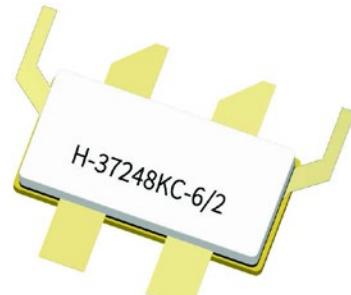


# GTRB267008FC

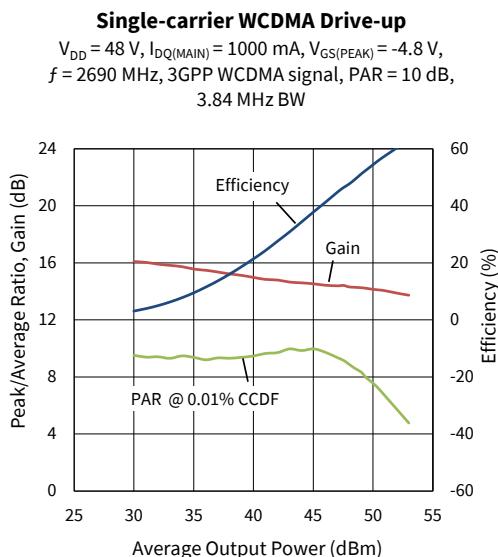
Thermally-Enhanced High Power RF GaN on SiC  
Amplifier, 620 W, 48 V, 2496 – 2690 MHz

## Description

The GTRB267008FC is a 620-watt ( $P_{4dB}$ ) GaN on SiC HEMT D-mode amplifier for use in multi-standard cellular power amplifier applications. It features high efficiency, and a thermally-enhanced package with earless flange.



Package Type: H-37248KC-6/2



## Features

- GaN on SiC HEMT technology
- Typical pulsed CW performance, 2690 MHz, 48 V, combined outputs, 10  $\mu$ s pulse width, 10% duty cycle
  - Output power at  $P_{4dB}$  = 619 W
  - Efficiency at  $P_{4dB}$  = 72%
- Human Body Model Class 1C (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 2496 – 2690 MHz)

$V_{DD} = 48$  V,  $I_{DQ} = 1000$  mA,  $V_{GS(Peak)} = -4.8$  V, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

	<b>P<sub>OUT</sub> (dBm)</b>	<b>Gain (dB)</b>	<b>Efficiency (%)</b>	<b>ACPR + (dBc)</b>	<b>ACPR - (dBc)</b>	<b>OPAR (dB)</b>
2490 MHz	49.3	14.3	55	-28.5	-28.3	7.8
2590 MHz	49.3	14.7	53	-31.7	-32.0	8.1
2690 MHz	49.3	14.2	52	-33.2	-33.5	8.1

All published data at  $T_{CASE} = 25^\circ\text{C}$  unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!



**DC Characteristics**

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain-source Breakdown Voltage (main) (peak)	$V_{BR(DSS)}$	150	—	—	V	$V_{GS} = -8 \text{ V}$ , $I_D = 10 \text{ mA}$
Drain-source Leakage Current (main) (peak)	$I_{DSS}$	—	—	6.3	mA	$V_{GS} = -8 \text{ V}$ , $V_{DS} = 10 \text{ V}$
		—	—	8.7		
Gate-source Leakage Current (main) (peak)	$I_{GSX}$	—	—	-9.9	mA	$V_{GS} = -8 \text{ V}$ , $V_{DS} = 50 \text{ V}$
		—	—	-13.8		
Gate Threshold Voltage (main) (peak)	$V_{GS(\text{th})}$	-3.8	-3.1	-2.3	V	$V_{DS} = 10 \text{ V}$ , $I_D = 36 \text{ mA}$
						$V_{DS} = 10 \text{ V}$ , $I_D = 50 \text{ mA}$

**Recommended Operating Voltages**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain Operating Voltage	$V_{DD}$	0	—	50	V	$V_{DS} = 48 \text{ V}$ , $I_D = 1000 \text{ mA}$
Gate Quiescent Voltage	$V_{GS(Q)}$	-3.5	-2.8	-2.0		

**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)	$I_G$	36	mA
Gate Current (peak)		50.4	
Drain Current (main)	$I_D$	13.5	A
Drain Current (peak)		18.9	
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**

Parameter	Symbol	Value	Unit	Conditions
Thermal Resistance (main)	$R_{\theta JC}$	1.0	°C/W	$T_{CASE} = 85^\circ\text{C}$ , 145 W DC, 48 V
Thermal Resistance (peak)		1.0		$T_{CASE} = 85^\circ\text{C}$ , 145 W DC, 48 V

## RF Characteristics

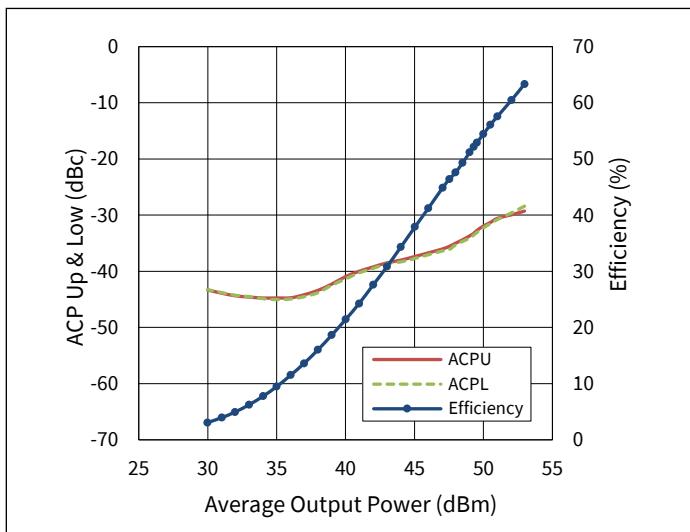
### Single-carrier WCDMA Specifications (tested in the Doherty production test circuit)

$V_{DD} = 48$  V,  $I_{DQ} = 1000$  mA,  $P_{OUT} = 85.1$  W avg,  $V_{GS(Peak)} = (V_{GS} \text{ at } I_{DQ(Peak)} = 1000 \text{ mA}) - 1.82$  V,  $f = 2690$  MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

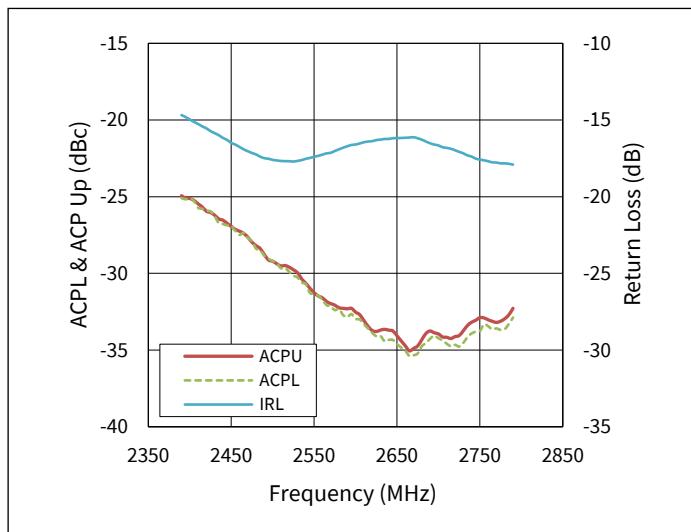
Characteristic	Symbol	Min.	Typ.	Max.	Unit
Gain	$G_{ps}$	12	13.5	—	dB
Drain Efficiency	$\eta_D$	43	48.7	—	%
Adjacent Channel Power Ratio	ACPR	—	-33.8	-28.5	dBc
Output PAR @ 0.01% CCDF	OPAR	6.0	6.8	—	dB

## Ordering Information

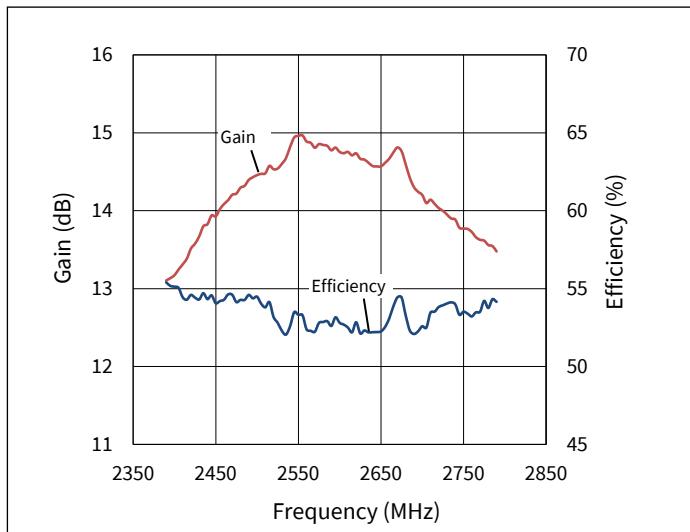
Type and Version	Order Code	Package	Shipping
GTRB267008FC V1 R0	GTRB267008FC-V1-R0	H-37248KC-6/2	Tape & Reel, 50 pcs
GTRB267008FC V1 R2	GTRB267008FC-V1-R2	H-37248KC-6/2	Tape & Reel, 250 pcs

**Typical Performance** (data taken in the Doherty evaluation board)**Figure 1.** Single-carrier WCDMA Drive-up

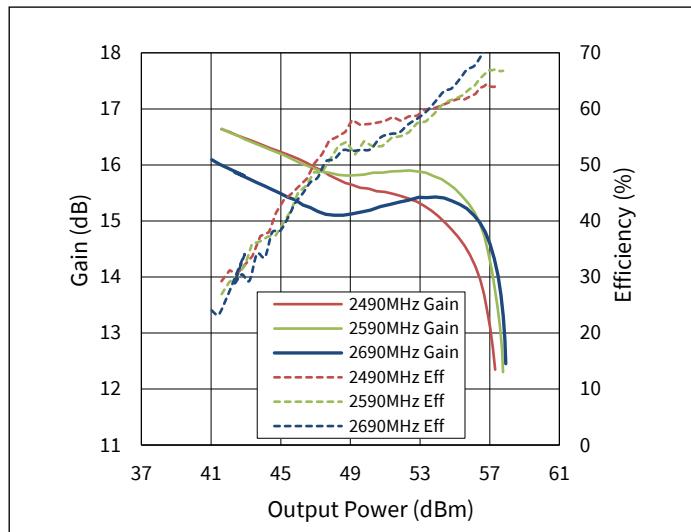
$V_{DD} = 48 \text{ V}$ ,  $I_{DQ(\text{MAIN})} = 1000 \text{ mA}$ ,  $V_{GS(\text{PEAK})} = -4.8 \text{ V}$ ,  
 $f = 2690 \text{ MHz}$ , 3GPP WCDMA signal, PAR = 10 dB,  
BW = 3.84 MHz

**Figure 2.** Single-carrier WCDMA Broadband

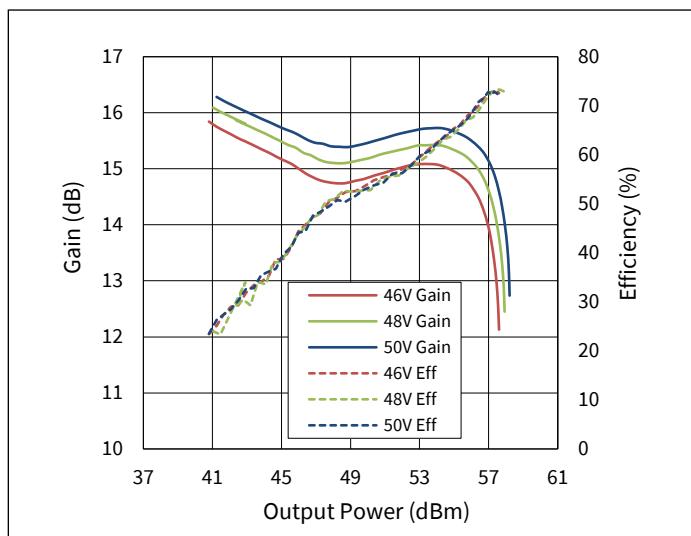
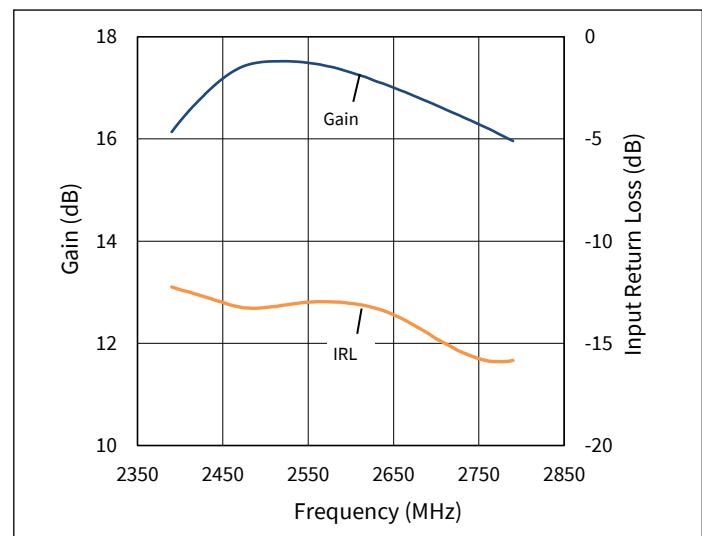
$V_{DD} = 48 \text{ V}$ ,  $I_{DQ(\text{MAIN})} = 1000 \text{ mA}$ ,  $V_{GS(\text{PEAK})} = -4.8 \text{ V}$ ,  
 $P_{OUT} = 49.3 \text{ dBm}$ , 3GPP WCDMA signal,  
PAR = 10 dB

**Figure 3.** Single-carrier WCDMA Broadband

$V_{DD} = 48 \text{ V}$ ,  $I_{DQ(\text{MAIN})} = 1000 \text{ mA}$ ,  $V_{GS(\text{PEAK})} = -4.8 \text{ V}$ ,  
 $P_{OUT} = 49.3 \text{ dBm}$ , 3GPP WCDMA signal,  
PAR = 10 dB

**Figure 4.** Pulse CW Performance

$V_{DD} = 48 \text{ V}$ ,  $I_{DQ(\text{MAIN})} = 1000 \text{ mA}$ ,  $V_{GS(\text{PEAK})} = -4.8 \text{ V}$

**Typical Performance** (cont.)**Figure 5.** Pulse CW Performance at various  $V_{DD}$  $I_{DQ(MAIN)} = 1000 \text{ mA}, V_{GS(Peak)} = -4.8 \text{ V}, f = 2690 \text{ MHz}$ **Figure 6.** Small Signal CW Gain & Input Return Loss $V_{DD} = 48 \text{ V}, I_{DQ(MAIN)} = 1000 \text{ mA}, V_{GSPEAK} = -4.8 \text{ V}$ **Load Pull Performance****Main side load pull performance** - pulsed CW signal: 10  $\mu\text{sec}$ , 10% duty cycle, 48 V,  $I_{DQ} = 150 \text{ mA}$ , class AB

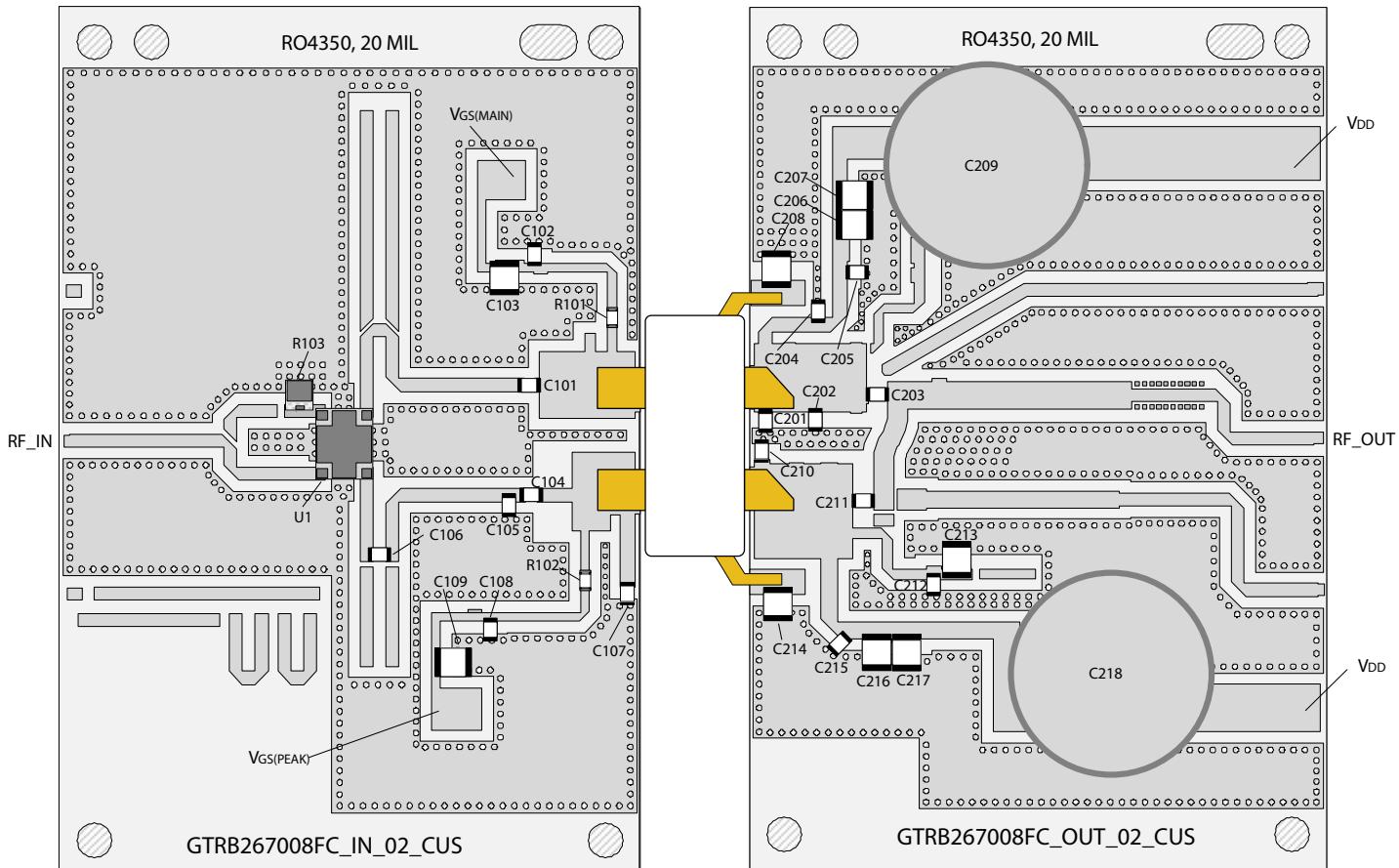
$P_{3dB}$											
Max Output Power							Max Drain Efficiency				
Freq [MHz]	$Z_s$ [ $\Omega$ ]	$Z_l$ [ $\Omega$ ]	Gain [dB]	$P_{OUT}$ [dBm]	$P_{OUT}$ [W]	Efficiency [%]	$Z_l$ [ $\Omega$ ]	Gain [dB]	$P_{OUT}$ [dBm]	$P_{OUT}$ [W]	Efficiency [%]
2495	4.00-j12.35	3.03-j5.34	14.2	55.8	383.7	70.0	4.05-j1.38	15.4	53.1	203.2	79.4
2595	7.81-j12.82	2.54-j4.60	14.3	55.5	351.6	72.4	3.92-j2.77	15.0	53.7	232.8	79.7
2690	12.51-j9.50	2.42-j5.65	13.9	55.4	342.8	67.6	2.87-j3.04	15.0	53.2	207.0	81.2

**Peak side load pull performance** - pulsed CW signal: 10  $\mu\text{sec}$ , 10% duty cycle, 48 V,  $V_{GS(Peak)} = -3.3 \text{ V}$ , Class B

$P_{3dB}$											
Max Output Power							Max Drain Efficiency				
Freq [MHz]	$Z_s$ [ $\Omega$ ]	$Z_l$ [ $\Omega$ ]	Gain [dB]	$P_{OUT}$ [dBm]	$P_{OUT}$ [W]	Efficiency [%]	$Z_l$ [ $\Omega$ ]	Gain [dB]	$P_{OUT}$ [dBm]	$P_{OUT}$ [W]	Efficiency [%]
2495	2.63-j9.56	2.22-j6.31	14.9	57.6	576.8	67.6	2.89-j3.49	16.6	55.4	349.9	79.9
2595	3.53-j10.20	2.40-j6.20	15.3	57.4	547.0	69.6	3.13-j4.13	16.9	55.6	363.1	79.2
2690	4.46-j9.28	1.97-j6.80	15.2	57.3	530.9	62.6	2.49-j4.51	17.5	55.4	347.5	77.4

**Doherty Evaluation Board, 2490 – 2690 MHz**

Test Circuit Part Number	LTA/GTRB267008FC-E2
PCB Information	Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$



Reference circuit assembly diagram (not to scale)

## Components Information

Component	Description	Manufacturer	P/N
<b>Input</b>			
C101	Capacitor, 10 pF	ATC	ATC600F100JT250XT
C102, C106, C108	Capacitor, 18 pF	ATC	ATC600F180JT250XT
C103, C109	Capacitor, 50 V, 10 $\mu$ F	Taiyo Yuden	UMK325C7106MM-T
C104	Capacitor, 5.1 pF	ATC	ATC600F5R1BT250XT
C105	Capacitor, 0.5 pF	ATC	ATC600F0R5BT250XT
C107	Capacitor, 0.8 pF	ATC	ATC600F0R8BT250XT
R101, R102	Resistor, 5.6 ohms	Panasonic	ERJ-3GEYJ5R6V
R103	Resistor, 50 ohms	Anaren	C8A50Z4A
U1	Hybrid Coupler	Anaren	X3C26P1-03S
<b>Output</b>			
C201	Capacitor, 1.5 pF	ATC	ATC600F1R5BT250XT
C202	Capacitor, 1.3 pF	ATC	ATC600F1R3BT250XT
C203	Capacitor, 2.4 pF	ATC	ATC600F2R4BT250XT
C204	Capacitor, 0.5 pF	ATC	ATC600F0R5BT250XT
C205, C212, C215	Capacitor, 18 pF	ATC	ATC600F180JT250XT
C206, C207, C208, C213, C214, C216, C217	Capacitor, 100 V, 10 $\mu$ F	Murata	GRM32EC72A106KE05L
C209, C218	Capacitor, 100 V, 470 $\mu$ F	Panasonic	ECA-2AHG47B
C210	Capacitor, 2.0 pF	ATC	ATC600F2R0BT250XT
C211	Capacitor, 5.6 pF	ATC	ATC600F5R6BT250XT

## Bias Sequencing

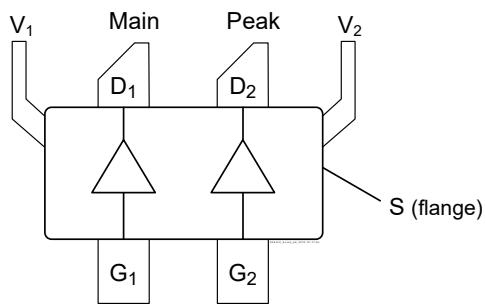
### Bias ON

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

### Bias OFF

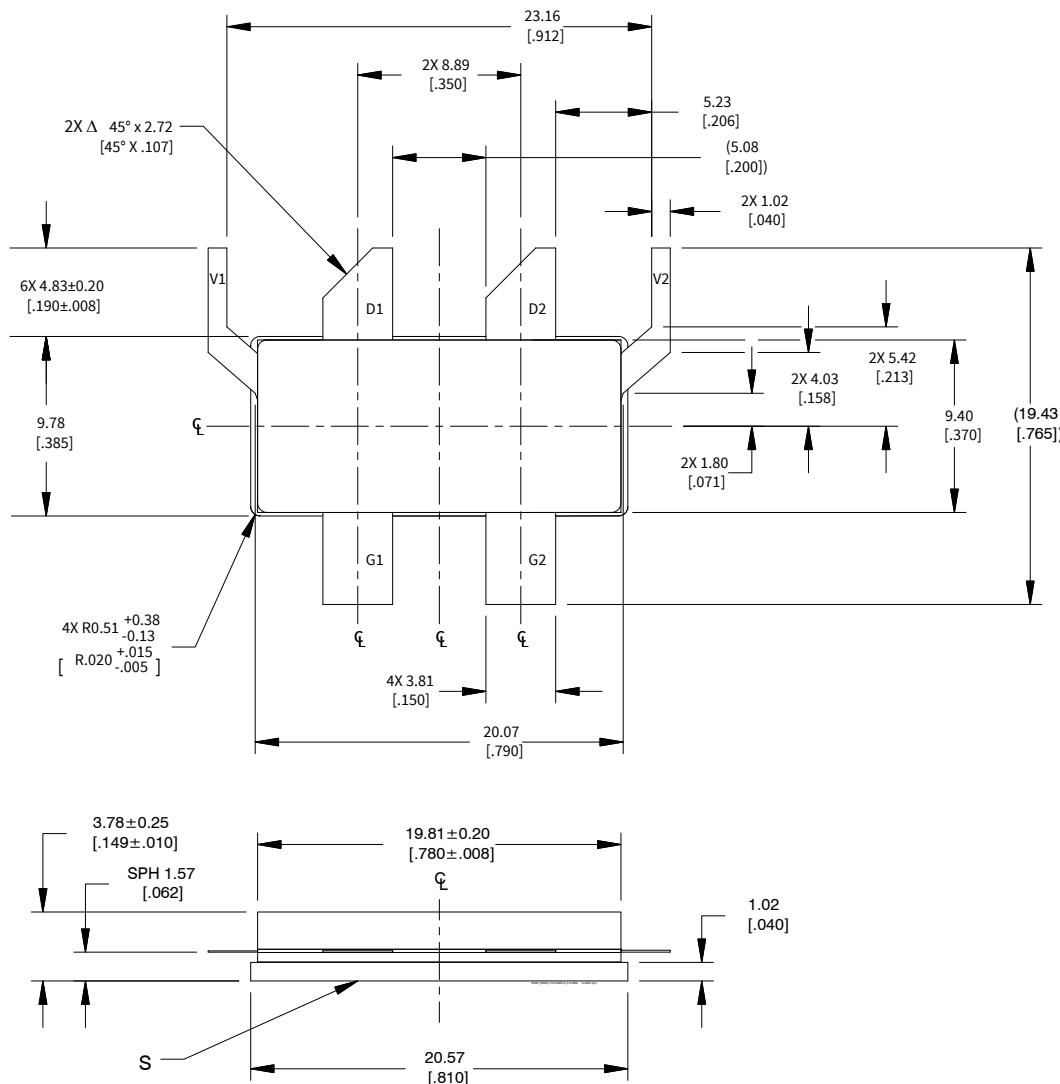
1. Turn RF off
2. Apply pinch-off voltage to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

## 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 and no DC bias
V2	Drain video decoupling and no DC bias
S	Source (flange)

Lead connections for GTRB267008FC

**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  $\pm 0.127$  [ $.005$ ]
4. Pins: D1, D2 – drain, G1, G2 – gate, V1, V2 – drain video decoupling and no DC bias, S – source (flange)
5. Lead thickness:  $0.127 +0.05/-0.025$  [ $.005 +0.002/-0.001$ ]
6. Gold plating thickness:  $1.14 \pm 0.38$  micron [ $45 \pm 15$  microinch]

## Notes & Disclaimer

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