

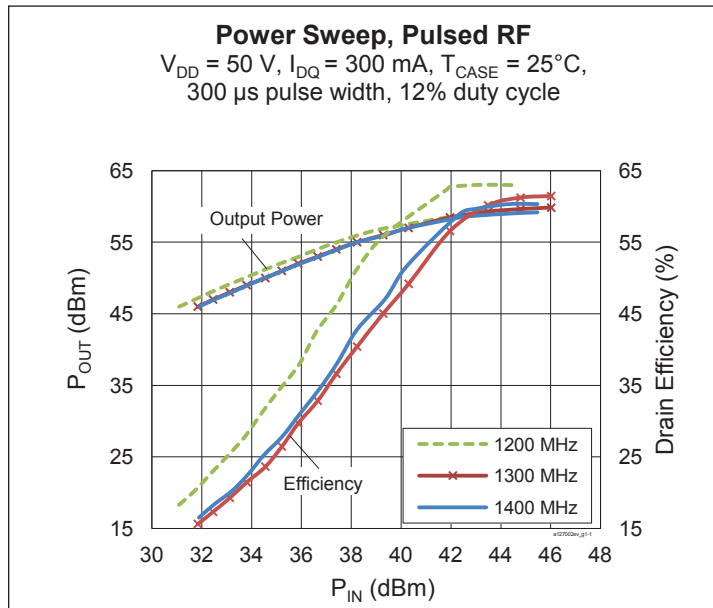
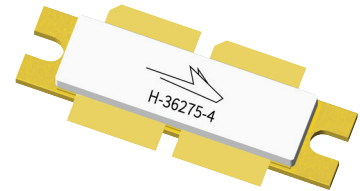
PTVA127002EV

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)

$V_{DD} = 50\text{ V}$, $I_{DQ} = 150\text{ mA}$ per side, $P_{OUT} = 700\text{ W}$, $f_1 = 1200\text{ MHz}$, $f_2 = 1300\text{ MHz}$, $f_3 = 1400\text{ MHz}$, 300 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 $T_{CASE} = 25^\circ\text{C}$ 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 ($t_r = 7\text{ ns}$, $t_f = 5\text{ ns}$), $300\text{ }\mu\text{s}$ pulse width, 12% duty cycle, class AB test

Mode of Operation	f (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)

$V_{DD} = 50\text{ V}$, $I_{DQ} = 150\text{ mA}$ 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_{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	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	$V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	1.0	μA
	$V_{DS} = 105\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	10.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.1	—	Ω
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	μA

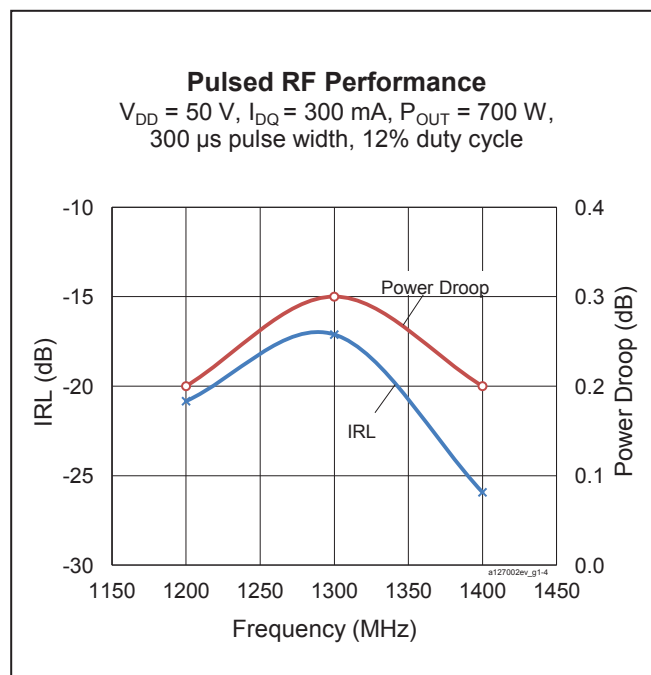
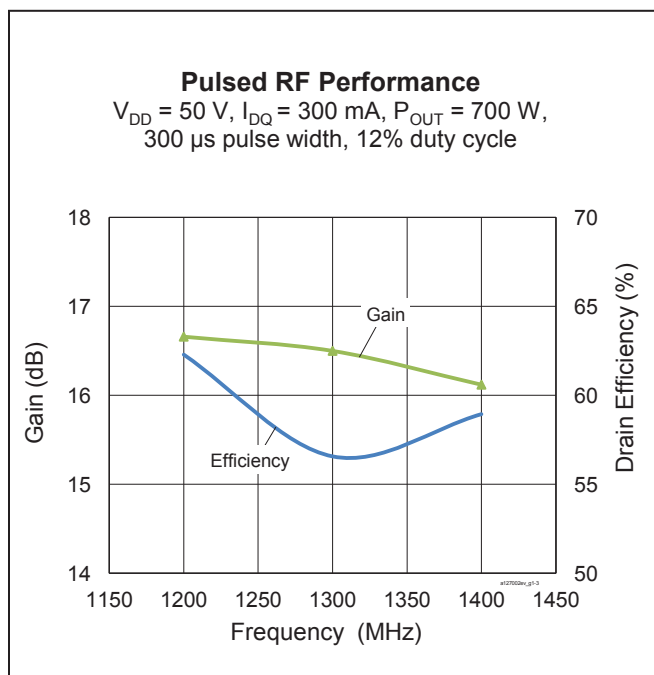
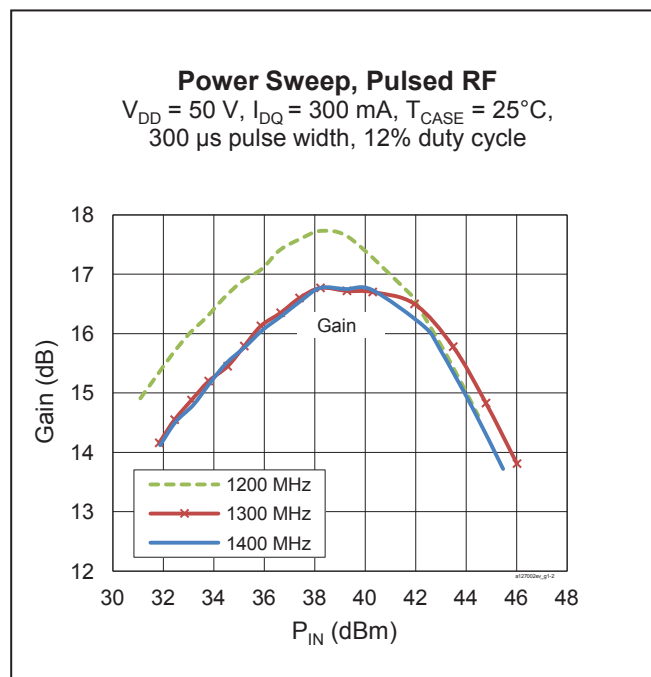
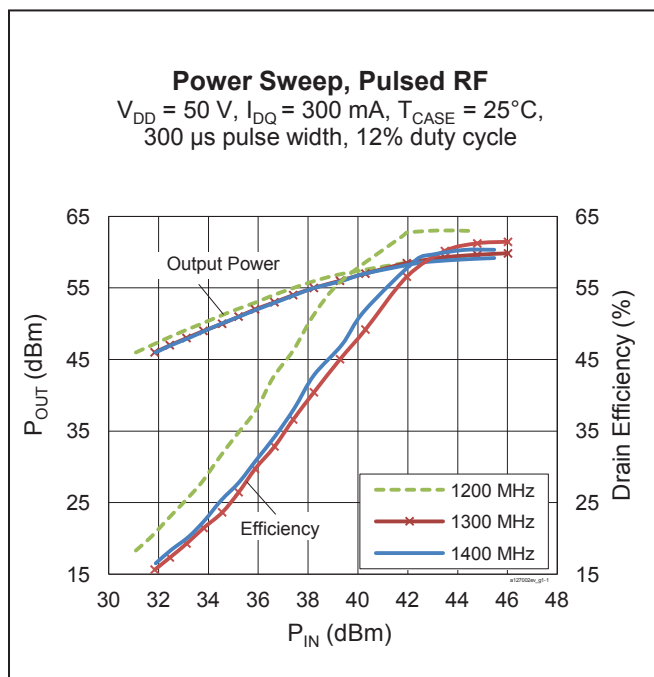
Maximum Ratings

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	$^{\circ}\text{C}$
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	$^{\circ}\text{C/W}$

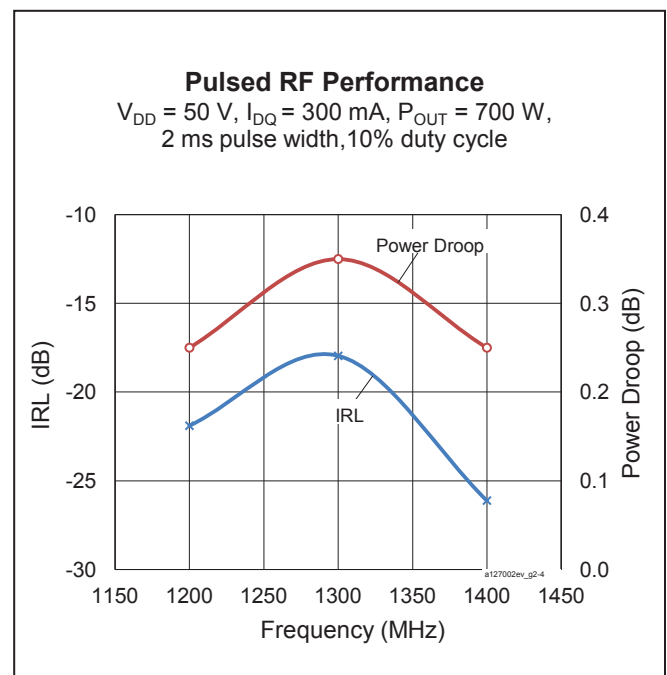
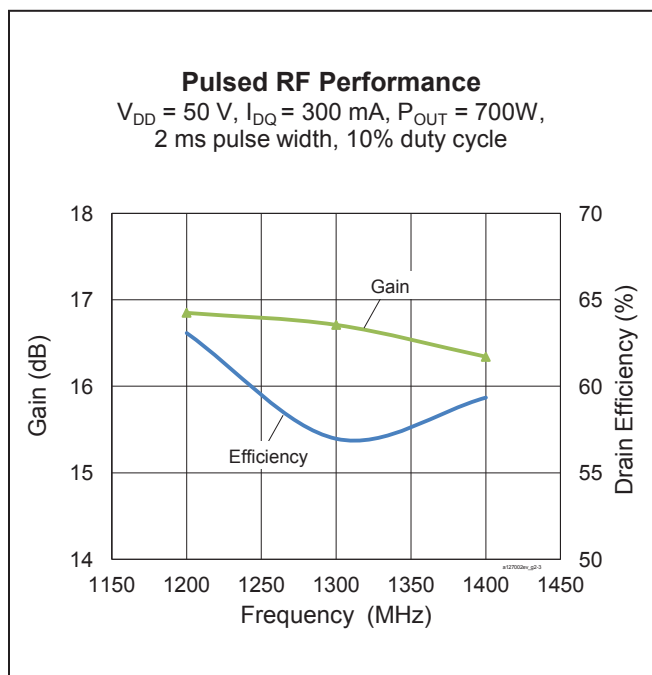
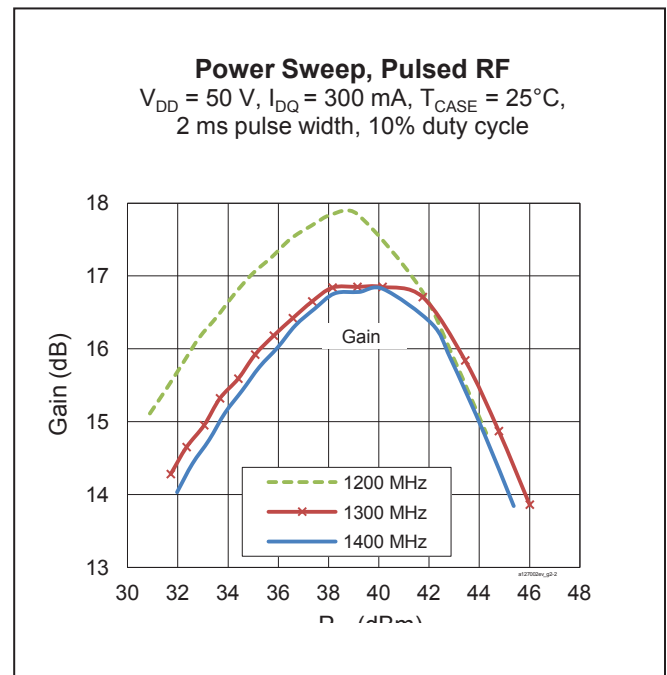
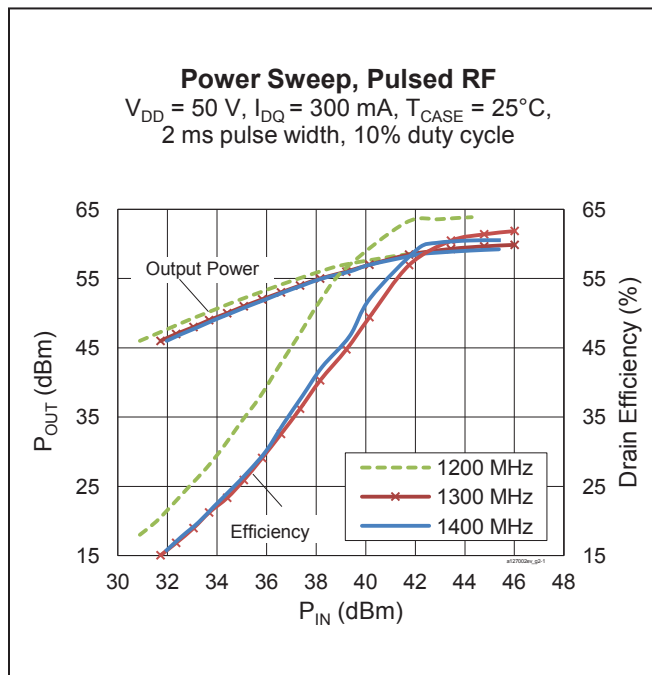
Ordering Information

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

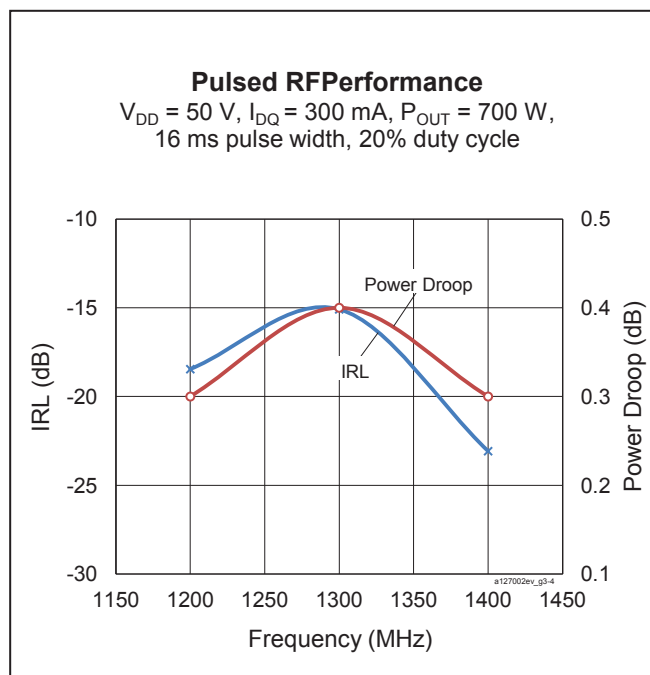
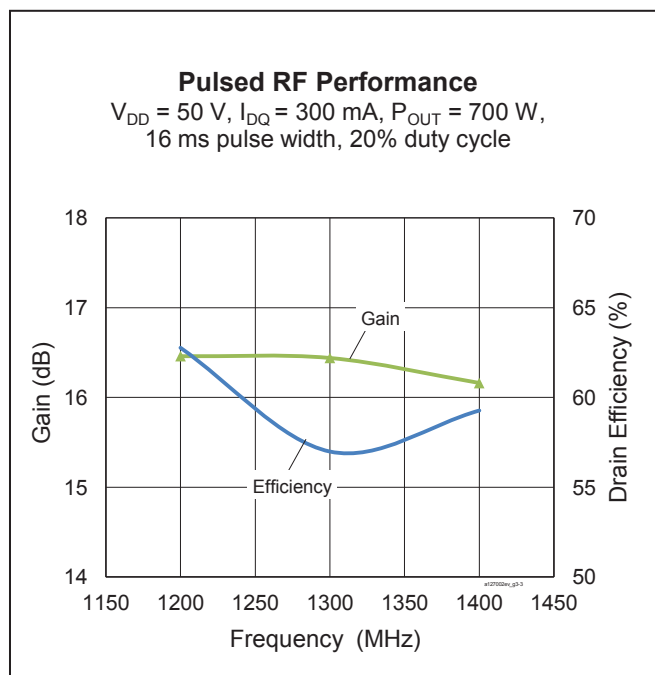
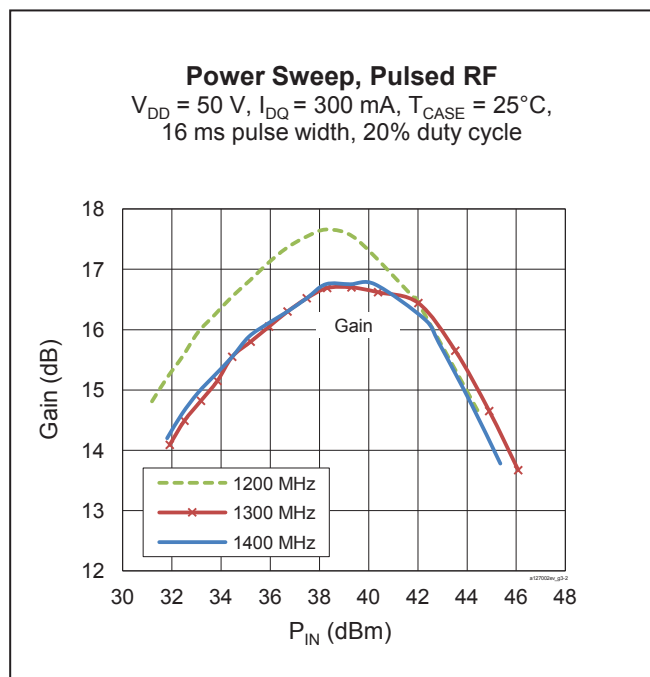
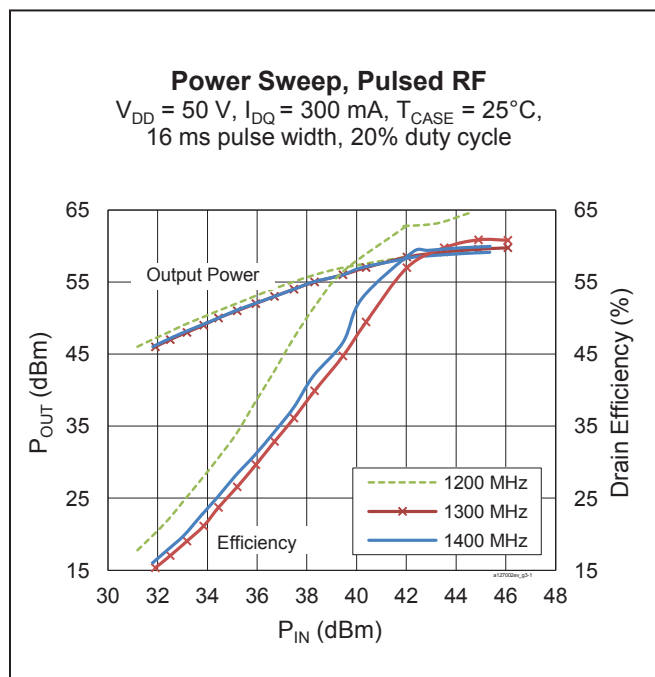
Typical RF Performance (data taken in production test fixture)



Typical RF Performance (cont.)

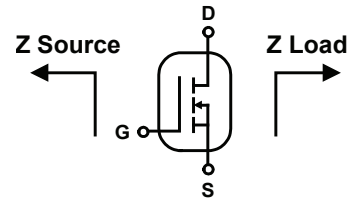


Typical RF Performance (cont.)



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 μ s 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 μ s 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 μ s 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 μ s 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



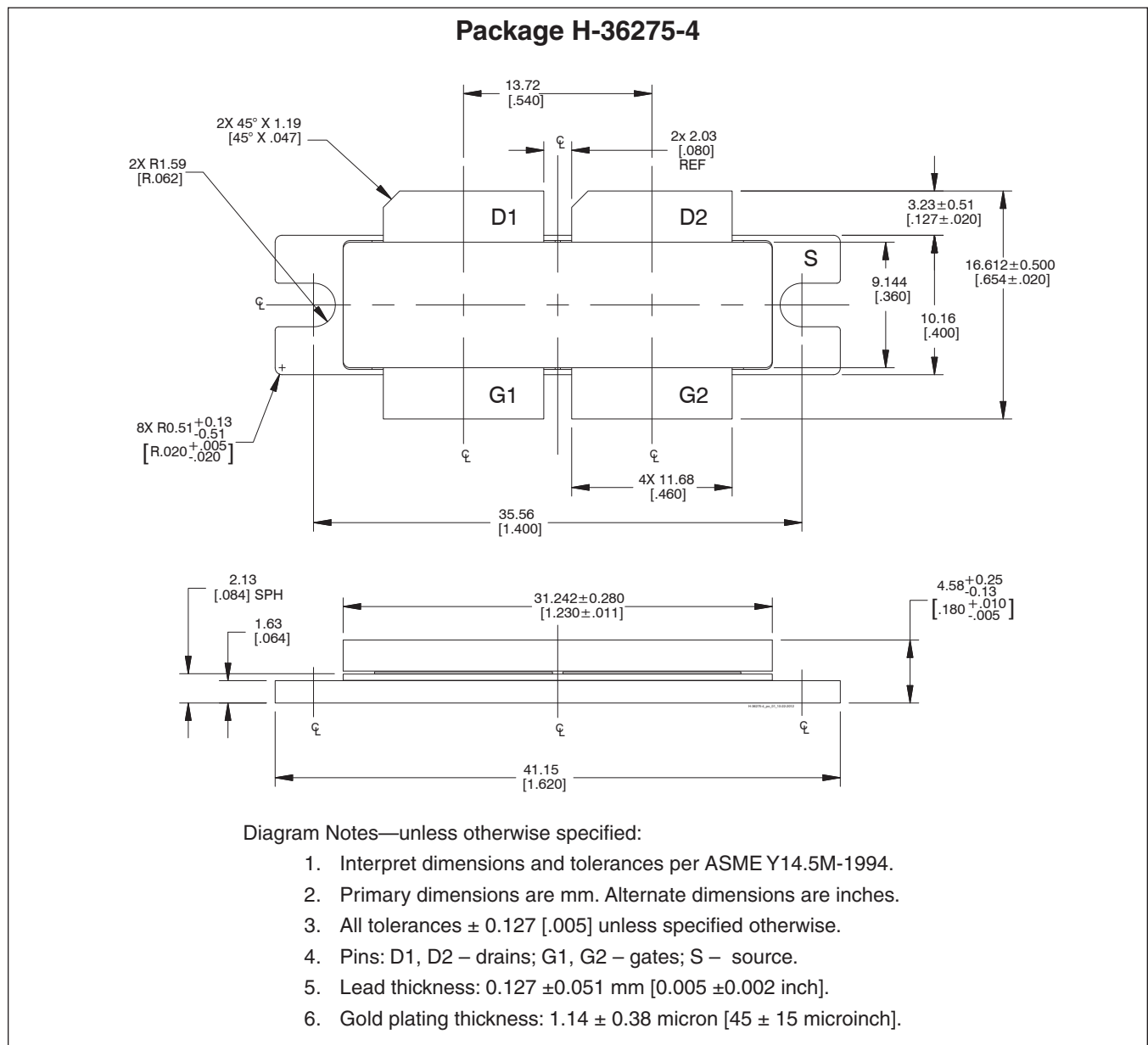
Reference Circuit (cont.)**Reference Circuit Assembly**

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 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 μ F	TDK Corporation	C5750X5R1H106K230KA
C104, C107	Capacitor, 1 μ 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 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 μ F	TDK Corporation	C4532X7R2A105M230KA
C202	Capacitor, 2.2 μ F	ATC	ATC100B2R2CW500
C203	Capacitor, 100 μ F	Cornell Dubilier Electronics (CDE)	SK101M100ST
C204	Capacitor, 22 μ F	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C205	Capacitor, 10 μ F	Cornell Dubilier Electronics (CDE)	SEK100M100ST
C206, C212	Capacitor, 10 μ F	TDK Corporation	C5750X5R1H106K230KA
C207, C211	Capacitor, 39 pF	ATC	ATC100B390KW500
C208	Capacitor, 6800 μ F	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



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

For more information, please contact:

4600 Silicon Drive
Durham, North Carolina, USA 27703
www.wolfspeed.com/RF

Sales Contact
RFSales@wolfspeed.com

RF Product Marketing Contact
RFMarketing@wolfspeed.com
919.407.7816

Notes

Disclaimer

Specifications are subject to change without notice. Cree, Inc. believes the information contained within this data sheet to be accurate and reliable. However, no responsibility is assumed by Cree for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Cree. Cree makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose. "Typical" parameters are the average values expected by Cree in large quantities and are provided for information purposes only. These values can and do vary in different applications and actual performance can vary over time. All operating parameters should be validated by customer's technical experts for each application. Cree products are not designed, intended or authorized for use as components in applications intended for surgical implant into the body or to support or sustain life, in applications in which the failure of the Cree product could result in personal injury or death or in applications for planning, construction, maintenance or direct operation of a nuclear facility.