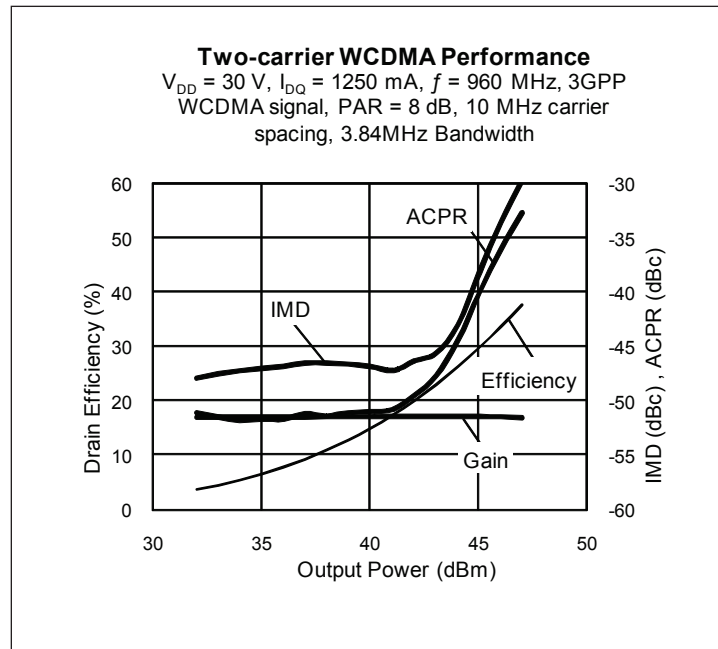


Thermally-Enhanced High Power RF LDMOS FET 150 W, 920 – 960 MHz

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



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)

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1250\text{ mA}$, $P_{OUT} = 32\text{ W}$ average

$f_1 = 950\text{ MHz}$, $f_2 = 960\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	17	—	dB
Drain Efficiency	η_D	—	29	—	%
Intermodulation Distortion	IMD	—	-37	—	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 Measurements (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1250\text{ mA}$, $P_{OUT} = 140\text{ W PEP}$, $f = 960\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	Gps	16	17	—	dB
Drain Efficiency	η_D	40	42	—	%
Intermodulation Distortion	IMD	—	−30	−28	dBc

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	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	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.07	—	Ω
Operating Gate Voltage	$V_{DS} = 30\text{ V}$, $I_{DQ} = 1250\text{ mA}$	V_{GS}	2.0	2.5	3.0	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	—	—	1.0	μA

Maximum Ratings

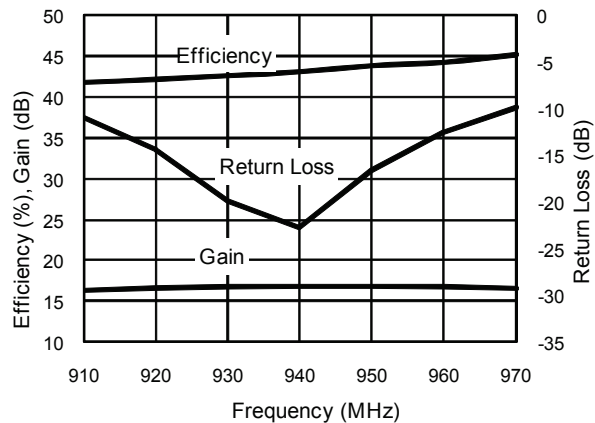
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	−0.5 to +12	V
Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{STG}	−40 to +150	°C
Thermal Resistance ($T_{CASE} = 70\text{ °C}$, 150 W CW)	$R_{\theta JC}$	0.42	°C/W

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

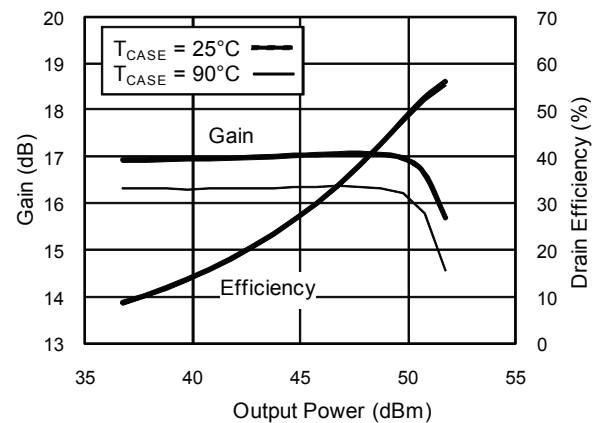
Typical Performance

Broadband Performance

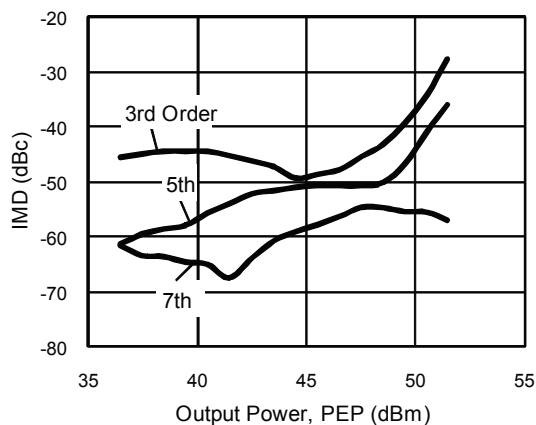
 $V_{DD} = 30\text{ V}$, $I_{DQ} = 1.25\text{ A}$, $P_{OUT} = 70\text{ W}$


CW Performance

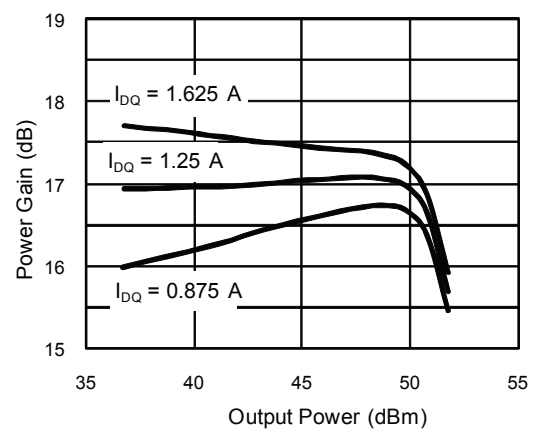
Gain & Efficiency vs. Output Power

 $V_{DD} = 30\text{ V}$, $I_{DQ} = 1.25\text{ A}$, $f = 960\text{ MHz}$


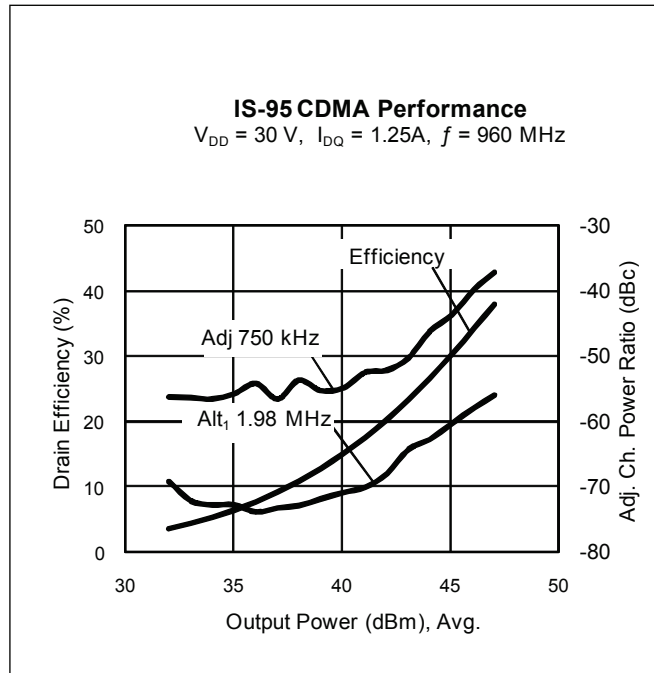
Intermodulation Distortion vs. Output Power

 $V_{DD} = 30\text{ V}$, $I_{DQ} = 1.25\text{ A}$,
 $f_1 = 960\text{ MHz}$, $f_2 = 959\text{ MHz}$


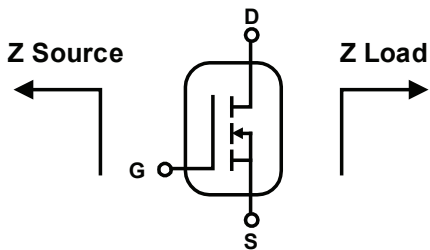
Power Sweep, CW

 $V_{DD} = 30\text{ V}$, $f = 960\text{ MHz}$


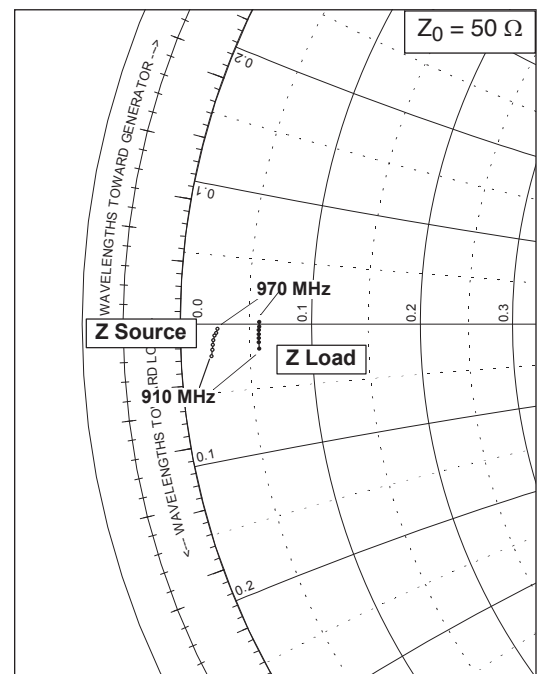
Typical Performance (cont.)



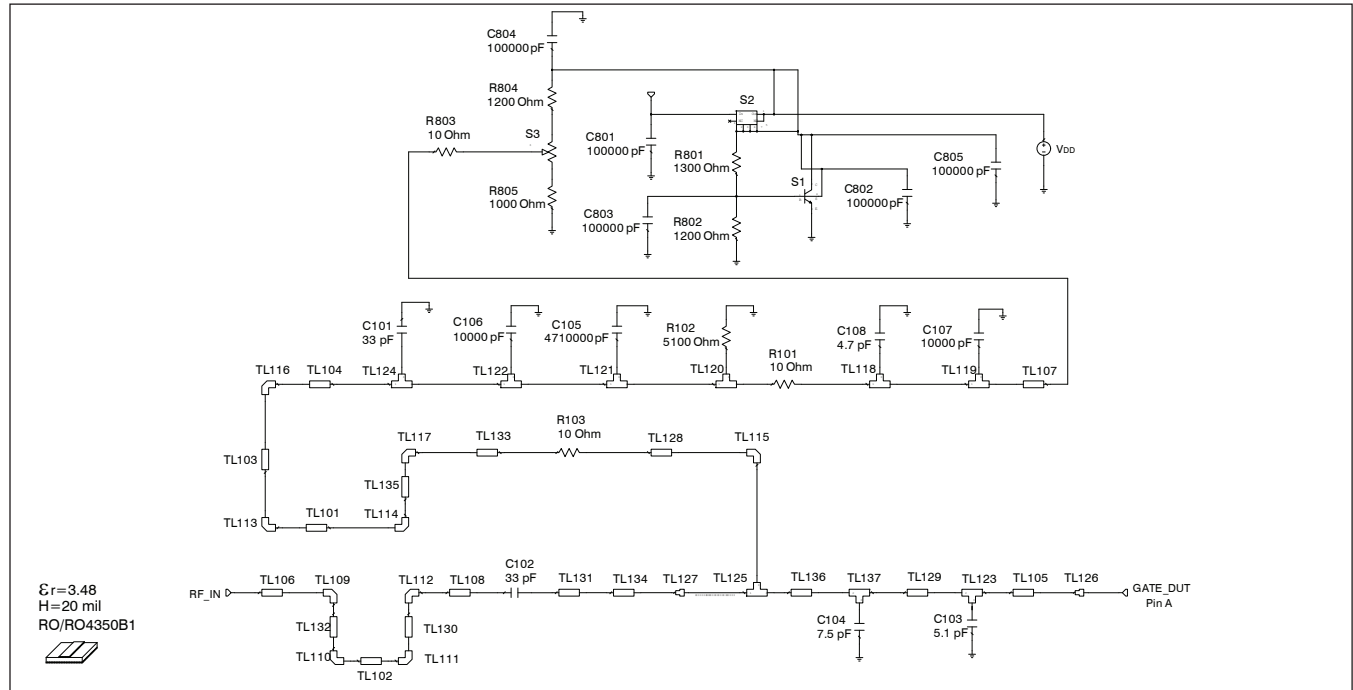
Broadband Circuit Impedance



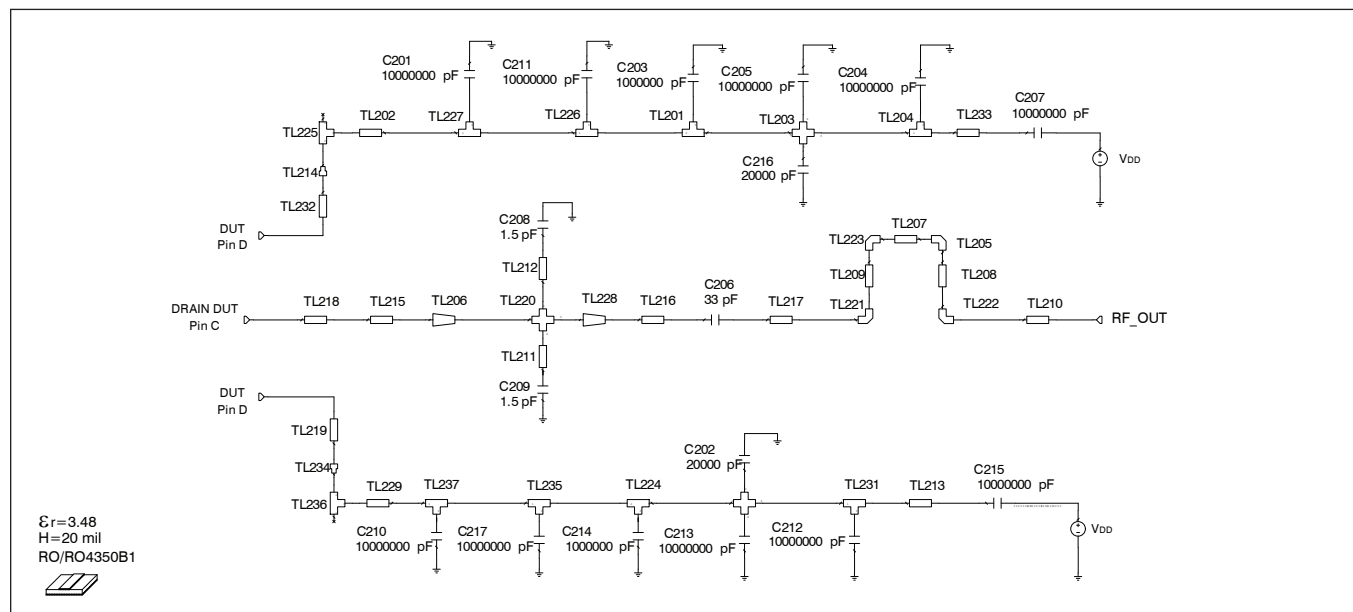
Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
910	1.08	-1.2	2.88	-1.0
920	1.12	-0.9	2.87	-0.7
930	1.15	-0.8	2.87	-0.6
940	1.16	-0.6	2.88	-0.4
950	1.21	-0.4	2.88	-0.3
960	1.28	-0.3	2.9	-0.1
970	1.33	-0.2	2.9	0.1



Reference Circuit



Reference circuit input schematic for $f = 960$ MHz



Reference circuit output schematic for $f = 960$ MHz

Reference Circuit (cont.)

Description

DUT	PTFA091503EL
PCB	0.76 mm [.030"] thick, $\epsilon_r = 3.48$, Rogers 4350, 1 oz. copper

Electrical Characteristics at 960 MHz

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

Reference Circuit (cont.)

Electrical Characteristics at 960 MHz

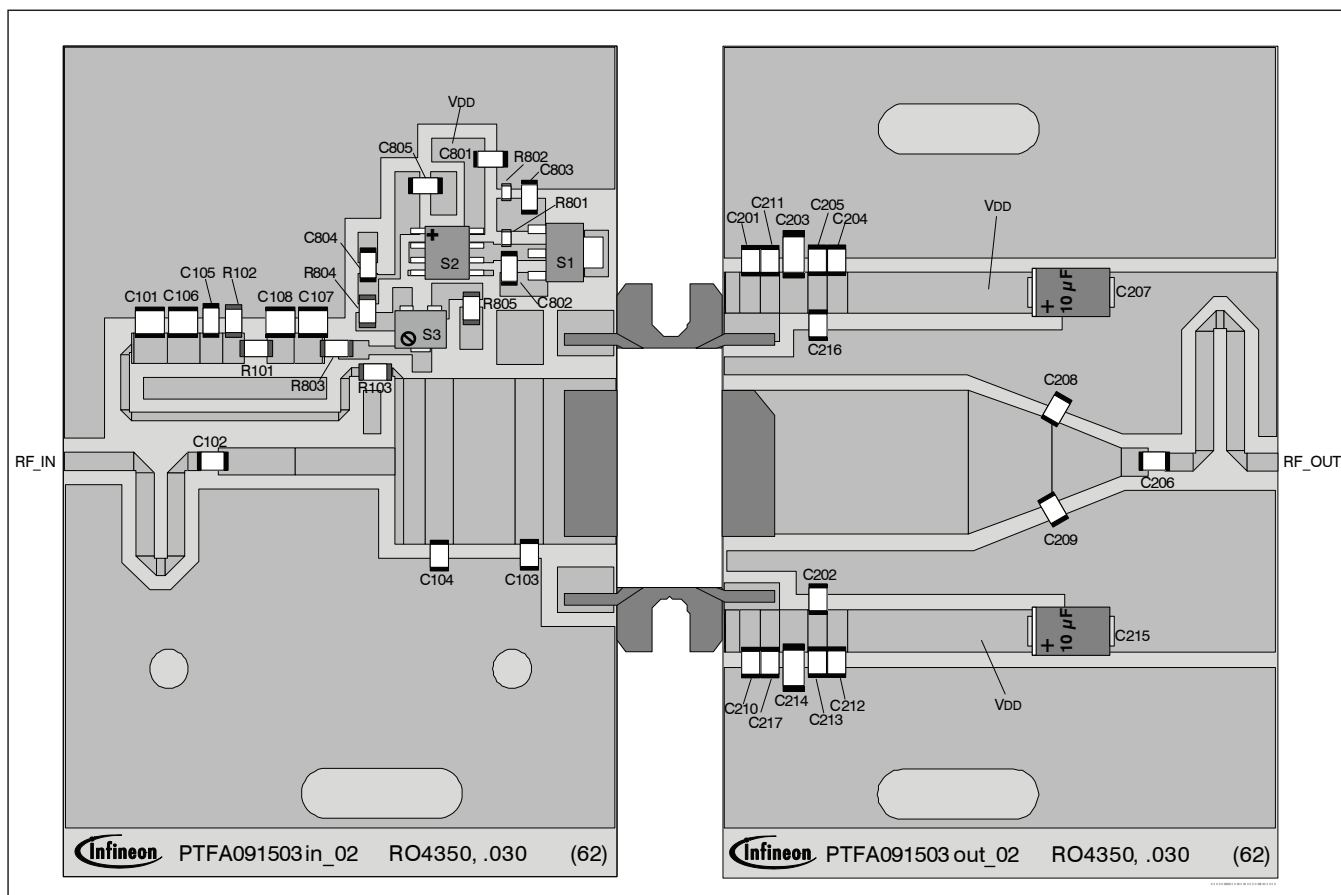
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201, TL224	0.014λ , 28.85 Ω	W1 = 3.810, W2 = 3.810, W3 = 2.540	W1 = 150, W2 = 150, W3 = 100
TL202, TL229	0.007λ , 28.85 Ω	W = 3.810, L = 1.270	W = 150, L = 50
TL203, TL230		W1 = 3.810, W2 = 1.829, W3 = 3.810, W4 = 1.829	W1 = 150, W2 = 72, W3 = 150, W4 = 72
TL204	0.010λ , 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)	0.044λ , 10.17 Ω / 16.47 Ω	W1 = 13.208, W2 = 7.620, L = 7.620	W1 = 520, W2 = 300, L = 300
TL207	0.004λ , 51.58 Ω	W = 1.651, L = 0.762	W = 65, L = 30
TL208, TL209	0.058λ , 51.58 Ω	W = 1.651, L = 10.922	W = 65, L = 430
TL210	0.015λ , 51.58 Ω	W = 1.651, L = 2.819	W = 65, L = 111
TL211, TL212	0.000λ , 146.88 Ω	W = 0.025, L = 0.025	W = 1, L = 1
TL213, TL233	0.093λ , 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	0.117λ , 10.17 Ω	W = 13.208, L = 20.320	W = 520, L = 800
TL216	0.014λ , 38.82 Ω	W = 2.540, L = 2.540	W = 100, L = 100
TL217	0.013λ , 51.58 Ω	W = 1.651, L = 2.540	W = 65, L = 100
TL218	0.012λ , 10.17 Ω	W = 13.208, L = 2.032	W = 520, L = 80
TL219, TL232	0.014λ , 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	0.019λ , 126.18 Ω	W1 = 0.152, W2 = 0.152, W3 = 3.810	W1 = 6, W2 = 6, W3 = 150
TL226, TL227, TL231, TL235, TL237	0.010λ , 28.85 Ω	W1 = 3.810, W2 = 3.810, W3 = 1.829	W1 = 150, W2 = 150, W3 = 72
TL228 (taper)	0.036λ , 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 μ F	Digi-Key	PCS3475CT-ND
C106, C107	Chip capacitor, 0.1 μ F	ATC	200B103MW
C108	Chip capacitor, 4.7 pF	ATC	ATC100B4R7BW500XB
C801, C802, C803, C804, C805	Chip capacitor, 0.1 μ F	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 μ F	Digi-Key	587-1818-2-ND
C202, C216	Chip capacitor, 20000 pF	ATC	200B203MW
C203, C214	Chip capacitor, 1 μ F	Digi-Key	478-3993-2-ND
C206	Chip capacitor, 33 pF	ATC	ATC100B330FW500XB
C207, C215	Capacitor, 10 μ F	Garrett Electronics	281M5002106K
C208, C209	Chip capacitor, 1.5 pF	ATC	ATC100B1R5BW500XB

Package Outline Specifications

Package H-33288-6

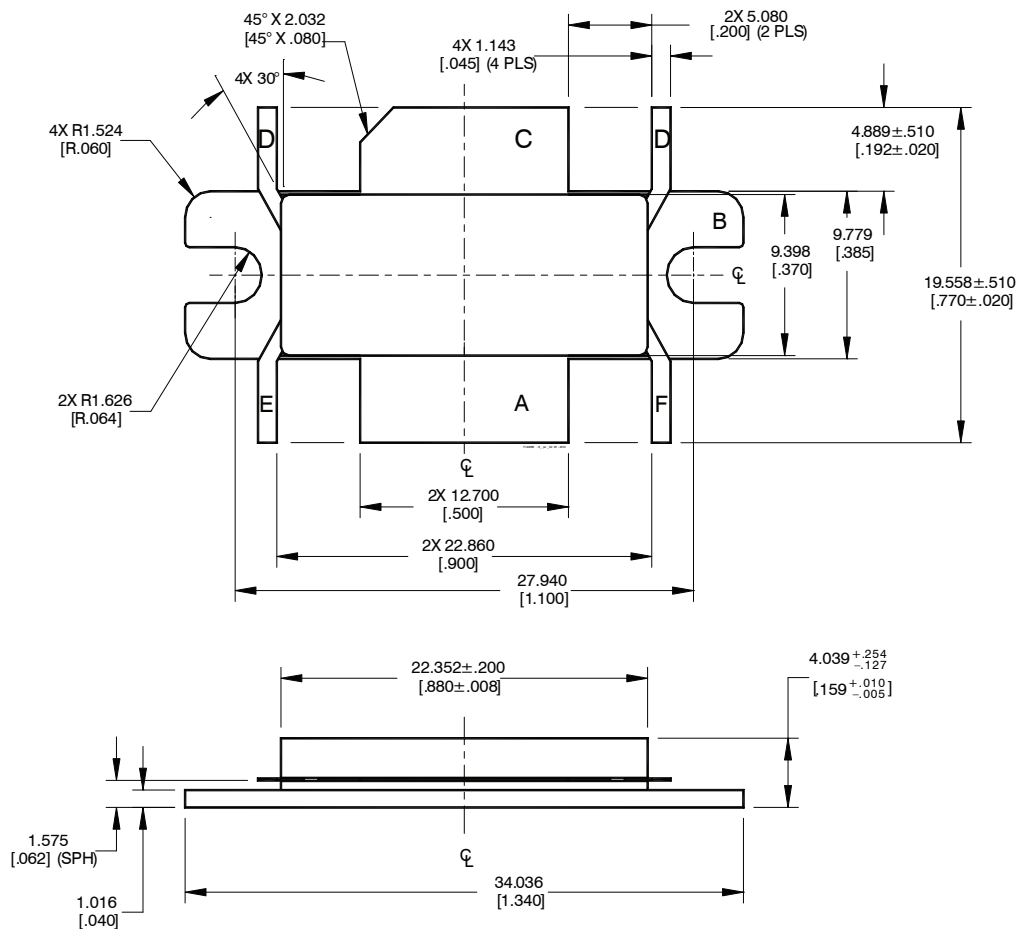


Diagram Notes—unless otherwise specified:

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

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