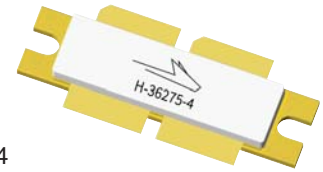


# PTVA101K02EV

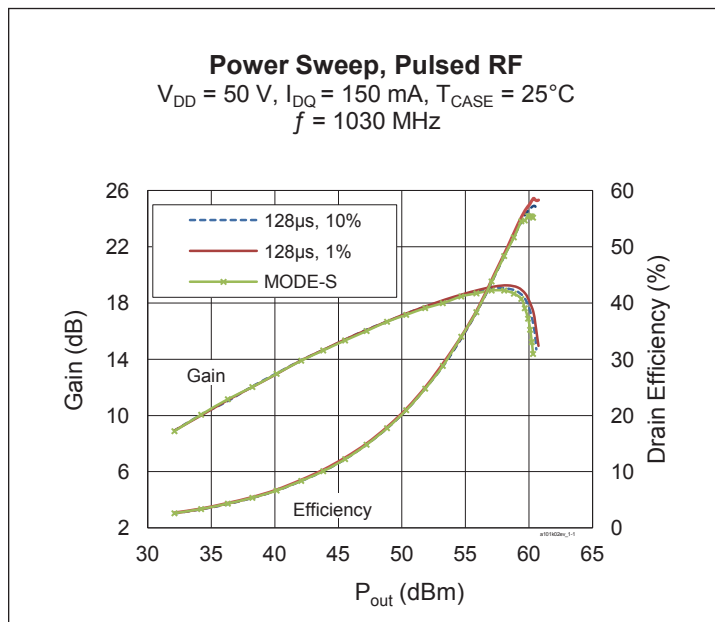
## Thermally-Enhanced High Power RF LDMOS FET 1000 W, 50 V, 1030 / 1090 MHz

### Description

The PTVA101K02EV LDMOS FET is designed for use in power amplifier applications in the 1030 MHz / 1090 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.



PTVA101K02EV  
Package H-36275-4



### Features

- Broadband input matching
- High gain and efficiency
- Integrated ESD protection
- Human Body Model Class 2 (per ANSI/ESDA/ JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant
- Capable of withstanding a 10:1 load mismatch (all phase angles) at 1000 W under MODE-S pulse condition, (32µS ON / 18µS OFF) X 80, LTDF = 6.4%.

### RF Characteristics

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

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.15\text{ A}$ ,  $P_{OUT} = 900\text{ W}$ ,  $f = 1030\text{ MHz}$ , 128 µs pulse width, 10% duty cycle

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	17	18	21	dB
Drain Efficiency	$\eta_D$	62	65	—	%

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)

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 75\text{ mA}$  per side, Input signal ( $t_r = 5\text{ ns}$ ,  $t_f = 6.5\text{ ns}$ ),  $T_{CASE} = 25^\circ\text{C}$ , class AB test

Mode of operation	f (MHz)	IRL (dB)	P <sub>1dB</sub>			P <sub>3dB</sub>			P <sub>droop(pulse)</sub> dB @ 1000 W	t <sub>r</sub> (ns)	t <sub>f</sub> (ns)
			Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)	Gain (dB)	Eff (%)	P <sub>OUT</sub> (W)			
128 $\mu\text{s}$ , 10%	1030	20	18	56	980	16	57	1090	0.18	7	8
128 $\mu\text{s}$ , 1%	1030	20	18.1	57	1010	16.1	58	1130	0.16	7	8
MODE-S (32 $\mu\text{s}$ ON / 18 $\mu\text{s}$ OFF)X80, LTDF=6.4%	1030	20	17.9	54	930	14.9	55	1060	0.45	7	8
128 $\mu\text{s}$ , 10%	1090	13	18.3	59	920	16.2	60	1050	0.16	7	8
128 $\mu\text{s}$ , 1%	1090	14	18.4	60	950	16.4	61	1080	0.17	7	8

## DC Characteristics (each 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	$\mu\text{A}$
	$V_{DS} = 105\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	10	$\mu\text{A}$
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

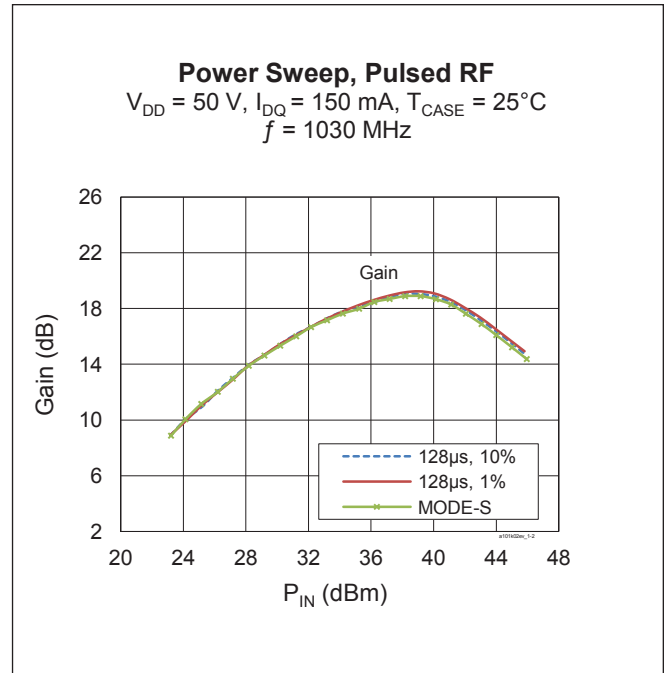
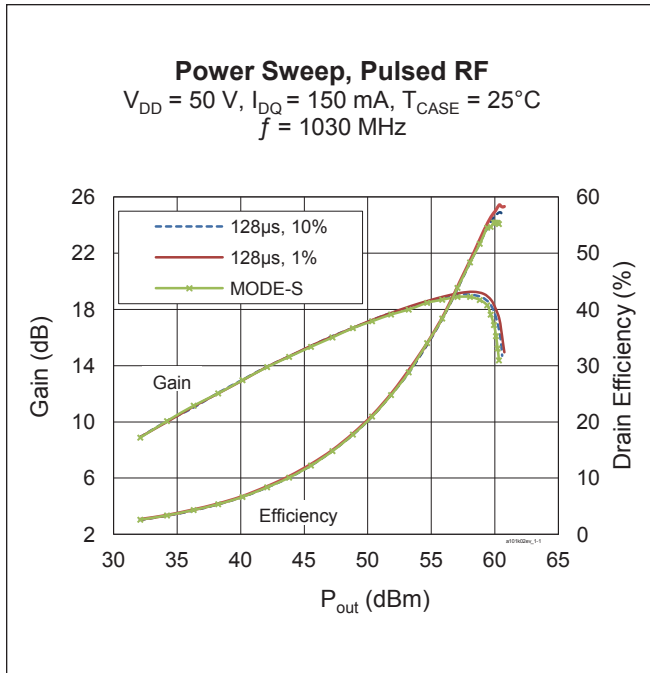
Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	105	V
Gate-Source Voltage	$V_{GS}$	-6 to +12	V
Operating Voltage	$V_{DD}$	0 to +55	V
Junction Temperature	$T_J$	225	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	$^\circ\text{C}$
Thermal Resistance ( $T_{CASE} = 70^\circ\text{C}$ , 1000 W, MODE-S)	$R_{\theta JC}$	0.16	$^\circ\text{C/W}$



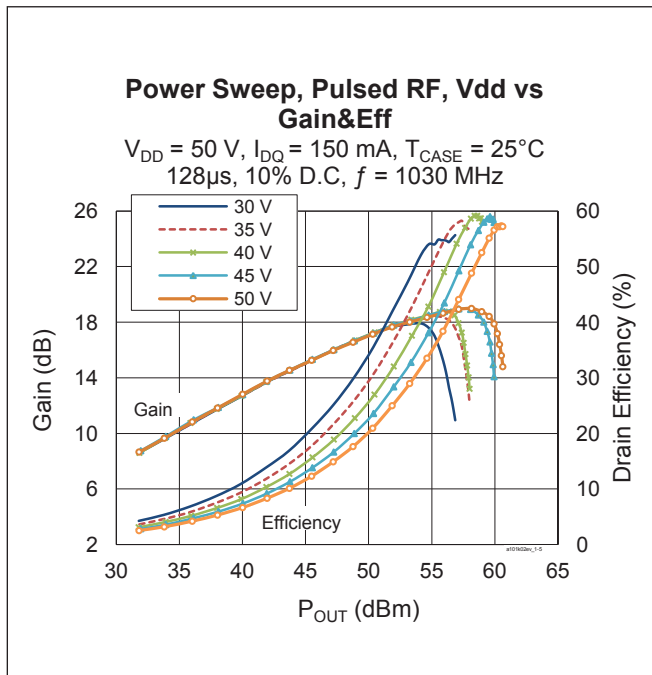
**Ordering Information**

Type and Version	Order Code	Package and Description	Shipping
PTVA101K02EV V1 R0	PTVA101K02EV-V1-R0	H-36275-4, bolt-down	Tape & Reel, 50pcs
PTVA101K02EV V1 R250	PTVA101K02EV-V1-R250	H-36275-4, bolt-down	Tape & Reel, 250pcs

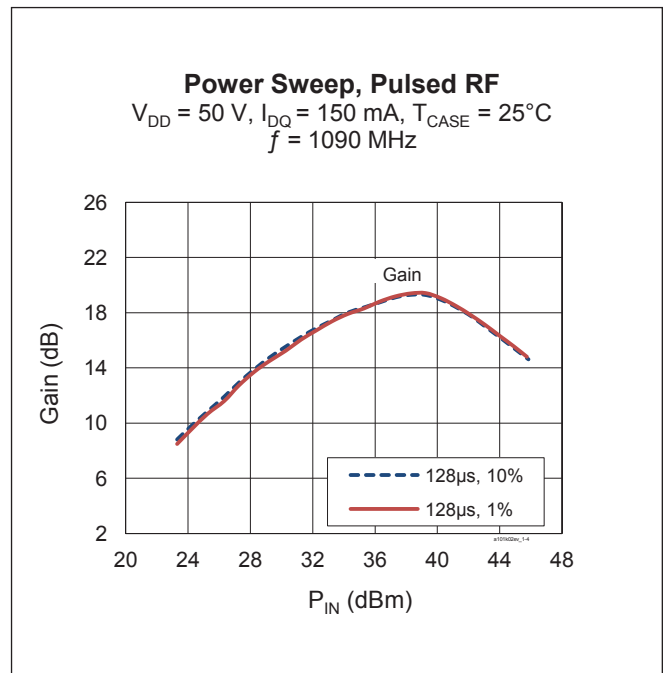
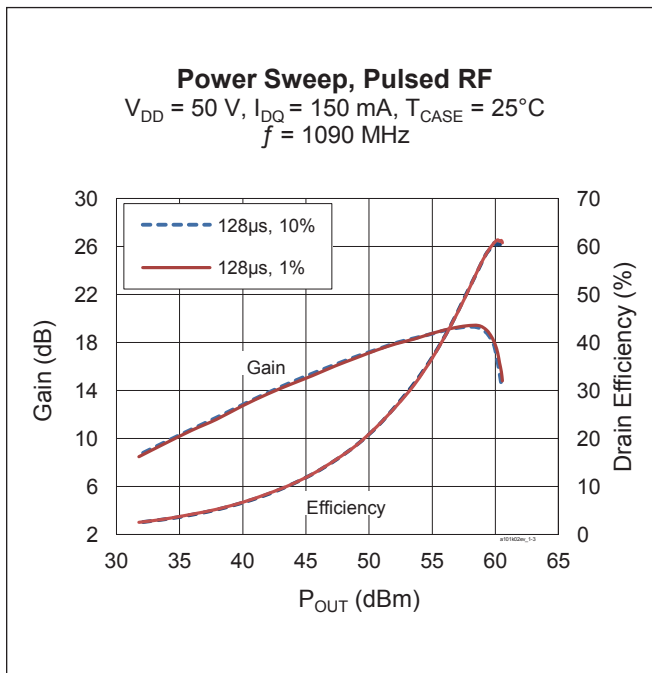
**Typical RF Performance** (tested with LTN/PTVA101K02EV V1 test fixture, 1030 MHz)



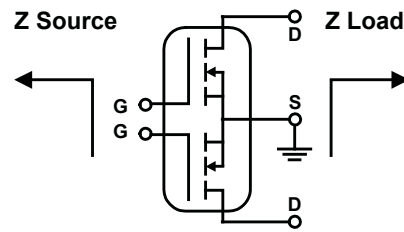
**Typical RF Performance** (cont.) (tested with LTN/PTVA101K02EV V1 test fixture, 1030 MHz)



**Typical RF Performance** (tested with LTN/PTVA101K02EV E6 test fixture, 1090 MHz)



## Broadband Circuit Impedance



Freq [MHz]	Z Source $\Omega$		Z Load $\Omega$	
	R	jX	R	jX
1030	2.00	1.51	1.48	0.07
1090	2.35	0.64	1.12	-0.28

Note: Measurement on single side.

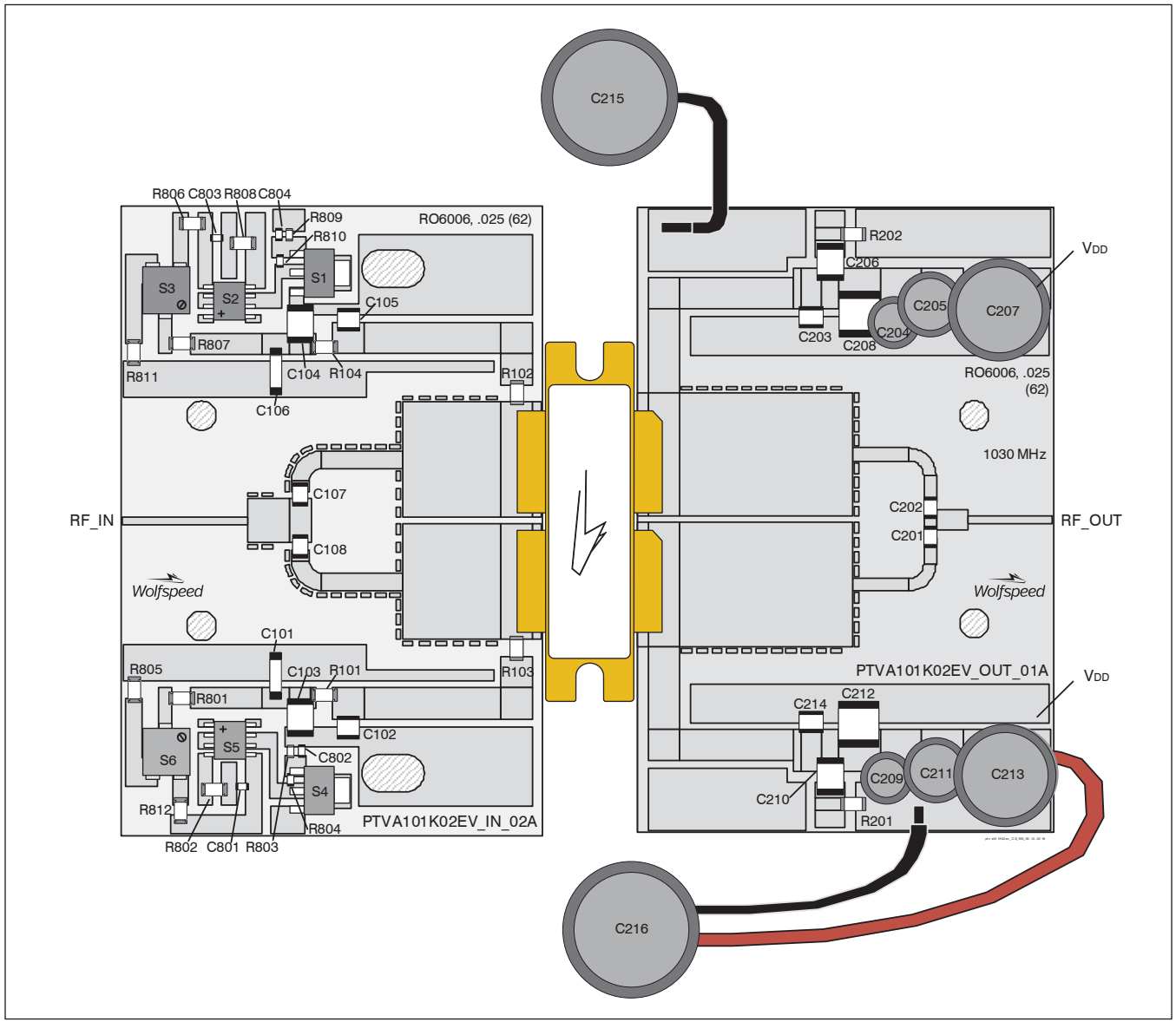
## Load Pull Performance

Each Side Load Pull Performance –16  $\mu$ s pulse width, 10% duty cycle, class AB,  $V_{DD} = 50$  V, 100 mA

Freq [MHz]	Max Output Power					Max Efficiency					Z Optimum					
	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	Eff [%]	Gain [dB]	Z <sub>Load</sub> [ $\Omega$ ]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	Eff [%]	Gain [dB]	Z <sub>Load</sub> [ $\Omega$ ]	P <sub>OUT</sub> [dBm]	P <sub>OUT</sub> [W]	Eff [%]	Gain [dB]	Z <sub>Load</sub> [ $\Omega$ ]	Z <sub>Source</sub> [ $\Omega$ ]
960	58.10	645.65	61.90	16.46	1.14 - j0.08	56.00	398.11	72.20	18.68	0.79 + j0.69	57.50	562.34	68.00	17.50	0.91 + j0.33	1.41 - j1.62
1030	57.80	602.56	55.60	16.00	0.91 - j0.08	56.00	398.11	71.00	18.80	0.71 + j0.66	57.10	512.86	65.00	17.50	0.78 + j0.34	1.76 - j2.12
1090	57.90	616.60	61.80	16.95	0.95 + j0.27	56.20	416.87	69.80	18.68	0.83 + j0.90	57.40	549.54	65.70	17.73	0.87 + j0.62	2.34 - j2.39
1150	57.36	544.50	50.52	15.80	1.11 + j0.12	56.90	489.78	65.00	17.63	0.94 + j0.76	57.20	524.81	61.20	17.00	1.01 + j0.48	3.21 - j1.47
1215	57.26	532.11	53.90	15.60	1.20 + j0.01	55.40	346.74	62.30	17.46	0.59 + j0.81	56.70	467.74	58.45	16.60	0.88 + j0.49	2.37 - j0.84



**Reference Circuit** (LTN/PTVA101K02EV V1 test fixture, 1030 MHz)



Reference circuit assembly diagram (not to scale)\*

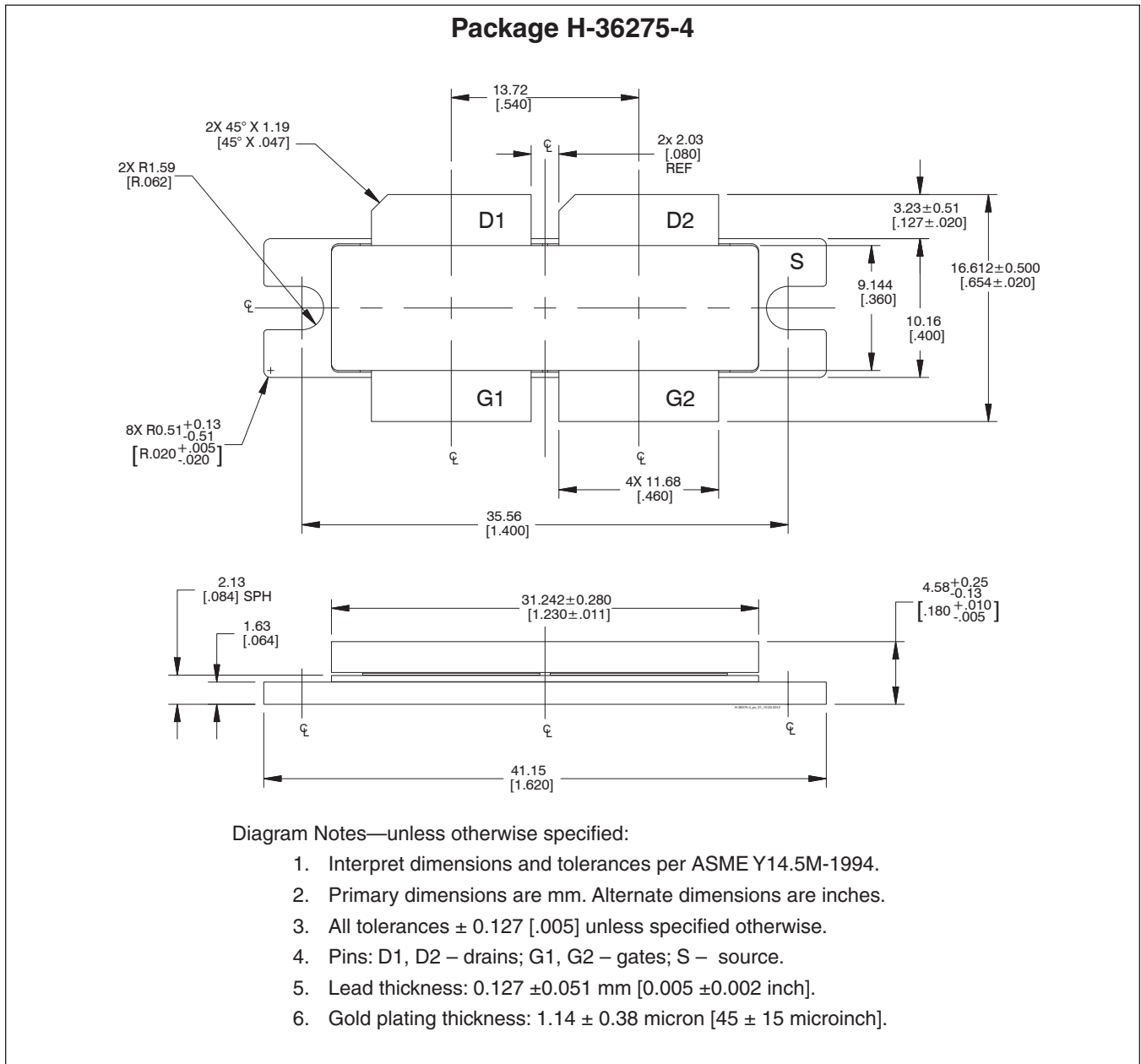
**Reference Circuit** (cont.)**Reference Circuit Assembly**

DUT	Test Fixture Part No.	PCB	Frequency (MHz)
PTVA101K02EV	LTN/PTVA101K02EV V1	Rogers 6006, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 6.15$	1030 MHz
PTVA101K02EV	LTN/PTVA101K02EV E4	Rogers 6006, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 6.15$	1090 MHz
PTVA101K02EV	LTN/PTVA101K02EV E6	Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 10.2$	1090 MHz
PTVA101K02EV	LTN/PTVA101K02EV E8	Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 10.2$	1030 MHz

**Components Information**

Component	Description	Suggested Manufacturer	P/N
<b>Input</b>			
C101, C106	Capacitor, 10 $\mu$ F	TDK Corporation	C5750X5R1H106K230KA
C102, C105, C107, C108	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C103, C104	Capacitor, 1 $\mu$ F	TDK Corporation	C4532X7R2A105M230KA
C801, C802, C803, C804	Capacitor, 1000 pF	Panasonic Electronic Components	ECJ-1VB1H102K
R101, R104, R801, R807	Resistor, 10 Ohm	Panasonic Electronic Components	ERJ-8GEYJ100V
R102, R103	Resistor, 100 Ohm	Panasonic Electronic Components	ERJ-8GEYJ101V
R802, R808	Resistor, 6200 Ohm	Panasonic Electronic Components	ERJ-8GEYJ623V
R803, R809	Resistor, 1300 Ohm	Panasonic Electronic Components	ERJ-3GEYJ132V
R804, R810	Resistor, 1200 Ohm	Panasonic Electronic Components	ERJ-3GEYJ122V
R805, R806, R811, R812	Resistor, 2000 Ohm	Panasonic Electronic Components	ERJ-8GEYJ202V
S1, S4	Transistor	Infineon Technologies	BCP56
S2, S5	Voltage regulator	National Semiconductor	LM7805
S3, S6	Potentiometer, 2k ohm	Bourns Inc.	3224W-202ECT-ND
<b>Output</b>			
C201, C202, C203, C214	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C204, C209	Capacitor, 100 $\mu$ F	Panasonic Electronic Components	EEV-HD1V101P
C205, C211	Capacitor, 22 $\mu$ F	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C206, C210	Capacitor, 1 $\mu$ F	TDK Corporation	C4532X7R2A105M230KA
C207, C213	Capacitor, 100 $\mu$ F	Cornell Dubilier Electronics (CDE)	SK101M100ST
C208, C212	Capacitor, 10 $\mu$ F	TDK Corporation	C5750X5R1H106K230KA
C215, C216	Capacitor, 6800 $\mu$ F	Panasonic Electronic Components	ECO-S2AP682EA
R201, R202	Resistor, 5600 Ohm	Panasonic Electronic Components	ERJ-8GEYJ562V

Package Outline Specifications





## Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2012-06-07	Preliminary	All	Data Sheet reflects preliminary specification
02	2013-04-15	Production	1	Data Sheet reflects released product specification
02.1	2016-04-19	Production	1, 2	Added ESD rating, updated ordering information
02.2	2017-02-09	Production	2	Updated operating voltage and junction temperature
03	2018-06-12	Production	All	Converted to Wolfspeed Data Sheet

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## Notes

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