

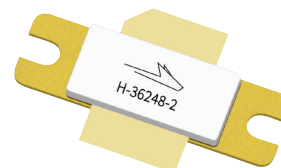
# PTVA123501EC/FC

## Thermally-Enhanced High Power RF LDMOS FETs 350 W, 50 V, 1200 – 1400 MHz

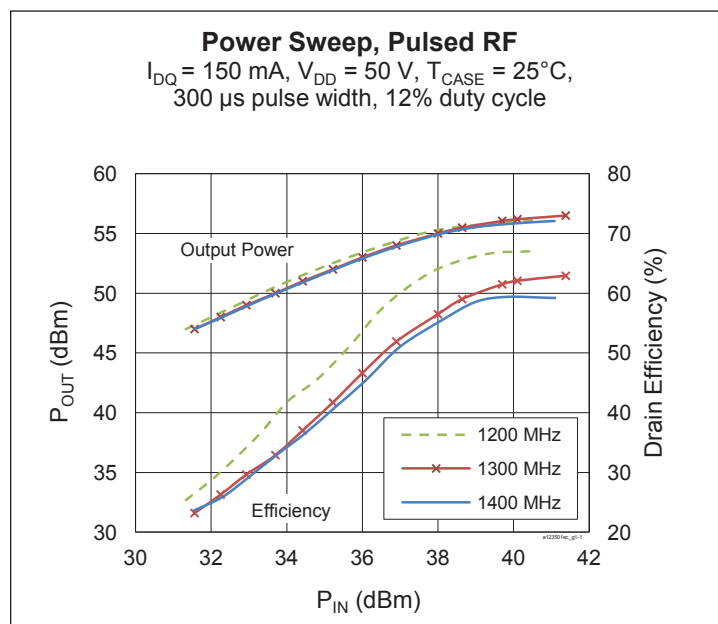
### Description

The PTVA123501EC and PTVA123501FC LDMOS FETs are designed for use in power amplifier applications in the 1200 MHz to 1400 MHz frequency band. Features include high gain and thermally-enhanced package with slotted and earless flanges. Manufactured with Wolfspeed's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTVA123501EC  
Package H-36248-2



PTVA123501FC  
Package H-37248-2



### Features

- Broadband internal 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 55.5 dBm under pulsed conditions: 300  $\mu\text{s}$  pulse width, 12% duty cycle,  $V_{DD} = 50 \text{ V}$

### RF Characteristics

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

$V_{DD} = 50 \text{ V}$ ,  $I_{DQ} = 0.15 \text{ A}$ ,  $P_{OUT} = 350 \text{ W}$ ,  $f_1 = 1200 \text{ MHz}$ ,  $f_2 = 1300 \text{ MHz}$ ,  $f_3 = 1400 \text{ MHz}$ , 300  $\mu\text{s}$  pulse width, 12% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	16.5	17	—	dB
Drain Efficiency	$\eta_D$	54	55	—	%
Return Loss	IRL	—	-12	-9	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)

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$ , Input signal ( $t_r = 5\text{ ns}$ ,  $t_f = 6.5\text{ ns}$ ),  $300\text{ }\mu\text{s}$  pulse width, 12% duty cycle, class AB test

Mode of Operation	$f$ (MHz)	IRL (dB)	P <sub>1dB</sub>			P <sub>3dB</sub>			Max P <sub>droop</sub> (pulse) dB @ 350 W	$t_r$ (ns) @ 350 W	$t_f$ (ns) @ 350 W
			Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)	Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)			
Pulsed RF	1200	-14	16.2	59	375	14.2	59	415	0.10	4	5<
Pulsed RF	1300	-14	16.0	59	390	14.0	59	435	0.15	4	5<
Pulsed RF	1400	-12	15.8	56	375	13.8	57	415	0.15	4	5<

**Typical RF Performance** (not subject to production test, verified by design/characterization in Wolfspeed test fixture)

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$ , 30 ms pulse width, 30% duty cycle, class AB test

Mode of Operation	$f$ (MHz)	P <sub>1dB</sub>			P <sub>3dB</sub>			P <sub>droop</sub> (pulse) dB @ 300 W
		Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)	Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)	
Pulsed RF	1200	16	47	316	14	48	350	0.23
Pulsed RF	1300	16	47	324	14	48	355	0.25
Pulsed RF	1400	15.5	45	315	13.5	47	355	0.29

## DC Characteristics

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 ( $T_{CASE} = 70^{\circ}\text{C}$ , 300 W CW)	$R_{\theta JC}$	0.34	$^{\circ}\text{C/W}$

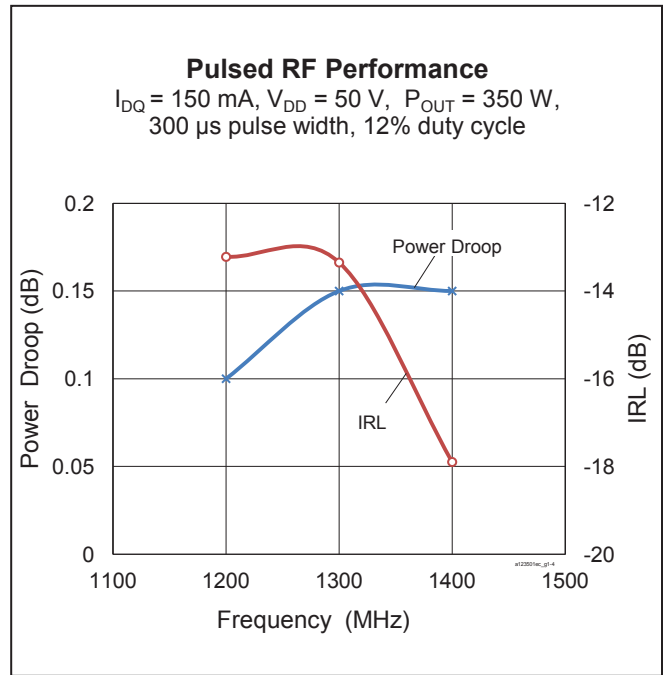
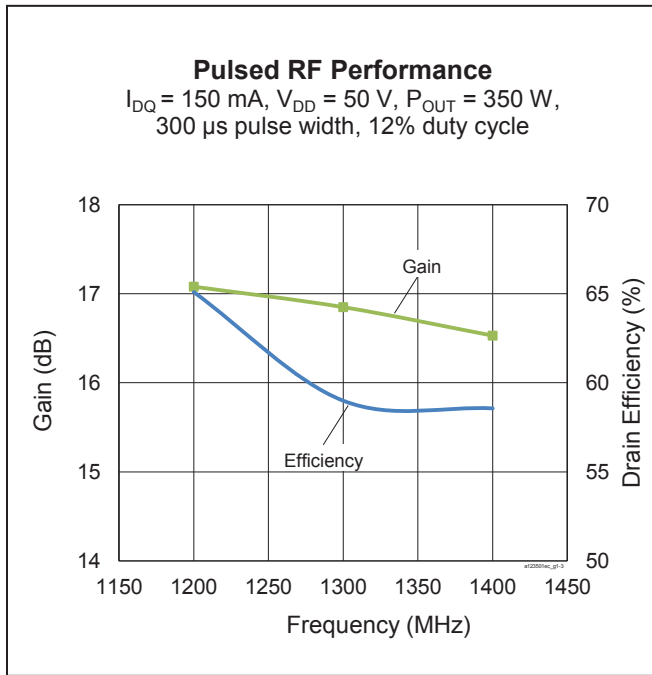
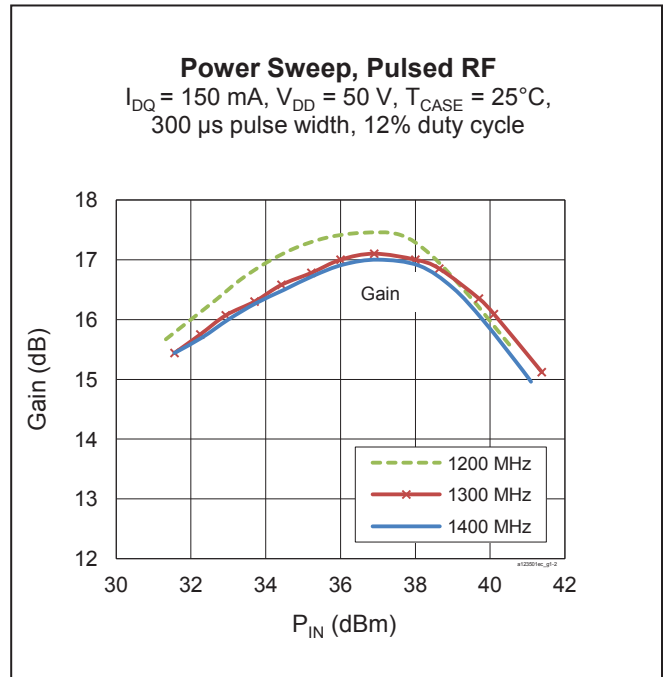
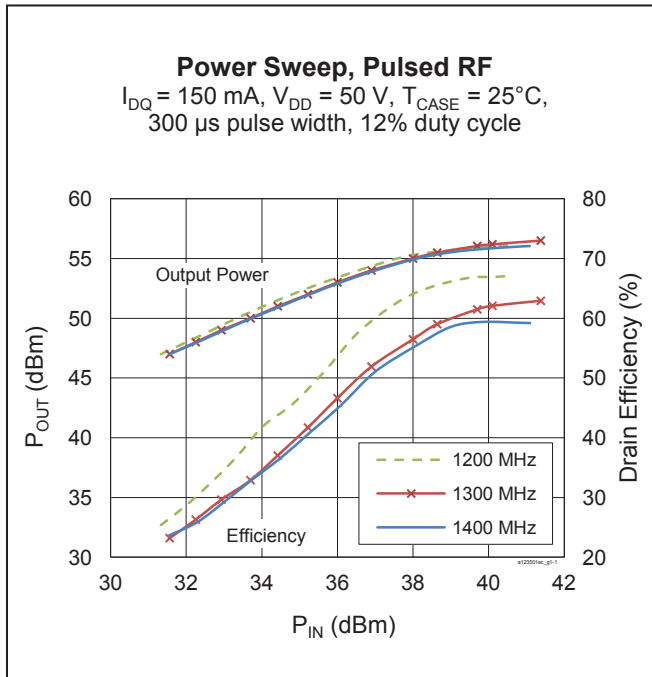


**Ordering Information**

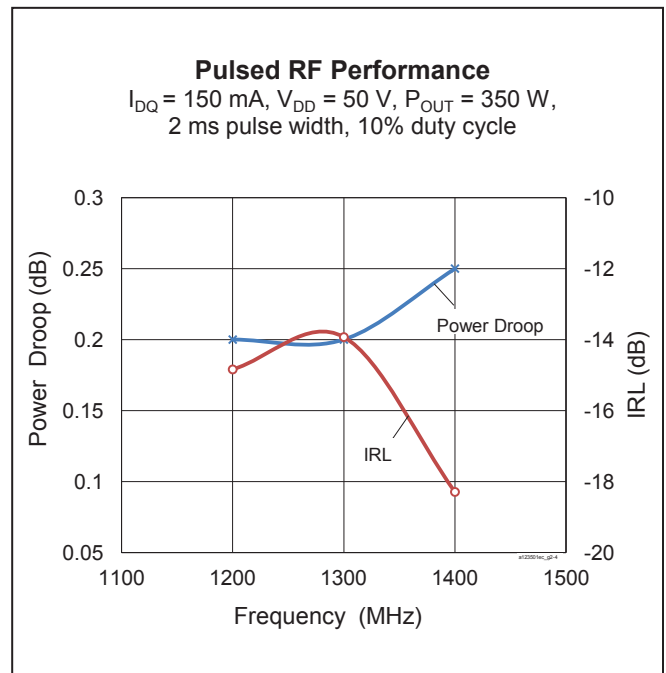
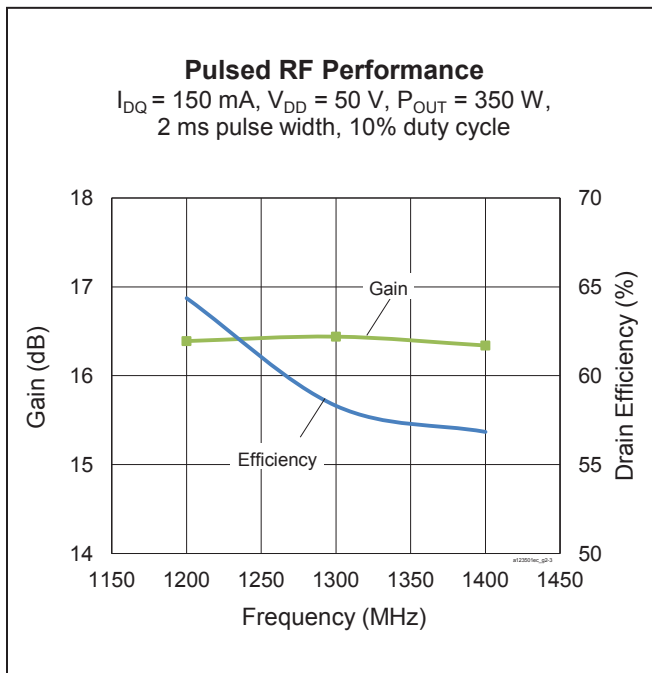
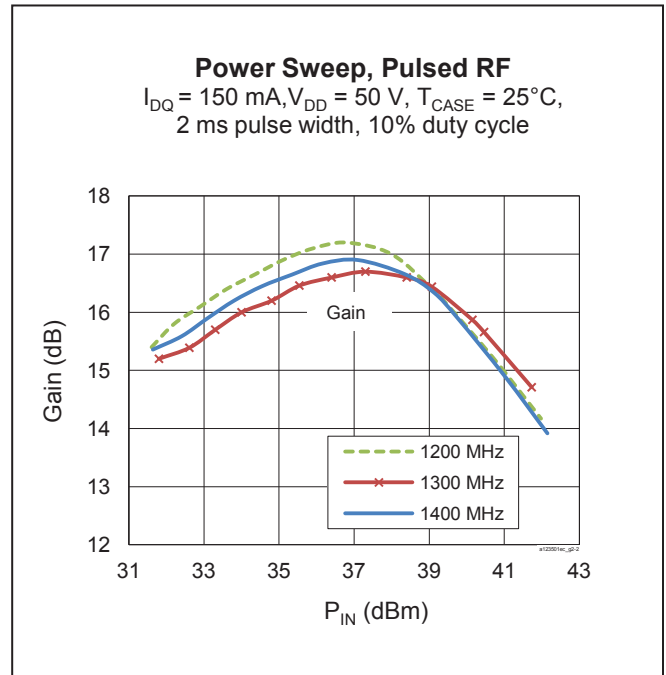
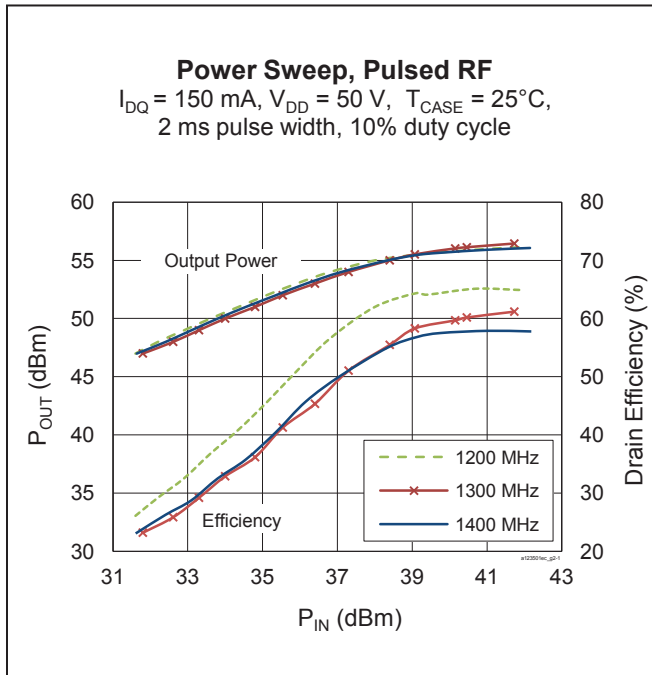
Type and Version	Order Code	Package Description	Shipping
PTVA123501EC V2 R0	PTVA123501EC-V2-R0	H-36248-2, bolt-down	Tape & Reel, 50 pcs
PTVA123501EC V2 R250	PTVA123501EC-V2-R250	H-36248-2, bolt-down	Tape & Reel, 250 pcs
PTVA123501FC V1 R0	PTVA123501FC-V1-R0	H-37248-2, earless	Tape & Reel, 50 pcs
PTVA123501FC V1 R250	PTVA123501FC-V1-R250	H-37248-2, earless	Tape & Reel, 250 pcs

**See next page for Typical RF Performance**

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

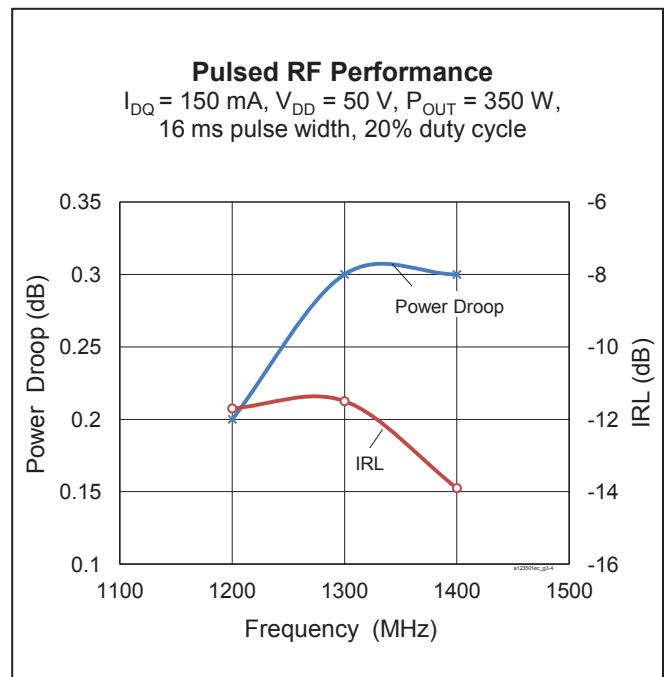
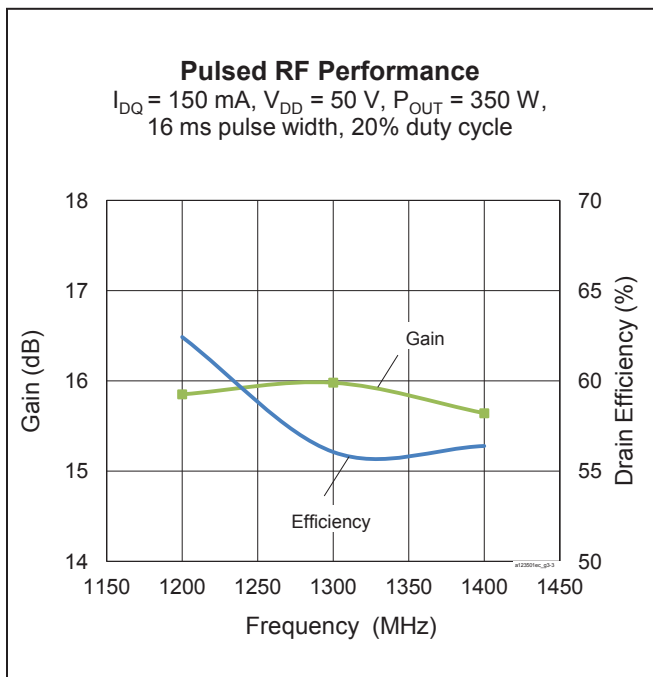
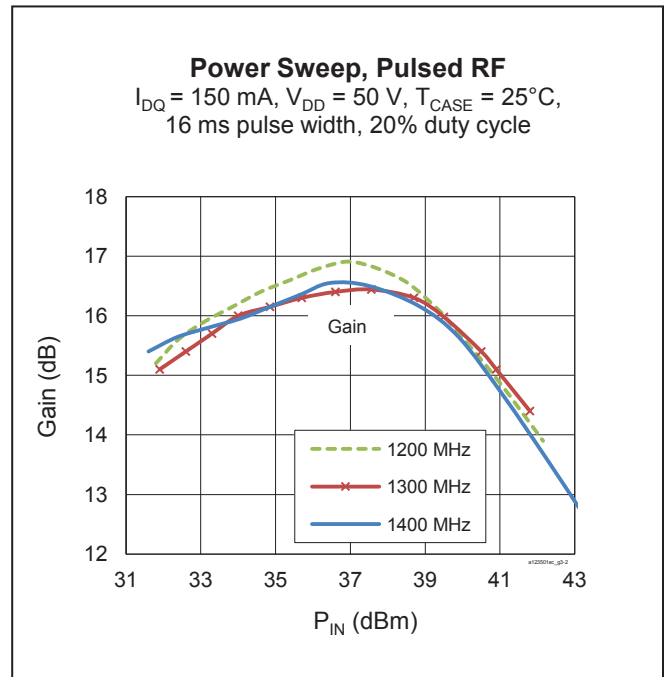
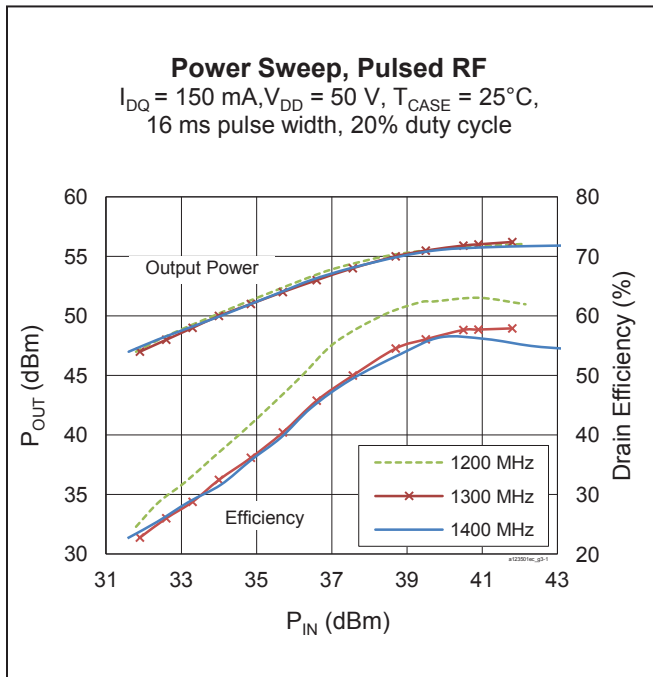


**Typical RF Performance (cont.)**



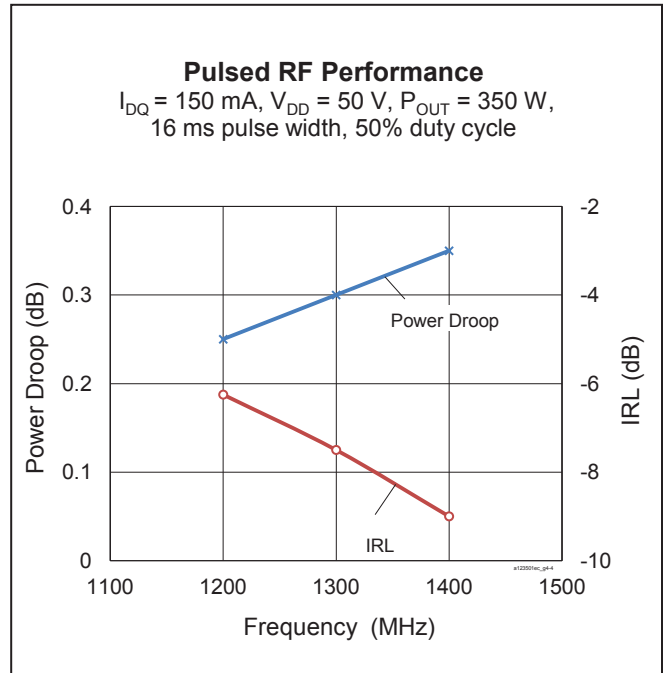
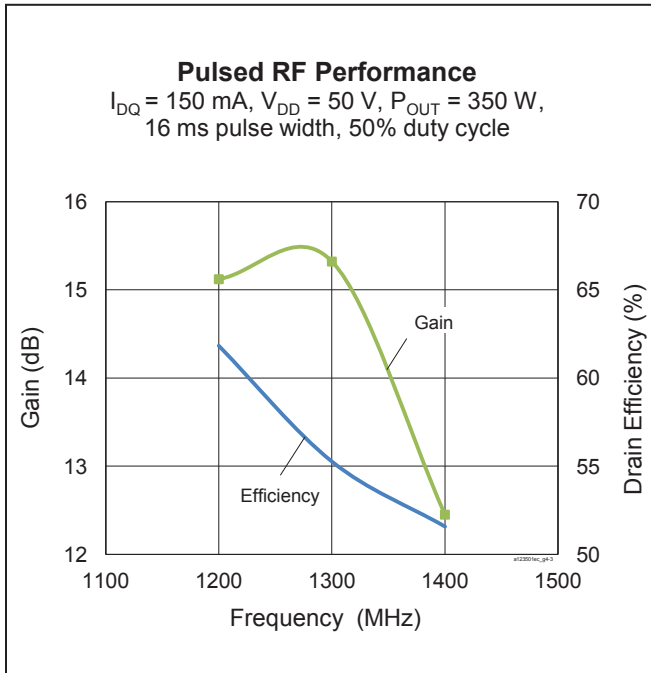
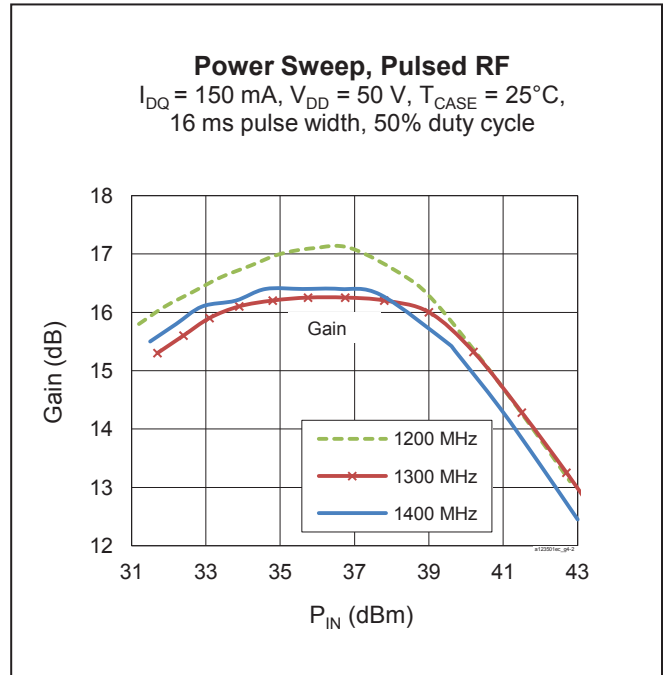
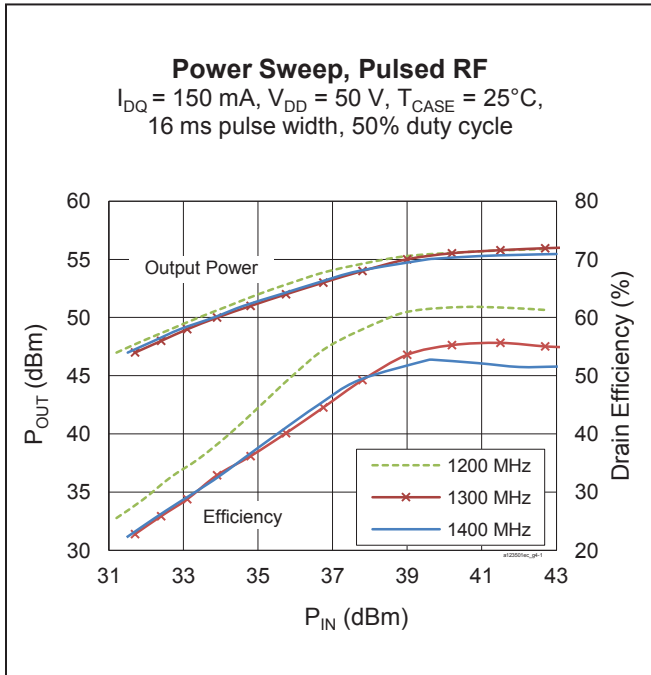


**Typical RF Performance (cont.)**



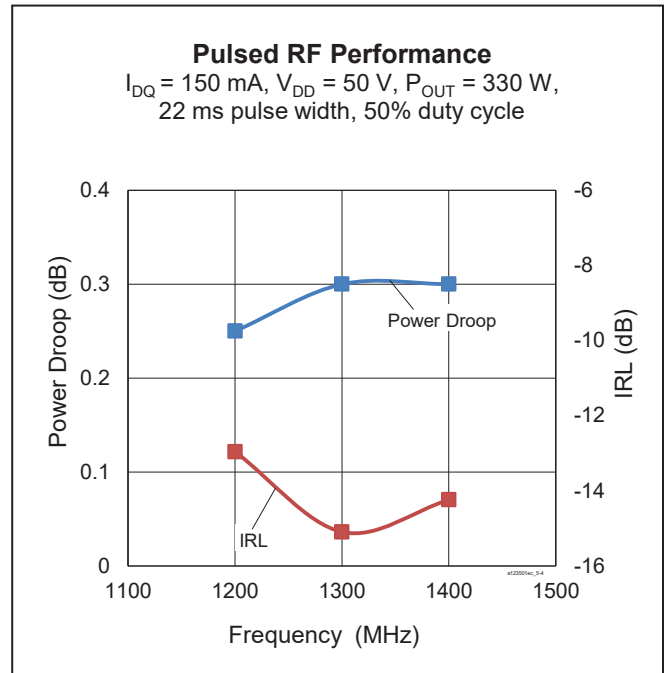
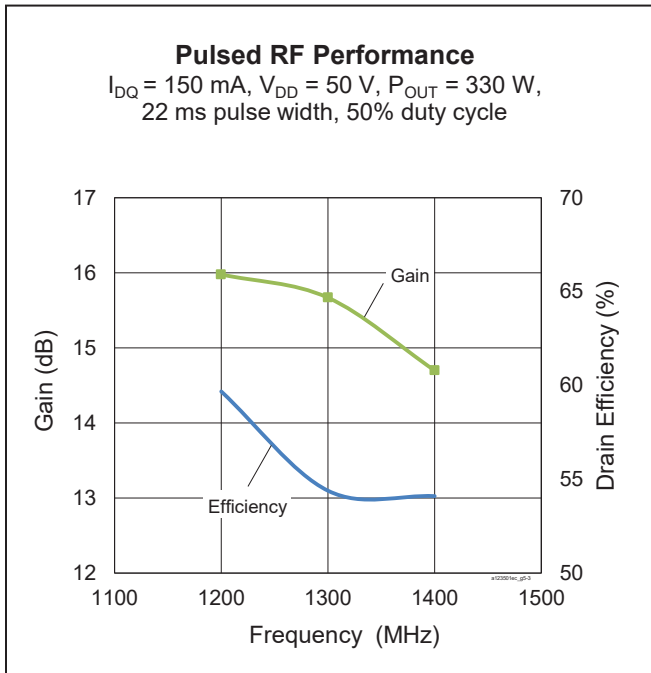
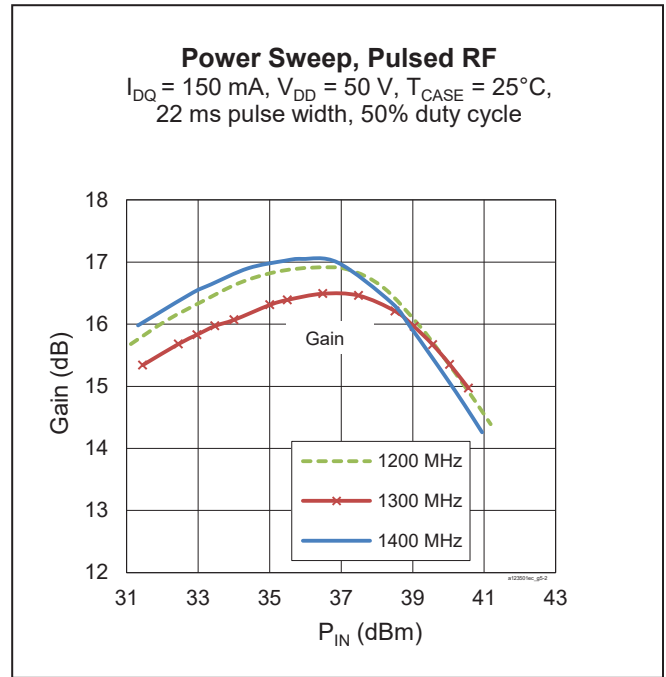
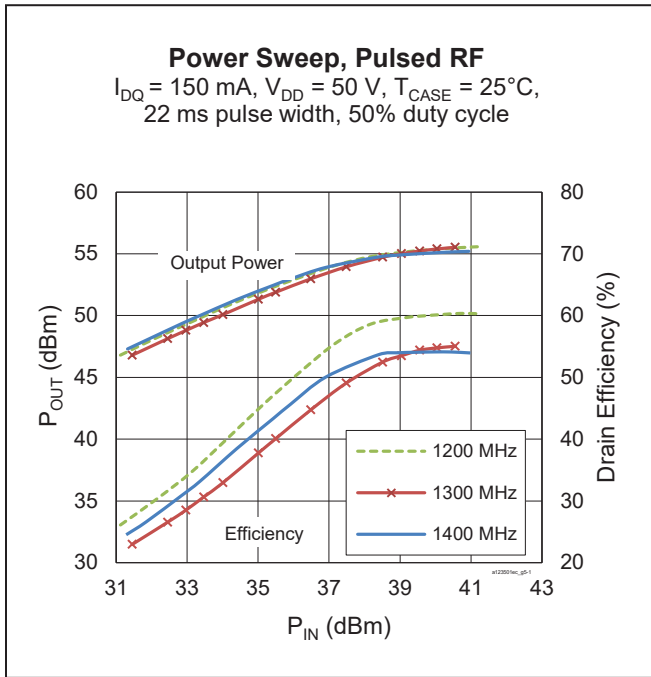


**Typical RF Performance (cont.)**





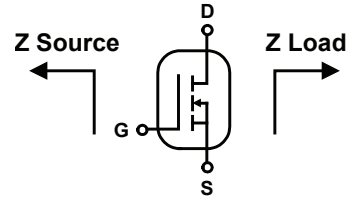
**Typical RF Performance (cont.)**





## Broadband Circuit Impedance

Freq [MHz]	Z Source $\Omega$		Z Load $\Omega$	
	R	jX	R	jX
1200	1.25	-1.99	1.96	-2.23
1300	1.54	-1.52	1.59	-2.03
1400	1.66	-1.58	1.26	-1.75



## Load Pull Performance

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]	ZI [ $\Omega$ ]	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	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]	ZI [ $\Omega$ ]	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

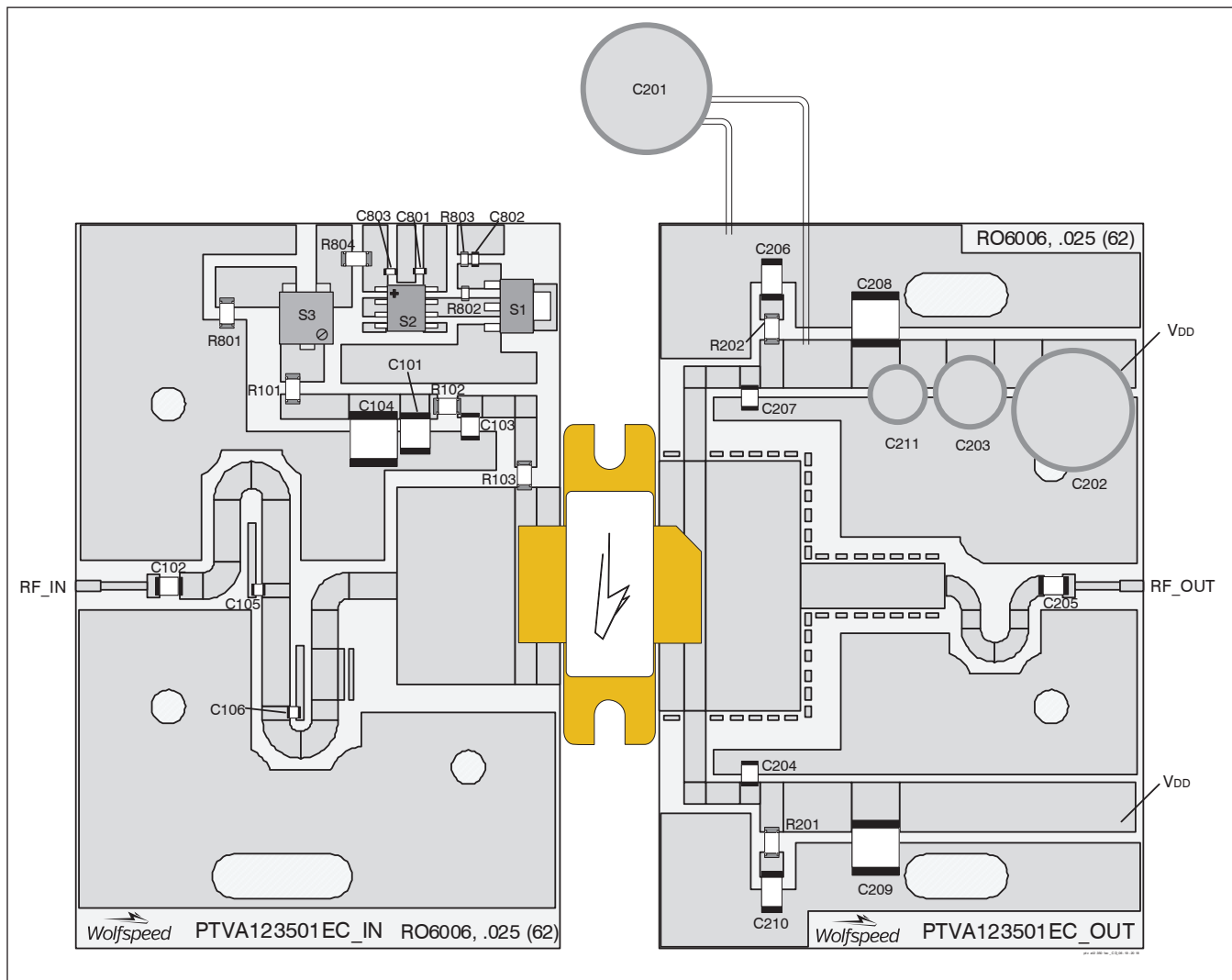
Freq [MHz]	ZI [ $\Omega$ ]	P <sub>IN</sub> [dBm]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	P <sub>G</sub> [dB]	PAE Eff [%]	Z <sub>OUT</sub> [ $\Omega$ ]
1200	1.91 - j2.04	39.60	55.80	380.19	16.20	60.71	2.22 - j2.43
1300	2.72 - j3.13	39.44	55.23	333.43	15.79	63.71	2.81 - j1.90
1400	4.83 - j1.46	39.39	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]	ZI [ $\Omega$ ]	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	16.4	60.5	2.41 - j2.50
1300	2.72 - j3.13	39.50	55.30	338.84	15.8	62.6	2.73 - j1.51
1400	4.83 - j1.46	40	55.60	363.08	15.6	60.7	1.86 - j1.37



### Reference Circuit



Reference circuit assembly diagram (not to scale)\*

Find Gerber files for this test fixture on the Wolfspeed Web site at [www.wolfspeed.com/RF](http://www.wolfspeed.com/RF)

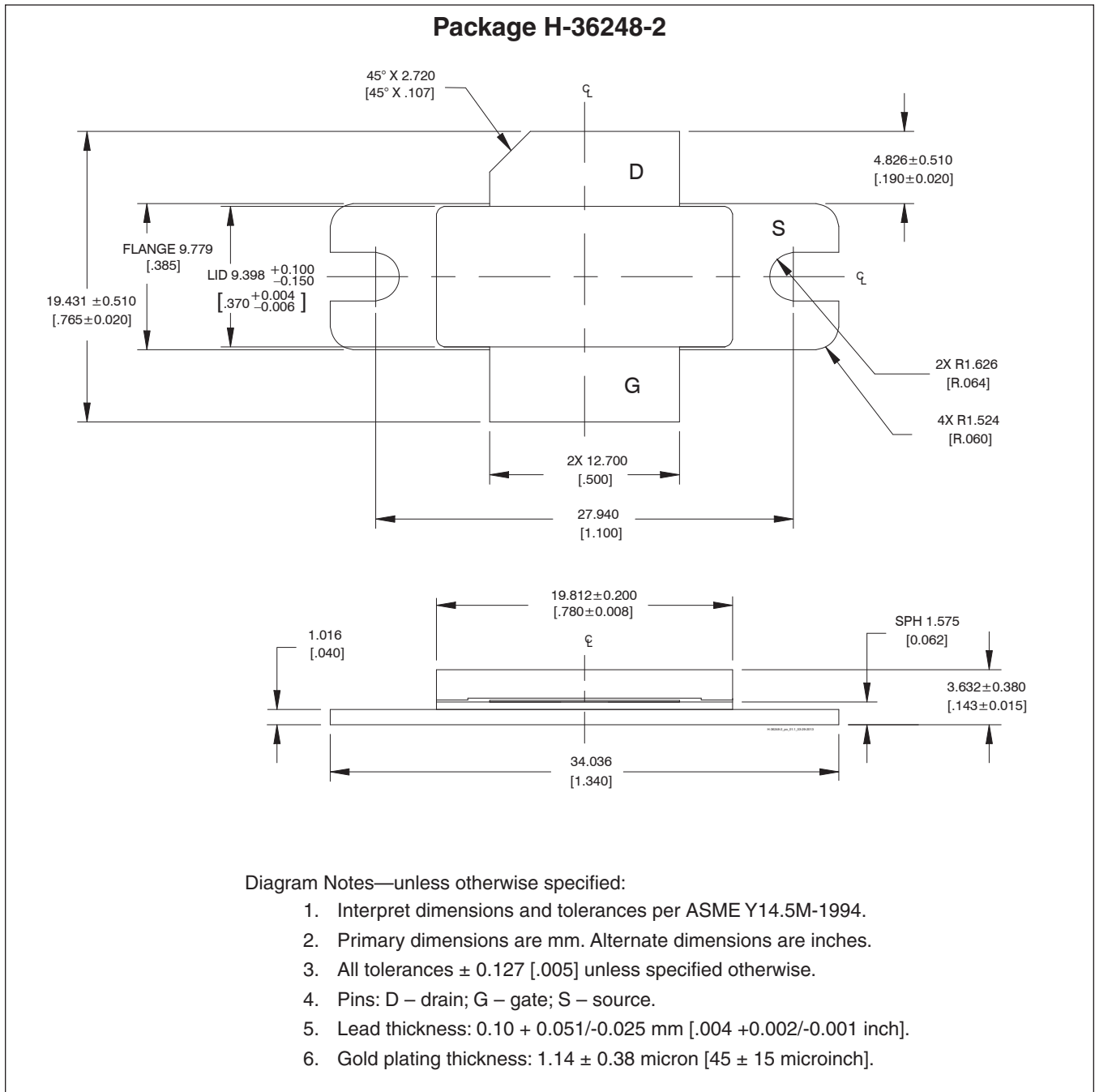
**Reference Circuit** (cont.)**Reference Circuit Assembly**

DUT	PTVA123501EC or PTVA123501FC
Test Fixture Part No.	LTN/PTVA123501EC V2 or LTN/PTVA123501FC V1
PCB	Rogers 6006, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 6.15$

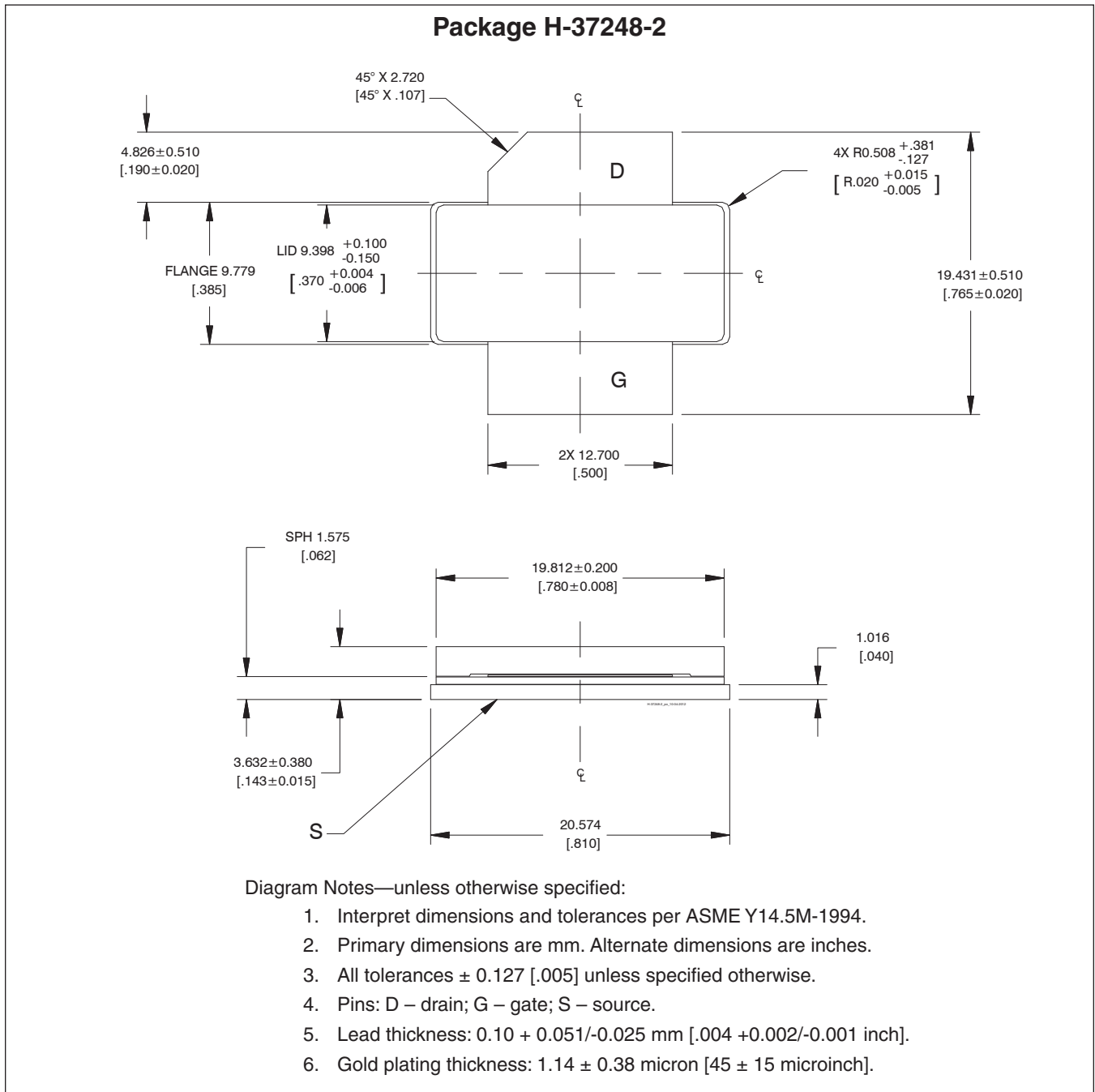
**Components Information**

Component	Description	Suggested Manufacturer	P/N
<b>Input</b>			
C101	Capacitor, 1 $\mu\text{F}$	TDK Corporation	C4532X7R2A105M230KA
C102, C103	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C104	Capacitor, 10 $\mu\text{F}$	TDK Corporation	C5750X5R1H106K230KA
C105	Capacitor, 3 pF	ATC	ATC100A3R0CW150XB
C106	Capacitor, 0.5 pF	ATC	ATC100A0R5CW150XB
C801, C802, C803	Capacitor, 1000 pF	Panasonic Electronic Components	ECJ-1VB1H102K
R101	Resistor, 1000 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ102V
R102	Resistor, 5600 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ562V
R103, R804	Resistor, 10 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ100V
R801	Resistor, 2000 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ202V
R802	Resistor, 1200 $\Omega$	Panasonic Electronic Components	ERJ-3GEYJ122V
R803	Resistor, 1300 $\Omega$	Panasonic Electronic Components	ERJ-3GEYJ132V
S1	Transistor	Infineon Technologies	BCP56
S2	Voltage Regulator	Texas Instruments	LM7805
S3	Potentiometer, 2k $\Omega$	Bourns Inc.	3224W-1-202E
<b>Output</b>			
C201	Capacitor, 6800 $\mu\text{F}$	Panasonic Electronic Components	ECO-S2AP682EA
C202	Capacitor, 100 $\mu\text{F}$	Cornell Dubilier Electronics (CDE)	SK101M100ST
C203	Capacitor, 22 $\mu\text{F}$	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C204, C205, C207	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C206, C210	Capacitor, 1 $\mu\text{F}$	TDK Corporation	C4532X7R2A105M230KA
C208, C209	Capacitor, 10 $\mu\text{F}$	TDK Corporation	C5750X5R1H106K230KA
C211	Capacitor, 10 $\mu\text{F}$	Panasonic Electronic Components	EEV-HD1H100P
R201, R202	Resistor, 5600 $\Omega$	Panasonic Electronic Components	ERJ-8GEYJ562V

Package Outline Specifications



Package Outline Specifications (cont.)



## Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2012-06-05	Preliminary	All	Data Sheet reflects preliminary specification
02	2013-03-06	Production	All	Data Sheet reflects released product specification
03	2013-07-11	Production	All 1, 9, 12	Updated to include FC version Revised Pulsed RF performance table, Minor cosmetic changes only, Added package outline
04	2014-04-29	Production	All, 1	Revised product from V1 to V2, Revised target RF Characteristics table
04.1	2014-06-26	Production	All 3	Corrected FC version to V1 throughout Corrected package to H-36248-2 and H-37248-2 in ordering table
05	2015-07-07	Production	8	Added typical performance at 22ms, 50% pulse
05.1	2016-04-26	Production	1, 3	Added ESD rating, updated ordering information
05.2	2016-02-07	Production	2	Updated operating voltage and junction temperature
06	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](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)  
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.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.