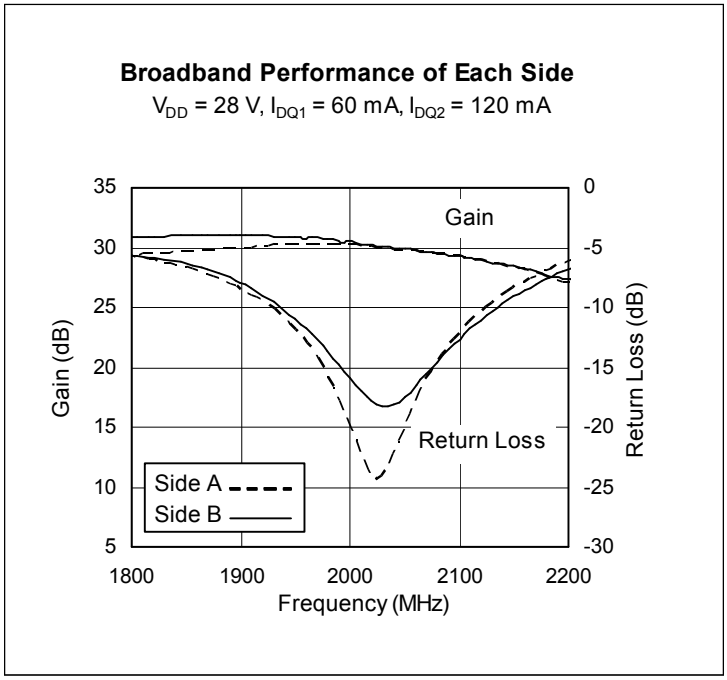
Dual Wideband RF LDMOS Power Amplifier 40 W, 1800 – 2200 MHz

Description

The PTMA210404FL integrates two wideband, 20-watt, 2-stage LDMOS integrated amplifiers into an open-cavity, ceramic package. It is designed for use in cellular amplifier applications in the 1800-2200 MHz frequency band. Manufactured with Infineon's advanced LDMOS process, this amplifier offers excellent thermal performance and superior reliability.

PTMA210404FL
Package H-34248-12



Features

- Designed for wide RF and modulation bandwidths and low memory effects
- Typical channel isolation = 26 dB
- Typical single channel performance CW, 2018 MHz, 28 V
  - Output power at P-1dB = 20 W
  - Linear Gain = 30.5 dB
  - Efficiency = 54%
- Typical Doherty performance with six-carrier TD-SCDMA signal, V_{DD} = 28 V, I_{DQ1A} = I_{DQ1B} = 55 mA, I_{DQ2B} = 110 mA, V_{G2A} = 1.06 V, f = 2018 MHz
  - Average output power = 10 W
  - Linear Gain = 27 dB
  - Efficiency = 35%
  - ACLR1 = –33 dBc
  - ACLR2 = –34 dBc
- Capable of handling 10:1 VSWR @ 28 V, 50 W (CW) output power
- Integrated ESD protection. Meets HBM Class 1B (minimum), per JESD22-A114F
- High-performance, thermally-enhanced package, Pb-free and RoHS compliant, with low-gold plating

RF Characteristics

Six-carrier TD-SCDMA Measurements in Doherty Circuit (tested in Infineon test fixture)

V_{DD} = 28 V, I_{DQ1A} = I_{DQ1B} = 55 mA, I_{DQ2B} = 110 mA, V_{GS2A} = 1.05 V, P_{OUT} = 10 W average, f = 2018 MHz, input PAR = 9.8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	26	27	—	dB
Drain Efficiency	η_D	33	35	—	%
Adjacent Channel Power Ratio	ACPR	—	–33	–30	dBc
Alternate Channel Power Ratio	Alt	—	–34	–31	dBc

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

CW Measurements (tested in Infineon test fixture)

V_{DD} = 28 V, I_{DQ1A} = I_{DQ1B} = 55 mA, I_{DQ2B} = 110 mA, V_{GS2A} = 1.05 V, f = 2018 MHz

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Gain Flatness	1 W / 15 MHz	ΔG	—	0.30	—	dB
Gain Compression	40 W	—	—	–0.4	–1.0	dB

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
	V_{DS} = 63 V, V_{GS} = 0 V	I_{DSS}	—	—	10.0	µA
Final Stage On-state Resistance	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)1}$	—	3.6	—	Ω
		$R_{DS(on)2}$	—	0.6	—	Ω
Operating Gate Voltage	V_{DS} = 28 V, I_{DQ1} = 50 mA, I_{DQ2} = 120 mA	V_{GS}	2.0	2.4	3.0	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 for CW - each side		P_{IN}	< 20	dBm
Total Device Dissipation	Stage 1	P_D	29	W
	Above 25°C derate by		0.167	W/°C
	Stage 2	P_D	110	W
	Above 25°C derate by		0.625	W/°C
Storage Temperature Range		T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C)	Stage 1	$R_{\theta JC}$	6.0	°C/W
	Stage 2	$R_{\theta JC}$	1.6	°C/W

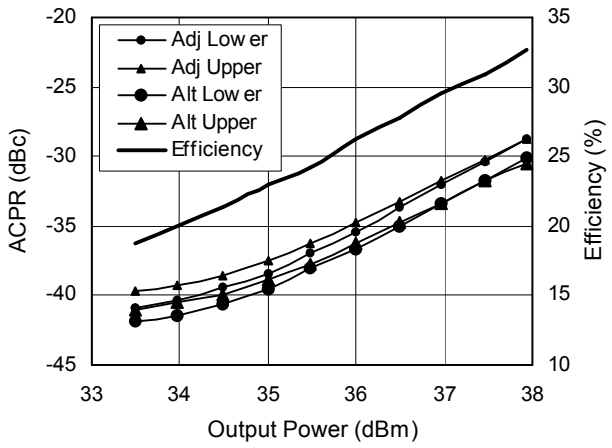
Ordering Information

Type and Version	Package Outline	Flange Type	Shipping	Marking
PTMA210404FL V1	H-34248-12	Earless flange	Tray	PTMA210404FL
PTMA210404FL V1 R250	H-34248-12	Earless flange	Tape & Reel 250 pcs	PTMA210404FL

Typical Performance (data taken in a production test fixture)

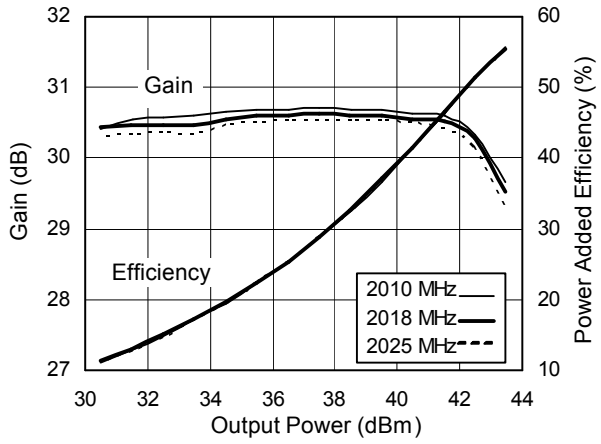
Six-carrier TD-SCDMA Drive-up

Single Side: V_{DD} = 28 V, I_{DQ1} = 60 mA, I_{DQ2} = 120 mA, f = 2017.5 MHz



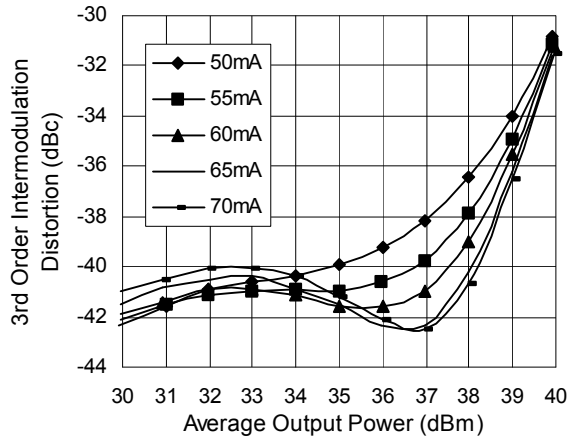
CW Performance of Each Side

V_{DD} = 28 V, I_{DQ1} = 60 mA, I_{DQ2} = 120 mA

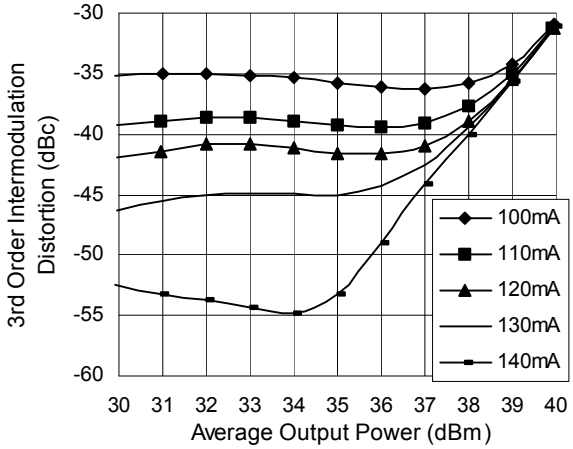


Typical Performance (cont.)

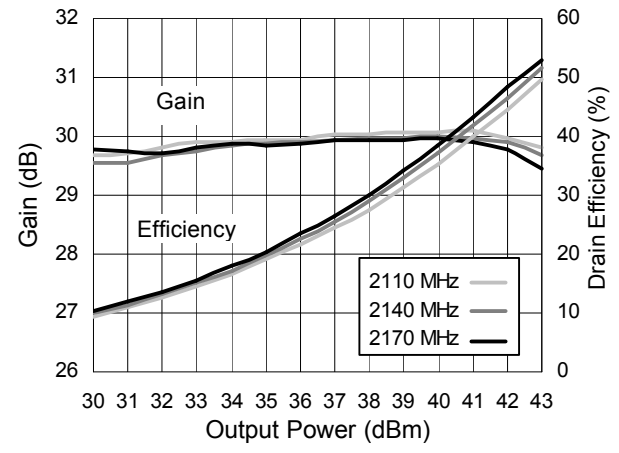
Two-tone Performance at Various I_{DQ1}
Single Side, f = 2018 MHz
V_{DD} = 28 V, I_{DQ1} = Varying, I_{DQ2} = 120 mA



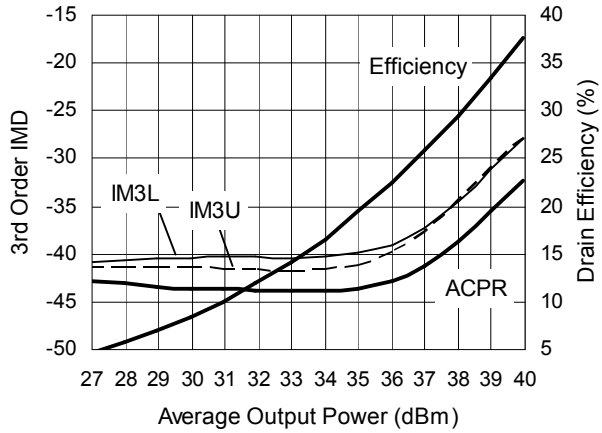
Two-tone Performance at Various I_{DQ2}
Single Side, f = 2018 MHz
V_{DD} = 28 V, I_{DQ1} = 60 mA, I_{DQ2} = Varying



CW Sweep at P_{-1dB}
V_{DD1} = V_{DD2} = 28V, I_{DQ1} = 50 mA, I_{DQ2} = 120 mA



Two-carrier WCDMA Performance
V_{DD1} = V_{DD2} = 28 V, I_{DQ1} = 60 mA, I_{DQ2} = 260 mA
10 MHz Spacing, 8 dB PAR, f = 2140 MHz



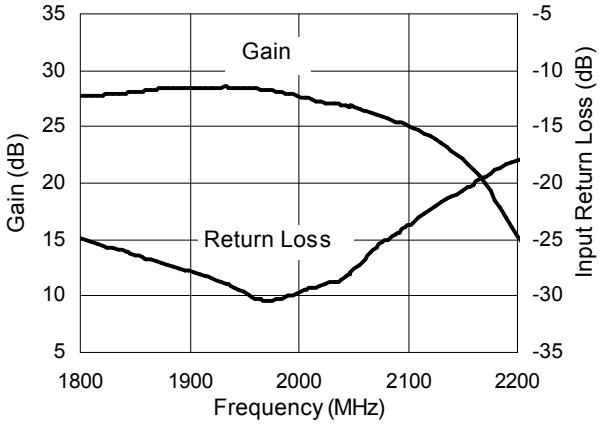
Typical Performance (cont.)

Broadband Performance

Doherty Circuit

Carrier: V_{DD} = 28 V, I_{DQ1} = 55 mA, I_{DQ2} = 120 mA

Peak: V_{DD} = 28 V, I_{DQ1} = 55 mA, V_{GS2} = 1.07 V

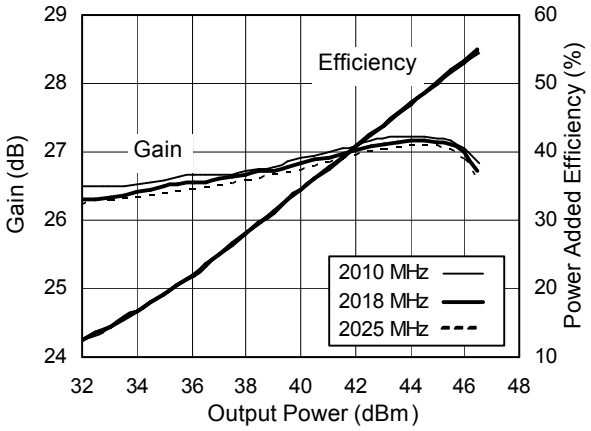


CW Performance

Doherty Circuit,

Carrier: V_{DD} = 28 V, I_{DQ1} = 55 mA, I_{DQ2} = 120 mA

Peaking: V_{DD} = 28 V, I_{DQ1} = 55 mA, V_{GS2} = 1.07 V

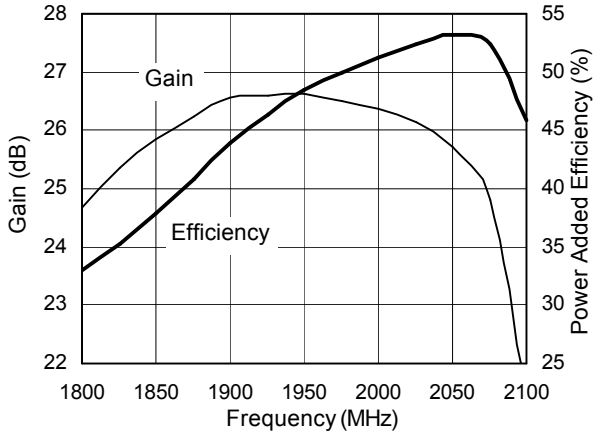


Power Gain vs Frequency

Doherty Circuit, CW, 40W

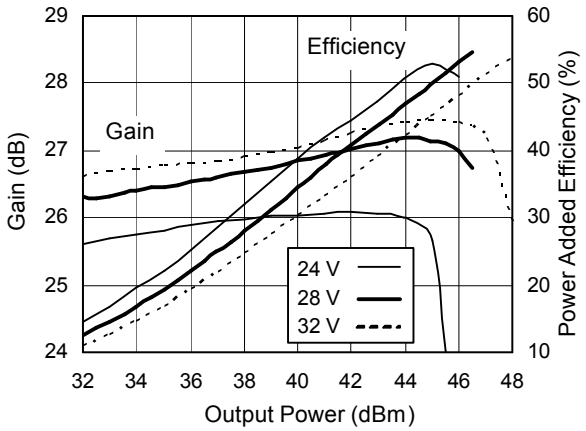
Carrier: V_{DD} = 28 V, I_{DQ1} = 60 mA, I_{DQ2} = 120 mA

Peaking: V_{DD} = 28V, I_{DQ1} = 60 mA, V_{GS2} = 1.07 V

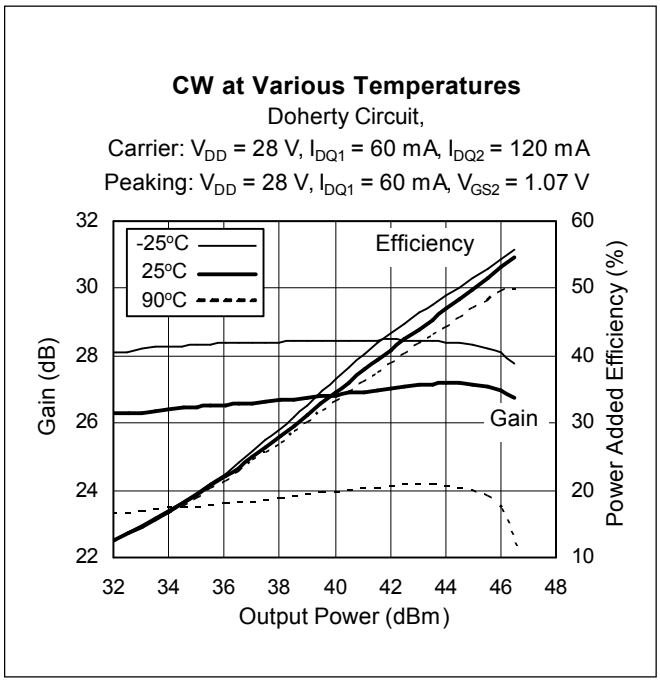


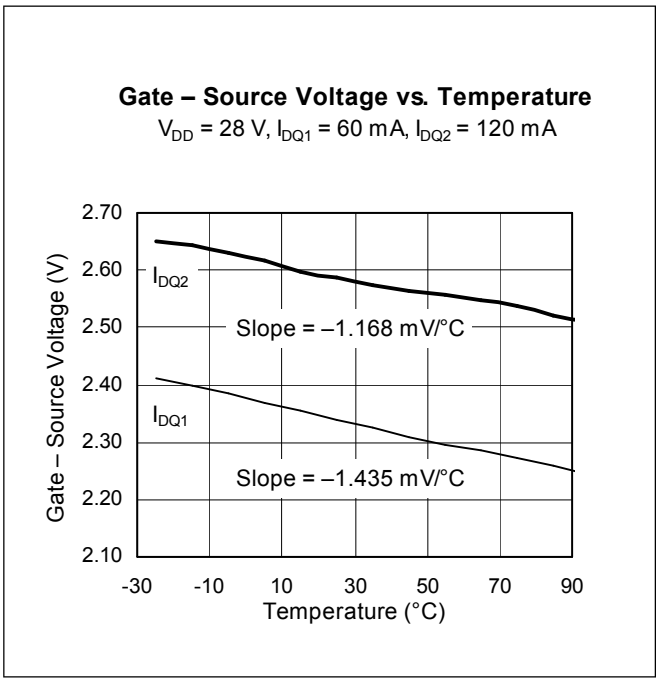
CW at Various Drain Voltage

Doherty Circuit, f = 2018 MHz



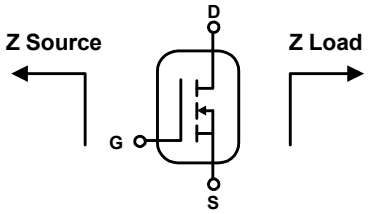
Typical Performance (cont.)

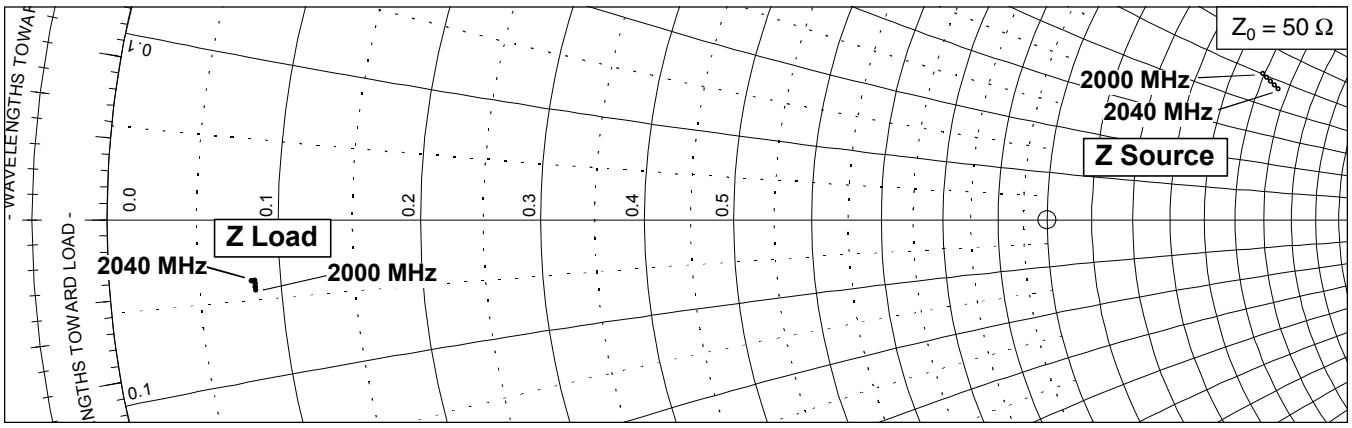




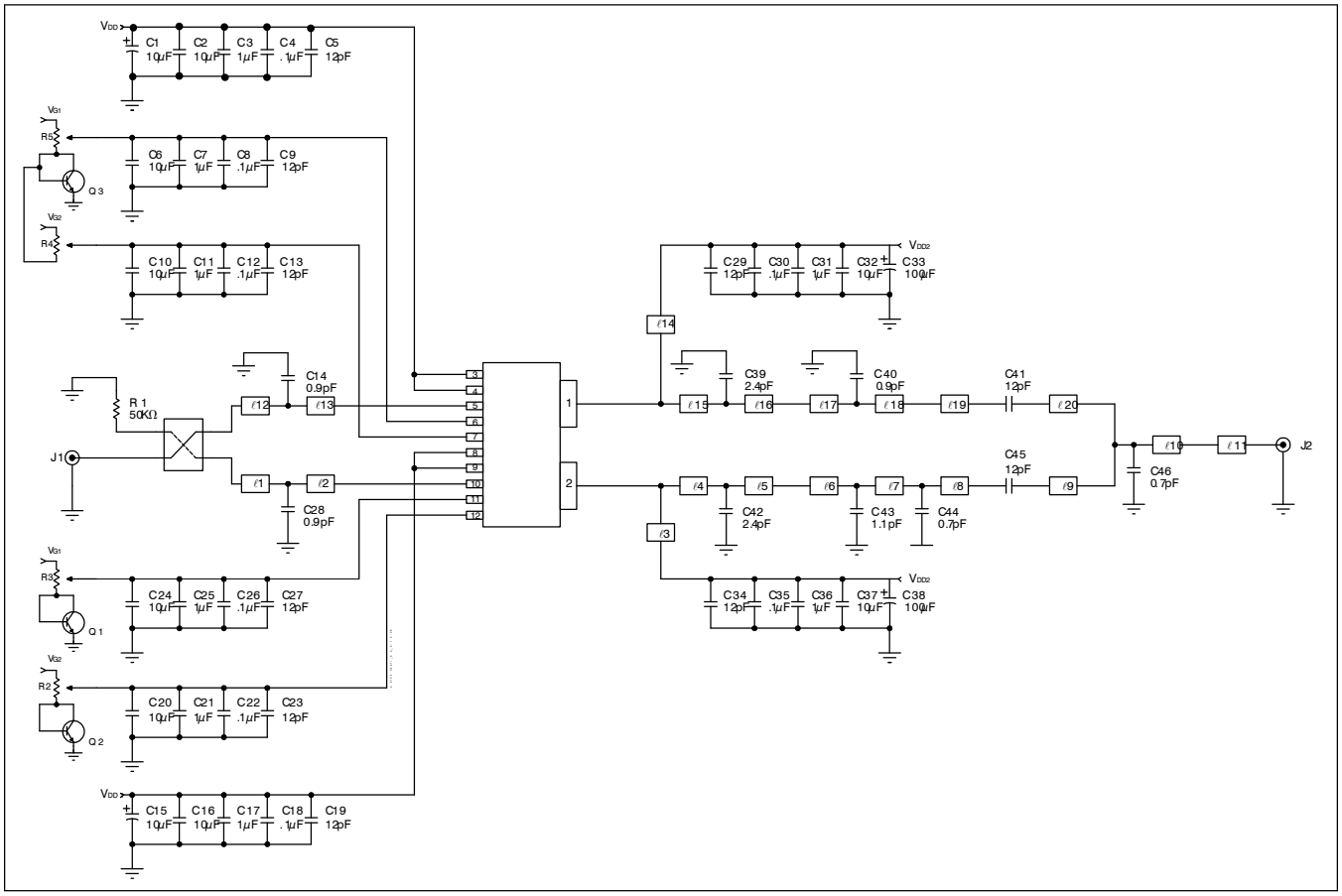
Broadband Circuit Impedance

Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
2000	74.7	25.2	4.2	-2.2
2010	75.6	24.9	4.2	-2.1
2020	76.5	24.5	4.2	-2.0
2030	77.4	24.1	4.2	-1.9
2040	78.3	23.7	4.1	-1.9





Reference Circuit



Reference circuit block diagram for ƒ = 2017.5 MHz

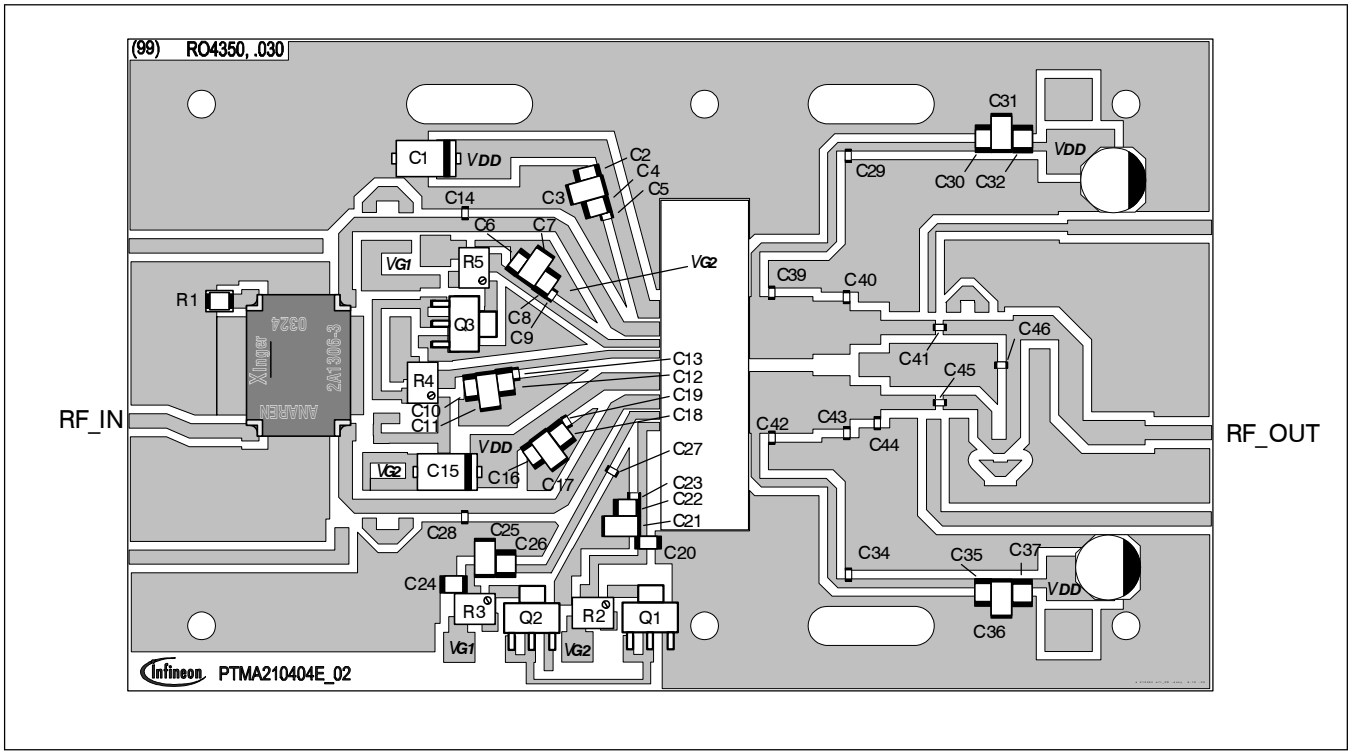
Reference Circuit (cont.)

Circuit Assembly Information

DUT	PTMA210404FL	LDMOS IC	
PCB	0.76 mm [.030"] thick, ε_r = 3.48	Rogers RO4350	1 oz. copper

Microstrip	Electrical Characteristics at 2017.5 MHz	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ1	0.285 λ, 51.0 Ω	25.68 x 1.63	1.011 x 0.064
ℓ2	0.302 λ, 51.0 Ω	27.23 x 1.63	1.072 x 0.064
ℓ3	0.311 λ, 67.0 Ω	28.58 x 1.02	1.125 x 0.040
ℓ4	0.031 λ, 17.2 Ω	2.59 x 7.24	0.102 x 0.285
ℓ5	0.056 λ, 17.2 Ω	4.75 x 7.24	0.187 x 0.285
ℓ6	0.051 λ, 19.5 Ω	4.29 x 6.22	0.169 x 0.245
ℓ7	0.043 λ, 28.0 Ω	3.71 x 3.94	0.146 x 0.155
ℓ8	0.071 λ, 51.0 Ω	6.43 x 1.63	0.253 x 0.064
ℓ9	0.239 λ, 51.0 Ω	21.54 x 1.63	0.848 x 0.064
ℓ10	0.289 λ, 33.0 Ω	24.54 x 3.15	0.966 x 0.124
ℓ11	0.086 λ, 51.0 Ω	7.75 x 1.63	0.305 x 0.064
ℓ12	0.285 λ, 51.0 Ω	25.68 x 1.63	1.011 x 0.064
ℓ13	0.302 λ, 51.0 Ω	27.23 x 1.63	1.072 x 0.064
ℓ14	0.311 λ, 67.0 Ω	28.58 x 1.02	1.125 x 0.040
ℓ15	0.031 λ, 17.2 Ω	2.59 x 7.24	0.102 x 0.285
ℓ16	0.056 λ, 17.2 Ω	4.75 x 7.24	0.187 x 0.285
ℓ17	0.051 λ, 19.5 Ω	4.29 x 6.22	0.169 x 0.245
ℓ18	0.043 λ, 28.0 Ω	3.71 x 3.94	0.146 x 0.155
ℓ19	0.071 λ, 51.0 Ω	6.43 x 1.63	0.253 x 0.064
ℓ20	0.140 λ, 51.0 Ω	12.65 x 1.63	0.498 x 0.064

Reference Circuit (cont.)



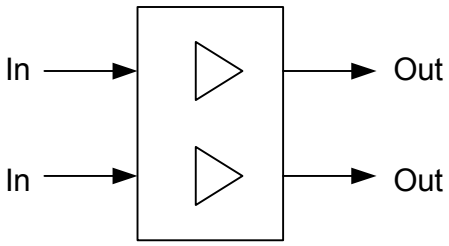
*Reference circuit assembly diagram (not to scale)**

Component	Description	Suggested Manufacturer	P/N or Comment
C1, C15	Tantalum Capacitor, 10 µF, 35 V	Digi-Key	399-1655-2-ND
C2, C6, C10, C15, C20, C24, C32, C37	Ceramic Capacitor, 10 µF	Digi-Key	490-1891-2-ND
C3, C7, C11, C17, C21, C25, C31, C36	Ceramic Capacitor, 1 µF	Digi-Key	445-1411-2-ND
C4, C8, C12, C18, C22, C26, C30, C35	Capacitor, 0.1 µF	Digi-Key	399-1267-2-ND
C5, C9, C13, C19, C23, C27, C29, C34, C41, C45	Ceramic Capacitor, 12 pF	ATC	600S120JT
C14, C28, C40	Ceramic Capacitor, 0.9 pF	ATC	600S0R9BT
C33, C38	Electrolitic Capacitor, 100 µF, 35 V	Digi-Key	PCE3373TR-ND
C39, C42	Ceramic Capacitor, 2.4 pF	ATC	600S2R4BT
C43	Ceramic Capacitor, 1.1 pF	ATC	600S1R1BT
C44, C46	Ceramic Capacitor, 0.7 pF	ATC	600S0R7BT
Q1, Q2, Q3	Transistor	Infineon Technologies	BCP56
R1	Chip Resistor, 50 ohms	Digi-Key	RFP100200-4Y502
R2, R3, R4, R5	Potentiometer, 2 k-ohms	Digi-Key	3224W-202ETR-ND

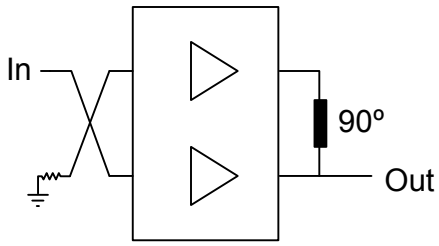
**Gerber Files for this circuit available on request*

Application Examples

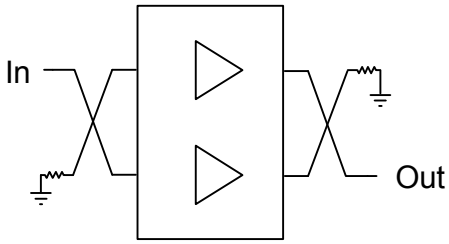
Single - ended



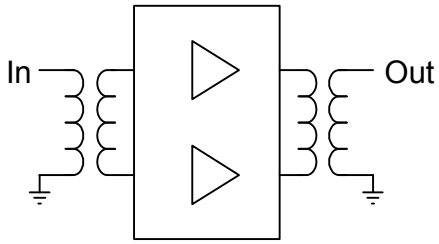
Doherty



Quadrature Combined



Push-pull



Package Specifications

Package H-34248-12 Outline

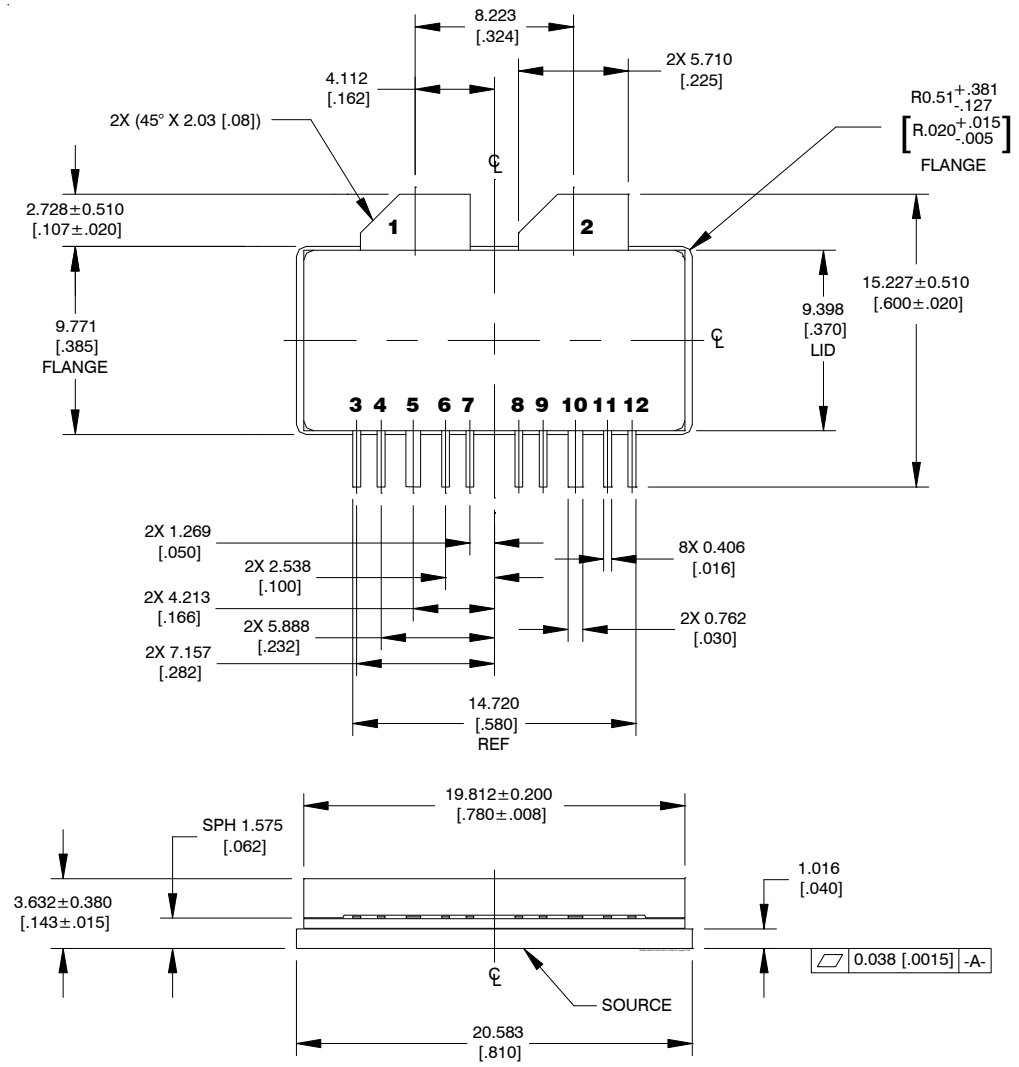
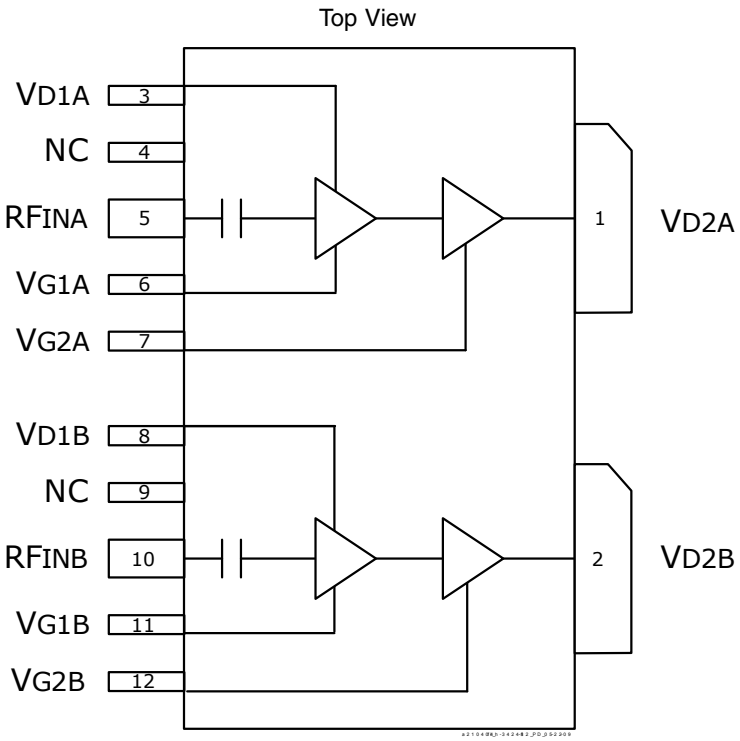


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
7. All tolerances ± 0.127 [.005] unless specified otherwise.
4. Lead thickness: 0.102 +0.051/–0.025 [.004 +.002/–.001].
5. Gold plating thickness: 0.254 micron [10 microinch] max.

Package Specifications (cont.)

Package H-34248-12 Pinout



Source: Package Flange

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

Revision History:	2009-06-16	Data Sheet
Previous Version:	2009-06-05, Preliminary Data Sheet	

Page	Subjects (major changes since last revision)
all	Remove Preliminary designation
7, 8, 9	Add reference circuit information
11	Finalize package information

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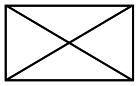

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