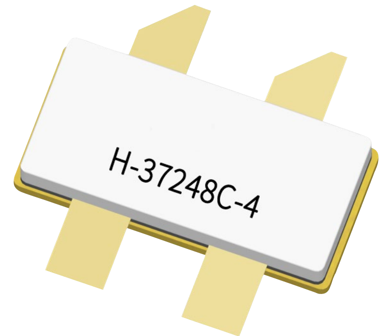
GTRA362802FC

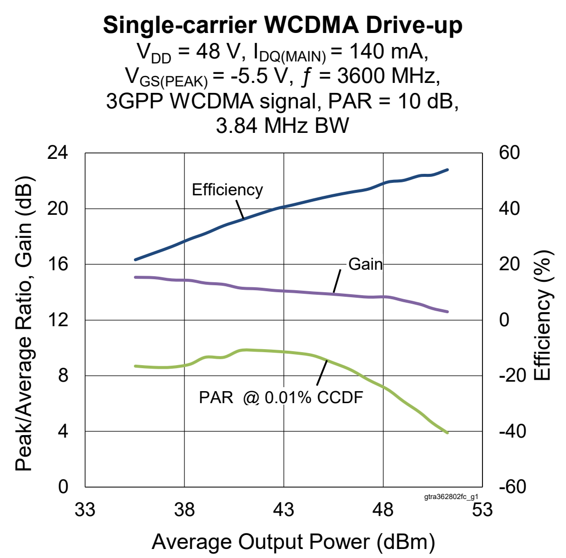
Thermally-Enhanced High Power RF GaN on SiC HEMT
280 W, 48 V, 3400 – 3600 MHz



Package Types: H-37248C-4
PN: GTRA362802FC

Description

The GTRA362802FC is a 280-watt (P_{3dB}) GaN on SiC high electron mobility transistor (HEMT) designed for use in multi-standard cellular power amplifier applications. It features input matching, high efficiency, and a thermally-enhanced package with earless flange.



Features

- GaN on SiC HEMT technology
- Input matched
- Asymmetrical Doherty design
  - Main: P_{3dB} = 120 W Typ
  - Peak: P_{3dB} = 180 W Typ
- Typical Pulsed CW performance, 3400 – 3600 MHz, 48 V, combined outputs, 10 µs pulse width, 10% duty cycle
  - Output power at P_{3dB} = 280 W
  - Drain Efficiency = 60%
  - Gain = 15 dB
- Capable of handling 10:1 VSWR @48 V, 44 W (CW) output power
- Human Body Model Class 1A (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

Single-carrier WCDMA Specifications (tested in the Doherty production test fixture)
V_{DD} = 48 V, I_{DQ} = 140 mA, P_{OUT} = 44 W avg, $V_{GS(PEAK)}$ = V_{GS} @I_{DQ} = 200 mA – 2.2 V, ƒ = 3600 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Linear Gain	G_{ps}	12	13.5	—	dB
Drain Efficiency	η_D	42.5	45.5	—	%
Adjacent Channel Power Ratio	ACPR	—	–29.5	–26.5	dBc
Output PAR @ 0.01% CCDF	OPAR	5.4	6.5	—	dB

Note:
All published data at T_{CASE} = 25°C unless otherwise indicated
ESD: Electrostatic discharge sensitive device—observe handling precautions!

RoHS compliant

DC Characteristics

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain-source Breakdown Voltage (main)	$V_{BR(DSS)}$	150	—	—	V	V_{GS} = -8 V, I_D = 10 mA
Drain-source Breakdown Voltage (peak)						
Drain-source Leakage Current	I_{DSS}	—	—	7	mA	V_{GS} = -8 V, V_{DS} = 10 V
Gate Threshold Voltage (main)	$V_{GS(th)}$	–3.8	–3	–2.3	V	V_{DS} = 10 V, I_D = 14.4 mA
Gate Threshold Voltage (peak)						V_{DS} = 10 V, I_D = 21.6 mA

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain Operating Voltage	V_{DD}	0	—	50	V	
Gate Quiescent Voltage	$V_{GS(Q)}$	-3.5	–3	-2.4		V_{DS} =48 V, I_D = 140 mA

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DSS}	125	V
Gate-source Voltage	V_{GS}	–10 to +2	
Operating Voltage	V_{DD}	55	
Gate Current (main)	I_G	14.4	mA
Gate Current (peak)		21.6	
Drain Current (main)	I_D	5.4	A
Drain Current (peak)		8.1	
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	

Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.

Thermal Characteristics

Characteristics	Symbol	Value	Unit	Conditions
Thermal Resistance (main)	$R_{\theta JC}$	2.2	°C/W	T_{CASE} = 70 °C, 67 W DC
Thermal Resistance (peak)		1.5		T_{CASE} = 70 °C, 100 W DC

Ordering Information

Type and Version	Order Code	Package Description	Shipping
GTRA362802FC V1 R0	GTRA362802FC-V1-R0	H-37248C-4, earless flange	Tape & Reel, 50 pcs
GTRA362802FC V1 R2	GTRA362802FC-V1-R2	H-37248C-4, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in production test fixture)

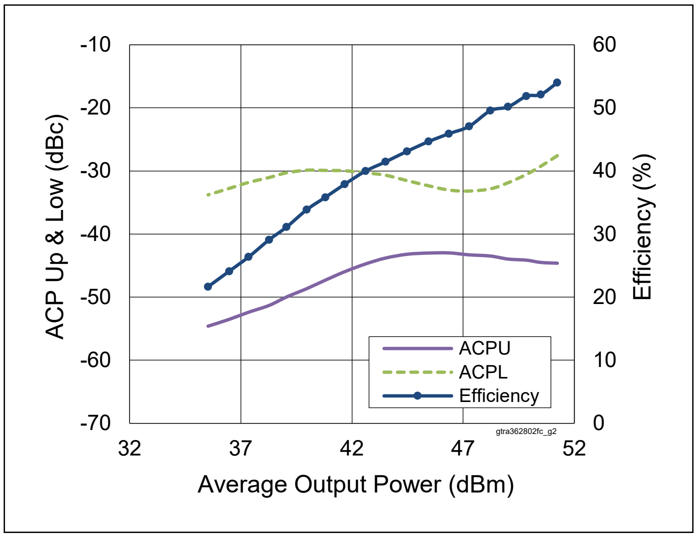


Figure 1. Single-carrier WCDMA Drive-up

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 140 mA,
$V_{GS(PEAK)}$ = -5.5 V, f = 3600 MHz, 3GPP
WCDMA signal, PAR = 10 dB, BW = 3.84 MHz

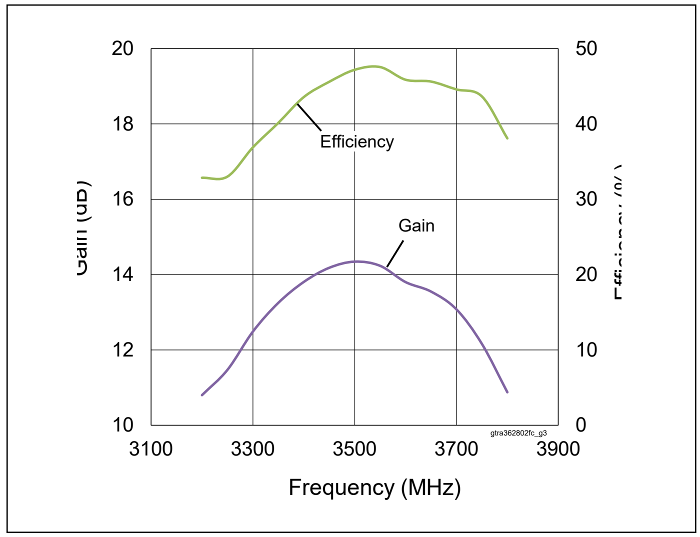


Figure 2. Single-carrier WCDMA Broadband Performance

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 140 mA,
$V_{GS(PEAK)}$ = -5.5 V, P_{OUT} = 46.4 dBm,
3GPP WCDMA signal, PAR = 10 dB

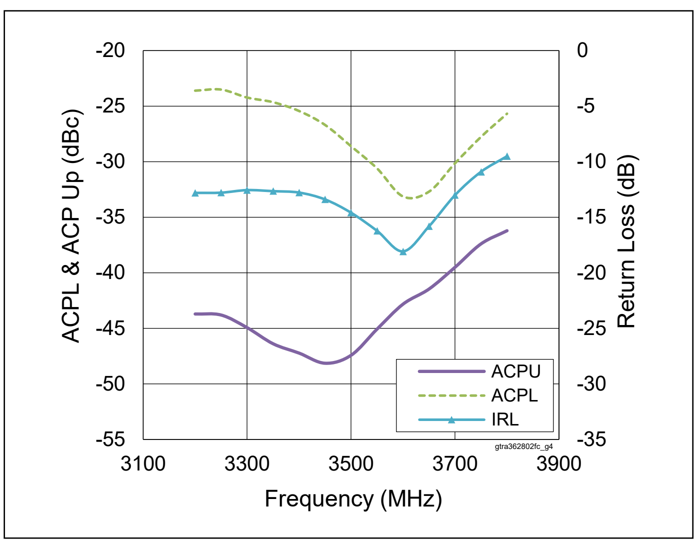


Figure 3. Single-carrier WCDMA Broadband Performance

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 140 mA,
$V_{GS(PEAK)}$ = -5.5 V, P_{OUT} = 46.4 dBm,
3GPP WCDMA signal, PAR = 10 dB

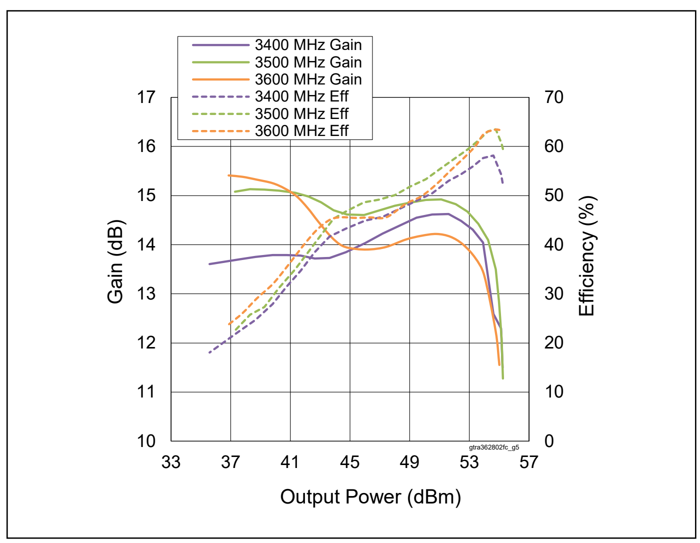


Figure 4. CW Performance

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 140 mA,
$V_{GS(PEAK)}$ = -5.5 V

Typical Performance (cont.)

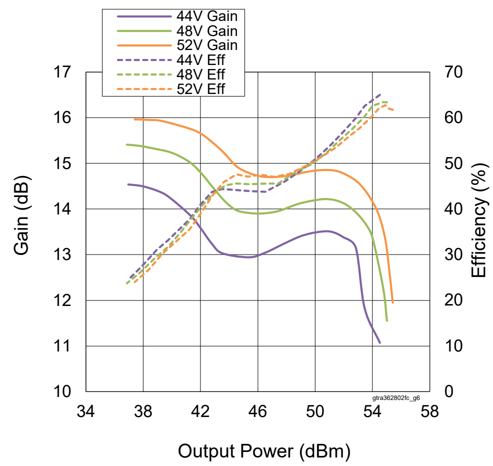


Figure 5. CW Performance at various V_{DD}

$I_{DQ(MAIN)}$ = 140 mA, $V_{GS(PEAK)}$ = -5.5 V,
f = 3600 MHz

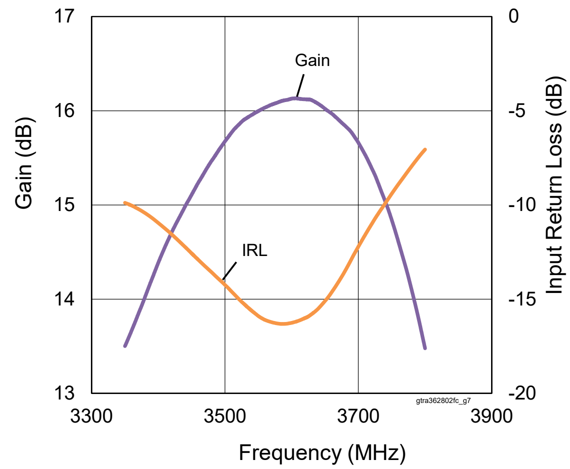


Figure 6. CW Performance Small Signal Gain & Input Return Loss

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 140 mA,
$V_{GS(PEAK)}$ = -5.5 V

Load Pull Performance

Main Side Load Pull Performance – Pulsed CW signal: 10 µs, 10% duty cycle, 48 V, I_{DQ} = 200 mA, class AB

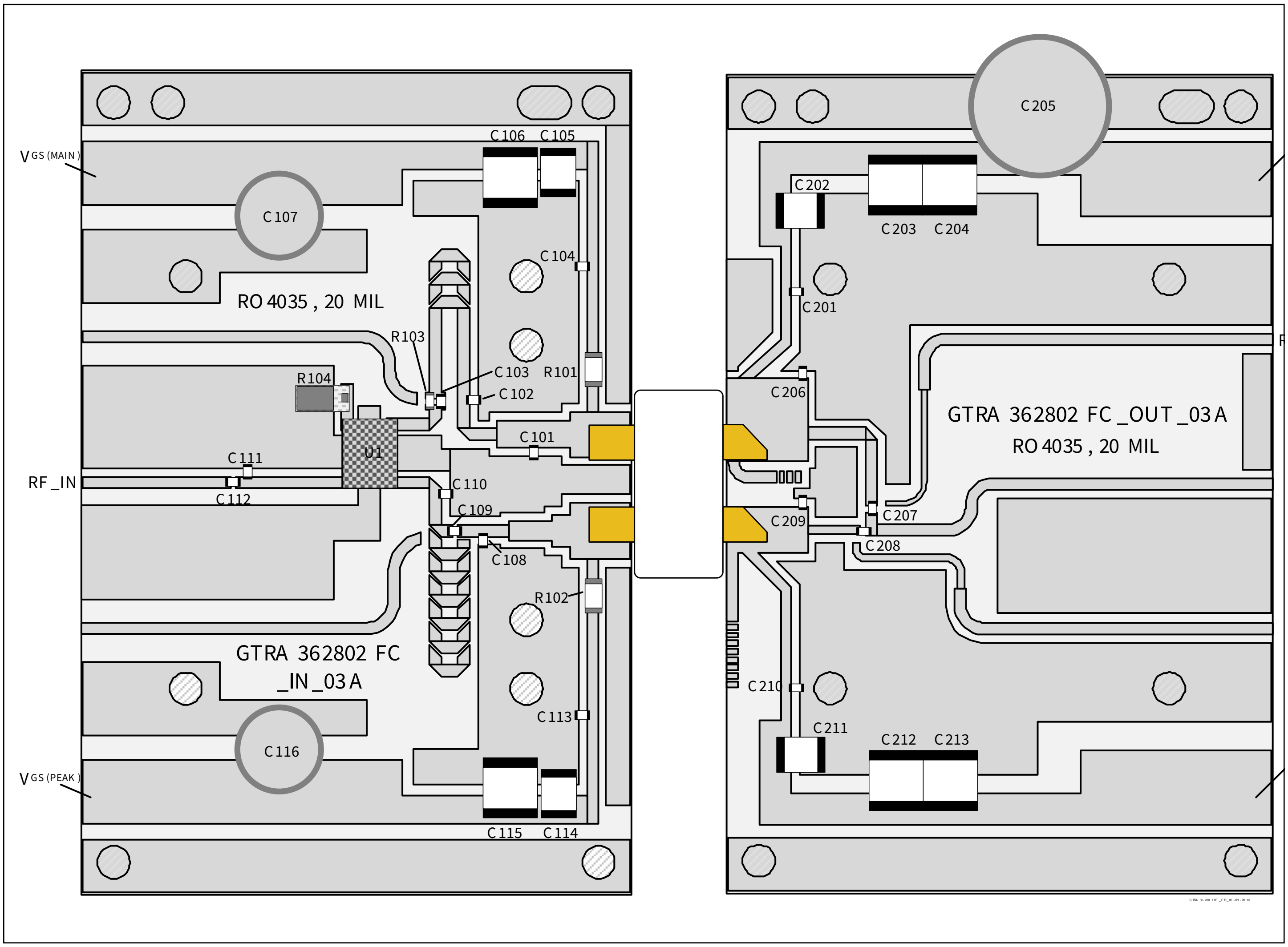
		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
3400	16-j19	5.9-j7.7	15	52.00	158.5	62.6	3.5-j4.8	16.6	50.10	102.3	74.0
3500	9.9-j11.5	9.4-j7.6	14.8	51.87	153.8	62.9	4.3-j5.2	16	50.52	112.7	71.5
3600	7.2-j6.5	7.1-j7.8	14.4	51.65	146.2	61.9	3.9-j4.7	15.9	49.70	93.3	71.6

Peak Side Load Pull Performance – Pulsed CW signal: 10 µs, 10% duty cycle, 48 V, I_{DQ} = 140 mA, class AB

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
3400	11.2-j9.2	3.9-j6.7	16	53.84	242.1	60.0	2.5-j4.8	17.8	52.30	170	71.0
3500	7.6-j8.6	3.8-j7.2	16.1	53.73	236.1	58.7	2.7-j5.2	17.9	52.35	171.8	70.0
3600	5.7-j9.5	4.6-j6.8	16.1	53.82	241	62.1	3.3-j4.8	17.1	52.60	182	68.6

Rev. 04.3, 2022-1-27

Reference Circuit, 3400 – 3600 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit Assembly

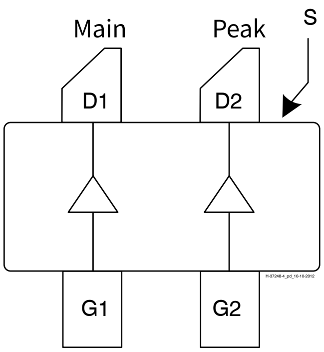
DUT	GTRA362802FC-V1
Test Fixture Part No.	LTA/GTRA362802FC-V1
PCB	Rogers 4350, 0.508 mm [0.020”] thick, 2 oz. copper, ε_r = 3.66, f = 3400 – 3600 MHz

Find Gerber files for this test fixture on the the Web site.

Components Information

Component	Description	Manufacturer	P/N
Input			
C101	Capacitor, 1.3 pF	ATC	ATC800A1R3CT250T
C102, C108	Capacitor, 0.5 pF	ATC	ATC800A0R5CT250T
C103, C104, C109, C112, C113	Capacitor, 12 pF	ATC	ATC800A120JT250T
C105, C114	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C106, C115	Capacitor, 100 V, 10 µF	TDK Corporation	C5750X7S2A106M230KB
C107, C116	Capacitor, 100 µF	Panasonic Electronic Components	EEE-FP1V101AP
C110	Capacitor, 0.3 pF	ATC	ATC800A0R3CT250T
C111	Capacitor, 0.2 pF	ATC	ATC800A0R2CT250T
R101, R102	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R103	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-3GEYJ100V
R104	Resistor, 50 ohms	Richardson	C16A50Z4
U1	Hybrid coupler	Anaren	XC3500P-03S
Output			
C201, C208, C210	Capacitor, 12 pF	ATC	ATC800A120JT250T
C202, C211	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C203, C204, C212, C213	Capacitor, 100 V, 10 µF	TDK Corporation	C5750X7S2A106M230KB
C205	Capacitor, 220 µF	Panasonic Electronic Components	ECA-2AHG221
C206, C209	Capacitor, 0.4 pF	ATC	ATC800A0R4CT250T
C207	Capacitor, 15 pF	ATC	ATC800A150JT250T

Pinout Diagram (top view)



Pin	Description
D1	Drain Device 1 (Main)
D2	Drain Device 2 (Peak)
G1	Gate Device 1 (Main)
G2	Gate Device 2 (Peak)
S	Source (flange)

Rev. 04.3, 2022-1-27

Package Outline Specifications – Package H-37248C-4

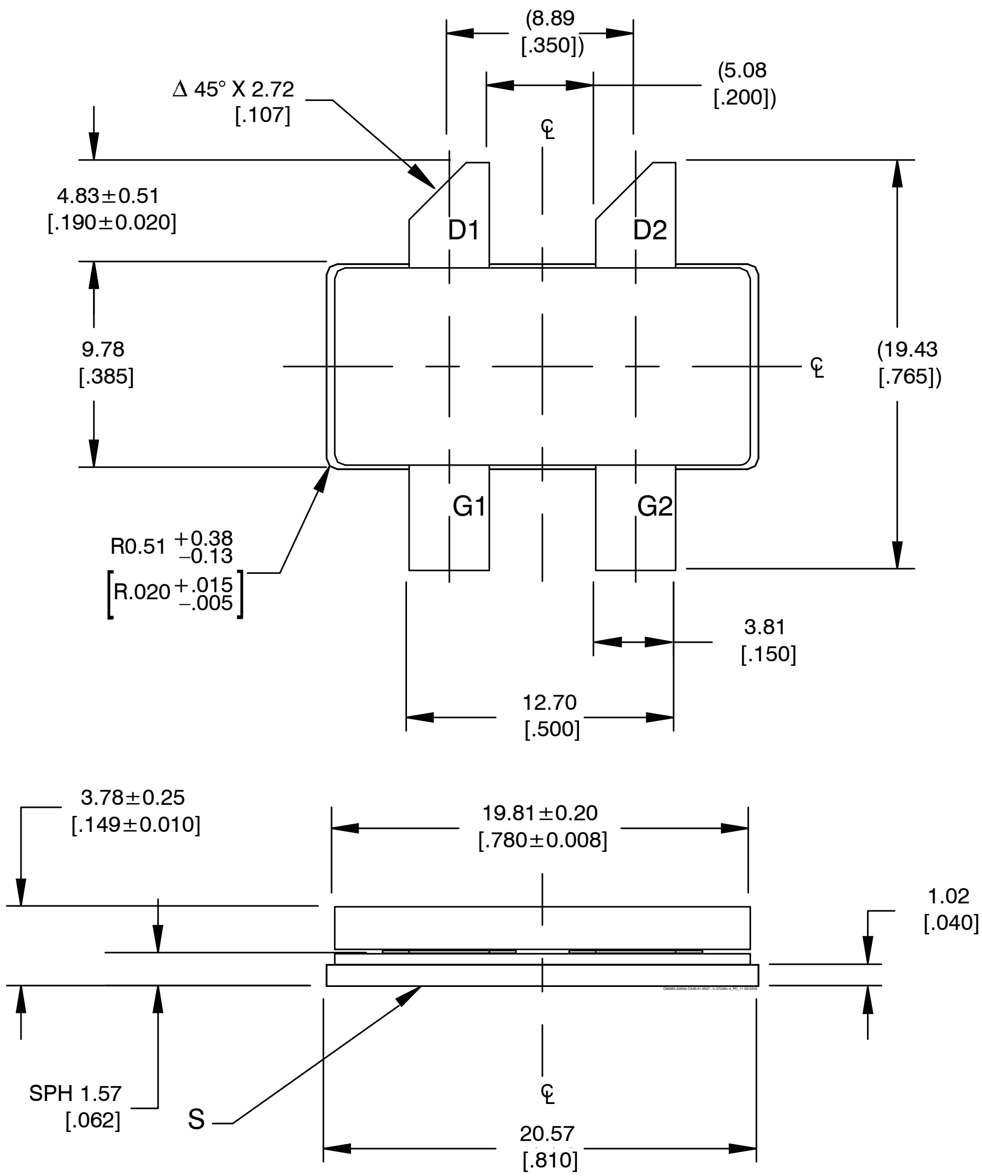


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994
2. Primary dimensions are mm, alternate dimensions are inches
3. All tolerances ± 0.127 [0.005]
4. Pins: D1, D2 – drain, G1, G2 – gate, S – source (flange)
5. Lead thickness: 0.13 ± 0.05 [0.005 ± 0.002]
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch]

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