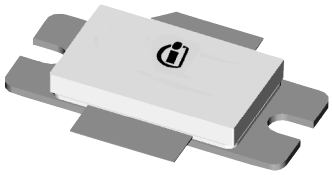
Thermally-Enhanced High Power RF LDMOS FETs
180 W, 2110 – 2170 MHz

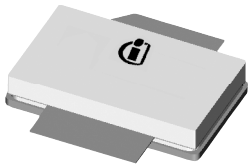
Description

The PTFA211801E and PTFA211801F are thermally-enhanced, 180-watt, internally matched *GOLDMOS* FETs intended for WCDMA applications. They are characaterized for single- and two-carrier WCDMA operation from 2110 to 2170 MHz. Thermally-enhanced packaging provides the coolest operation available. Full gold metallization ensures excellent device lifetime and reliability.

PTFA211801E
Package 30260

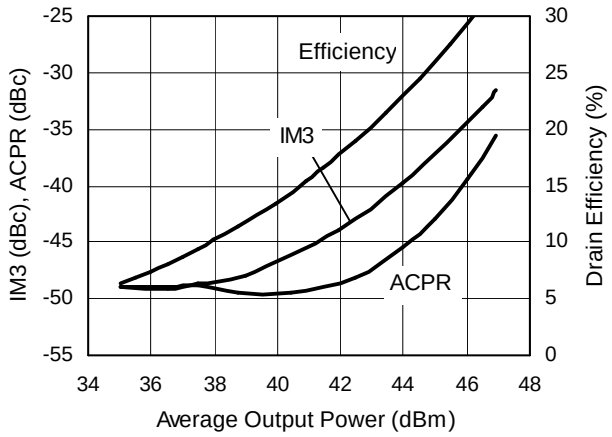


PTFA211801F
Package 31260



2-Carrier WCDMA Drive-up

V_{DD} = 28 V, I_{DQ} = 1.2 A, f = 2140 MHz, 3GPP WCDMA signal, P/A R = 8 dB, 10 MHz carrier spacing



Features

- Broadband internal matching
- Typical two-carrier WCDMA performance at 2140 MHz, 28 V
  - Average output power = 45.5 dBm
  - Linear Gain = 15.5 dB
  - Efficiency = 27.5%
  - Intermodulation distortion = –36 dBc
  - Adjacent channel power = –41 dBc
- Typical CW performance, 2170 MHz, 30 V
  - Output power at P–1dB = 180 W
  - Efficiency = 52%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 150 W (CW) output power

RF Characteristics

WCDMA Measurements (tested in Infineon test fixture)

V_{DD} = 28 V, I_{DQ} = 1.2 A, P_{OUT} = 35 W average
f_1 = 2135 MHz, f_2 = 2145 MHz, 3GPP signal, channel bandwidth = 3.84 MHz , peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	14.5	15.5	—	dB
Drain Efficiency	η_D	26	27.5	—	%
Intermodulation Distortion	IMD	—	–36	–34	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_{DQ} = 1.2 A, P_{OUT} = 150 W average, f = 2170 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain Compression	G_{comp}	—	0.5	1.0	dB

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

V_{DD} = 28 V, I_{DQ} = 1.2 A, P_{OUT} = 140 W PEP, f = 2140 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	15.5	—	dB
Drain Efficiency	η_D	—	38.5	—	%
Intermodulation Distortion	IMD	—	–28	—	dBc

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
Drain Leakage Current	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	$R_{DS(on)}$	—	0.05	—	Ω
Operating Gate Voltage	V_{DS} = 28 V, I_{DQ} = 1.2 A	V_{GS}	2.0	2.5	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
Total Device Dissipation	P_D	565	W
Above 25°C derate by		3.23	W/°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 150 W CW)	$R_{\theta JC}$	0.31	°C/W

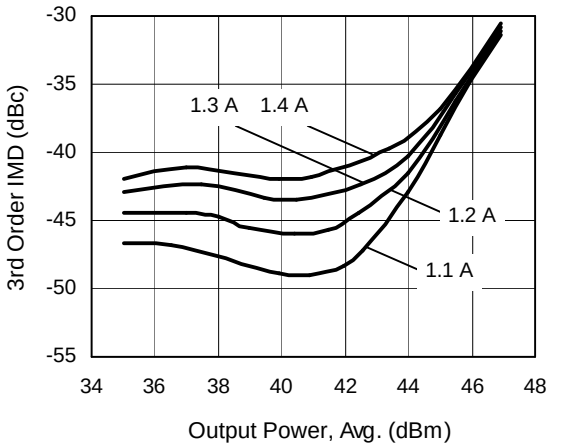
Ordering Information

Type	Package Outline	Package Description	Marking
PTFA211801E	30260	Thermally-enhanced slotted flange, single-ended	PTFA211801E
PTFA211801F	31260	Thermally-enhanced earless flange, single-ended	PTFA211801F

Typical Performance (data taken in a production test fixture)

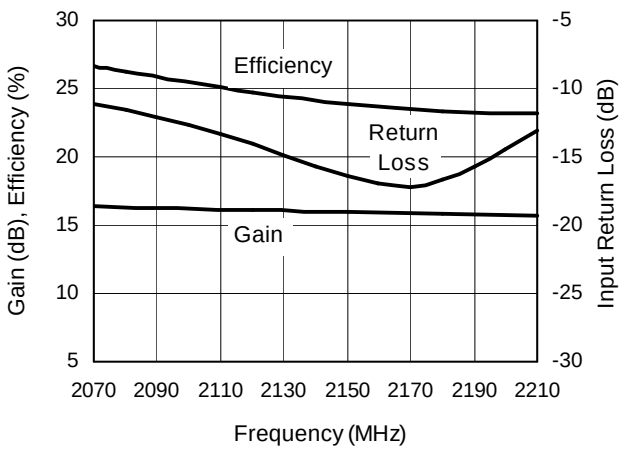
Two-carrier WCDMA at Various Biases

V_{DD} = 28 V, f = 2140 MHz, 3GPP WCDMA signal,
P/AR = 8 dB, 10 MHz carrier spacing, series show I_{DQ}



Broadband Performance

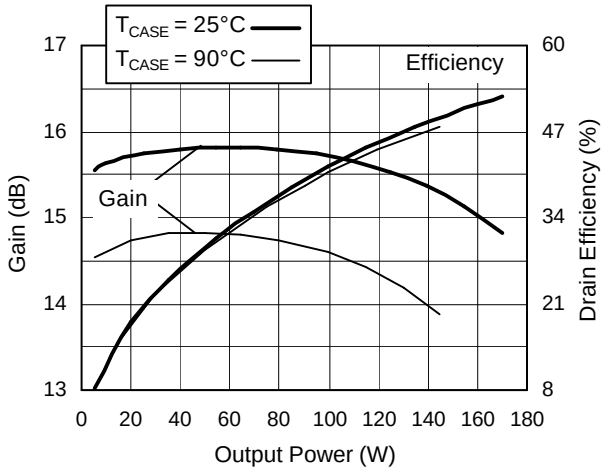
V_{DD} = 28 V, I_{DQ} = 1.2 A, P_{OUT} = 45.0 dBm CW



Typical Performance (cont.)

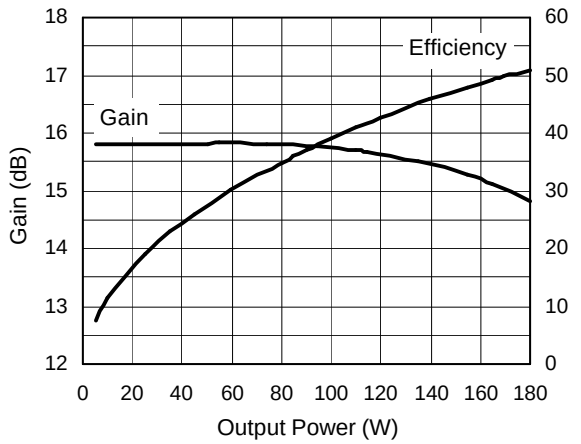
Power Sweep, CW Conditions

V_{DD} = 28 V, I_{DQ} = 1.2 A, f = 2170 MHz



Power Sweep, CW Conditions

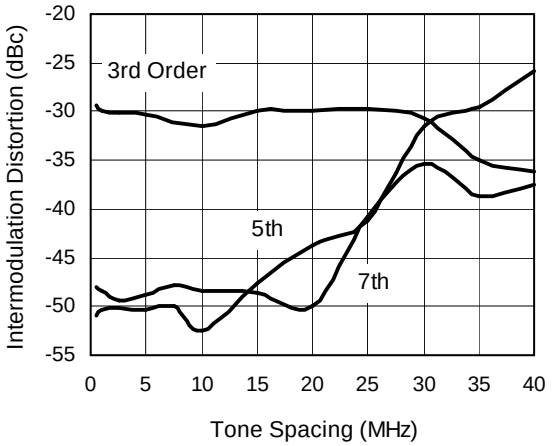
V_{DD} = 30 V, I_{DQ} = 1.2 A, f = 2170 MHz



Intermodulation Distortion Products vs. Tone Spacing

V_{DD} = 28 V I_{DQ} = 1.2 A, f = 2140 MHz,

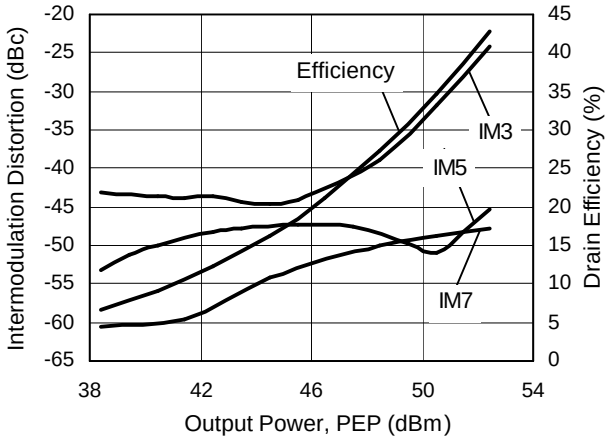
P_{OUT} = 51 dBm PEP



2-Tone Drive-up

V_{DD} = 28 V, I_{DQ} = 1.2 A,

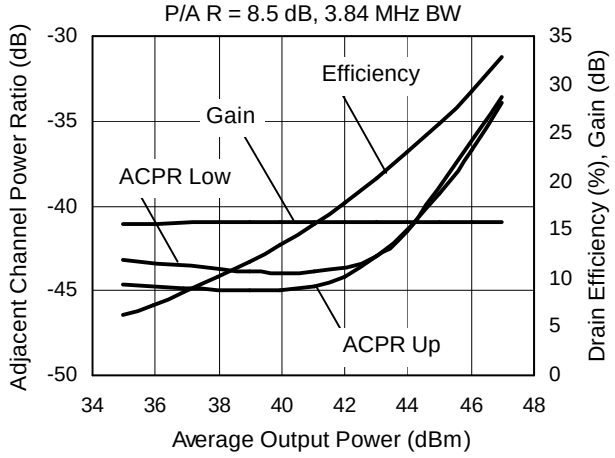
f = 2140 MHz, tone spacing = 1 MHz



Typical Performance (cont.)

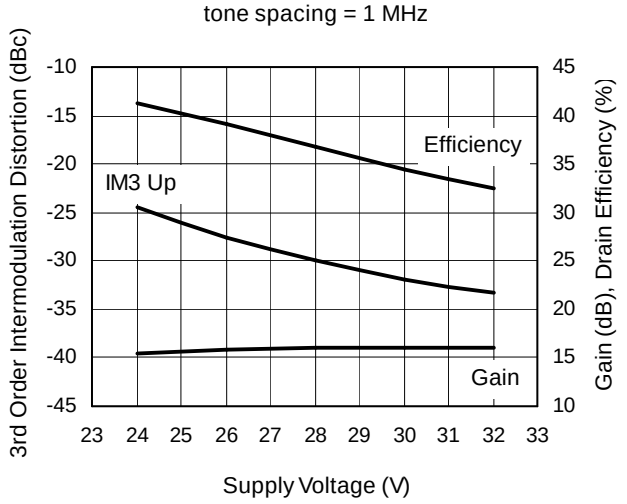
Single-carrier WCDMA Drive-up

V_{DD} = 28 V, I_{DQ} = 1.2 A, f = 2140 MHz,
3GPP WCDMA signal, TM1 w/16 DPCH, 67% clipping,
P/A R = 8.5 dB, 3.84 MHz BW



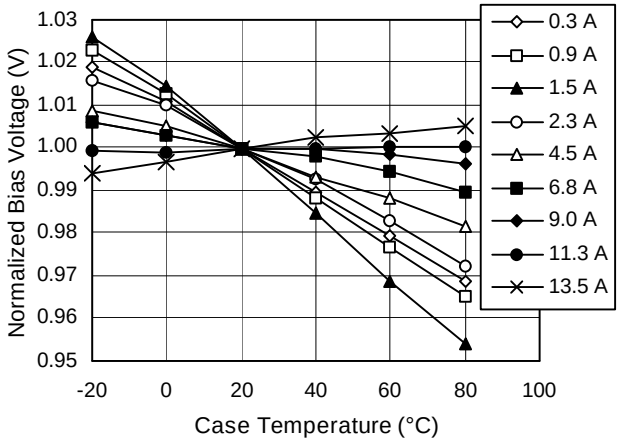
Voltage Sweep

I_{DQ} = 1.2 A, f = 2140 MHz, P_{OUT} = 51 dBm PEP,
tone spacing = 1 MHz

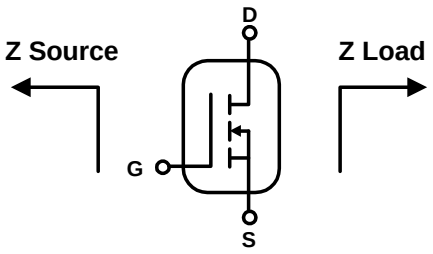


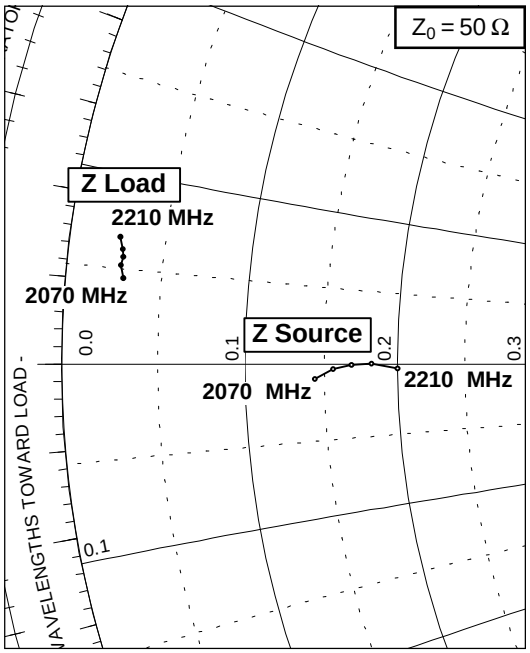
Bias Voltage vs. Temperature

Voltage normalized to typical gate voltage,
series show current



Broadband Circuit Impedance

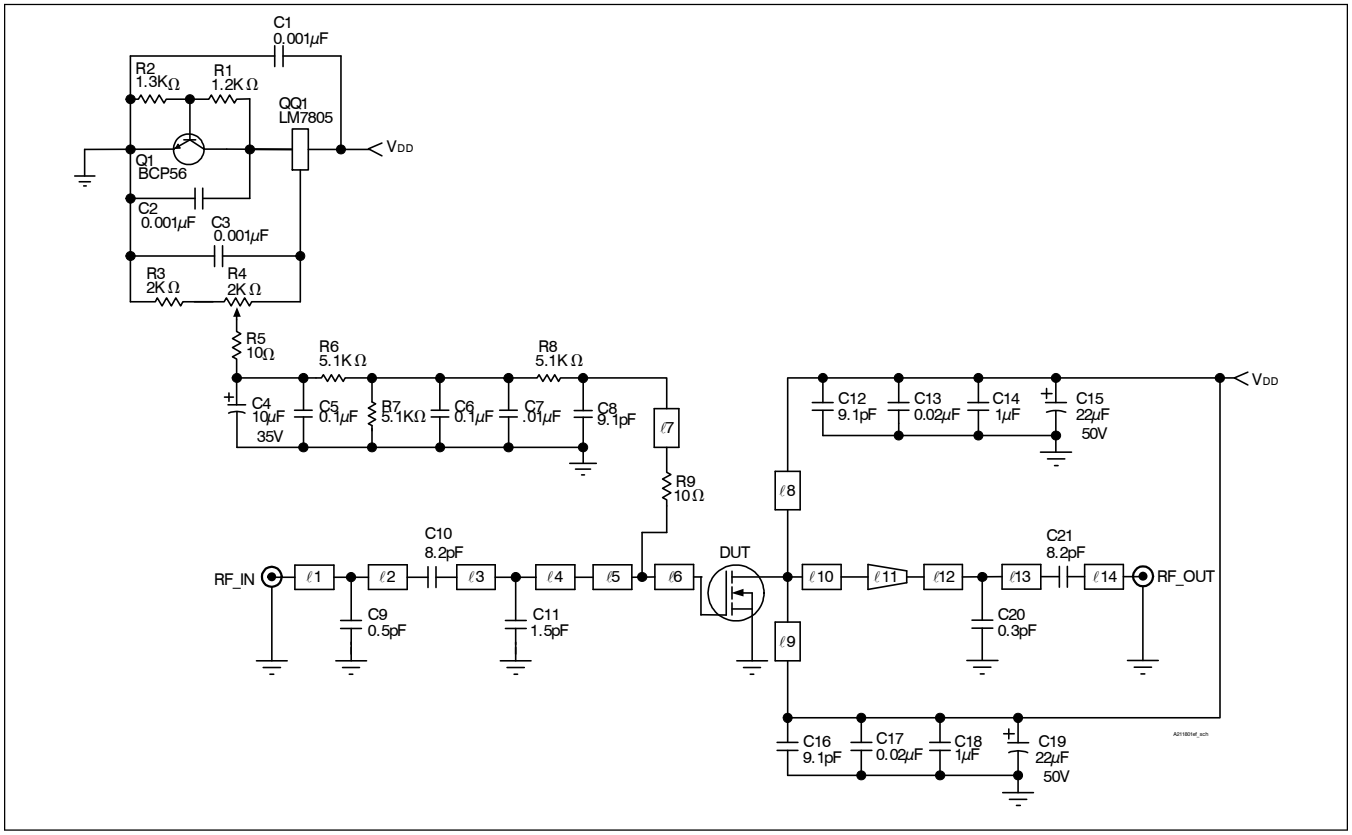




Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
2070	7.2	–0.5	1.5	2.3
2110	7.8	–0.2	1.4	2.6
2140	8.4	–0.0	1.4	2.8
2170	9.1	0.0	1.4	3.0
2210	10.0	–0.2	1.3	3.4

See next page for Reference Circuit information

Reference Circuit



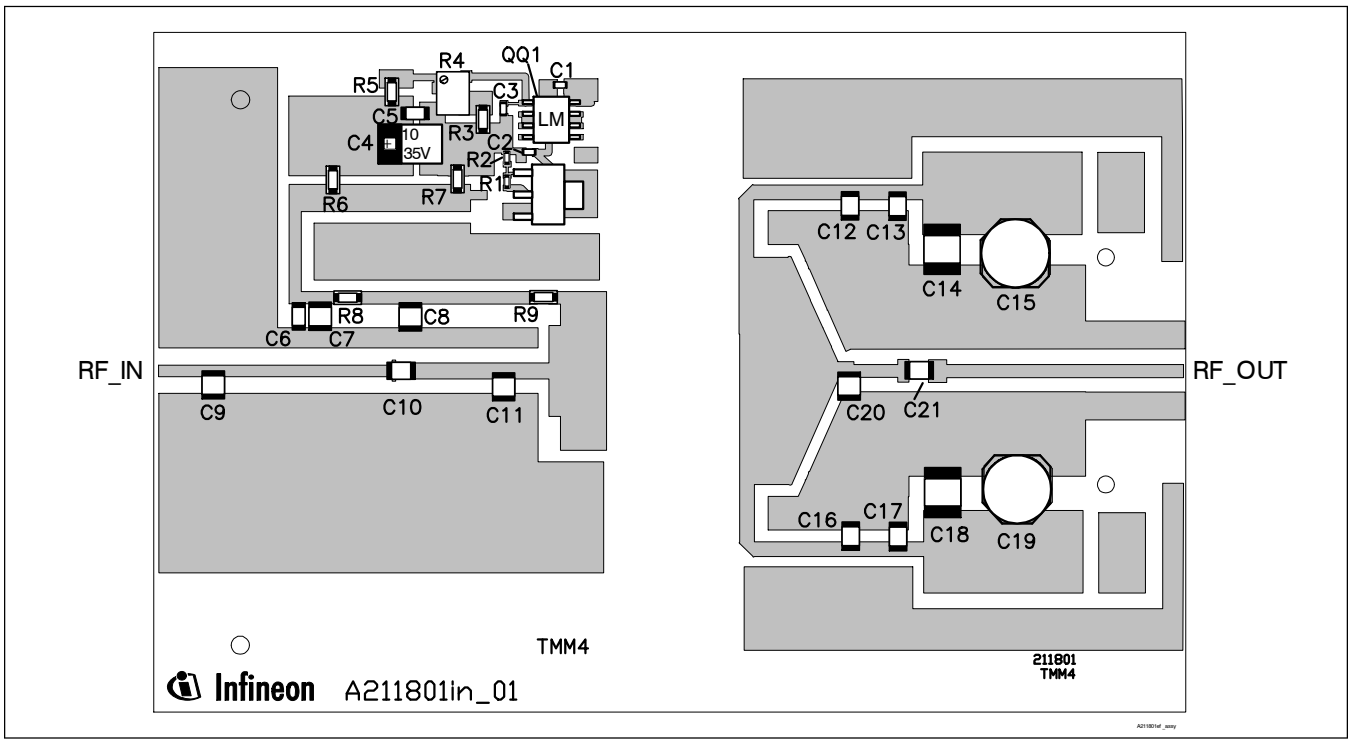
Reference Circuit Schematic for f = 2140 MHz

Circuit Assembly Information			
DUT	PTFA211801E or PTFA211801F	LDMOS Transistor	
PCB	0.76 mm [.030"] thick, ε_r = 4.5	Rogers TMM4	2 oz. copper

Microstrip	Electrical Characteristics at 2140 MHz*	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ1	0.097 λ, 50.0 Ω	7.37 x 1.40	0.290 x 0.055
ℓ2	0.267 λ, 50.0 Ω	19.86 x 1.40	0.782 x 0.055
ℓ3	0.136 λ, 42.0 Ω	10.24 x 1.85	0.403 x 0.073
ℓ4	0.087 λ, 42.0 Ω	6.50 x 1.85	0.256 x 0.073
ℓ5	0.018 λ, 11.4 Ω	1.24 x 10.24	0.049 x 0.403
ℓ6	0.077 λ, 6.9 Ω	5.23 x 17.78	0.206 x 0.700
ℓ7	0.207 λ, 48.0 Ω	15.70 x 1.50	0.618 x 0.059
ℓ8, ℓ9	0.256 λ, 45.0 Ω	19.30 x 1.65	0.760 x 0.065
ℓ10	0.087 λ, 5.0 Ω	5.84 x 25.40	0.230 x 1.000
ℓ11 (taper)	0.073 λ, 5.0 Ω / 40.0 Ω	5.59 x 25.40 / 1.98	0.220 x 1.000 / 0.078
ℓ12	0.019 λ, 40.0 Ω	1.45 x 1.98	0.057 x 0.078
ℓ13	0.087 λ, 50.0 Ω	6.65 x 1.40	0.262 x 0.055
ℓ14	0.403 λ, 50.0 Ω	30.73 x 1.40	1.210 x 0.055

**Electrical characteristics are rounded.*

Reference Circuit (cont.)



Reference Circuit[1] (not to scale)

Component	Description	Suggested Manufacturer	P/N or Comment
C1, C2, C3	Capacitor, 0.001 µF	Digi-Key	PCC1772CT-ND
C4	Tantalum capacitor, 10 µF, 35 V	Digi-Key	PCS6106TR-ND
C5, C6	Capacitor, 0.1 µF	Digi-Key	PCC104BCT
C7	Capacitor, 0.01 µF	ATC	200B103
C8, C12, C16	Ceramic capacitor, 9.1 pF	ATC	100B 9R1
C9	Ceramic capacitor, 0.5 pF	ATC	100B 0R5
C10, C21	Ceramic capacitor, 8.2 pF	ATC	100B 8R2
C11	Ceramic capacitor, 1.5 pF	ATC	100B 1R5
C13, C17	Ceramic capacitor, 0.02 µF	ATC	200B 203
C14, C18	Ceramic capacitor, 1 µF	ATC	920C105
C15, C19	Electrolytic capacitor, 22 µF, 50 V	Digi-Key	PCE3374CT-ND
C20	Ceramic capacitor, 0.3 pF	ATC	100B 0R3
Q1	Transistor	Infineon	BCP56
QQ1	Voltage regulator	National Semiconductor	LM7805
R1	Chip resistor, 1.2 k-ohms	Digi-Key	P1.2KGCT-ND
R2	Chip resistor, 1.3 k-ohms	Digi-Key	P1.3KGCT-ND
R3	Chip resistor, 2 k-ohms	Digi-Key	P2KECT-ND
R4	Potentiometer 2 k-ohms	Digi-Key	3224W-202ETR-ND
R5, R9	Chip resistor, 10 ohms	Digi-Key	P10ECT-ND
R6, R7, R8	Chip resistor, 5.1 k-ohms	Digi-Key	P5.1KECT-ND

[1]*Gerber Files for this circuit available on request*

Package Outline Specifications

Package 30260

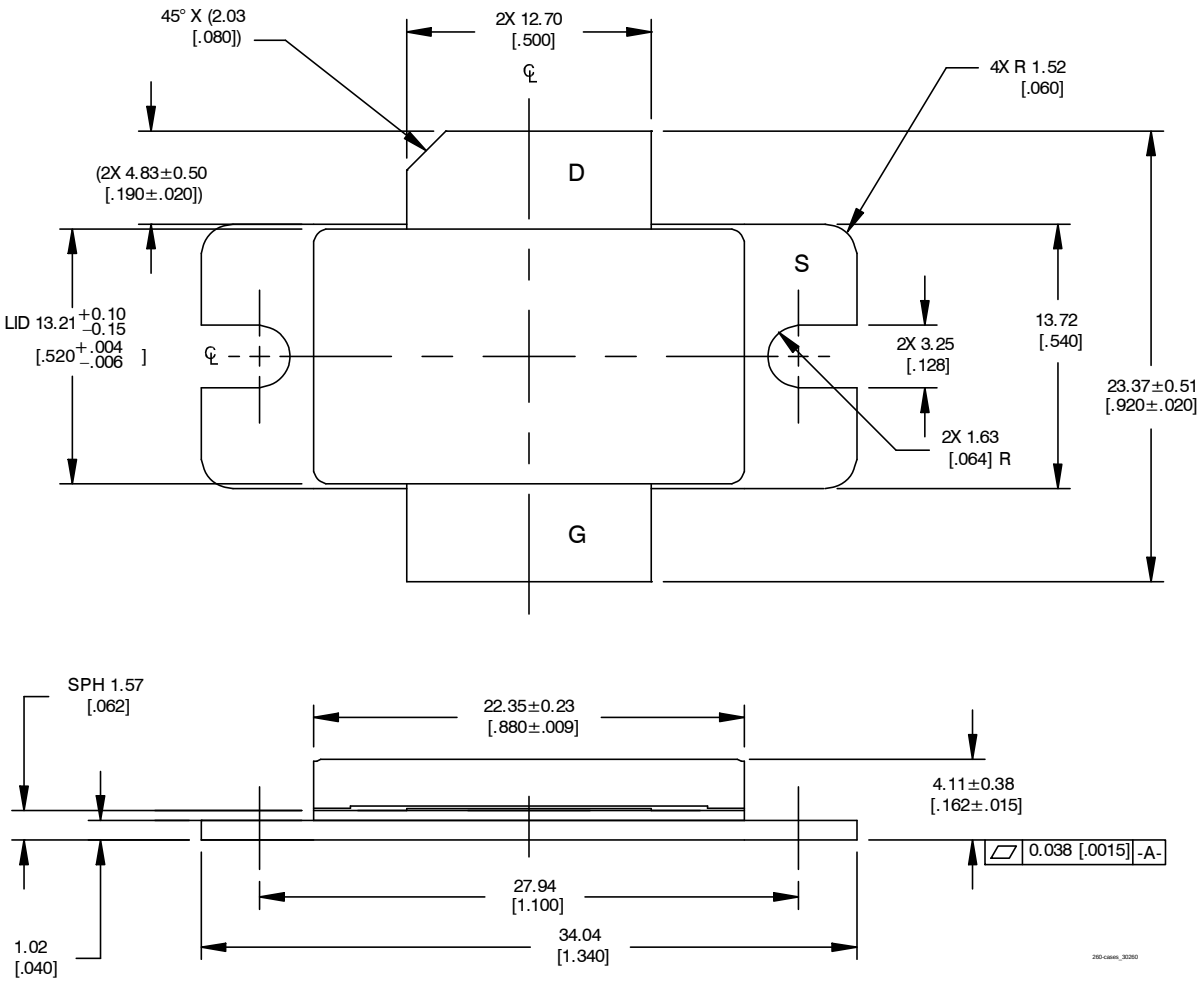


Diagram Notes:

1. Lead thickness: 0.10 +0.051/–0.025 [.004 +.002/–.001].
2. All tolerances ± 0.127 [.005] unless specified otherwise.
3. Pins: D = drain, S = source, G = gate.
4. Interpret dimensions and tolerances per ASME Y14.5M-1994.
5. Primary dimensions are mm. Alternate dimensions are inches.

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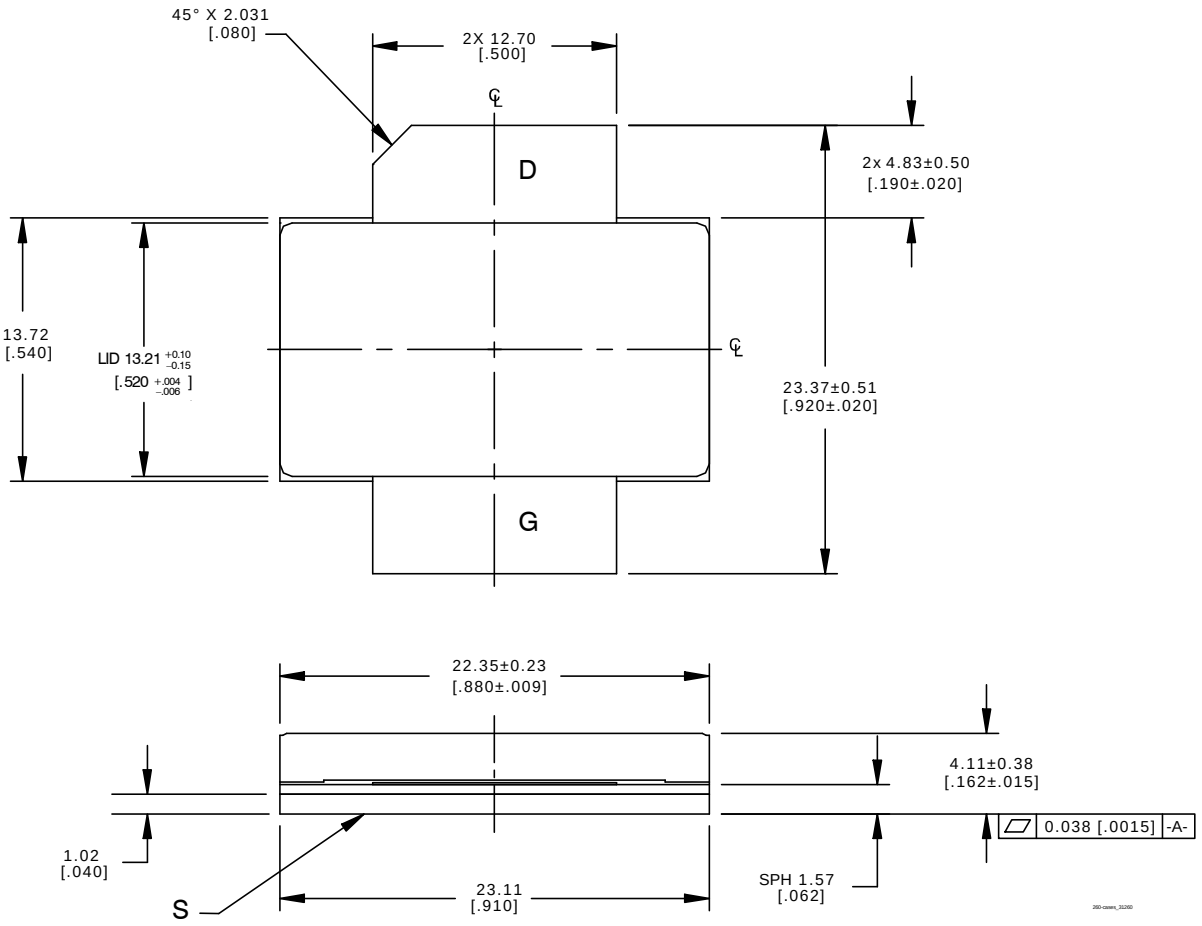
Package Outline Specifications (cont.)

Package 31260



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Revision History:	**2005-06-10, Rev. 03**	Data Sheet
Previous Version:	2005-05-02, Data Sheet	

Page	Subjects (major changes since last revision)
4	Add Power Sweep graph for 30 V

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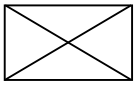

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