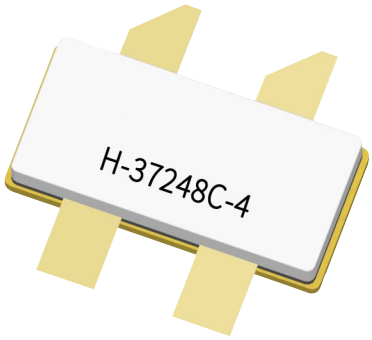
GTRB266502FC

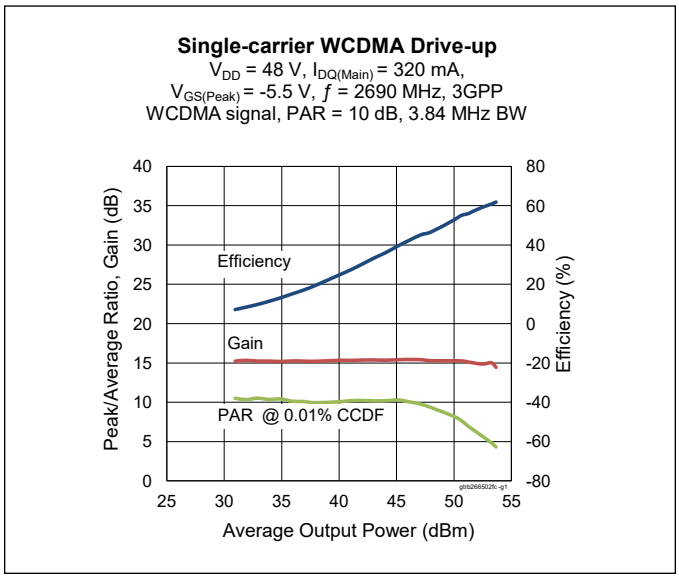
Thermally-Enhanced High Power RF GaN on SiC HEMT
630 W, 48 V, 2620 – 2690 MHz



Package Types: H-37248C-4
PN: GTRB266502FC

Description

The GTRB266502FC is a 630-watt (P3dB) 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.



Features

- GaN on SiC HEMT technology
- Input and output matched
- Asymmetric Doherty design
  - Main: P_{3dB} = 297 W Typ
  - Peak: P_{3dB} = 416 W Typ
- Typical Pulsed CW performance, 2690 MHz, 48 V, 10 µs pulse width, 10% duty cycle, combined outputs
  - Output power at P_{3dB} = 630 W
  - Efficiency at P_{3dB} = 67%
- Human Body Model Class 1B (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

Typical Broadband Performance

Single-carrier WCDMA Specifications (tested in the Doherty evaluation board for 2620 – 2690 MHz)
V_{DD} = 48 V, I_{DQ} = 320 mA, P_{OUT} = 49.5 dBm, $V_{GS(PEAK)}$ = –5.5 V, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

	P_{OUT} (dBM)	Gain (dB)	Efficiency (%)	–ALT1 (dBc)	ALT1 (dBc)	OPAR (dB)
2620 MHz	49.5	15.3	50.5	–31.9	–31.9	8.8
2655 MHz	49.5	15.4	51.2	–31.9	–31.7	8.7
2690 MHz	49.5	15.3	51.3	–31.9	–31.7	8.6

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

RoHS compliant

Rev. 02.1, 2022-07-20

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 (main)	I_{DSS}	—	—	6.3	mA	V_{GS} = -8 V, V_{DS} = 10 V
Drain-source Leakage Current (peak)		—	—	8.8		
Gate to Source Leakage Current (main)	I_{GSX}	—	—	–9.9	mA	V_{GS} = -8 V, V_{DD} = 50 V
Gate to Source Leakage Current (peak)		—	—	–13.9		
Gate Threshold Voltage (main)	$V_{GS(th)}$	–3.8	–3.1	–2.3	V	V_{DS} = 10 V, I_D = 36 mA
Gate Threshold Voltage (peak)						V_{DS} = 10 V, I_D = 50 mA

Recommended Operating Voltages

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Operating Voltage	V_{DD}	0	—	50	V	
Gate Quiescent Voltage	$V_{GS(Q)}$	–3.6	–3	-2.1		V_{DS} =48 V, I_D = 320 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	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)	$R_{\theta JC}$	1.1	°C/W	T_{CASE} = 85°C, 131 W DC
Thermal Resistance (peak)		1.0		T_{CASE} = 85°C, 141 W DC

RF Characteristics

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

V_{DD} = 48 V, I_{DQ} = 320 mA, P_{OUT} = 89 W, $V_{GS(PEAK)}$ = –5.5 V, f = 2690 MHz, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Gain	G_{ps}	13	14	—	dB
Drain Efficiency	η_D	45	49	—	%
Adjacent Channel Power Ratio	ACPR	—	–27.5	–24	dBc
Output PAR @ 0.01% CCDF	OPAR	7.5	8	—	dB

Ordering Information

Type and Version	Order Code	Package Description	Shipping
GTRB266502FC V1 R0	GTRB266502FC-V1-R0	H-37248C-4	Tape & Reel, 50 pcs
GTRB266502FC V1 R2	GTRB266502FC-V1-R2	H-37248C-4	Tape & Reel, 250 pcs

Typical Performance (data taken in a Doherty evaluation board)

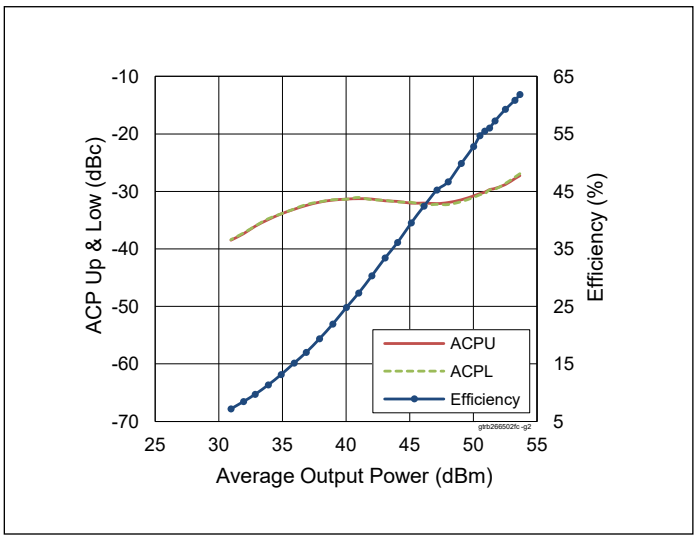


Figure 1. Single-carrier WCDMA Drive-up

V_{DD} = 48 V, $I_{DQ(Main)}$ = 320 mA,
$V_{GS(peak)}$ = -5.5 V, f = 2690 MHz, 3GPP
WCDMA signal, PAR = 10 dB, BW = 3.84 MHz

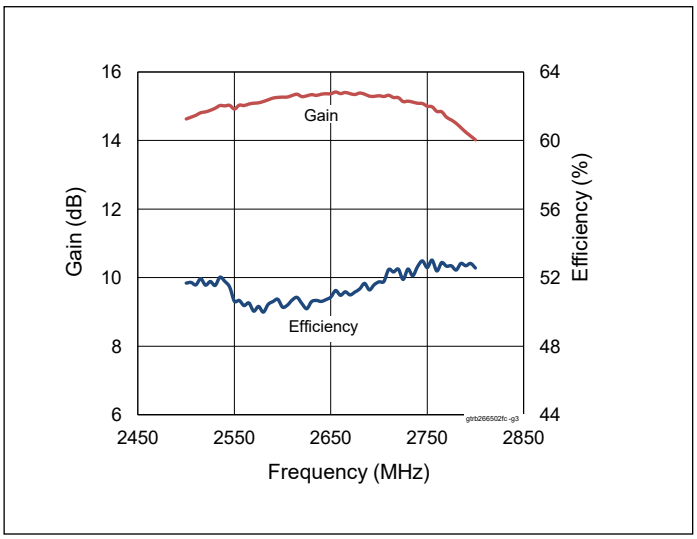


Figure 2. Single-carrier WCDMA Broadband

V_{DD} = 48 V, $I_{DQ(Main)}$ = 320 mA,
$V_{GS(Peak)}$ = -5.5 V, P_{OUT} = 49.5 dBm,
3GPP WCDMA signal, PAR = 10 dB

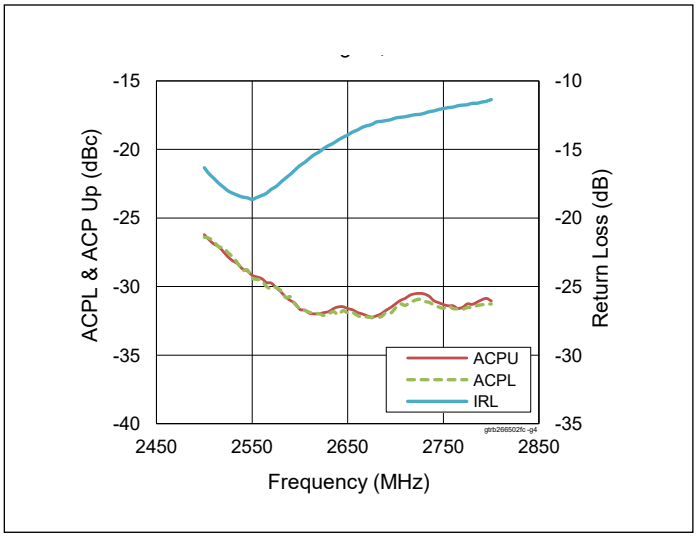


Figure 3. Single-carrier WCDMA Broadband

V_{DD} = 48 V, $I_{DQ(Main)}$ = 320 mA,
$V_{GS(Peak)}$ = -5.5 V, P_{OUT} = 49.5 dBm,
3GPP WCDMA signal, PAR = 10 dB

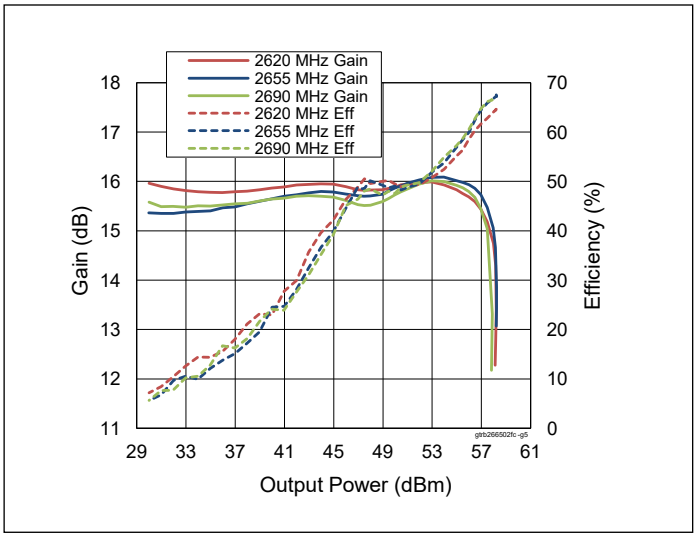


Figure 4. Pulse CW Performance

V_{DD} = 48 V, $I_{DQ(Main)}$ = 320 mA, $V_{GS(Peak)}$ = -5.5 V

Typical Performance (cont.)

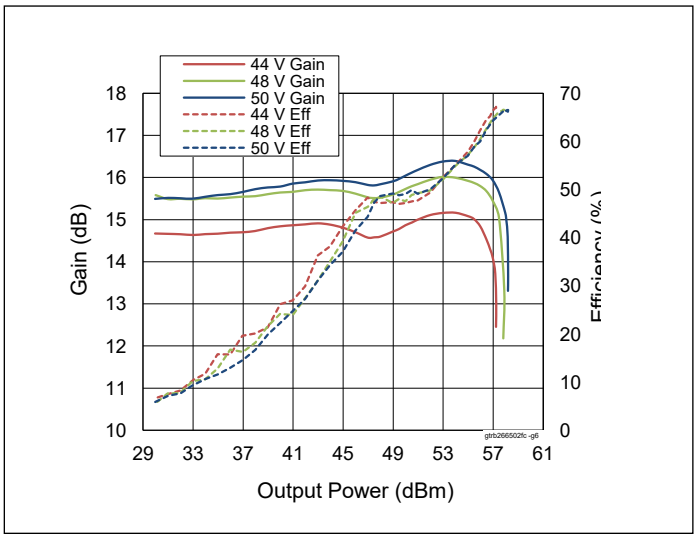


Figure 5. Pulse CW Performance at various V_{DD}

$I_{DQ(MAIN)}$ = 320 mA, $V_{GS(peak)}$= -5.5 V,
f = 2690 MHz

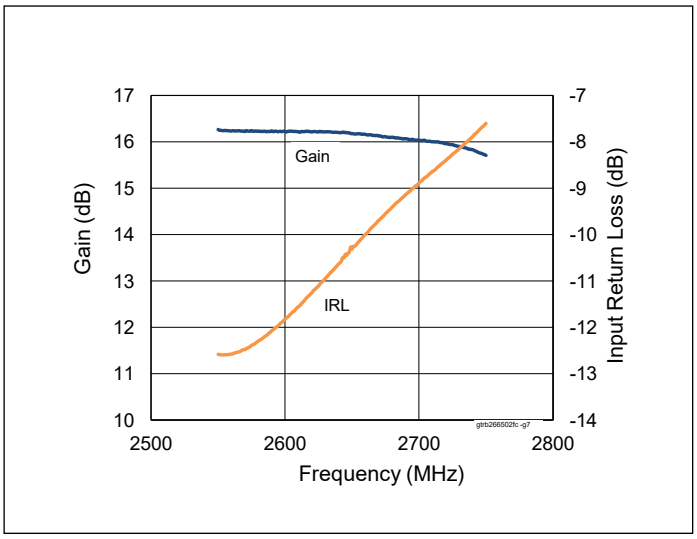


Figure 6. Small Signal CW Gain & Input Return Loss

V_{DD} = 48 V, $I_{DQ\ Main}$ = 320 mA,
$V_{GS(Peak)}$ = -5.5 V

Load Pull

Main side load pull performance – pulsed CW signal: 10 µsec, 10% duty cycle, 48 V, I_{DQ} = 360 mA , class AB

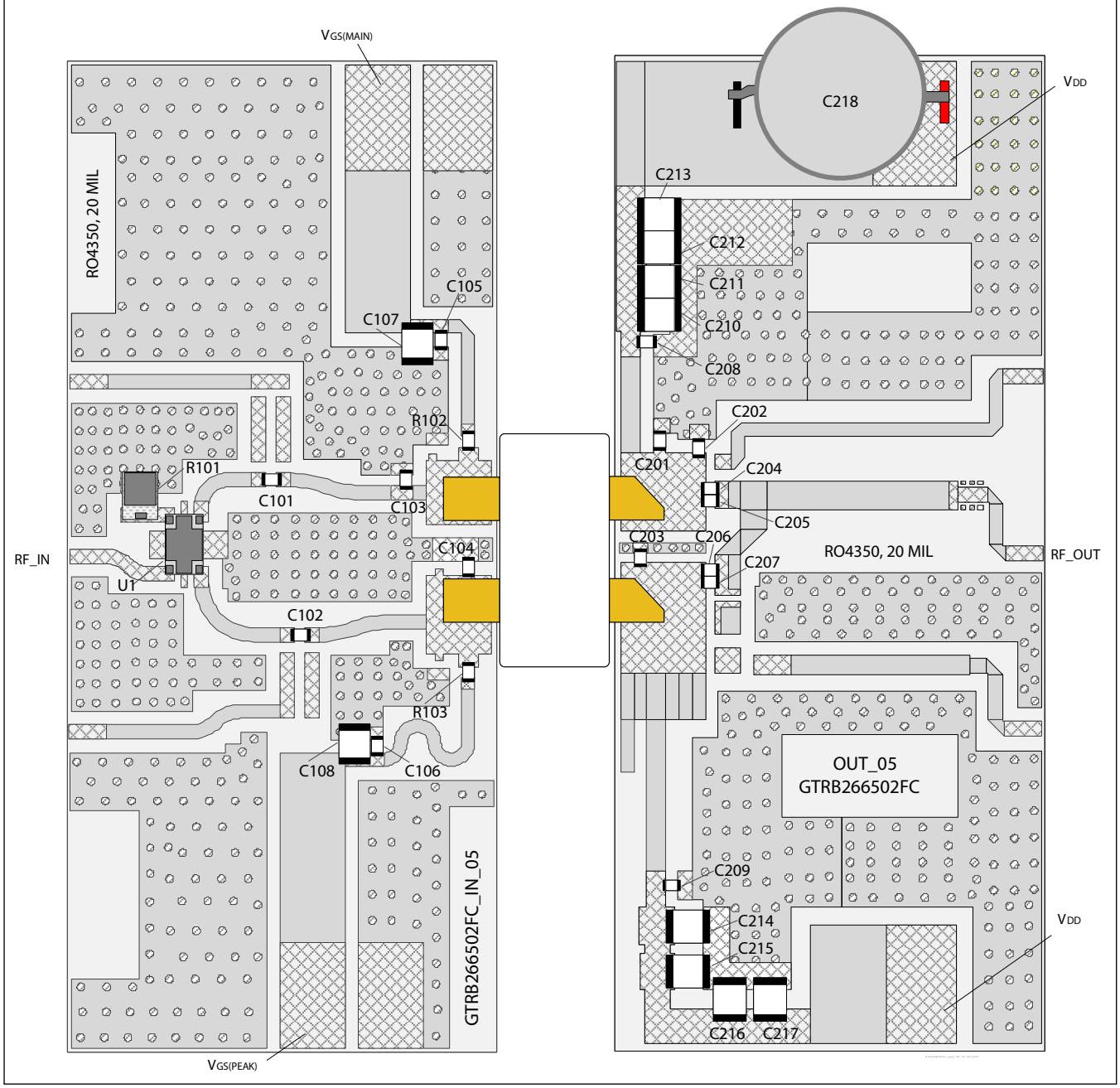
		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Z_s [Ω]	Z_l [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	Z_l [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
2620	12.0 – j6.1	2.6 – j7.3	16	55.47	352	63.0	4.6 – j5.7	17.6	53.94	248	71.0
2655	10.7 – j3.4	2.6 – j7.3	16	55.36	344	63.0	4.5 – j6.5	17.6	54.10	257	71.0
2690	9.2 – j1.2	2.7 – j7.6	16.1	55.48	353	65.0	4.4 – j6.0	17.5	54.00	250	71.0

Peak side load pull performance – pulsed CW signal: 10 µsec, 10% duty cycle, 48 V, $V_{GS(PEAK)}$ = –5 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 [%]
2620	3.0 – j12.1	1.7 – j5.9	12.7	56.31	428	61.0	1.3 – j4.5	14	54.77	300	75.0
2655	3.3 – j12.3	1.7 – j6.1	12.6	56.33	430	61.0	1.1 – j4.5	14.1	54.10	257	74.0
2690	4.2 – j12.3	1.5 – j6.1	13	56.33	430	60.0	1.1 – j4.5	14.2	53.70	234	74.0

Doherty Evaluation Board, 2620 – 2690 MHz

Evaluation Board Part Number	LTA/GTRB266502FC-E2
PCB Information	Rogers 4350, 0.508 mm [0.020”] thick, 2 oz. copper, ε_r = 3.66



Reference circuit assembly diagram (not to scale)

Components Information

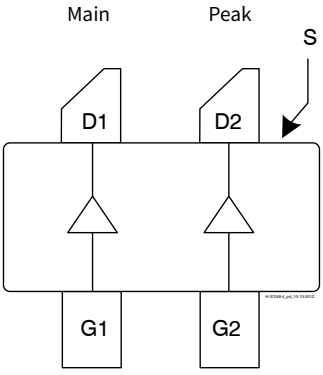
Component	Description	Manufacturer	P/N
Input			
C101, C102, C105, C106	Capacitor, 12 pF	ATC	ATC800A120JT250X
C103	Capacitor, 1.6 pF	ATC	ATC800A1R6CT250X
C104	Capacitor, 1.4 pF	ATC	ATC800A1R4CT250X
C107, C108	Capacitor, 10 µF, 100 V	Murata	GRM32EC72A106KE05L
R101	Resistor, 50 ohms	Richardson	C8A50Z4A
R102, R103	Resistor, 10 ohms	Panasonic	ERJ-3GEYJ100V
U1	Hybrid Coupler	Anaren	X3C25F1-02S
Output			
C201, C202, C203	Capacitor, 0.8 pF	ATC	ATC800A0R8CT250X
C204, C205, C206, C207, C208, C209	Capacitor, 12 pF	ATC	ATC800A120JT250X
C210, C211, C212, C213, C214, C215, C216, C217, C218	Capacitor, 10 µF, 100 V	Murata	GRM32EC72A106KE05L

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)
S	Source (flange)

Lead connections for GTRB266502FC

Package Outline Specifications – Package H-37248C-4

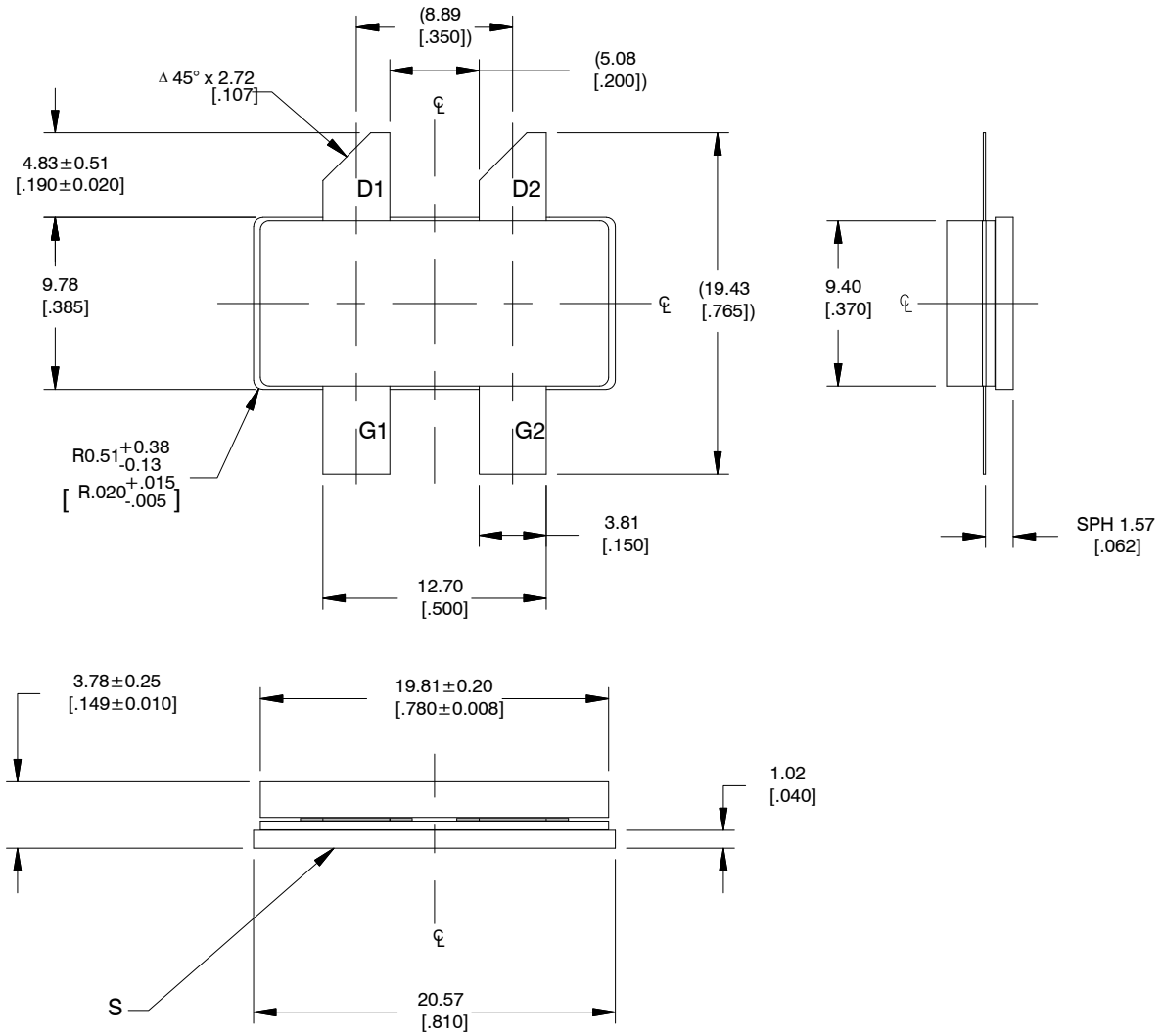


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.005] unless specified otherwise.
4. Pins: D1, D2 – drains; G1, G2 – gates; S – source (flange)
5. Lead thickness: 0.13 ± 0.05 [.005 ± 0.002].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

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