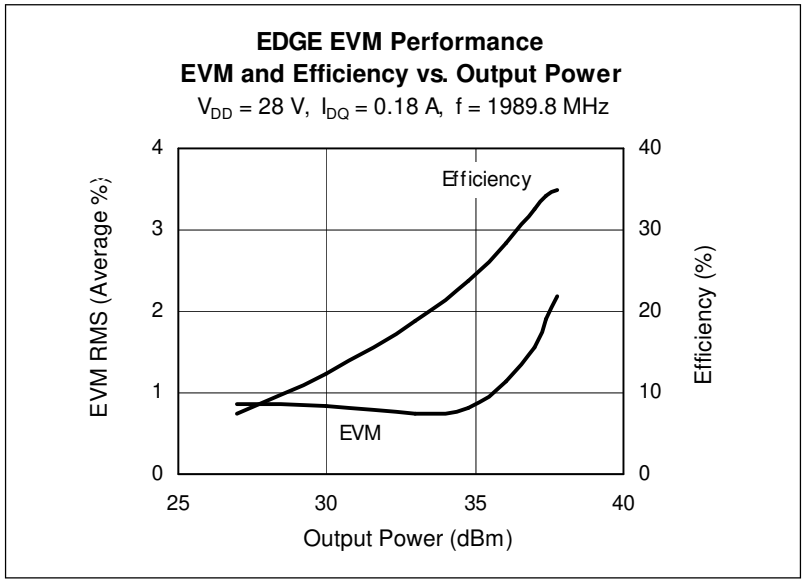
LDMOS RF Power Field Effect Transistor
10 W, 1805–1880 MHz, 1930–1990 MHz
10 W, 2110–2170 MHz

Description

The PTF180101 is a 10 W, internally–matched *GOLDMOS* FET device intended for EDGE applications in the DCS/PCS band. Full gold metallization ensures excellent device lifetime and reliability.



ESD: Electrostatic discharge sensitive device — observe handling precautions!

Features

- Typical EDGE performance
  - Average output power = 4.0 W
  - Gain = 19.0 dB
  - Efficiency = 28%
  - EVM = 1.1 %
- Typical WCDMA performance
  - Average output power = 1.8 W
  - Gain = 18.0 dB
  - Efficiency = 20%
  - ACPR = –45 dBc
- Typical CW performance
  - Output power at P–1dB = 15 W
  - Efficiency = 50%
- Integrated ESD protection: Human Body Model Class 1 (minimum)
- Excellent thermal stability
- Low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 10 W (CW) output power

PTF180101S
Package 32259

RF Characteristics, EDGE Operation at T_{CASE} = 25°C unless otherwise indicated

EDGE Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)
V_{DD} = 28 V, I_{DQ} = 180 mA, P_{OUT} = 4 W, f = 1989.8 MHz

Characteristic	Symbol	Min	Typ	Max	Units
Error Vector Magnitude	EVM (RMS)	—	1.1	—	%
Modulation Spectrum @ 400 kHz	ACPR	—	–60	—	dBc
Modulation Spectrum @ 600 kHz	ACPR	—	–70	—	dBc
Gain	G_{ps}	—	19	—	dB
Drain Efficiency	η_D	—	28	—	%

Two–Tone Measurements (tested in Infineon test fixture)
V_{DD} = 28 V, I_{DQ} = 180 mA, P_{OUT} = 10 W PEP, f = 1990 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Units
Gain	G_{ps}	18	19	—	dB
Drain Efficiency	η_D	30	33	—	%
Intermodulation Distortion	IMD	—	–30	–28	dBc

RF Characteristics, WCDMA Operation at T_{CASE} = 25°C unless otherwise indicated

WCDMA Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)
V_{DD} = 28 V, I_{DQ} = 135 mA, P_{OUT} = 1.8 W,
f = 2170 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8.7 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Units
Adjacent Channel Power Ratio	ACPR	—	–45	—	dBc
Gain	G_{ps}	—	18	—	dB
Drain Efficiency	η_D	—	20	—	%

Two–Tone Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)
V_{DD} = 28 V, I_{DQ} = 135 mA, P_{OUT} = 10 W PEP, f = 2170 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Units
Gain	G_{ps}	—	18	—	dB
Drain Efficiency @ –30 dBc IM3	η_D	—	37	—	%
Intermodulation Distortion	IMD	—	–30	—	dBc

DC Characteristics at T_{CASE} = 25°C unless otherwise indicated

Characteristic	Conditions	Symbol	Min	Typ	Max	Units
Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_{DS} = 10 µA	$V_{(BR)DSS}$	65	—	—	V
Drain Leakage Current	V_{DS} = 28 V, V_{GS} = 0 V	I_{DSS}	—	—	1.0	µA
On–State Resistance	V_{GS} = 10 V, V_{DS} = 0.1 A	$R_{DS(on)}$	—	0.83	—	Ω
Operating Gate Voltage	V_{DS} = 28 V, I_{DQ} = 180 mA	V_{GS}	2.5	3.2	4.0	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1.0	µA

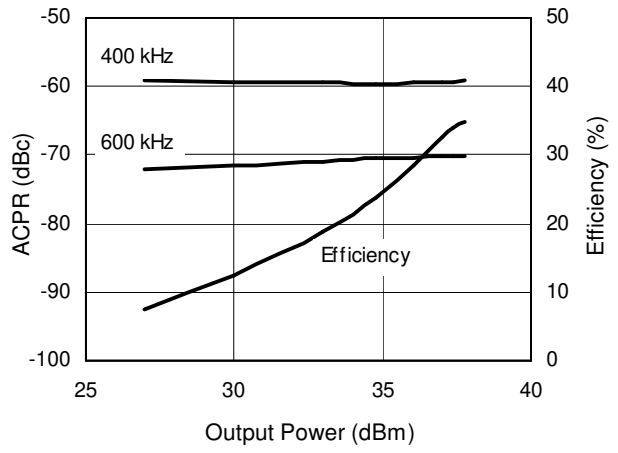
Maximum Ratings at T_{CASE} = 25°C unless otherwise indicated

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
Total Device Dissipation	P_D	58	W
Above 25°C derate by		0.333	W/°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 10 W CW)	$R_{\theta JC}$	3.0	°C/W

Typical Performance measurements taken in broadband test fixture

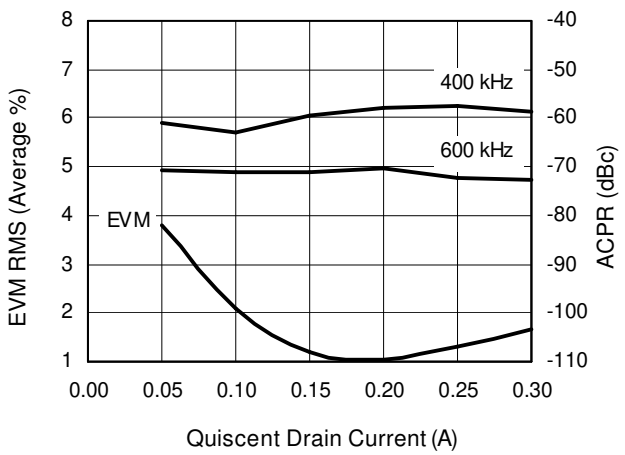
EDGE Modulation Spectrum Performance

V_{DD} = 28 V, I_{DQ} = 0.18 A, f = 1989.8 MHz



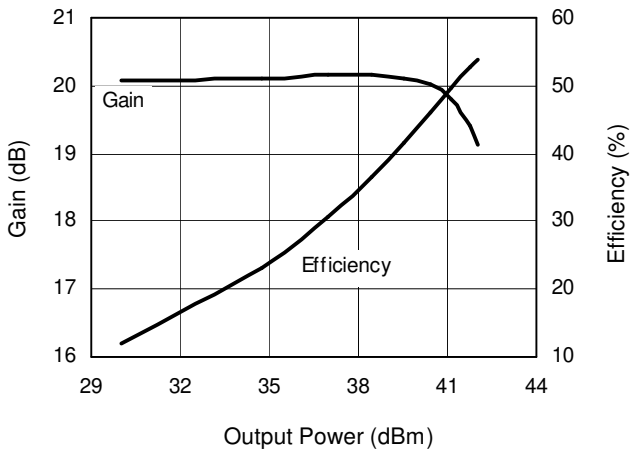
EVM and Modulation Spectrum Performance

f = 1989.8 MHz, P_{OUT} = 3.5 W



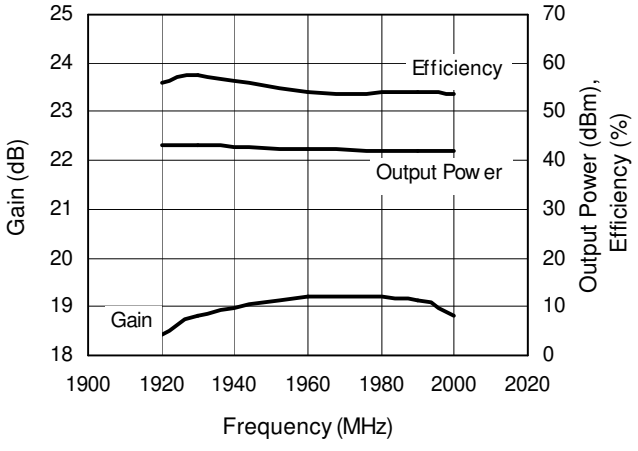
Gain & Efficiency vs. Output Power

V_{DD} = 28 V, I_{DQ} = 0.18 A, f = 1990 MHz



Output Power, Gain & Efficiency (at P-1dB) vs. Frequency

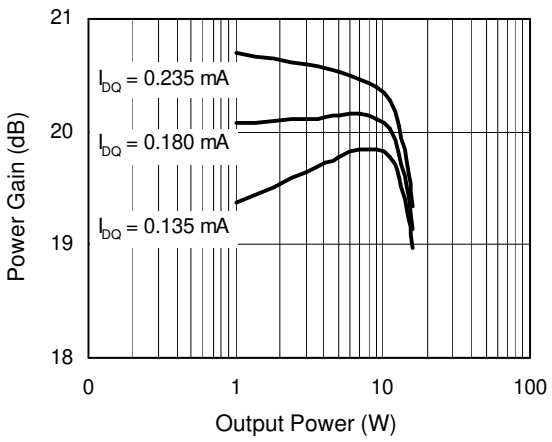
V_{DD} = 28 V, I_{DQ} = 0.18 A



Typical Performance (cont.)

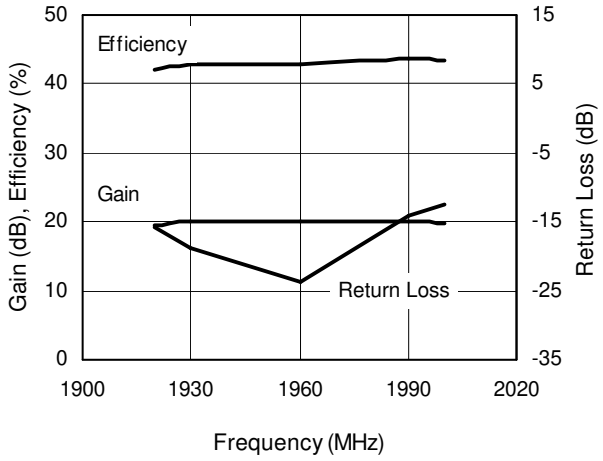
Power Gain vs. Output Power

V_{DD} = 28 V, f = 1990 MHz



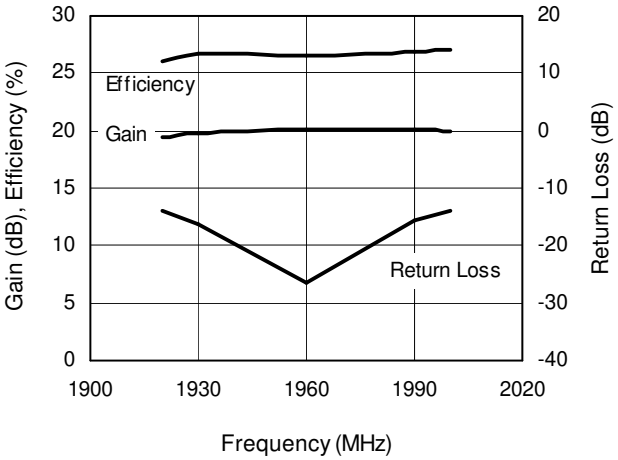
Broadband Test Fixture Performance

V_{DD} = 28 V, I_{DQ} = 0.18 A, P_{OUT} = 10 W



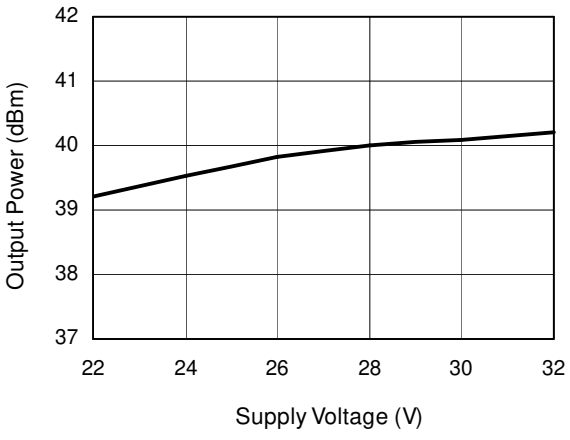
Broadband Test Fixture Performance

V_{DD} = 28 V, I_{DQ} = 0.18 A, P_{OUT} = 4 W



Output Power vs. Supply Voltage

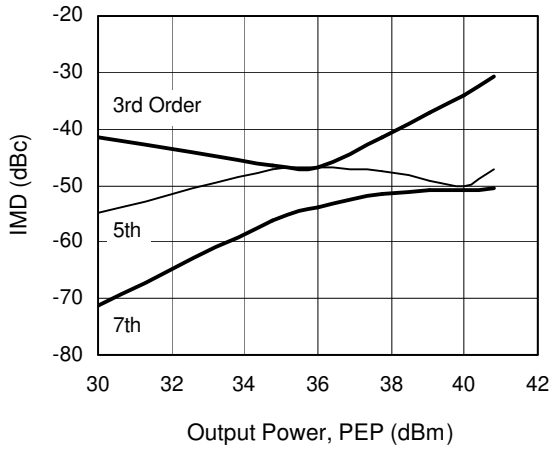
I_{DQ} = 0.18 A, f = 1990 MHz



Typical Performance (cont.)

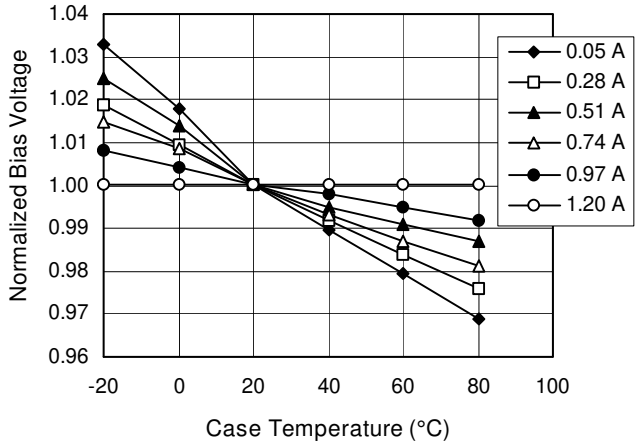
Intermodulation Distortion vs. Output Power

V_{DD} = 28 V, I_{DQ} = 0.18 A, f_1 = 1990 MHz, f_2 = 1991 MHz



Gate-Source Voltage vs. Case Temperature

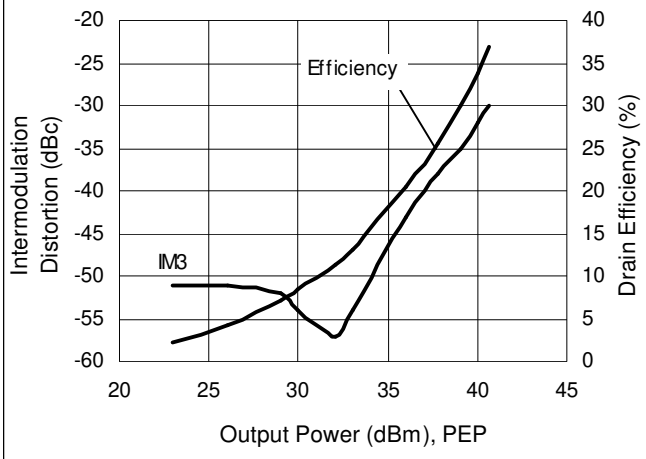
Voltage normalized to typical gate voltage.
Series show current.



Typical Performance, WCDMA Operation

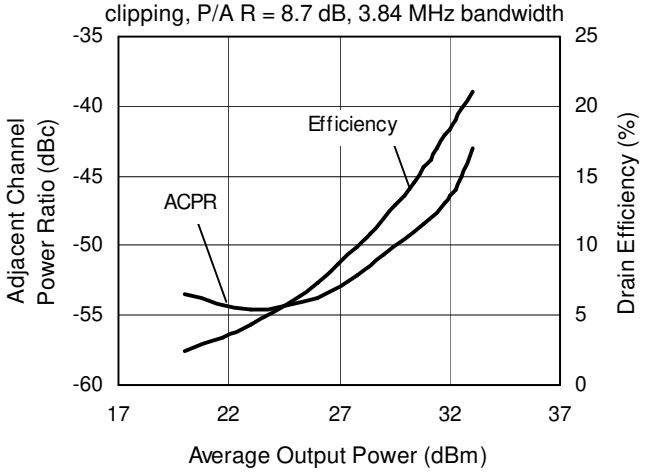
Two–Tone Drive–up

V_{DD} = 28V, I_{DQ} = 135 mA, f = 2170 MHz,
tone spacing = 1 MHz

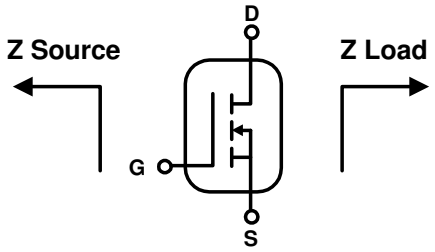


Single–Carrier WCDMA Drive–Up

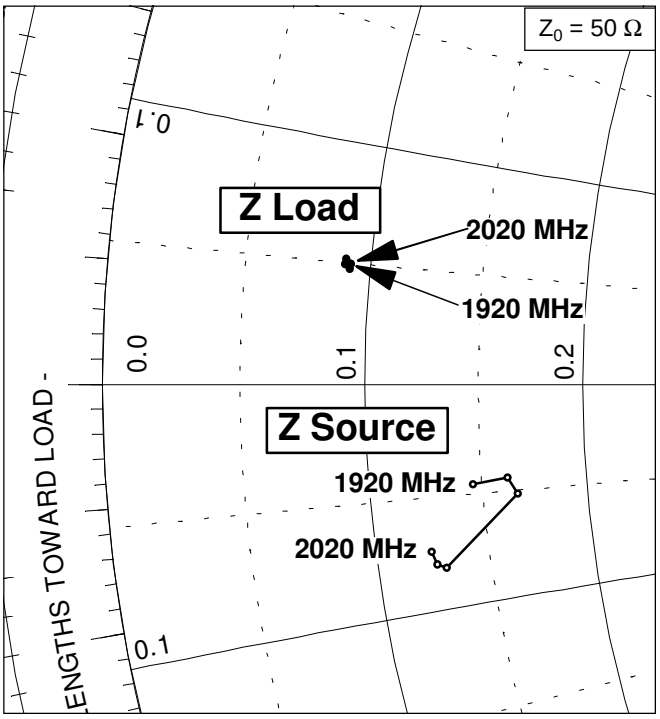
V_{DD} = 28 V, I_{DQ} = 135 mA, f = 2170 MHz,
3GPP WCDMA signal, Test Model 1 w/16 DPCH, 67%
clipping, P/A R = 8.7 dB, 3.84 MHz bandwidth



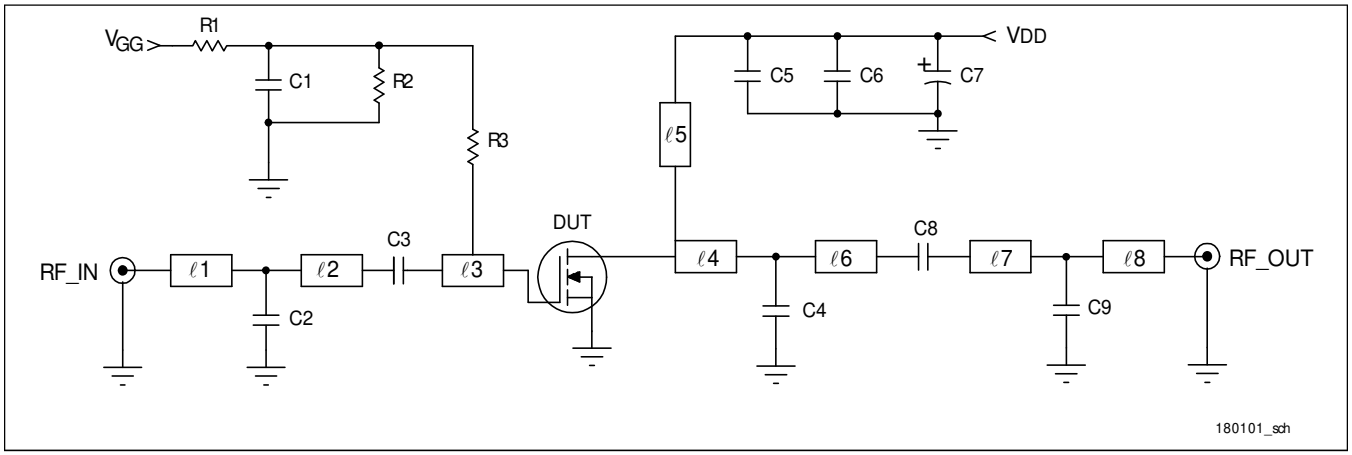
Broadband Circuit Impedance Data



Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
1920	7.3	-2.3	4.6	2.4
1930	8.1	-2.2	4.6	2.5
1960	8.3	-2.6	4.5	2.6
1990	6.5	-4.1	4.5	2.5
2000	6.3	-4.0	4.5	2.5
2020	6.2	-3.7	4.6	2.5



Reference Circuits



Reference Circuit Schematic

Circuit Assembly Information

DUT	PTF180101	LDMOS Transistor	
Circuit Board	0.76 mm [.030"] thick, ε_r = 4.5	Rogers TMM4, 2 oz. Copper	

Microstrip	Electrical Characteristics at 1990 MHz	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ1	0.133 λ, 50 Ω	10.92 x 1.37	0.430 x 0.054
ℓ2	0.096 λ, 50 Ω	7.87 x 1.37	0.310 x 0.054
ℓ3	0.155 λ, 9.5 Ω	11.30 x 12.45	0.445 x 0.490
ℓ4	0.008 λ, 12.8 Ω	0.64 x 8.86	0.025 x 0.349
ℓ5	0.286 λ, 70 Ω	23.88 x 0.71	0.940 x 0.028
ℓ6	0.247 λ, 12.8 Ω	18.29 x 8.86	0.720 x 0.349
ℓ7	0.145 λ, 50 Ω	11.81 x 1.37	0.465 x 0.054
ℓ8	0.008 λ, 50 Ω	0.64 x 1.37	0.025 x 0.054

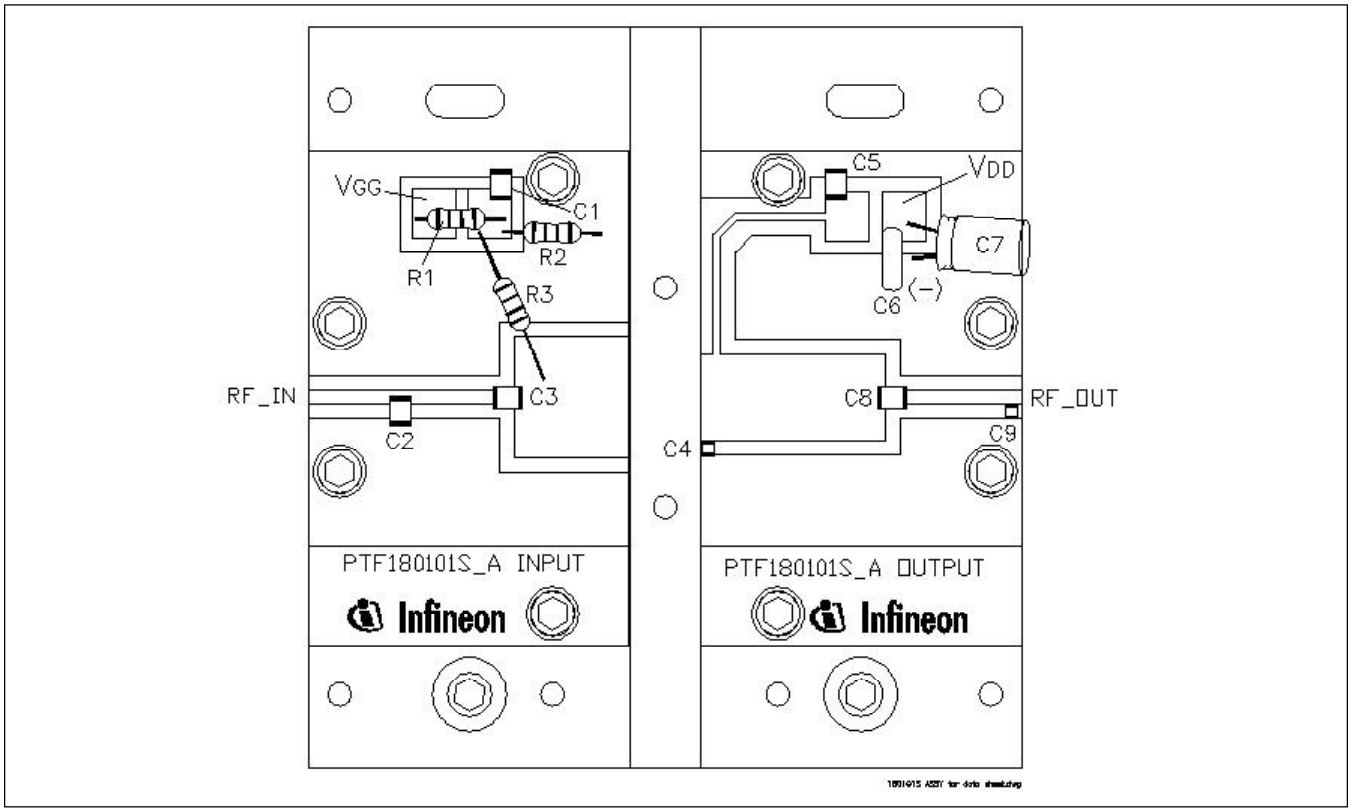
Reference Circuits (cont.)

1930–1990 MHz Operation

Component	Description	Manufacturer	P/N or Comment
C1, C3, C5, C8	Capacitor, 10 pF	ATC	100B 100
C2	Capacitor, 1.7 pF	ATC	100B 1R7
C4	Capacitor, 2.0 pF	ATC	100A 2R0
C6	Capacitor, 0.1 µF, 50 V	Digi-Key	P4525-ND
C7	Capacitor, 100 µF, 50 V	Digi-Key	P5182-ND
C9	Capacitor, 0.6 pF	ATC	100A 0R6
R1, R2, R3	Resistor, 220 ohm, 1/4 W	Digi-Key	220QBK

2.11–2.17 GHz Operation

Component	Description	Manufacturer	P/N or Comment
C1, C3, C5, C8	Capacitor, 10 pF	ATC	100B 100
C2	Capacitor, 0.8 pF	ATC	100B 0R8
C4	Capacitor, 2.2 pF	ATC	100A 2R2
C6	Capacitor, 0.1 µF, 50 V	Digi-Key	P4525-ND
C7	Capacitor, 100 µF, 50 V	Digi-Key	P5182-ND
C9	Capacitor, 1.0 pF	ATC	100A 1R0
R1, R2, R3	Resistor, 220 ohm, 1/4 W	Digi-Key	220QBK



Reference circuit assembly diagramt[1] (not to scale)

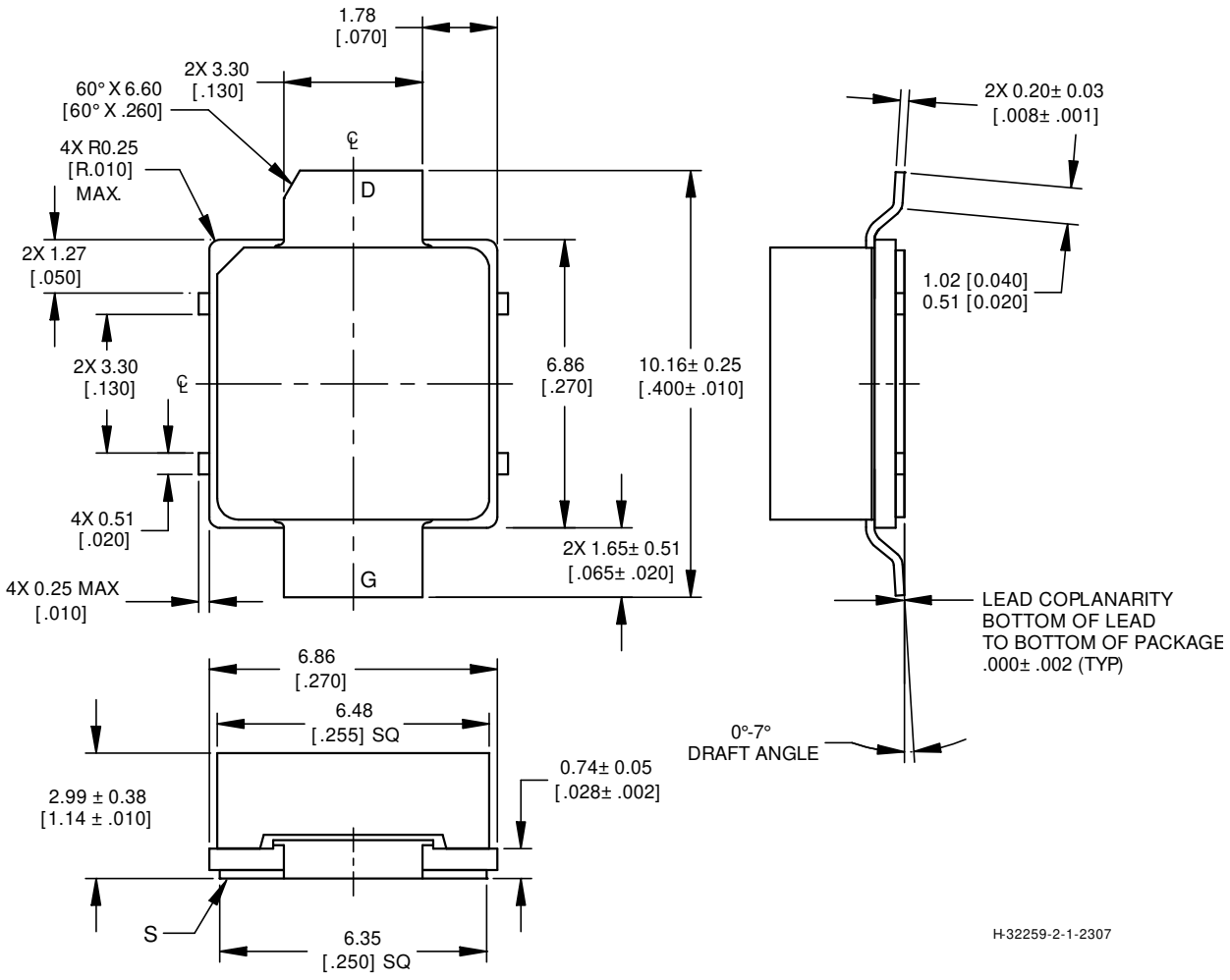
[1] *Gerber files for this circuit are available upon request.*

Ordering Information

Type	Package Outline	Package Description	Marking
PTF180101S	32259	Thermally enhanced, surface mount	PTF180101S

Package Outline Specifications

Package 32259



Notes: Unless otherwise specified

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. Pins: D = drain, S = source, G = gate
4. Lead thickness: 0.21 ± 0.03 [.008 ± .001]

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PTF180101

Revision History:	**2004-02-03**	Data Sheet
Previous Version:	none	
Page	Subjects (major changes since last revision)	
1, 5, 7	Add information about WCDMA operation	

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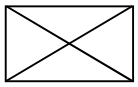

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