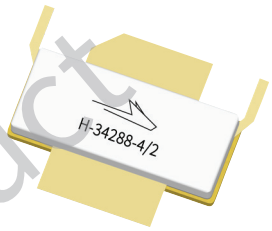
PTFB182503FL

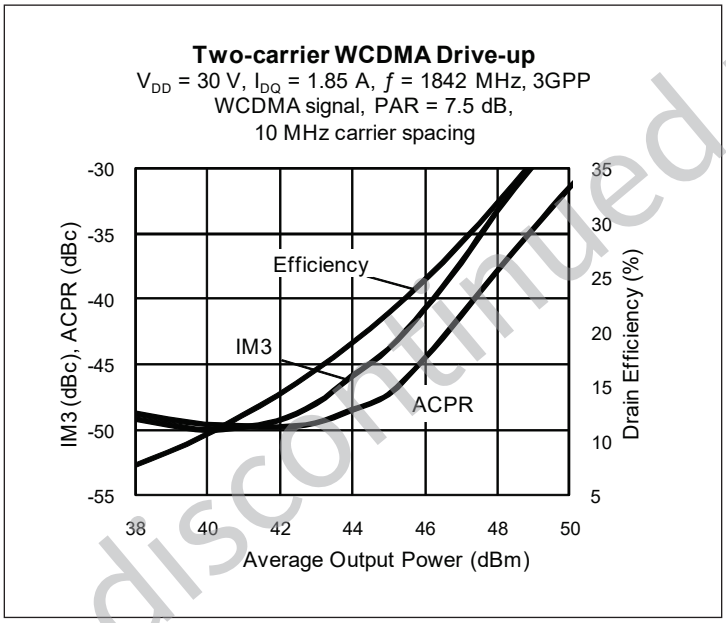
Thermally-Enhanced High Power RF LDMOS FET
240 W, 1805 – 1880 MHz

Description

The PTFB182503FL is a 240-watt LDMOS FET intended for use in multi-standard cellular power amplifier applications in the 1805 to 1880 MHz frequency band. Features include input and output matching, high gain, wide signal bandwidth and reduced memory effects for improved DPD correctability. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTFB182503FL
H-34288-4/2





Features

- Broadband internal input and output matching
- Enhanced for use in DPD error correction systems
- Typical two-carrier WCDMA performance, 1880 MHz, 30 V
  - Average output power = 50 W
  - Linear gain = 19 dB
  - Drain efficiency = 28 %
  - Intermodulation distortion = –35 dBc
- Typical CW performance, 1880 MHz, 30 V
  - Output power at P_{1dB} = 240 W
  - Efficiency = 55%
- Increased negative gate-source voltage range for improved performance in Doherty peaking amplifiers
- Integrated ESD protection. Human Body Model, Class 2 (minimum)
- Capable of handling 10:1 VSWR @ 30 V, 240 W (CW) output power
- Pb-free, RoHS compliant

RF Characteristics

Two-carrier WCDMA Specifications (tested in Wolfspeed test fixture)
V_{DD} = 30 V, I_{DQ} = 1.85 A, P_{OUT} = 50 W average
f_1 = 1840 MHz, f_2 = 1845 MHz, 3GPP signal, channel bandwidth = 3.84 MHz , peak/average = 7.5 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	18	19	—	dB
Drain Efficiency	ηD	27	28	—	%
Intermodulation Distortion	IMD	—	–35	–31	dBc

All published data at T_{CASE} = 25°C unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

Two-tone Specifications (not subject to production test—verified by design/characterization in Wolfspeed test fixture)
V_{DD} = 30 V, I_{DQ} = 1.85 A, P_{OUT} = 220 W PEP, f = 1840 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	18	—	dB
Drain Efficiency	ηD	—	40	—	%
Intermodulation Distortion	IMD	—	–28	—	dBc

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_{DS} = 10 mA	$V_{(BR)DSS}$	65	—	—	V
Drain Leakage Current	V_{DS} = 28 V, V_{GS} = 0 V	I_{DSS}	—	—	1.0	µA
Drain Leakage Current	V_{DS} = 63 V, V_{GS} = 0 V	I_{DSS}	—	—	10.0	µA
On-State Resistance	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.03	—	Ω
Operating Gate Voltage	V_{DS} = 30 V, I_{DQ} = 1.85 A	V_{GS}	2.3	2.8	3.3	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1.0	µA

Maximum Ratings

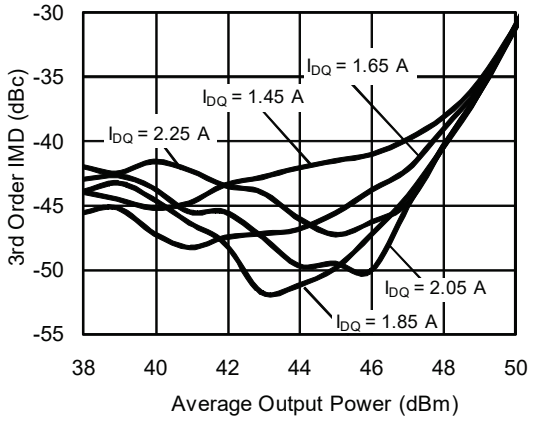
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	–6 to +10	V
Operating Voltage	V_{DD}	24 to 30	V
Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 50 W WCDMA)	$R_{\theta JC}$	0.262	°C/W

Ordering Information

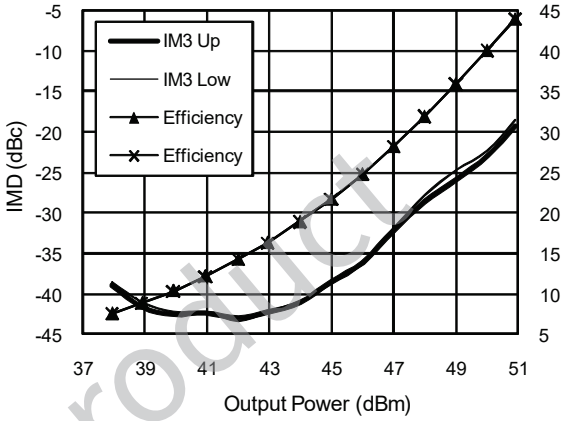
Type and Version	Order Code	Package Description	Shipping
PTFB182503FL V2 R0	PTFB182503FL-V2-R0	H-34288-4/2, earless flange	Tape & Reel, 50 pcs
PTFB182503FL V2 R250	PTFB182503FL-V2-R250	H-34288-4/2, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in a production test fixture)

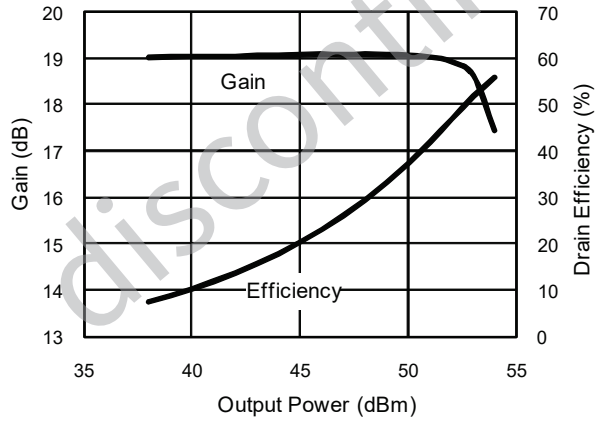
Two-Carrier WCDMA at Various Biases
V_{DD} = 30 V, f = 1842 MHz, 3GPP WCDMA signal, PAR = 7.5 dB, 5 MHz carrier spacing



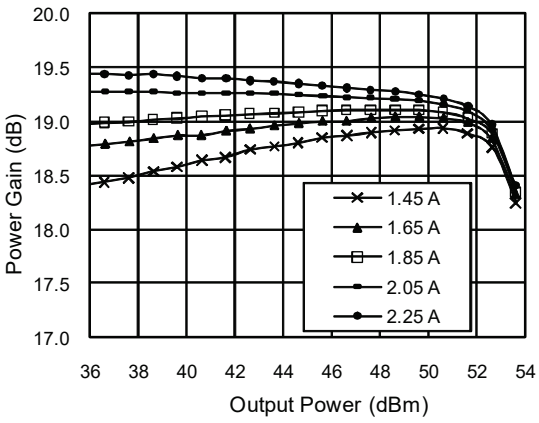
Six-Carrier GSM vs Power Out
V_{DD} = 30V, I_{DQ} =1.85 A f = 1842 MHz, PAR = 7.1 dB



CW Performance
Gain & Efficiency vs. Output Power
V_{DD} = 30 V, I_{DQ} = 1.85 A, f = 1842 MHz

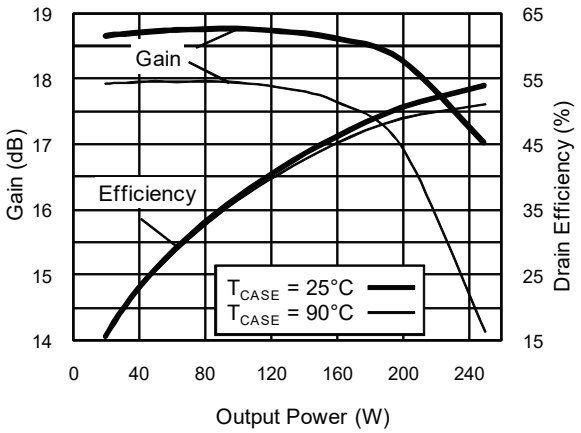


Power Sweep
V_{DD} = 30 V, f = 1842 MHz

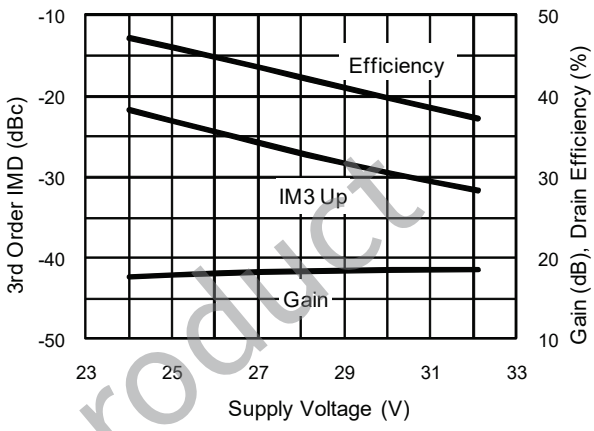


Typical Performance (cont.)

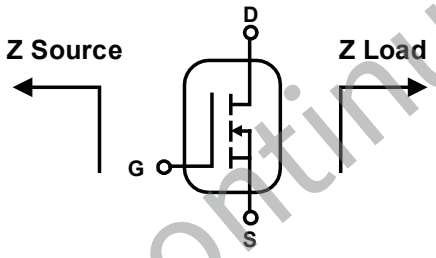
Power Sweep, CW Conditions
V_{DD} = 30 V, I_{DQ} = 1850 mA, f = 1842 MHz



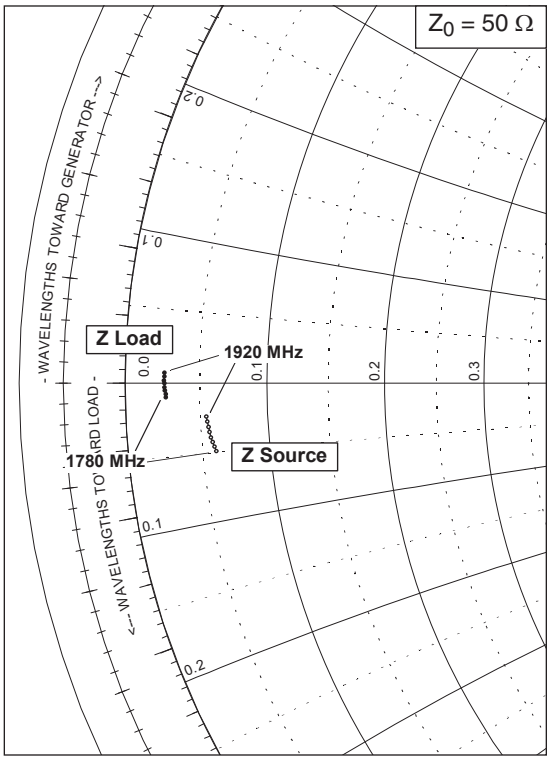
Voltage Sweep
I_{DQ} = 1850 mA, f = 1842 MHz, tone spacing = 1 MHz, Output Power (PEP) = 53 dBm



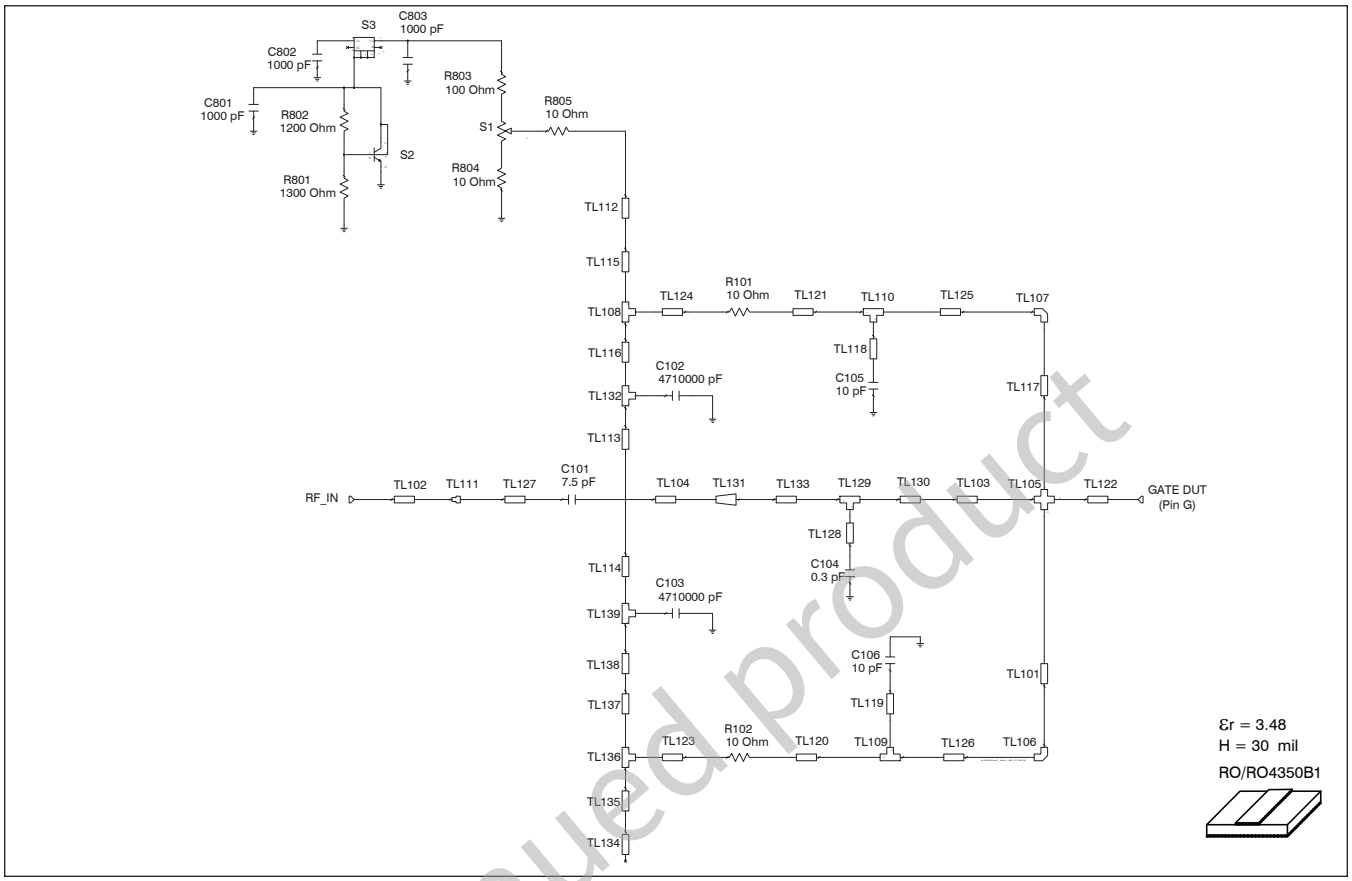
Broadband Circuit Impedance



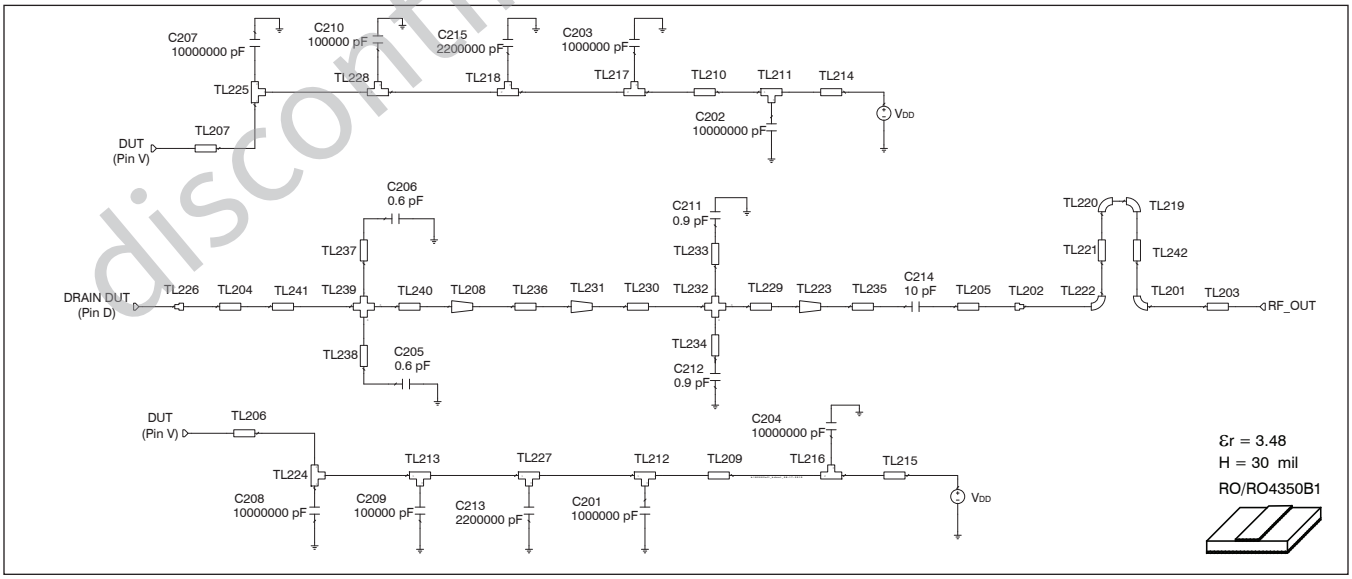
Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
1780	2.99	–2.48	1.33	–0.49
1800	2.95	–2.30	1.33	–0.38
1820	2.89	–2.13	1.31	–0.27
1840	2.84	–1.96	1.29	–0.16
1860	2.80	–1.76	1.29	–0.02
1880	2.78	–1.58	1.28	0.10
1900	2.74	–1.39	1.29	0.23
1920	2.72	–1.21	1.29	0.36



Reference Circuit



Reference circuit input schematic for ƒ = 1880 MHz



Reference circuit output schematic for ƒ = 1880 MHz

Reference Circuit (cont.)

Description	
DUT	PTFB182503FL
PCB	0.76 mm [.030"] thick, εr = 3.48, Rogers 4350, 1 oz. copper

Electrical Characteristics at 1880 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101, TL117	0.022 λ, 78.27 Ω	W = 0.762, L = 2.159	W = 30, L = 85
TL102	0.035 λ, 51.58 Ω	W = 1.651, L = 3.358	W = 65, L = 132
TL103	0.050 λ, 9.67 Ω	W = 13.970, L = 4.445	W = 550, L = 175
TL104	0.031 λ, 51.58 Ω	W = 1.651, L = 3.018	W = 65, L = 119
TL105		W1 = 13.970, W2 = 0.762, W3 = 13.970, W4 = 0.762	W1 = 550, W2 = 30, W3 = 550 W4 = 30
TL106, TL107		W = 0.762	W = 30
TL108, TL136	0.010 λ, 68.02 Ω	W1 = 1.016, W2 = 1.016, W3 = 1.016	W1 = 40, W2 = 40, W3 = 40
TL109, TL110, TL132, TL139	0.010 λ, 78.27 Ω	W1 = 0.762, W2 = 0.762, W3 = 1.016	W1 = 30, W2 = 30, W3 = 40
TL111		W1 = 1.651, W2 = 2.032	W1 = 65, W2 = 80
TL112, TL134	0.014 λ, 38.82 Ω	W = 2.540, L = 1.321	W = 100, L = 52
TL113	0.020 λ, 78.27 Ω	W = 0.762, L = 2.007	W = 30, L = 79
TL114	0.099 λ, 92.53 Ω	W = 0.508, L = 9.957	W = 20, L = 392
TL115	0.016 λ, 68.02 Ω	W = 1.016, L = 1.524	W = 40, L = 60
TL116, TL137	0.017 λ, 78.27 Ω	W = 0.762, L = 1.727	W = 30, L = 68
TL118, TL119	0.001 λ, 68.02 Ω	W = 1.016, L = 0.127	W = 40, L = 5
TL120, TL121	0.013 λ, 78.27 Ω	W = 0.762, L = 1.270	W = 30, L = 50
TL122	0.022 λ, 9.67 Ω	W = 13.970, L = 1.981	W = 550, L = 78
TL123, TL124	0.007 λ, 68.02 Ω	W = 1.016, L = 0.686	W = 40, L = 27
TL125, TL126	0.118 λ, 78.27 Ω	W = 0.762, L = 11.684	W = 30, L = 460
TL127	0.008 λ, 45.17 Ω	W = 2.032, L = 0.762	W = 80, L = 30
TL128	0.000 λ, 45.17 Ω	W = 2.032, L = 0.025	W = 80, L = 1
TL129	0.023 λ, 9.67 Ω	W1 = 13.970, W2 = 13.970, W3 = 2.032	W1 = 550, W2 = 550, W3 = 80
TL130	0.000 λ, 9.67 Ω	W = 13.970, L = 0.025	W = 550, L = 1
TL131 (taper)	0.028 λ, 9.67 Ω / 51.58 Ω	W1 = 13.970, W2 = 1.651, L = 2.515	W1 = 550, W2 = 65, L = 99
TL133	0.050 λ, 9.67 Ω	W = 13.970, L = 4.470	W = 550, L = 176
TL135	0.015 λ, 68.02 Ω	W = 1.016, L = 1.514	W = 40, L = 60
TL138	0.010 λ, 78.27 Ω	W = 0.762, L = 0.991	W = 30, L = 39

table continued on page 7

Reference Circuit (cont.)

Electrical Characteristics at 1880 MHz

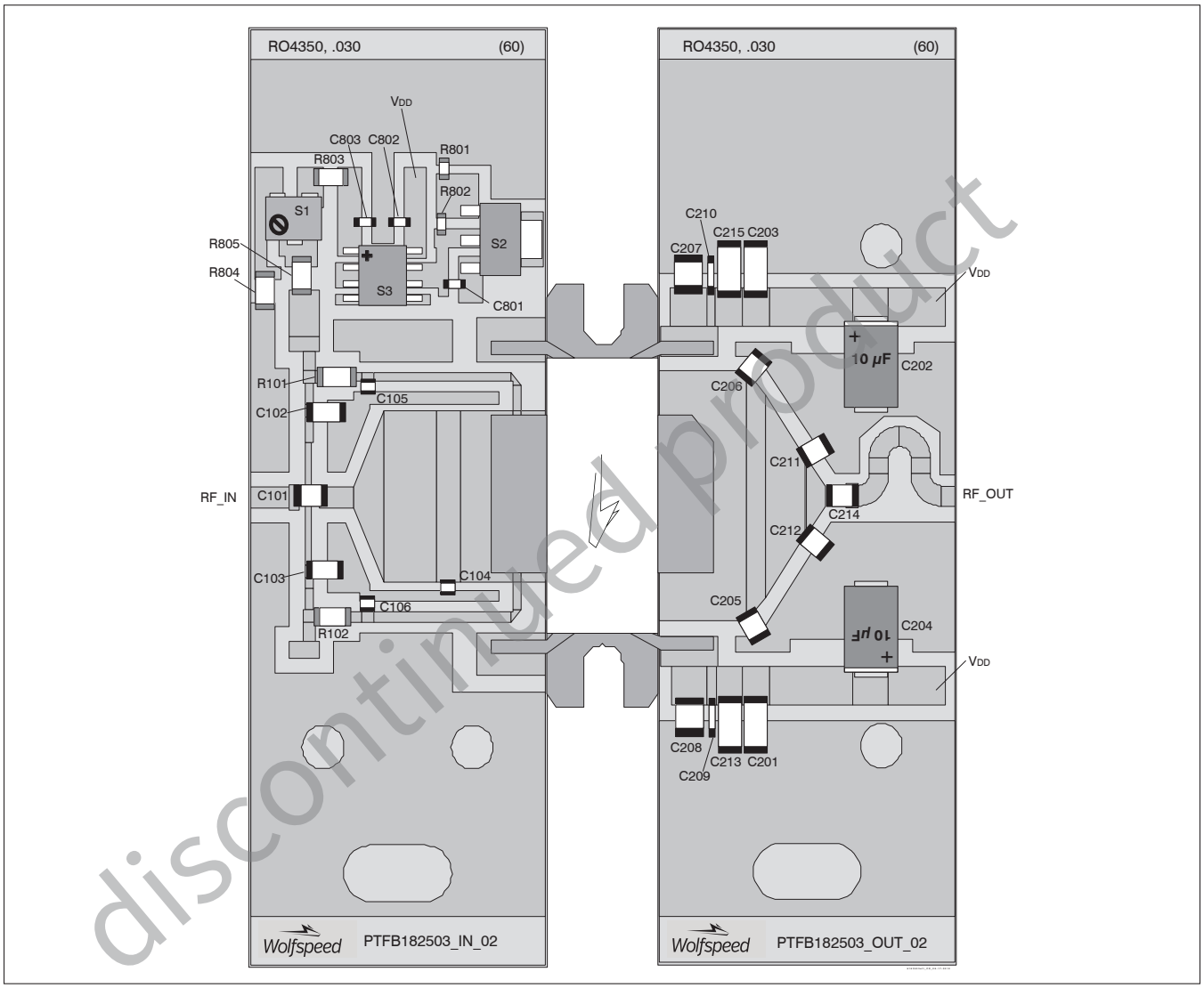
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201, TL219, TL220, TL222		W = 0.002, ANG = 90.000, R = 0.002	W = 2, ANG = 3543307, R = 70
TL202		W1 = 1.651, W2 = 2.032	W1 = 65, W2 = 80
TL203	0.012 λ, 51.58 Ω	W = 1.651, L = 1.118	W = 65, L = 44
TL204	0.084 λ, 6.86 Ω	W = 20.320, L = 7.366	W = 800, L = 290
TL205	0.011 λ, 45.17 Ω	W = 2.032, L = 1.016	W = 80, L = 40
TL206	0.028 λ, 23.60 Ω	W = 4.928, L = 2.540	W = 194, L = 100
TL207	0.028 λ, 23.79 Ω	W = 4.877, L = 2.540	W = 192, L = 100
TL208 (taper)	0.018 λ, 6.86 Ω / 8.31 Ω	W1 = 20.320, W2 = 16.510, L = 1.575	W1 = 800, W2 = 650, L = 62
TL209, TL210	0.076 λ, 34.08 Ω	W = 3.048, L = 7.112	W = 120, L = 280
TL211, TL216, TL224, TL225	0.032 λ, 34.08 Ω	W1 = 3.048, W2 = 3.048, W3 = 3.048	W1 = 120, W2 = 120, W3 = 120
TL212, TL228, TL217, TL218, TL227	0.024 λ, 34.08 Ω	W1 = 3.048, W2 = 3.048, W3 = 2.286	W1 = 120, W2 = 120, W3 = 90
TL213	0.008 λ, 34.08 Ω	W1 = 3.048, W2 = 3.048, W3 = 0.762	W1 = 120, W2 = 120, W3 = 30
TL214, TL215	0.051 λ, 34.08 Ω	W = 3.048, L = 4.826	W = 120, L = 190
TL221, TL242	0.013 λ, 51.58 Ω	W = 1.651, L = 1.270	W = 65, L = 50
TL223 (taper)	0.018 λ, 19.45 Ω / 51.58 Ω	W1 = 6.248, W2 = 1.651, L = 1.651	W1 = 246, W2 = 65, L = 65
TL226		W1 = 12.700, W2 = 17.780	W1 = 500, W2 = 700
TL229, TL230	0.000 λ, 19.45 Ω	W = 6.248, L = 0.025	W = 246, L = 1
TL231 (taper)	0.038 λ, 8.31 Ω / 19.45 Ω	W1 = 16.510, W2 = 6.248, L = 3.378	W1 = 650, W2 = 246, L = 133
TL232		W1 = 6.248, W2 = 0.025 , W3 = 6.248, W4 = 0.025	W1 = 246, W2 = 1, W3 = 246, W4 = 1
TL233, TL234, TL237, TL238	0.000 λ, 146.88 Ω	W = 0.025, L = 0.025	W = 1, L = 1
TL235	0.005 λ, 51.58 Ω	W = 1.651, L = 0.508	W = 65, L = 20
TL236 TL239	0.000 λ, 8.31 Ω	W = 16.510, L = 0.025 W1 = 20.320, W2 = 0.025, W3 = 20.320 W4 = 0.025	W = 650, L = 1 W1 = 800, W2 = 1, W3 = 800, W4 = 1
TL240, TL241	0.000 λ, 6.86 Ω	W = 20.320, L = 0.025	W = 800, L = 1

Reference Circuit (cont.)

Circuit Assembly Information

Test Fixture Part No.	LTN/PTFB182503FL

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



Reference circuit assembly diagram (not to scale)

Reference Circuit (cont.)

Component	Description	Suggested Manufacturer	P/N
Input			
C101	Chip capacitor, 7.5 pF	ATC	ATC100B7R5BW500XB
C102, C103	Chip capacitor, 4.71 µF	ATC	493-2372-2-ND
C104	Chip capacitor, 0.3 pF	ATC	ATC100A0R3BW150XB
C105, C106	Chip capacitor, 10 pF	ATC	ATC100A100FW150XB
C801, C802, C803	Capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
R101, R102, R804, R805	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R801	Resistor, 1300 Ω	Digi-Key	P1.3KGCT-ND
R802	Resistor, 1200 Ω	Digi-Key	P1.2KGCT-ND
R803	Resistor, 100 Ω	Digi-Key	P100ECT-ND
S1	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
S2	Transistor	Digi-Key	BCP5616TA-ND
S3	Voltage Regulator	Digi-Key	LM78L05ACM-ND
Output			
C201, C203	Chip capacitor, 0.1 µF	Digi-Key	445-1411-2-ND
C202, C204	Capacitor, 10 µF	Garrett Electronics	281M5002106K
C205, C206	Chip capacitor, 0.6 pF	ATC	ATC100B0R6BW500XB
C207, C208	Chip capacitor, 10 µF	Digi-Key	587-1818-2-ND
C209, C210	Chip capacitor, 0.1 µF	Digi-Key	399-1267-2-ND
C211, C212	Chip capacitor, 0.9 pF	ATC	ATC100B0R9BW500XB
C213, C215	Chip capacitor, 2.2 µF	Digi-Key	445-1447-2-ND
C214	Chip capacitor, 10 pF	ATC	ATC100B100FW500XB

Package Outline Specifications

Package H-34288-4/2

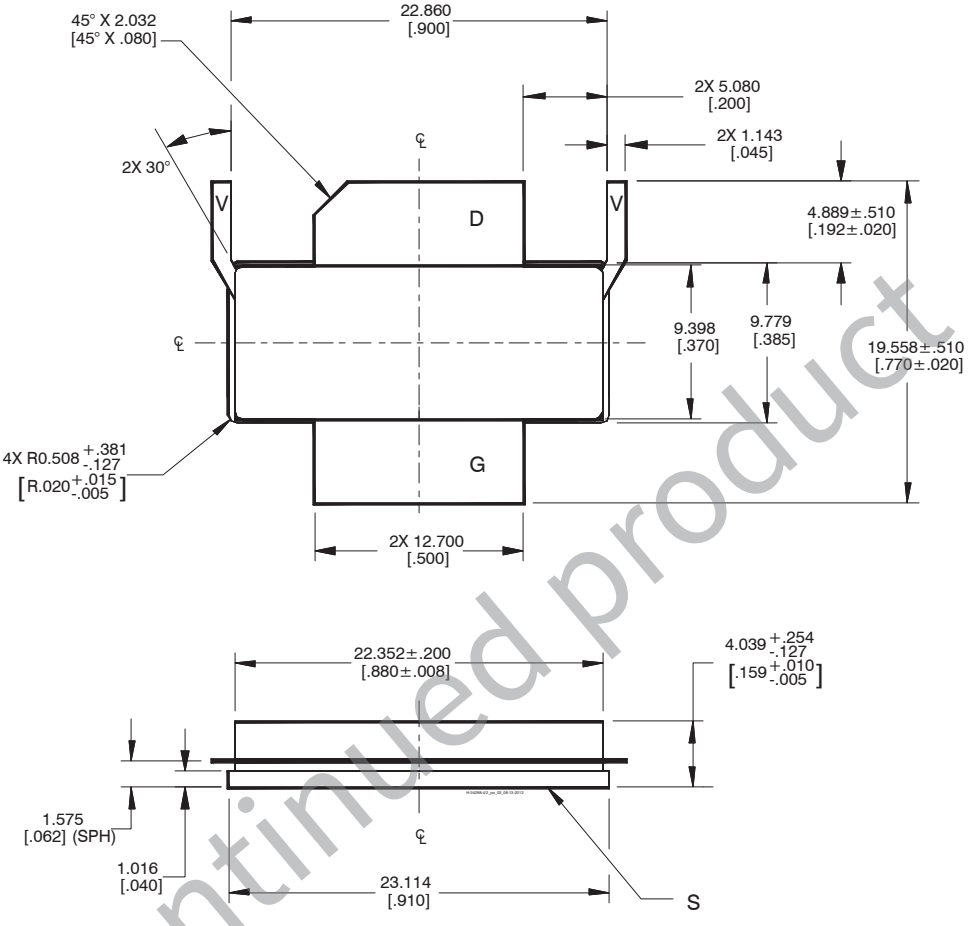


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ±0.127 [0.005] unless specified otherwise.
4. Pins: D – drain; G – gate; S – source; V – V_{DD}
5. Lead thickness: 0.10 + 0.051/–0.025 mm [0.004 + 0.002/–0.001 inch].
6. Gold plating thickness: 0.25 micron [10 microinch] max.

Revision History

07.2	2016-06-10	Production	2	Updated ordering code to R0
08	2018-07-18	Production	All	Converted to Wolfspeed data sheet.
09	2020-02-17	Production	All	Not recomended for new design
10	2020-06-03	End of life	All	Product discontinued

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

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.