

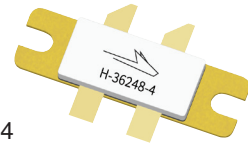
PTVA043502EC/FC

Thermally-Enhanced High Power RF LDMOS FETs 350 W, 50 V, 470 – 860 MHz

Description

The PTVA043502EC and PTVA043502FC are LDMOS FETs designed for use in power amplifier applications in the 470 to 860 MHz frequency band. Features include high gain and thermally-enhanced package with bolt-down and earless flanges. Manufactured with Wolfspeed's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTVA043502EC
Package H-36248-4

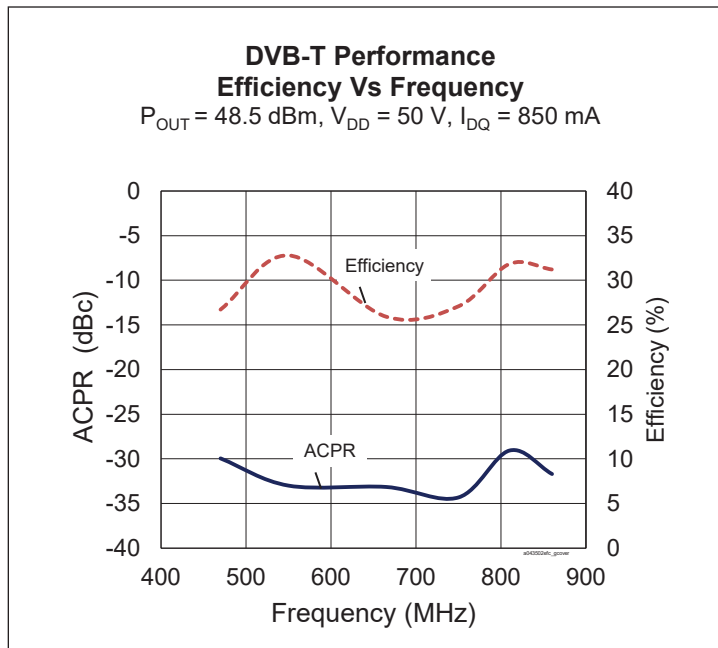


PTVA043502FC
Package H-37248-4



Features

- Input matched
- Integrated ESD protection
- Low thermal resistance
- High gain
- Capable of handling 10:1 VSWR @ 50 V, 70 W average power (DVB-T 8K OFDM, 64QAM) Integrated ESD protection
- Low thermal resistance
- Pb-free and RoHS compliant



RF Characteristics

DVB-T (8K OFMD, 64QAM) Characteristics (tested in Wolfspeed test fixture, narrowband 858 MHz)

$V_{DD} = 50 \text{ V}$, $I_{DQ} = 850 \text{ mA}$, $P_{OUT} = 70 \text{ W avg}$, $f = 858 \text{ MHz}$, input PAR = 3 dB (unclipped), output PAR = 7 dB @ 0.01% CCDF probability

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17	18	—	dB
Drain Efficiency	η_D	26	29.5	—	%
Adjacent Channel Power Ratio (ACPR integrated over 200 KHz BW at + 4.3 MHz offset from center frequency)	ACPR	—	-29.5	-26	dBc

All published data at $T_{CASE} = 25^\circ\text{C}$ unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics

Typical DVB-T (8K OFDM, 64QAM) Performance (not subject to production test, verified by design/characterization in Wolfspeed test fixture)

$V_{DD} = 50\text{ V}$, $I_{DQ} = 425\text{ mA}$ per side, $t_f = 25^\circ\text{C}$, DVB-T signal, BW = 8MHz, Mode = 8k, Modulation = 64-QAM, Guard = 1/4, Code rate = 1/2, PAR= 10.5 dB, ACPR integrated over 200 KHz BW at +4.3 MHz offset from center frequency

Freq (MHz)	Gain (dB)	IRL (dB)	I (A)	Eff (%)	P _{OUT} Avg (W)	ACPR Up	ACPR Low
470	19.8	5.3	5.3	26.7	70.8	30.76	30
550	19.24	5.8	4.36	32.8	71.45	34	33
665	17.89	8	5.49	25.9	71.12	34.6	33.15
750	17.26	4.9	5.3	27.1	71.78	36	34.32
810	17.55	4.8	4.5	31.8	71.61	29.1	29.1
860	17.82	5.67	4.58	31.2	71.45	29.8	31.7

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}	—	—	0.1	μA
	$V_{DS} = 111\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	1.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.1	—	Ω
Operating Gate Voltage	$V_{DS} = 50\text{ V}$, $I_{DQ} = 850\text{ mA}$	V_{GS}	3	6	8	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 ($T_{CASE} = 70^\circ\text{C}$, 230 W CW)	$R_{\theta JC}$	0.364	$^\circ\text{C/W}$

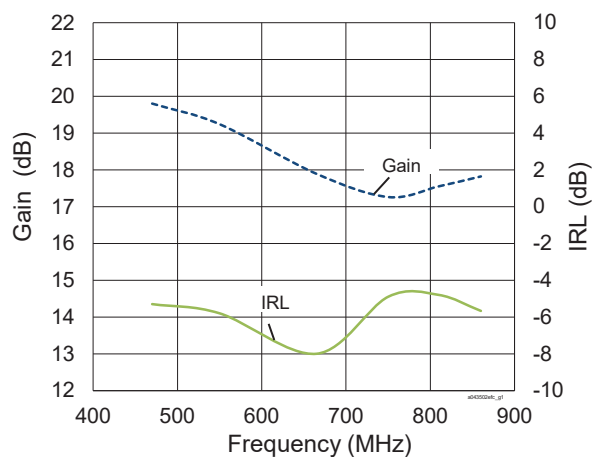
Ordering Information

Type and Version	Order Code	Package and Description	Shipping
PTVA043502EC V1 R0	PTVA043502EC-V1-R0	H-36248-4, bolt-down	Tape & Reel, 50 pcs
PTVA043502EC V1 R2	PTVA043502EC-V2-R0	H-36248-4, bolt-down	Tape & Reel, 250 pcs
PTVA043502FC V1 R0	PTVA043502FC-V1-R0	H-37248-4, earless flange	Tape & Reel, 50 pcs
PTVA043502FC V1 R2	PTVA043502FC-V1-R2	H-37248-4, earless flange	Tape & Reel, 250 pcs

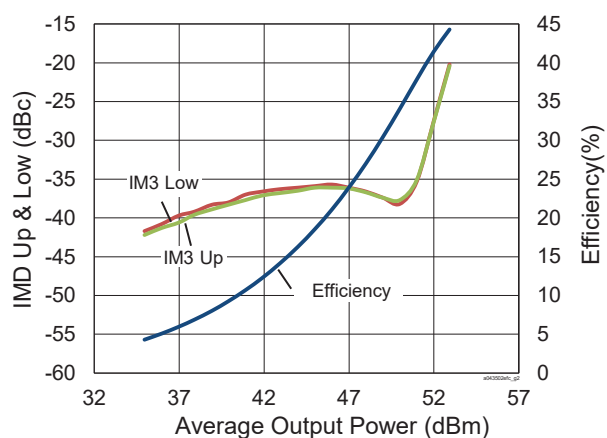
See next page for Typical Performance

Typical Performance (data taken in a production test fixture)

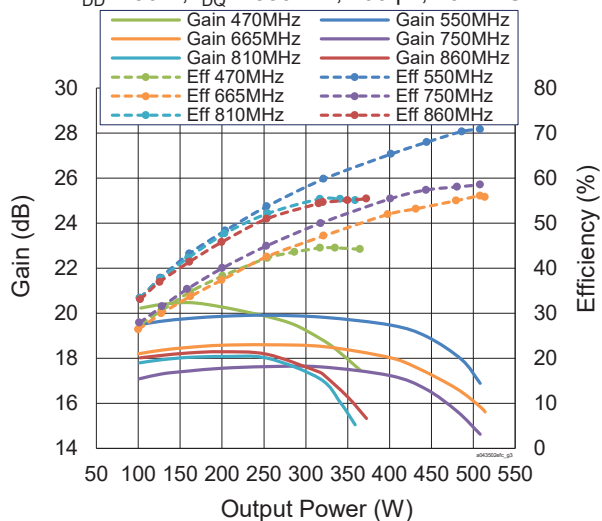
DVB-T Performance
Gain & IRL vs Frequency
 $P_{OUT} = 48.5 \text{ dBm}$, $V_{DD} = 50 \text{ V}$, $I_{DQ} = 850 \text{ mA}$



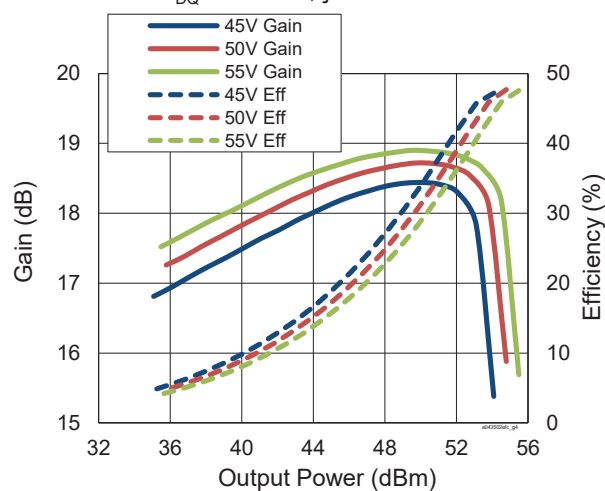
Two Tone Drive-up
 $V_{DD} = 50 \text{ V}$, $I_{DQ} = 850 \text{ mA}$, $f = 860 \text{ MHz}$,
 1 MHz Tone Spacing



Pulsed RF Performance
 $V_{DD} = 50 \text{ V}$, $I_{DQ} = 850 \text{ mA}$, $100 \mu\text{s}$, 10% DC



CW Performance at various V_{DD}
 $I_{DQ} = 850 \text{ mA}$, $f = 860 \text{ MHz}$



Load Pull Performance

Load Pull at Max P_{OUT} Point – 16 μ s pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, 250 mA

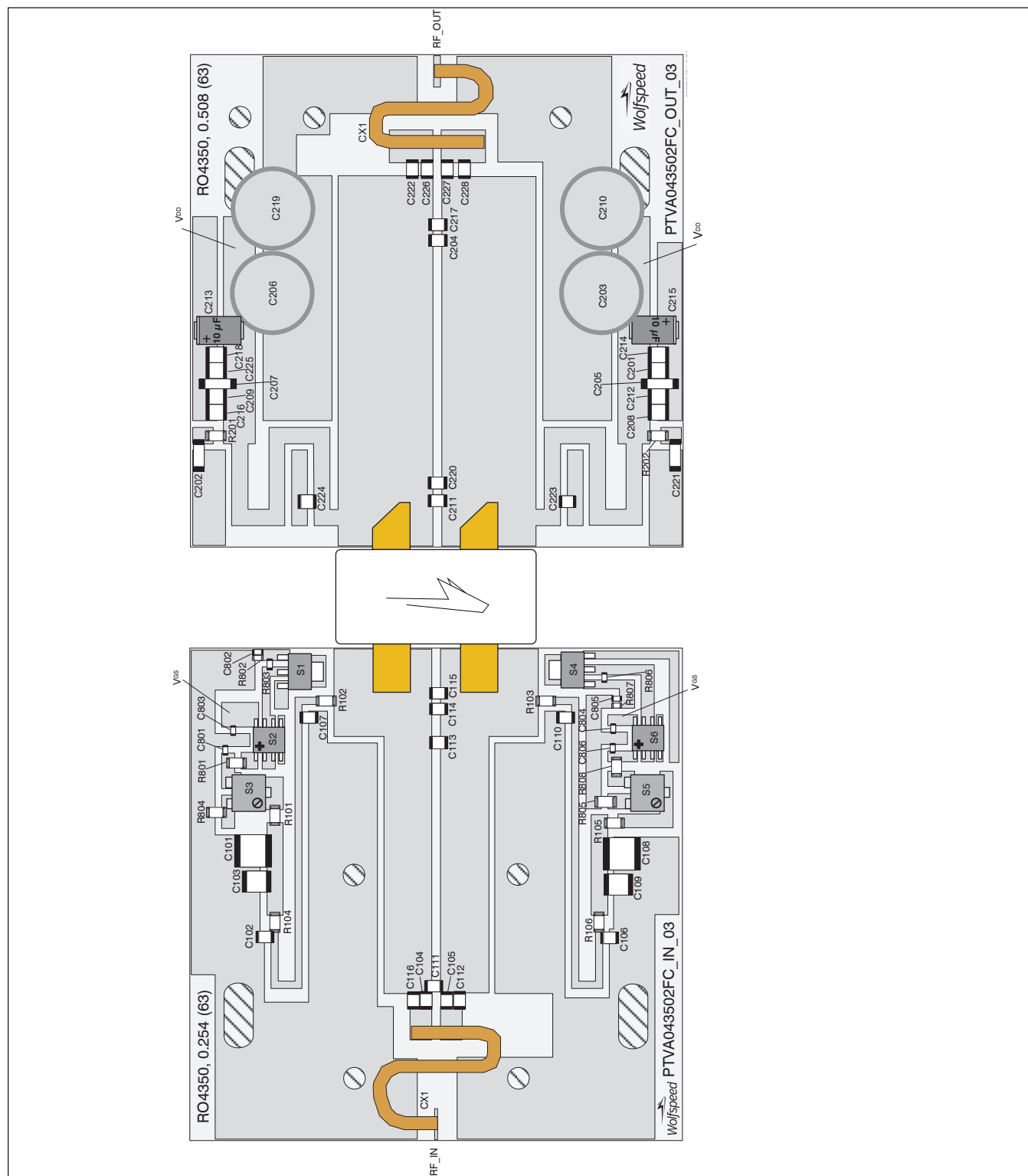
Freq [MHz]	Z _I [Ω]	P _{IN} [dBm]	P _{OUT} [dBm]	P _{OUT} [W]	P _G [dB]	PAE Eff [%]	Z _{OUT} [Ω]
470	0.61+j2.76	34.00	55.30	338.84	21.30	72.90	2.50-j3.0
560	1.64+j3.66	34.90	55.00	316.23	20.10	62.30	2.71-j1.91
640	2.24+j3.46	34.40	54.70	295.12	20.30	66.20	2.92-j0.66
750	3.34+j3.89	35.10	54.50	281.84	19.40	58.80	2.77-j0.91
806	3.52+j5.20	34.50	54.50	281.84	20.00	61.30	2.52-j0.80
860	7.78+j5.19	34.45	54.20	263.03	19.75	63.80	2.37+j0.56

Load Pull at Max Efficiency Point – 16 μ s pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, 250 mA

Freq [MHz]	Z _I [Ω]	P _{IN} [dBm]	P _{OUT} [dBm]	P _{OUT} [W]	P _G [dB]	PAE Eff [%]	Z _{OUT} [Ω]
470	0.61+j2.76	28.75	52.25	167.88	23.50	83.50	2.72-j5.28
560	1.64+j3.66	30.70	52.70	186.21	22.00	75.90	3.31-j3.98
640	2.24+j3.46	31.53	53.03	200.91	21.50	74.00	3.09-j3.05
750	3.34+j3.89	31.35	52.70	186.21	21.35	71.00	2.84-j1.20
806	3.52+j5.20	30.15	51.90	154.88	21.75	71.30	2.33-j0.90
860	7.78+j5.19	29.32	50.52	112.72	21.20	69.25	1.60-j1.42

Z Optimum – 16 μ s pulse width, 10% duty cycle, class AB, V_{DD} = 50 V, 250 mA

Freq [MHz]	Z _I [Ω]	P _{IN} [dBm]	P _{OUT} [dBm]	P _{OUT} [W]	P _G [dB]	PAE Eff [%]	Z _{OUT} [Ω]
470	0.61+j2.76	31.80	54.20	263.03	22.40	81.20	3.04-j4.05
560	1.64+j3.66	32.80	54.20	263.03	21.40	73.40	3.27-j3.12
640	2.24+j3.46	34.25	54.55	285.10	20.30	66.20	2.69-j1.04
750	3.34+j3.89	34.60	54.20	263.03	19.60	59.10	1.90+j0.42
806	3.52+j5.20	34.15	54.15	260.02	20.00	61.30	2.22+j0.60
860	7.78+j5.19	34.20	53.90	245.47	19.70	63.80	2.11+j0.08



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

DUT	PTVA043502EC or PTVA043502FC
Test Fixture Part No.	LTN/PTVA043502EC V1 or LTN/PTVA043502FC V1
PCB	Input: Rogers 4350, 0.254 mm [0.010"] thick, 2 oz. copper, $\epsilon_r = 3.66$, $f = 470 - 860$ MHz Output: Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$, $f = 470 - 860$ MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at http://www.wolfspeed.com/RF	

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C108	Capacitor, 10 μ F	TDK Corporation	C5750X5R1H106K230KA
C102, C106, C107, C110	Capacitor, 200 pF	ATC	ATC100B201K300XB
C103, C109	Capacitor, 1 μ F	TDK	C4532X7R2A105M230KA
C104, C105, C112, C116	Capacitor, 75 pF	ATC	ATC100B750JW500XB
C111	Capacitor, 7.5 pF	ATC	ATC100B7R5JW500XB
C113	Capacitor, 3.9 pF	ATC	ATC100B3R9CW500XB
C114	Capacitor, 5.6 pF	ATC	ATC100B5R6BW500XB
C115	Capacitor, 100 pF	ATC	ATC100B101K500XB
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, R103, R801, R808	Resistor, 10 Ω	Panasonic Electronic Components	ERJ-8GEYJ100V
R104, R106	Resistor, 5.6 Ω	Panasonic Electronic Components	ERJ-8RQJ5R6V
R802, R807	Resistor, 1300 Ω	Panasonic Electronic Components	ERJ-3GEYJ132V
R803, R806	Resistor, 1200 Ω	Panasonic Electronic Components	ERJ-3GEYJ122V
R804, R805	Resistor, 2000 Ω	Panasonic Electronic Components	ERJ-8GEYJ202V
S1, S4	Transistor	Infineon Technologies	BCP56
S2, S6	Voltage Regulator	Texas Instruments	LM78L05ACM-ND
S3, S5	Potentiometer, 2k Ω	Bourns Inc.	3224W-202ETR-ND
CX1	Coax cable	Micro-Coax	UT141C-25

table continued on page 7

Reference Circuit (cont.)**Components Information**

Component	Description	Manufacturer	P/N
Output			
C201, C208, C209, C212, C214, C216, C218, C225	Capacitor, 10 μ F	Taiyo Yuden	UMK325C7106MM-T
C202, C221	Capacitor, 1 μ F	TDK Corporation	C4532X7R2A105M230KA
C203, C206, C210, C219	Capacitor, 470 μ F	Cornell Dubilier Electronics (CDE)	SEK471M050ST
C204	Capacitor, 5.6 pF	ATC	ATC100B5R6CW500XB
C205, C207	Capacitor, 1 μ F	AVX Corporation	2225PC105KAT1A
C211	Capacitor, 13 pF	ATC	ATC100B130JW500XB
C213, C215	Capacitor, 10 μ F	AVX Corporation	TPSE106K050R0400
C217	Capacitor, 1 pF	ATC	ATC100B1R0CW500XB
C220	Capacitor, 3.9 pF	ATC	ATC100B3R9CW500XB
C222, C226, C227, C228	Capacitor, 75 pF	ATC	ATC100B750JW500XB
C223, C224	Capacitor, 300 pF	ATC	ATC100B301K500XB
R201, R202	Resistor, 5.6 Ω	Panasonic Electronic Components	ERJ-8RQJ5R6V
CX1	Coax cable	Micro-Coax	UT141C-25



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: $0.10 + 0.076/-0.025$ mm [$0.004+0.003/-0.001$ inch].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Package Outline Specifications (cont.)

Package H-37248-4

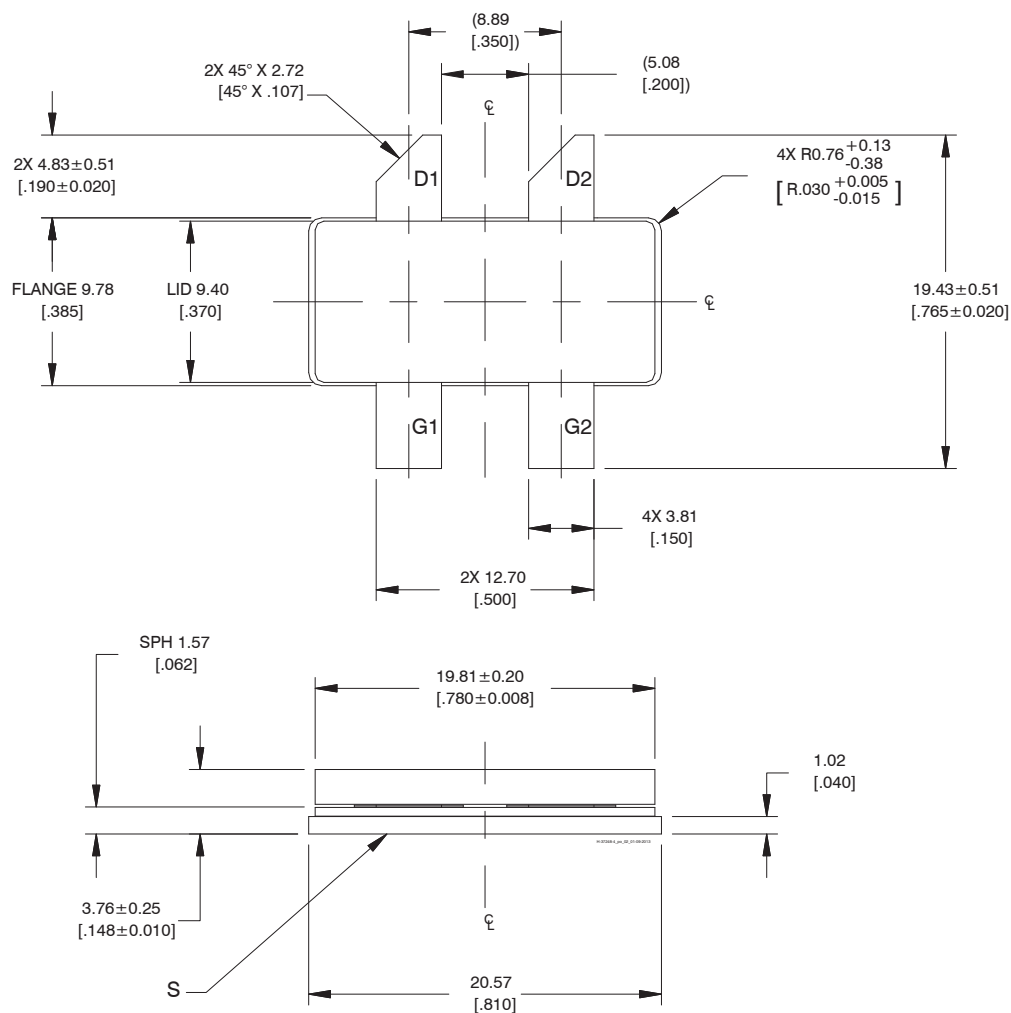


Diagram Notes—unless otherwise specified:

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Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2014-05-12	Advance	All	Data Sheet reflects advance specification for product development
02	2015-11-19	Production	All	Data Sheet reflects released product specification
02.1	2016-05-03	Production	6	Revise one manufacturer, P/N remains the same
02.2	2017-02-09	Production	2	Updated operating voltage and junction temperature
03	2018-11-02	Production	All	Converted to Wolfspeed data sheet

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Notes

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