PTFB192503EL
PTFB192503FL

green Product

Thermally-Enhanced High Power RF LDMOS FETs
240 W, 1930 – 1990 MHz

Description

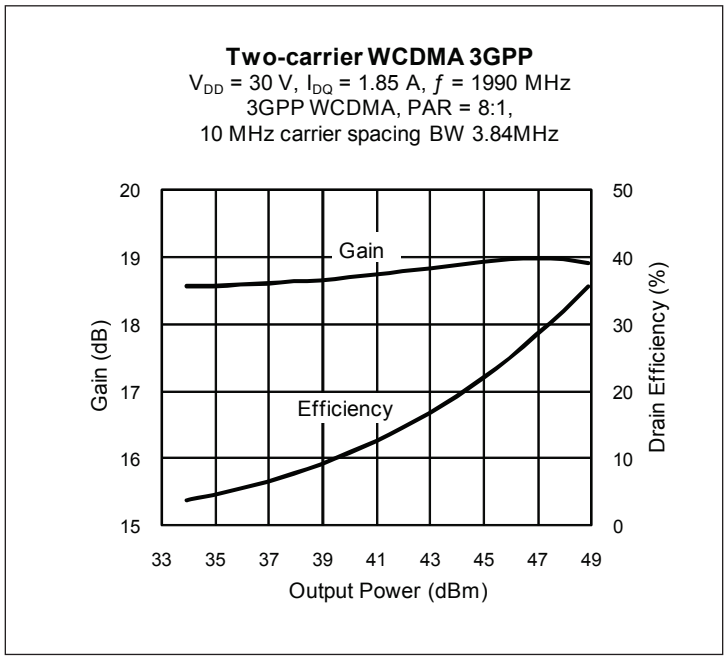
The PTFB192503EL and PTFB192503FL are 240-watt LDMOS FETs intended for use in multi-standard cellular power amplifier applications in the 1930 to 1990 MHz frequency band. Features include input and output matching, high gain, wide signal bandwidth and reduced memory effects for improved DPD correctability. Manufactured with Infineon's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTFB192503EL
Package H-33288-6



PTFB192503FL
Package H-34288-4/2





Features

- Broadband internal input and output matching
- Enhanced for use in DPD error correction systems
- Typical two-carrier WCDMA performance, 30 V, 1990 MHz
  - Average output power = 50 W
  - Linear gain = 19 dB
  - Drain efficiency = 28 %
  - Intermodulation distortion = –35 dBc
- Typical CW performance, 1990 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 Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)

V_{DD} = 30 V, I_{DQ} = 1.9 A, P_{OUT} = 50 W average, f_1 = 1980 MHz, f_2 = 1990 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8:1 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	19	—	dB
Drain Efficiency	ηD	—	28	—	%
Intermodulation Distortion	IMD	—	–35	—	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} = 1.9 A, P_{OUT} = 220 W PEP, f = 1990 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17	18	—	dB
Drain Efficiency	ηD	40	41.5	—	%
Intermodulation Distortion	IMD	—	–29	–27	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} = 1.9 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

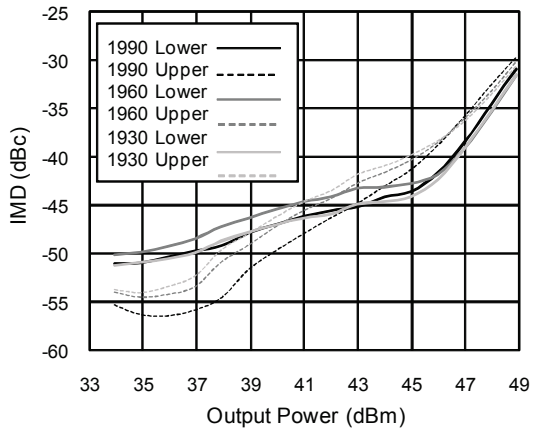
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	–6 to +10	V
Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 200 W CW)	$R_{\theta JC}$	0.262	°C/W

Ordering Information

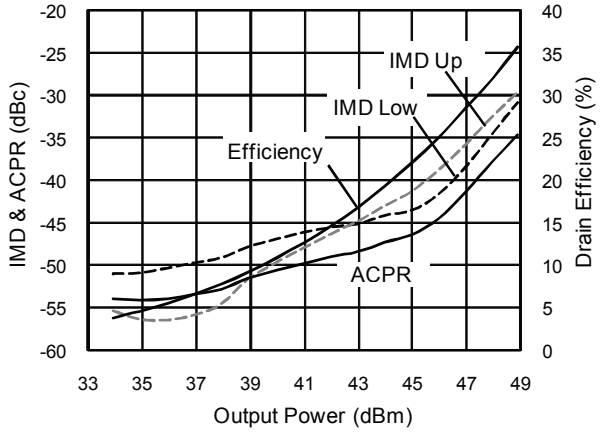
Type and Version	Order Code	Package Description	Shipping
PTFB192503EL V1 R0	PTFB192503ELV1R0XTMA1	H-33288-6, bolt-down	Tape & Reel, 50pcs
PTFB192503EL V1 R250	PTFB192503ELV1R250XTMA1	H-33288-6, bolt-down	Tape & Reel, 250pcs
PTFB192503FL V2 R0	PTFB192503FLV2R0XTMA1	H-34288-4/2, earless	Tape & Reel, 50pcs
PTFB192503FL V2 R250	PTFB192503FLV2R250XTMA1	H-34288-4/2, earless	Tape & Reel, 250pcs

Typical Performance (data taken in a production test fixture)

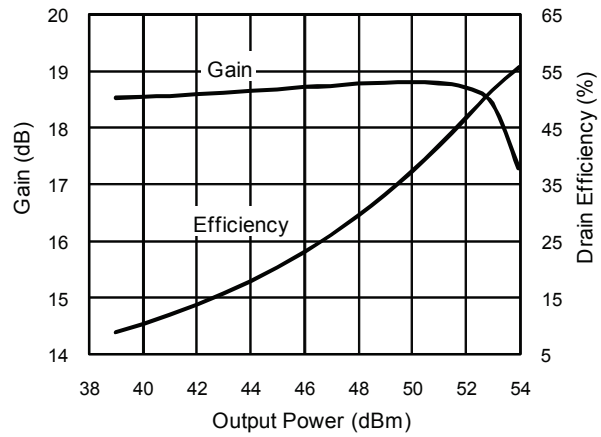
Two-carrier WCDMA 3GPP Drive-up
V_{DD} = 30 V, I_{DQ} = 1.85 A, 3GPP WCDMA,
PAR = 8:1, 10 MHz carrier spacing
BW 3.84 MHz



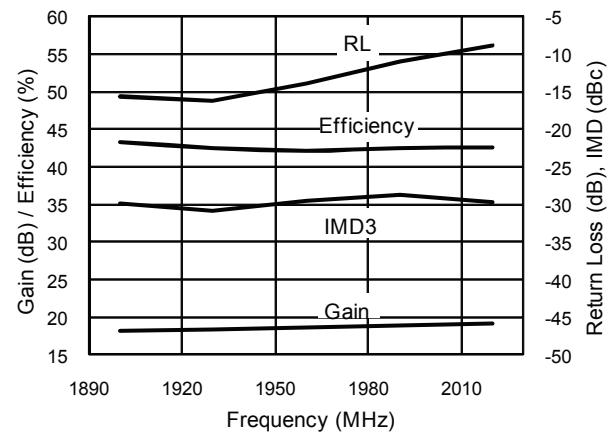
Two-carrier WCDMA 3GPP Drive-up
V_{DD} = 30 V, I_{DQ} = 1.85 A, f = 1990 MHz
3GPP WCDMA, PAR = 8:1,
10 MHz carrier spacing, BW 3.84 MHz



Power Sweep, CW
Gain & Efficiency vs. Output Power
V_{DD} = 30 V, I_{DQ} = 1.85 A, f = 1990 MHz

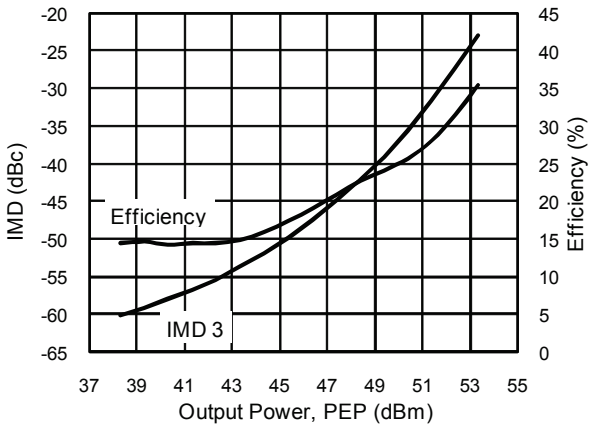


Two-tone Broadband
Gain, Efficiency & Return Loss
vs. Frequency
V_{DD} = 30 V, I_{DQ} = 1.85 A, P_{OUT} = 110 W

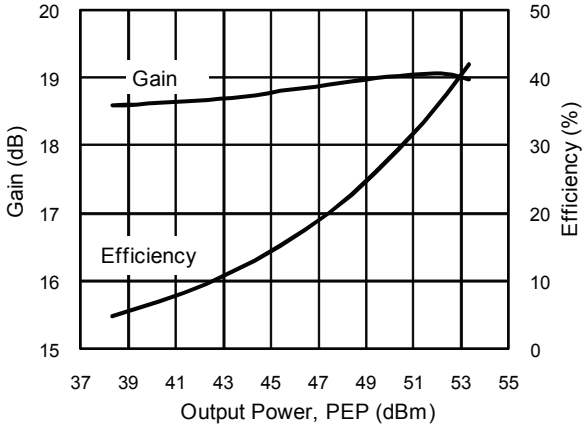


Typical Performance (cont.)

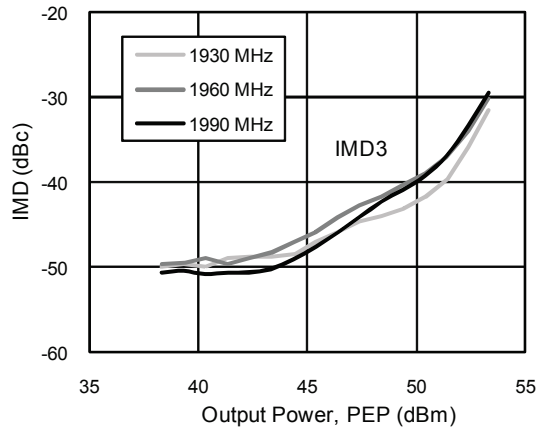
Two-tone Drive-up
V_{DD} = 30 V, I_{DQ} = 1.85 A,
f_1 = 1990 MHz, f_2 = 1989 MHz



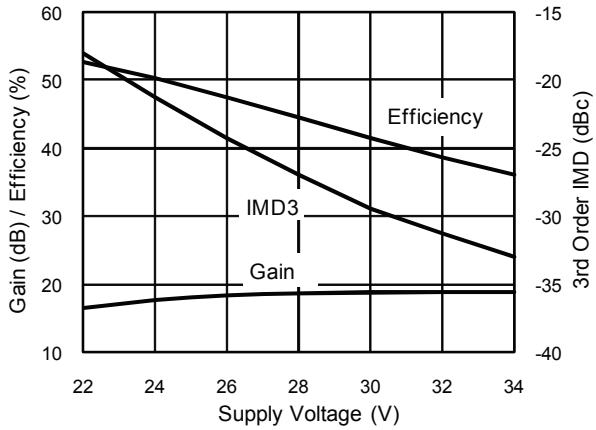
Two-tone Drive-up
V_{DD} = 30 V, I_{DQ} = 1.85 A,
f_1 = 1990 MHz, f_2 = 1989 MHz



Two-tone Drive-up
at Selected Frequencies
V_{DD} = 30 V, I_{DQ} = 1.85 A, Tone Spacing = 1 MHz

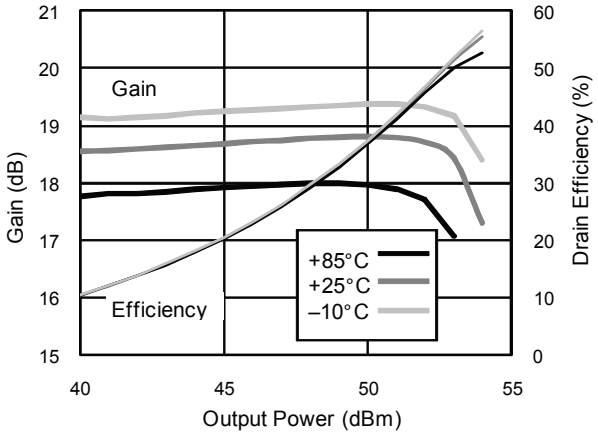


Two-tone Voltage Sweep
I_{DQ} = 1.85 A, f_1 = 1990 MHz, f_2 = 1989 MHz
Output Power = 53.3 dBm

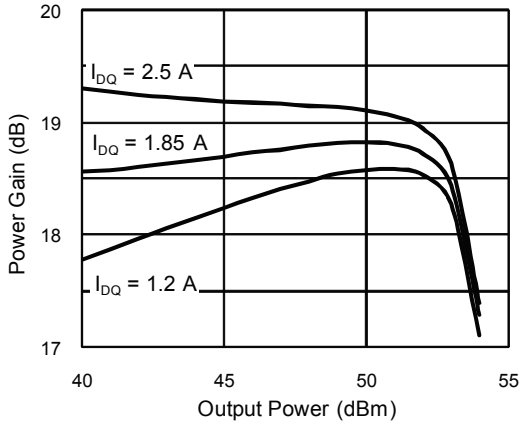


Typical Performance (cont.)

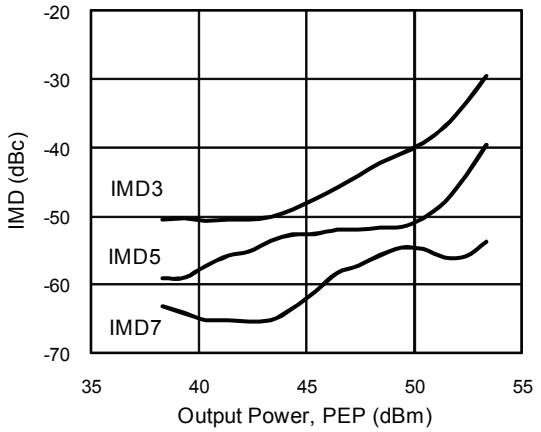
CW
Gain & Efficiency vs. Output Power
V_{DD} = 30 V, I_{DQ} = 1.85 A, f = 1990 MHz



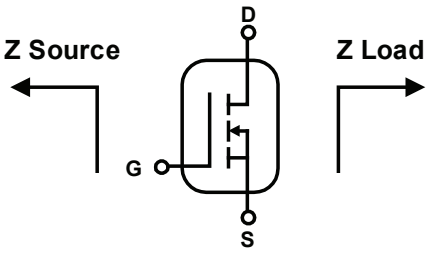
CW Performance
Gain vs. Output Power
V_{DD} = 30 V, f = 1990 MHz

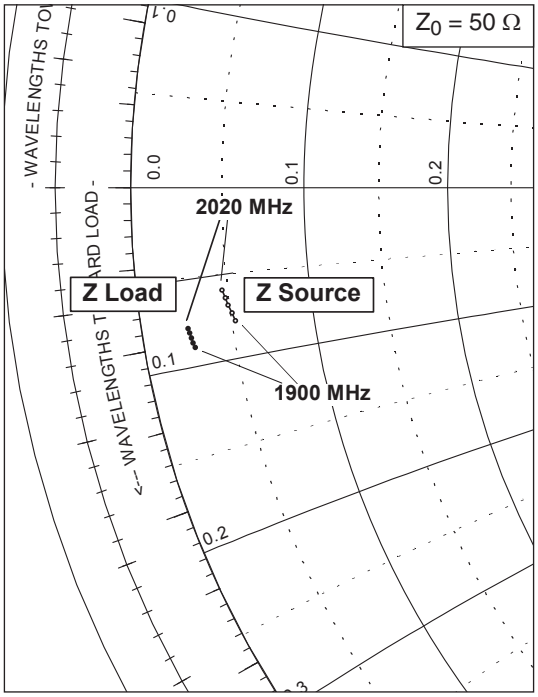


Intermodulation Distortion
vs. Output Power
V_{DD} = 30 V, I_{DQ} = 1.85 A,
f_1 = 1990 MHz, f_2 = 1989 MHz



Broadband Circuit Impedance

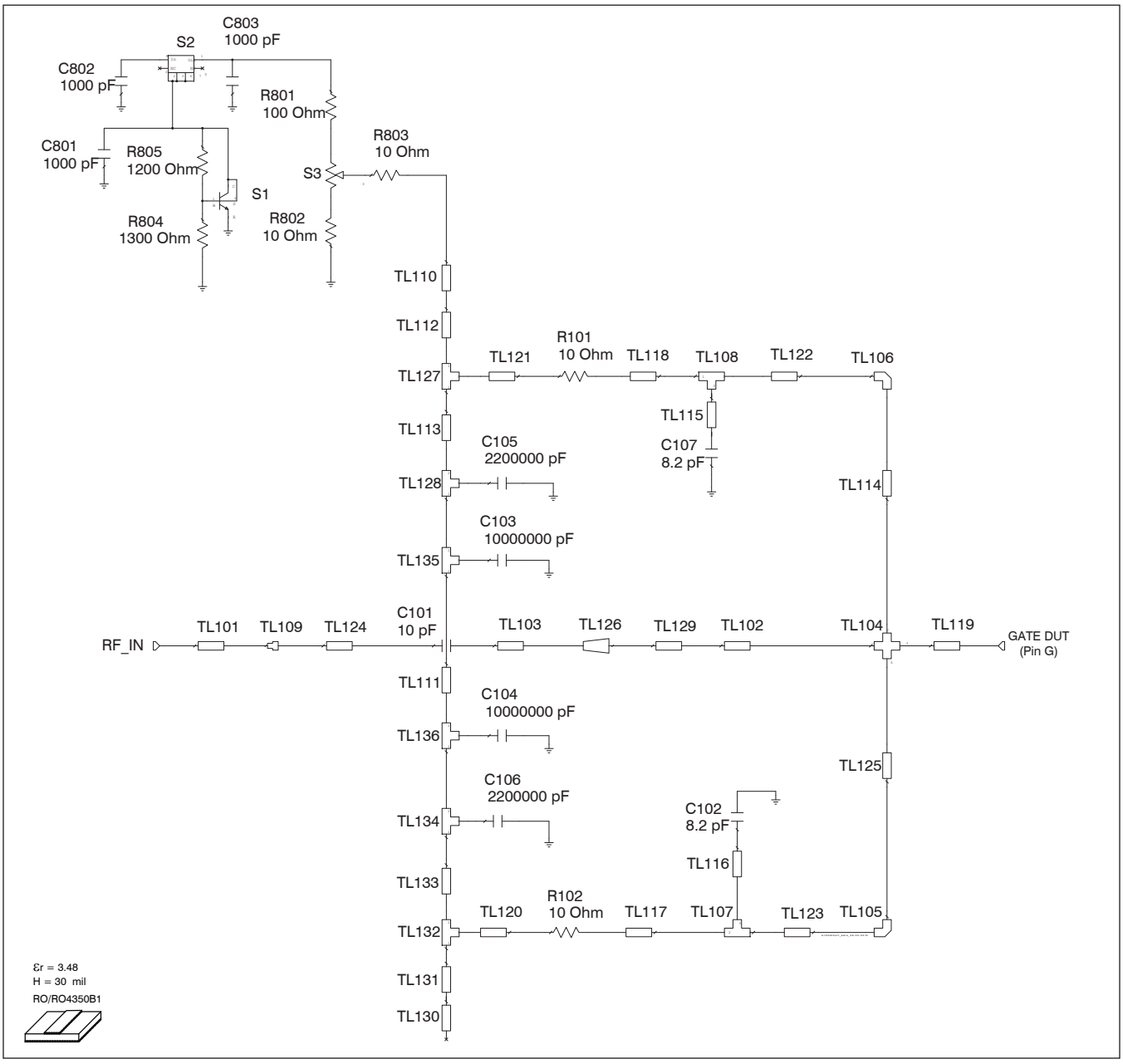




Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
1900	2.63	–3.92	1.36	–4.49
1930	2.56	–3.67	1.33	–4.35
1960	2.48	–3.44	1.31	–4.21
1990	2.42	–3.21	1.28	–4.07
2020	2.35	–2.98	1.26	–3.93

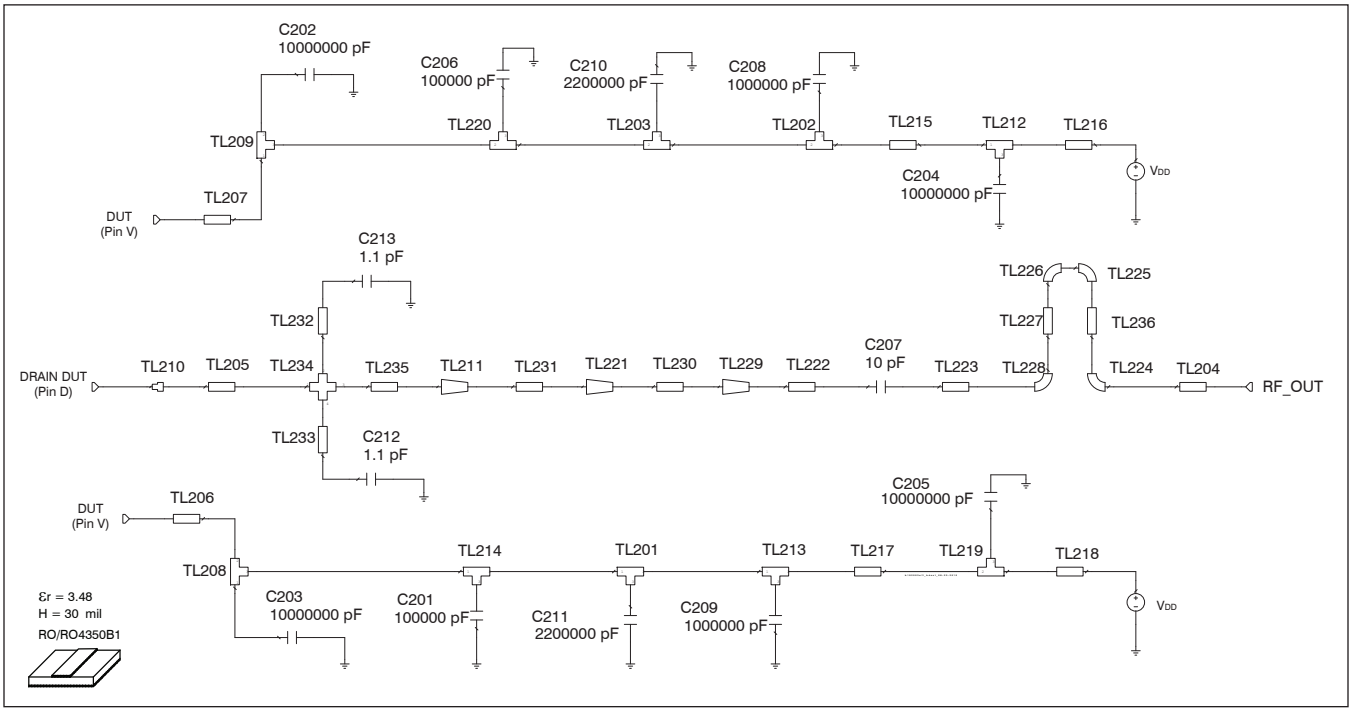
See next page for reference circuit information

Reference Circuit



Reference circuit input schematic for ƒ = 1990 MHz

Reference Circuit (cont.)



Reference circuit output schematic for ƒ = 1990 MHz

See next page for more reference circuit information

Reference Circuit (cont.)

Description	
DUT	PTFB192503EL or PTFB192503FL
PCB	0.76 mm [.030"] thick, εr = 3.48, Rogers 4350, 1 oz. copper

Electrical Characteristics at 1990 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL224	0.000 λ, 144.35 Ω	W1 = 0.025, W2 = 0.025, W3 = 0.025	W1 = 1, W2 = 1, W3 = 1
TL101	0.037 λ, 51.58 Ω	W = 1.651, L = 3.358	W = 65, L = 132
TL102	0.053 λ, 9.67 Ω	W = 13.970, L = 4.470	W = 550, L = 176
TL103	0.033 λ, 51.58 Ω	W = 1.651, L = 3.018	W = 65, L = 119
TL104		W1 = 13.970, W2 = 0.762, W3 = 13.970, W4 = 0.762	W1 = 550, W2 = 30, W3 = 550, W4 = 30
TL105, TL106		W = 0.762	W = 30
TL107, TL108	0.011 λ, 78.27 Ω	W1 = 0.762, W2 = 0.762, W3 = 1.016	W1 = 30, W2 = 30, W3 = 40
TL109		W1 = 1.651, W2 = 2.032	W1 = 65, W2 = 80
TL110, TL130	0.015 λ, 38.82 Ω	W = 2.540, L = 1.321	W = 100, L = 52
TL111	0.071 λ, 92.53 Ω	W = 0.508, L = 6.756	W = 20, L = 266
TL112	0.016 λ, 68.02 Ω	W = 1.016, L = 1.524	W = 40, L = 60
TL113, TL133	0.024 λ, 78.27 Ω	W = 0.762, L = 2.286	W = 30, L = 90
TL114, TL125	0.023 λ, 78.27 Ω	W = 0.762, L = 2.159	W = 30, L = 85
TL115, TL116	0.001 λ, 68.02 Ω	W = 1.016, L = 0.127	W = 40, L = 5
TL117, TL118	0.014 λ, 78.27 Ω	W = 0.762, L = 1.270	W = 30, L = 50
TL119	0.024 λ, 9.67 Ω	W = 13.970, L = 1.981	W = 550, L = 78
TL120, TL121	0.007 λ, 68.02 Ω	W = 1.016, L = 0.686	W = 40, L = 27
TL122, TL123	0.125 λ, 78.27 Ω	W = 0.762, L = 11.684	W = 30, L = 460
TL124	0.008 λ, 45.17 Ω	W = 2.032, L = 0.762	W = 80, L = 30
TL126 (taper)	0.030 λ, 9.67 Ω / 51.58 Ω	W1 = 13.970, W2 = 1.651, L = 2.515	W1 = 550, W2 = 65, L = 99
TL127, TL132	0.011 λ, 68.02 Ω	W1 = 1.016, W2 = 1.016, W3 = 1.016	W1 = 40, W2 = 40, W3 = 40
TL128	0.022 λ, 78.27 Ω	W1 = 0.762, W2 = 0.762, W3 = 2.032	W1 = 30, W2 = 30, W3 = 80
TL129	0.077 λ, 9.67 Ω	W = 13.970, L = 6.502	W = 550, L = 256
TL131	0.016 λ, 68.02 Ω	W = 1.016, L = 1.524	W = 40, L = 60
TL134	0.022 λ, 78.27 Ω	W1 = 0.762, W2 = 0.762, W3 = 2.032	W1 = 30, W2 = 30, W3 = 80
TL135, TL136	0.016 λ, 92.53 Ω	W1 = 0.508, W2 = 0.508, W3 = 1.524	W1 = 20, W2 = 20, W3 = 60

table continued on page 10

Reference Circuit (cont.)

Electrical Characteristics at 1990 MHz

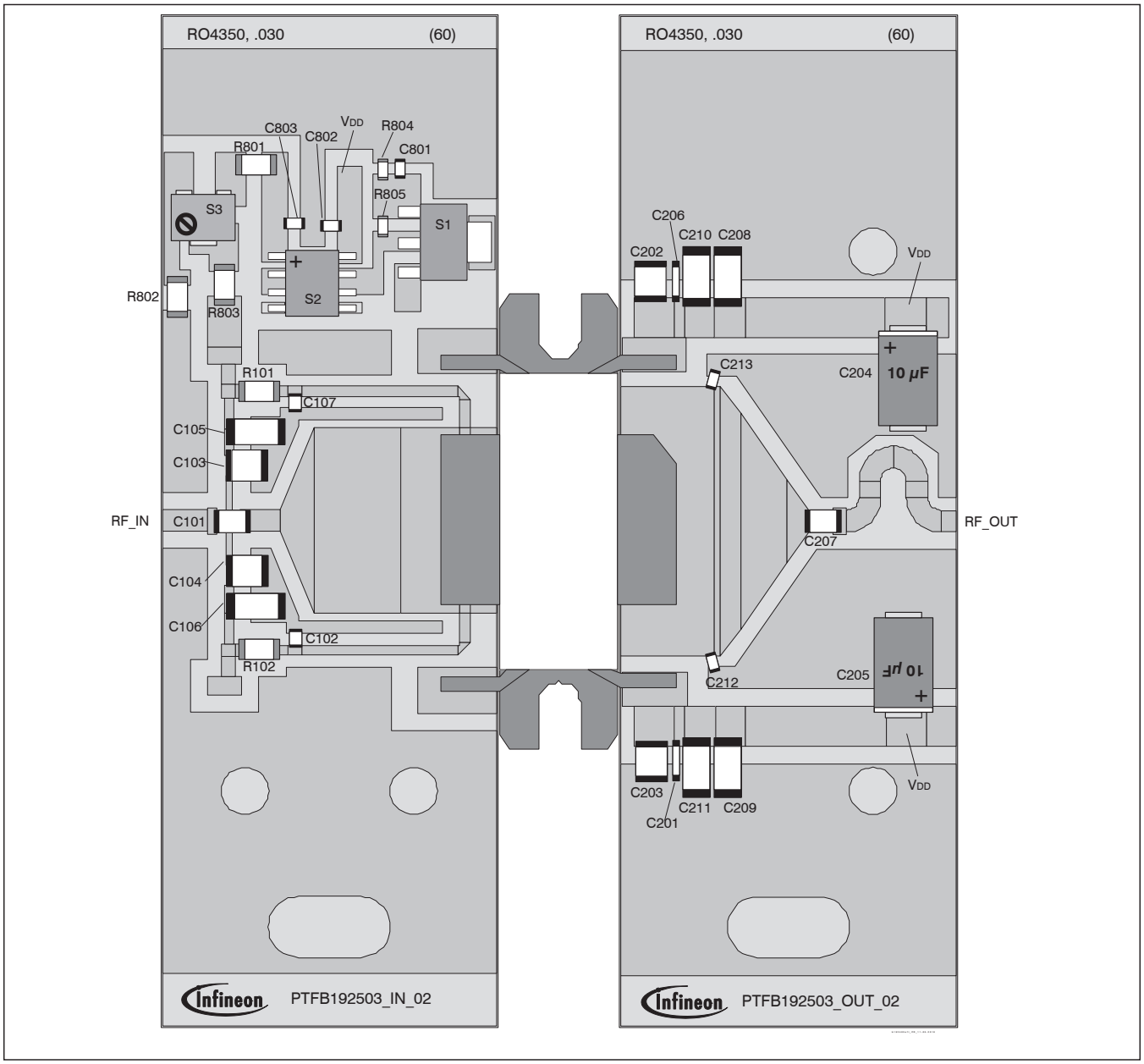
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201, TL202, TL203, TL213	0.026 λ, 34.08 Ω	W1 = 3.048, W2 = 3.048, W3 = 2.286	W1 = 120, W2 = 120, W3 = 90
TL204	0.012 λ, 51.58 Ω	W = 1.651, L = 1.118	W = 65, L = 44
TL205	0.084 λ, 6.86 Ω	W = 20.320, L = 6.985	W = 800, L = 275
TL206	0.029 λ, 23.60 Ω	W = 4.928, L = 2.540	W = 194, L = 100
TL207	0.029 λ, 23.79 Ω	W = 4.877, L = 2.540	W = 192, L = 100
TL208, TL209, TL212	0.034 λ, 34.08 Ω	W1 = 3.048, W2 = 3.048, W3 = 3.048	W1 = 120, W2 = 120, W3 = 120
TL210		W1 = 12.700, W2 = 17.780	W1 = 500, W2 = 700
TL211 (taper)	0.019 λ, 6.86 Ω / 8.37 Ω	W1 = 20.320, W2 = 16.383, L = 1.575	W1 = 800, W2 = 645, L = 62
TL214, TL220	0.009 λ, 34.08 Ω	W1 = 3.048, W2 = 3.048, W3 = 0.762	W1 = 120, W2 = 120, W3 = 30
TL215, TL217	0.118 λ, 34.08 Ω	W = 3.048, L = 10.516	W = 120, L = 414
TL216	0.019 λ, 34.08 Ω	W = 3.048, L = 1.702	W = 120, L = 67
TL218	0.025 λ, 34.08 Ω	W = 3.048, L = 2.210	W = 120, L = 87
TL219	0.034 λ, 34.08 Ω	W1 = 3.048, W2 = 3.048, W3 = 3.048	W1 = 120, W2 = 120, W3 = 120
TL221 (taper)	0.041 λ, 8.37 Ω / 19.45 Ω	W1 = 16.383, W2 = 6.248, L = 3.429	W1 = 645, W2 = 246, L = 135
TL222	0.007 λ, 51.58 Ω	W = 1.651, L = 0.635	W = 65, L = 25
TL223	0.011 λ, 45.17 Ω	W = 2.032, L = 1.016	W = 80, L = 40
TL224, TL225, TL226, TL228		W = 0.002, ANG = 90, R = 0.002	W = 2, ANG = 3543307, R = 70
TL227	0.014 λ, 51.58 Ω	W = 1.651, L = 1.270	W = 65, L = 50
TL229 (taper)	0.019 λ, 19.45 Ω / 51.58 Ω	W1 = 6.248, W2 = 1.651, L = 1.651	W1 = 246, W2 = 65, L = 65
TL230	0.000 λ, 19.45 Ω	W = 6.248, L = 0.025	W = 246, L = 1
TL231	0.000 λ, 8.37 Ω	W = 16.383, L = 0.025	W = 645, L = 1
TL232, TL233	0.000 λ, 146.88 Ω	W = 0.025, L = 0.025	W = 1, L = 1
TL234		W1 = 20.320, W2 = 0.025, W3 = 20.320, W4 = 0.025	W1 = 800, W2 = 1, W3 = 800, W4 = 1
TL235	0.005 λ, 6.86 Ω	W = 20.320, L = 0.406	W = 800, L = 16
TL236	0.014 λ, 51.58 Ω	W = 1.651, L = 1.270	W = 65, L = 50

Reference Circuit (cont.)

Circuit Assembly Information

Test Fixture Part No.	LTN/PTFB192503EF

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.)

Component	Description	Suggested Manufacturer	P/N
Input			
C101	Chip capacitor, 10 pF	ATC	ATC100B100FW500XB
C102, C107	Chip capacitor, 8.2 pF	ATC	ATC100A8R2BW150XB
C103, C104	Capacitor, 10 µF	Digi-Key	587-1818-2-ND
C105, C106	Chip capacitor, 2.2 µF	Digi-Key	445-1447-2-ND
C801, C802, C803	Capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
R101, R102, R802, R803	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R801	Resistor, 100 Ω	Digi-Key	P100ECT-ND
R804	Resistor, 1300 Ω	Digi-Key	P1.3KGCT-ND
R805	Resistor, 1200 Ω	Digi-Key	P1.2KGCT-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, C206	Chip capacitor, 0.1 µF	Digi-Key	399-1267-2-ND
C202, C203	Chip capacitor, 10 µF	Digi-Key	587-1818-2-ND
C204, C205	Capacitor, 10 µF	Digi-Key	281M5002106K
C207	Capacitor, 10 pF	ATC	ATC100B100FW500XB
C208, C209	Chip capacitor, 1 µF	Digi-Key	445-1411-2-ND
C210, C211	Chip capacitor, 2.2 µF	Digi-Key	445-1447-2-ND
C212, C213	Chip capacitor, 1.1 pF	ATC	ATC100A1R1BW150XB

Package Outline Specifications

Package H-33288-6

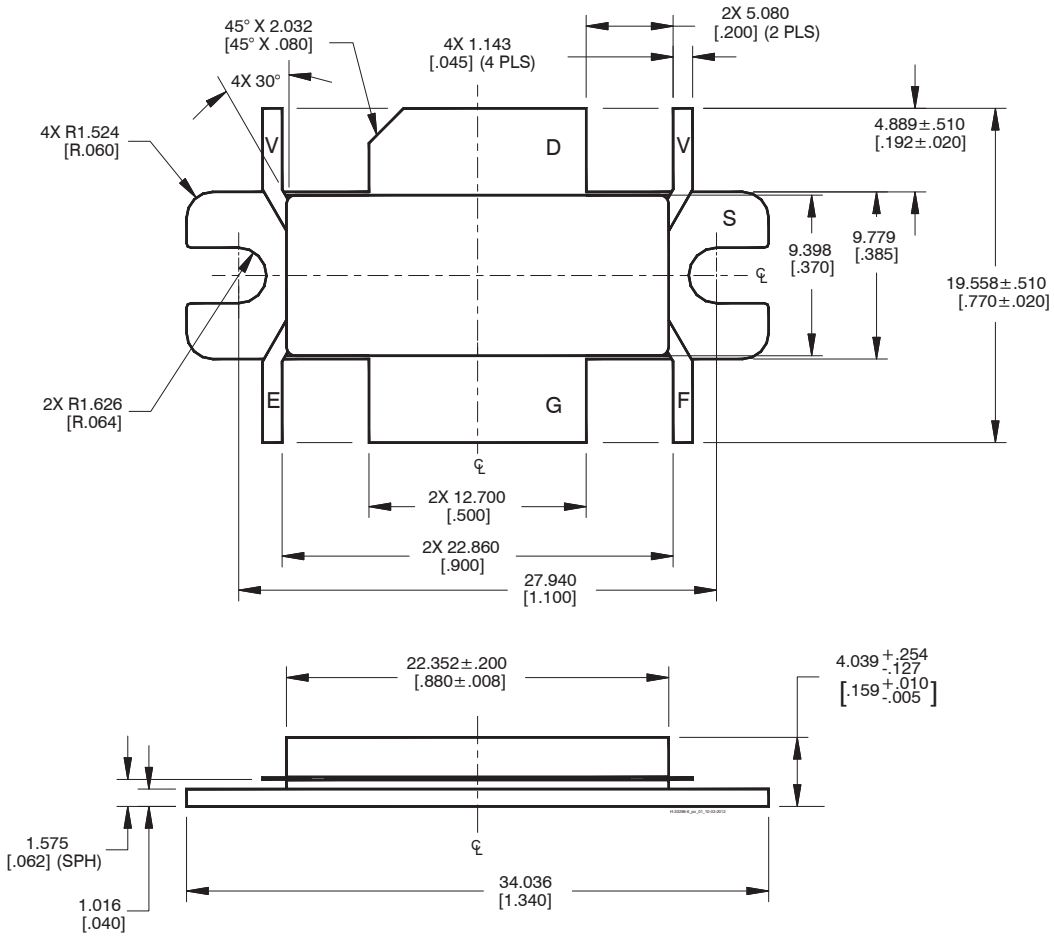


Diagram Notes—unless otherwise specified:

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: G = gate, S = source, D = drain, V = V_{DD}, E, F = N.C.
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.

Package Outline Specifications (cont.)

Package H-34288-4/2

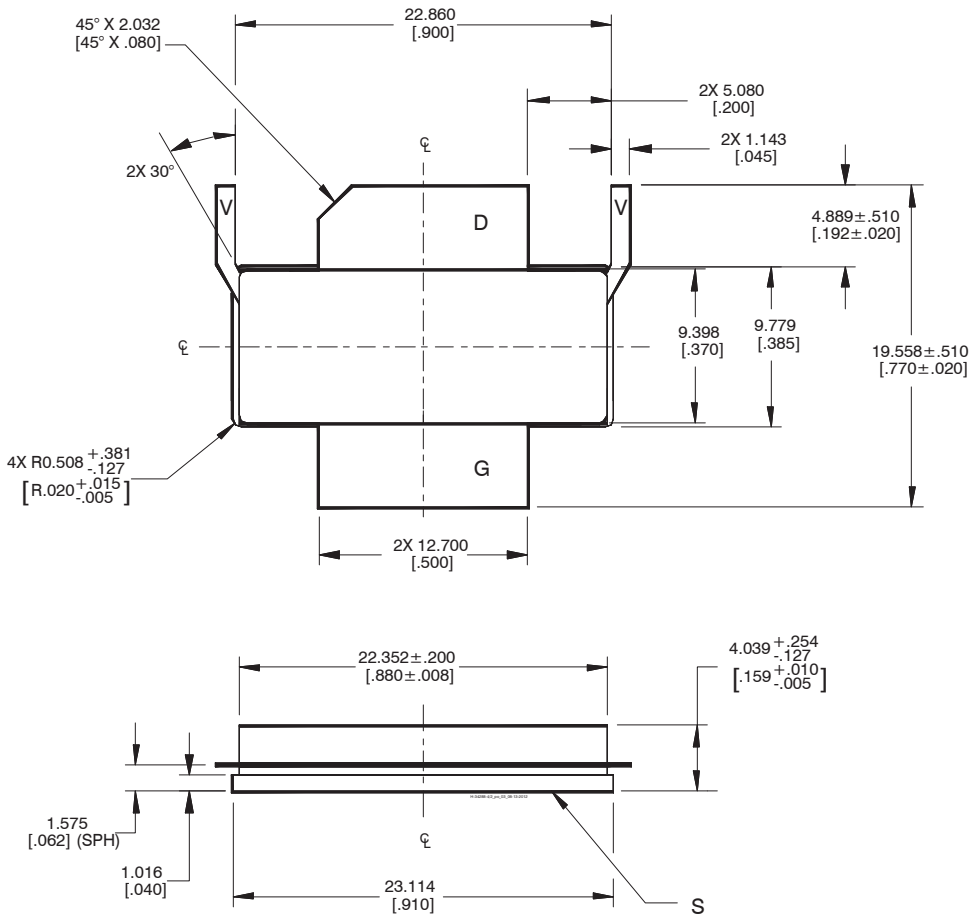


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.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.

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

Revision History:	2016-06-13	Data Sheet
Previous Version:	2010-11-09, Data Sheet	

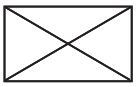
Page	Subjects (major changes since last revision)
2	Updated ordering code to R0

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 2016-06-13

Published by
Infineon Technologies AG
81726 Munich, Germany

© 2009 Infineon Technologies AG
All Rights Reserved.

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.