PTF140451E
PTF140451F

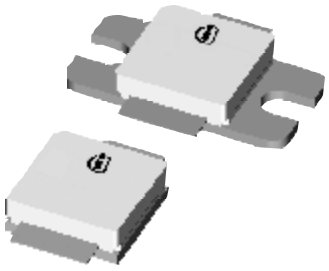
Thermally-Enhanced High Power RF LDMOS FETs
45 W, 1450 – 1550 MHz

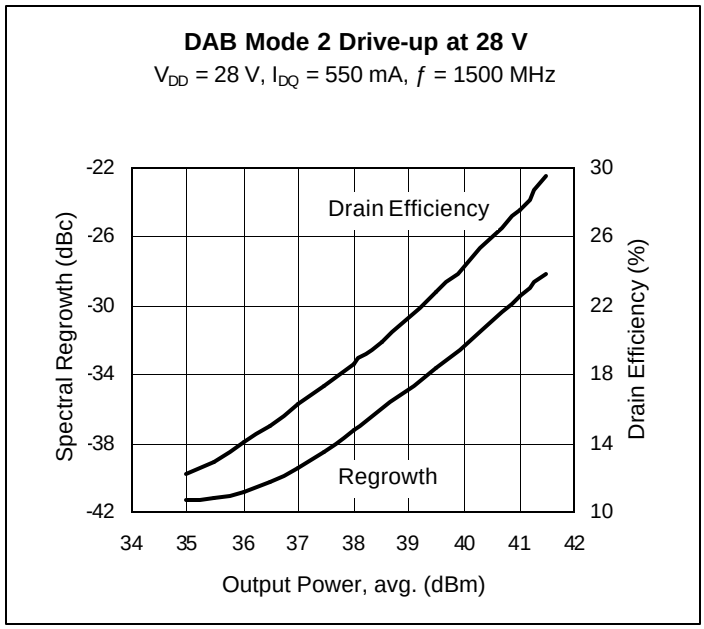
Description

The PTF140451E and PTF140451F are 45-watt, *GOLDMOS*® FETs intended for DAB applications. These devices are characterized for Digital Audio Broadcast operation in the 1450 to 1550 MHz band. Thermally-enhanced packages provide the coolest operation available. Full gold metallization ensures excellent device lifetime and reliability.

PTF140451E
Package 30265

PTF140451F
Package 31265





Features

- Thermally-enhanced packages
- Broadband internal matching
- Typical DAB Mode 2 performance at 1500 MHz, 28 V
  - Average output power = 12.5 W
  - Efficiency = 27.5%
  - Spectral regrowth = –30 dBc
  - Δ 975 kHz f_C
- Typical DAB Mode 2 performance at 1500 MHz, 32 V
  - Average output power = 15.5 W
  - Efficiency = 27%
  - Spectral regrowth = –30 dBc
  - Δ 975 kHz f_C
- Typical CW performance, 1500 MHz, 28 V
  - Output power = 60 W
  - Linear gain = 18 dB
  - Efficiency = 54% at P–1dB
- Integrated ESD protection: Human Body Model, Class 1 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR at 28 V, 45 W (CW) output power
- Pb-free and RoHS compliant

RF Characteristics

DAB Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)
V_{DD} = 28 V, I_{DQ} = 550 mA, P_{OUT} = 12.5 W_{AVG}, f = 1500 MHz, DAB Mode 2, Δ 975 kHz f_C

Characteristic	Symbol	Min	Typ	Max	Unit
Spectral Regrowth	RGTH	—	–30	—	dBc
Gain	G_{ps}	—	18	—	dB
Drain Efficiency	η_D	—	27.5	—	%

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

Two-Tone Measurements (tested in Infineon test fixture)

V_{DD} = 28 V, I_{DQ} = 550 mA, P_{OUT} = 45 W_{PEP}, f = 1500 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17	18	—	dB
Drain Efficiency	η_D	35	36.5	—	%
Intermodulation Distortion	IMD	—	–32	–30	dBc

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 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 V	$R_{DS(on)}$	—	0.02	—	Ω
Operating Gate Voltage	V_{DS} = 28 V, I_{DQ} = 550 mA	V_{GS}	2.5	3.3	4.0	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	175	W
Above 25°C derate by		1.0	W/°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C)	$R_{\theta JC}$	1.0	°C/W

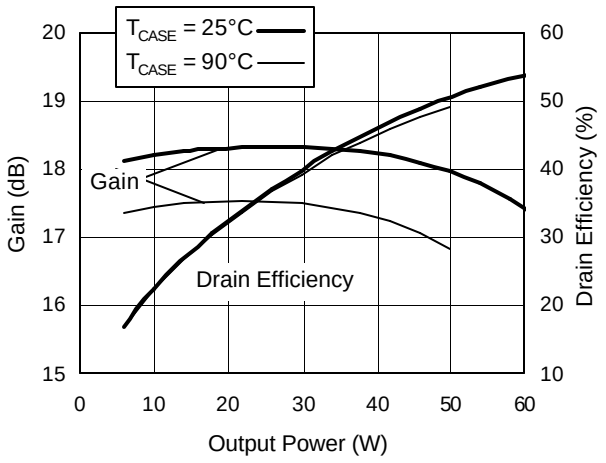
Ordering Information

Type	Package Outline	Package Description	Marking
PTF140451E	30265	Thermally-enhanced slotted flange, single-ended	PTF140451E
PTF140451F	31265	Thermally-enhanced earless flange, single-ended	PTF140451F

Typical Performance

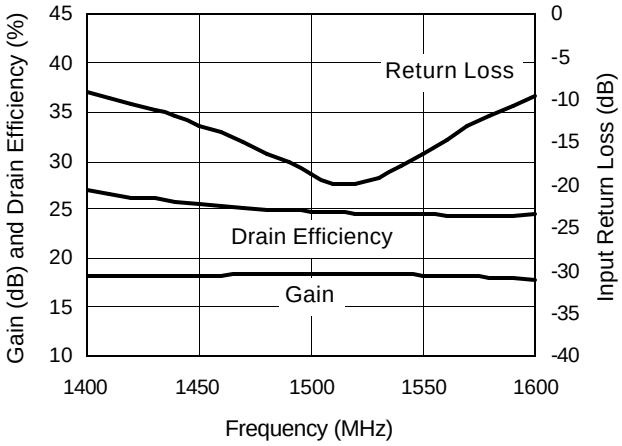
CW Power Sweep (P–1dB)

V_{DD} = 28 V, I_{DQ} = 550 mA, f = 1500 MHz



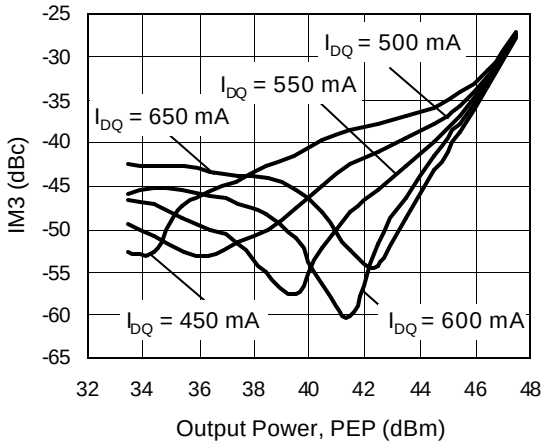
CW Sweep in a Broadband Test Fixture

V_{DD} = 28 V, I_{DQ} = 550 mA, P_{OUT} (CW) = 12 W



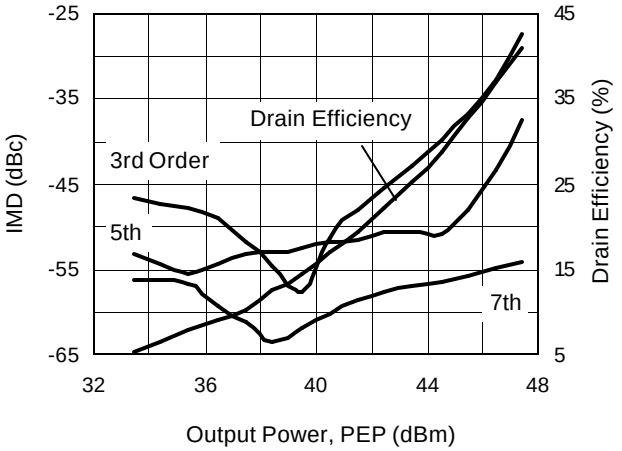
3rd Order Intermodulation Distortion vs. Output Power for Various I_{DQ}

V_{DD} = 28, f = 1500 MHz, tone spacing = 1 MHz

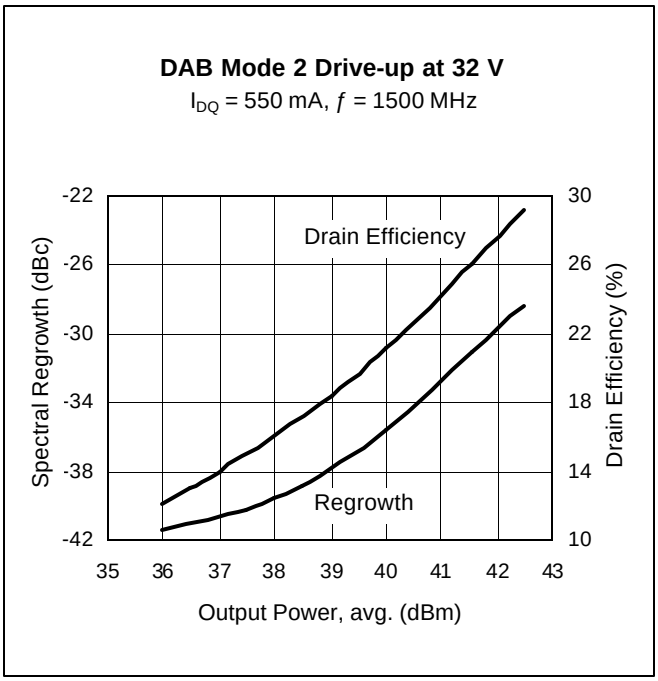


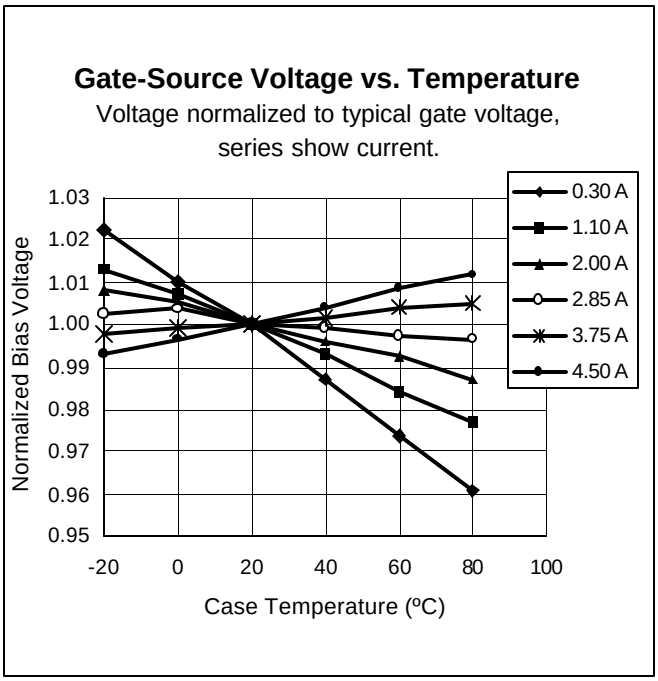
2-Tone Drive-up at Optimum Current

V_{DD} = 28 V, I_{DQ} = 550 mA, f = 1500 MHz,
tone spacing = 1 MHz

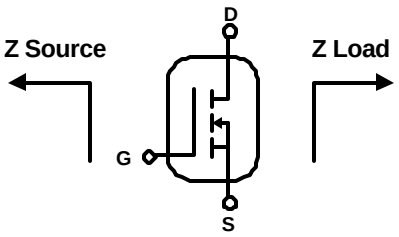


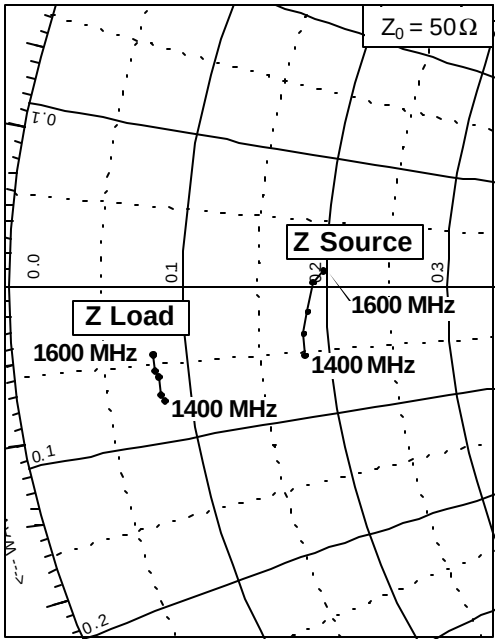
Typical Performance (cont.)





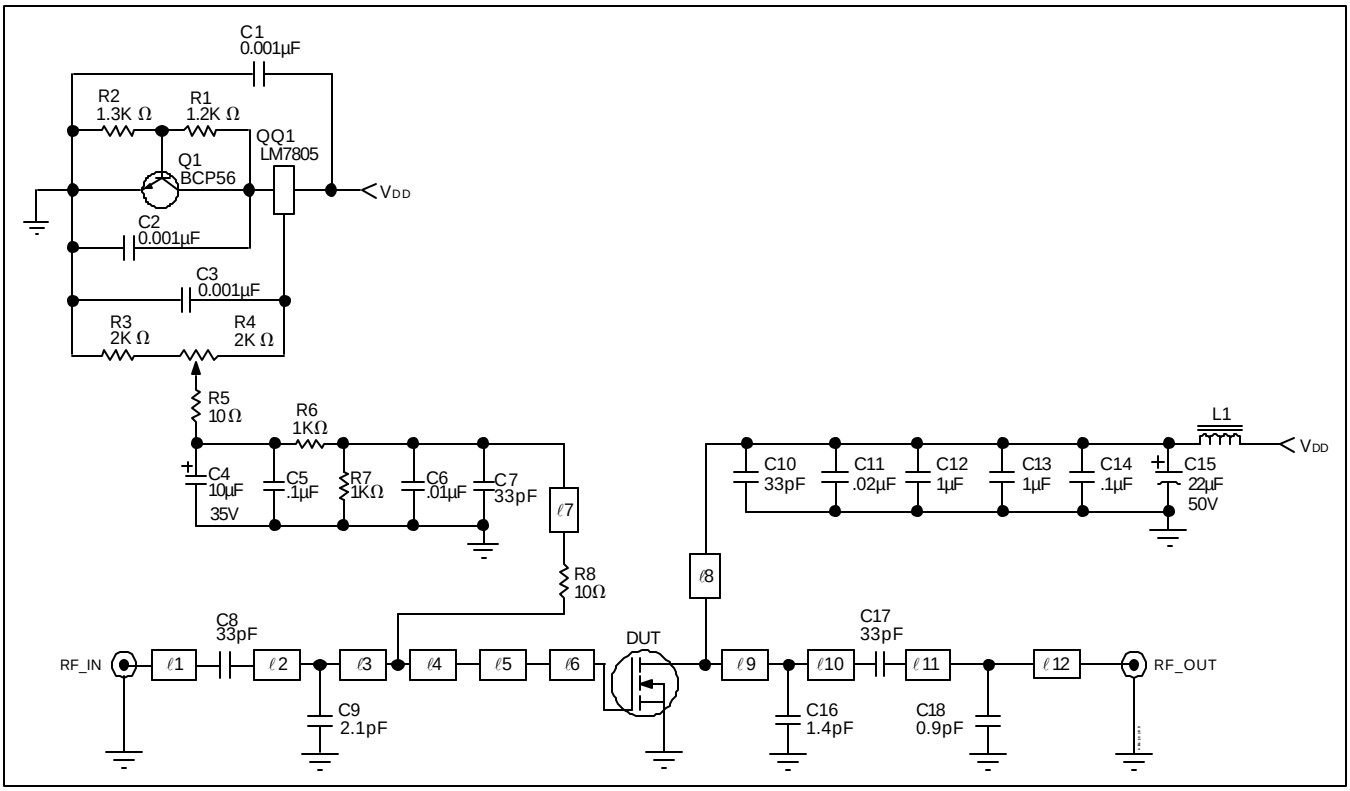
Broadband Circuit Impedance





Frequency	Z Source W		Z Load W	
MHz	R	jX	R	jX
1400	9.1	–2.65	4.20	–3.70
1450	9.1	–1.81	4.10	–3.50
1500	9.3	–0.98	4.10	–2.90
1550	9.5	0.15	4.00	–2.70
1600	9.9	0.60	4.00	–2.20

Reference Circuit



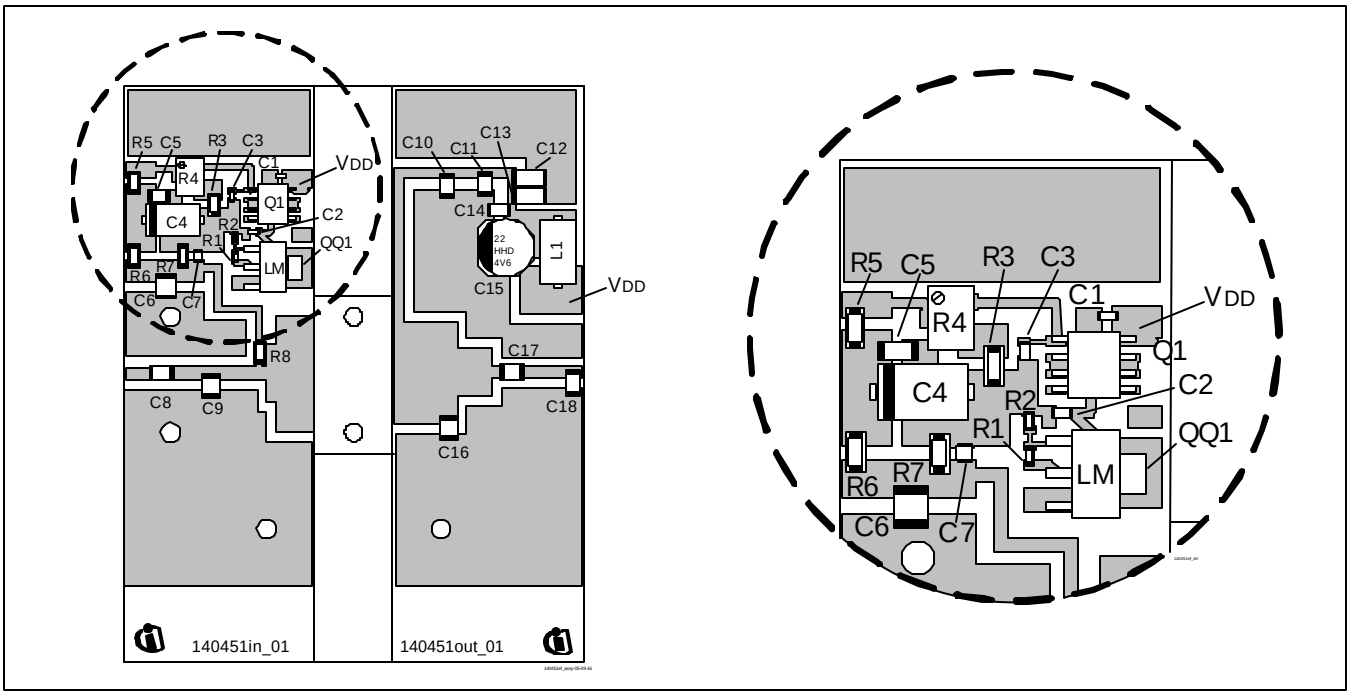
Reference circuit schematic for 1500 MHz

Circuit Assembly Information			
DUT	PTF140451E or PTF140451F	LDMOS Transistor	
PCB	0.76 mm [0.030"] thick, $\varepsilon_r = 4.5$	TMM4	2 oz. copper, both sides

Microstrip	Electrical Characteristics at 1500 MHz[1]	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ1	0.035 λ, 50.0Ω	3.81 x 1.47	0.150 x 0.058
ℓ2	0.043 λ, 41.0Ω	4.60 x 1.93	0.181 x 0.076
ℓ3	0.064 λ, 41.0Ω	6.91 x 1.93	0.272 x 0.076
ℓ4	0.010 λ, 41.0Ω	1.04 x 1.93	0.041 x 0.076
ℓ5	0.012 λ, 14.7Ω	1.19 x 7.62	0.047 x 0.300
ℓ6	0.050 λ, 8.0Ω	4.90 x 15.24	0.193 x 0.600
ℓ7	0.150 λ, 60.0Ω	16.69 x 0.97	0.657 x 0.038
ℓ8	0.246 λ, 54.0Ω	26.85 x 1.24	1.057 x 0.049
ℓ9	0.087 λ, 9.0Ω	8.48 x 13.46	0.334 x 0.530
ℓ10	0.045 λ, 17.0Ω	4.57 x 6.25	0.180 x 0.246
ℓ11	0.083 λ, 50.0Ω	9.02 x 1.52	0.355 x 0.060
ℓ12	0.0113 λ, 50.0Ω	1.22 x 1.52	0.048 x 0.060

[1]Electrical Characteristics are rounded.

Reference Circuit (cont.)



*Reference circuit assembly diagram (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	366-1655-2-ND
C5, C14	Capacitor, 0.1 µF	Digi-Key	PCC104BCT-ND
C6	Capacitor, 0.01 µF	ATC	200B 103
C7	Capacitor, 33 pF	ATC	100A 330
C8, C10, C17	Ceramic capacitor, 33 pF	ATC	100B 330
C9	Ceramic capacitor, 2.1 pF	ATC	100B 2R1
C11	Capacitor, 0.02 µF	ATC	200B 203
C12, C13	Ceramic capacitor, 1.0 µF	Digi-Key	445-1411-1-ND
C15	Electrolytic capacitor, 22 µF, 50 V	Digi-Key	PCE3374CT-ND
C16	Ceramic capacitor, 1.4 pF	ATC	100B 1R4
C18	Ceramic capacitor, 0.9 pF	ATC	100B 0R9
L1	Ferrite, 8.9 mm	Elna Magnetics	BDS 4.6/3/8.9-4S2
Q1	Transistor	Infineon Technologies	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, R8	Chip resistor, 10 ohms	Digi-Key	P10ECT-ND
R6, R7	Chip resistor, 1 k-ohms	Digi-Key	P1KECT-ND

**Gerber files for this circuit are available on request.*

Package Outline Specifications

Package 30265

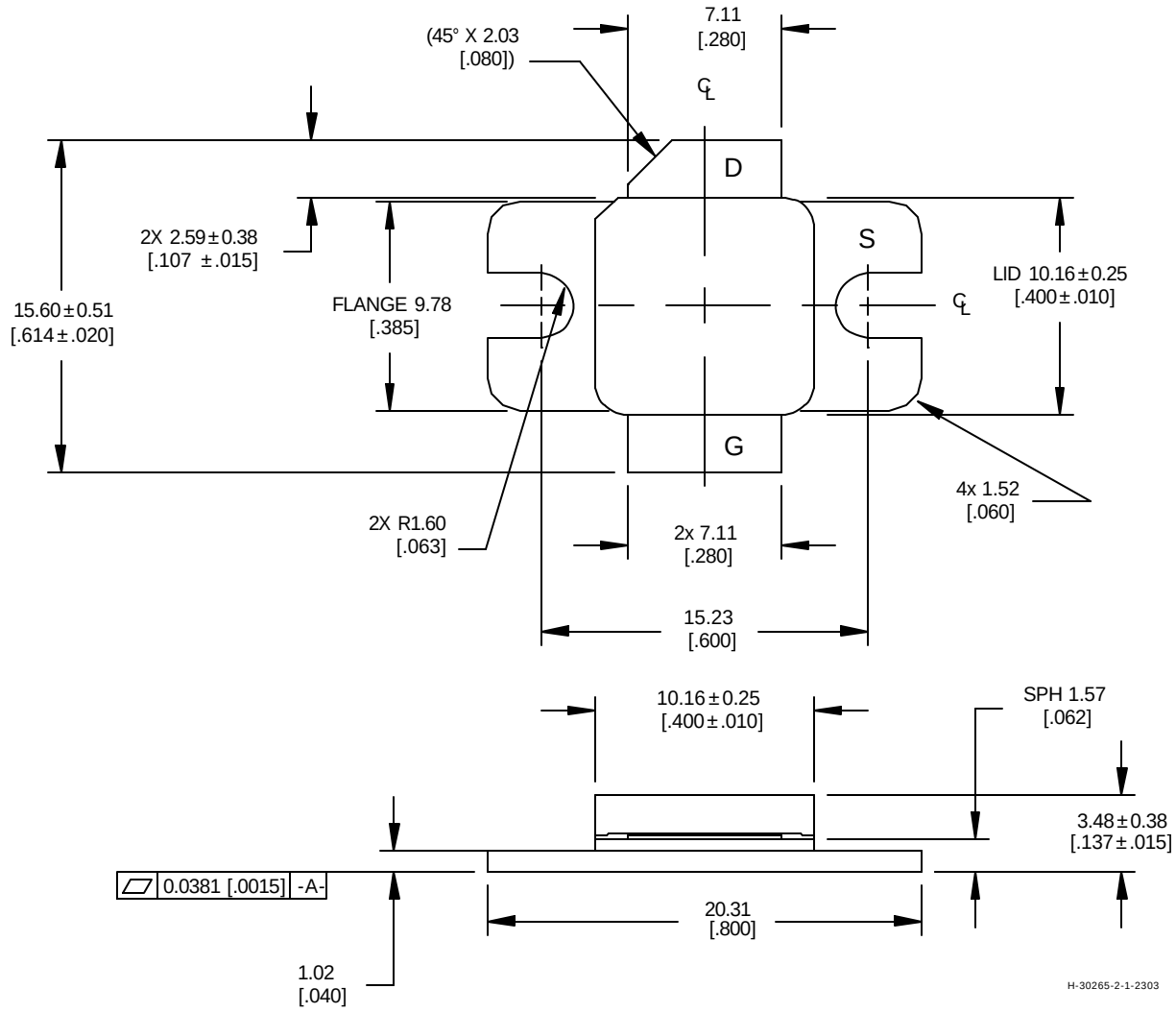


Diagram Notes:

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.
6. Gold plating thickness:
   S - flange: 2.54 micron [100 microinch] (min)
   D, G - leads: 1.14 micron ± 0.38 micron [45 microinch ± 15 microinch]

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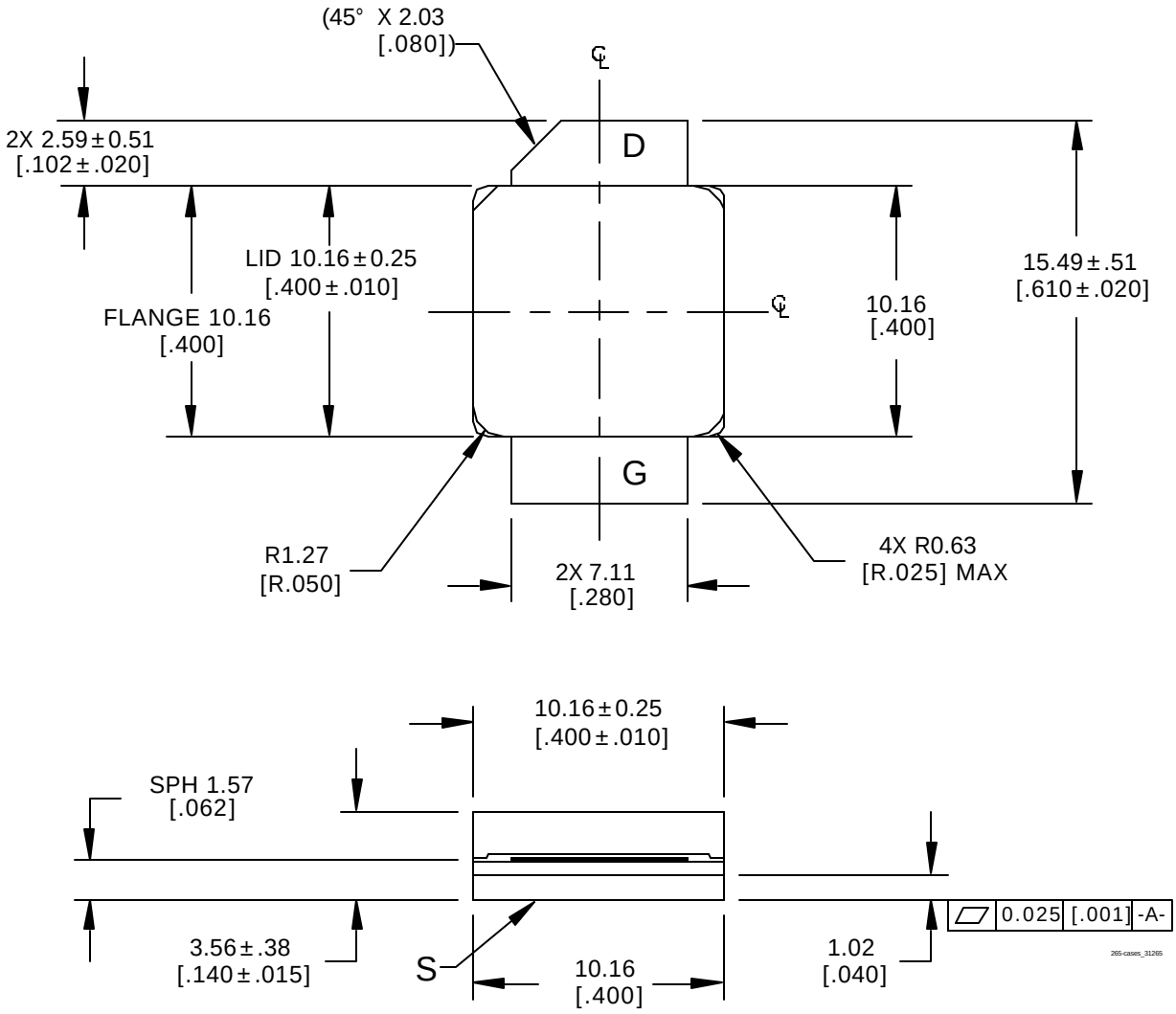
Package Outline Specifications (cont.)

Package 31265



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Revision History:	2005-11-01	Data Sheet
Previous Version:	2005-09-07, Preliminary Data Sheet	

Page	Subjects (major changes since last revision)
All	Add graphs and circuit information. Remove Preliminary designation.

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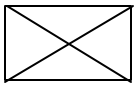

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