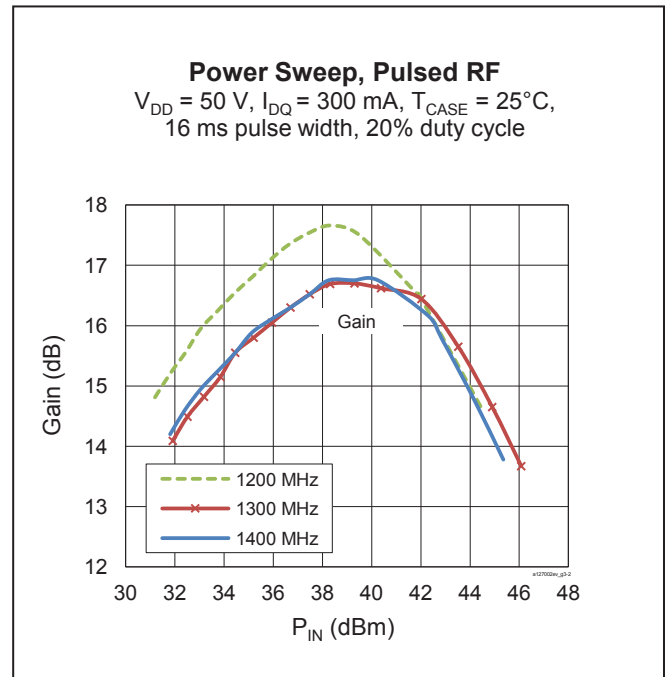
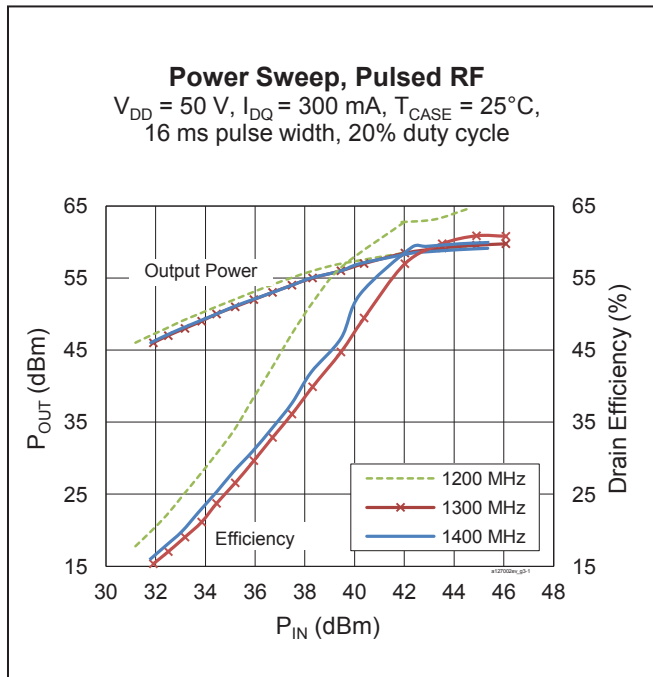




**Typical RF Performance (cont.)**

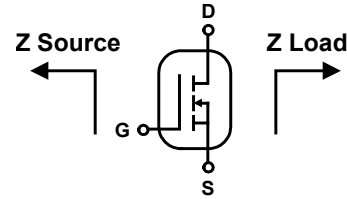


Typical RF Performance (cont.)



## Broadband Circuit Impedance

Freq [MHz]	Z Source $\Omega$		Z Load $\Omega$	
	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<sub>OUT</sub> Point** – 16  $\mu$ s pulse width, 10% duty cycle, class AB, V<sub>DD</sub> = 50 V, 150 mA

Freq [MHz]	Z <sub>L</sub> [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
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<sub>T</sub> Point** – 16  $\mu$ s pulse width, 10% duty cycle, class AB, V<sub>DD</sub> = 50 V, 150 mA

Freq [MHz]	Z <sub>L</sub> [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
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

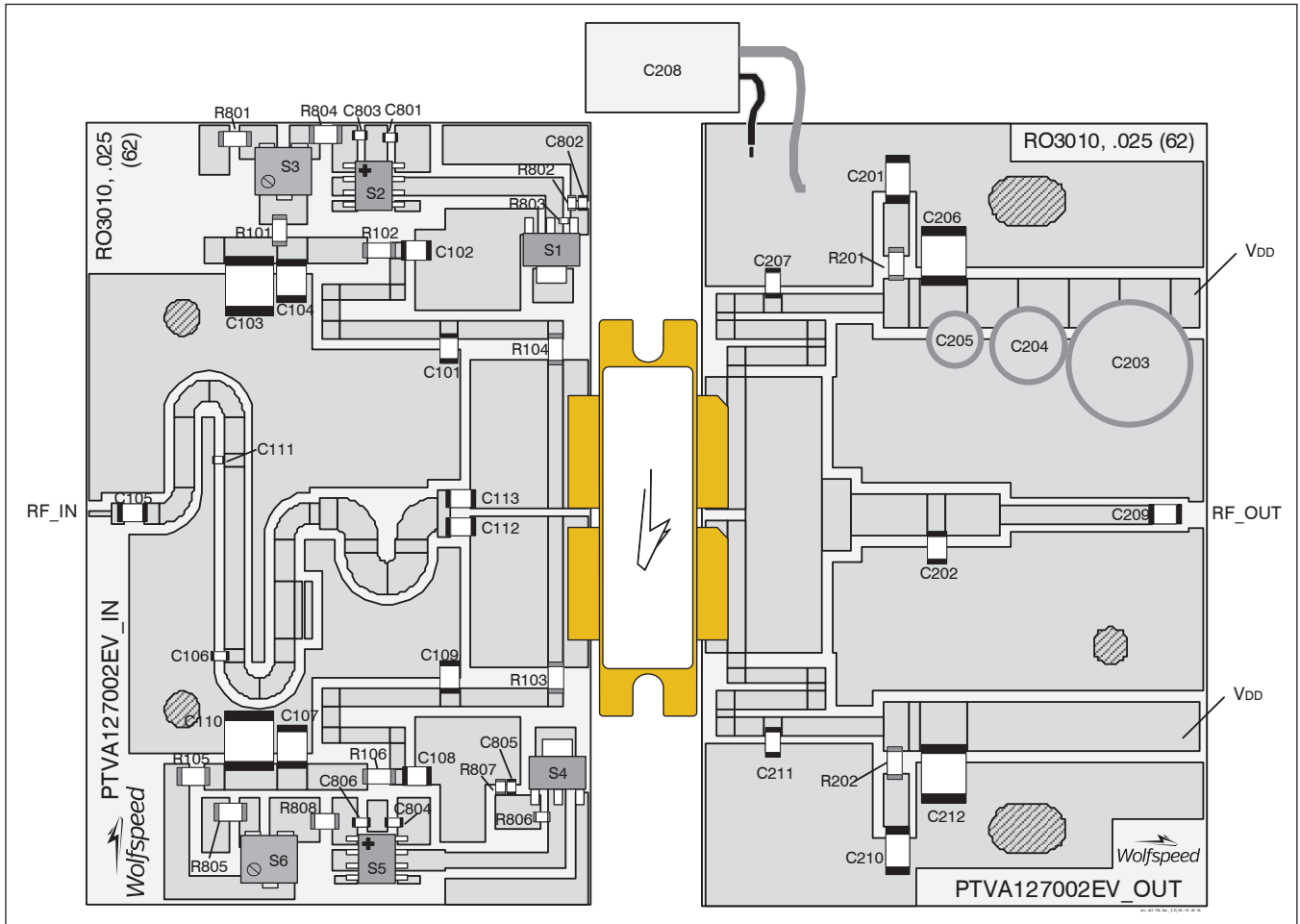
**Load Pull at Max Efficiency Point** – 16  $\mu$ s pulse width, 10% duty cycle, class AB, V<sub>DD</sub> = 50 V, 150 mA

Freq [MHz]	Z <sub>L</sub> [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
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  $\mu$ s pulse width, 10% duty cycle, class AB, V<sub>DD</sub> = 50 V, 150 mA

Freq [MHz]	Z <sub>L</sub> [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
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**

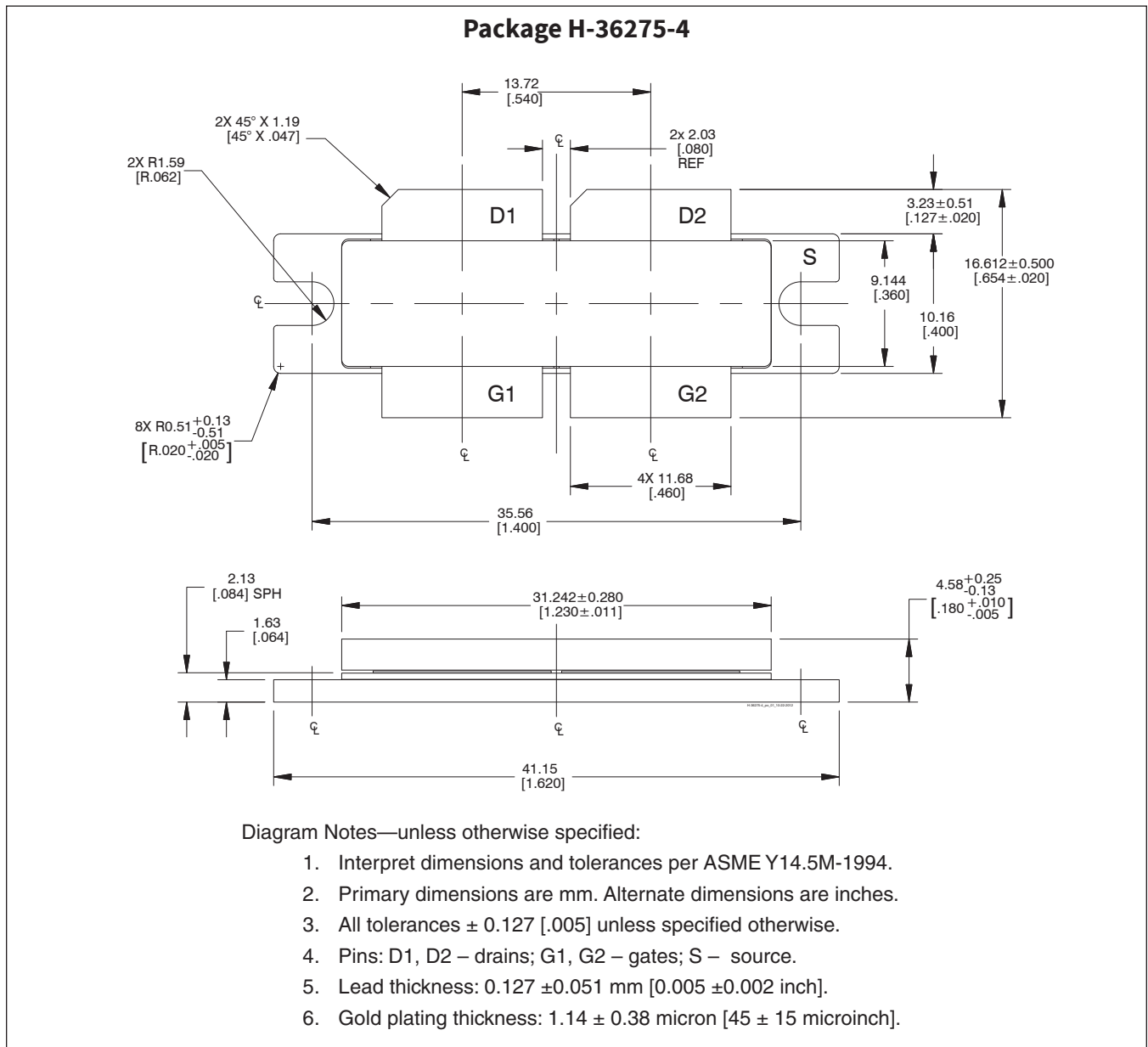
DUT	PTVA27002EV V1
Test Fixture Part No.	LTN/PTVA127002EV V1
PCB	Rogers 3010, 0.635mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 10.2$ , $f = 1930 - 1990$ MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at <a href="http://www.wolfspeed.com/RF">www.wolfspeed.com/RF</a>	

**Components Information**

Component	Description	Suggested Manufacturer	P/N
<b>Input</b>			
C101, C102, C108, C109	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C103, C110	Capacitor, 10 $\mu$ F	TDK Corporation	C5750X5R1H106K230KA
C104, C107	Capacitor, 1 $\mu$ F	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 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ102V
R102, R106	Resistor, 5.6 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ5R6V
R103, R104, R804, R808	Resistor, 10 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ100V
R801, R805	Resistor, 2000 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ202V
R802, R807	Resistor, 1300 $\Omega$	Panasonic Electronic Components	ERJ-3GEYJ132V
R803, R806	Resistor, 1200 $\Omega$	Panasonic Electronic Components	ERJ-3GEYJ122V
S1, S4	Transistor	Infineon Technologies	BCP56
S2, S5	Voltage Regulator	National Semiconductor	LM7805
S3, S6	Potentiometer, 2k $\Omega$	Bourns Inc.	3224W-1-202E
<b>Output</b>			
C201, C210	Capacitor, 1 $\mu$ F	TDK Corporation	C4532X7R2A105M230KA
C202	Capacitor, 2.2 $\mu$ F	ATC	ATC100B2R2CW500
C203	Capacitor, 100 $\mu$ F	Cornell Dubilier Electronics (CDE)	SK101M100ST
C204	Capacitor, 22 $\mu$ F	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C205	Capacitor, 10 $\mu$ F	Cornell Dubilier Electronics (CDE)	SEK100M100ST
C206, C212	Capacitor, 10 $\mu$ F	TDK Corporation	C5750X5R1H106K230KA
C207, C211	Capacitor, 39 pF	ATC	ATC100B390KW500
C208	Capacitor, 6800 $\mu$ F	Panasonic Electronic Components	ECO-S2AP682EA
C209	Capacitor, 56 pF	ATC	ATC100B560JW500
R201, R202	Resistor, 5.6 $\Omega$	Panasonic Electronic Components	ERJ-8RQJ5R6V



## Package Outline Specifications



**For more information, please contact:**

4600 Silicon Drive  
Durham, NC 27703 USA  
Tel: +1.919.313.5300  
[www.wolfspeed.com/RF](http://www.wolfspeed.com/RF)

Sales Contact  
[RFSales@wolfspeed.com](mailto:RFSales@wolfspeed.com)

RF Product Marketing Contact  
[RFMarketing@wolfspeed.com](mailto:RFMarketing@wolfspeed.com)

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