PTMA210152M

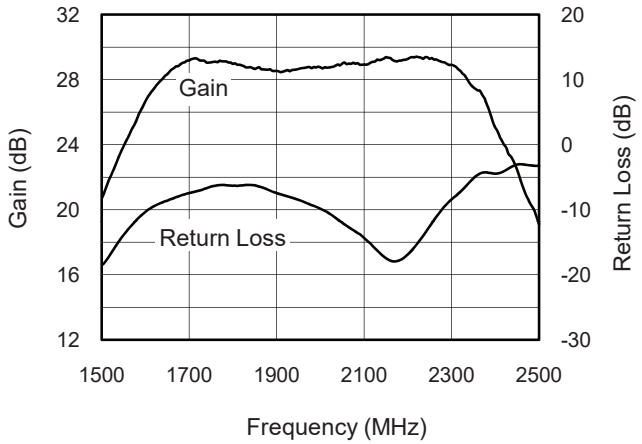
Wideband RF LDMOS Integrated Power Amplifier
15 W, 28 V, 1800 – 2200 MHz

Description

The PTMA210152M is a wideband, matched, 15-watt, 2-stage LDMOS integrated amplifier intended for wideband driver applications in the 1800 to 2200 MHz band. This device is offered in a 20-lead thermally-enhanced overmolded package for cool and reliable operation.

PTMA210152M
Package PG-DSO-20-63

Broadband Performance
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA
fixture tuned for 2110 - 2170 MHz



Features

- Designed for wide RF bandwidth and low memory effects
- Broadband input on-chip matching
- Typical two-carrier WCDMA performance at 2140 MHz, 28 V, 7 W avg.
  - Gain = 28.5 dB
  - Power Added Efficiency = 33 %
  - IMD3 = –32 dBc
- Typical CW performance at 2140 MHz, 28 V
  - Output power at P_{1dB} ~ 20 W
  - Efficiency > 49%
- Integrated ESD protection. Meets HBM Class 1B (minimum), per JESD22-A114F.
- Capable of handling 10:1 VSWR @ 28 V, 15 W (CW) output power
- Thermally-enhanced RoHS-compliant package

RF Characteristics

Two-carrier WCDMA Specifications (not subject to production test—verified by design/characterization in Wolfspeed test fixture)
V_{DS} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA, f = 2110 – 2170 MHz, P_{OUT} = 7 W average

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	28.5	—	dB
Power Added Efficiency	PAE	—	33	—	%
Input Return Loss	IRL	—	–14	—	dB
Adjacent Channel Power Ratio	ACPR	—	–36	—	dBc
Third Order Intermodulation Distortion	IMD3	—	–32	—	dBc
Spurs Load 3:1	—	—	–60	—	dBc
Gain Flatness	ΔG	—	0.43	—	dB

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

Two-tone Measurement (tested in Wolfspeed test fixture)
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA, P_{OUT} = 8 W AVG, f = 2140 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	27.5	28.5	30	dB
Drain Efficiency	η_D	33	34	—	%
Third Order Intermodulation Distortion	IMD3	—	–33	–31	dBc
Input Return Loss	IRL	—	–14	–10	dB

DC Characteristics

Stage 1 Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
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	$R_{DS(on)}$	—	3.5	—	Ω
Operating Gate Voltage	V_{DS} = 28 V, I_{DQ} = 80 mA	V_{GS}	2	2.5	3	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1.0	µA

Stage 2 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	$R_{DS(on)}$	—	0.6	—	Ω
Operating Gate Voltage	V_{DS} = 28 V, I_{DQ} = 160 mA	V_{GS}	2	2.5	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}	–0.5 to +12	V
Junction Temperature		T_J	200	°C
Input Power		P_{IN}	15	dBm
Total Device Dissipation		P_D	70	W
Above 25°C derate by			0.4	W/°C
Storage Temperature Range		T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 15 W CW)	Stage 1	$R_{\theta JC}$	10.7	°C/W
	Stage 2	$R_{\theta JC}$	2.9	°C/W

Moisture Sensitivity Level

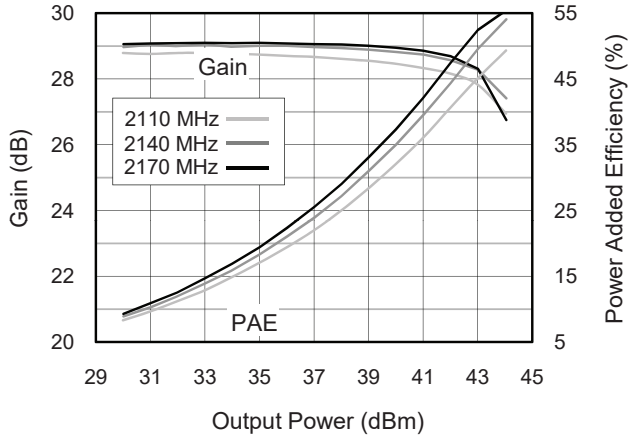
Level	Test Standard	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	°C

Ordering Information

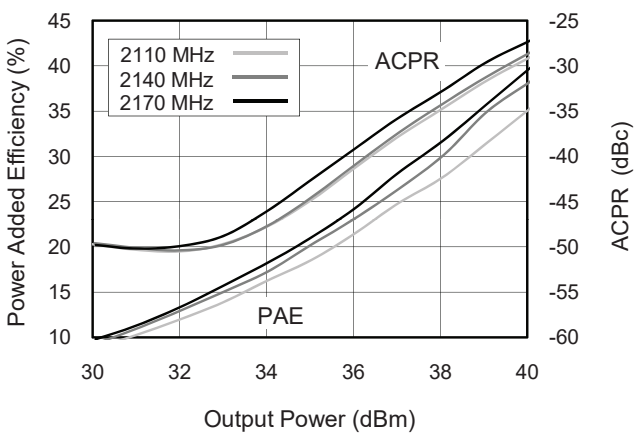
Type and Version	Order Code	Package and Description	Shipping
PTMA210152M V1 R500	PTMA210152M-V1-R500	PG-DSO-20-63, molded plastic	Tape & Reel, 500 pcs

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

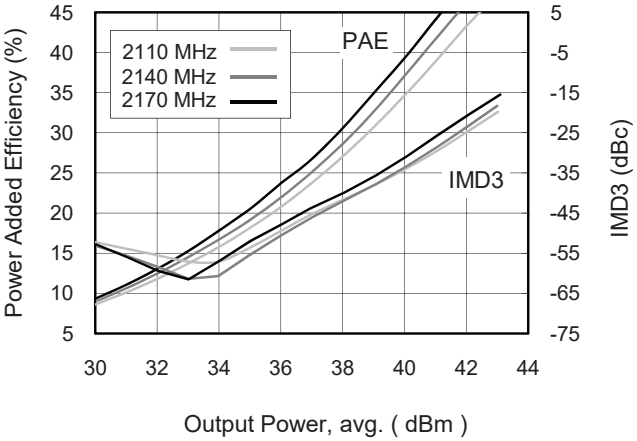
CW Performance
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA
for 2110, 2140, 2170 MHz



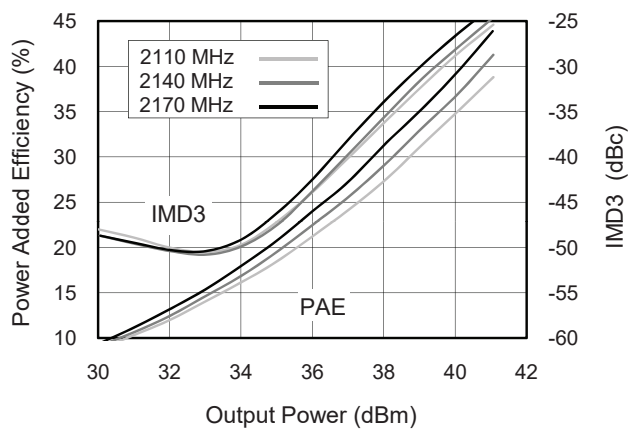
WCDMA Performance
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA,
series show 2110, 2140, 2170 MHz



Two-tone Drive-up
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA
For 2110, 2140, 2170 MHz

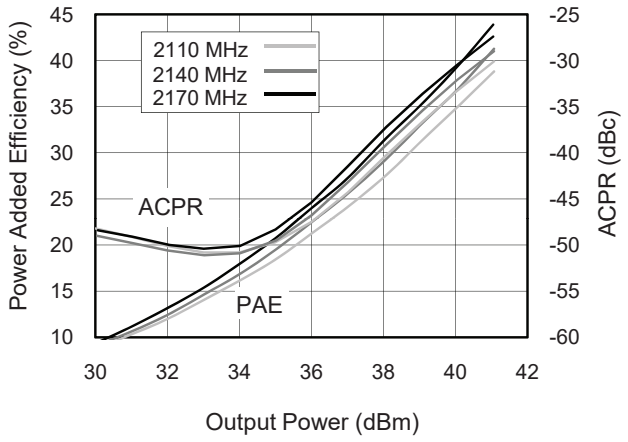


Two-carrier WCDMA Performance
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA,
series show 2110, 2140, 2170 MHz

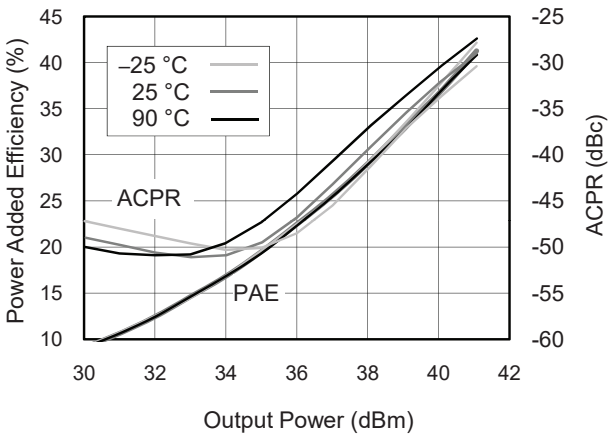


Typical Performance—2140 MHz (cont.)

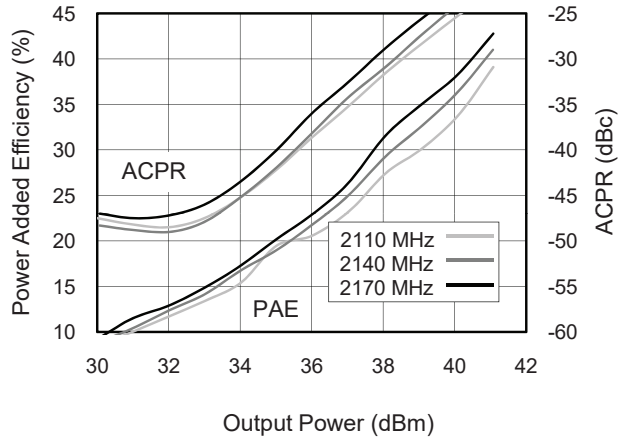
Two-carrier WCDMA Performance
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA,
series show 2110, 2140, 2170 MHz



Two-carrier WCDMA Performance
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA,
f = 2140 MHz

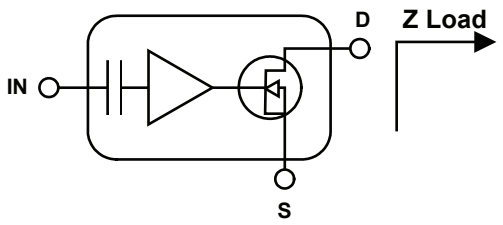


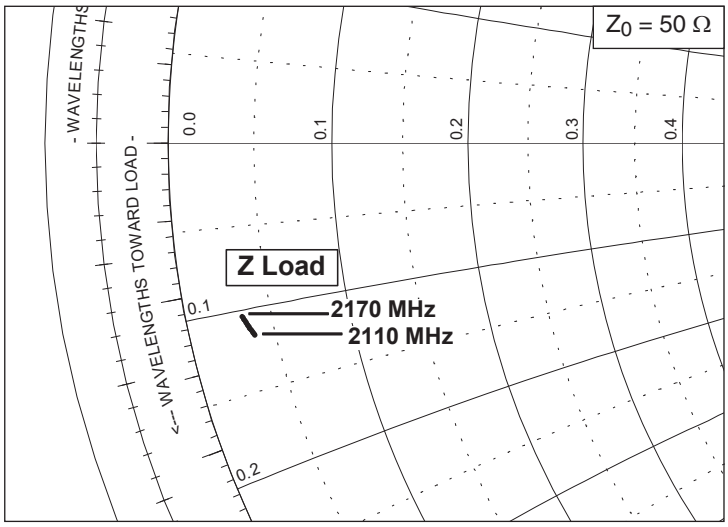
Six-carrier TD-SCDMA Performance
V_{DD} = 28 V, I_{DQ1} = 80 mA, I_{DQ2} = 160 mA



Broadband Circuit Impedance—2140 MHz

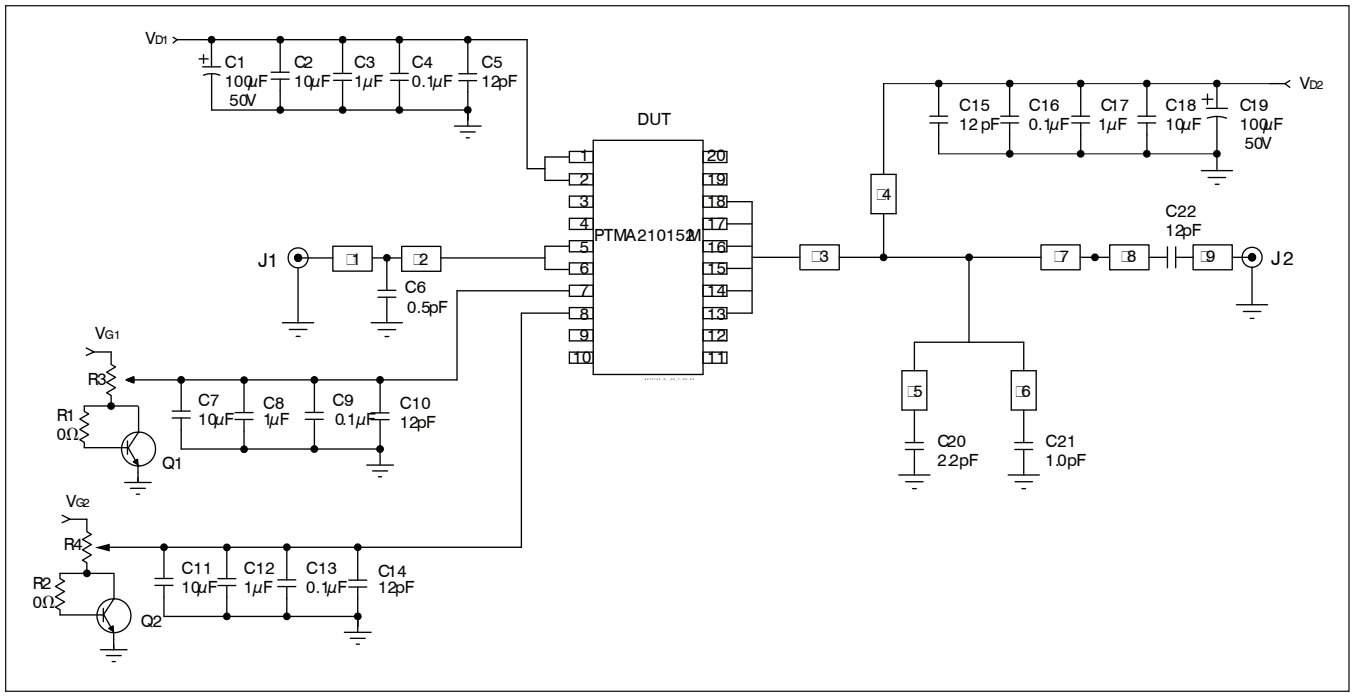
Frequency	Z Load Ω	
MHz	R	jX
2110	1.89	–5.84
2114	1.87	–5.80
2118	1.85	–5.76
2122	1.84	–5.72
2126	1.82	–5.67
2130	1.80	–5.63
2134	1.78	–5.60
2138	1.77	–5.55
2142	1.75	–5.51
2146	1.73	–5.47
2150	1.71	–5.42
2154	1.70	–5.38
2158	1.68	–5.34
2162	1.66	–5.30
2166	1.65	–5.25
2170	1.63	–5.21





See next page for reference circuit information

Reference Circuit—tuned for 2140 MHz



Reference circuit schematic for ƒ = 2140 MHz

Circuit Assembly Information

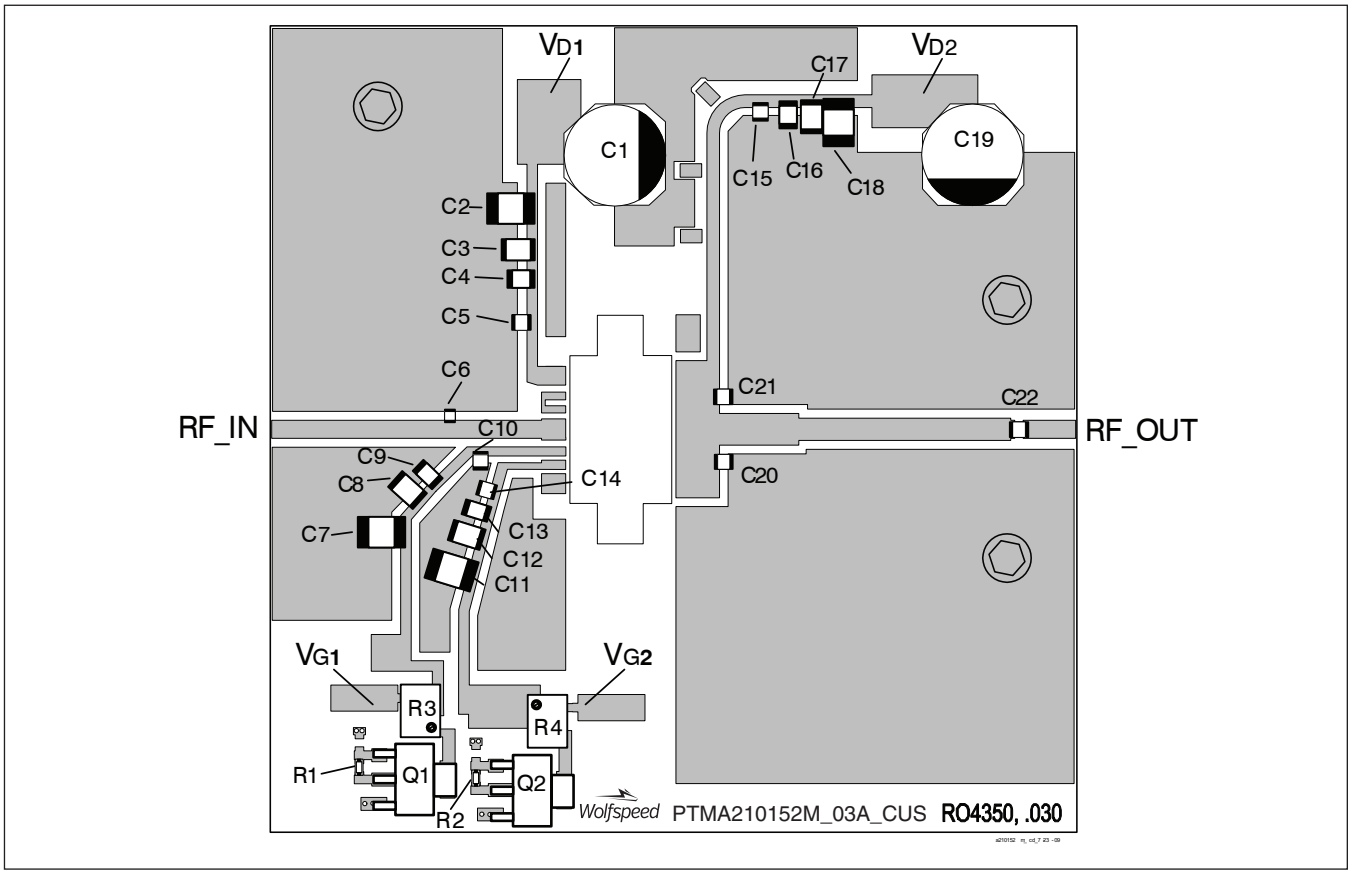
DUT	PTMA210152M, LDMOS IC
Reference Fixture Part No.	LTN/PTMA210152M
PCB	Rogers RO4350: 0.76 mm [.030"] thick, εr = 3.48, 1 oz. copper

Find Gerber files for this reference fixture on the Wolfspeed Web site at (**www.wolfspeed.com/RF**)

Microstrip	Electrical Characteristics at 2140 MHz	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ1	0.206 λ, 50 Ω	17.48 x 1.70	0.688 x 0.067
ℓ2	0.111 λ, 50 Ω	9.40 x 1.70	0.370 x 0.067
ℓ3	0.052 λ, 11 Ω*	4.09 x 12.83	0.161 x 0.505
ℓ4	0.301 λ, 61 Ω	25.91 x 1.19	1.020 x 0.047
ℓ5	0.004 λ, 71 Ω	0.38 x 0.89	0.015 x 0.035
ℓ6	0.004 λ, 71 Ω	0.38 x 0.89	0.015 x 0.035
ℓ7	0.090 λ, 34 Ω	7.47 x 3.00	0.294 x 0.118
ℓ8	0.243 λ, 44 Ω	20.40 x 2.11	0.803 x 0.083
ℓ9	0.058 λ, 50 Ω	4.95 x 1.70	0.195 x 0.067

**Calculated at 10.5*

Reference Circuit—2140 MHz (cont.)

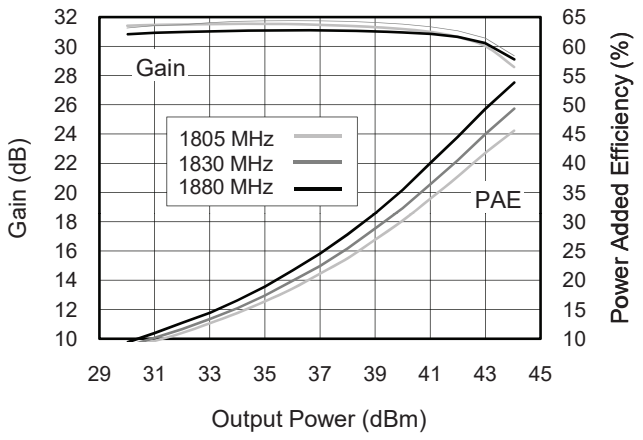


Reference circuit assembly diagram (not to scale)

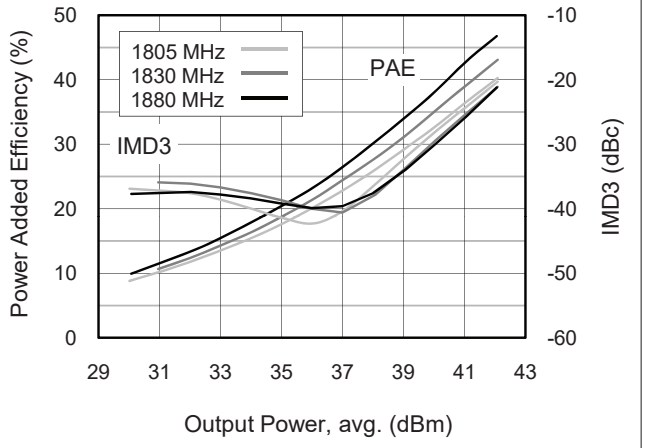
Component	Description	Suggested Manufacturer	P/N or Comment
C3, C8, C12, C17	Ceramic capacitor, 1 µF	Digi-Key	445-1411-2-ND
C4, C9, C13, C16	Capacitor, 0.1 µF	Digi-Key	PCC104BCT-ND
C2, C7, C11, C18	Tantalum capacitor, 10 µF, 50 V	Digi-Key	P5571-ND
C1, C19	Electrolytic capacitor, 100 µF, 50 V	Digi-Key	PCE3718CT-ND
C6	Ceramic capacitor, 0.5 pF	ATC	600S 0R5 CT
C20	Ceramic capacitor, 2.2 pF	ATC	600S 2R2 CT
C21	Ceramic capacitor, 1.0 pF	ATC	600S 1R0 CT
C5, C10, C14, C15, C22	Ceramic capacitor, 12 pF	ATC	600S 120 JT
Q1, Q2	Transistor	Infineon Technologies	BCP56
R1, R2	Chip resistor, 0 ohms	Digi-Key	P00ECT-ND
R3, R4	Potentiometer, 2 k ohms	Digi-Key	3224W-202ETR-ND

Typical Performance, circuit tuned for 1840 MHz (data taken in a production test fixture)

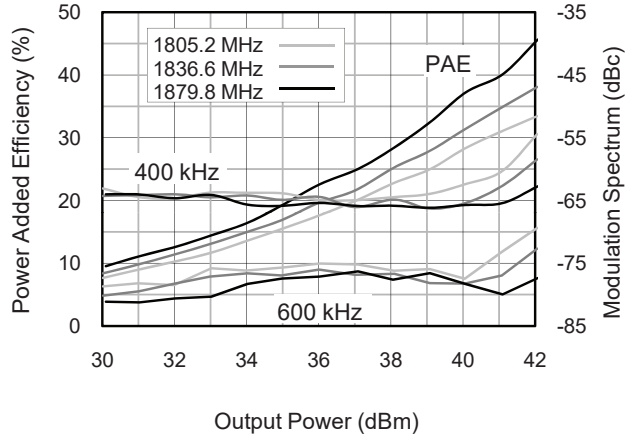
CW Performance
V_{DD} = 28 V, I_{DQ1} = 70 mA, I_{DQ2} = 120 mA,
f = 1805, 1830, 1880 MHz



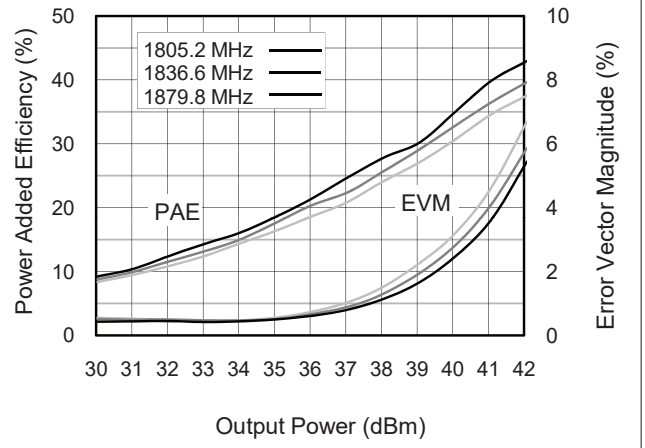
Two-tone Drive-up
V_{DD} = 28 V, I_{DQ1} = 70 mA, I_{DQ2} = 120 mA,
f = 1805, 1830, 1880 MHz



Edge Modulation Spectrum Performance
V_{DD} = 28 V, I_{DQ1} = 70 mA, I_{DQ2} = 160 mA,
series are at selected frequencies

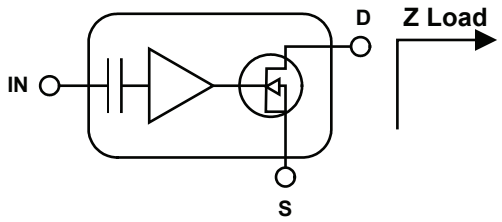


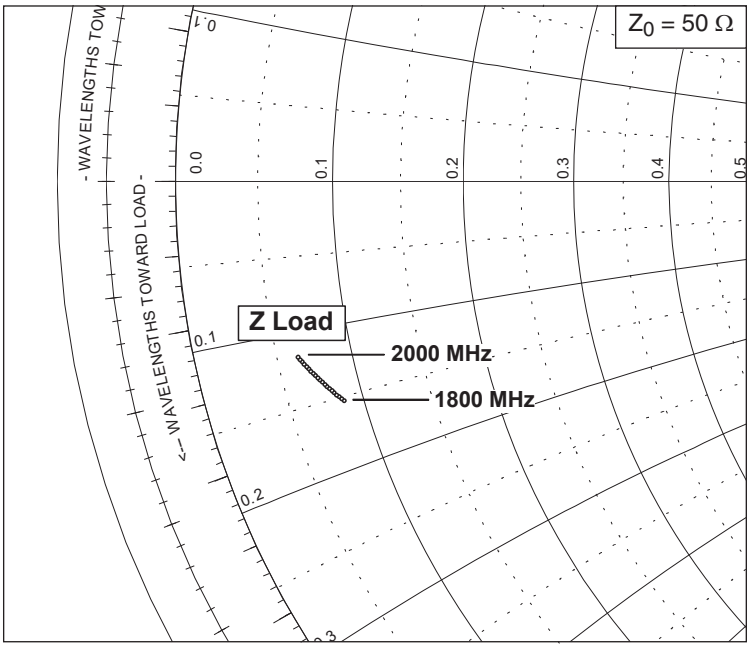
Edge - EVM
V_{DD} = 28 V, I_{DQ1} = 70 mA, I_{DQ2} = 160 mA,
series are at selected frequencies



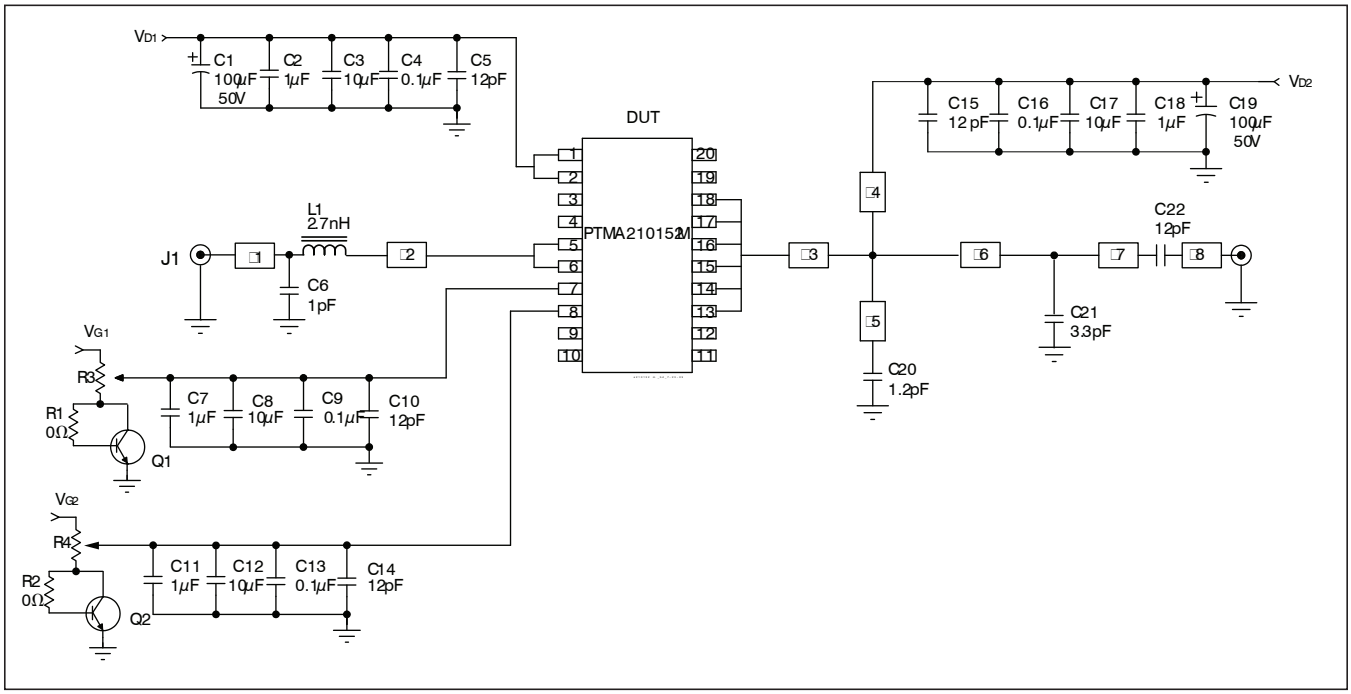
Broadband Circuit Impedance—1840 MHz

Frequency	Z Load Ω	
MHz	R	jX
1800	4.34	–7.66
1810	4.28	–7.57
1820	4.21	–7.48
1830	4.15	–7.40
1840	4.09	–7.30
1850	4.03	–7.21
1860	3.96	–7.12
1870	3.90	–7.03
1880	3.85	–6.94
1890	3.79	–6.85
1900	3.73	–6.76
1910	3.67	–6.67
1920	3.62	–6.57
1930	3.56	–6.48
1940	3.50	–6.39
1950	3.45	–6.30
1960	3.40	–6.21
1970	3.34	–6.11
1980	3.29	–6.02
1990	3.24	–5.93
2000	3.19	–5.84





Reference Circuit, tuned for 1840 MHz



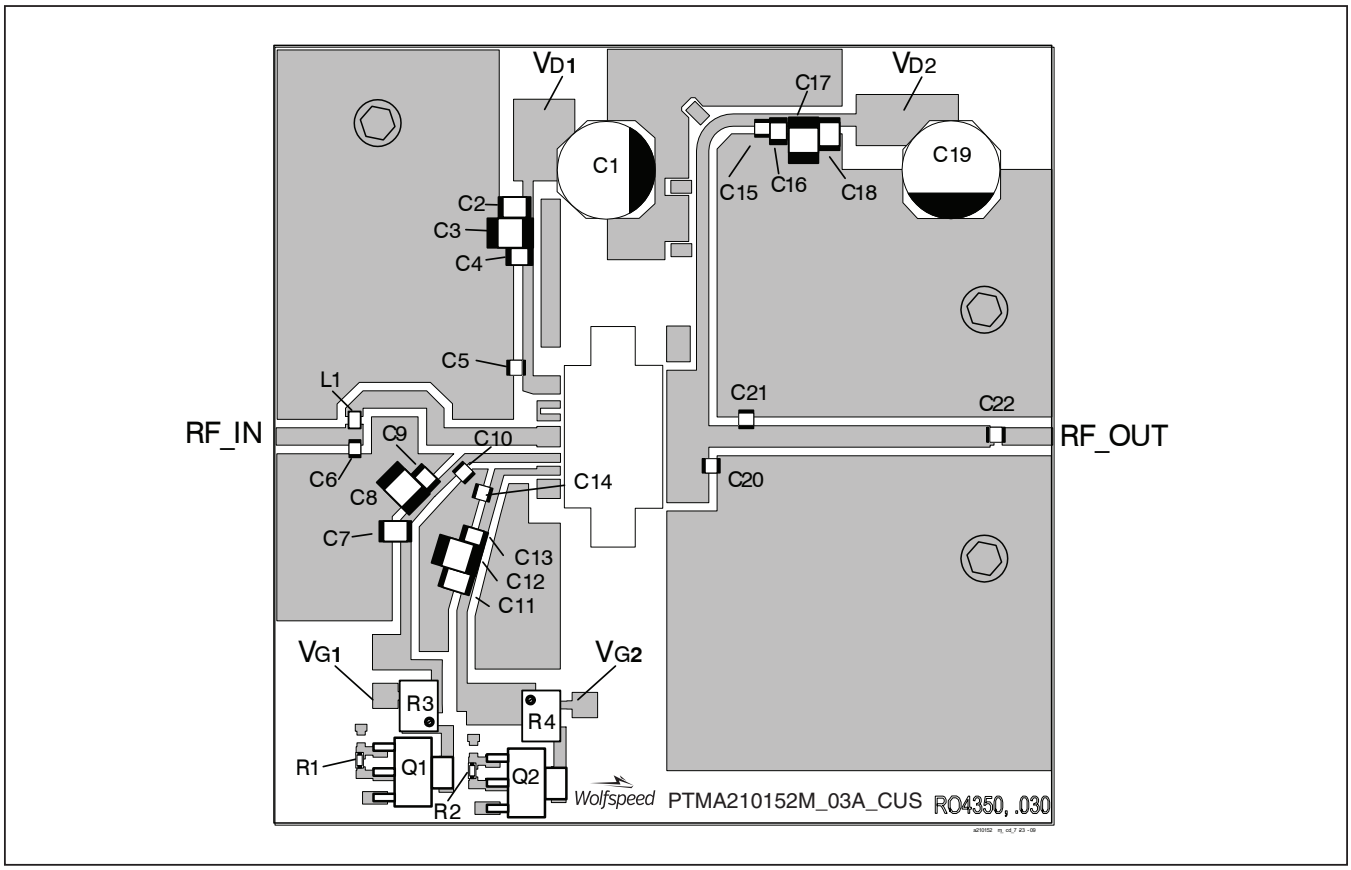
Reference circuit schematic for ƒ = 1840 MHz

Circuit Assembly Information	
DUT	PTMA210152M, LDMOS IC
Test Fixture Part No.	LTN/PTMA210152M–18
PCB	Rogers RO4350: 0.76 mm [.030"] thick, εr = 3.48, 1 oz. copper
Fnd Gerber files for this test fixture on the Wolfspeed Web site at (**www.wolfspeed.com/RF**)	

Microstrip	Electrical Characteristics at 1840 MHz	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ1	0.077 λ, 50 Ω	7.59 x 1.70	0.299 x 0.067
ℓ2	0.250 λ, 50 Ω	24.66 x 1.70	0.971 x 0.067
ℓ3	0.045 λ, 11 Ω*	4.09 x 12.83	0.161 x 0.505
ℓ4	0.259 λ, 61 Ω	25.91 x 1.19	1.020 x 0.047
ℓ5	0.004 λ, 71 Ω	0.38 x 0.89	0.015 x 0.035
ℓ6	0.018 λ, 44 Ω	1.73 x 2.08	0.068 x 0.082
ℓ7	0.268 λ, 44 Ω	26.16 x 2.08	1.030 x 0.082
ℓ8	0.050 λ, 50 Ω	4.95 x 1.70	0.195 x 0.067

**Calculated at 10.5*

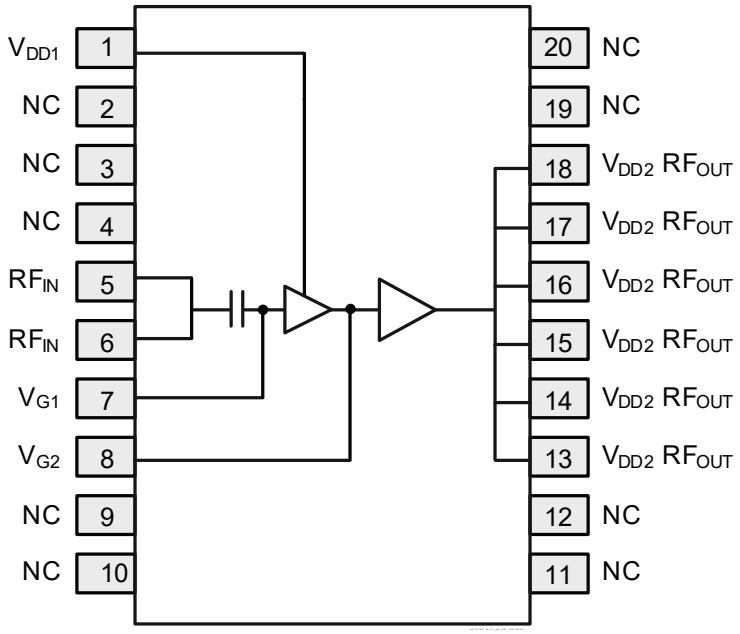
Reference Circuit—1840 MHz (cont.)



Reference circuit assembly diagram (not to scale)

Component	Description	Suggested Manufacturer	P/N or Comment
C3, C8, C12, C17	Ceramic capacitor, 1 µF	Digi-Key	445-1411-2-ND
C4, C9, C13, C16	Capacitor, 0.1 µF	Digi-Key	PCC104BCT-ND
C2, C7, C11, C18	Tantalum capacitor, 10 µF, 50 V	Digi-Key	P5571-ND
C1, C19	Electrolytic capacitor, 100 µF, 50 V	Digi-Key	PCE3718CT-ND
C6	Ceramic capacitor, 1.0 pF	ATC	600S 1R0 CT
C20	Ceramic capacitor, 1.2 pF	ATC	600S 1R2 CT
C21	Ceramic capacitor, 3.3 pF	ATC	600S 3R3 CT
C5, C10, C14, C15, C22	Ceramic capacitor, 12 pF	ATC	600S 120 JT
Q1, Q2	Transistor	Infineon Technologies	BCP56
R1, R2	Chip resistor, 0 ohms	Digi-Key	P00ECT-ND
R3, R4	Potentiometer, 2 k ohms	Digi-Key	3224W-202ETR-ND
L1	Inductor, 2.7 nH	Digi-Key	PCD1287CT-ND

Pinout Diagram (top view)



Source/ground: plated copper heatslug on backside of package

Package Outline Specifications

Package PG-DSO-20-63

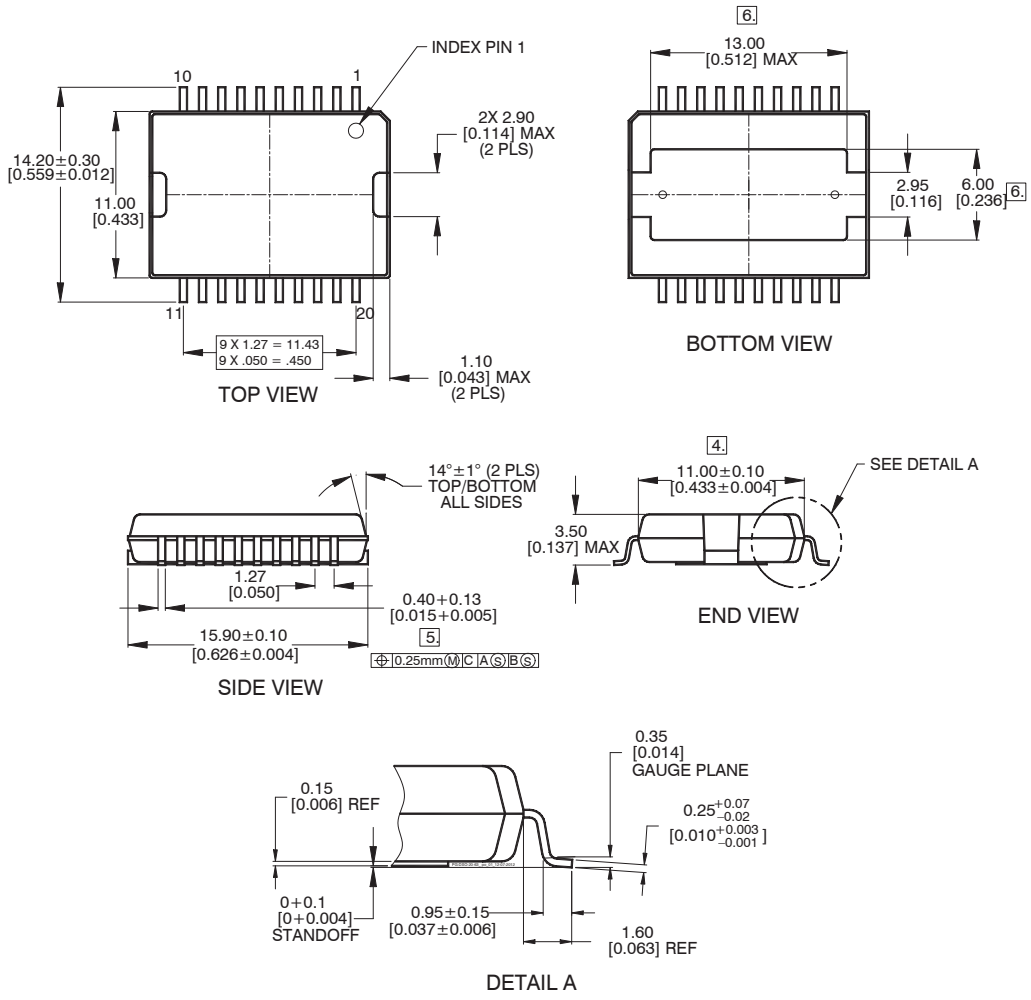


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Package dimensions: 11.0 mm by 15.9 mm by 3.35 mm.
3. JEDEC drawing number: MO-166.
4. Does not include plastic or metal protrusion of 0.15 mm max per side.
5. Does not include dambar protrusion; maximum allowable dambar protrusion shall be 0.08 mm.
6. Bottom metallization.
7. Sn plating (matte): 5 – 15 micron [196.85 – 590.55 microinch].

Revision History

01	2009-06-15	Preliminary	all	Preliminary specification for new product in development.
02	2009-08-11	Production	all	Add 1840 MHz characterization.
03	2009-09-02	Production	14	Update pinout diagram.
04	2010-04-16	Production	3; 14	Add moisture sensitivity information; update package outline notes.
05	2010-10-28	Production	6, 11	Recalculate electrical characteristics.
06	2011-04-25	Production	4, 6	Removed graphs.
07	2011-06-10	Production	2	Clarify DC characteristics per stage
08	2011-06-11	Production	2	Revise RF table to better reflect test specifications.
09	2014-05-07	Production	3	Add shipping option.
10	2018-05-19	Production	All	Converted to Wolfspeed Data Sheet

For more information, please contact:

4600 Silicon Drive
Durham, North Carolina, USA 27703
www.wolfspeed.com/RF

Sales Contact
RFSales@wolfspeed.com

RF Product Marketing Contact
RFMarketing@wolfspeed.com
919.407.7816

Notes

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