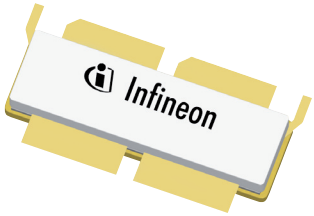
green Product

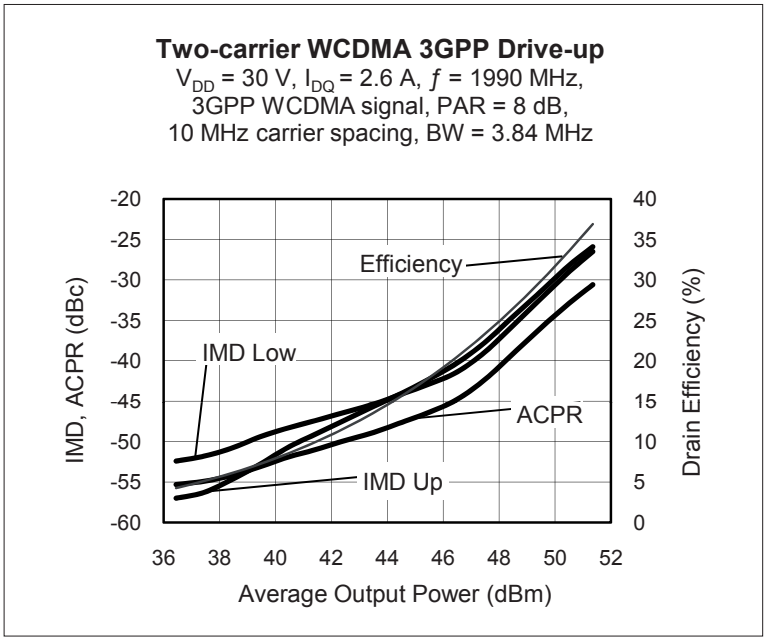
Thermally-Enhanced High Power RF LDMOS FETs
340 W, 30 V, 1930 – 1990 MHz

Description

The PTFB193404F is a 340-watt LDMOS FET 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 and thermally-enhanced package with earless flange. Manufactured with Infineon's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PTFB193404F
Package H-37275-6/2



Features

- Broadband internal matching
- Wide video bandwidth
- Typical single-carrier WCDMA performance, 1990 MHz, 30 V
  - Output power = 100 W
  - Efficiency = 33%
  - Gain = 19 dB
  - PAR = 7.5 dB @ 0.01% CCDF
  - ACPR @ 5 MHz = –35 dBc
- Increased negative gate-source voltage range for improved performance in Doherty amplifiers
- Capable of handling 10:1 VSWR @ 30 V, 340 W (CW) output power
- Integrated ESD protection
- Excellent thermal stability
- Pb-free and RoHS compliant

RF Characteristics

Single-carrier WCDMA Measurements (tested in Infineon test fixture)

V_{DD} = 30 V, I_{DQ} = 2.6 A, P_{OUT} = 80 W average, f = 1990 MHz,
3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10.0 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17.5	19	—	dB
Drain Efficiency	η_D	29	33	—	%
Adjacent Channel Power Ratio	ACPR	—	–34.5	–32.5	dBc

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

Two-carrier WCDMA Characteristics (not subject to production test—verified by design/characterization in Infineon test fixture)
V_{DD} = 30 V, I_{DQ} = 2.6 A, P_{OUT} = 80 W average, f_1 = 1980 MHz, f_2 = 1990 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8.0 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	19	—	dB
Drain Efficiency	η_D	—	29	—	%
Intermodulation Distortion	IMD	—	–33	—	dBc

Two-tone Characteristics (not subject to production test—verified by design/characterization in Infineon test fixture)
V_{DD} = 30 V, I_{DQ} = 2.6 A, P_{OUT} = 265 W PEP, f = 1990 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	19	—	dB
Drain Efficiency	η_D	—	36	—	%
Intermodulation Distortion	IMD	—	30	—	dBc

DC Characteristics (both sides)

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	$R_{DS(on)}$	—	0.05	—	Ω
Operating Gate Voltage	V_{DS} = 30 V, I_{DQ} = 2.6 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

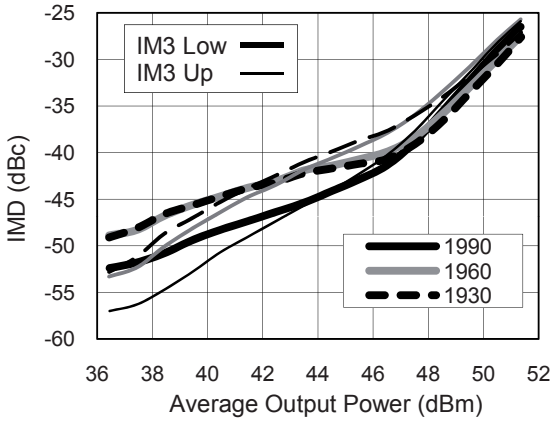
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	–6 to +10	V
Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C)	$R_{\theta JC}$	0.2	°C/W

Ordering Information

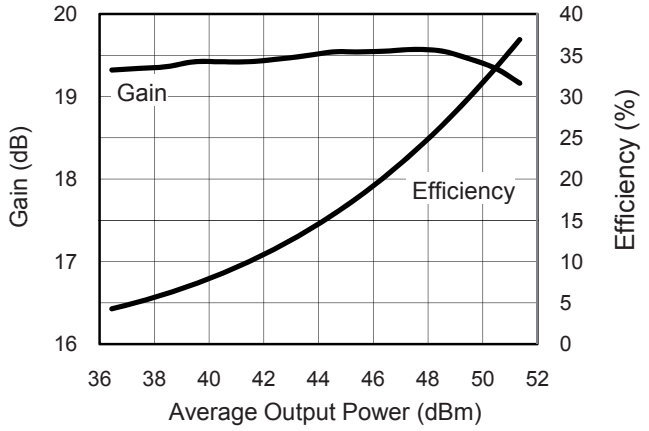
Type and Version	Order Code	Package Description	Shipping
PTFB193404F V1 R0	PTFB193404FV1R0XTMA1	H-37275-6/2, earless flange	Tape & reel, 50 pcs
PTFB193404F V1 R250	PTFB193404FV1R250XTMA1	H-37275-6/2, earless flange	Tape & reel, 250 pcs

Typical Performance (data taken in production test fixture)

Two-carrier WCDMA 3GPP Drive-up
V_{DD} = 30 V, I_{DQ} = 2.6 A,
3GPP WCDMA, PAR = 8 dB,
10 MHz carrier spacing, BW = 3.84 MHz

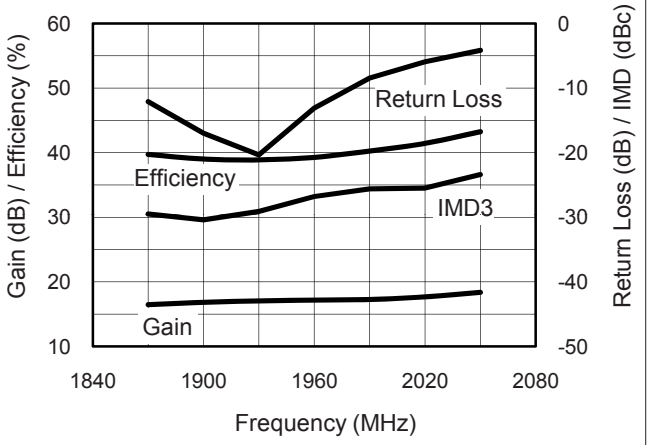


Two-carrier WCDMA 3GPP Drive-up
V_{DD} = 30 V, I_{DQ} = 2.6 A, f = 1990 MHz,
3GPP WCDMA signal, PAR = 8 dB,
10 MHz carrier spacing, BW = 3.84 MHz

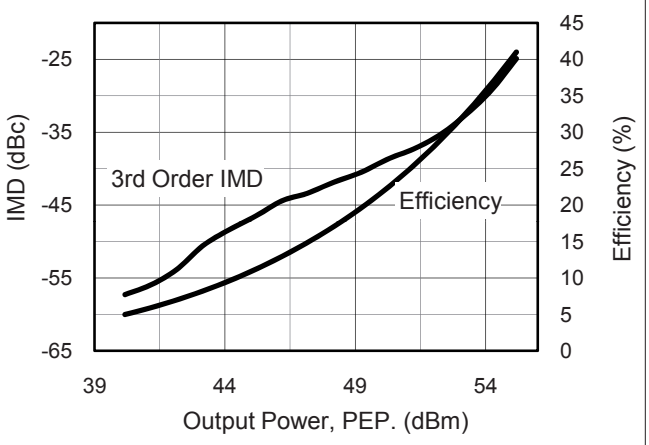


Typical Performance (cont.)

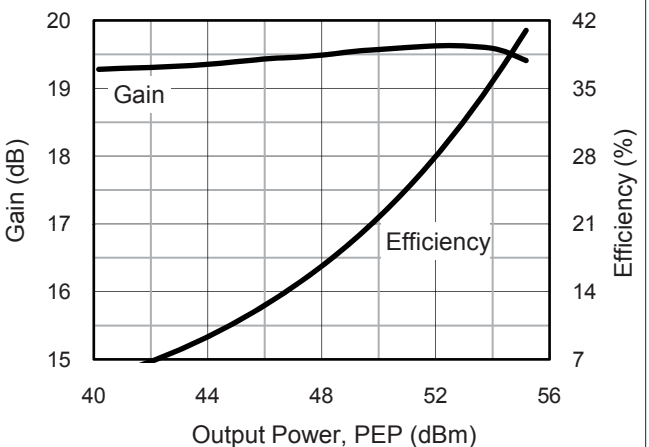
Two-tone Broadband Performance
V_{DD} = 30 V, I_{DQ} = 2.6 A, P_{OUT} = 52 dBm



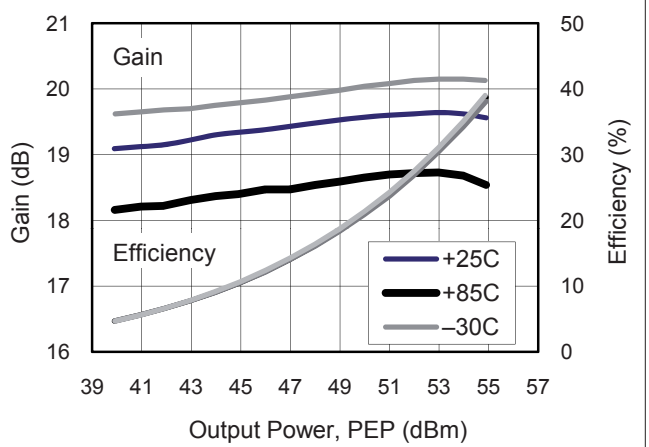
Two-tone Drive-up
V_{DD} = 30 V, I_{DQ} = 2.6 A,,
f_1 = 1989 MHz, f_2 = 1990 MHz



Two-tone Drive-up
V_{DD} = 30 V, I_{DQ} = 2.6 A,
f_1 = 1989 MHz, f_2 = 1990 MHz

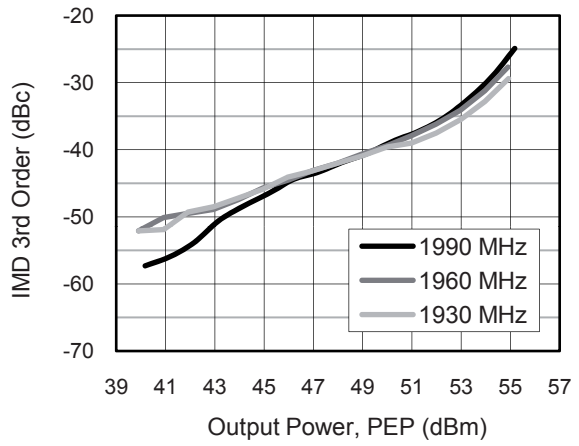


Two-tone Drive-up (over temperature)
(P_{OUT}-max 3rd order IMD @ –30 dBc)
V_{DD} = 30 V, I_{DQ} = 2.6 A,
f_1 = 1959 MHz, f_2 = 1960 MHz

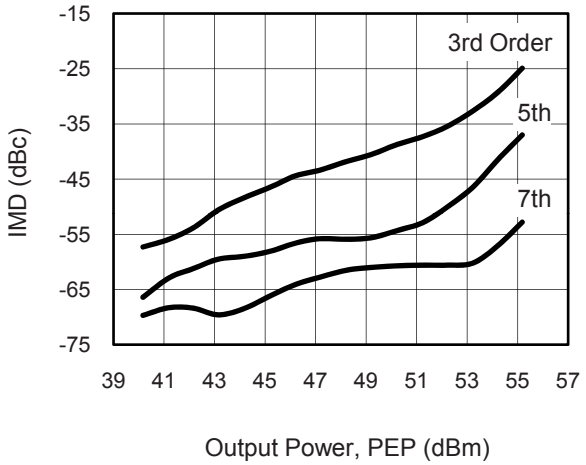


Typical Performance (cont.)

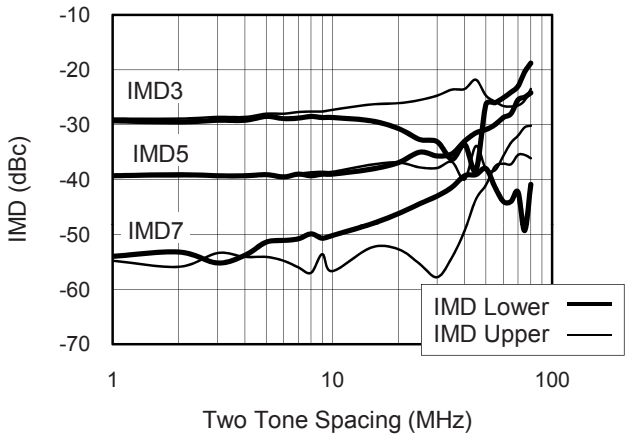
Two-tone Drive-up
at Selected Frequencies
V_{DD} = 30 V, I_{DQ} = 2.6 A, tone spacing = 1 MHz



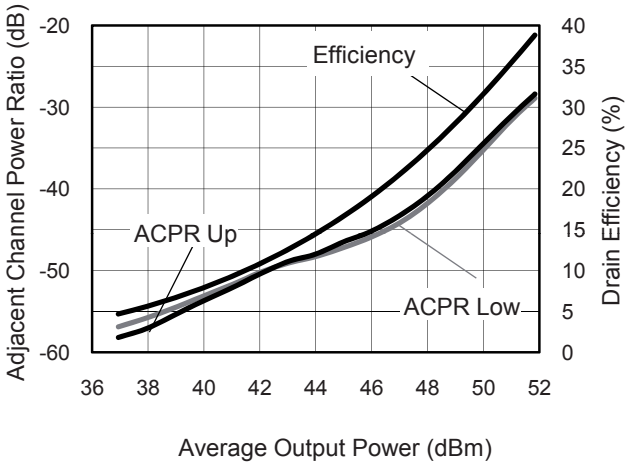
Intermodulation Distortion
vs. Output Power
V_{DD} = 30 V, I_{DQ} = 2.6 A,
f_1 = 1989 MHz, f_2 = 1990 MHz



Intermodulation Distortion
vs. Tone Spacing
V_{DD} = 30 V, I_{DQ} = 2.6 A,
f = 1930 MHz, P_{OUT} = 317 W (PEP)

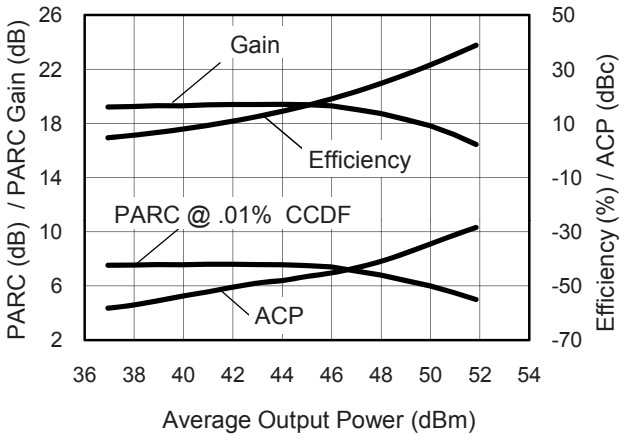


Single-carrier WCDMA Drive-up
V_{DD} = 30 V, I_{DQ} = 2.6 A, f = 1990 MHz,
3GPP WCDMA signal, TM1 w/16 DPCH,
43% clipping, PAR = 7.5 dB, 3.84 MHz BW

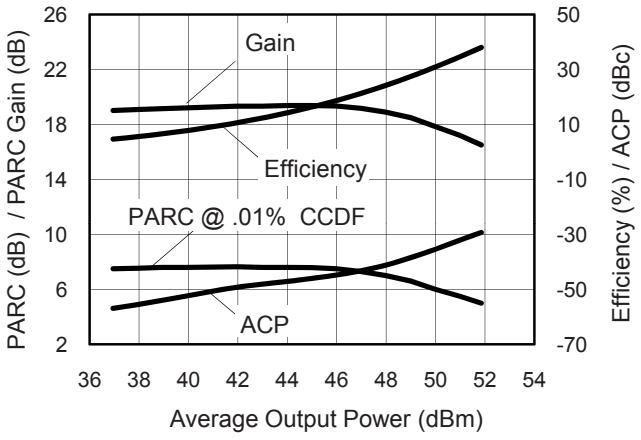


Typical Performance (cont.)

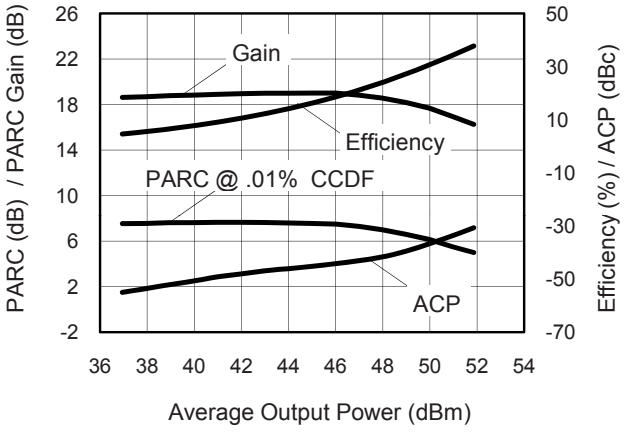
Single-carrier WCDMA Drive-up
V_{DD} = 30 V, I_{DQ} = 2.6 A, f = 1990 MHz,
3GPP WCDMA signal,
PAR = 7.5 dB, BW = 3.84 MHz



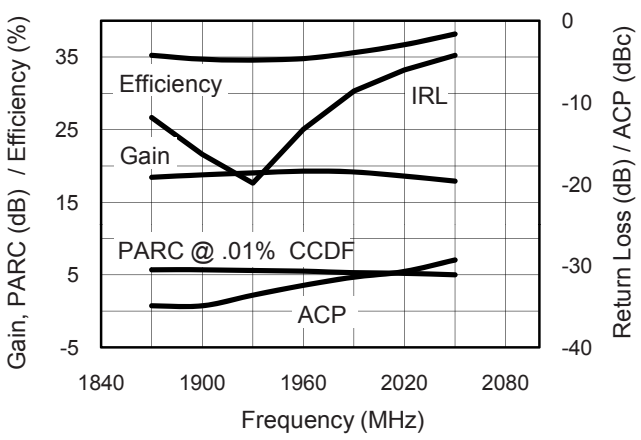
Single-carrier WCDMA Drive-up
V_{DD} = 30 V, I_{DQ} = 2.6 A, f = 1960 MHz,
3GPP WCDMA signal,
PAR = 7.5 dB, BW = 3.84 MHz



Single-carrier WCDMA Drive-up
V_{DD} = 30 V, I_{DQ} = 2.6 A, f = 1930 MHz,
3GPP WCDMA signal,
PAR = 7.5 dB, BW = 3.84 MHz

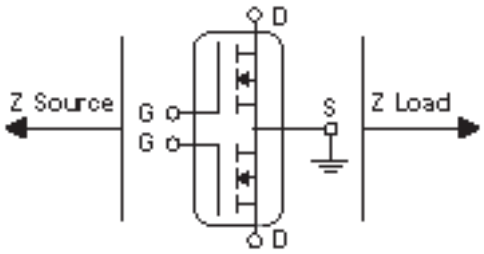


Single-carrier WCDMA Broadband
V_{DD} = 30 V, I_{DQ} = 2.6 A, P_{OUT} = 125 W,
3GPP WCDMA signal



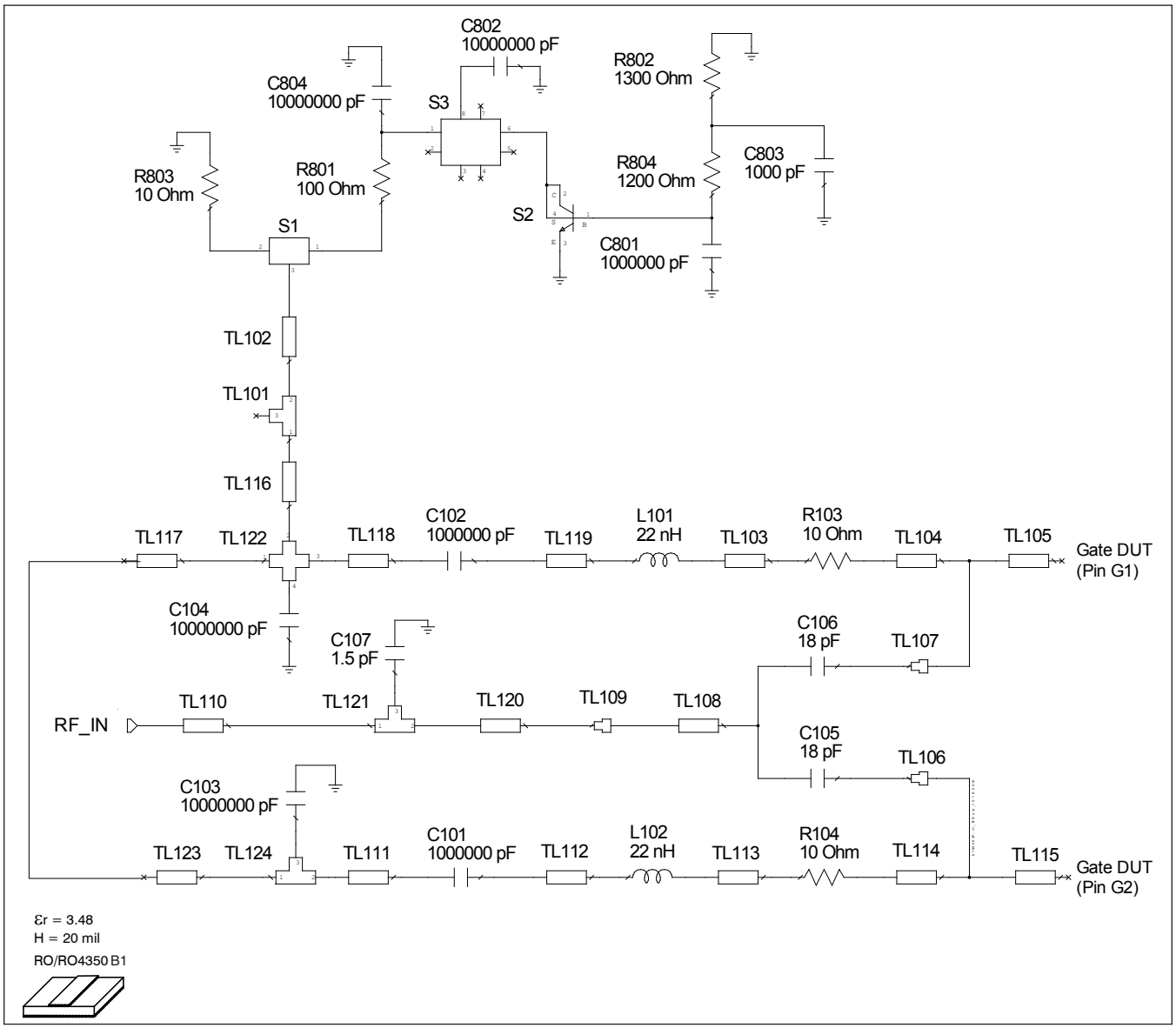
Broadband Circuit Impedance (measurements taken on full part, both sides)

Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
1900	1.21	–3.60	0.73	–2.08
1930	1.21	–3.53	0.72	–2.01
1960	1.20	–3.47	0.72	–1.94
1990	1.20	–3.41	0.72	–1.87
2020	1.19	–3.35	0.72	–1.81



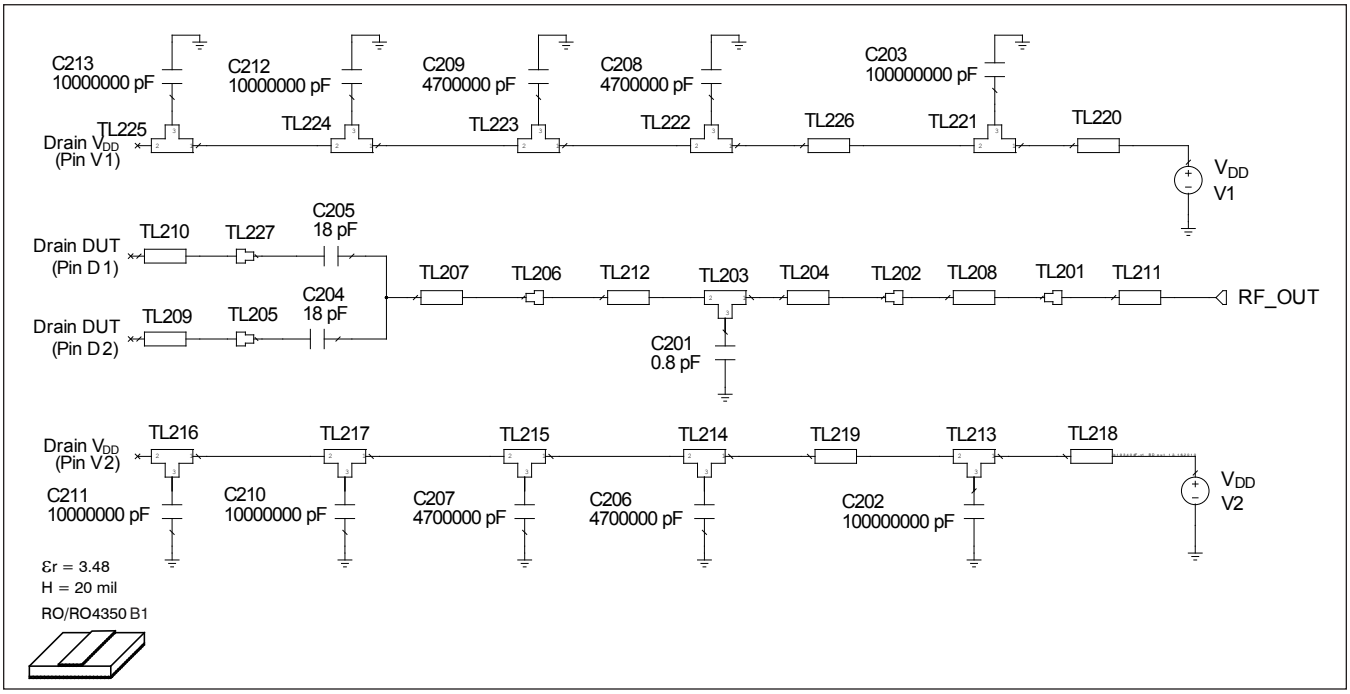
See next page for circuit information

Reference Circuit



Reference circuit input schematic for ƒ = 1990 MHz

Reference Circuit (cont.)



Reference circuit output schematic for ƒ = 1990 MHz

Reference Circuit Assembly

DUT	PTFB193404F
Test Fixture Part No.	LTN/PTFB193404EF
PCB	Rogers RO4350, 0.508 mm [0.020"] thick, 1 oz. copper, ε_r = 3.48

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

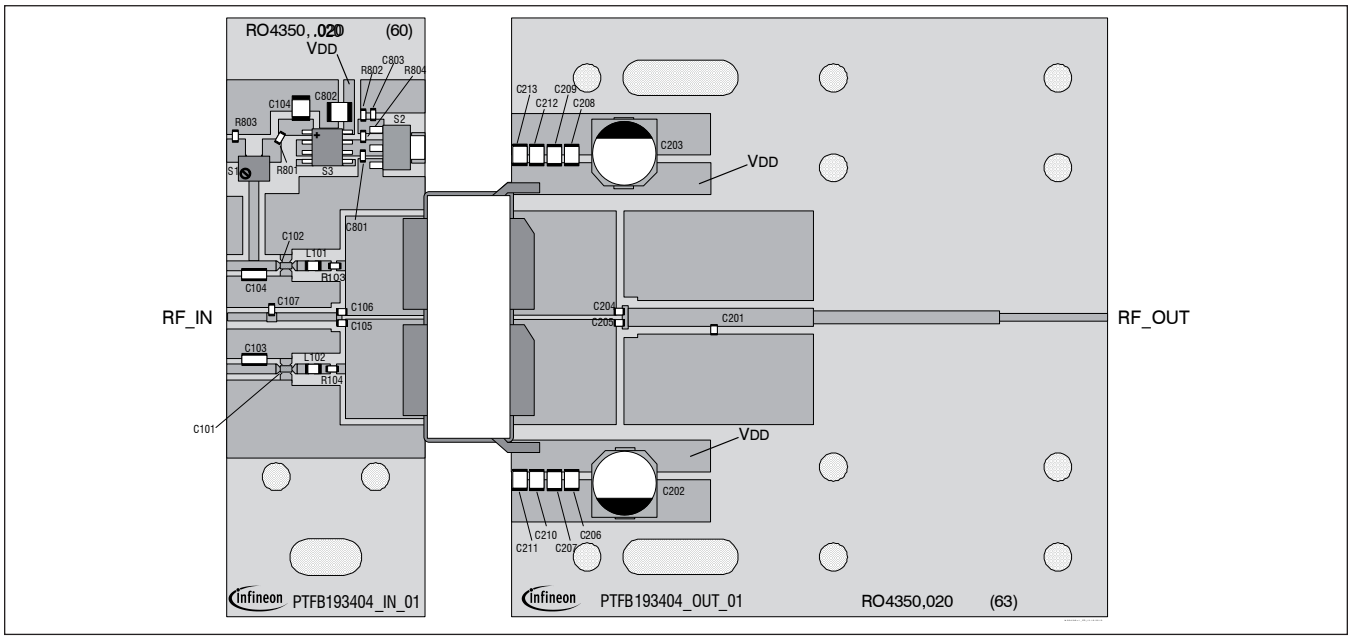
Transmission Line	Electrical Characteristics	Dimensions: W, L (mm)	Dimensions: W, L (mils)
Input			
TL101	0.017 λ, 47.12 Ω	W1 = 1.270, W2 = 1.270, W3 = 1.524	W1 = 50, W2 = 50, W3 = 60
TL102	0.039 λ, 47.12 Ω	W = 1.270, L = 3.553	W = 50, L = 140
TL103	0.023 λ, 47.12 Ω	W = 1.270, L = 2.055	W = 50, L = 81
TL104	0.013 λ, 47.12 Ω	W = 1.270, L = 1.168	W = 50, L = 46
TL105	0.122 λ, 7.29 Ω	W = 12.700, L = 10.160	W = 500, L = 400
TL106		W1 = 0.010, W2 = 1.168, Offset = 5.893	W1 = 10, W2 = 46, Offset = 232
TL107		W1 = 0.010, W2 = 1.168, Offset = –5.893	W1 = 10, W2 = 46, Offset = –232
TL108	0.007 λ, 34.08 Ω	W = 2.032, L = 0.635	W = 80, L = 25
TL109	0.012 λ, 34.08 Ω	W1 = 2.032, W2 = 1.034	W1 = 80, W2 = 41
TL110	0.055 λ, 53.60 Ω	W = 1.034, L = 5.029	W = 41, L = 198
TL111	0.023 λ, 47.12 Ω	W = 1.270, L = 2.111	W = 50, L = 83
TL112	0.017 λ, 47.12 Ω	W = 1.270, L = 1.524	W = 50, L = 60
TL113	0.023 λ, 47.12 Ω	W = 1.270, L = 2.055	W = 50, L = 81

table continued on next page

Reference Circuit (cont.)

Transmission Line	Electrical Characteristics	Dimensions: W, L (mm)	Dimensions: W, L (mils)
Input (cont.)			
TL114	0.013 λ, 47.12 Ω	W = 1.270, L = 1.168	W = 50, L = 46
TL115	0.122 λ, 7.29 Ω	W = 12.700, L = 10.160	W = 500, L = 400
TL116	0.068 λ, 47.12 Ω	W = 1.270, L = 6.170	W = 50, L = 243
TL117	0.032 λ, 47.12 Ω	W = 1.270, L = 2.875	W = 50, L = 113
TL118	0.024 λ, 47.12 Ω	W = 1.270, L = 2.131	W = 50, L = 84
TL119	0.017 λ, 47.12 Ω	W = 1.270, L = 1.524	W = 50, L = 60
TL120	0.084 λ, 53.60 Ω	W = 1.034, L = 7.671	W = 41, L = 302
TL121	0.014 λ, 53.60 Ω	W1 = 1.034, W2 = 1.034, W3 = 1.27	W1 = 41, W2 = 41, W3 = 50
TL122	0.014 λ, 47.12 Ω	W1 = 1.270, W2 = 1.270, W3 = 1.270, W4 = 1.270	W1 = 50, W2 = 50, W3 = 50, W4 = 50
TL123	0.032 λ, 47.12 Ω	W = 1.270, L = 2.896	W = 50, L = 114
TL124	0.014 λ, 47.12 Ω	W1 = 1.270, W2 = 1.270, W3 = 1.27	W1 = 50, W2 = 50, W3 = 50
Output			
TL201		W1 = 1.577, W2 = 1.046	W1 = 62, W2 = 41
TL202		W1 = 2.263, W2 = 1.577	W1 = 89, W2 = 62
TL203	0.009 λ, 31.48 Ω	W1 = 2.263, W2 = 2.263, W3 = 0.762	W1 = 89, W2 = 89, W3 = 30
TL204	0.139 λ, 31.48 Ω	W = 2.263, L = 12.299	W = 89, L = 484
TL205		W1 = 0.001, W2 = 13.335, Offset = –6.223	W1 = 1, W2 = 525, Offset = –245
TL206		W1 = 3.048, W2 = 2.263	W1 = 120, W2 = 89
TL207	0.009 λ, 25.04 Ω	W = 3.048, L = 0.762	W = 120, L = 30
TL208	0.266 λ, 40.78 Ω	W = 1.577, L = 23.889	W = 62, L = 941
TL209	0.160 λ, 6.97 Ω	W = 13.335, L = 13.335	W = 525, L = 525
TL210	0.160 λ, 6.97 Ω	W = 13.335, L = 13.335	W = 525, L = 525
TL211	0.151 λ, 53.21 Ω	W = 1.046, L = 13.774	W = 41, L = 542
TL212	0.120 λ, 31.48 Ω	W = 2.263, L = 10.617	W = 89, L = 418
TL213	0.024 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.032	W1 = 160, W2 = 160, W3 = 80
TL214	0.026 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.286	W1 = 160, W2 = 160, W3 = 90
TL215	0.026 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.286	W1 = 160, W2 = 160, W3 = 90
TL216	0.024 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.032	W1 = 160, W2 = 160, W3 = 80
TL217	0.026 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.286	W1 = 160, W2 = 160, W3 = 90
TL218	0.116 λ, 19.85 Ω	W = 4.064, L = 10.008	W = 160, L = 394
TL219	0.052 λ, 19.85 Ω	W = 4.064, L = 4.470	W = 160, L = 176
TL220	0.116 λ, 19.85 Ω	W = 4.064, L = 10.008	W = 160, L = 394
TL221	0.024 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.032	W1 = 160, W2 = 160, W3 = 80
TL222	0.026 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.286	W1 = 160, W2 = 160, W3 = 90
TL223	0.026 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.286	W1 = 160, W2 = 160, W3 = 90
TL224	0.026 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.286	W1 = 160, W2 = 160, W3 = 90
TL225	0.024 λ, 19.85 Ω	W1 = 4.064, W2 = 4.064, W3 = 2.032	W1 = 160, W2 = 160, W3 = 80
TL226	0.052 λ, 19.85 Ω	W = 4.064, L = 4.470	W = 160, L = 176
TL227		W1 = 0.001, W2 = 13.335, Offset = 6.223	W1 = 1, W2 = 525, Offset = 245

Reference Circuit (cont.)

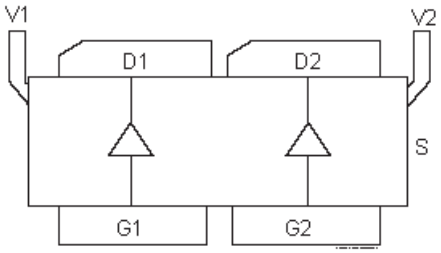


Reference circuit assembly diagram (not to scale)

Component ID	Description	Suggested Manufacturer	P/N
C101, C102	Chip capacitor, 1 µF	ATC	NFM18PS105R0J30
C103, C104	Capacitor, 10 µF	Digi-Key	490-4393-2-ND
C105, C106, C204, C205	Capacitor, 18 pF	ATC	800A180JT
C107	Capacitor, 1.5 pF	ATC	800A1R5BT
C801	Capacitor, 1 µF	Digi-Key	490-4736-2-ND
C802, C804	Capacitor, 10 µF	Digi-Key	587-1818-2-ND
C803	Chip capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
L101, L102	Inductor, 22 nH	Digi-Key	0805W220JT
R101, R102	Resistor, 1000 Ω	Digi-Key	P1.0KECT-ND
R103, R104	Resistor, 10 Ω	Digi-Key	P10GTR-ND
R801	Resistor, 100 Ω	Digi-Key	P100GTR-ND
R802	Resistor, 1300 Ω	Digi-Key	P1.3KGTR-ND
R803	Resistor, 10 Ω	Digi-Key	P101GTR-ND
R804	Resistor, 1200 Ω	Digi-Key	P1.2KGTR-ND
S1	Potentiometer	Digi-Key	3224W-202ECT-ND
S2	Transistor	Digi-Key	BCP56-ND, BCP56
S3	Voltage regulator	Digi-Key	LM780L05ACM-ND, 7805
C201	Capacitor, 0.8 pF	ATC	800A0R8BT
C202, C203	Capacitor, 100 µF	Digi-Key	PCE4442TR-ND
C206, C207, C208, C209	Capacitor, 4.7 µF	Digi-Key	490-1864-2-ND
C210, C211, C212, C213	Capacitor, 10 µF	Digi-Key	587-1818-2-ND

Pinout Diagram

Package H-37275-6/2



Pin	Description
V1	V_{DD} device 1
V2	V_{DD} device 2
D1	Drain device 1
D2	Drain device 2
G1	Gate device 1
G2	Gate device 2
S	Source (flange)

See next page for package outline specifications

Package Outline Specifications

Package H-37275-6/2

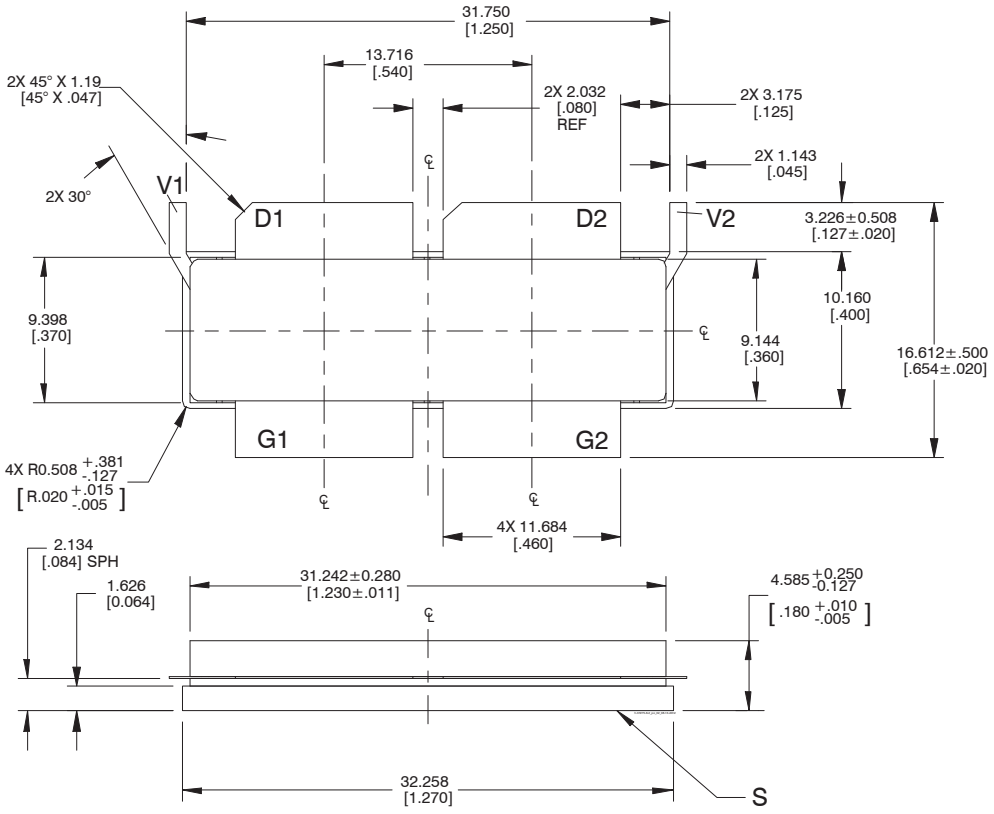


Diagram Notes—unless otherwise specified:

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.

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: D1, D2 - drain, devices 1 & 2; G1, G2 - gate, devices 1 & 2; V1, V2 - V_{DD}, devices 1 & 2; S - source (flange).
5. Lead thickness: 0.127 ±0.051 [.005 ±.002].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

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

Revision History:	2016-06-14	Data Sheet
Previous Version:	2011-05-13 Data Sheet	

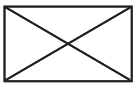
Page	Subjects (major changes since last revision)
3	Updated ordering information to include R0

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 2016-06-14
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.