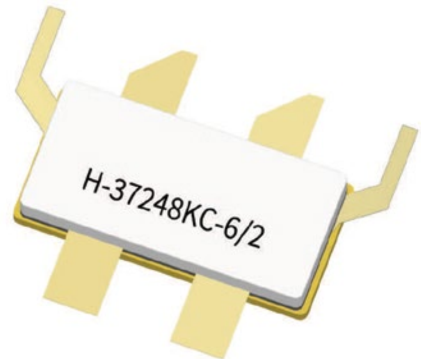
GTRB264318FC

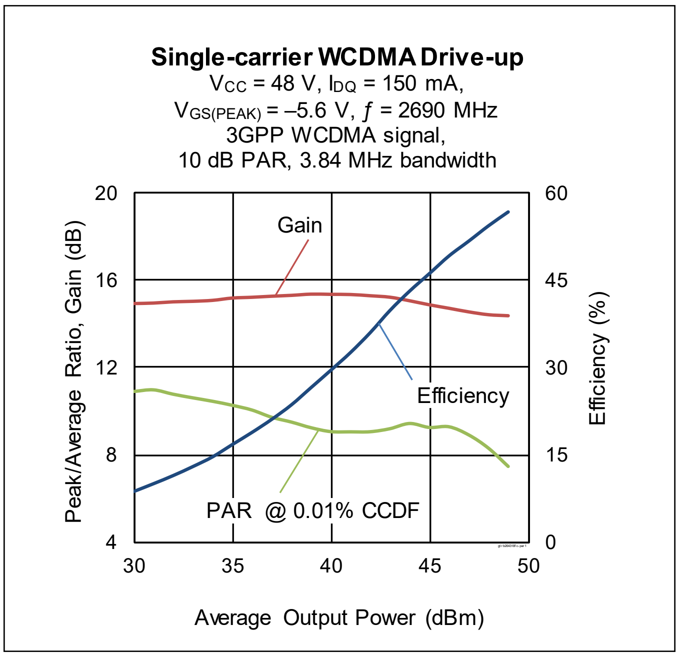
Thermally-Enhanced High Power RF GaN on SiC Amplifier, 400 W, 48 V, 2500 – 2700 MHz



Package Types: H-37248KC-6/2

Description

The GTRB264318FC is a 400-watt (P_{3dB}) GaN on SiC HEMT D-mode amplifier for use in multi-standard cellular power amplifier applications. It features internal matching, high efficiency, and a thermally-enhanced package with earless flange.



Features

- GaN on SiC HEMT technology
- Broadband Internal matching
- Typical pulsed CW performance: 10 µs pulse width, 10% duty cycle, 2675 MHz, 48 V, Doherty fixture
  - Gain = 15 dB @ 47.2 dBm
  - Efficiency = 53% @ 47.2 dBm
  - Output power at P_{3dB} = 400 W
- Human Body Model Class 1B (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

Single-carrier WCDMA Specifications (tested in the production Doherty test fixture)
V_{DD} = 48 V, I_{DQ} = 150 mA, P_{OUT} = 52.5 W avg, $V_{GS(PEAK)}$ = –5.6 V, ƒ = 2675 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Gain	G_{ps}	12	14	—	dB
Drain Efficiency	η_D	45	50	—	%
Adjacent Channel Power Ratio	ACPR	—	–32	-26	dBc
Output PAR @ 0.01% CCDF	OPAR	7	8.5	—	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}	—	—	5	mA	V_{GS} = -8 V, V_{DS} = 10 V
Gate Threshold Voltage (main)	$V_{GS(th)}$	–3.8	–3.1	–2.3	V	V_{DS} = 10 V, I_D = 18 mA
Gate Threshold Voltage (peak)						V_{DS} = 10 V, I_D = 32 mA

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Operating Voltage	V_{DD}	0	—	50	V	
Gate Quiescent Voltage	$V_{GS(Q)}$	-3.7	-3.1	-2.6		V_{DS} =48 V, I_D = 150 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	18	mA
Gate Current (peak)		32	
Drain Current (main)	I_D	6.75	A
Drain Current (peak)		12	
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 was performed at 225°C. Operation at T_J (275°C) reduces median time to failure.

Thermal Characteristics - T_{CASE} = 85°C, V_{DD} = 48 V, $I_{DQ\ (main)}$ = 150 mA, $V_{GS(PEAK)}$ = –5.6 V

Parameter	Symbol	Value	Unit	Conditions
Thermal Resistance (main)	$R_{\theta JC}$	1.8	°C/W	P_{DISS} = 78 W DC
Thermal Resistance (peak)		1.2		P_{DISS} = 116 W DC

Ordering Information

Type and Version	Order Code	Package	Shipping
GTRB264318FC V1 R0	GTRB264318FC-V1-R0	H-37248KC-6/2, earless flange	Tape & Reel, 50 pcs
GTRB264318FC V1 R2	GTRB264318FC-V1-R2	H-37248KC-6/2, earless flange	Tape & Reel, 250 pcs

Typical Performance (tested in the production Doherty test fixture)

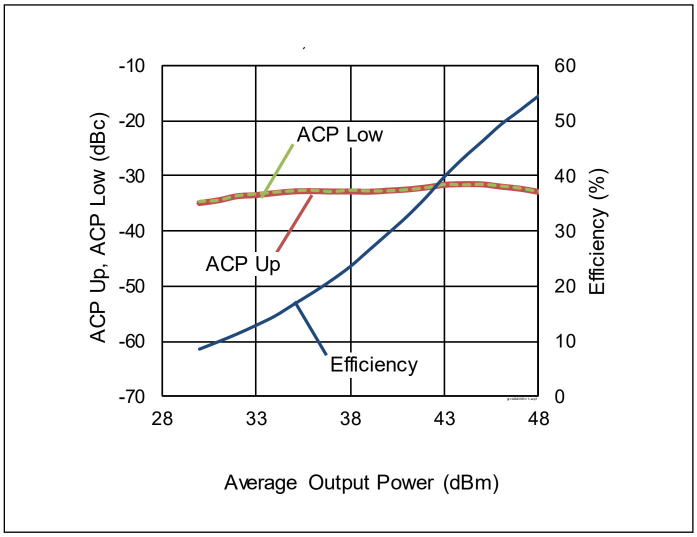


Figure 1. Single-carrier WCDMA Broadband

V_{DD} = 48 V, I_{DQ} = 150 mA,
$V_{GS(PEAK)}$ = –5.6 V, f = 2690 MHz
3GPP WCDMA signal,
10 dB PAR, 3.84 MHz bandwidth

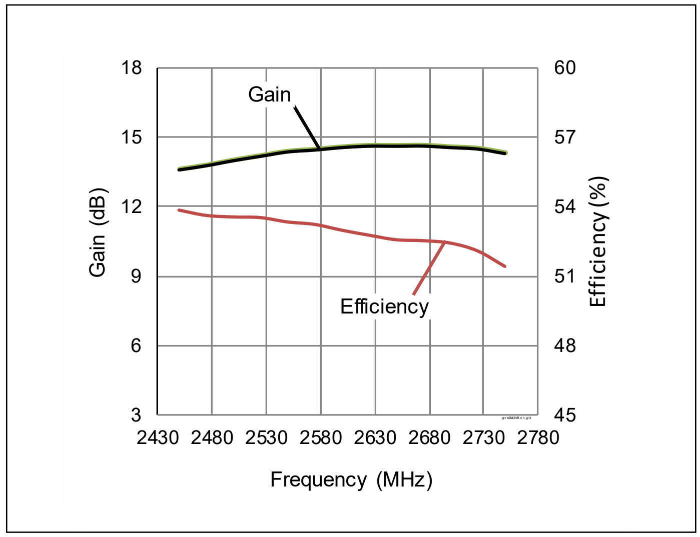


Figure 2. Single-carrier WCDMA Broadband

V_{DD} = 48V, I_{DQ}= 150 mA, $V_{GS(PEAK)}$ = –5.6 V,
P_{OUT} = 47.2 dBm,
3GPP WCDMA signal, 10 dB PAR

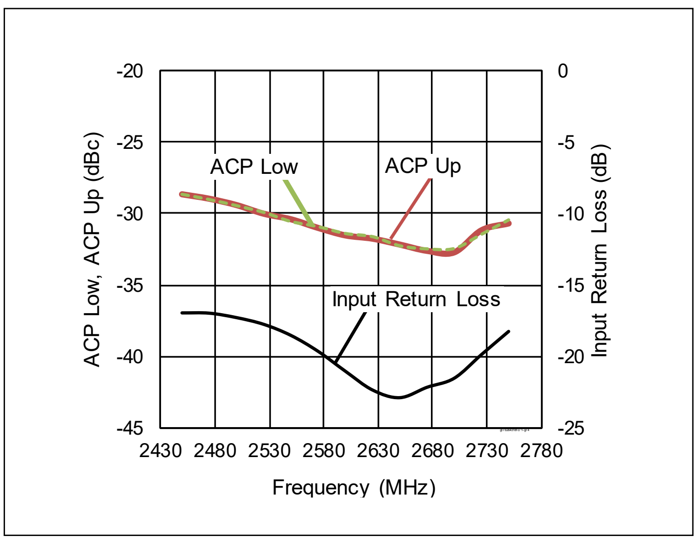


Figure 3. Single-carrier WCDMA Broadband

V_{DD} = 48 V, I_{DQ} = 150 mA, $V_{GS(PEAK)}$ = –5.6 V,
P_{OUT} = 47.2 dBm,
3GPP WCDMA signal, PAR = 10 dB

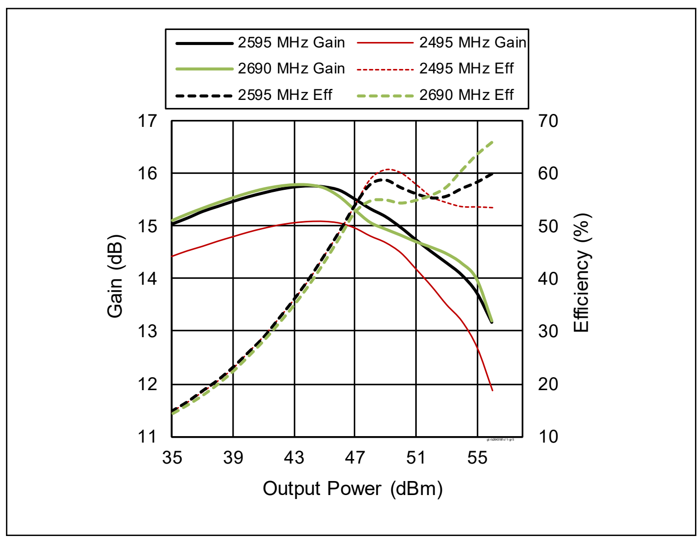


Figure 4. Pulse CW Performance

V_{DD} = 48 V, I_{DQ} = 150 mA, $V_{GS(PEAK)}$ = –5.6 V

Typical Performance (cont.)

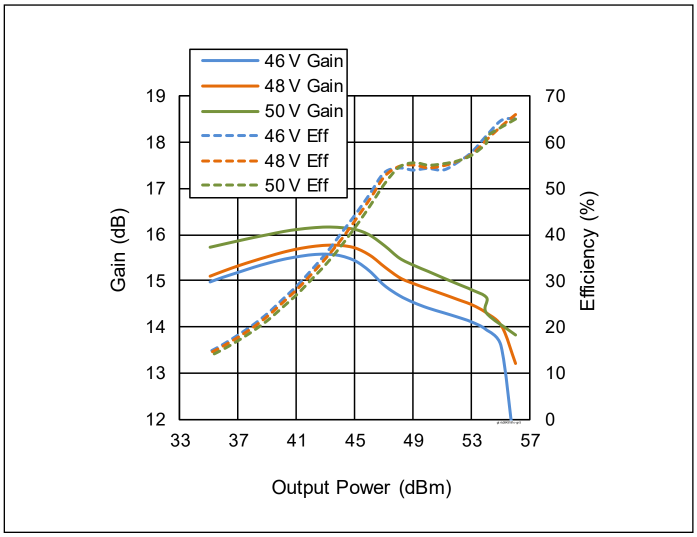


Figure 5. Pulse CW Performance at Various V_{DD}

$I_{DQ(MAIN)}$ = 150 mA, $V_{GS(PEAK)}$ = –5.6 V, *f* = 2690 MHz

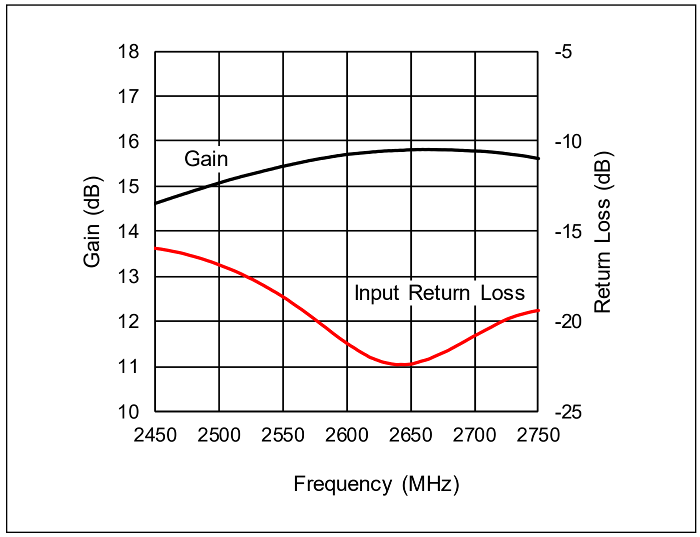


Figure 6. CW Performance Small Signal

V_{DD} = 48 V, I_{DQ} = 150 mA, $V_{GS(PEAK)}$ = –5.6 V

Load Pull

Main Side Load Pull – Pulsed CW signal: 12 µs, 10% duty cycle, 48 V, I_{DQ} = 150 mA, Class AB

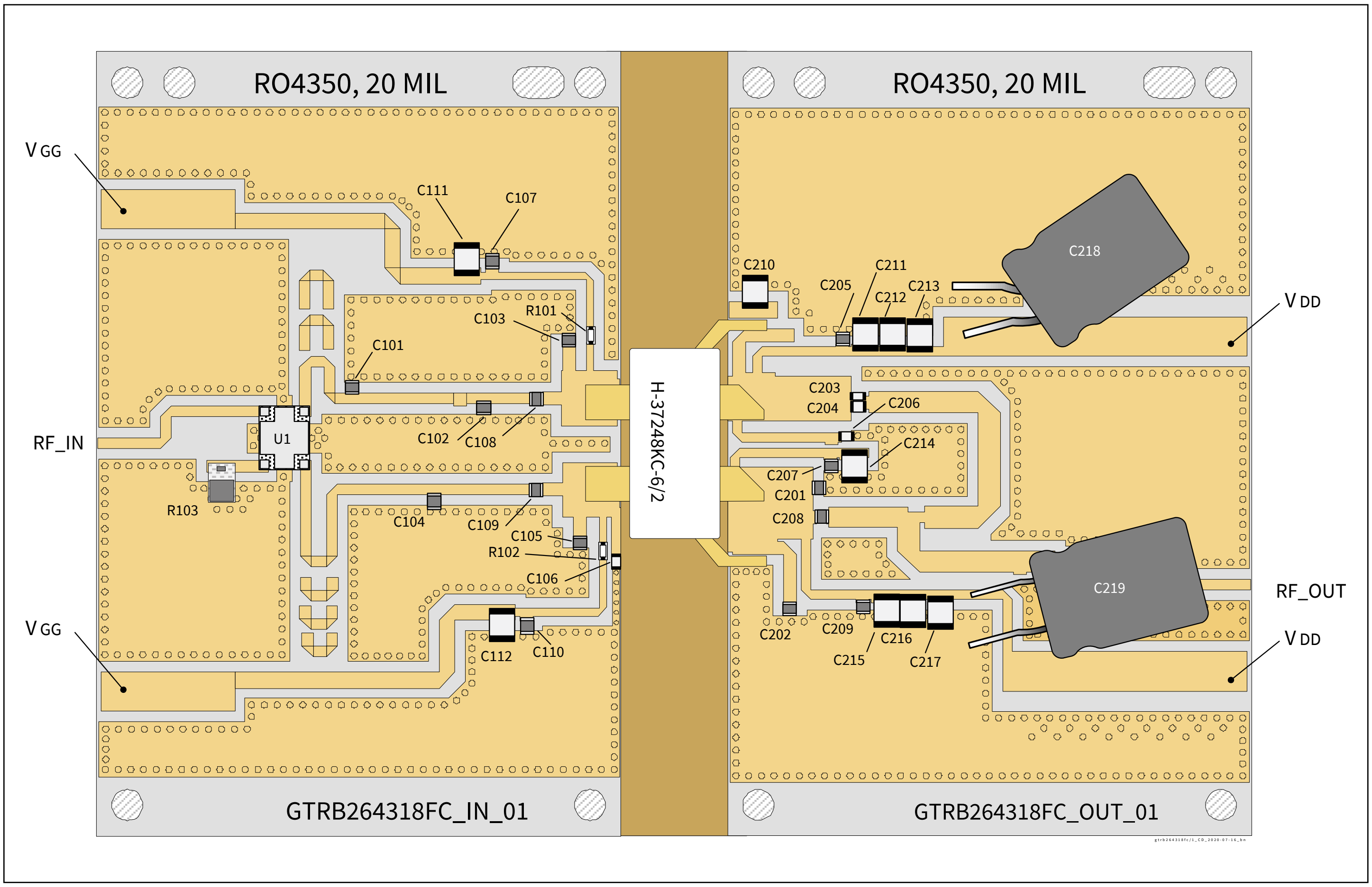
		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]	Z_l [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]
2515	5.9 – j17.6	7.6 – j11.2	15.8	53.25	211	67.1	9.3 – j0.3	17.84	50.12	103	81.3
2675	21.5 – j14.8	7.3 – j11.7	15.5	53.11	204	66.7	8.3 – j4.2	16.99	51.20	131	81.0

Peak Side Load Pull – Pulsed CW signal: 12 µs, 10% duty cycle, 48 V, $V_{GS(PEAK)}$ = –6 V, Class C

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Z_s [Ω]	Z_l [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	Z_l [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
2515	2.7 – j13.0	2.4 – j4.8	13.4	55.26	335	65.3	2.4 – j2.8	13.5	53.25	211	75.4
2675	4.1 – j15.0	2.6 – j5.7	13.0	55.08	322	63.5	1.9 – j3.6	13.3	52.50	177	72.8

Evaluation Board, 2495 – 2690 MHz

Evaluation Board Part Number	LTA/GTRB264318FC-E1
PCB Information	Rogers 4350, 0.508 mm [0.020”] thick, 2 oz. copper, ε_r = 3.66



Reference circuit assembly diagram (not to scale)

Bias Sequencing

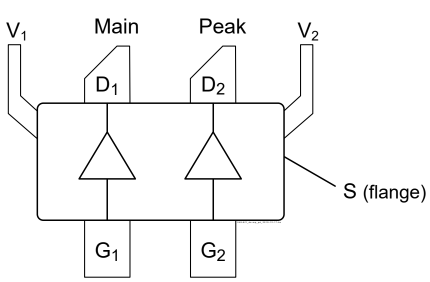
Bias ON
1. Ensure RF is turned off
2. Apply pinch-off voltage of –5 V to the gate
3. Apply nominal drain voltage
4. Bias gate to desired quiescent drain current
5. Apply RF

Bias OFF
1. Turn RF off
2. Appliy pinch-off voltage to the gate
3. Turn off drain voltage
4. Turn off gate voltage

Components Information

Component	Description	Manufacturer	P/N
Input			
C101	Capacitor, 0.2 pF	ATC	ATC600F0R2BT250XT
C102	Capacitor, 1.3 pF	ATC	ATC600F1R3BT250XT
C103	Capacitor, 0.6 pF	ATC	ATC600F0R6BT250XT
C104	Capacitor, 0.3 pF	ATC	ATC600F0R3BT250XT
C105	Capacitor, 0.4 pF	ATC	ATC600F0R4BT250XT
C106	Capacitor, 0.5 pF	ATC	ATC600S0R5BT250XT
C107, C108, C109, C110	Capacitor, 18 pF	ATC	ATC600F180JT250XT
C111, C112	Capacitor, 10 µF, 100 V	Murata Electronics	GRM32EC72A106KE05L
R101, R102	Resistor, 9.1 ohms	Panasonic	ERJ-3GEYJ9R1V
R103	Resistor, 50 ohms	Anaren	C8A50Z4A
U1	Hybrid Coupler	Anaren	X3C26P1-03S
Output			
C201	Capacitor, 1 pF	ATC	ATC600F1R0BT250XT
C202	Capacitor, 0.5 pF	ATC	ATC600F0R5BT250XT
C203, C204	Capacitor, 4.7 pF	ATC	ATC600F4R7CT250XT
C205, C206, C207, C208, C209	Capacitor, 18 pF	ATC	ATC600F180JT250XT
C210, C211, C212, C213, C214, C215, C216, C217	Capacitor, 10 µF, 100 V	Murata Electronics	GRM32EC72A106KE05L
C218, C219	Capacitor, 220 µF, 100 V	Panasonic	ECA-2AHG221

Pinout Diagram (top view)



Pin	Description
D1	Drain Device 1
D2	Drain Device 2
G1	Gate Device 1
G2	Gate Device 2
V1	Drain video decoupling, no DC bias
V2	NC (it is recommended to ground this pin)
S	Source (flange)

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

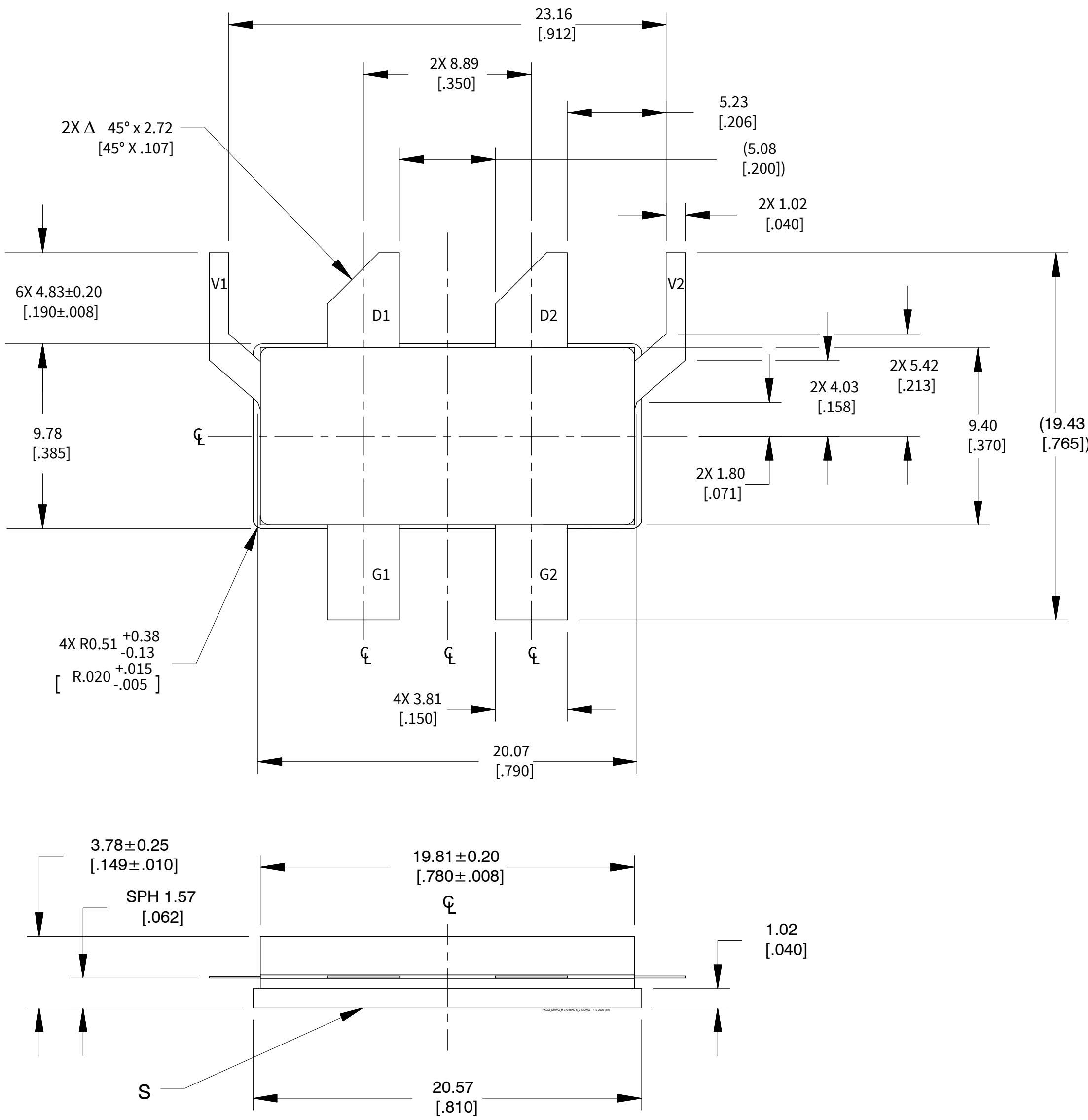


Diagram Notes—unless otherwise specified:

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]

Notes & Disclaimer