

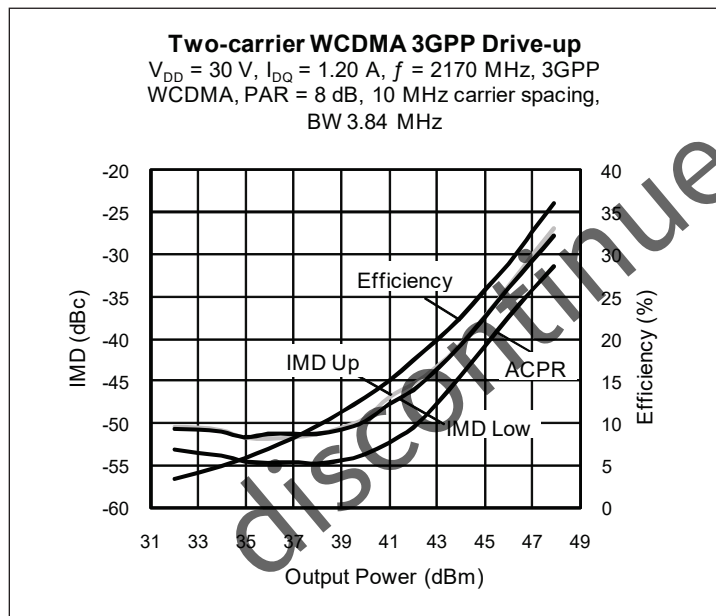
PTFB211503FL

Thermally-Enhanced High Power RF LDMOS FET 150 W, 2110 – 2170 MHz

Description

The PTFB211503FL is a thermally-enhanced, 150-watt, LDMOS FET designed for cellular power amplifier applications in the 2110 to 2170 frequency band. Features include I/O matching, high gain, and thermally-enhanced ceramic open-cavity package with earless flange. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTFB211503FL
H-34288-4/2



Features

- Broadband internal matching
- Enhanced for use in DPD error correction systems
- Typical CW performance, 2170 MHz, 30 V
 - Output power at $P_{1dB} = 150\text{ W}$
 - Efficiency = 55%
- Increased negative gate-source voltage range for improved performance in Doherty peaking amplifiers
- Integrated ESD protection
- Capable of handling 10:1 VSWR @ 30 V, 150 W (CW) output power
- Pb-Free and RoHS compliant

RF Characteristics

Two-carrier WCDMA Measurements (not subject to production test—verified by design/characterization in Wolfspeed test fixture)
 $V_{DD} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 32\text{ W AVG}$, $f_1 = 2135\text{ MHz}$, $f_2 = 2145\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	18	—	dB
Drain Efficiency	η_D	—	29	—	%
Adjacent Channel Power Ratio	ACPR	—	-36	—	dBc

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)**Two-tone Measurement** (tested in wolfspeed test fixture) $V_{DD} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 150\text{ W PEP}$, $f = 2170\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	Gps	16.5	18	—	dB
Drain Efficiency	η_D	39	40	—	%
Intermodulation Distortion	IMD	—	-30	-28	dBc

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ }\mu\text{A}$	$V_{(BR)DSS}$	65	—	—	V
Drain Leakage Current	$V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	1.0	μA
	$V_{DS} = 63\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	10.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.08	—	Ω
Operating Gate Voltage	$V_{DS} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$	V_{GS}	1.6	2.1	3.0	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	—	—	1.0	μA

Maximum Ratings

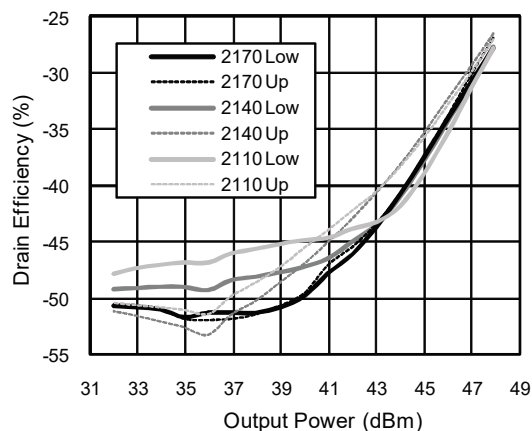
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	-6 to +10	V
Junction Temperature	T_J	200	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-40 to +150	$^{\circ}\text{C}$
Thermal Resistance ($T_{CASE} = 70^{\circ}\text{C}$, 150 W CW)	$R_{\theta JC}$	0.27	$^{\circ}\text{C/W}$

Ordering Information

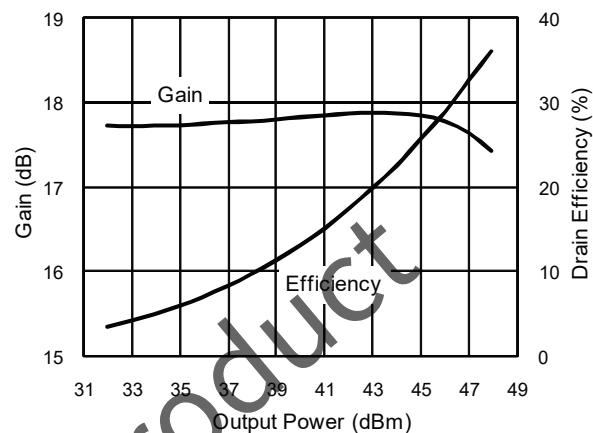
Type and Version	Order Code	Package Description	Shipping
PTFB211503FL V2 R0	PTFB211503FL-V2-R0	H-34288-4/2, earless flange	Tape & Reel, 50 pcs
PTFB211503FL V2 R250	PTFB211503FL-V2-R250	H-34288-4/2, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in a production test fixture)**Two-carrier WCDMA 3GPP Drive-up**

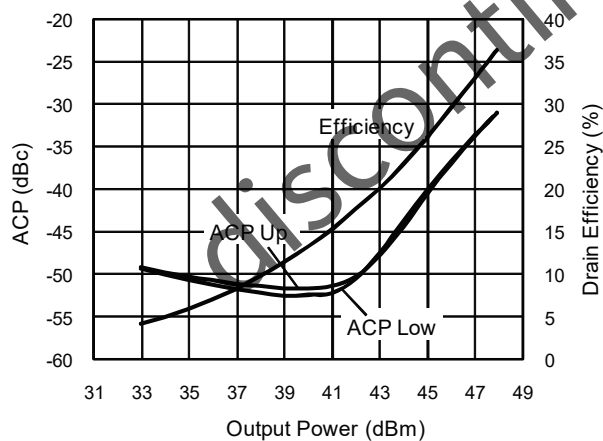
$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.20\text{ A}$, 3GPP WCDMA,
PAR = 8 dB, 10 MHz carrier spacing,
BW 3.84 MHz

**Two-carrier WCDMA 3GPP**

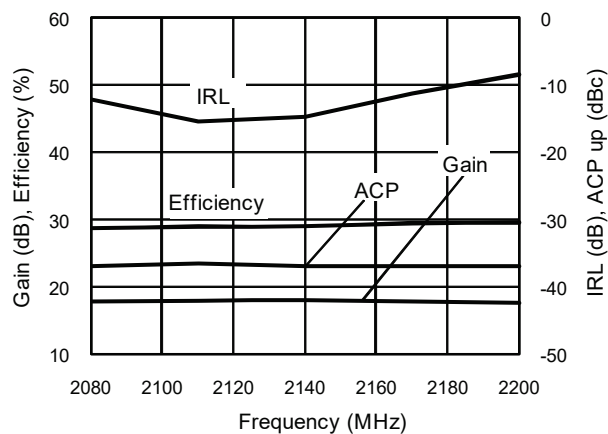
$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.20\text{ A}$, $f = 2170\text{ MHz}$, 3GPP
WCDMA, PAR = 8 dB, 10 MHz carrier spacing,
BW 3.84MHz

**Single-carrier WCDMA Drive-Up**

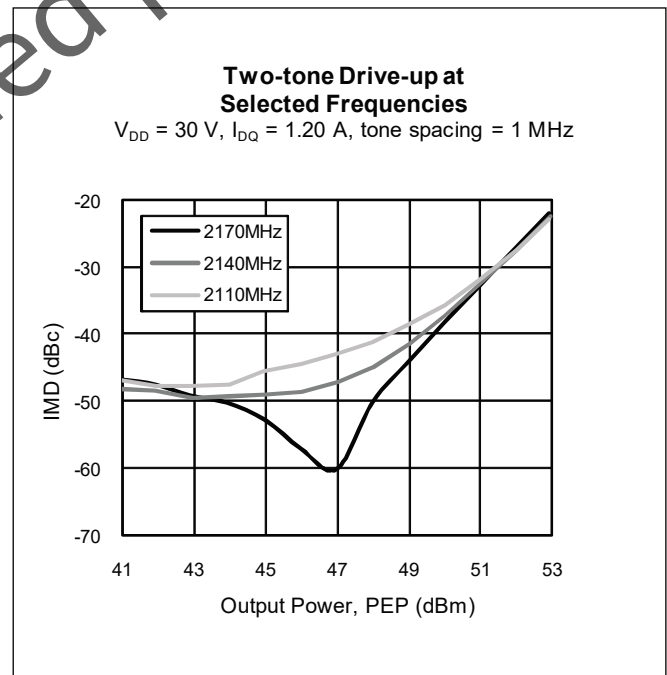
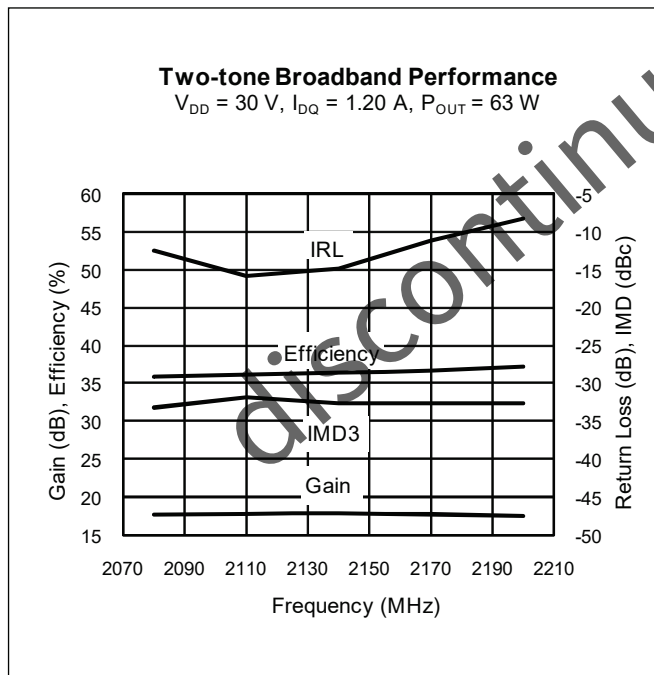
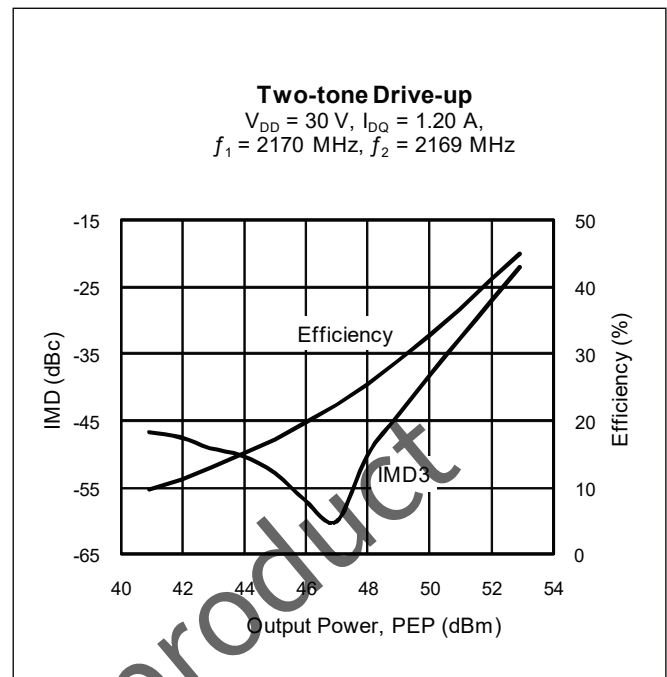
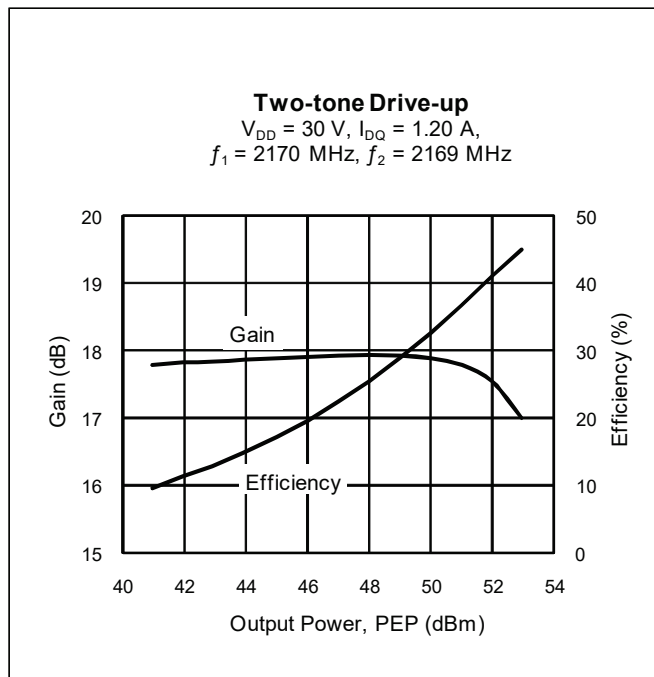
$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.20\text{ A}$, $f = 2170\text{ MHz}$
3GPP WCDMA, PAR = 8 dB, BW 3.84 MHz

**Single-carrier WCDMA, 3GPP Broadband**

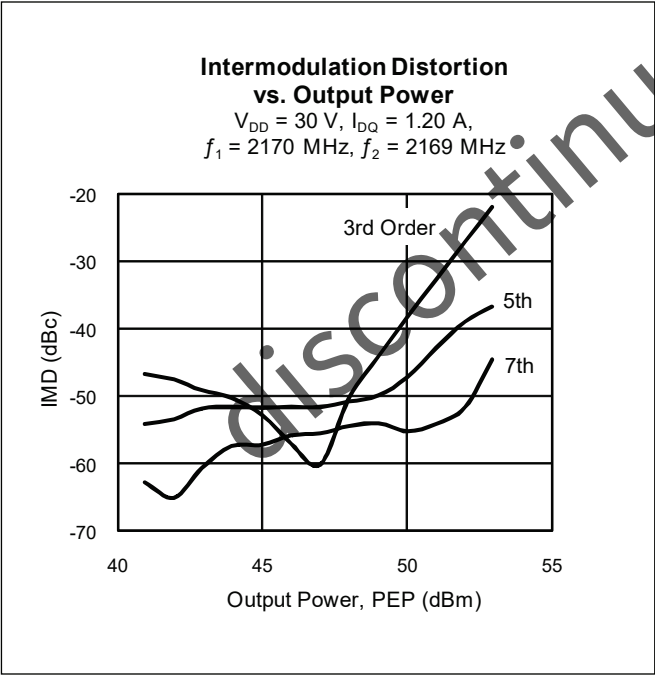
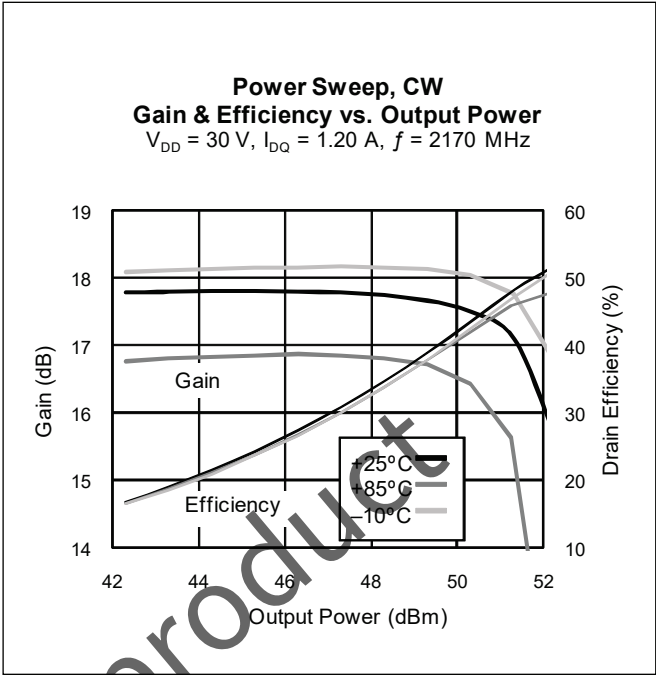
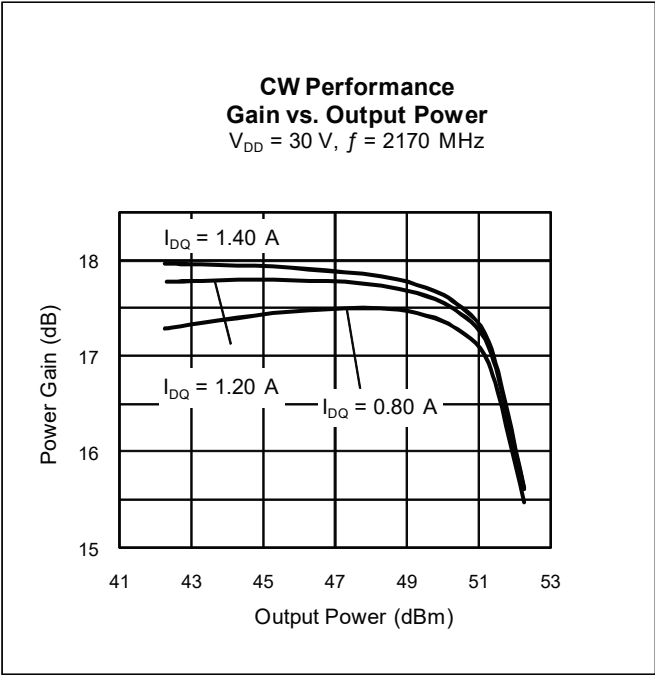
$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.20\text{ A}$, $P_{OUT} = 40\text{ W}$



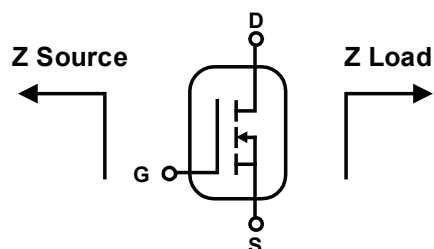
Typical Performance (cont.)



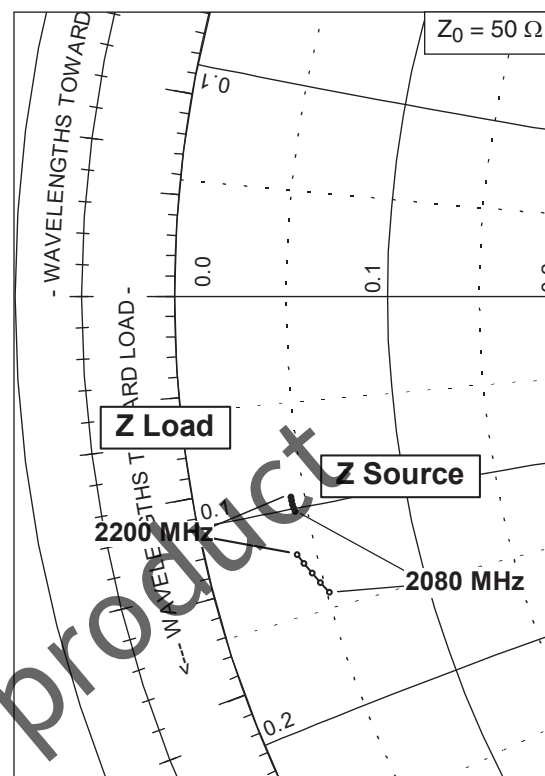
Typical Performance (cont.)



Broadband Circuit Impedance

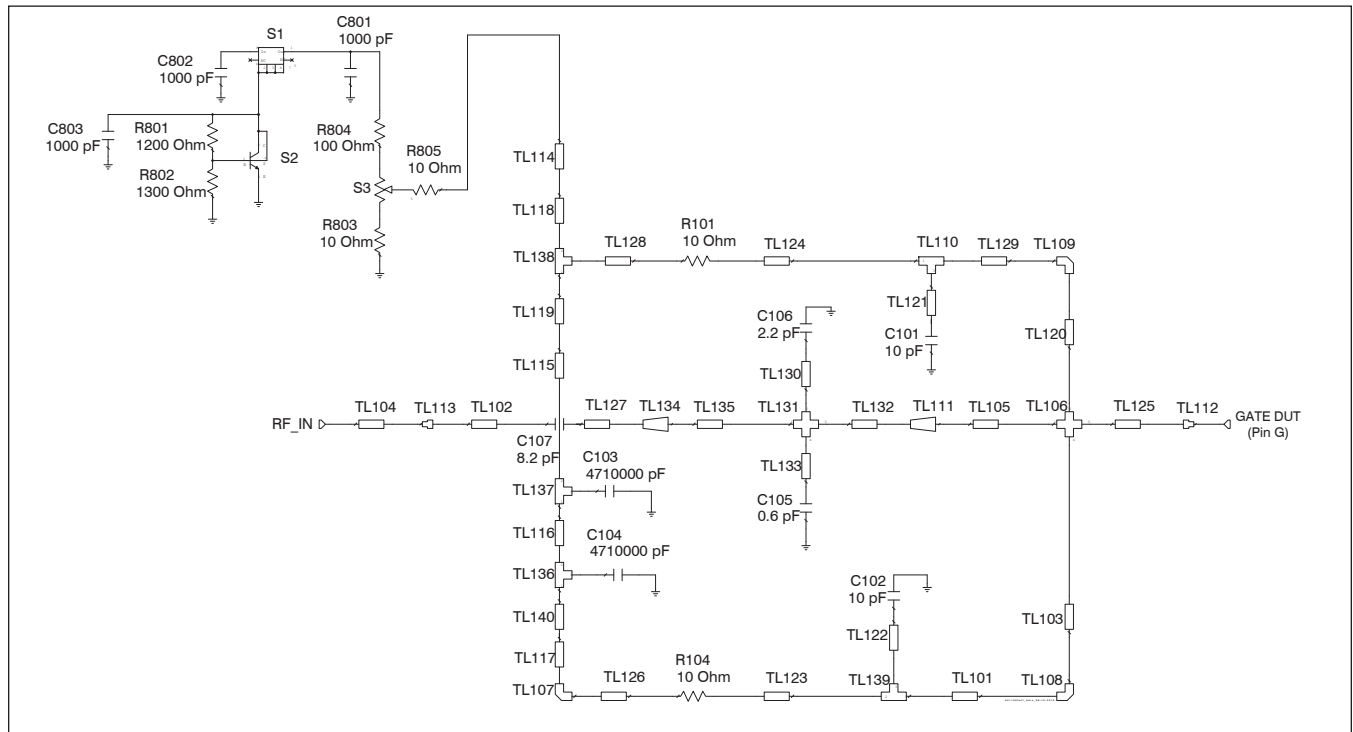
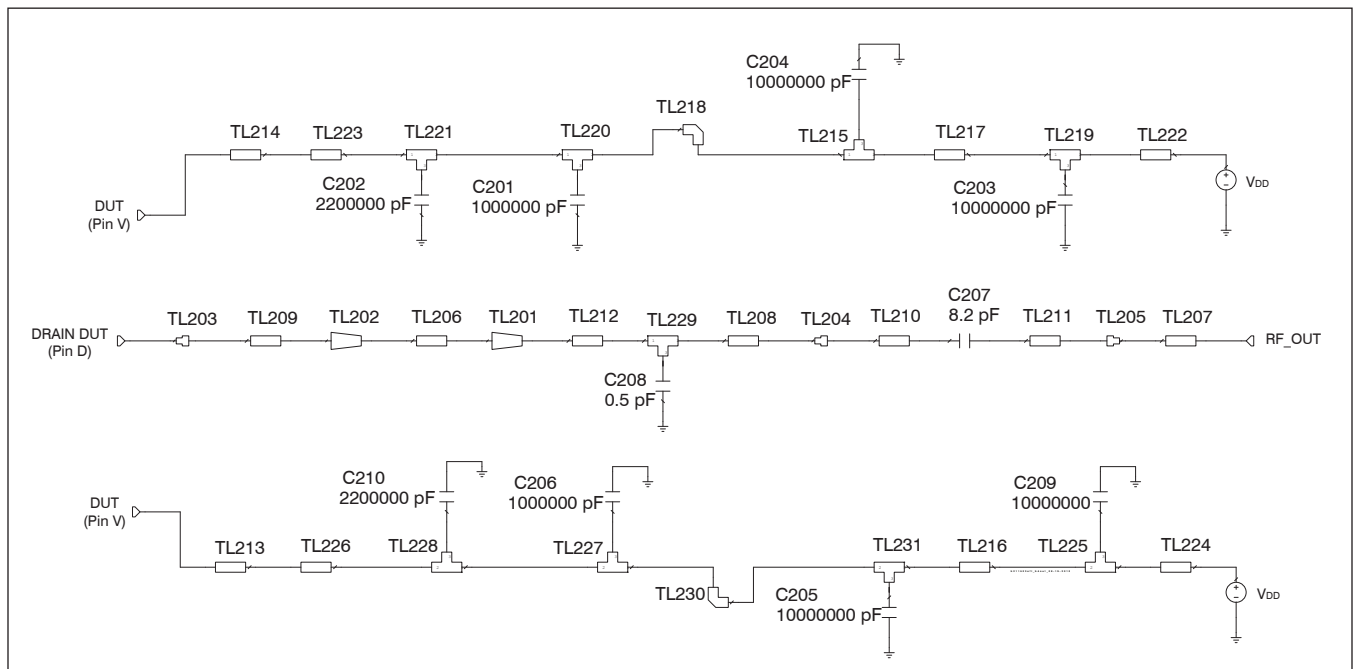


Frequency MHz	Z Source Ω		Z Load Ω	
	R	jX	R	jX
2200	2.06	-6.08	2.19	-4.73
2170	2.17	-6.33	2.19	-4.82
2140	2.30	-6.59	2.20	-4.91
2110	2.43	-6.86	2.21	-5.00
2080	2.58	-7.14	2.22	-5.09



See next page for reference circuit information

Reference Circuit

Reference circuit input schematic for $f = 2170$ MHzReference circuit output schematic for $f = 2170$ MHz

Reference Circuit (cont.)

Description	
DUT	PTFB211503FL
PCB	0.508 mm [.020"] thick, $\epsilon_r = 3.48$, Rogers 4350, 1 oz. copper

Electrical Characteristics at 2170 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101, TL129	0.095λ , 54.17 Ω	W = 1.016, L = 8.001	W = 40, L = 315
TL102	0.016λ , 31.24 Ω	W = 2.286, L = 1.270	W = 90, L = 50
TL103	0.026λ , 54.17 Ω	W = 1.016, L = 2.159	W = 40, L = 85
TL104	0.032λ , 47.12 Ω	W = 1.270, L = 2.692	W = 50, L = 106
TL105	0.005λ , 6.67 Ω	W = 13.970, L = 0.381	W = 550, L = 15
TL106		W1 = 13.970, W2 = 1.016, W3 = 13.970, W4 = 1.016	W1 = 550, W2 = 40, W3 = 550, W4 = 40
TL107, TL108, TL109		W = 1.016	W = 40
TL110, TL139	0.012λ , 54.17 Ω	W1 = 1.016, W2 = 1.016, W3 = 1.016	W1 = 40, W2 = 40, W3 = 40
TL111 (taper)	0.006λ , 6.67 Ω / 8.37 Ω	W1 = 13.970, W2 = 10.922, L = 0.483	W1 = 550, W2 = 430, L = 19
TL112		W1 = 17.780, W2 = 12.700	W1 = 700, W2 = 500
TL113		W1 = 1.270, W2 = 2.286	W1 = 50, W2 = 90
TL114	0.031λ , 34.72 Ω	W = 1.981, L = 2.540	W = 78, L = 100
TL115	0.027λ , 63.89 Ω	W = 0.762, L = 2.286	W = 30, L = 90
TL116	0.096λ , 63.89 Ω	W = .762, L = 8.136	W = 30, L = 320
TL117	0.029λ , 54.17 Ω	W = 1.016, L = 2.451	W = 40, L = 97
TL118	0.018λ , 54.17 Ω	W = 1.016, L = 1.524	W = 40, L = 60
TL119	0.021λ , 54.17 Ω	W = 1.016, L = 1.727	W = 40, L = 68
TL120	0.026λ , 54.17 Ω	W = 1.016, L = 2.159	W = 40, L = 85
TL121, TL122	0.002λ , 54.17 Ω	W = 1.016, L = 0.127	W = 40, L = 5
TL123, TL124	0.030λ , 54.17 Ω	W = 1.016, L = 2.540	W = 40, L = 100
TL125	0.053λ , 6.67 Ω	W = 13.970, L = 4.064	W = 550, L = 160
TL126	0.012λ , 54.17 Ω	W = 1.016, L = 1.021	W = 40, L = 40
TL127	0.134λ , 47.12 Ω	W = 1.270, L = 11.151	W = 50, L = 439
TL128	0.012λ , 54.17 Ω	W = 1.016, L = 1.016	W = 40, L = 40
TL130, TL133	0.000λ , 144.35 Ω	W = 0.025, L = 0.025	W = 1, L = 1
TL131		W1 = 10.922, W2 = 0.025, W3 = 10.922, W4 = 0.025	W1 = 430, W2 = 1, W3 = 430, W4 = 1
TL132, TL135	0.000λ , 8.37 Ω	W = 10.922, L = 0.000	W = 430, L = 0
TL134 (taper)	0.033λ , 8.37 Ω / 47.12 Ω	W1 = 10.922, W2 = 1.270, L = 2.540	W1 = 430, W2 = 50, L = 100
TL136, TL137	0.012λ , 63.89 Ω	W1 = 0.762, W2 = 0.762, W3 = 1.016	W1 = 30, W2 = 30, W3 = 40
TL138	0.012λ , 54.17 Ω	W1 = 1.016, W2 = 1.270, W3 = 1.016	W1 = 40, W2 = 50, W3 = 40
TL140	0.021λ , 63.89 Ω	W = 0.762, L = 1.778	W = 30, L = 70

table continued on page 9

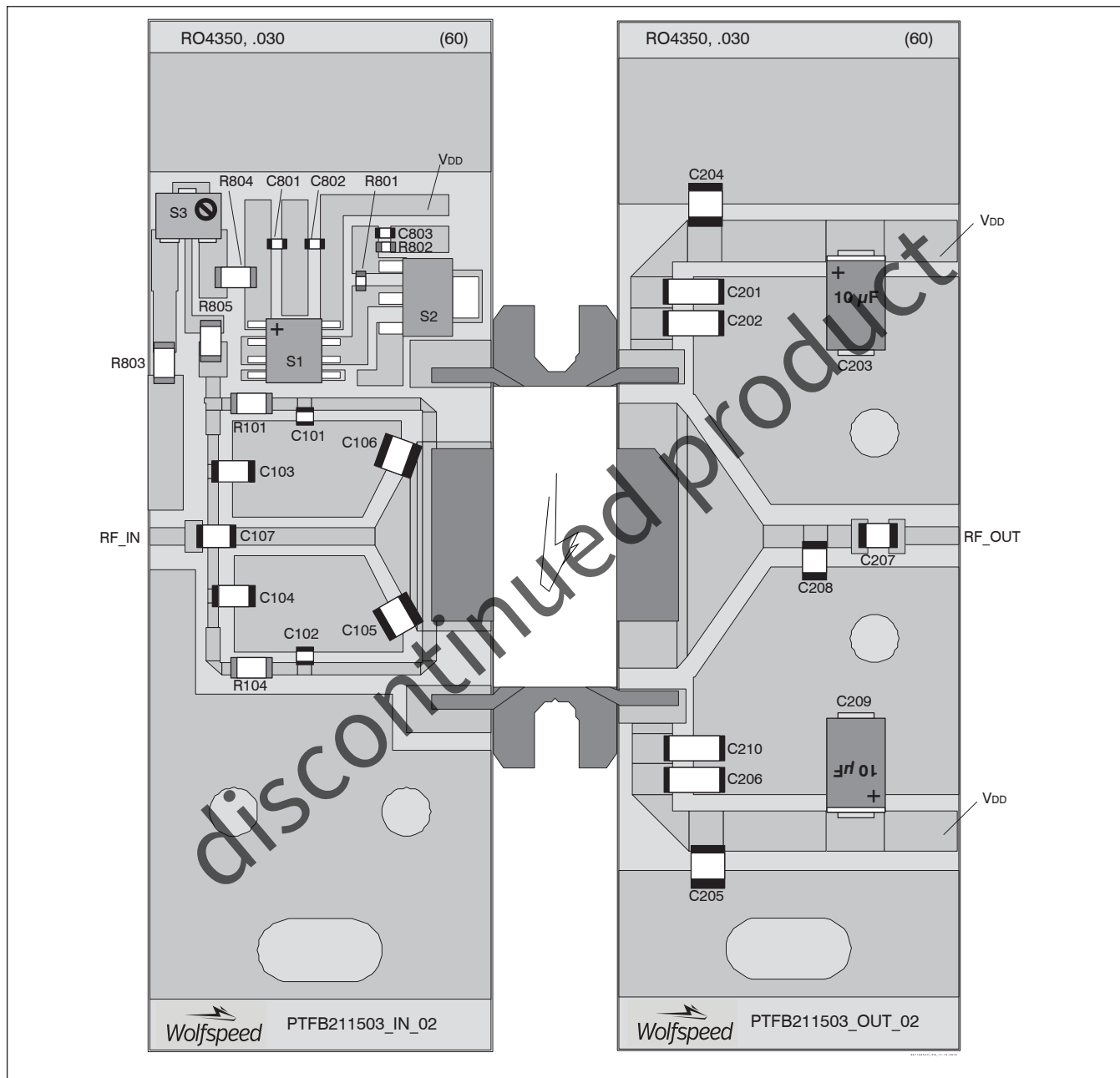
Reference Circuit (cont.)**Electrical Characteristics at 2170 MHz**

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201 (taper)	0.074λ , 5.33Ω / 39.51Ω	$W1 = 17.780$, $W2 = 1.651$, $L = 5.613$	$W1 = 700$, $W2 = 65$, $L = 221$
TL202 (taper)	0.010λ , 4.84Ω / 5.33Ω	$W1 = 19.685$, $W2 = 17.780$, $L = 0.787$	$W1 = 775$, $W2 = 700$, $L = 31$
TL203		$W1 = 12.700$, $W2 = 17.780$	$W1 = 500$, $W2 = 700$
TL204		$W1 = 1.651$, $W2 = 2.540$	$W1 = 65$, $W2 = 100$
TL205		$W1 = 1.270$, $W2 = 2.540$	$W1 = 50$, $W2 = 100$
TL206	0.000λ , 5.33Ω	$W = 17.780$, $L = 0.025$	$W = 700$, $L = 1$
TL207	0.047λ , 47.12Ω	$W = 1.270$, $L = 3.886$	$W = 50$, $L = 153$
TL208	0.021λ , 39.51Ω	$W = 1.651$, $L = 1.753$	$W = 65$, $L = 69$
TL209	0.057λ , 4.84Ω	$W = 19.685$, $L = 4.318$	$W = 775$, $L = 170$
TL210, TL211	0.016λ , 28.85Ω	$W = 2.540$, $L = 1.270$	$W = 100$, $L = 50$
TL212	0.035λ , 39.51Ω	$W = 1.651$, $L = 2.896$	$W = 65$, $L = 114$
TL213	0.032λ , 16.90Ω	$W = 4.928$, $L = 2.540$	$W = 194$, $L = 100$
TL214	0.032λ , 17.05Ω	$W = 4.877$, $L = 2.540$	$W = 192$, $L = 100$
TL215, TL231	0.032λ , 25.04Ω	$W1 = 3.048$, $W2 = 3.048$, $W3 = 2.540$	$W1 = 120$, $W2 = 120$, $W3 = 100$
TL216, TL217	0.095λ , 25.04Ω	$W = 3.048$, $L = 7.645$	$W = 120$, $L = 301$
TL218, TL230		$W = 3.048$	$W = 120$
TL219, TL225	0.054λ , 25.04Ω	$W1 = 3.048$, $W2 = 3.048$, $W3 = 4.318$	$W1 = 120$, $W2 = 120$, $W3 = 170$
TL220, TL221	0.029λ , 25.04Ω	$W1 = 3.048$, $W2 = 3.048$, $W3 = 2.286$	$W1 = 120$, $W2 = 120$, $W3 = 90$
TL222, TL224	0.067λ , 25.04Ω	$W = 3.048$, $L = 5.859$	$W = 120$, $L = 211$
TL223, TL226	0.010λ , 25.04Ω	$W = 3.048$, $L = 0.762$	$W = 120$, $L = 30$
TL227, TL228	0.029λ , 25.04Ω	$W1 = 3.048$, $W2 = 3.048$, $W3 = 2.286$	$W1 = 120$, $W2 = 120$, $W3 = 90$
TL229	0.022λ , 39.51Ω	$W1 = 1.651$, $W2 = 1.651$, $W3 = 1.778$	$W1 = 65$, $W2 = 65$, $W3 = 70$

discontinued product

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

Test Fixture Part No. LTN/PTFB211503EF

Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF

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

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C102	Chip capacitor, 10 pF	ATC	ATC100A100FW150XB
C103, C104	Chip capacitor, 4.71 μ F	Digi-Key	493-2372-2-ND
C105	Chip capacitor, 0.6 pF	ATC	ATC100B0R6BW500XB
C106	Chip capacitor, 2.2 pF	ATC	ATC100B2R2BW500XB
C107	Chip capacitor, 8.2 pF	ATC	ATC100B8R2BW500XB
C801, C802, C803	Capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
R101, R104, R803, R805	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R801	Resistor, 1200 Ω	Digi-Key	P1.2KGCT-ND
R802	Resistor, 1300 Ω	Digi-Key	P1.3KGCT-ND
R804	Resistor, 100 Ω	Digi-Key	P100ECT-ND
S1	Voltage Regulator	Digi-Key	LM78L05ACM-LD
S2	Transistor	Digi-Key	BCP5616TA-ND
S3	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
Output			
C201, C206	Chip capacitor, 1 μ F	Digi-Key	445-1411-2-ND
C202, C210	Chip capacitor, 2.2 μ F	Digi-Key	445-1447-2-ND
C203, C209	Capacitor, 10 μ F	Digi-Key	281M5002106K
C204, C205	Capacitor, 10 μ F	Digi-Key	587-1818-2-ND
C207	Chip capacitor, 8.2 pF	ATC	ATC100B8R2BW500XB
C208	Chip capacitor, 0.5 pF	ATC	ATC100B0R5BW500XB

discontinued product

Package Outline Specifications

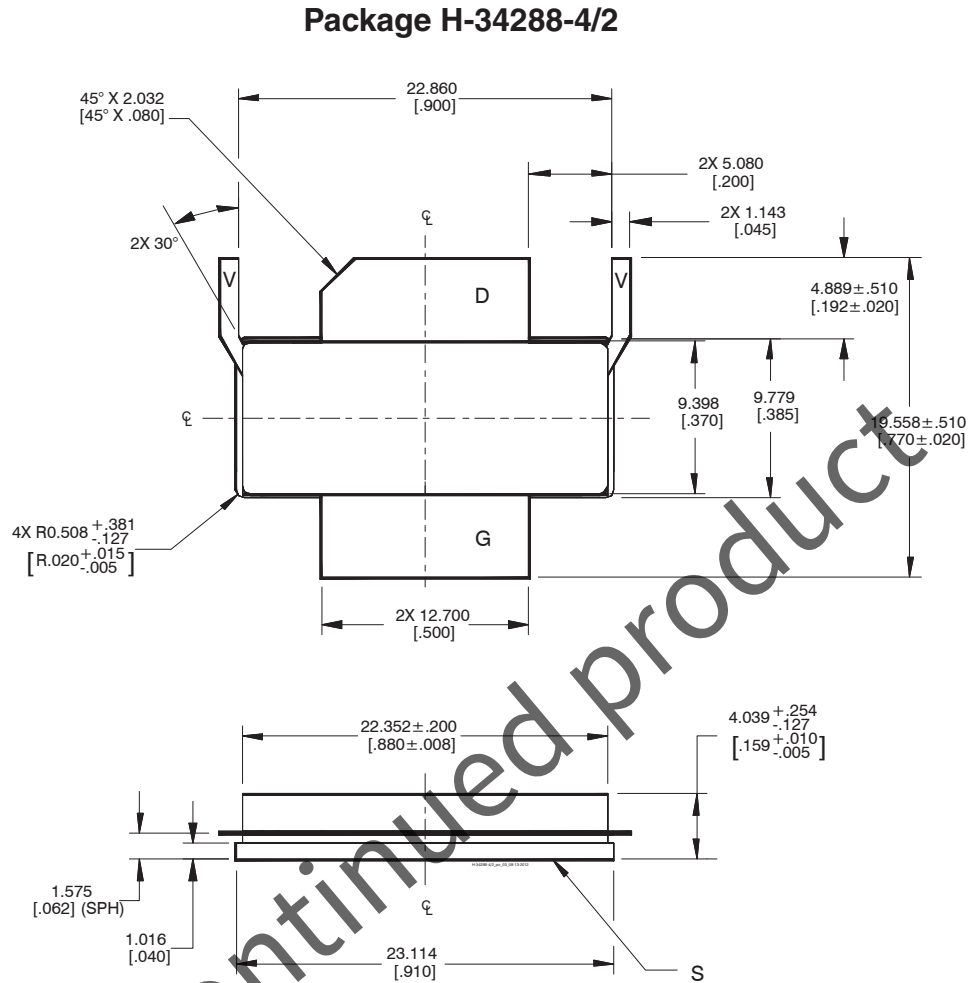


Diagram Notes—unless otherwise specified:

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: D = drain; S = source; G = gate; V = V_{DD} .
5. Lead thickness: $0.10 + 0.051/-0.025$ mm [.004 +0.002/-0.001 inch].
6. Gold plating thickness: 0.25 micron [10 microinch] max.

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes at each revision)
04.1	2016-06-14	Production	2	Updated ordering information
05	2018-06-29	Production	All	Converted to Wolfspeed Data Sheet
06	2020-02-27	Production	All	Product discontinued

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Notes

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