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Contact us

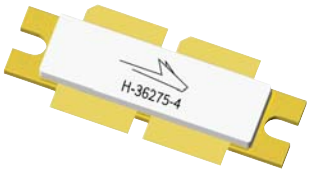
Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

PTVA101K02EV

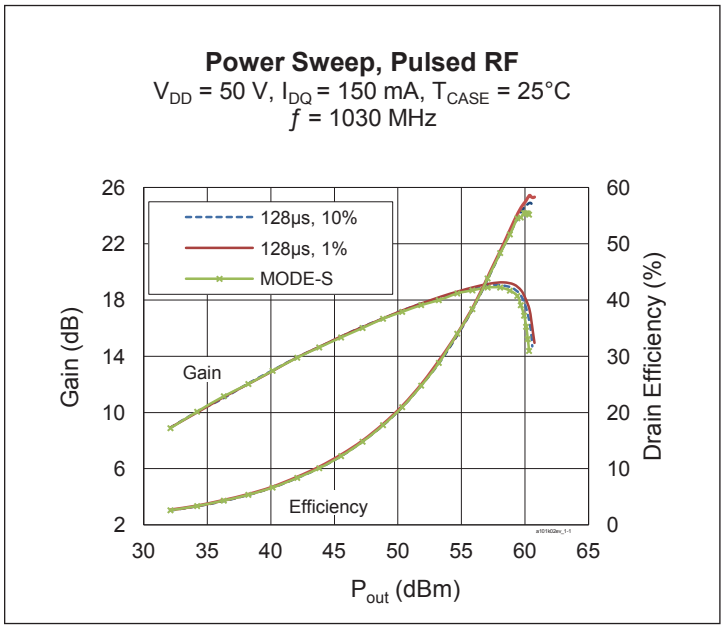
Thermally-Enhanced High Power RF LDMOS FET
1000 W, 50 V, 1030 / 1090 MHz

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

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

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} = 75 mA per side, Input signal (t_r = 5 ns, t_f = 6.5 ns), T_{CASE} = 25°C, class AB test

Mode of operation	f	IRL	P_{1dB}			P_{3dB}			$P_{droop(pulse)}$	t_r	t_f
	(MHz)	(dB)	Gain (dB)	Eff (%)	P_{OUT} (W)	Gain (dB)	Eff (%)	P_{OUT} (W)	dB @ 1000 W	(ns)	(ns)
128 µs, 10%	1030	20	18	56	980	16	57	1090	0.18	7	8
128 µs, 1%	1030	20	18.1	57	1010	16.1	58	1130	0.16	7	8
MODE-S (32µS ON / 18µS OFF)X80, LTDF=6.4%	1030	20	17.9	54	930	14.9	55	1060	0.45	7	8
128 µs, 10%	1090	13	18.3	59	920	16.2	60	1050	0.16	7	8
128 µs, 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 V, I_{DS} = 10 mA	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	V_{DS} = 50 V, V_{GS} = 0 V	I_{DSS}	—	—	1	µA
	V_{DS} = 105 V, V_{GS} = 0 V	I_{DSS}	—	—	10	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

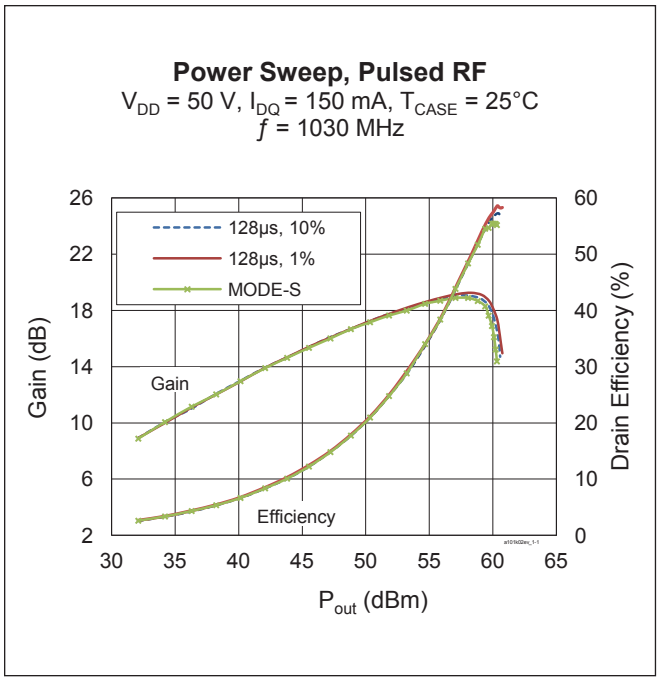
Maximum Ratings

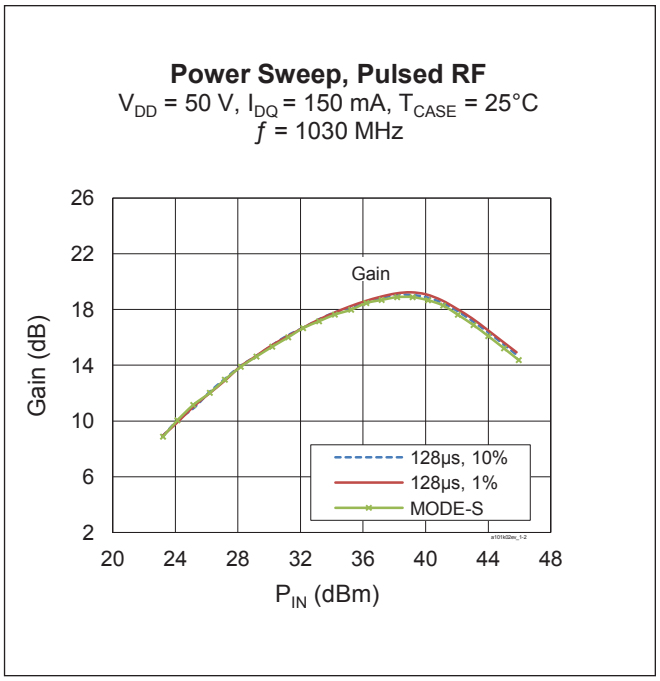
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	105	V
Gate-Source Voltage	V_{GS}	–6 to +12	V
Operating Voltage	V_{DD}	0 to +55	V
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 1000 W, MODE–S)	$R_{\theta JC}$	0.16	°C/W

Ordering Information

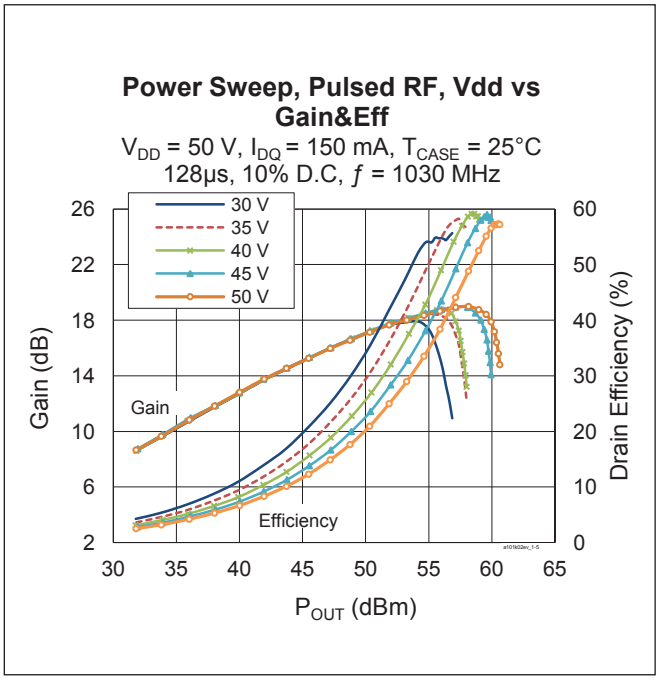
Type and Version	Order Code	Package and Description	Shipping
PTVA101K02EV V1 R0	PTVA101K02EV-V1-R0	H-36275-4, bolt-down	Tape & Reel, 50pcs
PTVA101K02EV V1 R250	PTVA101K02EV-V1-R250	H-36275-4, bolt-down	Tape & Reel, 250pcs

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

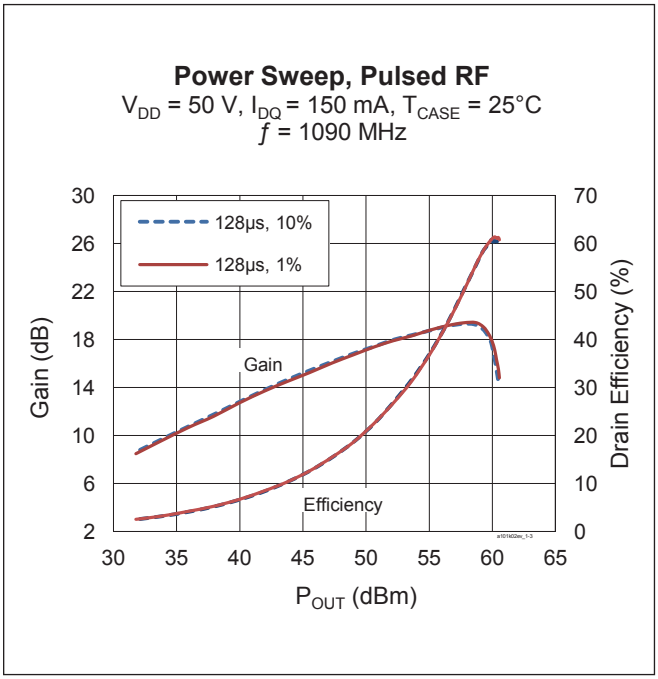


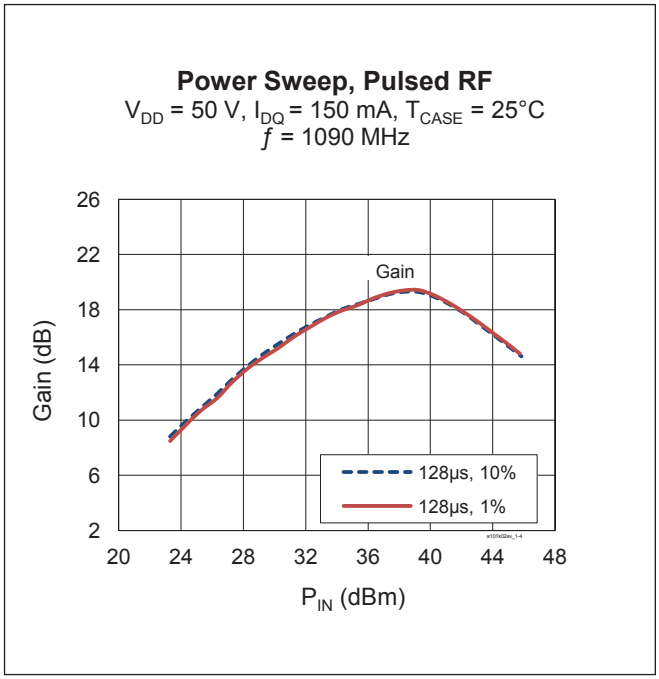


Typical RF Performance (cont.) (tested with LTN/PTVA101K02EV V1 test fixture, 1030 MHz)

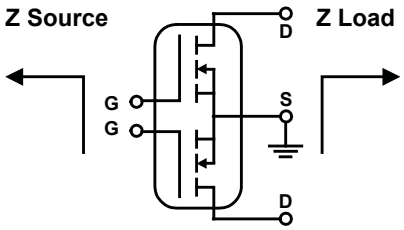


Typical RF Performance (tested with LTN/PTVA101K02EV E6 test fixture, 1090 MHz)





Broadband Circuit Impedance



Freq [MHz]	Z Source Ω		Z Load Ω	
	R	jX	R	jX
1030	2.00	1.51	1.48	0.07
1090	2.35	0.64	1.12	–0.28

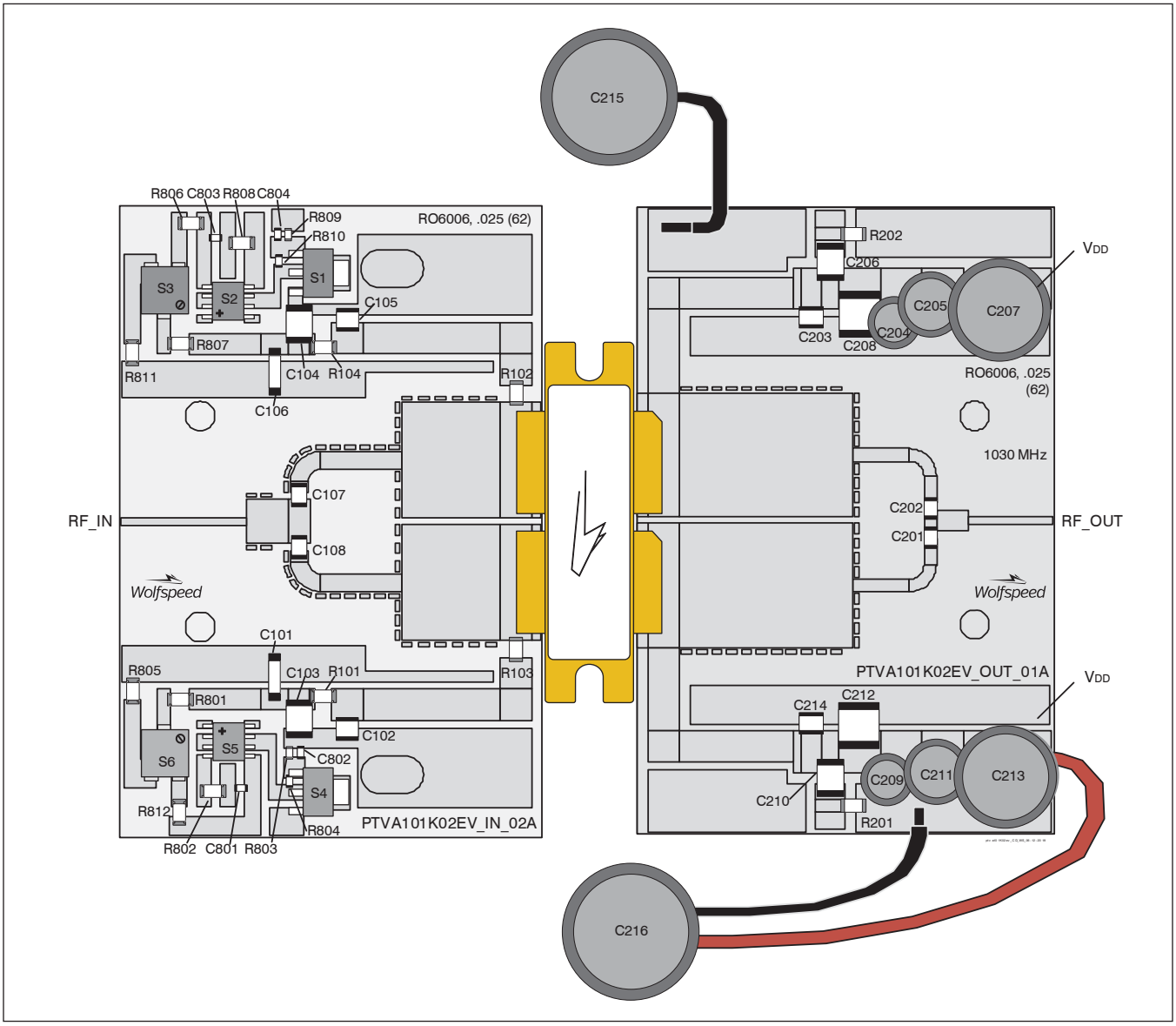
Note: Measurement on single side.

Load Pull Performance

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

	Max Output Power					Max Efficiency					Z Optimum					
Freq [MHz]	P_{OUT} [dBm]	P_{OUT} [W]	Eff [%]	Gain [dB]	Z_{Load} [Ω]	P_{OUT} [dBm]	P_{OUT} [W]	Eff [%]	Gain [dB]	Z_{Load} [Ω]	P_{OUT} [dBm]	P_{OUT} [W]	Eff [%]	Gain [dB]	Z_{Load} [Ω]	Z_{Source} [Ω]
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, εr = 6.15	1030 MHz
PTVA101K02EV	LTN/PTVA101K02EV E4	Rogers 6006, 0.635 mm [0.025"] thick, 2 oz. copper, εr = 6.15	1090 MHz
PTVA101K02EV	LTN/PTVA101K02EV E6	Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, εr = 10.2	1090 MHz
PTVA101K02EV	LTN/PTVA101K02EV E8	Rogers 3010, 0.635 mm [0.025"] thick, 2 oz. copper, εr = 10.2	1030 MHz

Components Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C106	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C102, C105, C107, C108	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C103, C104	Capacitor, 1 µF	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
Output			
C201, C202, C203, C214	Capacitor, 39 pF	ATC	ATC100B390KW500XB
C204, C209	Capacitor, 100 µF	Panasonic Electronic Components	EEV-HD1V101P
C205, C211	Capacitor, 22 µF	Cornell Dubilier Electronics (CDE)	SEK220M100ST
C206, C210	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C207, C213	Capacitor, 100 µF	Cornell Dubilier Electronics (CDE)	SK101M100ST
C208, C212	Capacitor, 10 µF	TDK Corporation	C5750X5R1H106K230KA
C215, C216	Capacitor, 6800 µF	Panasonic Electronic Components	ECO-S2AP682EA
R201, R202	Resistor, 5600 Ohm	Panasonic Electronic Components	ERJ-8GEYJ562V

Package Outline Specifications

Package H-36275-4

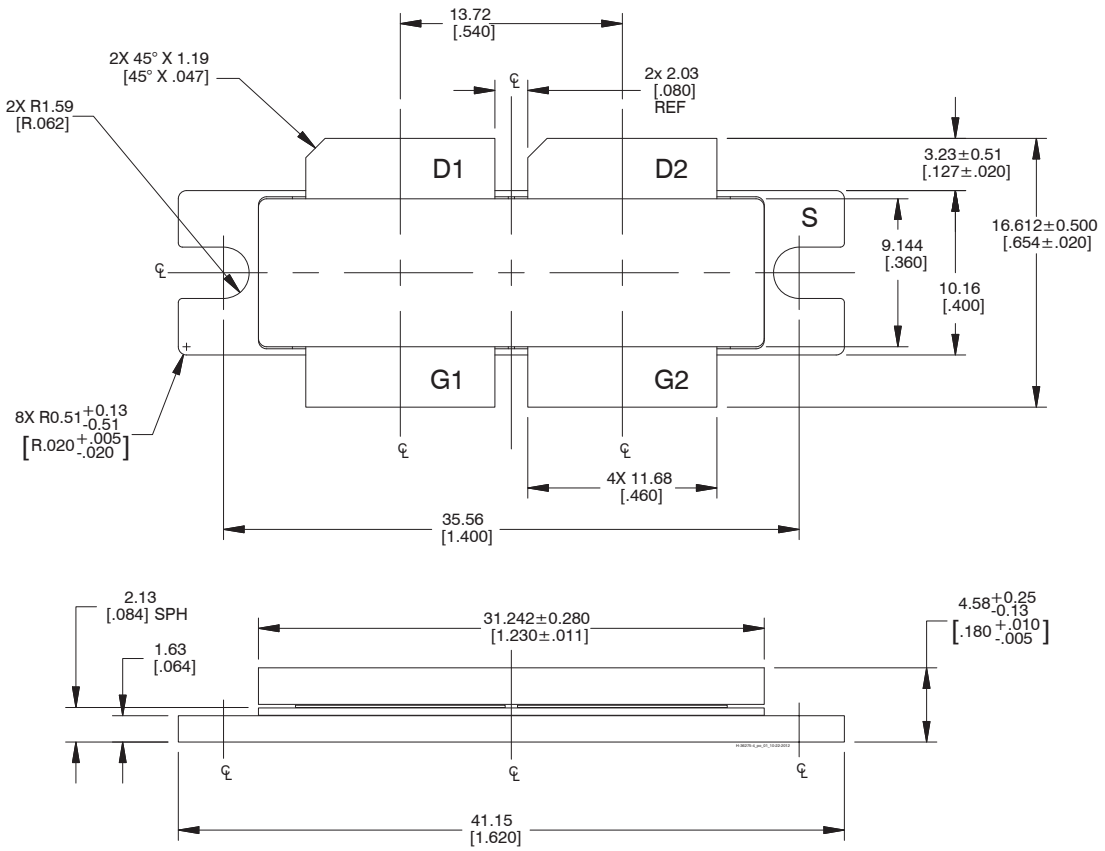


Diagram Notes—unless otherwise specified:

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	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

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

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