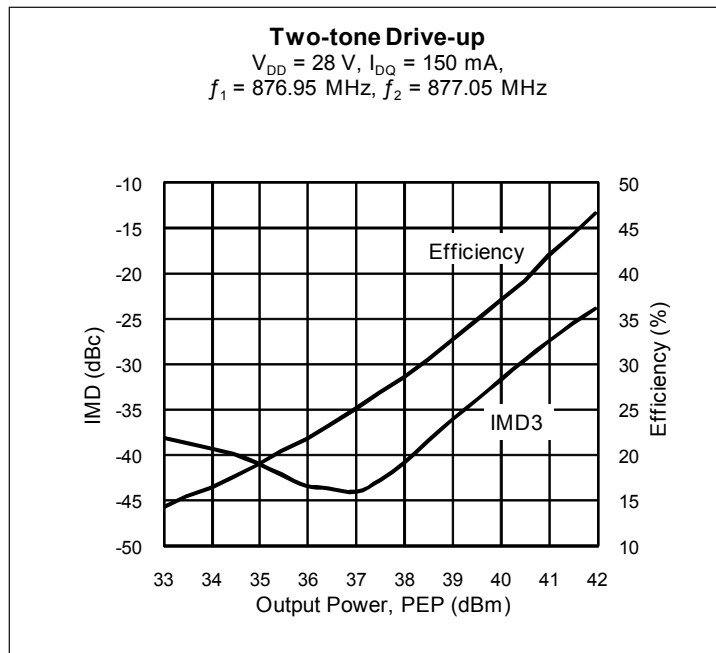


High Power RF LDMOS Field Effect Transistor 12 W, 700 – 2200 MHz

Description

The PTFA220121M is an unmatched 12-watt LDMOS FET intended for power amplifier applications in the 700 to 2200 MHz. This LDMOS device offers excellent gain, efficiency and linearity performance in a small overmolded plastic package.

PTFA220121M
Package PG-SON-10



Features

- Typical two-carrier WCDMA performance at 2140 MHz, 8 dB PAR
 - $P_{OUT} = 33\text{ dBm Avg}$
 - $ACPR = -45.5\text{ dBc}$
- Typical two-carrier WCDMA performance at 877 MHz, 8 dB PAR
 - $P_{OUT} = 33\text{ dBm Avg}$
 - $ACPR = -44.5\text{ dBc}$
- Typical CW performance, 2140 MHz, 28 V
 - $P_{OUT} = 41.6\text{ dBm}$
 - Efficiency = 53.5%
 - Gain = 15.5 dB
- Typical CW performance, 877 MHz, 28 V
 - $P_{OUT} = 41.8\text{ dBm}$
 - Efficiency = 60%
 - Gain = 19.9 dB
- Capable of handling 10:1 VSWR @ 28 V, 12 W (CW) output power
- Integrated ESD protection
- Excellent thermal stability
- Pb-free and RoHS compliant

RF Characteristics

Two-tone Measurements (not subject to production test – verified by design / characterization in Infineon test fixture)
 $V_{DD} = 28\text{ V}$, $I_{DQ} = 150\text{ mA}$, $P_{OUT} = 12\text{ W PEP}$, $f = 877\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	20	20.5	—	dB
Drain Efficiency	η_D	41	42.5	—	%
Intermodulation Distortion	IMD	—	-33	-32	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)
 $V_{DD} = 28\text{ V}$, $I_{DQ} = 150\text{ mA}$, $P_{OUT} = 9.3\text{ W PEP}$, $f = 2140\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	16.2	—	dB
Drain Efficiency	η_D	—	37	—	%
Intermodulation Distortion	IMD	—	-29.4	—	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	$V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	1.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ A}$	$R_{DS(on)}$	—	2.01	—	Ω
Operating Gate Voltage	$V_{DS} = 28\text{ V}$, $I_{DQ} = 150\text{ mA}$	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	175	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-40 to +150	$^{\circ}\text{C}$
Thermal Resistance ($T_{CASE} = 70^{\circ}\text{C}$, 12 W CW)	$R_{\theta JC}$	3.4	$^{\circ}\text{C/W}$

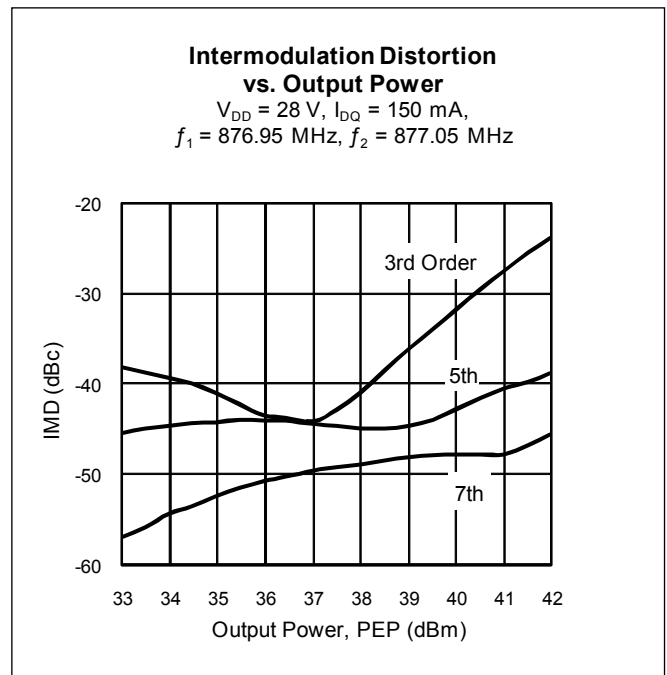
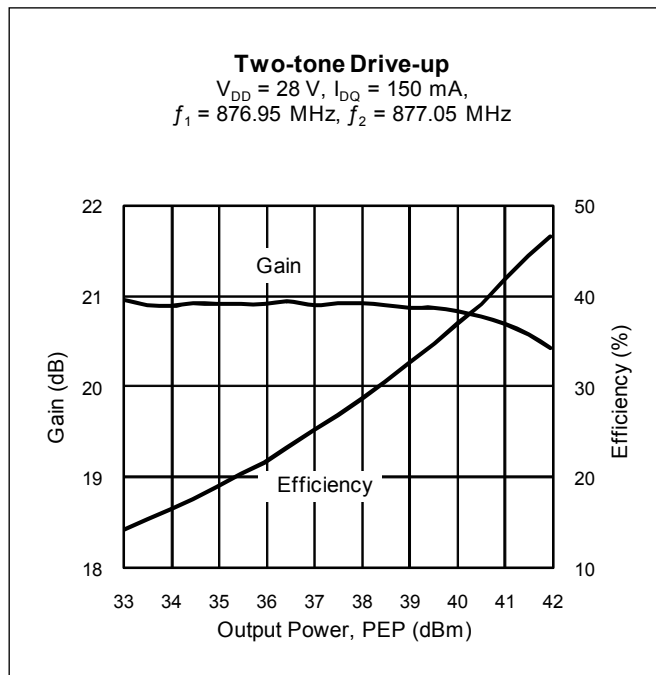
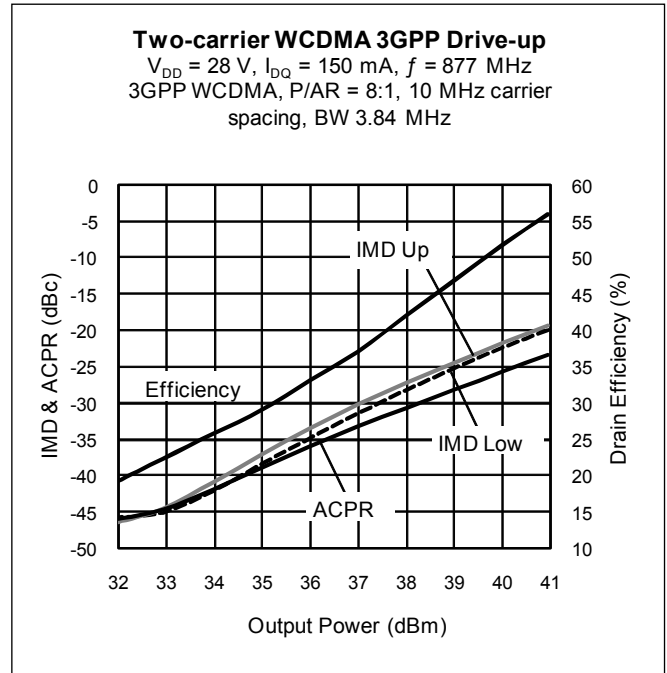
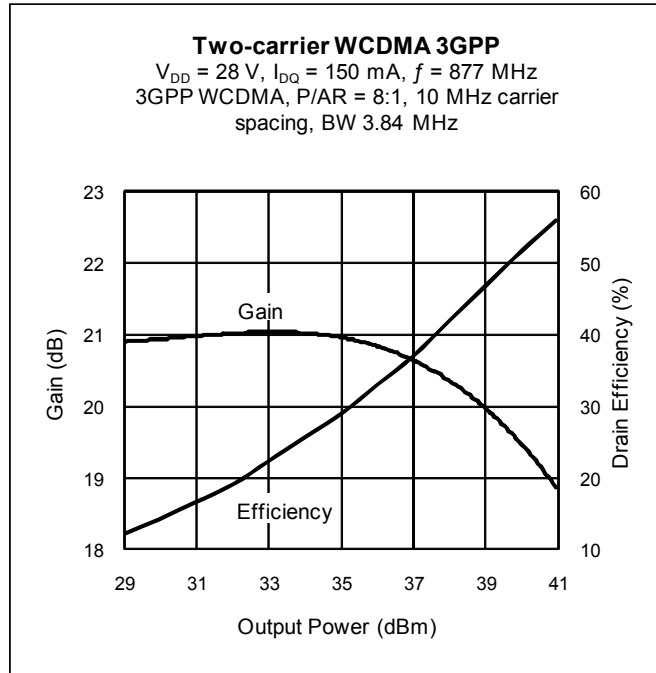
Moisture Sensitivity Level

Level	Test Standard	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	$^{\circ}\text{C}$

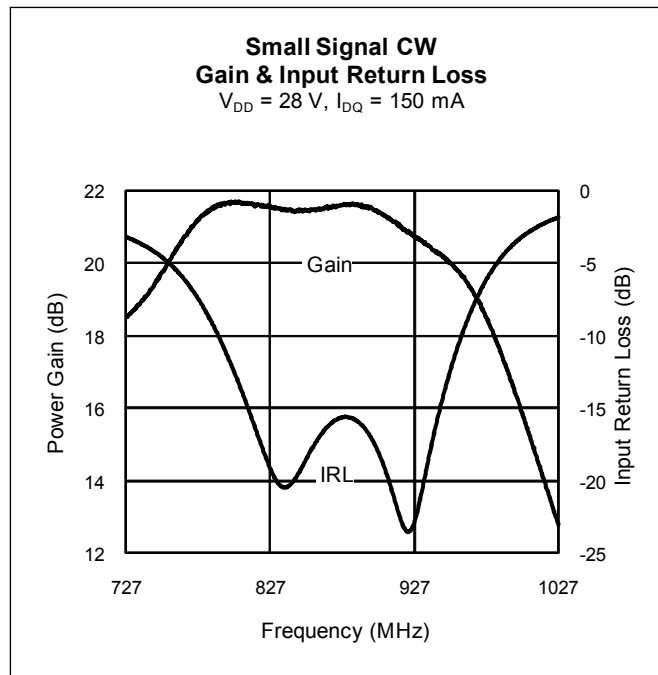
Ordering Information

Type and Version	Package Outline	Package Description	Shipping
PTFA220121M V4 R250	PG-SON-10	Molded plastic, SMD	Tape & Reel, 500 pcs

Typical Performance, 877 MHz (data taken in a production test fixture)

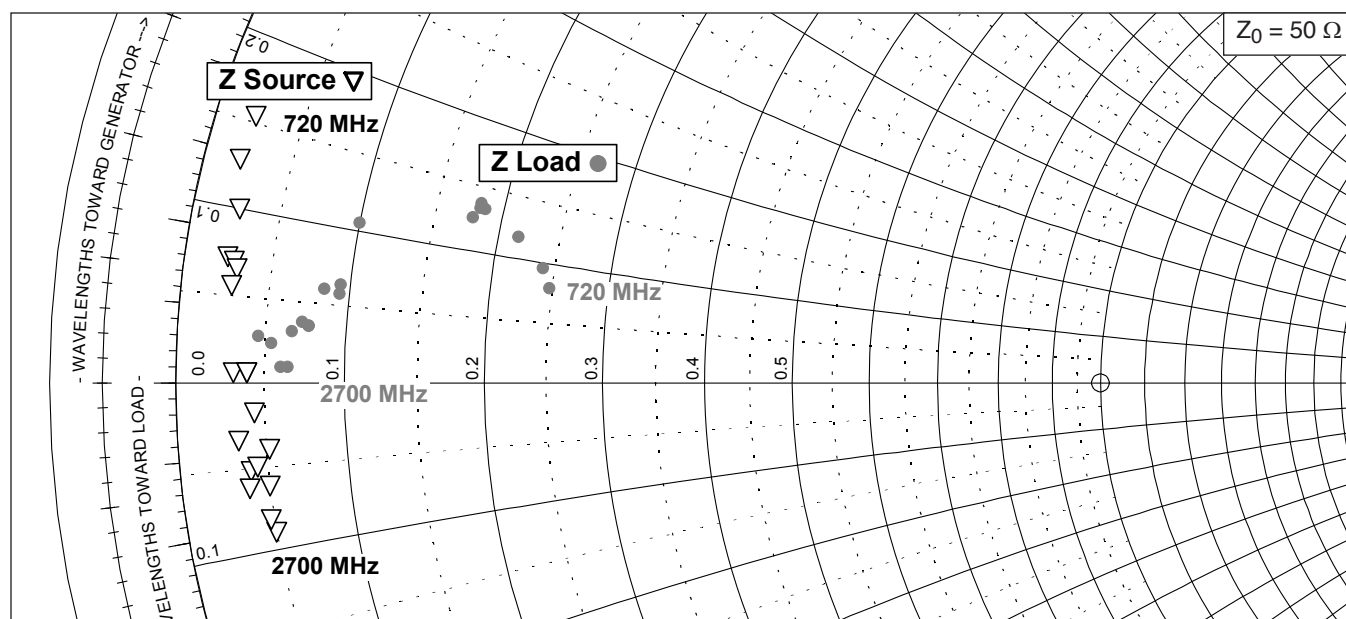
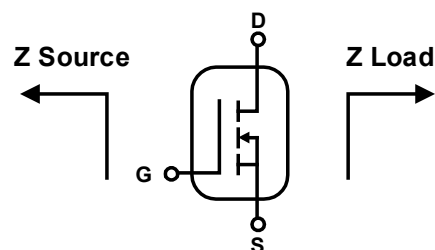


Typical Performance, 877 MHz (cont.)

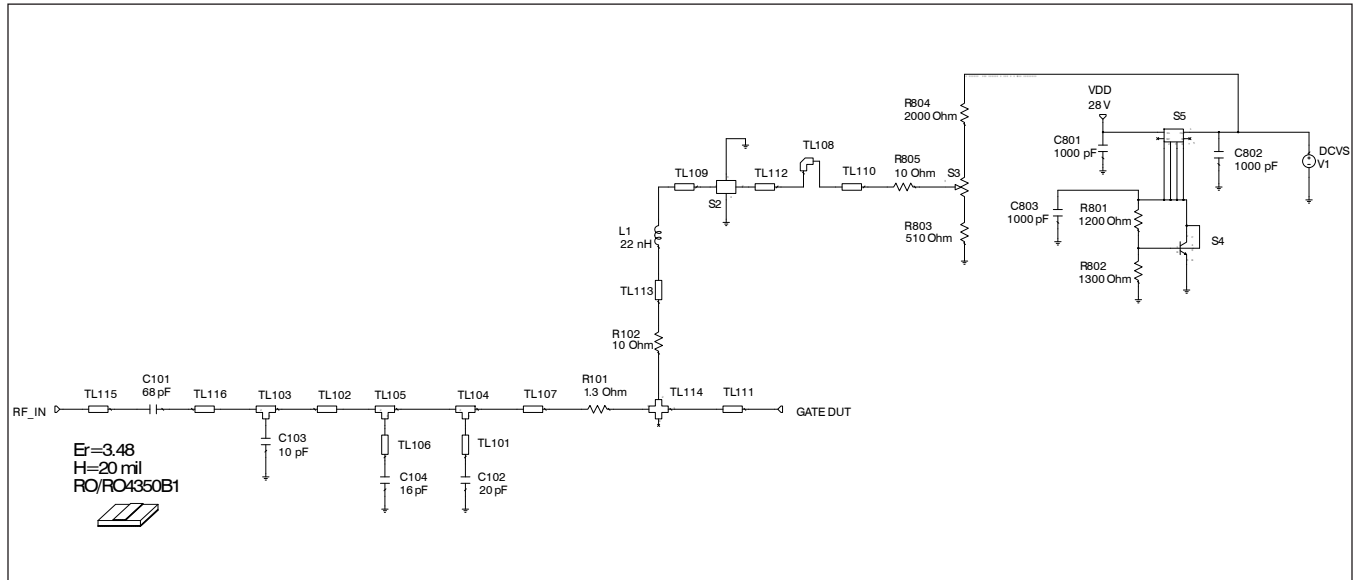


Broadband Circuit Impedance

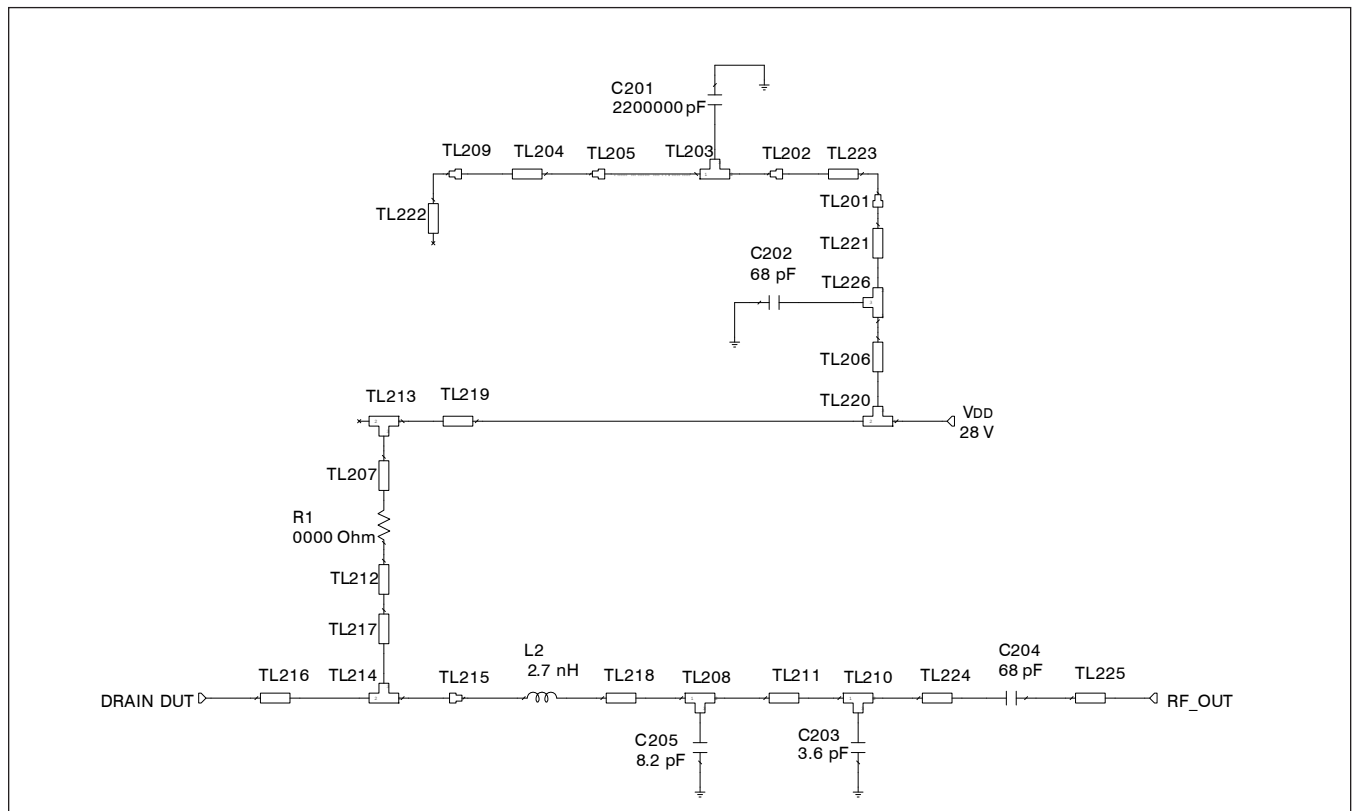
Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
720	1.1	7.7	12.0	4.8
820	1.0	6.4	12.4	4.0
869	1.3	5.0	10.8	5.9
894	1.2	3.6	9.3	6.7
920	1.4	3.5	9.1	6.7
940	1.5	3.3	9.1	6.9
960	1.4	2.8	8.9	6.3
1675	1.6	0.3	5.0	5.3
1805	2.0	0.3	4.7	3.2
1880	2.0	0.3	4.7	2.9
1930	2.2	-0.9	4.2	3.0
1990	2.6	-2.0	3.8	1.8
2110	2.5	-3.1	3.8	1.8
2170	2.0	-2.6	3.6	1.9
2300	1.7	-1.7	3.3	1.6
2400	2.2	-2.5	3.2	0.5
2500	2.5	-4.5	3.0	0.5
2600	2.4	-4.1	2.7	1.2
2700	1.9	-3.1	2.3	1.4



Reference Circuit, 877 MHz



Reference circuit input schematic for $f = 877$ MHz



Reference circuit output schematic for $f = 877$ MHz

Reference Circuit, 877 MHz (cont.)

Description

DUT	PTFA220121M
PCB	0.508 mm [.020"] thick, $\epsilon_r = 3.48$, Rogers 4350, 1 oz. copper

Electrical Characteristics at 877 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101, TL106		$W = 0.000$, $L = 0.000$	$W = 0$, $L = 0$
TL102	0.050λ , 51.98Ω	$W = 1.087$, $L = 10.262$	$W = 43$, $L = 404$
TL103, TL104, TL105	0.004λ , 51.98Ω	$W1 = 1.087$, $W2 = 1.087$, $W3 = 0.813$	$W1 = 43$, $W2 = 43$, $W3 = 32$
TL107	0.004λ , 51.98Ω	$W = 1.087$, $L = 0.813$	$W = 43$, $L = 32$
TL108		$W = 1.524$	$W = 60$
TL109	0.007λ , 54.17Ω	$W = 1.016$, $L = 1.524$	$W = 40$, $L = 60$
TL110	0.025λ , 41.75Ω	$W = 1.524$, $L = 5.080$	$W = 60$, $L = 200$
TL111	0.009λ , 25.04Ω	$W = 3.048$, $L = 1.778$	$W = 120$, $L = 70$
TL112	0.002λ , 41.75Ω	$W = 1.524$, $L = 0.508$	$W = 60$, $L = 20$
TL113	0.006λ , 41.75Ω	$W = 1.524$, $L = 1.270$	$W = 60$, $L = 50$
TL114		$W1 = 3.048$, $W2 = 0.762$, $W3 = 3.048$, $W4 = 0.762$	$W1 = 120$, $W2 = 30$, $W3 = 120$, $W4 = 30$
TL115	0.016λ , 51.98Ω	$W = 1.087$, $L = 3.264$	$W = 43$, $L = 129$
TL116	0.044λ , 51.98Ω	$W = 1.087$, $L = 9.093$	$W = 43$, $L = 358$

table continued on page 8

Reference Circuit, 877 MHz (cont.)

Electrical Characteristics at 877 MHz

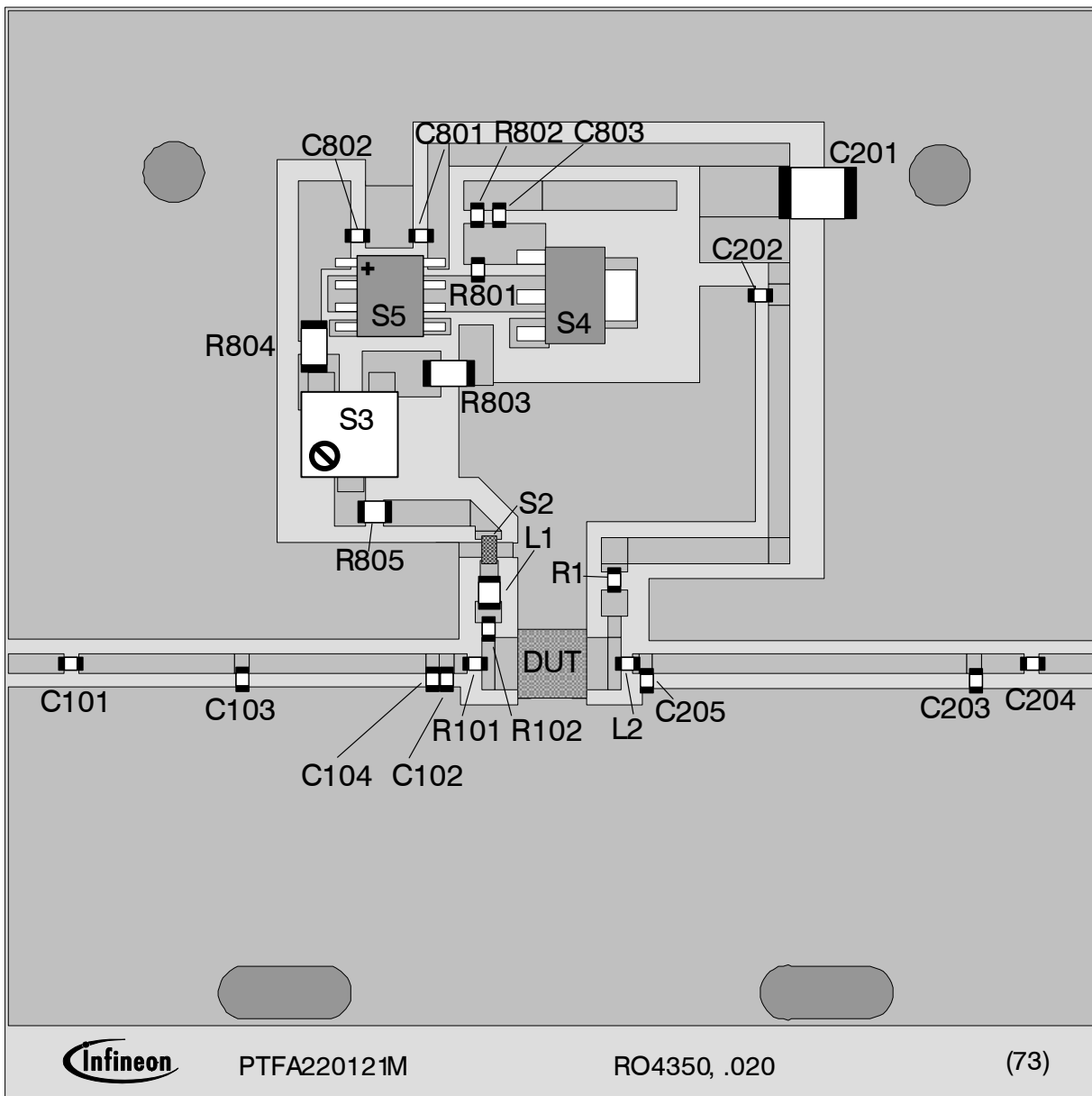
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201		W1 = 1.270, W2 = 5.283, Offset = -2.007	W1 = 50, W2 = 208, Offset = -79
TL202		W1 = 5.283, W2 = 5.283, Offset = 0.000	W1 = 208, W2 = 208, Offset = 0
TL203	0.016 λ , 15.92 Ω	W1 = 5.283, W2 = 5.283, W3 = 3.023	W1 = 208, W2 = 208, W3 = 119
TL204	0.007 λ , 4.80 Ω	W = 19.850, L = 1.270	W = 782, L = 50
TL205		W1 = 19.812, W2 = 19.812, Offset = 7.264	W1 = 780, W2 = 780, Offset = 286
TL206	0.066 λ , 47.12 Ω	W = 1.270, L = 13.467	W = 50, L = 530
TL207	0.002 λ , 41.75 Ω	W = 1.524, L = 0.508	W = 60, L = 20
TL208, TL210	0.004 λ , 51.98 Ω	W1 = 1.087, W2 = 1.087, W3 = 0.813	W1 = 43, W2 = 43, W3 = 32
TL209		W1 = 1.270, W2 = 1.270, Offset = 10.566	W1 = 50, W2 = 50, Offset = 416
TL211	0.089 λ , 51.98 Ω	W = 1.087, L = 18.313	W = 43, L = 721
TL212	0.007 λ , 41.75 Ω	W = 1.524, L = 1.524	W = 60, L = 60
TL213	0.007 λ , 41.75 Ω	W1 = 1.524, W2 = 1.524, W3 = 1.524	W1 = 60, W2 = 60, W3 = 60
TL214	0.004 λ , 25.04 Ω	W1 = 3.048, W2 = 3.048, W3 = 0.762	W1 = 120, W2 = 120, W3 = 30
TL215		W1 = 1.087, W2 = 3.048	W1 = 43, W2 = 120
TL216	0.009 λ , 25.04 Ω	W = 3.048, L = 1.778	W = 120, L = 70
TL217	0.006 λ , 63.89 Ω	W = 0.762, L = 1.270	W = 30, L = 50
TL218	0.002 λ , 51.98 Ω	W = 1.087, L = 0.356	W = 43, L = 14
TL219	0.040 λ , 41.75 Ω	W = 1.524, L = 8.204	W = 60, L = 323
TL220	0.006 λ , 41.75 Ω	W1 = 1.524, W2 = 1.524, W3 = 1.270	W1 = 60, W2 = 60, W3 = 50
TL221	0.006 λ , 47.12 Ω	W = 1.270, L = 1.191	W = 50, L = 47
TL222	0.035 λ , 47.12 Ω	W = 1.270, L = 7.290	W = 50, L = 287
TL223	0.014 λ , 15.92 Ω	W = 5.283, L = 2.667	W = 208, L = 105
TL224	0.012 λ , 51.98 Ω	W = 1.087, L = 2.502	W = 43, L = 99
TL225	0.016 λ , 51.98 Ω	W = 1.087, L = 3.264	W = 43, L = 129
TL226	0.006 λ , 47.12 Ω	W1 = 1.270, W2 = 1.270, W3 = 1.270	W1 = 50, W2 = 50, W3 = 50

Reference Circuit, 877 MHz (cont.)

Circuit Assembly Information

Test Fixture Part No. LTN/ PTFA220121M-8

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



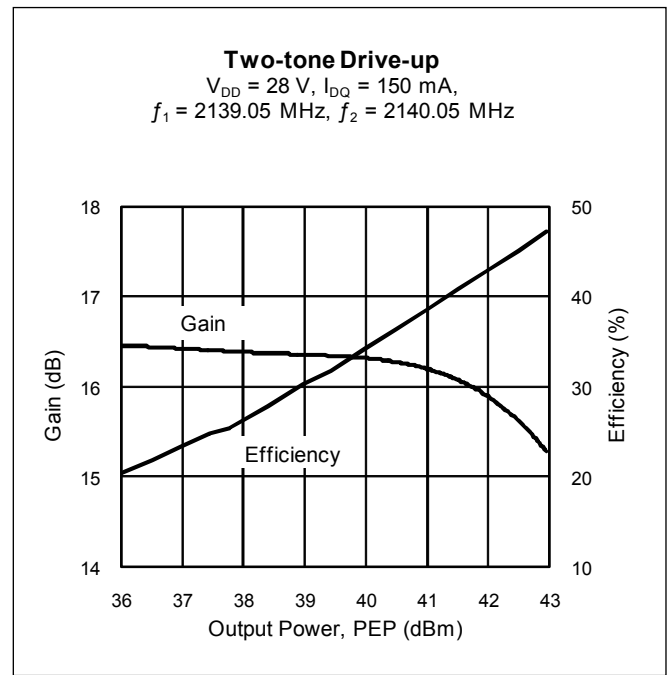
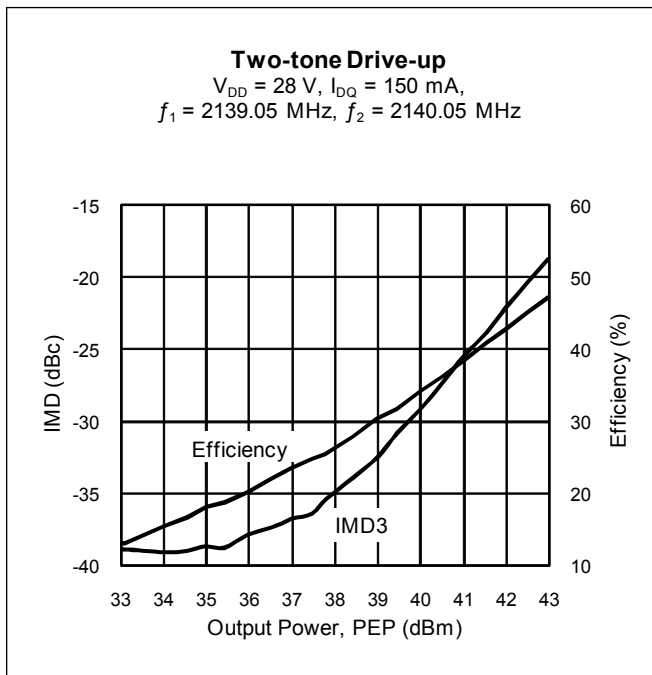
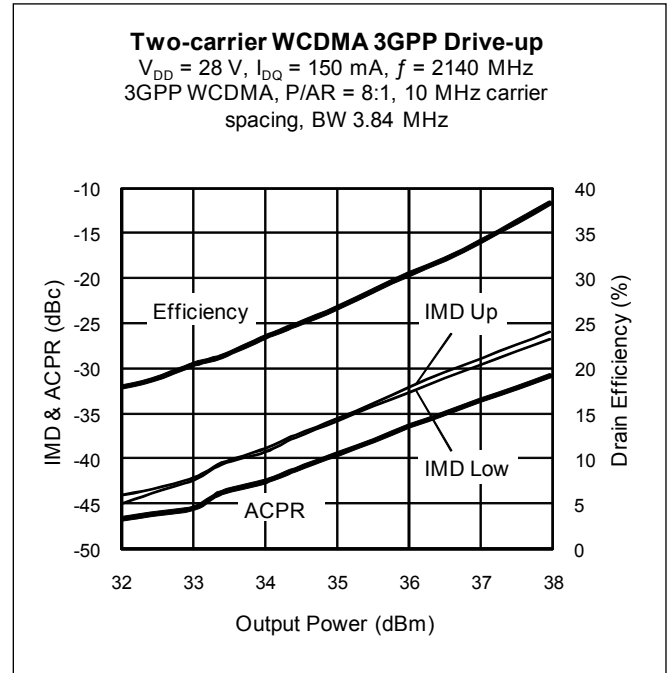
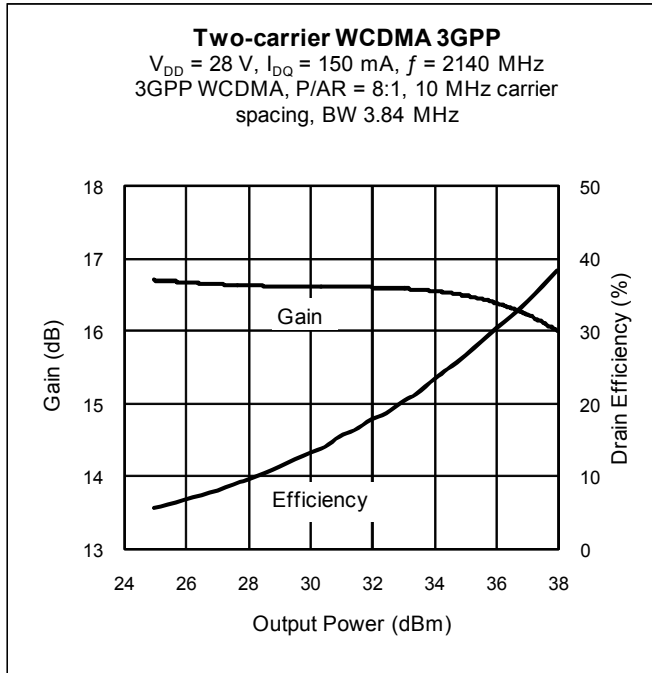
Reference circuit assembly diagram (not to scale)

Reference Circuit, 877 MHz (cont.)

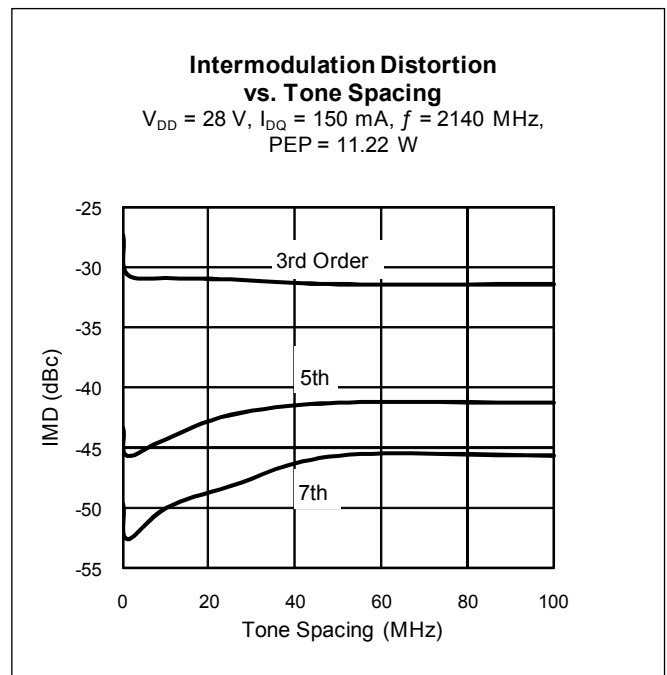
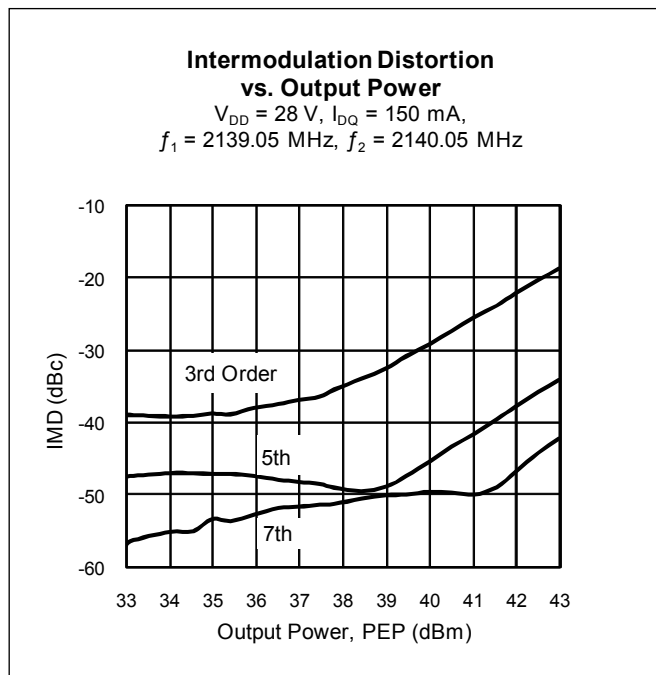
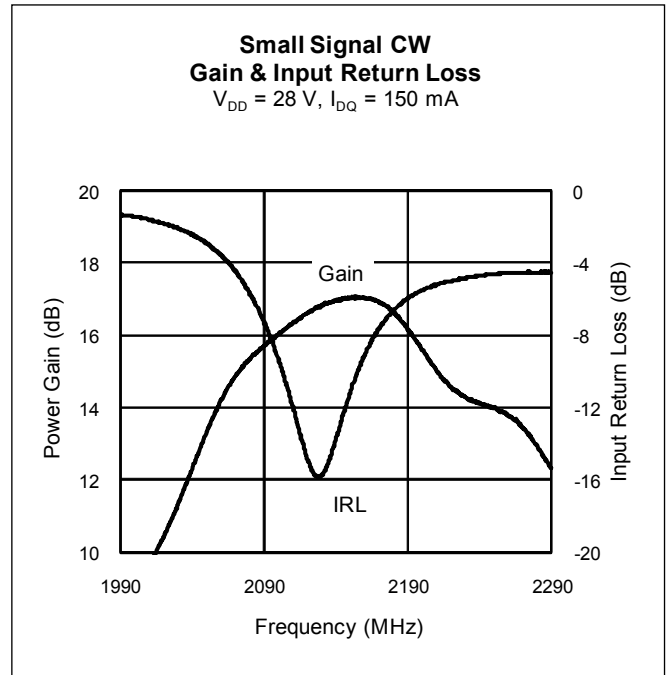
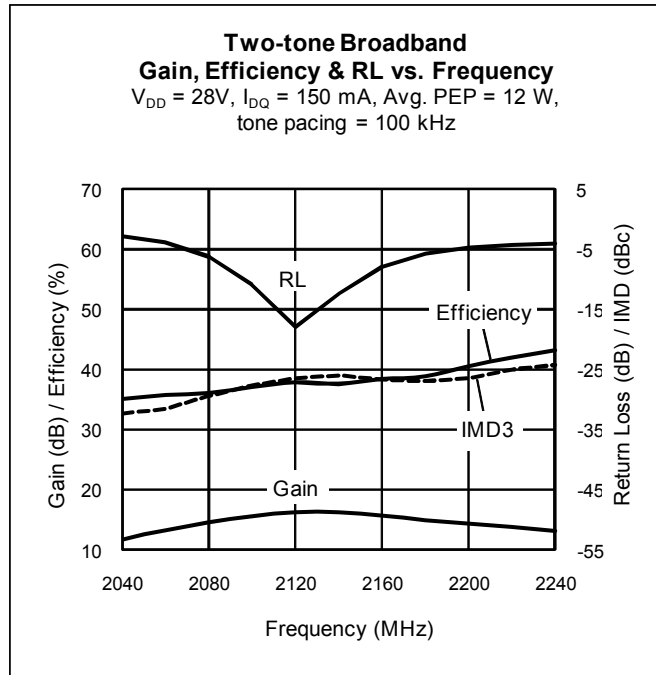
Components Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101	Chip capacitor, 68 pF	ATC	ATC100A680JW150X
C102	Chip capacitor, 20 pF	ATC	ATC100A200JW150X
C103	Chip capacitor, 10 pF	ATC	ATC100A100JW150X
C104	Chip capacitor, 16 pF	ATC	ATC100A160JW150X
C801, C802, C803	Chip capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
L1	Inductor, 22 nH	Coilcraft	0805HT-22NX_BG
R101	Resistor, 1.3 Ω	Digi-Key	P1.3ECT-ND
R102, R805	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R801	Resistor, 1200 Ω	Digi-Key	P1.2KECT-ND
R802	Resistor, 1300 Ω	Digi-Key	P1.3KECT-ND
R803	Resistor, 510 Ω	Digi-Key	P510ECT-ND
R804	Resistor, 2000 Ω	Digi-Key	P2.0KECT-ND
S2	EMI Suppression Capacitor	Murata	NFM18PS105R0J3
S3	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
S4	Transistor	Infineon Technologies	BCP56
S5	Voltage regulator	National Semiconductor	LM7805
Output			
C201	Chip capacitor, 2.2 μ F	Digi-Key	445-1474-2-ND
C202, C204	Chip capacitor, 68 pF	ATC	ATC100A680JW150X
C203	Chip capacitor, 3.6 pF	ATC	ATC100A3R6CW150X
C205	Chip capacitor, 8.2 pF	ATC	ATC100A8R2CW150X
L2	Inductor, 2.7 nH	Coilcraft	0402CS-2N7X_BG
R1	Resistor, 0 W	Digi-Key	P0.0KECT-ND

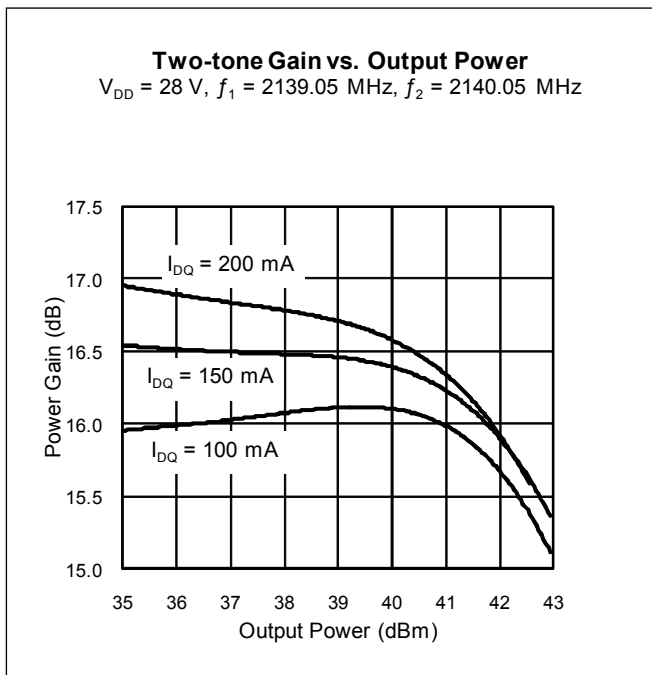
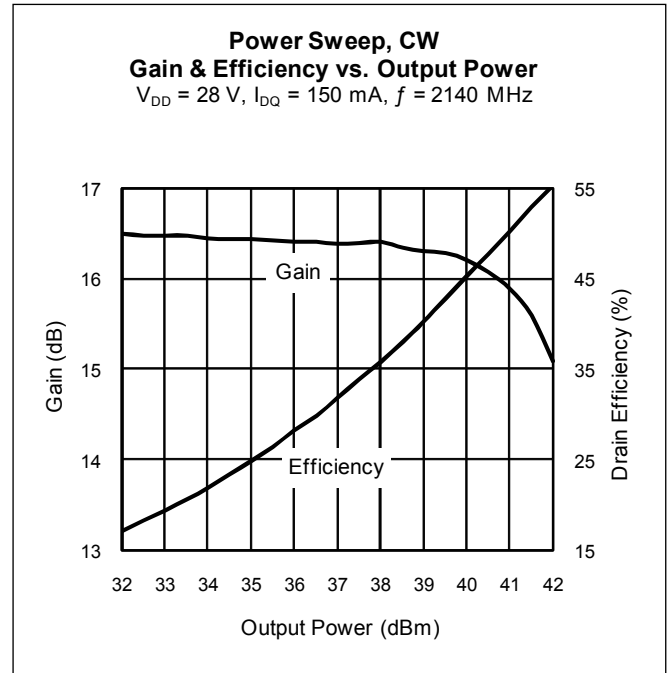
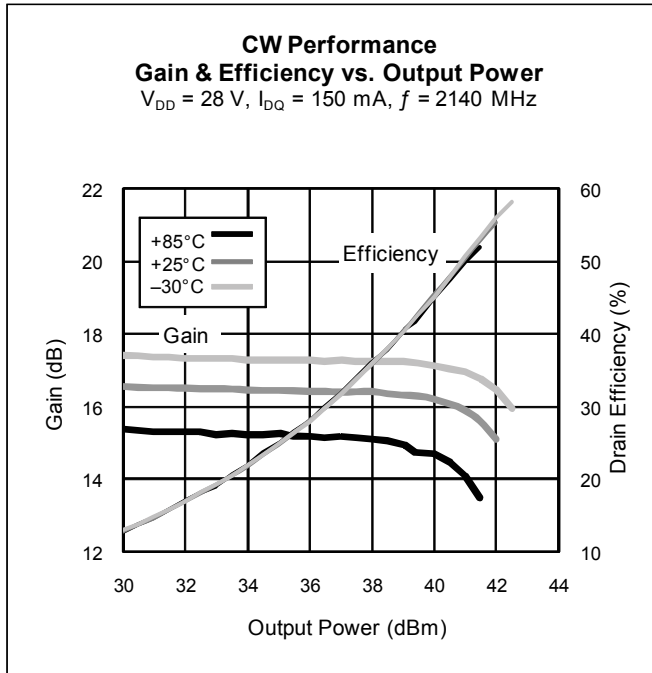
Typical Performance, 2140 MHz (data taken in a production test fixture)



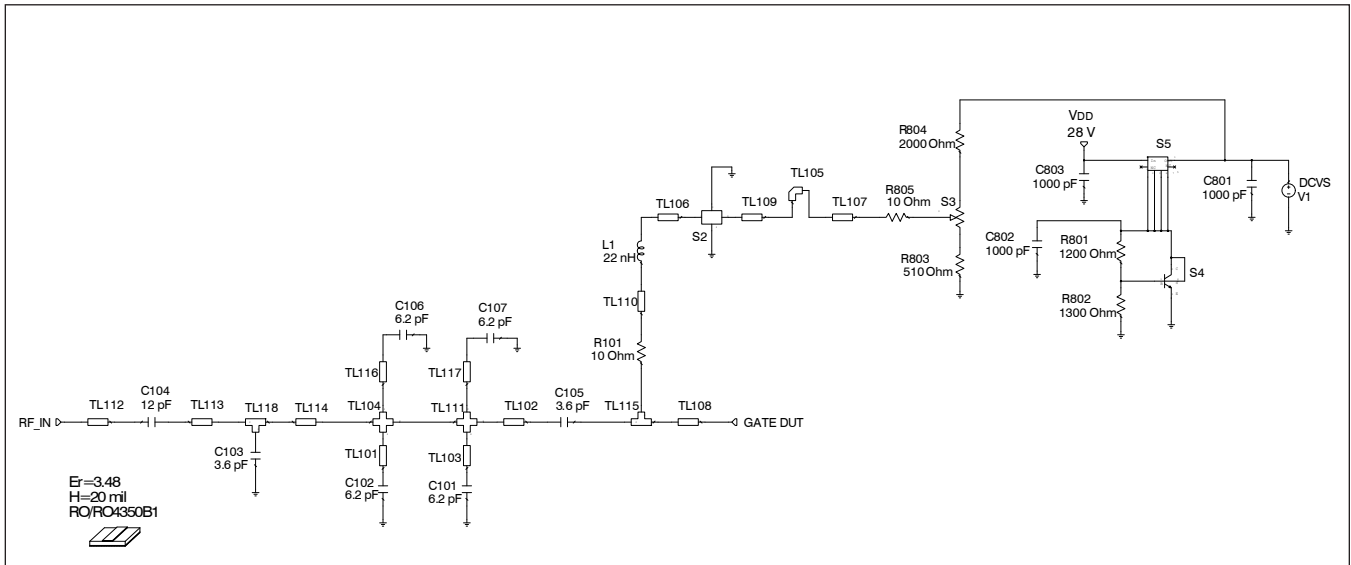
Typical Performance, 2140 MHz (cont.)



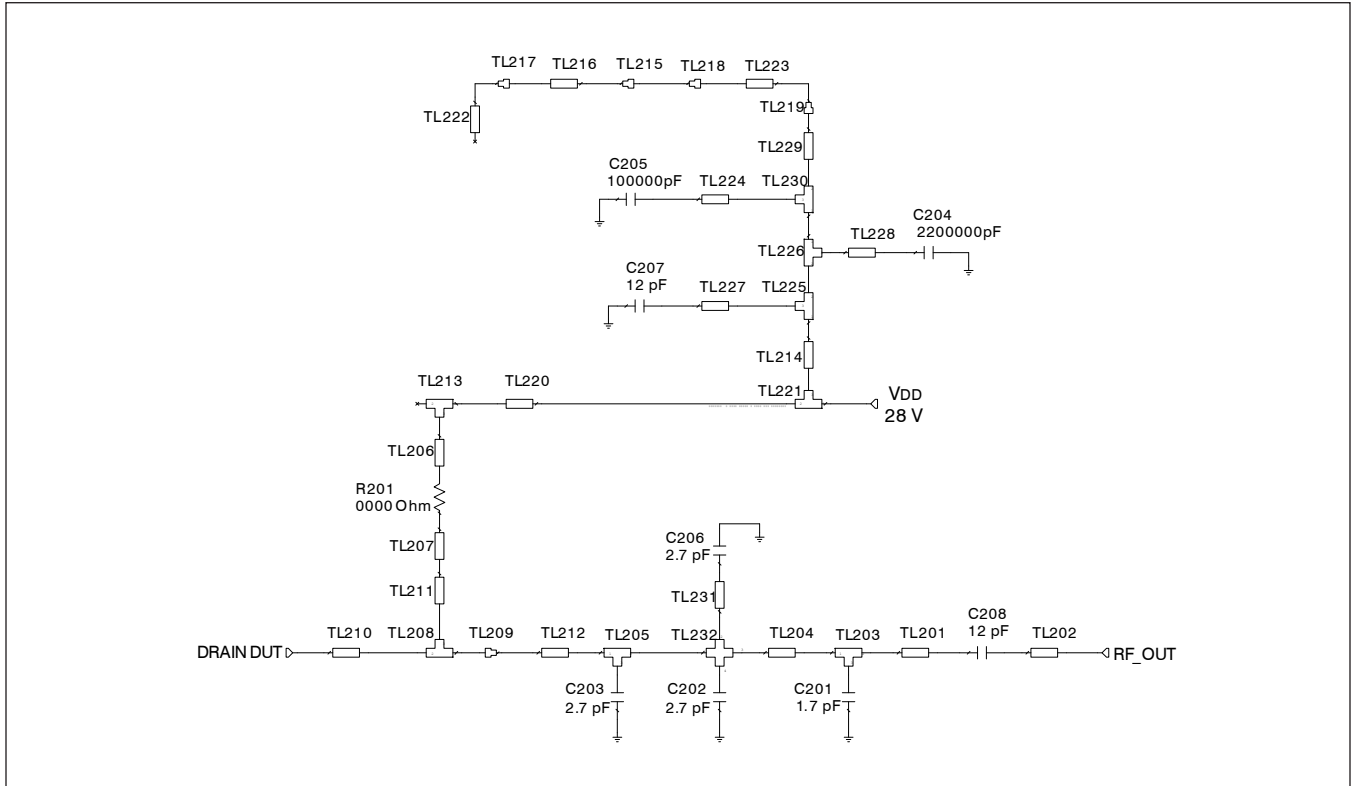
Typical Performance, 2140 MHz (cont.)



Reference Circuit, 2140 MHz



Reference circuit input schematic for $f = 2140$ MHz



Reference circuit output schematic for $f = 2140$ MHz

Reference Circuit, 2140 MHz (cont.)

Description

DUT	PTFA220121M
PCB	0.508 mm [.020"] thick, $\epsilon_r = 3.48$, Rogers 4350, 1 oz. copper

Electrical Characteristics at 2140 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101, TL103	0.000λ , 144.35Ω	$W = 0.025$, $L = 0.000$	$W = 1$, $L = 0$
TL102	0.019λ , 51.98Ω	$W = 1.087$, $L = 1.575$	$W = 43$, $L = 62$
TL104, TL111		$W1 = 1.087$, $W2 = 0.813$, $W3 = 1.087$, $W4 = 0.813$	$W1 = 43$, $W2 = 32$, $W3 = 43$, $W4 = 32$
TL105		$W = 1.524$	$W = 60$
TL106	0.018λ , 54.17Ω	$W = 1.016$, $L = 1.524$	$W = 40$, $L = 60$
TL107	0.061λ , 41.75Ω	$W = 1.524$, $L = 5.080$	$W = 60$, $L = 200$
TL108	0.022λ , 25.04Ω	$W = 3.048$, $L = 1.778$	$W = 120$, $L = 70$
TL109	0.006λ , 41.75Ω	$W = 1.524$, $L = 0.508$	$W = 60$, $L = 20$
TL110	0.015λ , 41.75Ω	$W = 1.524$, $L = 1.270$	$W = 60$, $L = 50$
TL112	0.039λ , 51.98Ω	$W = 1.087$, $L = 3.264$	$W = 43$, $L = 129$
TL113	0.180λ , 51.98Ω	$W = 1.087$, $L = 15.291$	$W = 43$, $L = 602$
TL114	0.039λ , 51.98Ω	$W = 1.087$, $L = 3.302$	$W = 43$, $L = 130$
TL115	0.009λ , 25.04Ω	$W1 = 3.048$, $W2 = 3.048$, $W3 = 0.762$	$W1 = 120$, $W2 = 120$, $W3 = 30$
TL116, TL117	0.000λ , 144.35Ω	$W = 0.025$, $L = 0.000$	$W = 1$, $L = 0$
TL118	0.010λ , 51.98Ω	$W1 = 1.087$, $W2 = 1.087$, $W3 = 0.813$	$W1 = 43$, $W2 = 43$, $W3 = 32$

See next page for more Reference Circuit information

Reference Circuit, 2140 MHz (cont.)

Electrical Characteristics at 2140 MHz

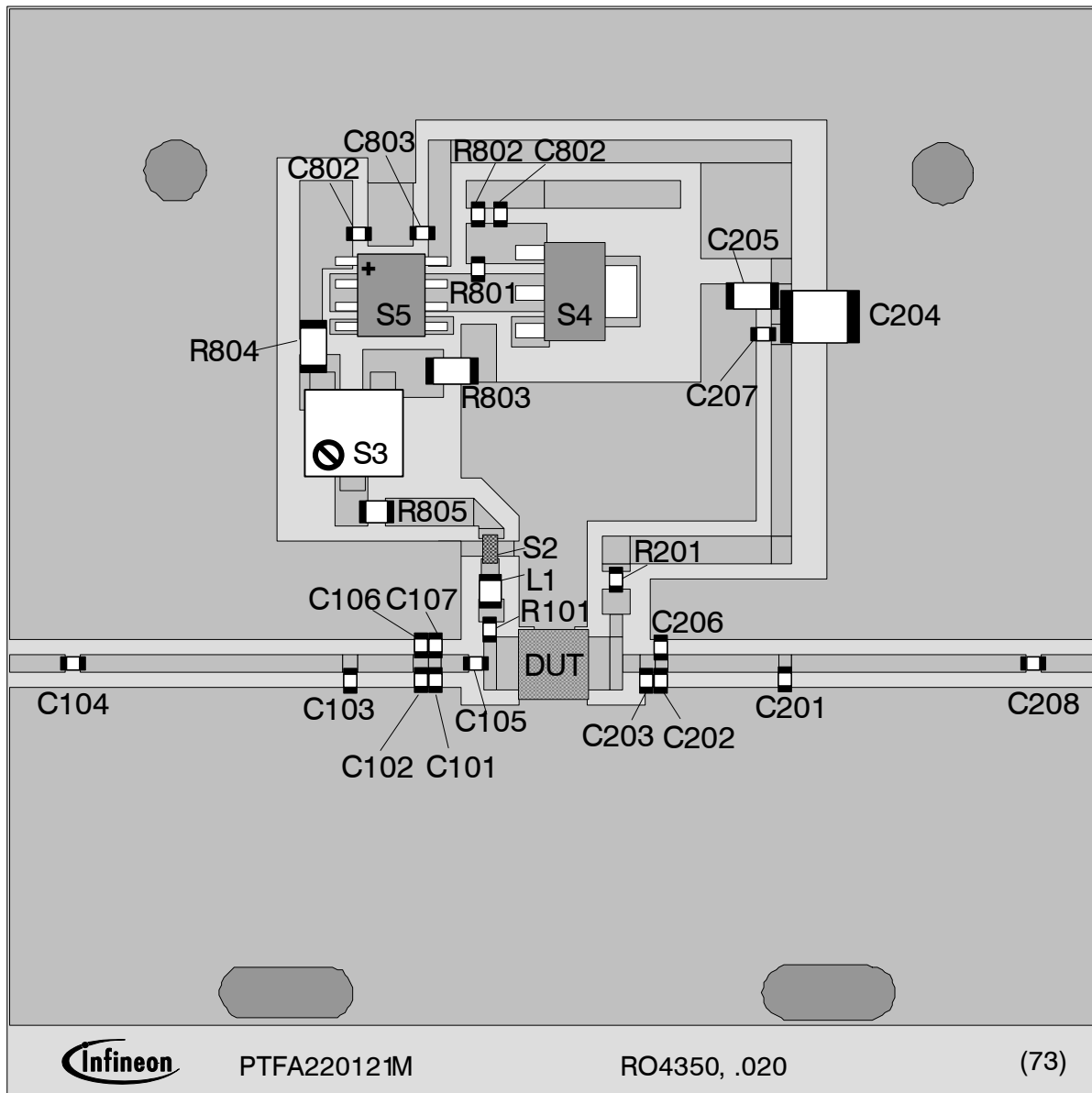
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL201	0.161λ , 51.98 Ω	W = 1.087, L = 13.627	W = 43, L = 537
TL202	0.039λ , 51.98 Ω	W = 1.087, L = 3.264	W = 43, L = 129
TL203, TL205	0.010λ , 51.98 Ω	W1 = 1.087, W2 = 1.087, W3 = 0.813	W1 = 43, W2 = 43, W3 = 32
TL204	0.075λ , 51.98 Ω	W = 1.087, L = 6.375	W = 43, L = 251
TL206	0.006λ , 41.75 Ω	W = 1.524, L = 0.508	W = 60, L = 20
TL207	0.018λ , 41.75 Ω	W = 1.524, L = 1.524	W = 60, L = 60
TL208	0.009λ , 25.04 Ω	W1 = 3.048, W2 = 3.048, W3 = 0.762	W1 = 120, W2 = 120, W3 = 30
TL209		W1 = 1.087, W2 = 3.048	W1 = 43, W2 = 120
TL210	0.022λ , 25.04 Ω	W = 3.048, L = 1.778	W = 120, L = 70
TL211	0.015λ , 63.89 Ω	W = 0.762, L = 1.270	W = 30, L = 50
TL212	0.012λ , 51.98 Ω	W = 1.087, L = 1.041	W = 43, L = 41
TL213	0.018λ , 41.75 Ω	W1 = 1.524, W2 = 1.524, W3 = 1.524	W1 = 60, W2 = 60, W3 = 60
TL214	0.133λ , 47.12 Ω	W = 1.270, L = 11.186	W = 50, L = 440
TL215		W1 = 0.020, W2 = 0.020, Offset = 0.007	W1 = 20, W2 = 780, Offset = 286
TL216	0.017λ , 4.80 Ω	W = 19.850, L = 1.270	W = 782, L = 50
TL217		W1 = 0.001, W2 = 0.001, Offset = 0.011	W1 = 1, W2 = 50, Offset = 416
TL218		W1 = 0.005, W2 = 0.005, Offset = 0.000	W1 = 5, W2 = 208, Offset = 0
TL219		W1 = 0.001, W2 = 0.005, Offset = -0.002	W1 = 1, W2 = 208, Offset = -79
TL220	0.098λ , 41.75 Ω	W = 1.524, L = 8.204	W = 60, L = 323
TL221	0.015λ , 41.75 Ω	W1 = 1.524, W2 = 1.524, W3 = 1.270	W1 = 60, W2 = 60, W3 = 50
TL222	0.087λ , 47.12 Ω	W = 1.270, L = 7.290	W = 50, L = 287
TL223	0.071λ , 15.92 Ω	W = 5.283, L = 5.690	W = 208, L = 224
TL224	0.000λ , 41.75 Ω	W = 1.524, L = 0.000	W = 60, L = 0
TL225	0.014λ , 47.12 Ω	W = 1.270, W2 = 1.270, W3 = 1.191	W = 50, W2 = 50, W3 = 47
TL226	0.009λ , 47.12 Ω	W = 1.270, W2 = 1.270, W3 = 0.762	W = 50, W2 = 50, W3 = 30
TL227	0.000λ , 63.89 Ω	W = 0.762, L = 0.000	W = 30, L = 0
TL228	0.000λ , 25.04 Ω	W = 3.048, L = 0.000	W = 120, L = 0
TL229	0.017λ , 47.12 Ω	W = 1.270, L = 1.422	W = 50, L = 56
TL230	0.018λ , 47.12 Ω	W1 = 1.270, W2 = 1.270, W3 = 1.524	W1 = 50, W2 = 50, W3 = 60
TL231	0.000λ , 144.35 Ω	W = 0.025, L = 0.000	W = 1, L = 0
TL232		W1 = 1.087, W2 = 0.813, W3 = 1.087 W4 = 0.813	W1 = 43, W2 = 32, W3 = 43, W4 = 32

Reference Circuit, 2140 MHz (cont.)

Circuit Assembly Information

Test Fixture Part No. LTN/ PTFA220121M

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



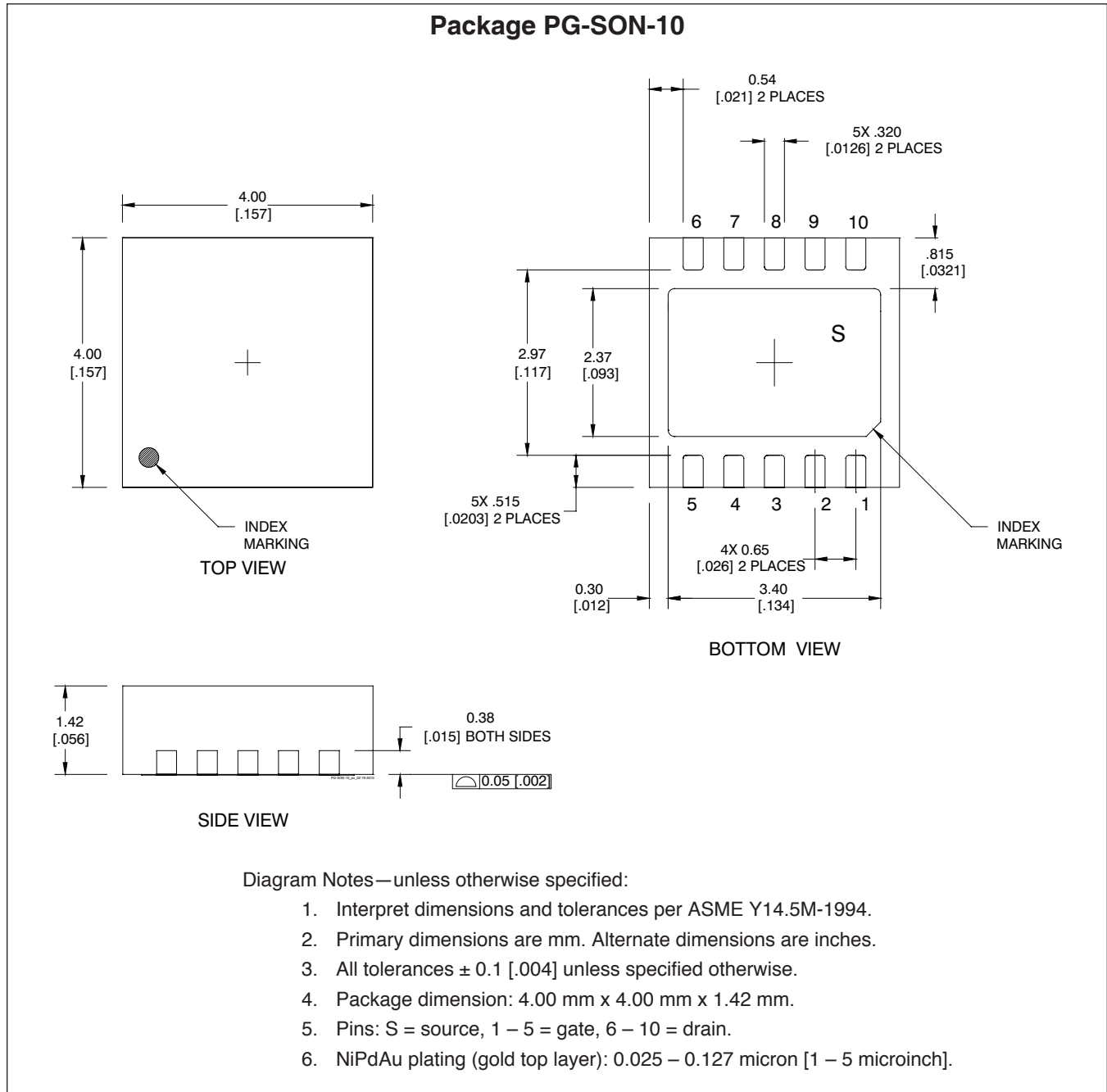
Reference circuit assembly diagram (not to scale)

Reference Circuit, 2140 MHz (cont.)

Components Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C102, C106, C107	Chip capacitor, 6.2 pF	ATC	ATC100A6R2CW150X
C103, C105	Chip capacitor, 3.6 pF	ATC	ATC100A3R6CW150X
C104	Chip capacitor, 12 pF	ATC	ATC100A120JW150X
C801, C802, C803	Chip capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
L1	Inductor, 22 nH	Coilcraft	0805HT-22NX_BG
R101, R805	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R801	Resistor, 1200 Ω	Digi-Key	P1.2KECT-ND
R802	Resistor, 1300 Ω	Digi-Key	P1.3KECT-ND
R803	Resistor, 510 Ω	Digi-Key	P510ECT-ND
R804	Resistor, 2000 Ω	Digi-Key	P2.0KECT-ND
S2	EMI Suppression Capacitor	Murata	NFM18PS105R0J3
S3	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
S4	Transistor	Infineon Technologies	BCP56
S5	Voltage regulator	National Semiconductor	LM7805
Output			
C201	Chip capacitor, 1.7 pF	ATC	ATC100A1R7CW150X
C202, C203, C206	Chip capacitor, 2.7 pF	ATC	ATC100A2R7CW150X
C204	Chip capacitor, 2.2 μ F	Digi-Key	445-1474-2-ND
C205	Chip capacitor, 0.1 μ F	Digi-Key	PCC104BCT-ND
C207, C208	Chip capacitor, 12 pF	ATC	ATC100A120JW150X
R201	Resistor, 0 Ω	Digi-Key	P0.0KECT-ND

Package Outline Specifications



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

Revision History: 2011-04-11

Data Sheet

Previous Version: 2010-04-15, Data Sheet

Page	Subjects (major changes since last revision)
1	Updated ESD protection feature
3, 12	Removed CW performance at selected drain voltages graph
4	Removed bias voltage vs. temperature graph

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

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