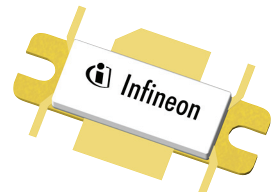
Thermally-Enhanced High Power RF LDMOS FET
150 W, 920 – 960 MHz

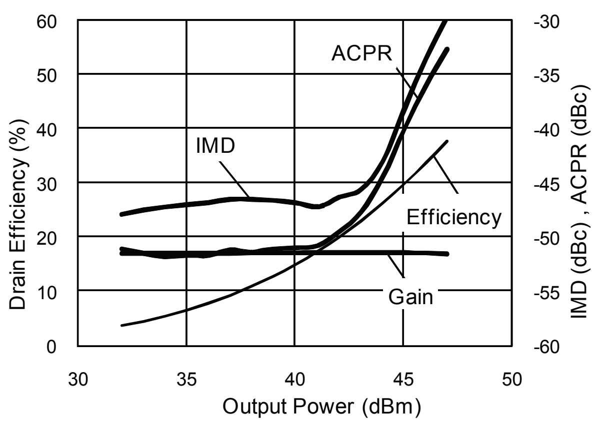
Description

The PTFA091503EL is a 150-watt, internally-matched FET intended for use in power amplifier applications in the 920 to 960 MHz band. This device features internal I/O matching and thermally-enhanced open cavity ceramic package. Manufactured with Infineon's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTFA091503EL
Package H-33288-6



Two-carrier WCDMA Performance
V_{DD} = 30 V, I_{DQ} = 1250 mA, f = 960 MHz, 3GPP WCDMA signal, PAR = 8 dB, 10 MHz carrier spacing, 3.84MHz Bandwidth



Features

- Broadband internal matching
- Typical two-carrier WCDMA performance at 960 MHz, 30 V
  - Average output power = 32 W
  - Linear Gain = 17 dB
  - Efficiency = 29%
  - Intermodulation distortion = –37 dBc
  - Adjacent channel power = –39 dBc
- Typical CW performance, 960 MHz, 30 V
  - Output power at P_{1dB} = 150 W
  - Linear Gain = 17 dB
  - Efficiency = 54%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 30 V, 150 W (CW) output power
- Pb-free, RoHS-compliant

RF Characteristics

Two-carrier WCDMA Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)
V_{DD} = 30 V, I_{DQ} = 1250 mA, P_{OUT} = 32 W average
f_1 = 950 MHz, f_2 = 960 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	17	—	dB
Drain Efficiency	ηD	—	29	—	%
Intermodulation Distortion	IMD	—	–37	—	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 Measurements (tested in Infineon test fixture)
V_{DD} = 30 V, I_{DQ} = 1250 mA, P_{OUT} = 140 W PEP, f = 960 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	Gps	16	17	—	dB
Drain Efficiency	ηD	40	42	—	%
Intermodulation Distortion	IMD	—	–30	–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
	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	$R_{DS(on)}$	—	0.07	—	Ω
Operating Gate Voltage	V_{DS} = 30 V, I_{DQ} = 1250 mA	V_{GS}	2.0	2.5	3.0	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1.0	μA

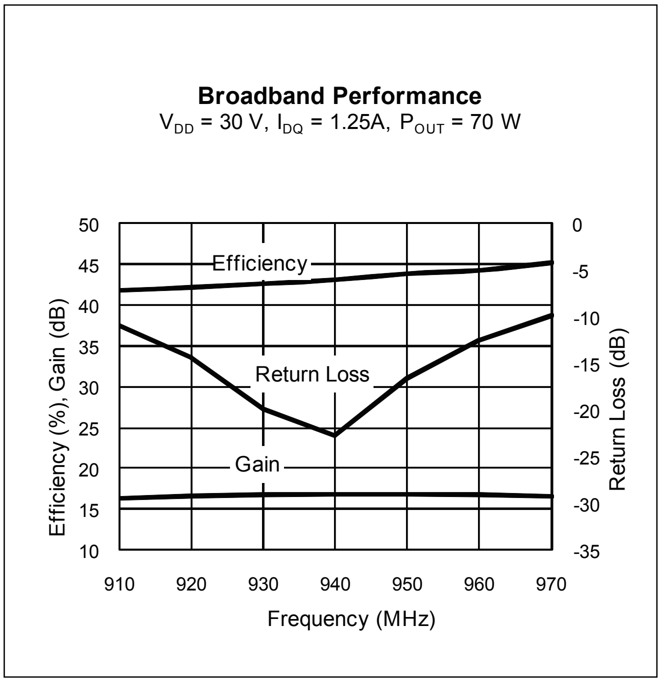
Maximum Ratings

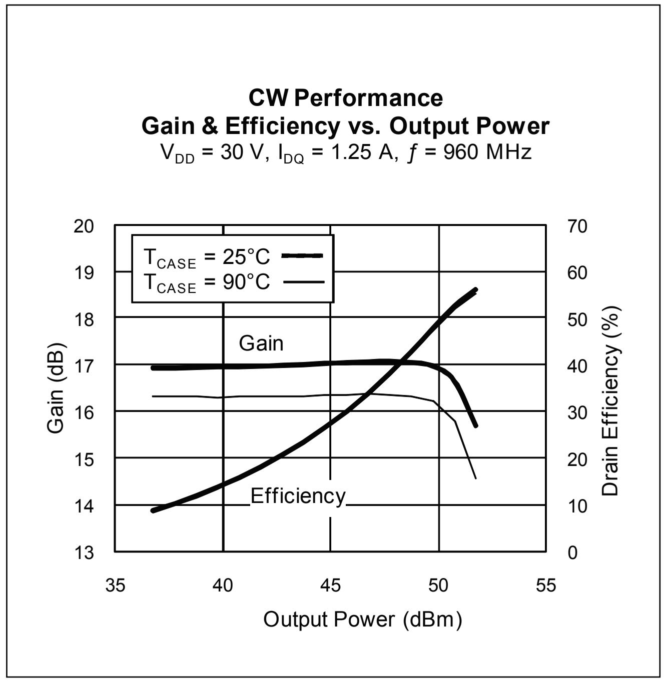
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	–0.5 to +12	V
Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70 °C, 150 W CW)	$R_{\theta JC}$	0.42	°C/W

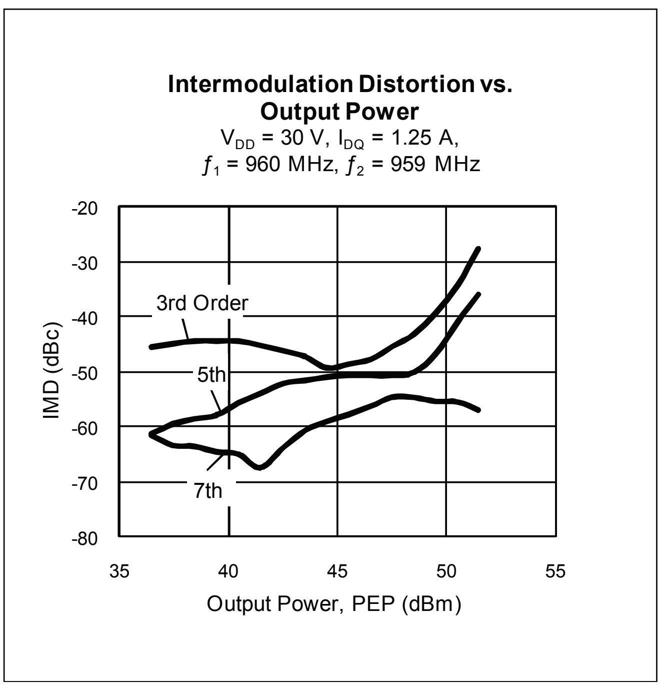
Ordering Information

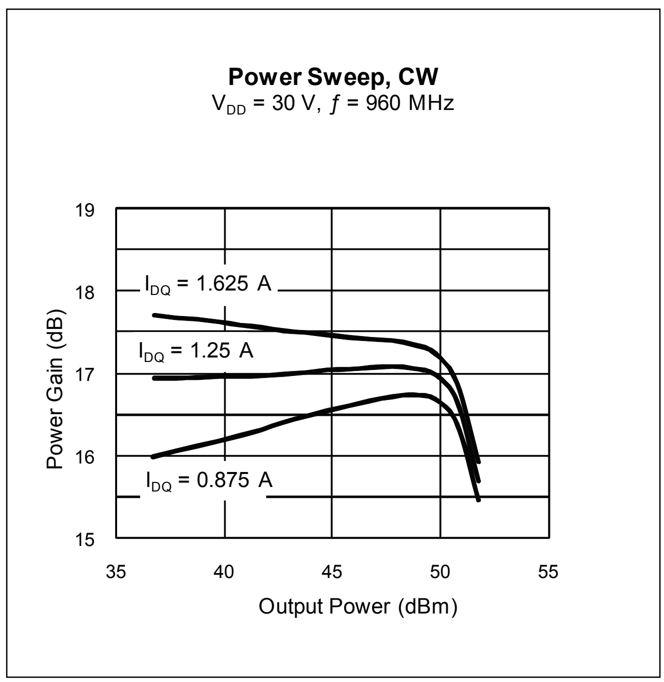
Type and Version	Package Outline	Package Description	Shipping
PTFA091503EL V4	H-33288-6	Thermally-enhanced slotted flange, single-ended	Tray
PTFA091503EL V4 R250	H-33288-6	Thermally-enhanced slotted flange, single-ended	Tape & Reel, 250 pcs

Typical Performance

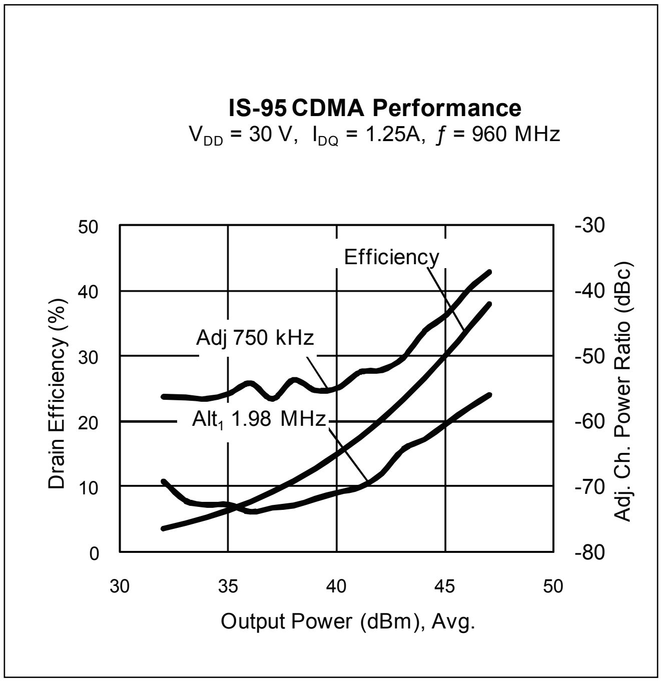




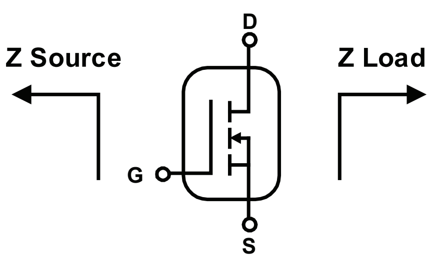


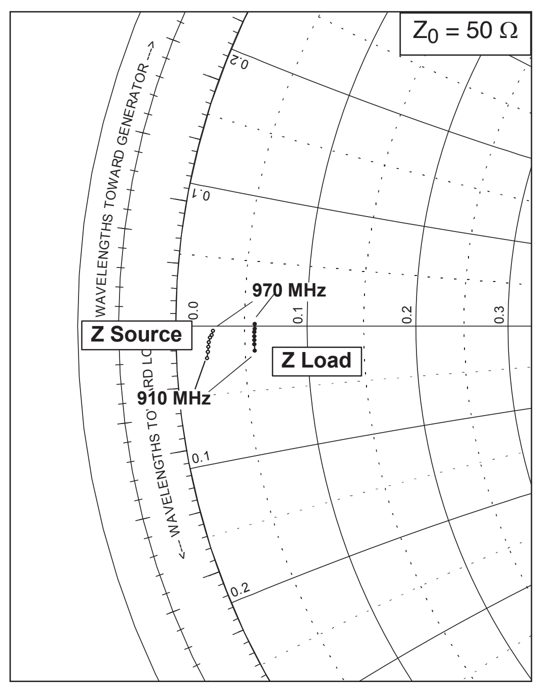


Typical Performance (cont.)



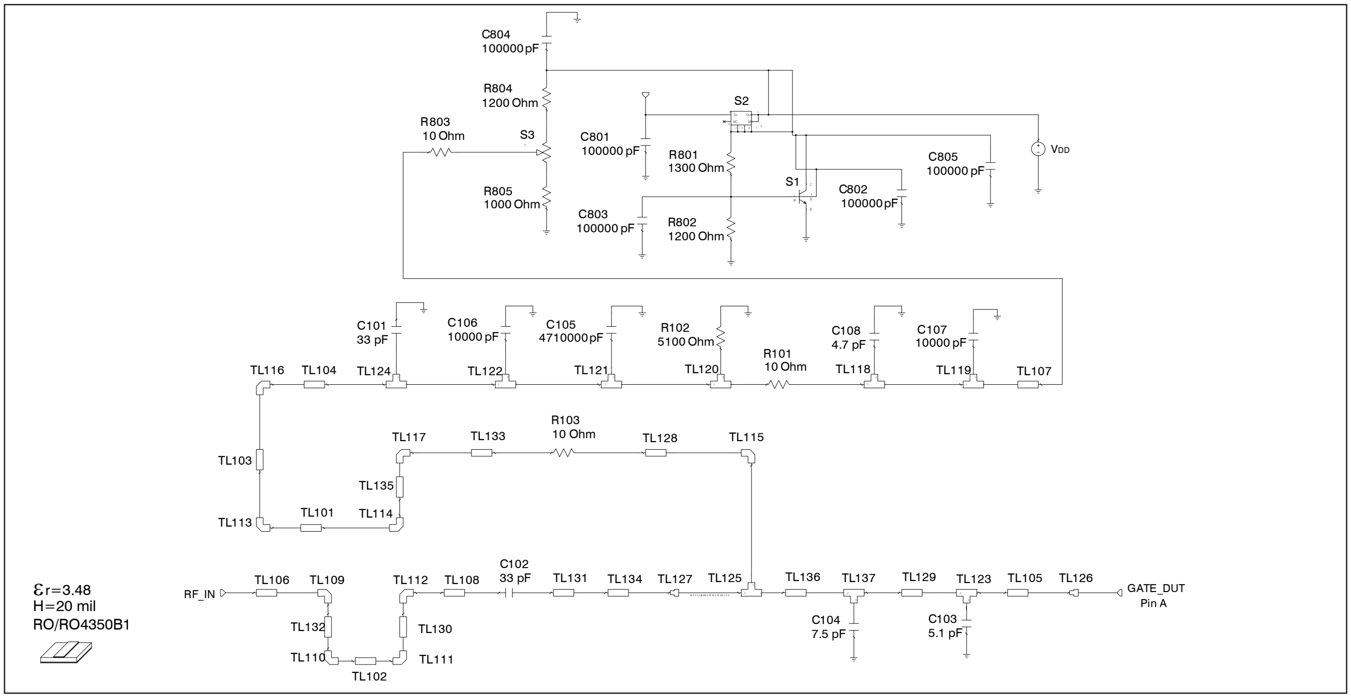
Broadband Circuit Impedance



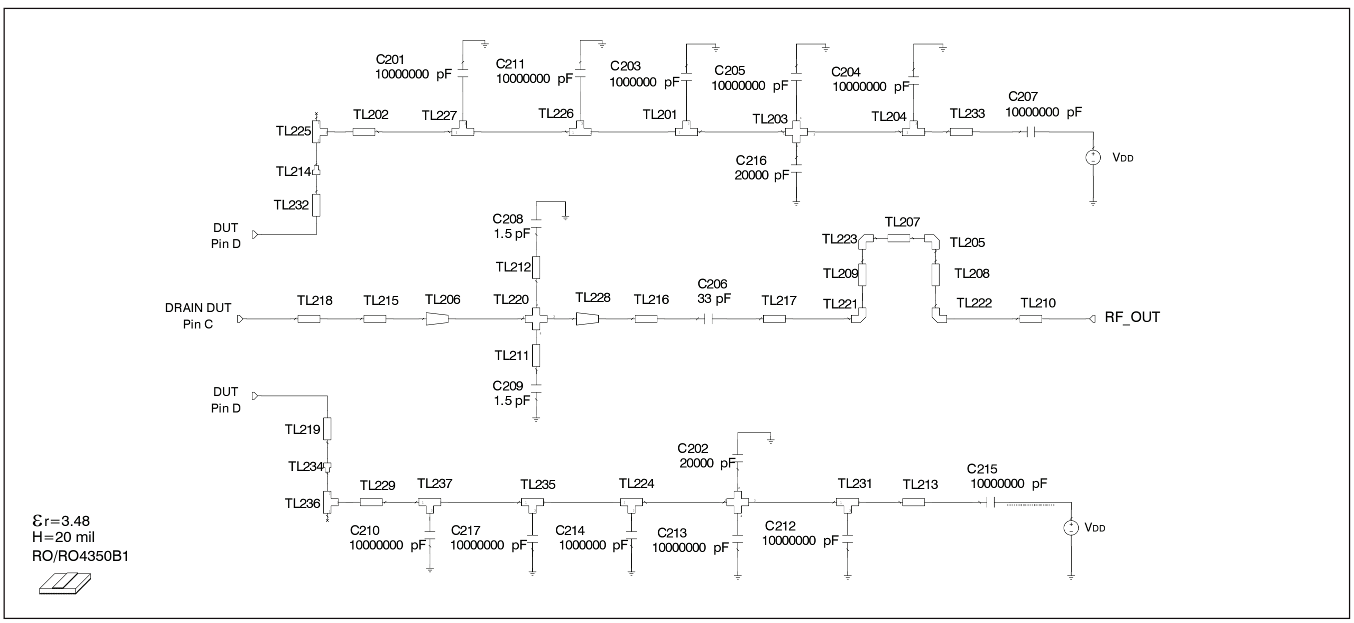


Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
910	1.08	–1.2	2.88	–1.0
920	1.12	–0.9	2.87	–0.7
930	1.15	–0.8	2.87	–0.6
940	1.16	–0.6	2.88	–0.4
950	1.21	–0.4	2.88	–0.3
960	1.28	–0.3	2.9	–0.1
970	1.33	–0.2	2.9	0.1

Reference Circuit



Reference circuit input schematic for ƒ = 960 MHz



Reference circuit output schematic for ƒ = 960 MHz

Reference Circuit (cont.)

Description	
DUT	PTFA091503EL
PCB	0.76 mm [.030"] thick, εr = 3.48, Rogers 4350, 1 oz. copper

Electrical Characteristics at 960 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101	0.098 λ, 78.27 Ω	W = 0.762, L = 19.050	W = 30, L = 750
TL101	0.098 λ, 78.27 Ω	W = 0.762, L = 19.050	W = 30, L = 750
TL102	0.004 λ, 51.58 Ω	W = 1.651, L = 0.762	W = 65, L = 30
TL103	0.026 λ, 78.27 Ω	W = 0.762, L = 5.080	W = 30, L = 200
TL104	0.001 λ, 36.29 Ω	W = 2.794, L = 0.254	W = 110, L = 10
TL105	0.039 λ, 8.94 Ω	W = 15.240, L = 6.731	W = 600, L = 265
TL106	0.034 λ, 51.58 Ω	W = 1.651, L = 6.375	W = 65, L = 251
TL107	0.001 λ, 36.29 Ω	W = 2.794, L = 0.254	W = 110, L = 10
TL108	0.007 λ, 51.58 Ω	W = 1.651, L = 1.270	W = 65, L = 50
TL109, TL110, TL111, TL112		W = 1.651	W = 65
TL113, TL114, TL115, TL116, TL117		W = 0.762	W = 30
TL118, TL119	0.014 λ, 36.29 Ω	W1 = 2.794, W2 = 2.794, W3 = 2.540	W1 = 110, W2 = 110, W3 = 100
TL120, TL121	0.011 λ, 36.29 Ω	W1 = 2.794, W2 = 2.794, W3 = 2.032	W1 = 110, W2 = 110, W3 = 80
TL122, TL124	0.016 λ, 36.29 Ω	W1 = 2.794, W2 = 2.794, W3 = 3.048	W1 = 110, W2 = 110, W3 = 120
TL123, TL137	0.015 λ, 8.94 Ω	W1 = 15.240, W2 = 15.240, W3 = 2.540	W1 = 600, W2 = 600, W3 = 100
TL125	0.004 λ, 8.94 Ω	W1 = 15.240, W2 = 15.240, W3 = 0.762	W1 = 600, W2 = 600, W3 = 30
TL126		W1 = 17.780, W2 = 12.700	W1 = 700, W2 = 500
TL127		W1 = 2.540, W2 = 15.240	W1 = 100, W2 = 600
TL128	0.003 λ, 78.27 Ω	W = 0.762, L = 0.508	W = 30, L = 20
TL129	0.033 λ, 8.94 Ω	W = 15.240, L = 5.715	W = 600, L = 225
TL130, TL132	0.040 λ, 51.58 Ω	W = 1.651, L = 7.620	W = 65, L = 300
TL131	0.038 λ, 38.82 Ω	W = 2.540, L = 7.112	W = 100, L = 280
TL133	0.007 λ, 78.27 Ω	W = 0.762, L = 1.270	W = 30, L = 50
TL134	0.049 λ, 38.82 Ω	W = 2.540, L = 9.144	W = 100, L = 360
TL135	0.015 λ, 78.27 Ω	W = 0.762, L = 2.921	W = 30, L = 115
TL136	0.012 λ, 8.94 Ω	W = 15.240, L = 2.032	W = 600, L = 80

Reference Circuit (cont.)

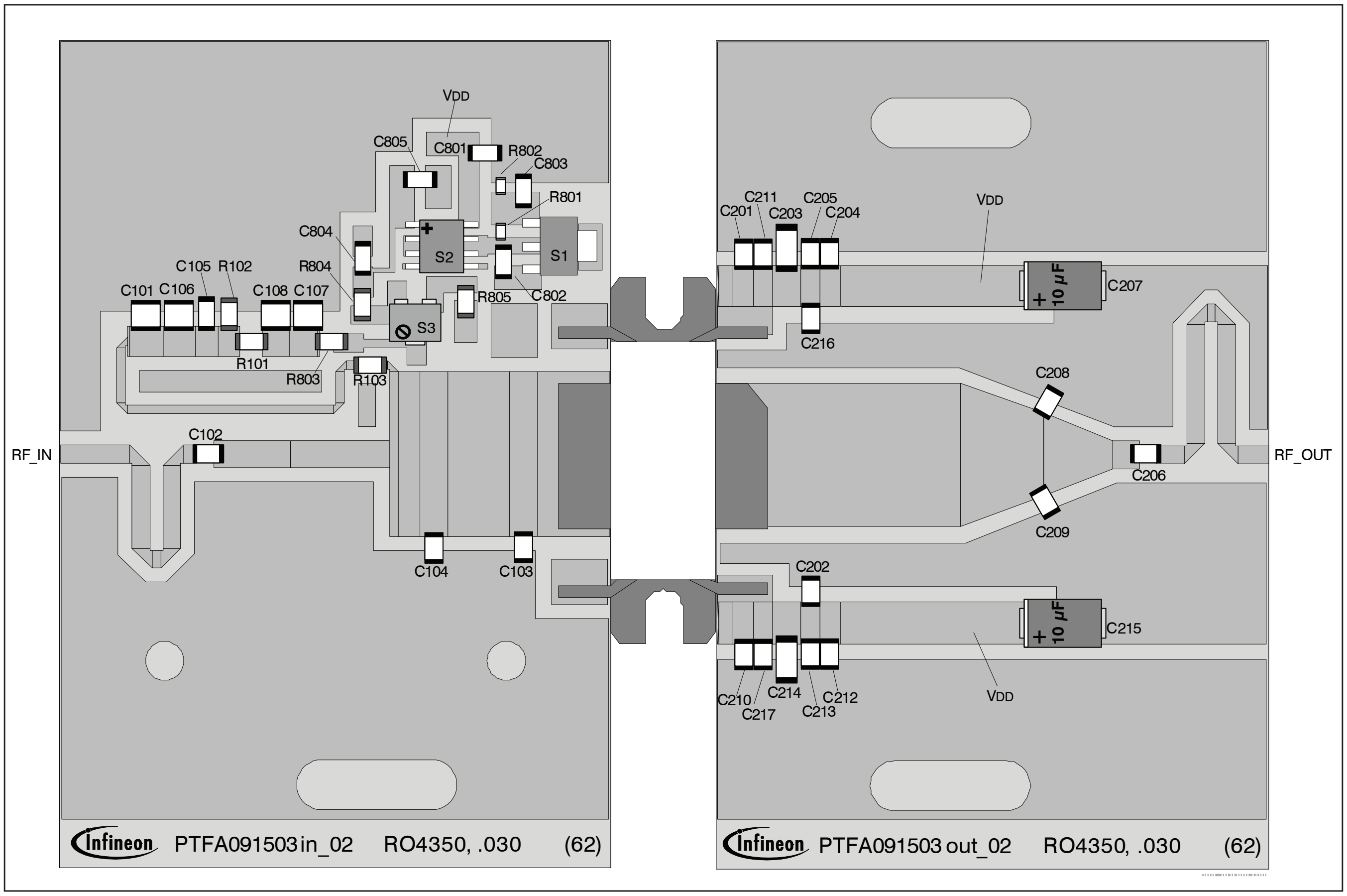
Electrical Characteristics at 960 MHz			
Transmission Line	**Electrical Characteristics**	**Dimensions: mm**	**Dimensions: mils**
Output			
TL201, TL224	0.014 λ, 28.85 Ω	W1 = 3.810, W2 = 3.810, W3 = 2.540	W1 = 150, W2 = 150, W3 = 100
TL202, TL229	0.007 λ, 28.85 Ω	W = 3.810, L = 1.270	W = 150, L = 50
TL203, TL230		W1 = 3.810, W2 = 1.829, W3 = 3.810, W4 = 1.829	W1 = 150, W2 = 72, W3 = 150, W4 = 72
TL204	0.010 λ, 28.85 Ω	W1 = 3.810, W2 = 3.810, W3 = 1.829	W1 = 150, W2 = 150, W3 = 72
TL205, TL221, TL222, TL223		W = 1.651	W = 65
TL206 (taper)	0.044 λ, 10.17 Ω / 16.47 Ω	W1 = 13.208, W2 = 7.620, L = 7.620	W1 = 520, W2 = 300, L = 300
TL207	0.004 λ, 51.58 Ω	W = 1.651, L = 0.762	W = 65, L = 30
TL208, TL209	0.058 λ, 51.58 Ω	W = 1.651, L = 10.922	W = 65, L = 430
TL210	0.015 λ, 51.58 Ω	W = 1.651, L = 2.819	W = 65, L = 111
TL211, TL212	0.000 λ, 146.88 Ω	W = 0.025, L = 0.025	W = 1, L = 1
TL213, TL233	0.093 λ, 28.85 Ω	W = 3.810, L = 17.043	W = 150, L = 671
TL214, TL234		W1 = 0.000, W2 = 0.000, Offset = –0.002	W1 = 0, W2 = 6, Offset = –97
TL215	0.117 λ, 10.17 Ω	W = 13.208, L = 20.320	W = 520, L = 800
TL216	0.014 λ, 38.82 Ω	W = 2.540, L = 2.540	W = 100, L = 100
TL217	0.013 λ, 51.58 Ω	W = 1.651, L = 2.540	W = 65, L = 100
TL218	0.012 λ, 10.17 Ω	W = 13.208, L = 2.032	W = 520, L = 80
TL219, TL232	0.014 λ, 23.03 Ω	W = 5.080, L = 2.540	W = 200, L = 100
TL220		W1 = 7.620, W2 = 0.025, W3 = 7.620 W4 = 0.025	W1 = 300, W2 = 1, W3 = 300, W4 = 1
TL225, TL236	0.019 λ, 126.18 Ω	W1 = 0.152, W2 = 0.152, W3 = 3.810	W1 = 6, W2 = 6, W3 = 150
TL226, TL227, TL231, TL235, TL237	0.010 λ, 28.85 Ω	W1 = 3.810, W2 = 3.810, W3 = 1.829	W1 = 150, W2 = 150, W3 = 72
TL228 (taper)	0.036 λ, 16.47 Ω / 38.82 Ω	W1 = 7.620, W2 = 2.540, L = 6.350	W1 = 300, W2 = 100, L = 250

Reference Circuit (cont.)

Circuit Assembly Information

Test Fixture Part No.	LTN/PTFA091503E

Find Gerber files for this test fixture on the Infineon Web site at *http://www.infineon.com/rfpower*



*Reference circuit assembly diagram (not to scale)**

Reference Circuit (cont.)

Components Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C102	Chip capacitor, 33 pF	ATC	ATC100B330FW500XB
C103	Chip capacitor, 5.1 pF	ATC	ATC100B5R1BW500XB
C104	Chip capacitor, 7.5 pF	ATC	ATC100B7R5BW500XB
C105	Chip capacitor, 4.71 μF	Digi-Key	PCS3475CT-ND
C106, C107	Chip capacitor, 0.1 μF	ATC	200B103MW
C108	Chip capacitor, 4.7 pF	ATC	ATC100B4R7BW500XB
C801, C802, C803, C804, C805	Chip capacitor, 0.1 μF	Digi-Key	PCC104BCT-ND
R101, R103, R803	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R102	Resistor, 5100 Ω	Digi-Key	P5.1KECT-ND
R801	Resistor, 1300 Ω	Digi-Key	P1.3KGCT-ND
R802	Resistor, 1200 Ω	Digi-Key	P1.2KGCT-ND
R804	Resistor, 1200 Ω	Digi-Key	P1.2KECT-ND
R805	Resistor, 1000 Ω	Digi-Key	P1.0KECT-ND
S1	Transistor	Digi-Key	BCP5616TA-ND
S2	Voltage Regulator	Digi-Key	LM78L05ACM-ND
S3	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
Output			
C201, C204, C205, C210, C211, C213, C214, C217	Capacitor, 10 μF	Digi-Key	587-1818-2-ND
C202, C216	Chip capacitor, 20000 pF	ATC	200B203MW
C203, C214	Chip capacitor, 1 μF	Digi-Key	478-3993-2-ND
C206	Chip capacitor, 33 pF	ATC	ATC100B330FW500XB
C207, C215	Capacitor, 10 μF	Garrett Electronics	281M5002106K
C208, C209	Chip capacitor, 1.5 pF	ATC	ATC100B1R5BW500XB

Package Outline Specifications

Package H-33288-6

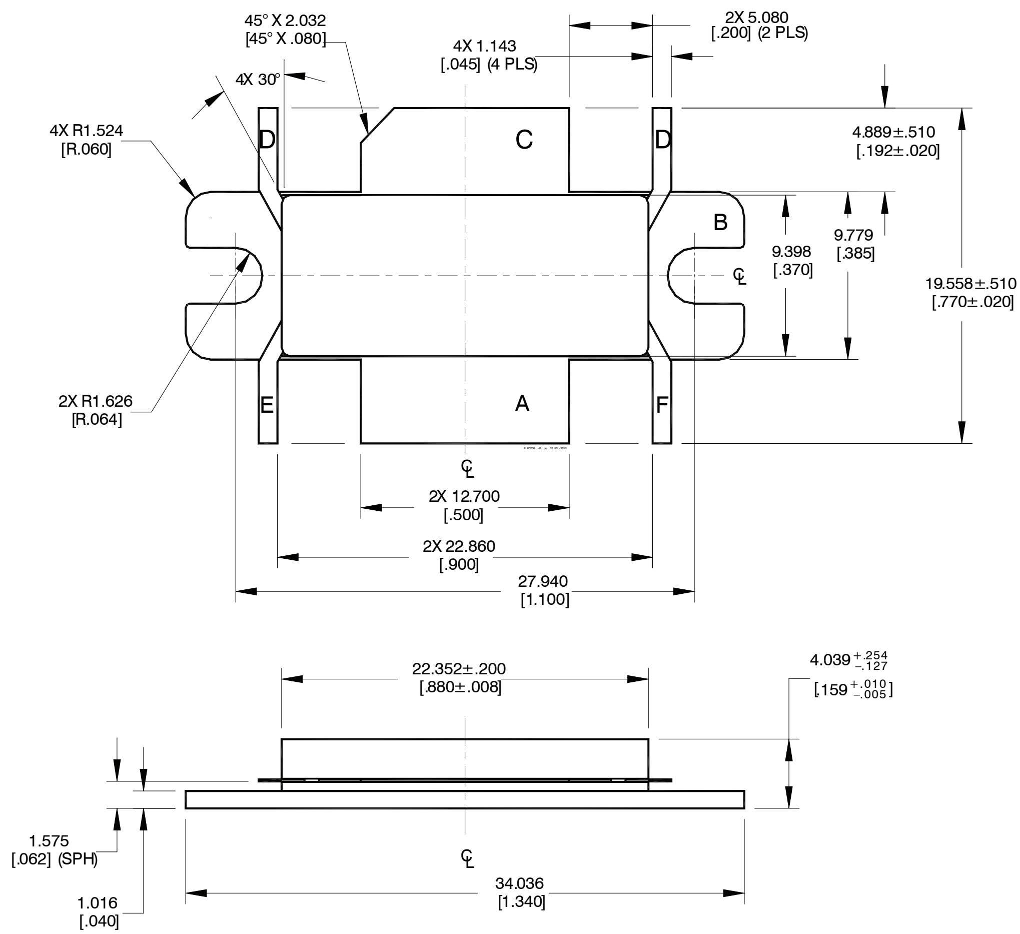


Diagram Notes—unless otherwise specified:

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: A = gate; B = source; C = drain; D = drain voltage; E, F = N.C.
5. Lead thickness: 0.10 +0.051/–0.025 [.004 +.002/–.001].
6. Gold plating thickness: 0.25 micron [10 microinch] max.

Find the latest and most complete information about products and packaging at the Infineon Internet page
http://www.infineon.com/rfpower

Revision History:	2010-08-11	Data Sheet
Previous Version:	2010-07-26, Data Sheet	
Page	Subjects (major changes since last revision)	
5-9	Updated reference circuit information	

We Listen to Your Comments

Any information within this document that you feel is wrong, unclear or missing at all?
Your feedback will help us to continuously improve the quality of this document.
Please send your proposal (including a reference to this document) to:

highpowerRF@infineon.com

To request other information, contact us at:
+1 877 465 3667 (1-877-GO-LDMOS) USA
or +1 408 776 0600 International

Edition 2010-08-11

Published by
Infineon Technologies AG
81726 Munich, Germany

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (**www.infineon.com/rfpower**).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.