

Thermally-Enhanced High Power RF LDMOS FETs 160 W, 1930 – 1990 MHz

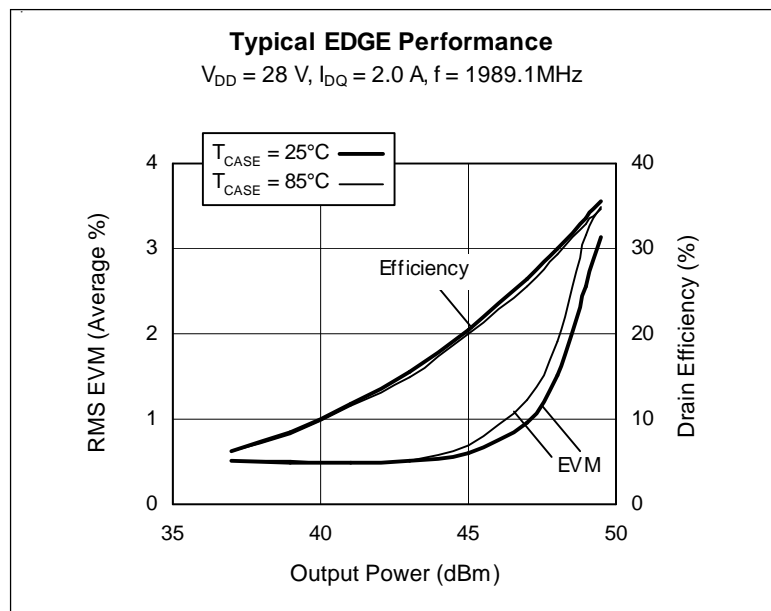
Description

The PTF191601E and PTF191601F are 160-watt, internally-matched GOLDMOS FETs intended for GSM EDGE and CDMA applications in the 1930 to 1990 MHz band. Thermally-enhanced packaging provides the coolest operation available. Full gold metallization ensures excellent device lifetime and reliability.

PTF191601E
Package 30260



PTF191601F*
Package 31260



Features

- Thermally-enhanced packaging
- Broadband internal matching
- Typical EDGE performance
 - Average output power = 80 W
 - Gain = 14 dB
 - Efficiency = 35%
 - EVM = 2.5%
- Typical CW performance
 - Output power at P-1dB = 180 W
 - Gain = 13 dB
 - Efficiency = 47%
- Integrated ESD protection: Human Body Model, Class 1 (minimum)
- Excellent thermal stability
- Low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 160 W (CW) output power

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics at $T_{CASE} = 25^\circ\text{C}$ unless otherwise indicated

EDGE Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 2.0\text{ A}$, $P_{OUT} = 80\text{ W}$, $f = 1989.8\text{ MHz}$

Characteristic	Symbol	Min	Typ	Max	Units
Error Vector Magnitude	EVM (RMS)	—	2.5	—	%
Modulation Spectrum @ 400 kHz	ACPR	—	-60	—	dBc
Modulation Spectrum @ 600 kHz	ACPR	—	-73	—	dBc
Gain	G_{ps}	—	14	—	dB
Drain Efficiency	η_D	—	35	—	%

*See Infineon distributor for future availability.

RF Characteristics (cont.)

Two-Tone Measurements (tested in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 2.0\text{ A}$, $P_{OUT} = 150\text{ W PEP}$, $f = 1990\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Units
Gain	G_{ps}	12.5	14	—	dB
Drain Efficiency @ -30 dBc IM3	η_D	33	35	—	%
Intermodulation Distortion	IMD	—	-30	-28	dBc

DC Characteristics at $T_{CASE} = 25^\circ\text{C}$ unless otherwise indicated

Characteristic	Conditions	Symbol	Min	Typ	Max	Units
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	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.065	—	Ω
Operating Gate Voltage	$V_{DS} = 28\text{ V}$, $I_{DQ} = 2.0\text{ A}$	V_{GS}	2.5	3.2	4.0	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	—	—	1.0	μA

Maximum Ratings

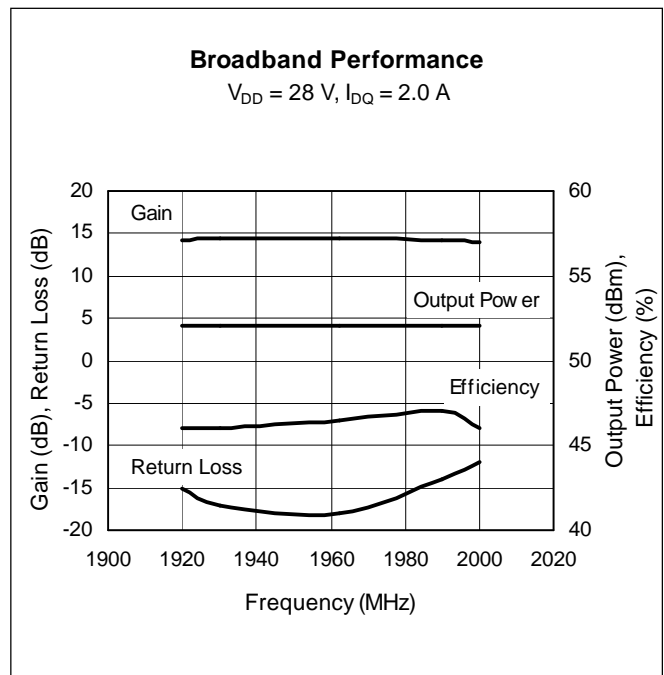
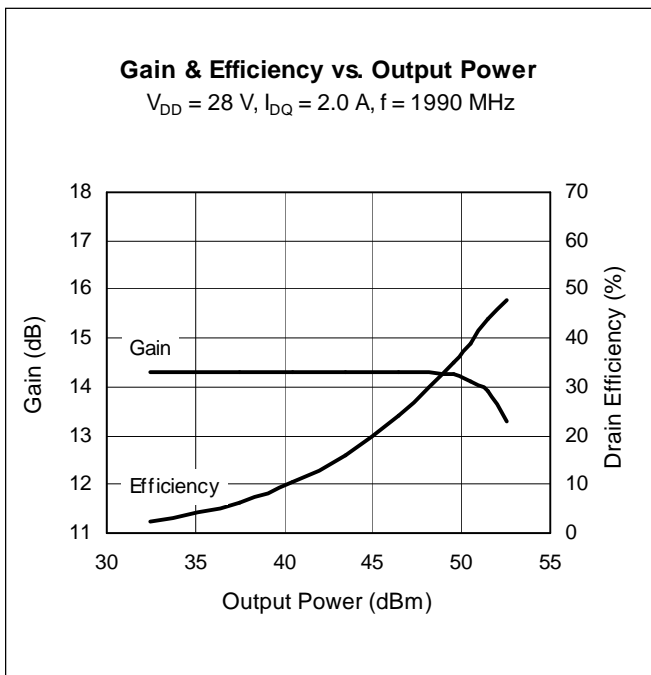
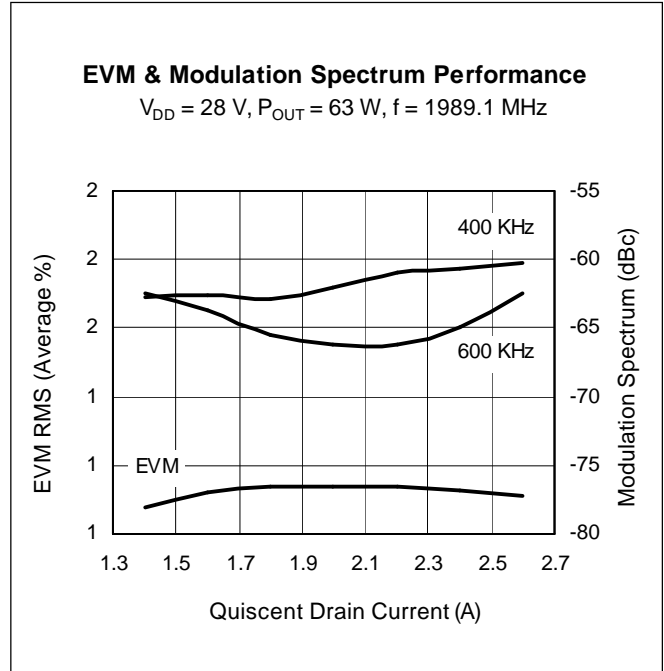
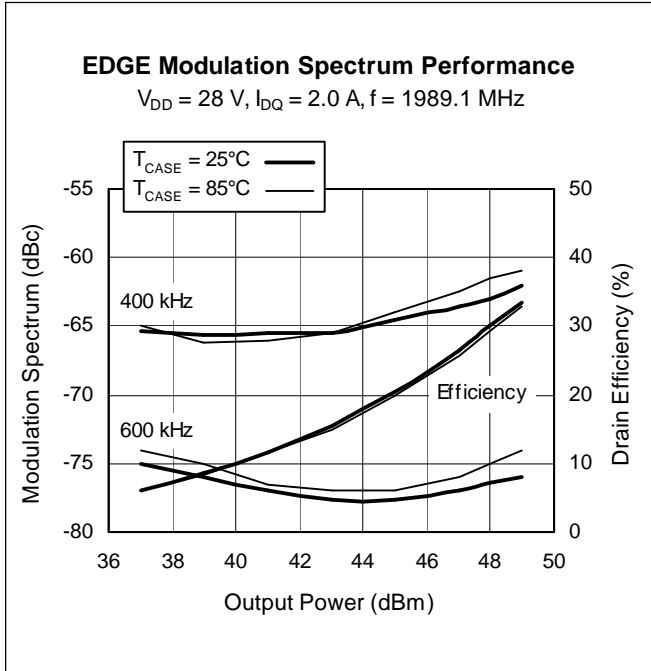
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	-0.5 to +12	V
Junction Temperature	T_J	200	$^\circ\text{C}$
Total Device Dissipation	P_D	603	W
Above 25°C derate by		3.45	W/ $^\circ\text{C}$
Storage Temperature Range	T_{STG}	-40 to +150	$^\circ\text{C}$
Thermal Resistance ($T_{CASE} = 70^\circ\text{C}$, 160 W CW)	$R_{\theta JC}$	0.29	$^\circ\text{C/W}$

Ordering Information

Type	Package Outline	Package Description	Marking
PTF191601E	30260	Thermally-enhanced slotted flange, single-ended	PTF191601E
PTF191601F*	31260	Thermally-enhanced earless flange, single-ended	PTF191601F

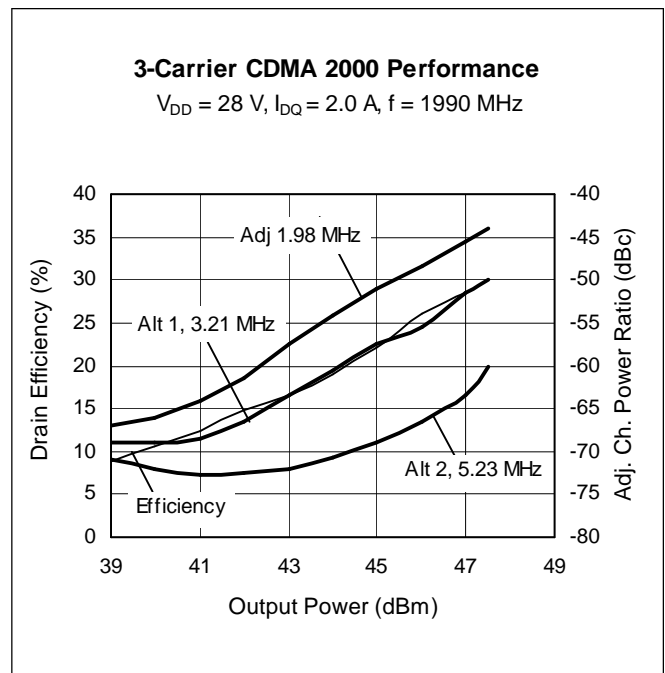
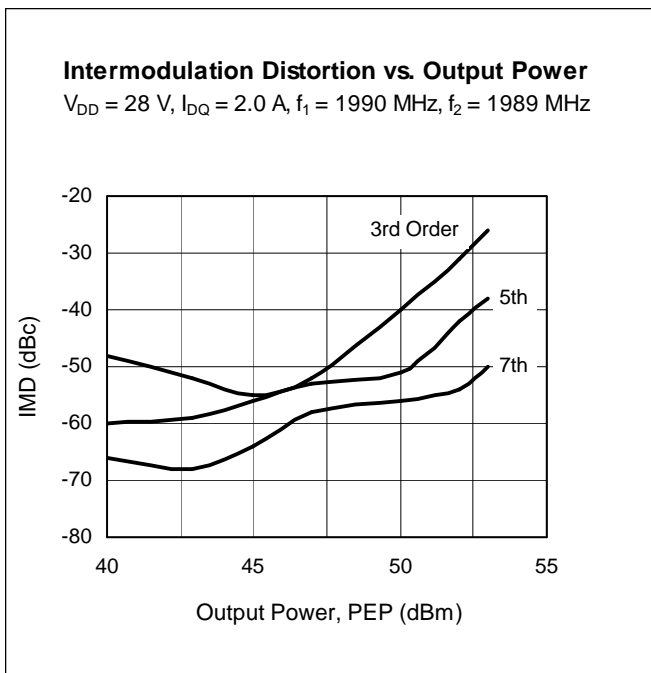
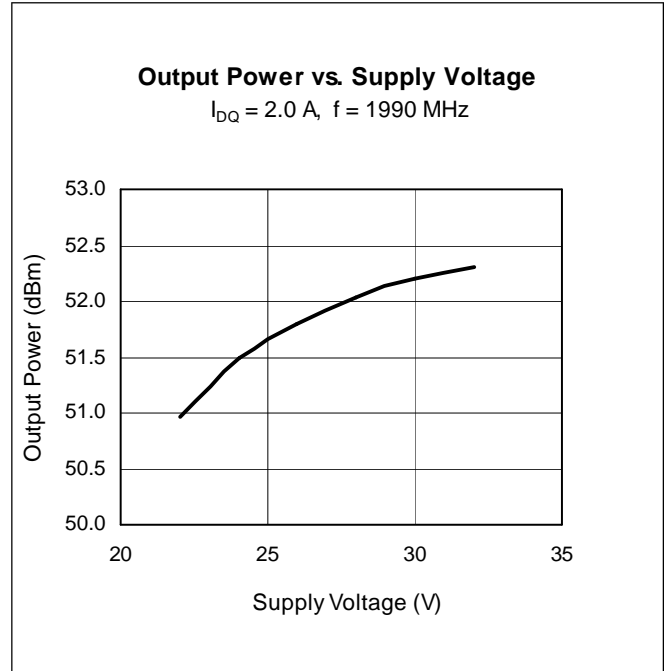
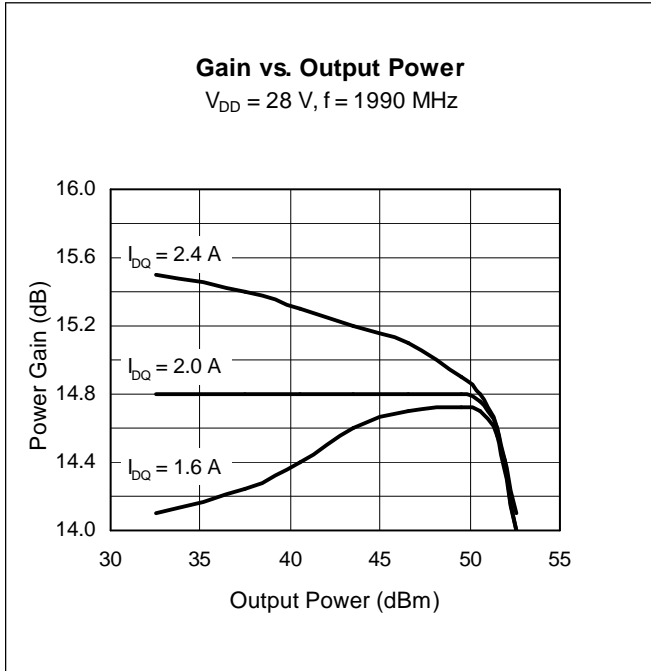
*See Infineon distributor for future availability.

Typical Performance (data taken in production test fixture)

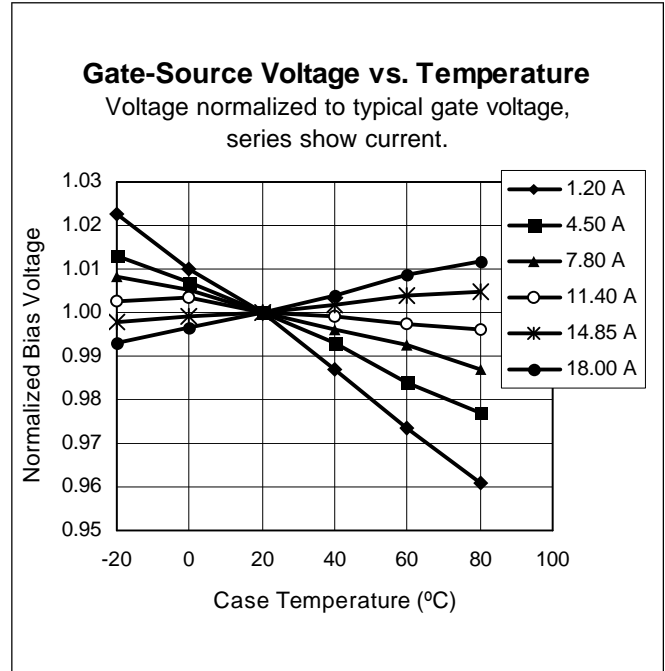
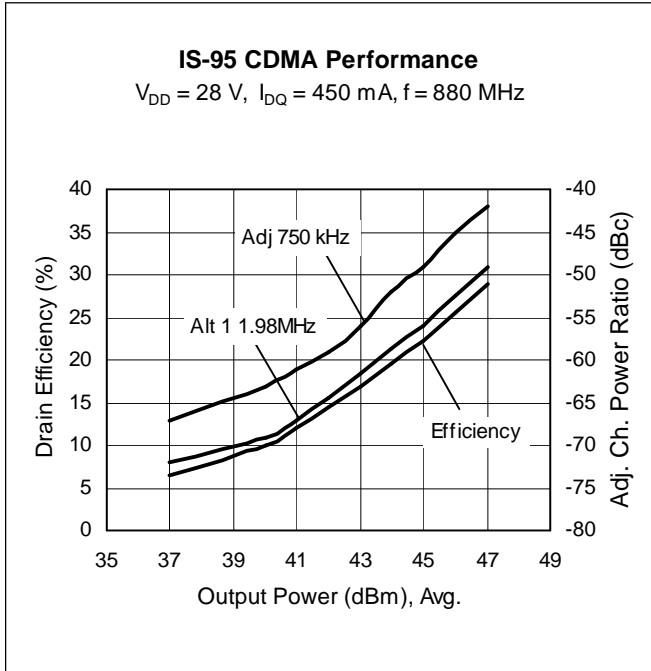


All published data at $T_{CASE} = 25^{\circ}\text{C}$ unless otherwise indicated

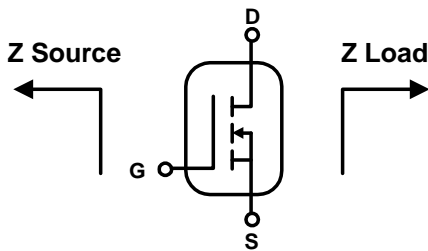
Typical Performance (cont.)



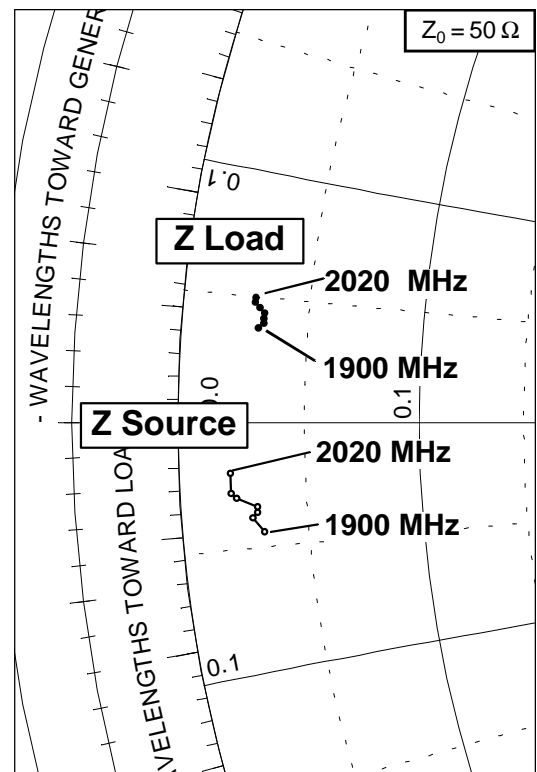
Typical Performance (cont.)



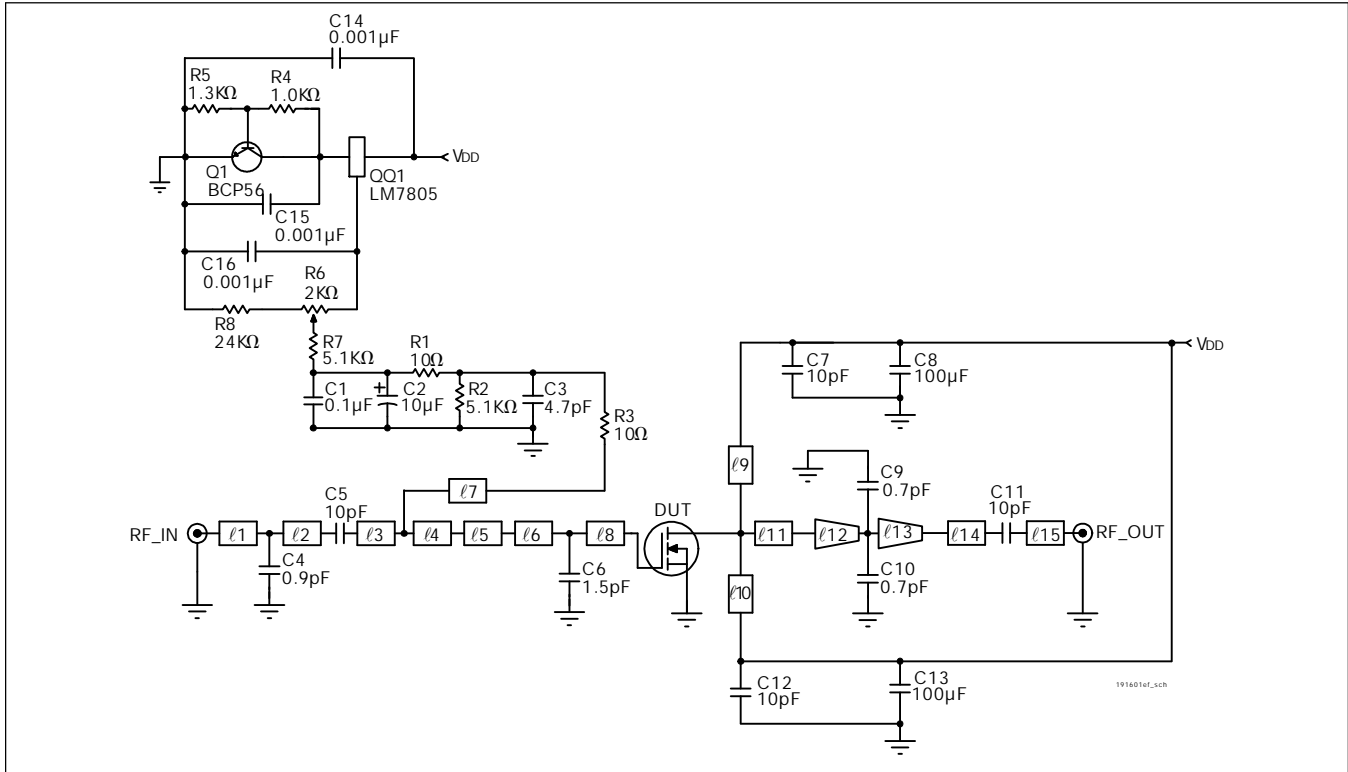
Broadband Circuit Impedance



Frequency MHz	Z Source Ω		Z Load Ω	
	R	jX	R	jX
1900	1.6	-2.2	1.5	1.9
1920	1.4	-1.9	1.6	2.0
1930	1.5	-1.8	1.6	2.1
1960	1.5	-1.7	1.6	2.2
1990	1.1	-1.5	1.5	2.3
2000	1.0	-1.4	1.4	2.4
2020	1.0	-1.0	1.4	2.5



Reference Circuit



Reference Circuit Schematic for $f = 1960 \text{ MHz}$

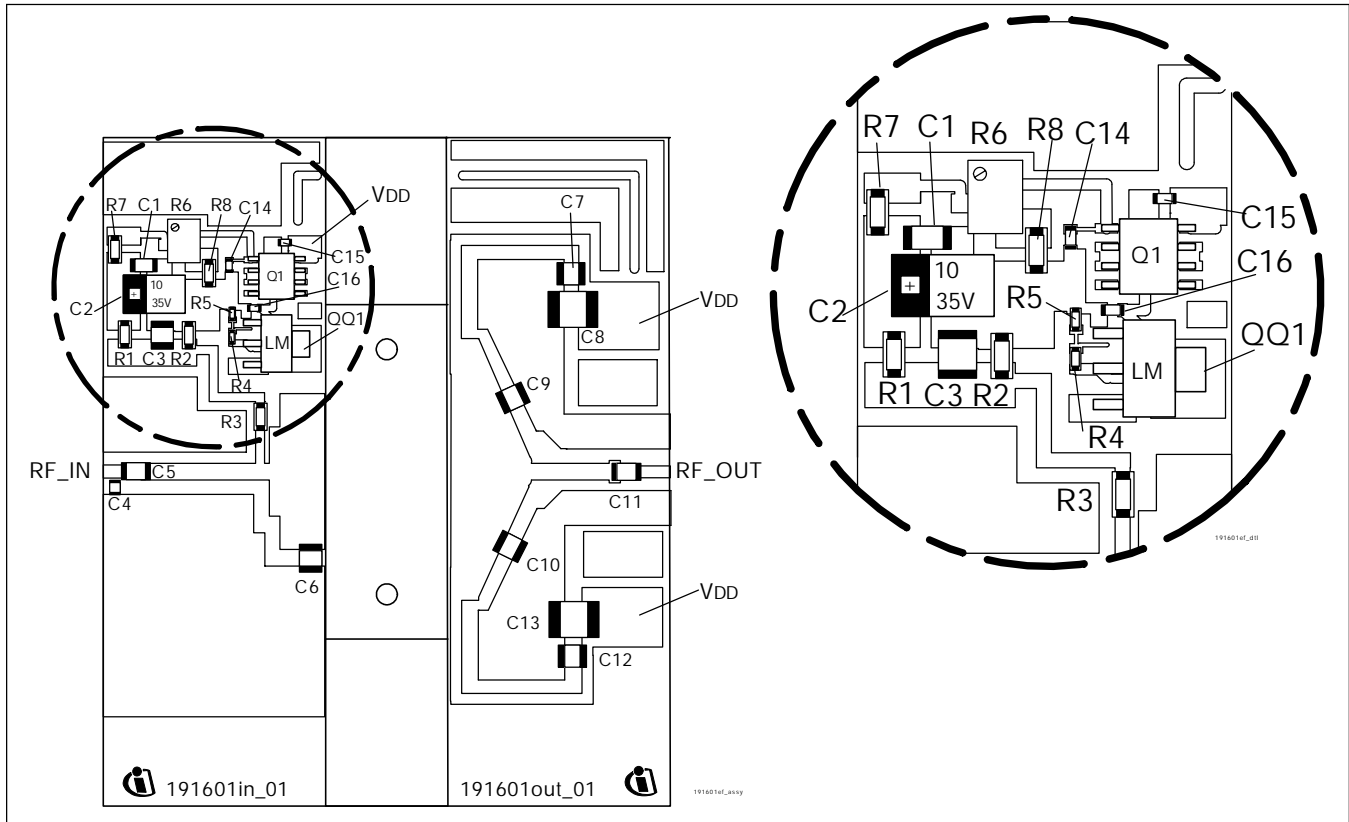
Circuit Assembly Information

DUT	PTF191601E or PTF191601F	LDMOS Transistor	
PCB	0.76 mm [.030"] thick, $\epsilon_r = 4.5$	Rogers TMM4	2 oz. copper

Microstrip	Electrical Characteristics at 1960 MHz*	Dimensions: L x W (mm)	Dimensions: L x W (in.)
l_1	0.017λ , 50.0Ω	1.40 x 1.30	0.055 x 0.051
l_2	0.017λ , 50.0Ω	1.40 x 1.30	0.055 x 0.051
l_3	0.152λ , 43.0Ω	12.47 x 1.85	0.491 x 0.073
l_4	0.137λ , 43.0Ω	1.12 x 1.85	0.044 x 0.073
l_5	0.016λ , 11.8Ω	1.24 x 10.16	0.049 x 0.400
l_6	0.069λ , 7.2Ω	5.13 x 17.75	0.202 x 0.699
l_7	0.059λ , 58.0Ω	4.98 x 1.07	0.196 x 0.042
l_8	0.017λ , 7.2Ω	1.40 x 17.75	0.055 x 0.699
l_9, l_{10}	0.357λ , 57.0Ω	30.05 x 1.12	1.183 x 0.044
l_{11}	0.030λ , 4.1Ω	2.41 x 29.74	0.095 x 1.171
l_{12} (taper)	0.085λ , $4.5 \Omega / 5.5 \Omega$	8.13 x 29.46 / 17.65	0.320 x 1.160 / 0.695
l_{13} (taper)	0.105λ , $5.5 \Omega / 43.0 \Omega$	7.37 x 17.65 / 1.85	0.290 x 0.695 / 0.073
l_{14}	0.112λ , 43.0Ω	9.14 x 1.85	0.360 x 0.073
l_{15}	0.048λ , 50.0Ω	3.96 x 1.30	0.156 x 0.051

*Electrical characteristics are rounded.

Reference Circuit (cont.)

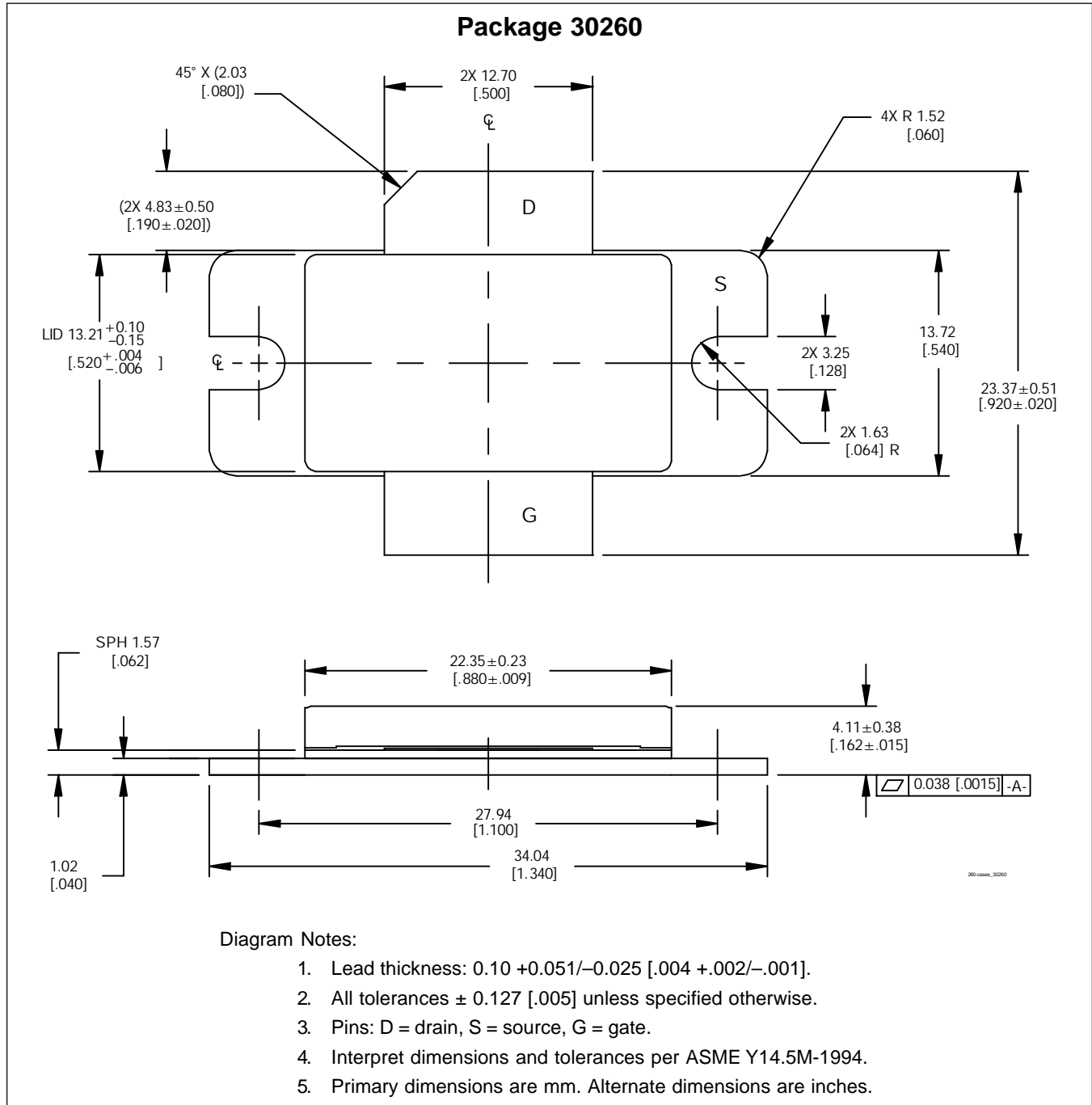


Reference circuit assembly (not to scale)¹

Component	Description	Manufacturer	P/N or Comment
C1	Capacitor, 0.1 μ F, 50V, 1206	Digi-Key	P4525-ND
C2	Capacitor, 10 μ F, 35V, Tant TE Series	Digi-Key	PCS6106TR-ND, SMD
C3	Capacitor, 4.7 pF	ATC	100B 4R7
C4	Capacitor, 0.9 pF	ATC	100A 0R9
C5, C7, C11, C12	Capacitor, 10 pF	ATC	100B 100
C6	Capacitor, 1.5 pF	ATC	100B 1R5
C8, C13	Capacitor, 1 μ F, 100 V	ATC	920C105KW
C9, C10	Capacitor, 0.7 pF	ATC	100B 0R7
C14, C15, C16	Capacitor, 0.001 μ F, 50 V, 0603	Digi-Key	PCC1772CT-ND
Q1	Transistor	Infineon	BCP56
QQ1	Voltage Regulator	National Semiconductor	LM7805
R1, R3	Resistor, 10 ohms, 1/4W, 1206	Digi-Key	P10ACT-ND
R2, R7	Resistor, 5.1 k-ohms, 1/4W, 1206	Digi-Key	P5.1KACT-ND
R4	Resistor, 100 ohms, 1/10W, 0603	Digi-Key	P1.0KGCT-ND
R5	Resistor, 300 ohms, 1/10W, 0603	Digi-Key	P1.3KGCT-ND
R6	Potentiometer, 2 k-ohms, 1/4W, 0603	Digi-Key	3224W-202ETR-ND
R8	Resistor, 24K ohms, 1/4W, 1206	Digi-Key	P24KECT-ND

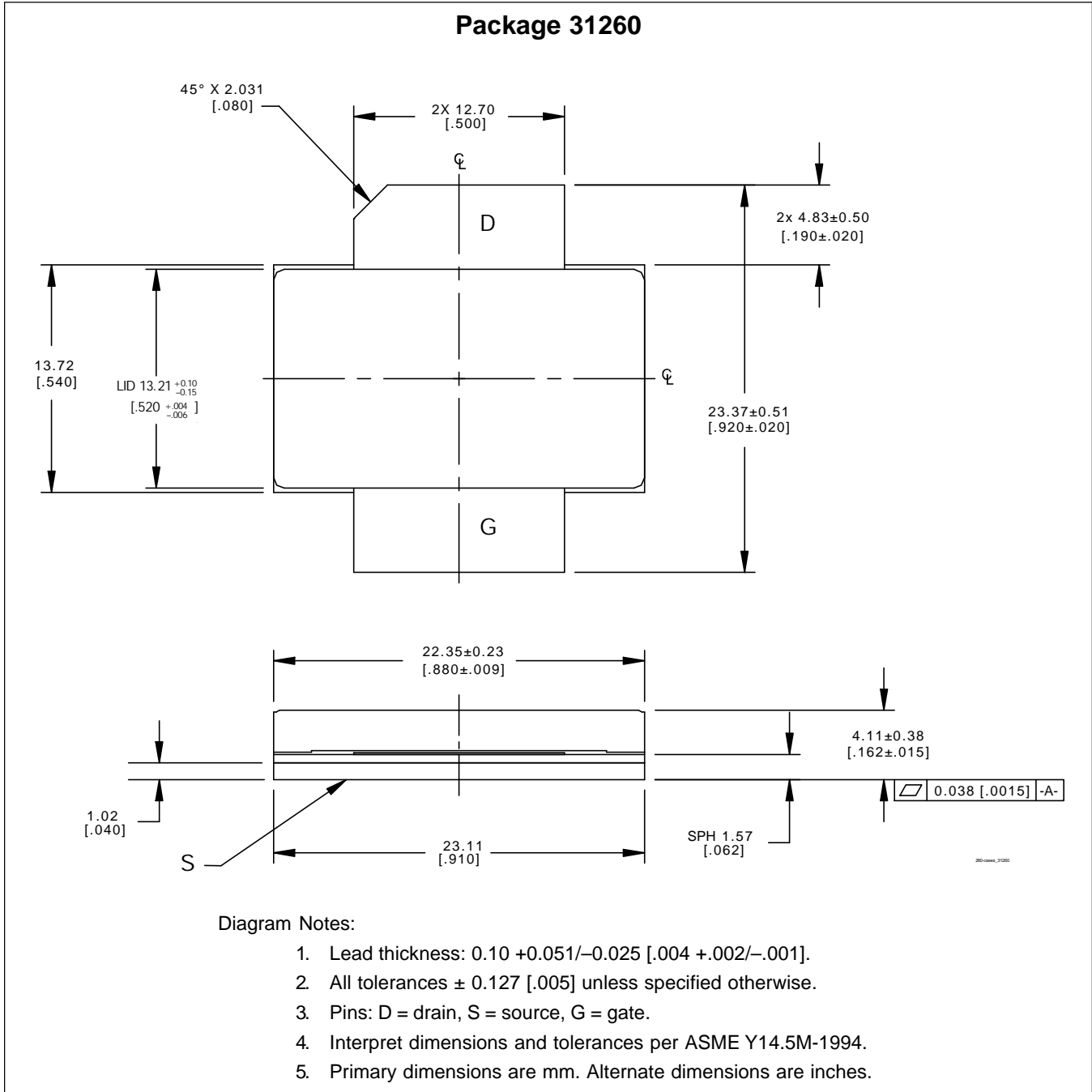
¹Gerber files for this circuit are available on request.

Package Outline Specifications



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Package Outline Specifications (cont.)



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Revision History:	2004-09-16	Data Sheet
Previous Version:	2004-07-20	Preliminary Data Sheet

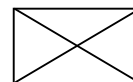
Page	Subjects (major changes since last revision)
	Add PTF191601F, update data, remove Preliminary status.

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