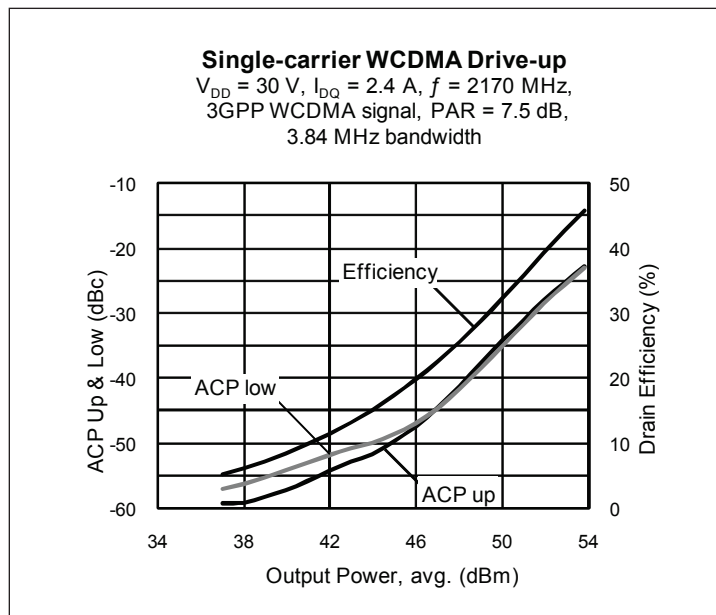
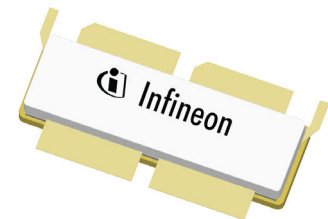


High Power RF LDMOS Field Effect Transistor 300 W, 2110 – 2170 MHz

Description

The PTFB213004F is a 300-watt LDMOS FET designed for class AB operation in cellular amplifiers covering the 2110 to 2170 MHz frequency band. Features include high peak power, input and output match, and a thermally-enhanced, open-cavity earless ceramic package.

PTFB213004F
Package H-37275-6/2



Features

- Broadband internal matching
- Enhanced for use in DPD error correction systems
- Wide video bandwidth
- Typical single-carrier WCDMA performance at 2170 MHz, 30 V
 - $P_{OUT} = 49.5\text{ dBm Avg}$
 - Gain = 17.5 dB
 - Efficiency = 30%
- Increased negative gate-source voltage range for improved performance in Doherty amplifiers
- Capable of handling 10:1 VSWR @ 30 V, 300 W (CW) output power
- Excellent thermal stability
- Integrated ESD protection
- Pb-free and RoHS-compliant

RF Characteristics

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

$V_{DD} = 30\text{ V}$, $I_{DQ} = 2.4\text{ A}$, $P_{OUT} = 60\text{ W average}$,
 $f_1 = 2167.5\text{ MHz}$, $f_2 = 2172.5\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, PAR = 7.5 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17	18	—	dB
Drain Efficiency	η_D	25	26.5	—	%
Intermodulation Distortion	IMD	—	-36	-33	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 (not subject to production test—verified by design / characterization in Infineon test fixture)
 $V_{DD} = 30\text{ V}$, $I_{DQ} = 2.4\text{ A}$, $P_{OUT} = 250\text{ W PEP}$, $f = 2140\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	18	—	dB
Drain Efficiency	η_D	—	37	—	%
Intermodulation Distortion	IMD	—	-30	—	dBc

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ }\mu\text{A}$	$V_{(BR)DSS}$	65	—	—	V
Drain Leakage Current	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	1.0	μA
	$V_{DS} = 63\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	10.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ A}$	$R_{DS(on)}$	—	0.03	—	Ω
Operating Gate Voltage	$V_{DS} = 30\text{ V}$, $I_{DQ} = 2.4\text{ A}$	V_{GS}	2.3	2.8	3.3	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	—	—	1.0	μA

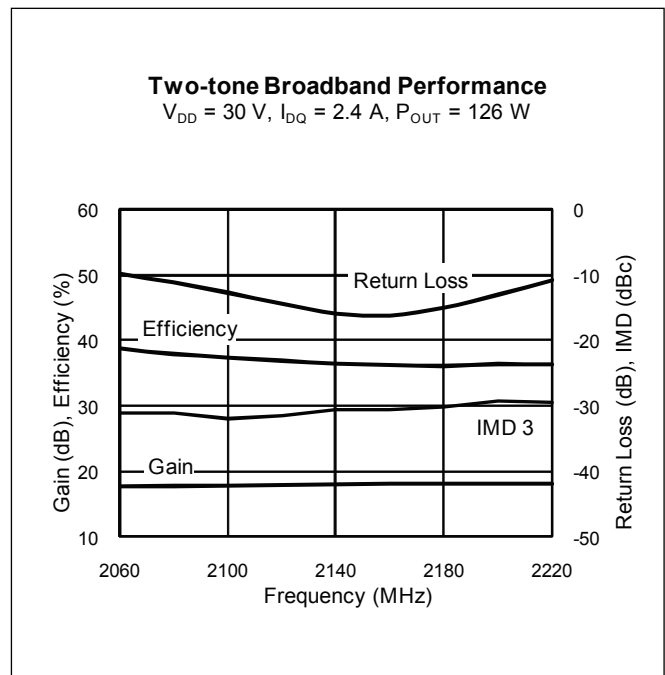
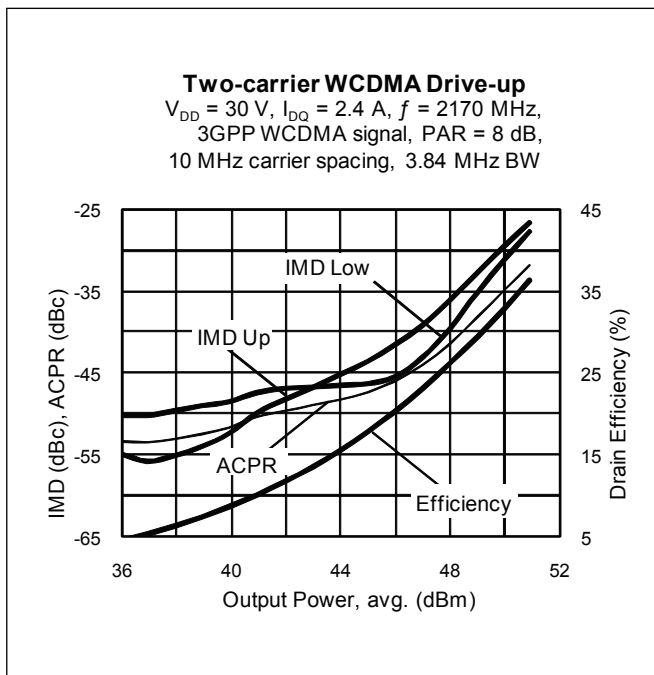
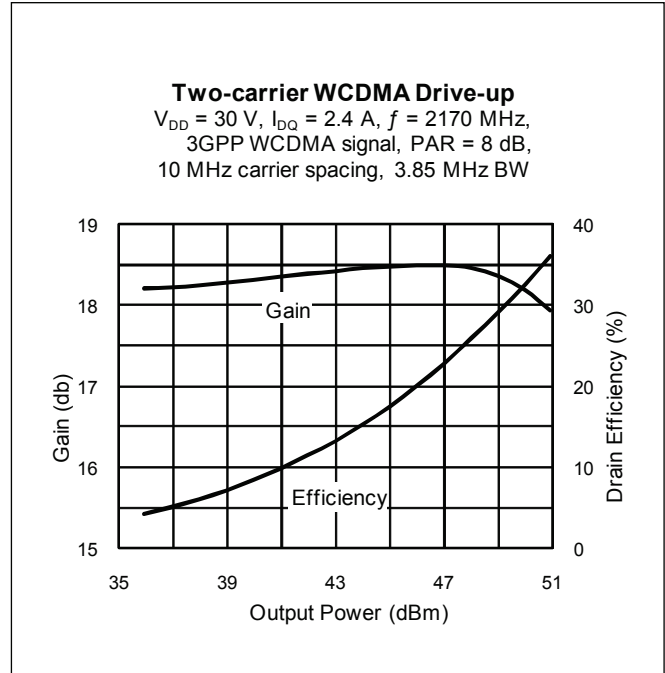
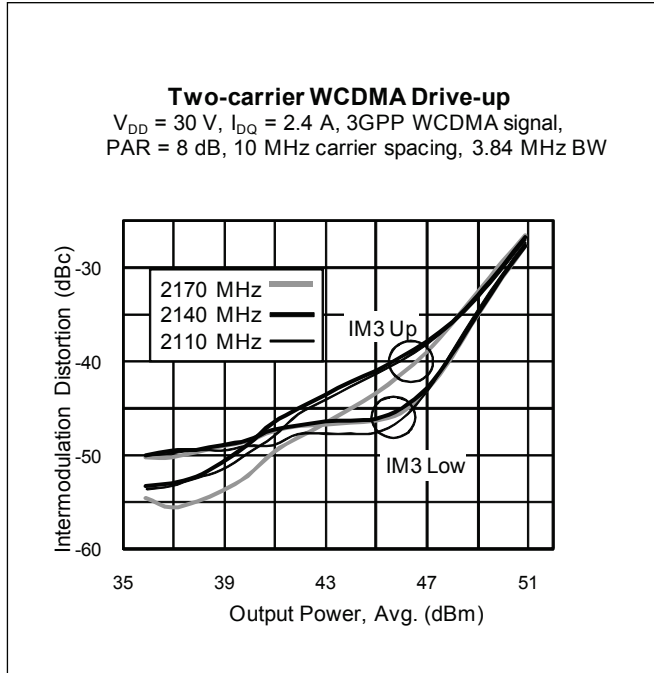
Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5 to +65	V
Gate-Source Voltage	V_{GS}	-6 to +10	V
Junction Temperature	T_J	200	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-40 to +150	$^{\circ}\text{C}$
Thermal Resistance ($T_{CASE} = 70^{\circ}\text{C}$)	$R_{\theta JC}$	0.23	$^{\circ}\text{C/W}$

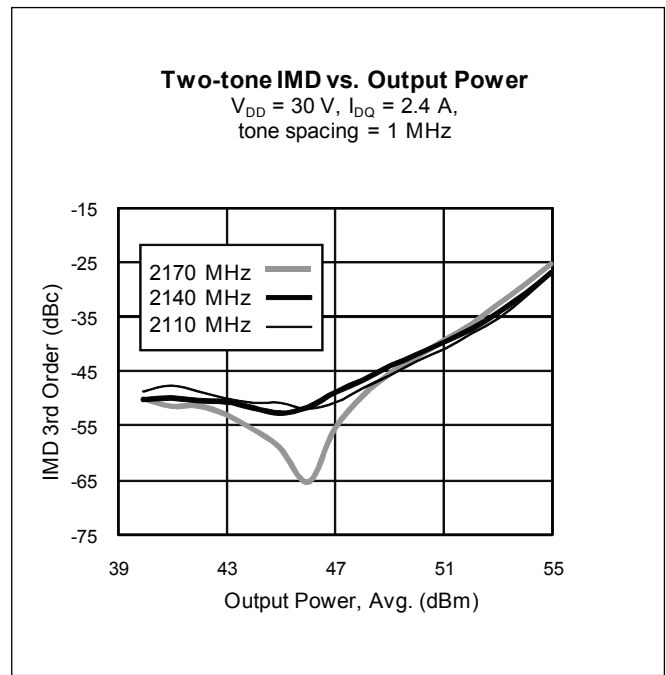
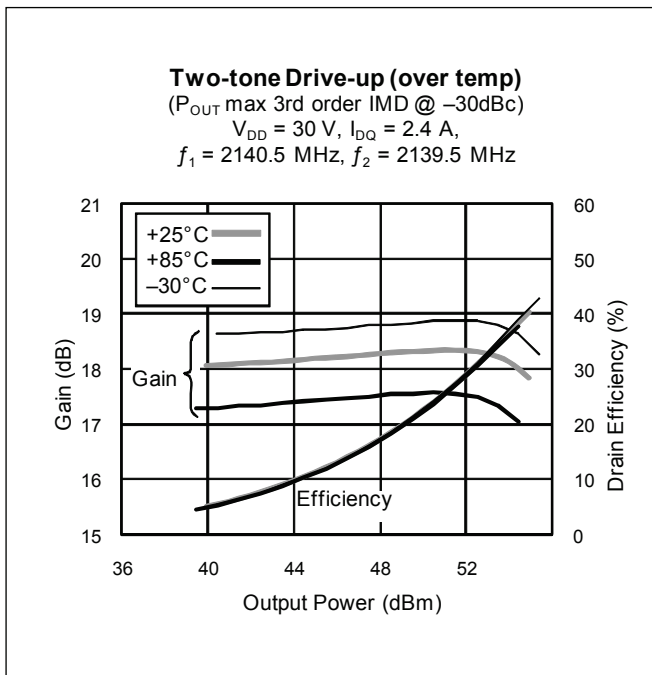
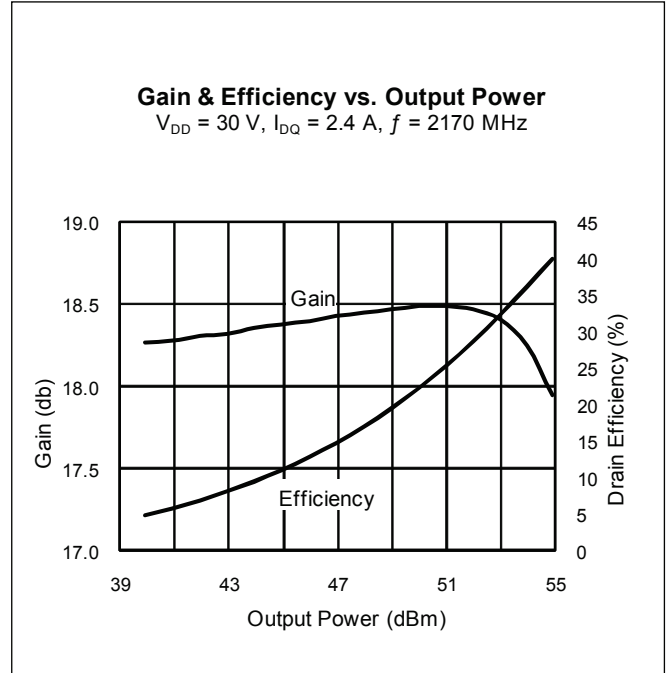
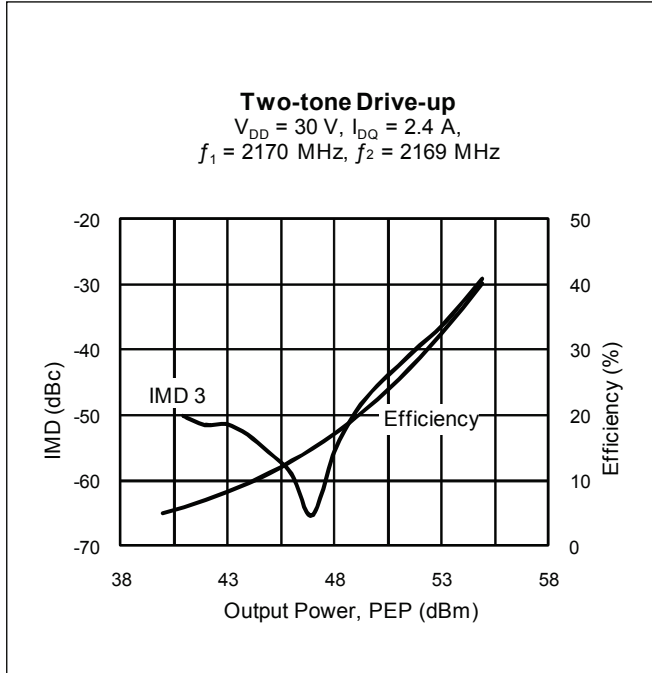
Ordering Information

Type and Version	Order Code	Package Description	Shipping
PTFB213004F V2 R0	PTFB213004FV2R0XTMA1	H-37275-6/2, earless flange	Tape & Reel, 50 pcs
PTFB213004F V2 R250	PTFB213004FV2R250XTMA1	H-37275-6/2, earless flange	Tape & Reel, 250 pcs

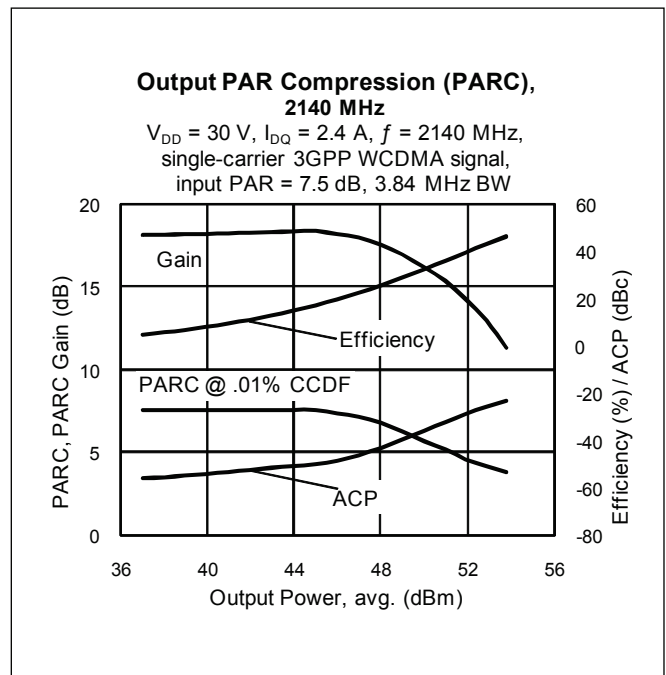
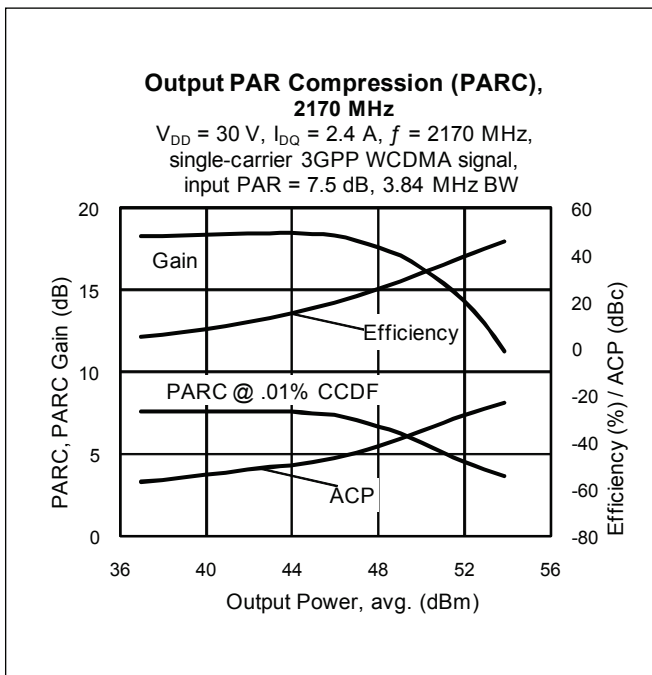
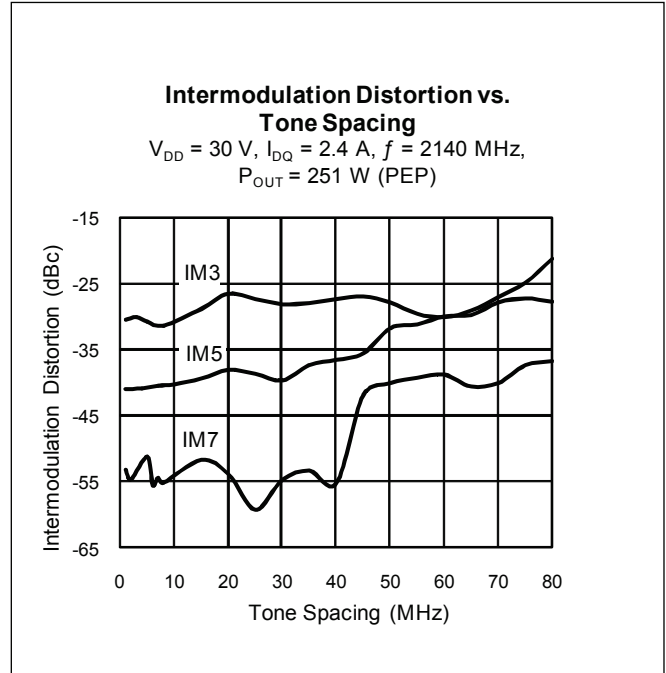
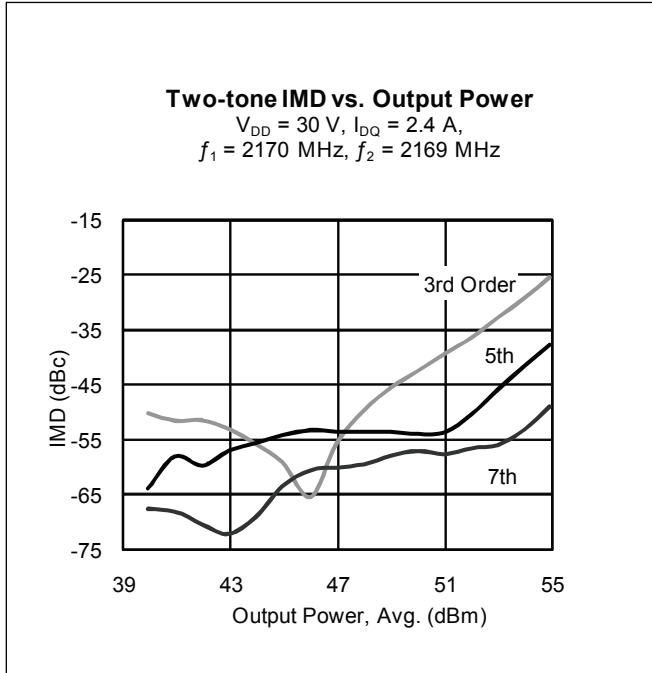
Typical Performance (data taken in a production test fixture)



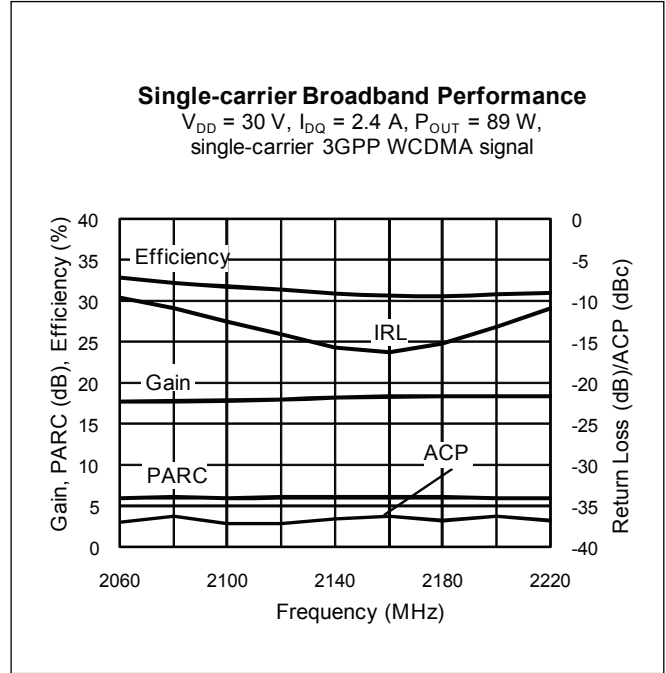
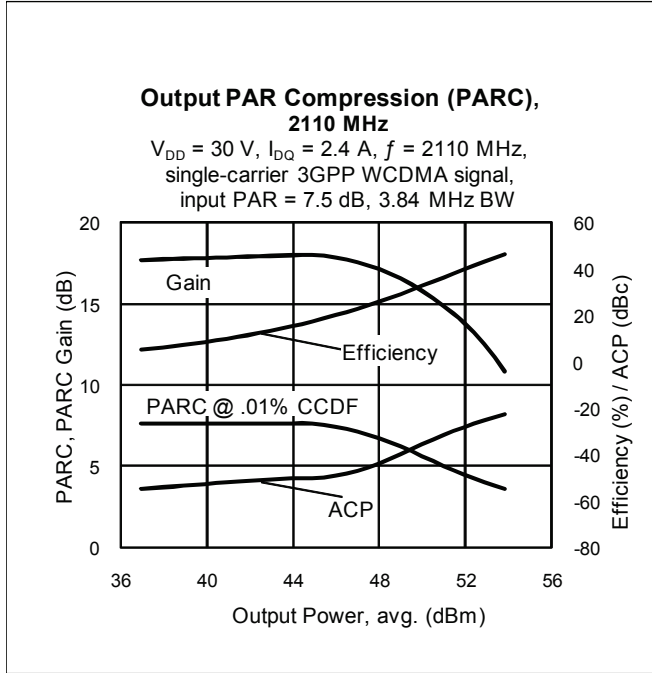
Typical Performance (cont.)



Typical Performance (cont.)

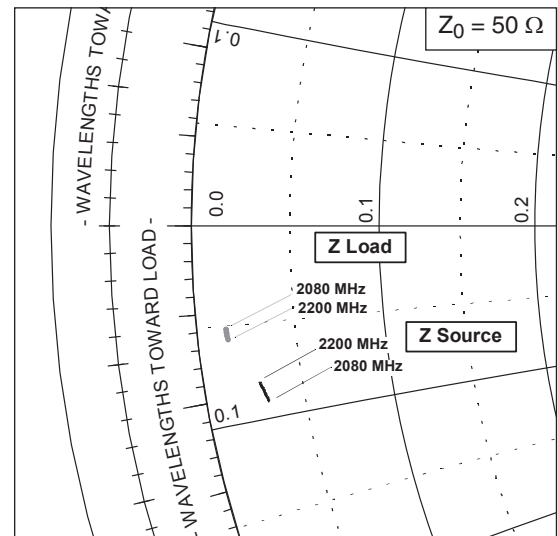
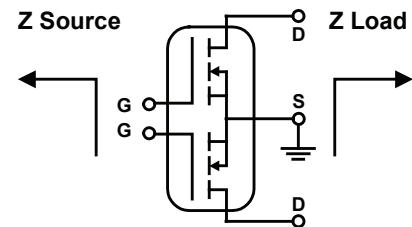


Typical Performance (cont.)

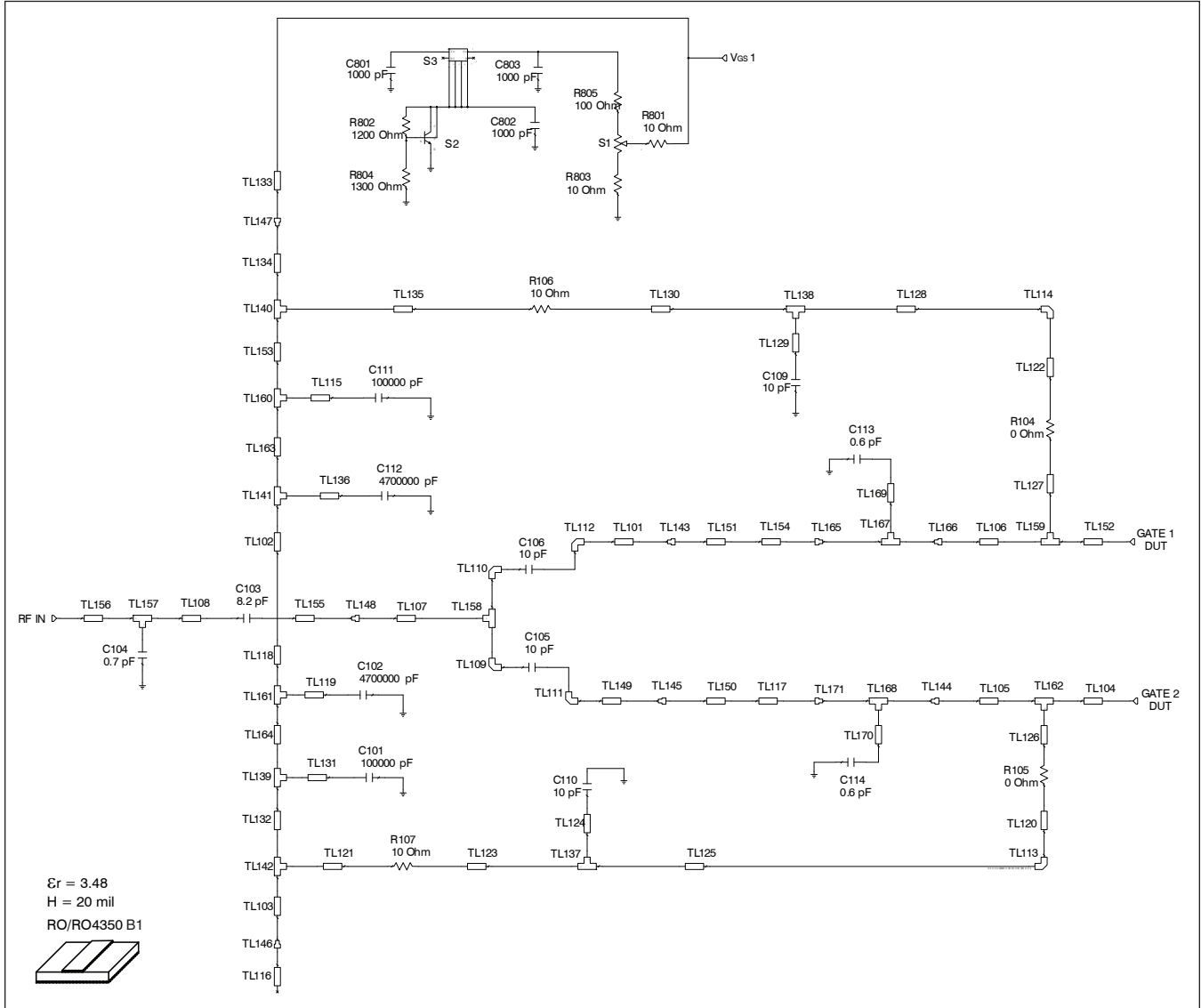


Broadband Circuit Impedance

Frequency MHz	Z Source Ω		Z Load Ω	
	R	jX	R	jX
2080	1.55	-4.57	0.71	-2.91
2090	1.54	-4.52	0.71	-2.89
2100	1.52	-4.48	0.70	-2.86
2110	1.51	-4.44	0.70	-2.84
2120	1.50	-4.40	0.70	-2.81
2130	1.48	-4.36	0.70	-2.79
2140	1.47	-4.32	0.70	-2.77
2150	1.46	-4.28	0.70	-2.74
2160	1.45	-4.24	0.69	-2.72
2170	1.43	-4.20	0.69	-2.70
2180	1.42	-4.17	0.69	-2.67
2190	1.41	-4.13	0.69	-2.65
2200	1.40	-4.09	0.69	-2.63

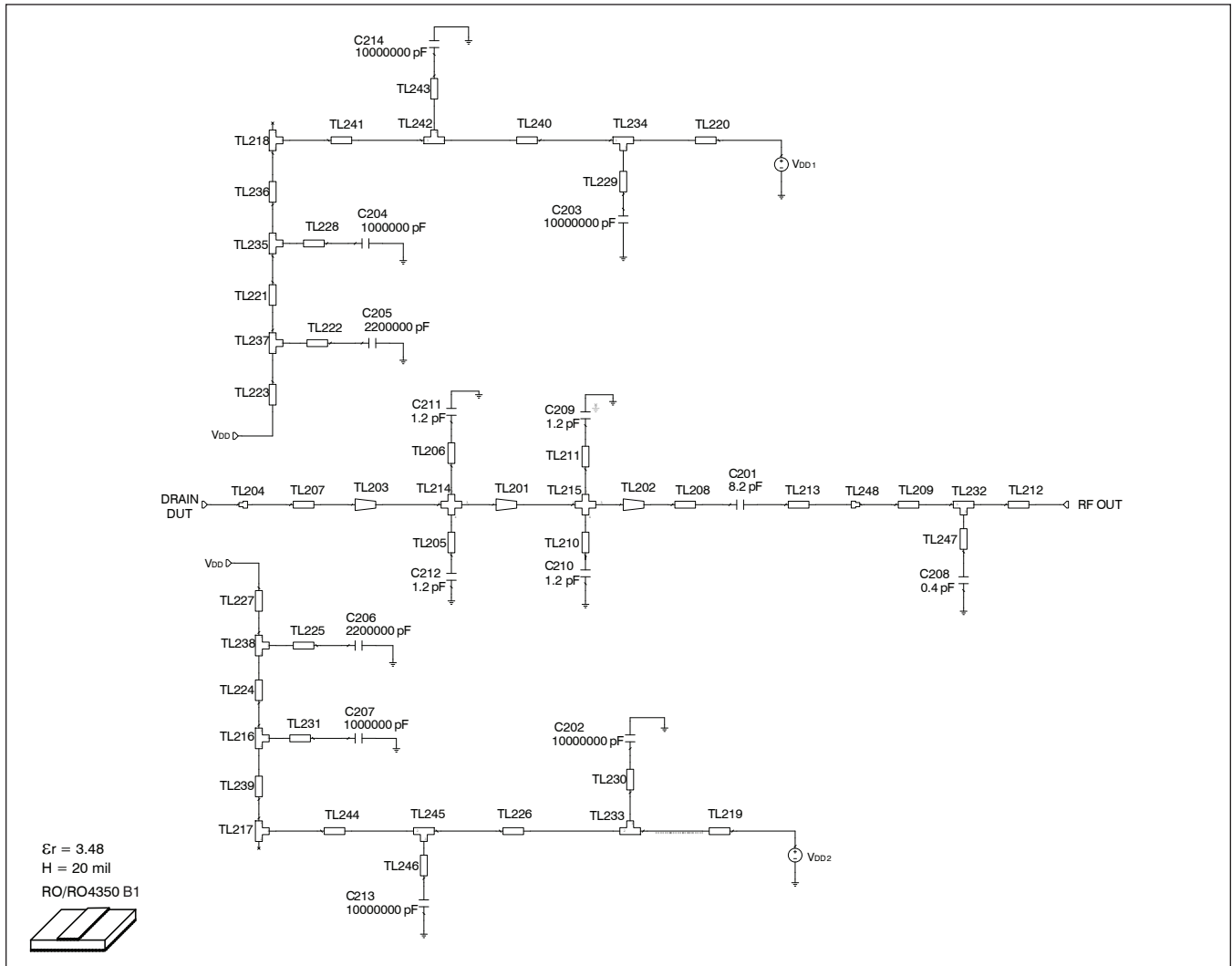


Reference Circuit (cont.)



Reference circuit input schematic for $f = 2170 \text{ MHz}$

Reference Circuit (cont.)



Reference circuit output schematic for $f = 2170 \text{ MHz}$

Reference Circuit (cont.)

Description

DUT	PTFB213004F	LDMOS Transistor	
PCB	LTN/PTFB213004EF	0.508 mm [.020"] thick, $\epsilon_r = 3.48$	Rogers 4350, 1 oz. copper

Electrical Characteristics at 2170 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101	0.004 λ , 51.98 Ω	W1 = 1.087, W2 = 1.087, W3 = 0.813	W1 = 43, W2 = 43, W3 = 32
TL101	0.010 λ , 28.85 Ω	W = 2.540, L = 0.787	W = 100, L = 31
TL102	0.207 λ , 63.89 Ω	W = 0.762, L = 17.526	W = 30, L = 690
TL103	0.006 λ , 63.89 Ω	W = 0.762, L = 0.508	W = 30, L = 20
TL104	0.070 λ , 8.03 Ω	W = 11.430, L = 5.359	W = 450, L = 211
TL105, TL106	0.017 λ , 8.03 Ω	W = 11.430, L = 1.270	W = 450, L = 50
TL107	0.025 λ , 32.60 Ω	W = 2.159, L = 2.032	W = 85, L = 80
TL108	0.015 λ , 49.69 Ω	W = 1.168, L = 1.270	W = 46, L = 50
TL109, TL110, TL111, TL112		W = 2.540	W = 100
TL113, TL114		W = 1.016	W = 40
TL115, TL131	0.000 λ , 41.75 Ω	W = 1.524, L = 0.025	W = 60, L = 1
TL116, TL133	0.016 λ , 34.08 Ω	W = 2.032, L = 1.270	W = 80, L = 50
TL117	0.016 λ , 17.20 Ω	W = 4.826, L = 1.270	W = 190, L = 50
TL118	0.041 λ , 63.89 Ω	W = 0.762, L = 3.480	W = 30, L = 137
TL119, TL136	0.000 λ , 41.75 Ω	W = 1.524, L = 0.025	W = 60, L = 1
TL120, TL122	0.015 λ , 54.17 Ω	W = 1.016, L = 1.262	W = 40, L = 50
TL121, TL135	0.020 λ , 54.17 Ω	W = 1.016, L = 1.651	W = 40, L = 65
TL123, TL130	0.017 λ , 54.17 Ω	W = 1.016, L = 1.397	W = 40, L = 55
TL124, TL129	0.000 λ , 34.08 Ω	W = 2.032, L = 0.025	W = 80, L = 1
TL125, TL128	0.091 λ , 54.17 Ω	W = 1.016, L = 7.620	W = 40, L = 300
TL126, TL127	0.009 λ , 54.17 Ω	W = 1.016, L = 0.762	W = 40, L = 30
TL132	0.018 λ , 63.89 Ω	W = 0.762, L = 1.524	W = 30, L = 60
TL134	0.006 λ , 63.89 Ω	W = 0.762, L = 0.508	W = 30, L = 20
TL137, TL138	0.024 λ , 54.17 Ω	W1 = 1.016, W2 = 1.016, W3 = 2.032	W1 = 40, W2 = 40, W3 = 80
TL139, TL141	0.018 λ , 63.89 Ω	W1 = 0.762, W2 = 0.762, W3 = 1.524	W1 = 30, W2 = 30, W3 = 60
TL140, TL142	0.012 λ , 63.89 Ω	W1 = 0.762, W2 = 0.762, W3 = 1.016	W1 = 30, W2 = 30, W3 = 40
TL143		W1 = 0.003, W2 = 0.005, Offset = 0.000	W1 = 3, W2 = 190, Offset = 10
TL144		W1 = 0.005, W2 = 0.011, Offset = -0.003	W1 = 5, W2 = 450, Offset = -130
TL145		W1 = 0.003, W2 = 0.005, Offset = 0.000	W1 = 3, W2 = 190, Offset = -10
TL146		W1 = 2.032, W2 = 0.762	W1 = 80, W2 = 30
TL147		W1 = 2.540, W2 = 0.762	W1 = 100, W2 = 30
TL148		W1 = 1.168, W2 = 2.159	W1 = 46, W2 = 85
TL149	0.009 λ , 28.85 Ω	W = 2.540, L = 0.762	W = 100, L = 30
TL150, TL151	0.006 λ , 17.20 Ω	W = 4.826, L = 0.508	W = 190, L = 20

table continued on page 10

Reference Circuit (cont.)

Electrical Characteristics at 2170 MHz

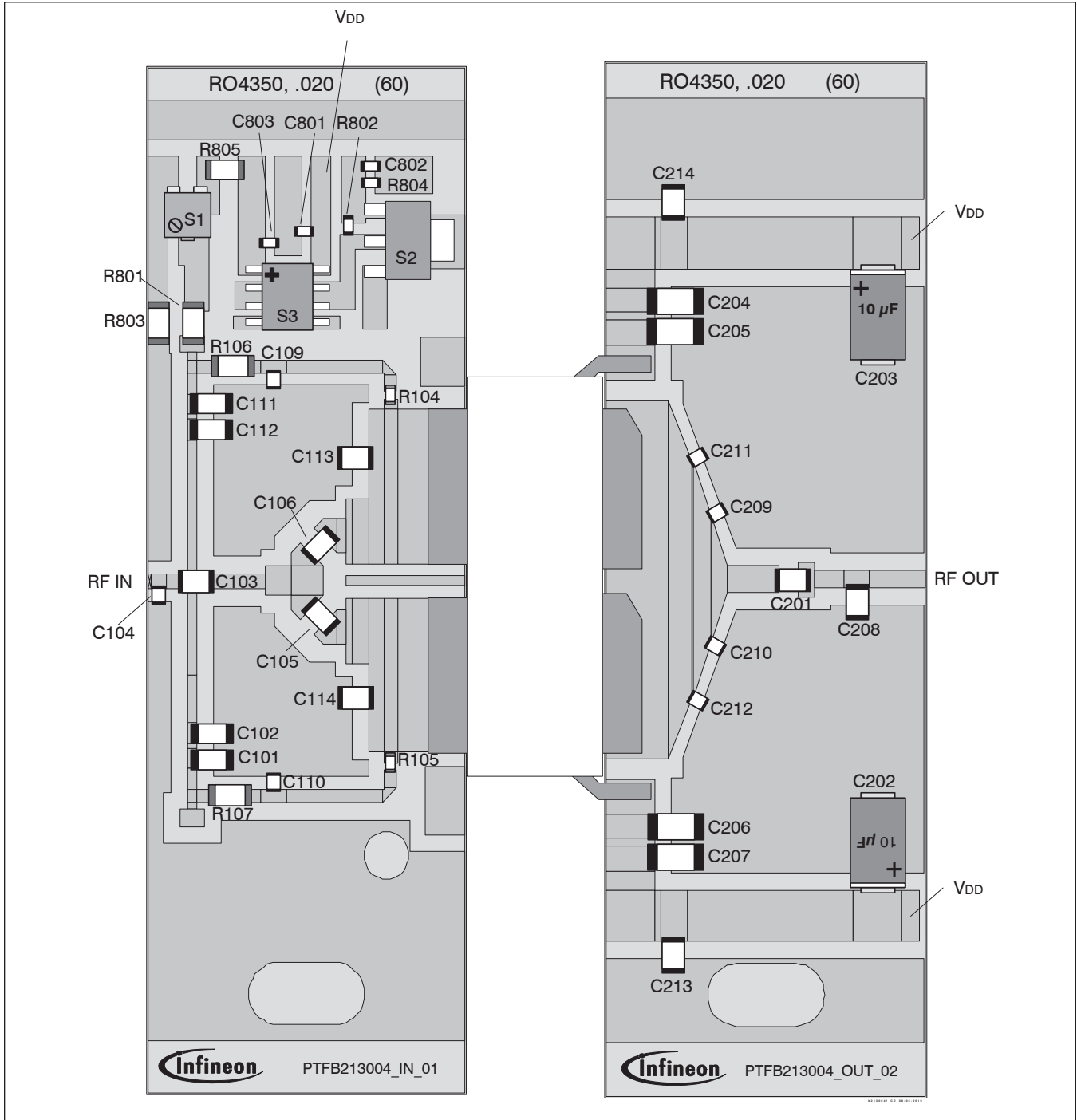
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL152	0.070 λ , 8.03 Ω	W = 11.430, L = 5.359	W = 450, L = 211
TL153	0.018 λ , 63.89 Ω	W = 0.762, L = 1.524	W = 30, L = 60
TL154	0.016 λ , 17.20 Ω	W = 4.826, L = 1.270	W = 190, L = 50
TL155	0.060 λ , 49.69 Ω	W = 1.168, L = 5.022	W = 46, L = 198
TL156	0.002 λ , 49.69 Ω	W = 1.168, L = 0.203	W = 46, L = 8
TL157	0.015 λ , 49.69 Ω	W1 = 1.168, W2 = 1.168, W3 = 1.270	W1 = 46, W2 = 46, W3 = 50
TL158	0.027 λ , 28.85 Ω	W1 = 2.540, W2 = 2.540, W3 = 2.159	W1 = 100, W2 = 100, W3 = 85
TL159, TL162	0.013 λ , 8.03 Ω	W1 = 11.430, W2 = 11.430, W3 = 1.016	W1 = 450, W2 = 450, W3 = 40
TL160, TL161	0.018 λ , 63.89 Ω	W1 = 0.762, W2 = 0.762, W3 = 1.524	W1 = 30, W2 = 30, W3 = 60
TL163, TL164	0.004 λ , 63.89 Ω	W = 0.762, L = 0.330	W = 30, L = 13
TL165, TL171		W1 = 0.011, W2 = 0.003, Offset = 0.005	W1 = 11, W2 = 100, Offset = 200
TL166		W1 = 0.005, W2 = 0.011, Offset = 0.003	W1 = 5, W2 = 450, Offset = 130
TL167		W1 = 0.000, W2 = 0.000, W3 = 0.000	W1 = 0, W2 = 1, W3 = 1
TL168	0.000 λ , 148.22 Ω	W1 = 0.013, W2 = 0.013, W3 = 0.013	W1 = 1, W2 = 1, W3 = 1
TL169	0.000 λ , 102.05 Ω	W = 0.254, L = 0.025	W = 10, L = 1
TL170	0.000 λ , 47.12 Ω	W = 1.270, L = 0.025	W = 50, L = 1

See next page for reference circuit output characteristics

Reference Circuit (cont.)
Electrical Characteristics at 2170 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201 (taper)	0.018 λ , 5.40 Ω / 9.59 Ω	W1 = 17.526, W2 = 9.398, L = 1.397	W1 = 690, W2 = 370, L = 55
TL202 (taper)	0.016 λ , 9.59 Ω / 34.72 Ω	W1 = 9.398, W2 = 1.981, L = 1.270	W1 = 370, W2 = 78, L = 50
TL203 (taper)	0.026 λ , 3.67 Ω / 5.40 Ω	W1 = 26.365, W2 = 17.526, L = 1.956	W1 = 1038, W2 = 690, L = 77
TL204		W1 = 25.400, W2 = 26.365	W1 = 1000, W2 = 1038
TL205, TL206, TL210, TL211	0.000 λ , 144.35 Ω	W = 0.025, L = 0.025	W = 1, L = 1
TL207	0.064 λ , 3.67 Ω	W = 26.365, L = 4.801	W = 1038, L = 189
TL208	0.050 λ , 34.72 Ω	W = 1.981, L = 4.115	W = 78, L = 162
TL209	0.028 λ , 47.12 Ω	W = 1.270, L = 2.337	W = 50, L = 92
TL212	0.053 λ , 47.12 Ω	W = 1.270, L = 4.394	W = 50, L = 173
TL213	0.016 λ , 28.85 Ω	W = 2.540, L = 1.270	W = 100, L = 50
TL214		W1 = 17.526, W2 = 0.025, W3 = 17.526, W4 = 0.025	W1 = 690, W2 = 1, W3 = 690, W4 = 1
TL215		W1 = 9.398, W2 = 0.025, W3 = 9.398, W4 = 0.025	W1 = 370, W2 = 1, W3 = 370, W4 = 1
TL216	0.022 λ , 20.93 Ω	W1 = 3.810, W2 = 3.810, W3 = 1.778	W1 = 150, W2 = 150, W3 = 70
TL217, TL218	0.048 λ , 20.93 Ω	W1 = 3.810, W2 = 3.810, W3 = 3.810	W1 = 150, W2 = 150, W3 = 150
TL219, TL220	0.017 λ , 20.93 Ω	W = 3.810, L = 1.372	W = 150, L = 54
TL221	0.008 λ , 20.93 Ω	W = 3.810, L = 0.635	W = 150, L = 25
TL222, TL225, TL228, TL231	0.000 λ , 37.51 Ω	W = 1.778, L = 0.025	W = 70, L = 1
TL223	0.032 λ , 20.93 Ω	W = 3.810, L = 2.540	W = 150, L = 100
TL224	0.008 λ , 20.93 Ω	W = 3.810, L = 0.635	W = 150, L = 25
TL226	0.165 λ , 20.93 Ω	W = 3.810, L = 13.106	W = 150, L = 516
TL227	0.032 λ , 20.93 Ω	W = 3.810, L = 2.540	W = 150, L = 100
TL229, TL230	0.000 λ , 20.93 Ω	W = 3.810, L = 0.025	W = 150, L = 1
TL232	0.024 λ , 47.12 Ω	W1 = 1.270, W2 = 1.270, W3 = 2.032	W1 = 50, W2 = 50, W3 = 80
TL233, TL234	0.048 λ , 20.93 Ω	W1 = 3.810, W2 = 3.810, W3 = 3.810	W1 = 150, W2 = 150, W3 = 150
TL235, TL237, TL238	0.022 λ , 20.93 Ω	W1 = 3.810, W2 = 3.810, W3 = 1.778	W1 = 150, W2 = 150, W3 = 70
TL236, TL239	0.018 λ , 20.93 Ω	W = 3.810, L = 1.397	W = 150, L = 55
TL240	0.165 λ , 20.93 Ω	W = 3.810, L = 13.106	W = 150, L = 516
TL241	0.006 λ , 20.93 Ω	W = 3.810, L = 0.508	W = 150, L = 20
TL242, TL245	0.026 λ , 20.93 Ω	W1 = 3.810, W2 = 3.810, W3 = 2.032	W1 = 150, W2 = 150, W3 = 80
TL243, TL246, TL247	0.000 λ , 34.08 Ω	W = 2.032, L = 0.025	W = 80, L = 1
TL244	0.006 λ , 20.93 Ω	W = 3.810, L = 0.508	W = 150, L = 20
TL248		W1 = 2.540, W2 = 1.270	W1 = 100, W2 = 50

Reference Circuit (cont.)



Reference circuit assembly diagram (not to scale)*

*Gerber Files for this circuit available on request

Reference Circuit (cont.)

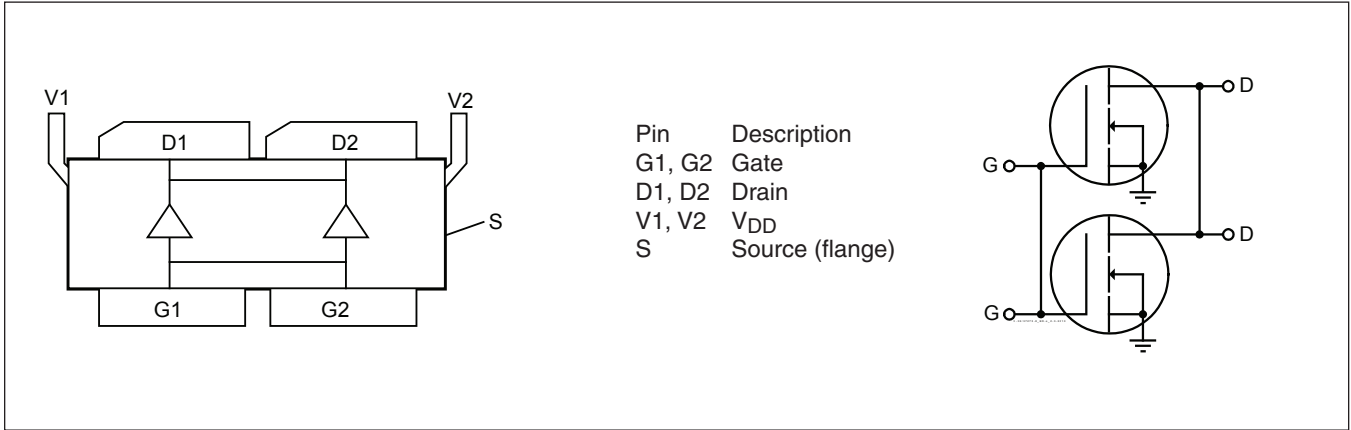
Circuit Assembly Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C108, C111	Chip capacitor, 0.1 μ F	Digi-Key	PCC104BTR-ND
C102, C112	Chip capacitor, 4.7 μ F	Digi-Key	493-2372-2-ND
C103	Chip capacitor, 8.2 pF	ATC	ATC100B8R2BW500XB
C104	Chip capacitor, 0.7 pF	ATC	ATC100A0R7BW150XB
C105, C106	Chip capacitor, 10 pF	ATC	ATC100B100FW500XB
C107	Capacitor, 10 μ F	Digi-Key	399-1655-2-ND
C109, C110	Chip capacitor, 10 pF	ATC	ATC100A100FW150XB
C113, C114	Chip capacitor, 0.6 pF	ATC	ATC100B0R6BW500XB
C801, C802, C803	Chip capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
R101, R102	Resistor, 0 Ω	Digi-Key	P0.0ECT-ND
R103, R106, R107, R801, R803	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R104, R105	Resistor, 0 Ω	Digi-Key	P0.0GCT-ND
R802	Resistor, 1200 Ω	Digi-Key	P1.2KECT-ND
R804	Resistor, 1300 Ω	Digi-Key	P1.3KGCT-ND
R805	Resistor, 100 Ω	Digi-Key	P100ECT-ND
S1	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
S2	Transistor	Digi-Key	BCP56
S3	Voltage Regulator	Digi-Key	LM7805

Output

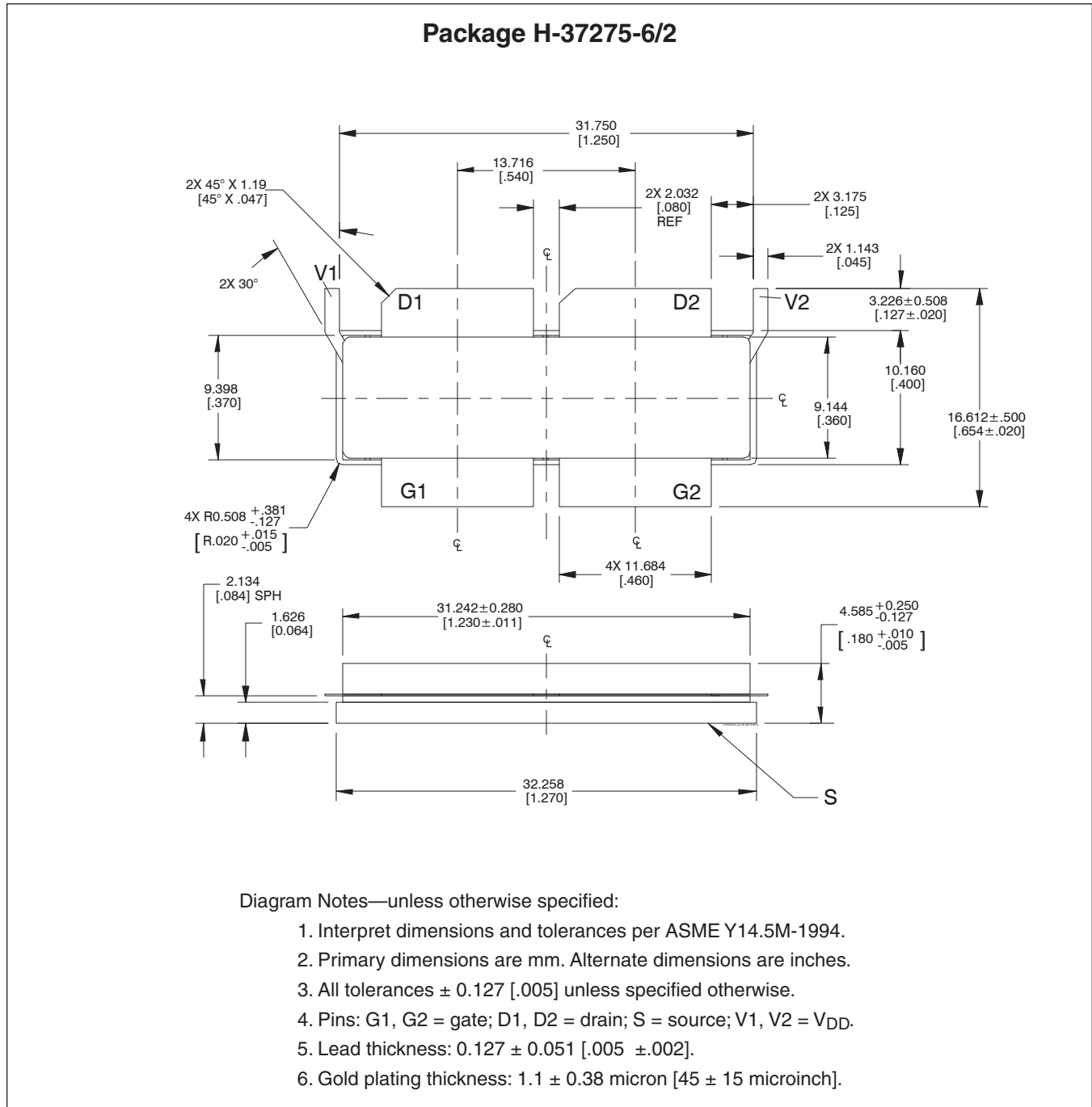
C201	Chip capacitor, 8.2 pF	ATC	ATC100B8R2BW500XB
C202, C203	Capacitor, 10 μ F	Digi-Key	399-1655-2-ND
C204, C207	Chip capacitor, 1 μ F	Digi-Key	445-1411-2-ND
C205, C206	Chip capacitor, 2.2 μ F	Digi-Key	445-1447-2-ND
C208	Chip capacitor, 0.4 pF	ATC	ATC100B0R4BW500XB
C209, C210, C211, C212	Chip capacitor, 1.2 pF	ATC	ATC100A1R2BW150XB
C213, C214	Capacitor, 10 μ F	Digi-Key	587-1818-2-ND

Pinout Diagram



See next page for package outline specifications

Package Outline Specifications



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

Page	Subjects (major changes since last revision)
2	Updated ordering information

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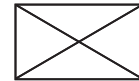
Please send your proposal (including a reference to this document) to:

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Edition 2016-06-15

Published by

Infineon Technologies AG

81726 Munich, Germany

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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.

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