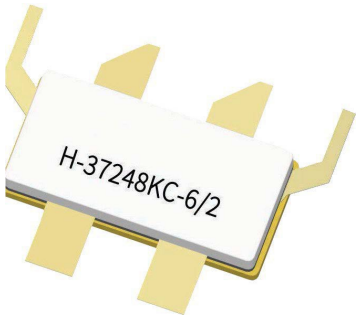
GTRB246608FC

Thermally-Enhanced High Power RF GaN on SiC HEMT
500 W, 48 V, 2300 – 2400 MHz



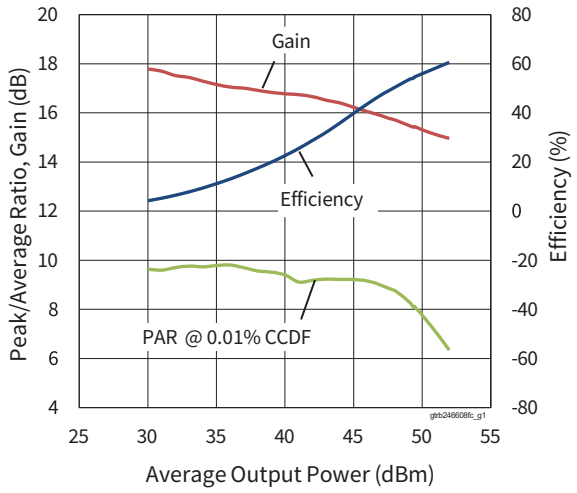
Package Type: H-37248KC-6/2

Description

The GTRB246608FC is a 500-watt (P_{3dB}) GaN on SiC high electron mobility transistor (HEMT) designed for use in multi-standard cellular power amplifier applications. It features high efficiency, and a thermally-enhanced package with earless flange.

Single-carrier WCDMA Drive-up

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 600 mA, $V_{GS(PEAK)}$ = -5.5 V,
f = 2400 MHz, 3GPP WCDMA signal, PAR = 10 dB,
3.84 MHz BW



Features

- GaN on SiC HEMT technology
- Typical pulsed CW performance, 2400 MHz, 48 V, 10 µs pulse width, 10% duty cycle, combined outputs
  - Output power at P_{3dB} = 500 W
  - Efficiency at P_{3dB} = 65%
- Human Body Model Class 1B (per ANSI/ESDA/JEDEC JS-001)
- Pb-free and RoHS compliant

Typical RF Characteristics

Single-carrier WCDMA Specifications (tested in the Doherty evaluation board for 2300 to 2400 MHz)

V_{DD} = 48 V, I_{DQ} = 600 mA, P_{OUT} = 85 W, $V_{GS(peak)}$ = –5.5 V, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

	P_{OUT} (dBM)	Gain (dB)	Efficiency (%)	ACPR + (dBc)	ACPR – (dBc)	OPAR (dB)
2300 MHz	49.3	15.2	52.6	–28.2	–28.6	8.2
2350 MHz	49.3	15.5	52.4	–29.7	–29.9	8.3
2400 MHz	49.3	15.4	54.0	–28.8	–29.0	8.1

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

RoHS compliant

Rev. 02, 2022-08-05

DC Characteristics

Characteristics		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain-source Breakdown Voltage	(main)	$V_{(BR)DSS}$	150	—	—	V	V_{GS} = –8 V, I_D = 10 mA
	(peak)		150	—	—		
Drain-source Leakage Current	(main)	I_{DSS}	—	—	5.6	mA	V_{GS} = –8 V, V_{DS} = 10 V
	(peak)		—	—	8.8		
Gate-Source Leakage Current	(main)	I_{GSX}	—	—	–8.3	mA	V_{GS} = –8 V, V_{DD} = 50 V
	(peak)		—	—	–13.9		
Gate Threshold Voltage	(main)	$V_{GS(th)}$	–3.8	–3.0	–2.3	V	V_{DS} = 10 V, I_D = 32 mA
	(peak)		–3.8	–3.0	–2.3		V_{DS} = 10 V, I_D = 50 mA

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Operating Voltage	V_{DD}	0	—	50	V	
Gate Quiescent Voltage	$V_{GS(Q)}$	–3.6	–3.0	–2.1	V	V_{DS} = 48 V, I_D = 600 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	32	mA
	(peak)	I_G	50	
Drain Current	(main)	I_D	12	A
	(peak)	I_D	19	
Junction Temperature		T_J	275	°C
Storage Temperature Range		T_{STG}	–65 to +150	

1. 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.
2. Product's qualification were performed at 225 °C. Operation at T_J (275 °C) reduces median time to failure.

Thermal Characteristics

Characteristics	Symbol	Value	Unit
Thermal Resistance (main, T_{CASE} = 85°C, P_{DISS} = 113 W DC)	$R_{\theta JC}$	1.2	°C/W
(peak, T_{CASE} = 85°C, P_{DISS} = 142 W DC)		1.0	

RF Characteristics

Single-carrier WCDMA Specifications (tested in the Doherty production test fixture)

V_{DD} = 48 V, I_{DQ} = 600 mA, P_{OUT} = 49.3 dBm, $V_{GS(peak)}$ = –5.3 V, f = 2400 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

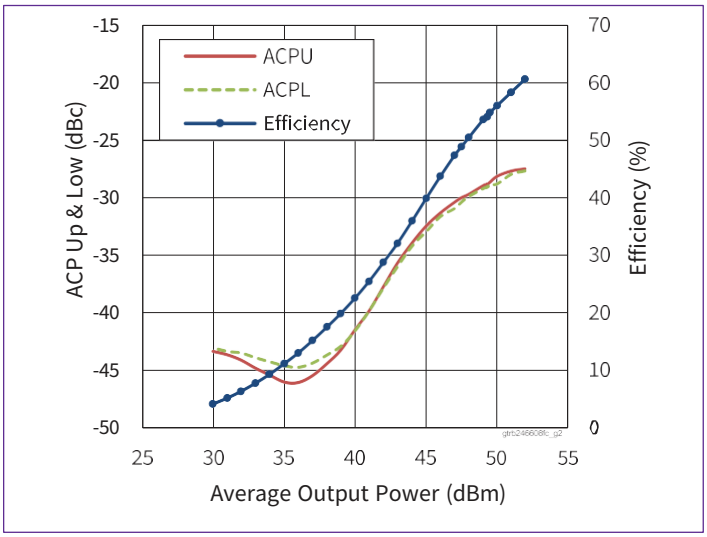
Characteristics	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	14	15.5	—	dB
Drain Efficiency	η_D	48	55	—	%
Adjacent Channel Power Ratio	ACPR	—	–28.4	–25	dBc
Output PAR @ 0.01% CCDF	OPAR	6.5	7.6	—	dB

Ordering Information

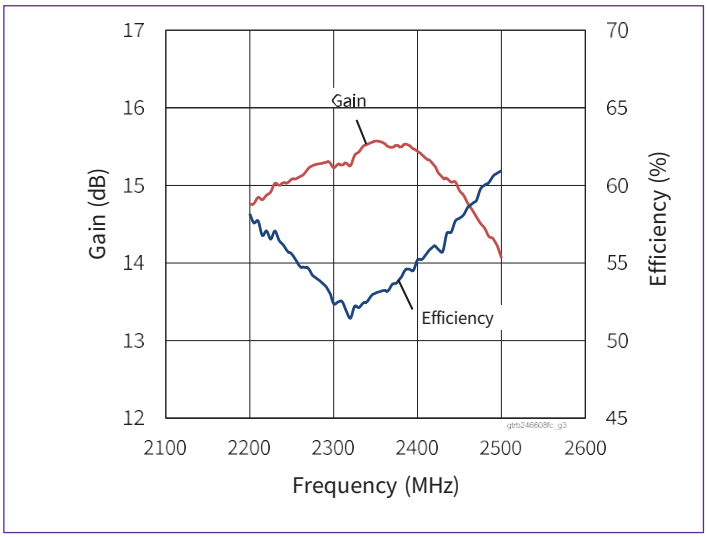
Type and Version	Order Code	Package	Shipping
GTRB246608FC V1 R0	GTRB246608FC-V1-R0	H-37248KC-6/2	Tape & Reel, 50 pcs
GTRB246608FC V1 R2	GTRB246608FC-V1-R2	H-37248KC-6/2	Tape & Reel, 250 pcs

See next page for typical performance curves

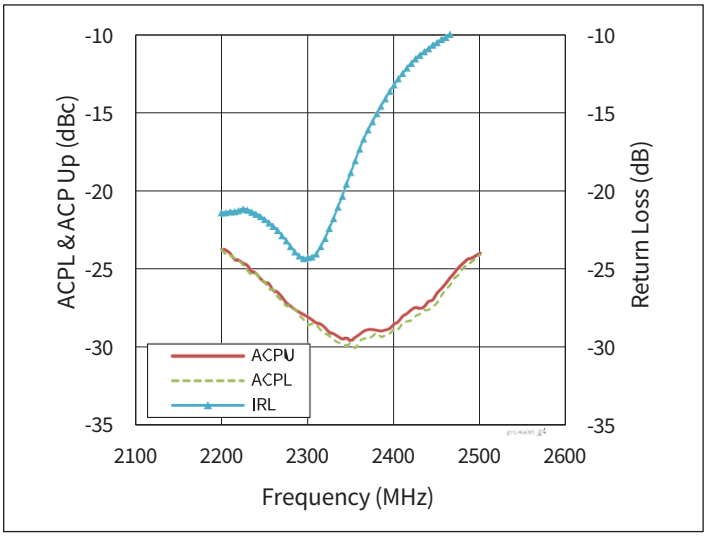
Typical Performance (data taken in the Doherty evaluation board)



Single-carrier WCDMA Drive-up
V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 600 mA, $V_{GS(PEAK)}$ = -5.5 V,
f = 2400 MHz, 3GPP WCDMA signal,
PAR = 10 dB, BW = 3.84 MHz



Single-carrier WCDMA Broadband Performance
V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 600 mA, $V_{GS(PEAK)}$ = -5.5 V,
P_{OUT} = 49.5 dBm, 3GPP WCDMA signal,
PAR = 10 dB



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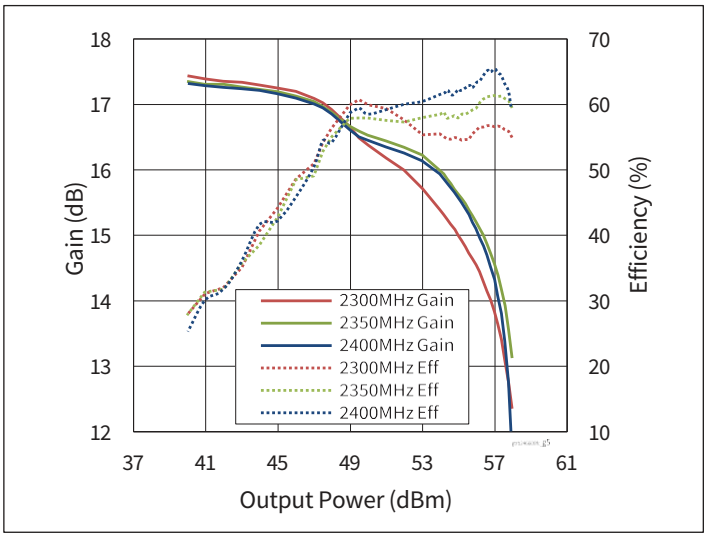
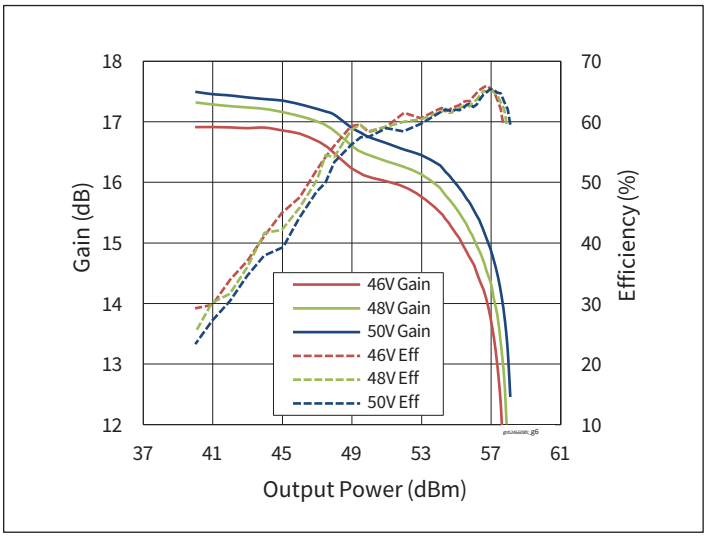


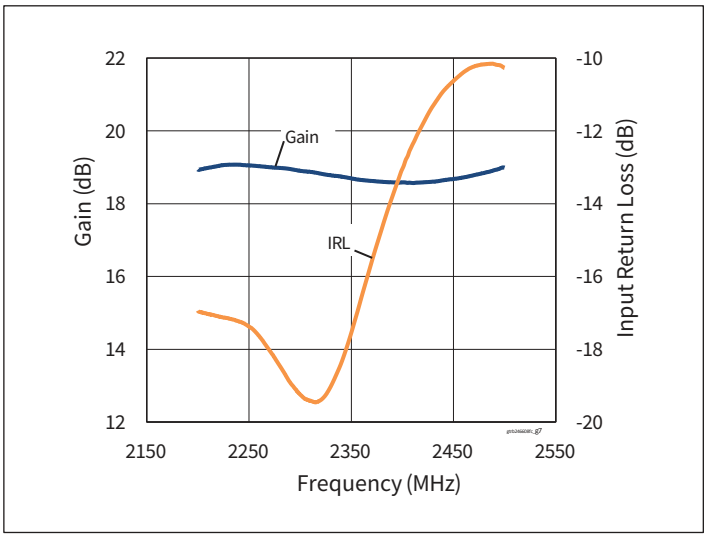
Pulse CW Performance
V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 600 mA, $V_{GS(PEAK)}$ = -5.5 V

Typical Performance (cont.)



Pulse CW Performance at various V_{DD}

$I_{DQ(MAIN)}$ = 600 mA, $V_{GS(PEAK)}$ = -5.5 V,
f = 2400 MHz



CW Performance Small Signal

Gain & Input Return Loss

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 600 mA, $V_{GS(PEAK)}$ = –5.5 V

Load Pull Performance

Main Side Load Pull Performance – Pulsed CW signal: 10 µsec, 10% duty cycle, 48 V, I_{DQ} = 350 mA, class AB

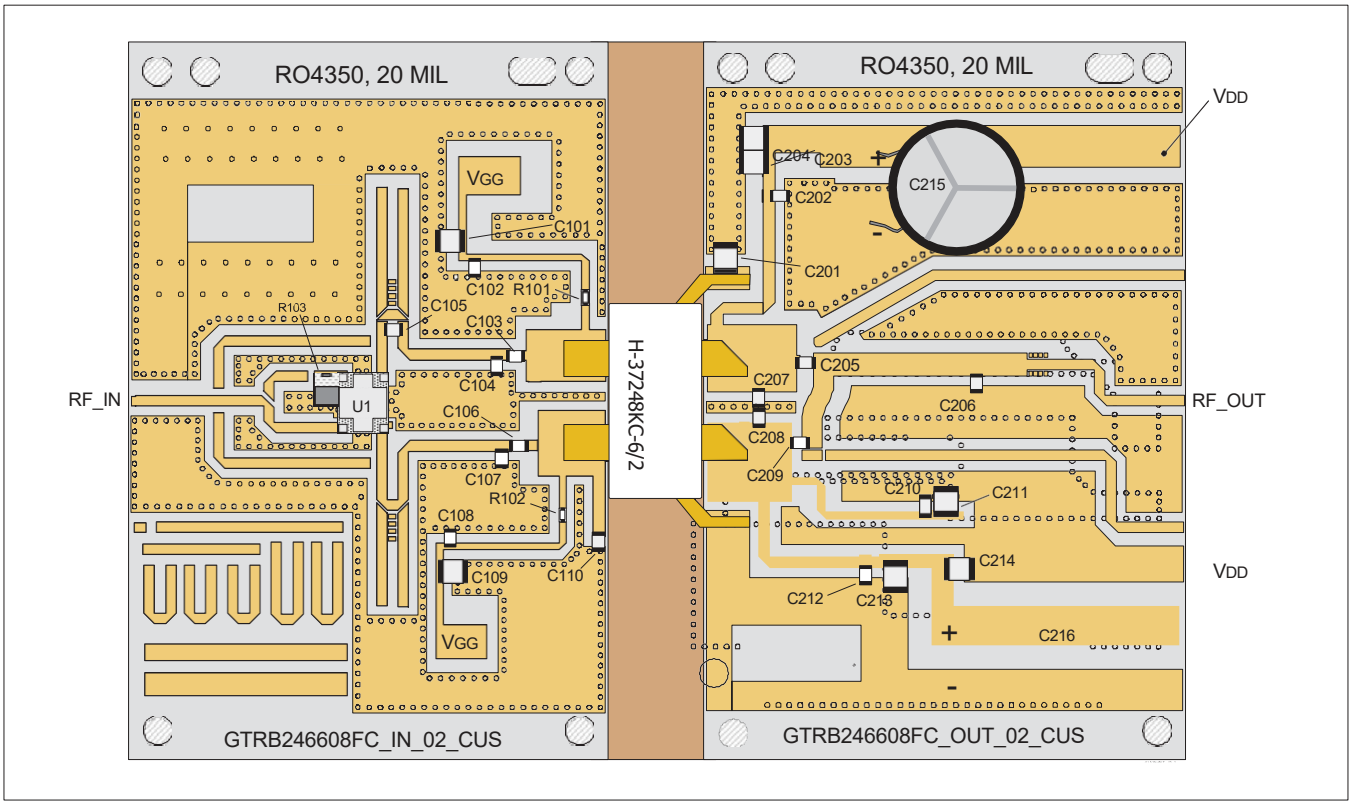
		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]
2300	3.8 –j9.0	3.7 –j7.8	16.8	55.70	372	70.4	3.5 –j3.4	18.7	52.90	195	82.5
2400	6.7 -j11.0	3.9 –j8.1	16.5	55.70	372	68.2	4.2 –j4.4	18.3	53.60	230	79.7

Peak Side Load Pull Performance – Pulsed CW signal: 10 µsec, 10% duty cycle, 48 V, V_{GSPK} = –5 V, class C

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]
2300	2.1 - j7.6	2.0 –j6.4	12.6	57.12	512	64.3	1.1 –j3.9	14.0	53.60	231	85.6
2400	2.3 –j9.0	2.1 –j5.8	13.6	57.01	502	68.9	1.2 - j4.1	15.4	54.72	296	86.4

Doherty Evaluation Board, 2300 – 2400 MHz

DUT	GTRB246608FC-V1
Test Fixture Part No.	LTA/GTRB246608FC-E2
PCB	Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, ε_r = 3.66



Reference circuit assembly diagram (not to scale)

Doherty Evaluation Board (cont.)

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C109	Capacitor, 10 µF, 100 V	Murata	GRM32EC72A106KE05L
C102, C105, C106, C108	Capacitor, 18 pF	ATC	ATC600F180JT250XT
C103	Capacitor, 6.8 pF	ATC	ATC600F6R8BT250XT
C104	Capacitor, 1.3 pF	ATC	ATC600F1R3BT250XT
C107	Capacitor, 0.5 pF	ATC	ATC600F0R5BT250XT
C110	Capacitor, 0.9 pF	ATC	ATC600F0R9BT250XT
R101	Resistor, 12 ohms	Panasonic Electronic Components	ERJ-3GEYJ120V
R102	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-3GEYJ5R6V
R103	Resistor, 50 ohms	TTM Technologies, Inc.	C8A50Z4B
U1	Hybrid coupler	Anaren	X3C26P1-03S
Output			
C201, C203, C204, C211, C213, C214	Capacitor, 10 µF, 100 V	Murata	GRM32EC72A106KE05L
C202, C209, C210, C212	Capacitor, 18 pF	ATC	ATC600F180JT250XT
C205	Capacitor, 2.4 pF	ATC	ATC600F2R4BT250XT
C206	Capacitor, 0.7 pF	ATC	ATC600F0R7BT250XT
C207, C208	Capacitor, 1.0 pF	ATC	ATC600F1R0BT250XT
C215, C216	Capacitor, 470 µF, 100 V	Panasonic Electronic Components	ECA-2AHG471B

Bias Sequencing

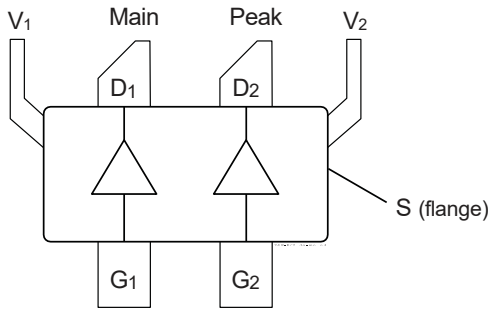
Bias ON

1. Ensure RF is turned off
2. Apply pinch-off voltage of –5 V to the gate
3. Apply nominal drain voltage
4. Bias gate to desired quiescent drain current
5. Apply RF

Bias OFF

1. Turn RF off
2. Apply pinch-off voltage to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

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)
V1	Drain video decoupling, no DC bias
V2	N.C (It is recommended to ground this pin)
S	Source (flange)

See next page for package outline specifications

Package Outline Specifications – Package H-37248KC-6/2

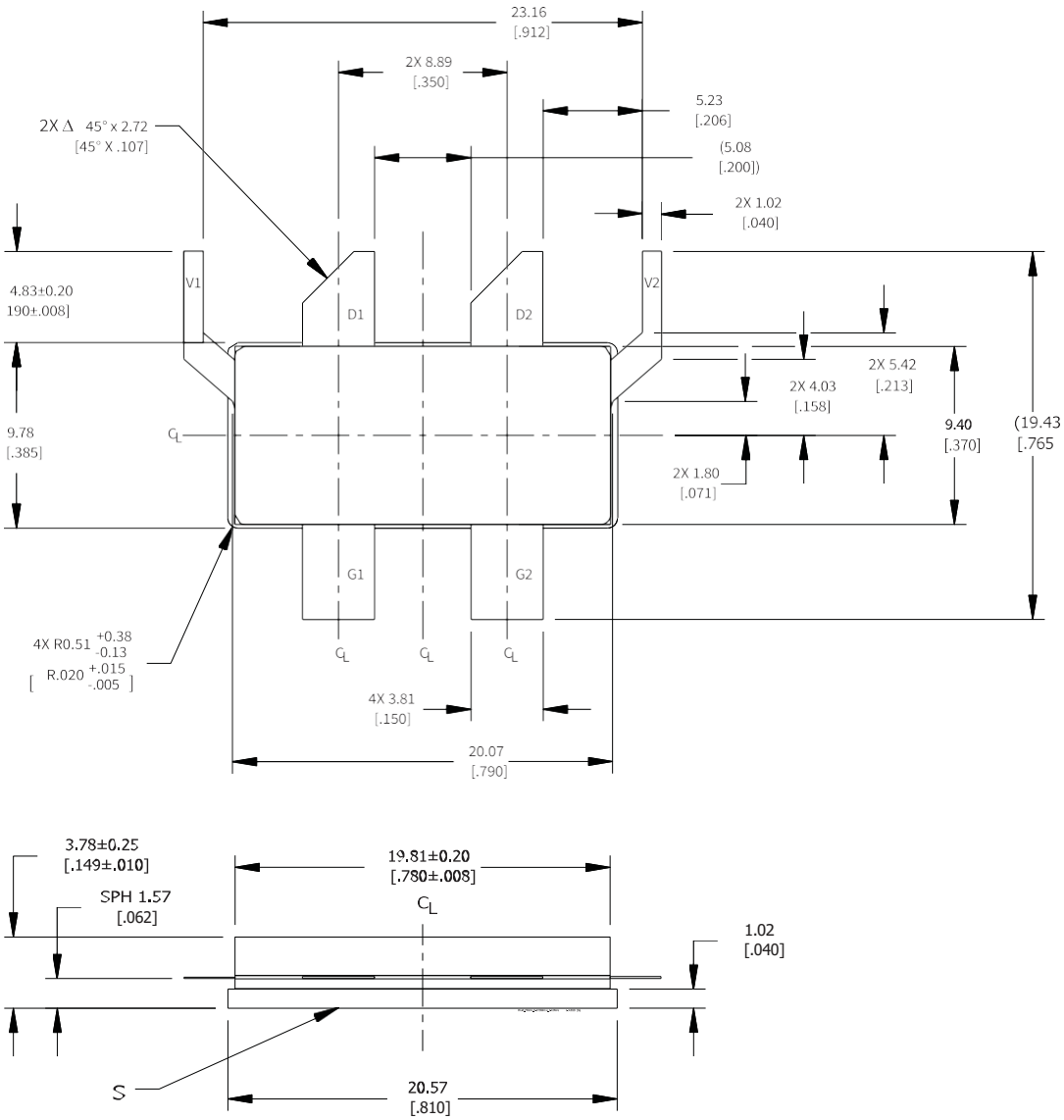


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994
2. Primary dimensions are mm; alternate dimensions are inches
3. All tolerances ± 0.127 [.005]
4. Pins: D1, D2 – drain, G1, G2 – gate, V1 – drain video decoupling, no DC bias, V2 – NC, S – source (flange)
5. Lead thickness: 0.127 +0.05/–0.025 [.005 +.002/–.001]
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch]

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