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

GTRB266502FC
Rev. V1

Features

- GaN on SiC Technology
- Input & Output Matched
- Asymmetric Design:
  - Main: P3dB = 297 W
  - Peak: P3dB = 416 W
- Pulsed CW Performance: 2690 MHz, 48 V, 10 µs Pulse Width, 10% Duty Cycle, Combined Outputs
- Output Power @ P3dB = 630 W
- Efficiency @ P3dB = 67%
- Low Thermal Resistance
- RoHS* Compliant

Applications

- Cellular Power

Description

The GTRB266502FC is a 630 W (P3dB) GaN on SiC amplifier designed for use in multi-standard cellular power applications. It features high efficiency, and a thermally-enhanced package with earless flange.

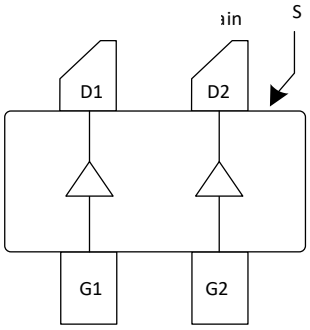
Typical RF Performance

Single-Carrier WCDMA Specifications[1]:
V_{DD} = 48 V, I_{DQ} = 320 mA, $V_{GS(PEAK)}$ = -5.5 V, T_C = 25°C, Channel Bandwidth = 3.84 MHz, Peak/ Average = 10 dB @ 0.01% CCDF

Parameter	Frequency (MHz)	Units	Typical
Output Power	2620 2655 2690	dBm	49.5 49.5 49.5
Gain	2620 2655 2690	dB	15.3 15.4 15.3
Efficiency	2620 2655 2690	%	50.5 51.2 51.3
ACPR+	2620 2655 2690	dBc	-31.9 -31.9 -31.9
ACPR-	2620 2655 2690	dBc	-31.9 -31.7 -31.7
OPAR	2620 2655 2690	dB	8.8 8.7 8.6

1. Measurements taken on Evaluation Board

Functional Schematic



Pin Configuration

Pin #	Function
D1	Drain Device 1 (main)
D2	Drain Device 2 (peak)
G1	Gate Device 1 (main)
G2	Gate Device 2 (peak)
S	Source (flange)

Ordering Information

Part Number	Package
GTRB266502FC-V1-R0	50 piece reel
GTRB266502FC-V1-R2	250 piece reel

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

RF Characteristics, Single-Carrier WCDMA Specifications[2]:

V_{DD} = 48 V, I_{DQ} = 320 mA, $V_{GS(PEAK)}$ = -5.5 V, T_C = 25°C, *f* = 2690 MHz,
Channel Bandwidth = 3.84 MHz, Peak/Average = 10 dB @ 0.01% CCDF

Parameter	Frequency Test Conditions (MHz)	Units	Min.	Typ.	Max.
Gain	G_{ps}	dB	13	14	—
Drain Efficiency	μ_D	%	45	49	—
Adjacent Channel Power Ratio	ACPR	dBc	—	-27.5	-24
Output PAR @ 0.01% CCDF	OPAR	dB	7.5	8	—

2. Measurements taken in Doherty Production Test Fixture

DC Characteristics

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain-Source Breakdown Voltage	V_{GS} = -8 V, I_D = 10 mA Main, Peak	V	150	—	—
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V Main Peak	mA	—	—	6.3 8.8
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DD} = 50 V Main Peak	mA	—	—	-9.9 -13.9
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 36 mA, Main V_{DS} = 10 V, I_D = 50 mA, Peak	V	-3.8	-3.1	-2.3

Recommended Operating Voltages

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain Operating Voltage	—	V	0	—	50
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 320 mA	V	-3.6	-3.0	-2.1

Absolute Maximum Ratings[3,4,5]

Parameter	Absolute Maximum
Drain Source Voltage	125 V
Gate Source Voltage	-10 V to +2 V
Operating Voltage	55 V
Gate Current main Peak	 36.0 mA 54.4 mA
Drain Current main peak	 13.5 A 18.9 A
Junction Temperature	+275°C
Storage Temperature	-65°C to +150°C

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. MACOM does not recommend sustained operation near these survivability limits.
5. Product's qualification were performed @ +225°C. Operation @ T_J (+275°C) reduces median time to failure.

Thermal Characteristics

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Thermal Resistance ($R_{\theta JC}$) main peak	T_C = +85°C, 48 V 131 W DC 141 W DC	°C/W	—	 1.1 1.0	—

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

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1B devices.

Load Pull Performance: Pulsed CW Signal: 10 µs, 10% Duty Cycle

Main Side:

Frequency (MHz)	Z_{SOURCE} (Ω)	Maximum Output Power				
		V_{DS} = 48 V, I_{DQ} = 360 mA, T_C = 25°C, P3dB, Class AB				
		Z_{LOAD} (Ω)	Gain (dB)	P_{3dB} (dBm)	P_{3dB} (W)	η_D (%)
2620	12.0 - j6.1	2.6 - j7.3	16.0	55.47	352	63
2655	10.7 - j3.4	2.6 - j7.3	16.0	55.36	344	63
2690	9.2 - j1.2	2.7 - j7.6	16.1	55.48	353	65

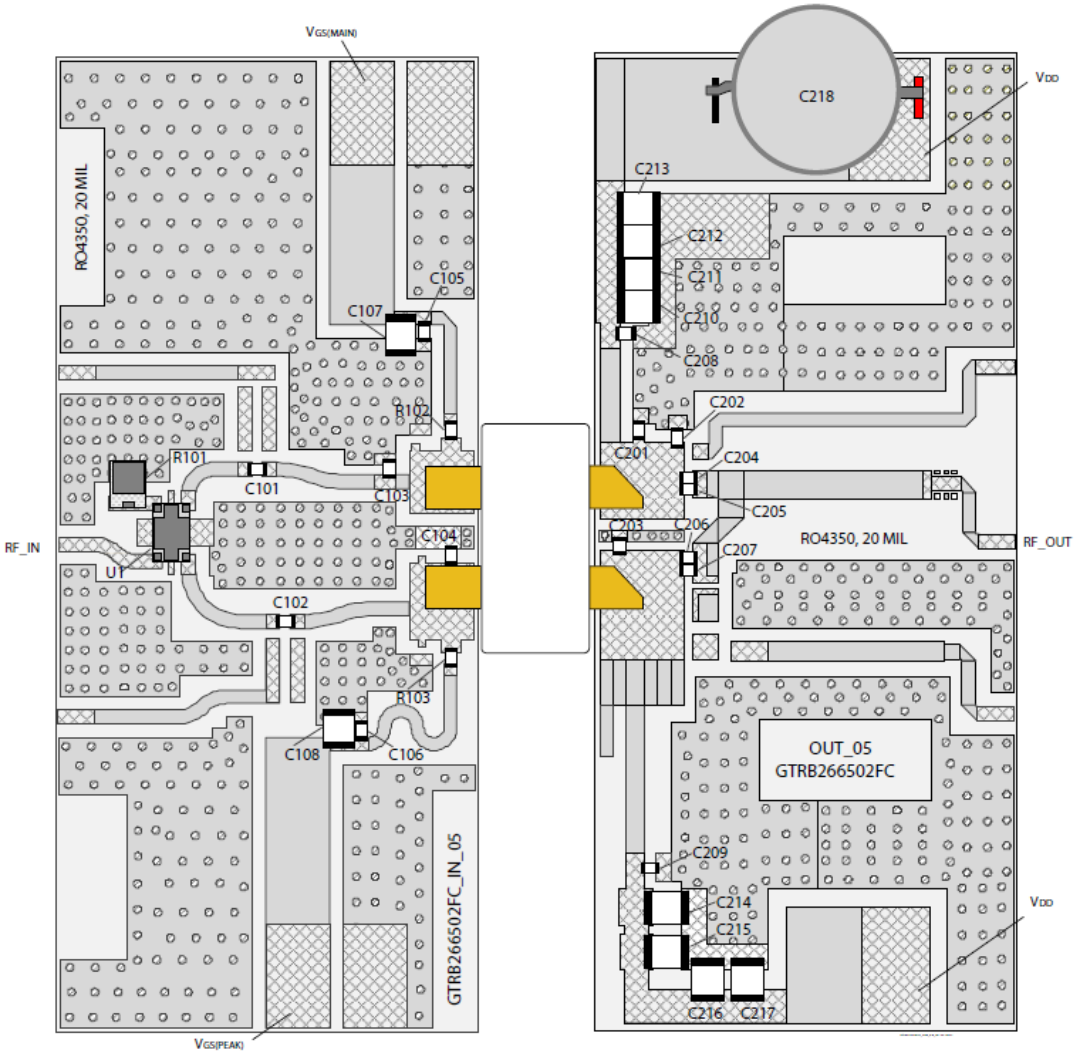
Frequency (MHz)	Z_{SOURCE} (Ω)	Maximum Drain Efficiency				
		V_{DS} = 48 V, I_{DQ} = 360 mA, T_C = 25°C, P3dB, Class AB				
		Z_{LOAD} (Ω)	Gain (dB)	P_{3dB} (dBm)	P_{3dB} (W)	η_D (%)
2620	12.0 - j6.1	4.6 - j5.7	17.6	53.94	248	71
2655	10.7 - j3.4	4.5 - j6.5	17.6	54.10	257	71
2690	9.2 - j1.2	4.6 - j6.0	17.5	54.00	250	71

Peak Side:

Frequency (MHz)	Z_{SOURCE} (Ω)	Maximum Output Power				
		V_{DS} = 48 V, $V_{GS(PEAK)}$ = -5 V, T_C = 25°C, P3dB, Class C				
		Z_{LOAD} (Ω)	Gain (dB)	P_{3dB} (dBm)	P_{3dB} (W)	η_D (%)
2620	3.0 - j12.1	1.7 - j5.9	12.7	56.31	428	61
2655	3.3 - j12.3	1.7 - j6.1	12.6	56.33	430	61
2690	4.2 - j12.3	1.5 - j6.1	13.0	56.33	430	60

Frequency (MHz)	Z_{SOURCE} (Ω)	Maximum Drain Efficiency				
		V_{DS} = 48 V, $V_{GS(PEAK)}$ = -5 V, T_C = 25°C, P3dB, Class C				
		Z_{LOAD} (Ω)	Gain (dB)	P_{3dB} (dBm)	P_{3dB} (W)	η_D (%)
2620	3.0 - j12.1	1.3 + j4.5	14.0	54.77	300	75
2655	3.3 - j12.3	1.1 + j4.5	14.1	54.10	257	74
2690	4.2 - j12.3	1.1 + j4.5	14.2	53.70	234	74

Evaluation Board: 2620 - 2690 MHz

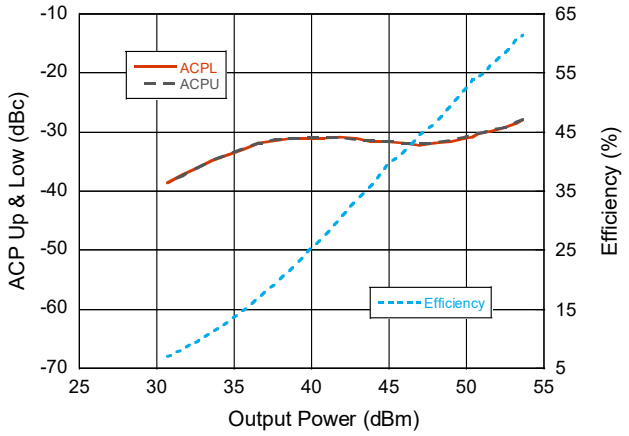


Parts List for Evaluation Board: 2620 - 2690 MHz

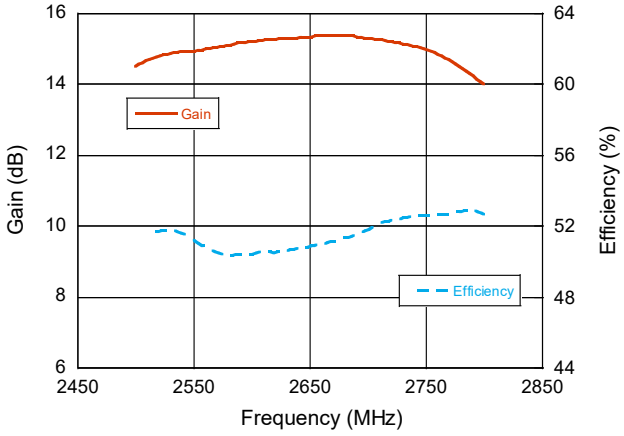
Component	Description	Manufacturer	Manufacturer P/N
Input			
C101, C102, C105, C106	Capacitor, 12 pF	ATC	ATC800A120JT250X
C103	Capacitor, 1.6 pF	ATC	ATC800A1R6CT250X
C104	Capacitor, 1.4 pF	ATC	ATC800A1R4CT250X
C107, C108	Capacitor, 10 µF, 100 V	Murata	GRM32EC72A106KE05L
R101	Resistor, 50 Ω	Richardson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

Typical Performance Curves: Data taken in Evaluation Board

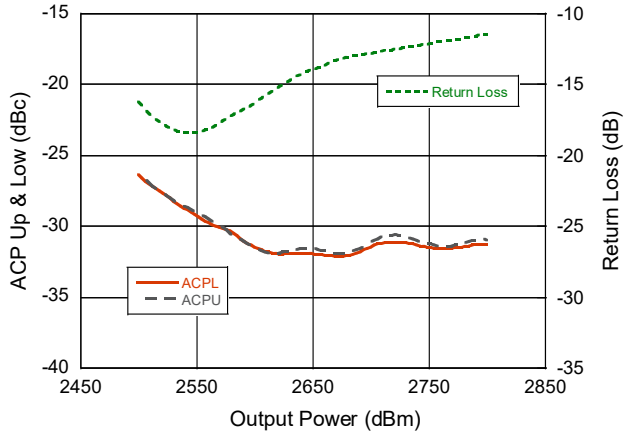
Single-Carrier WCDMA Drive-up @ 2690 MHz



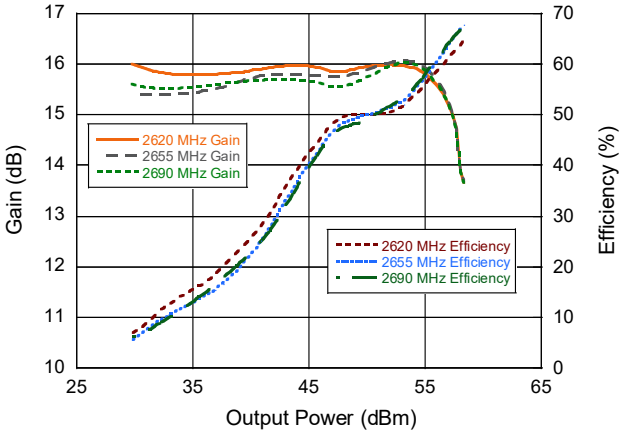
Single-Carrier WCDMA Broadband



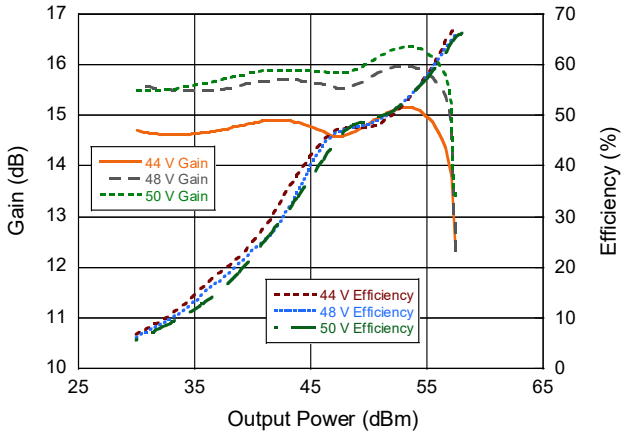
Single-Carrier WCDMA Broadband



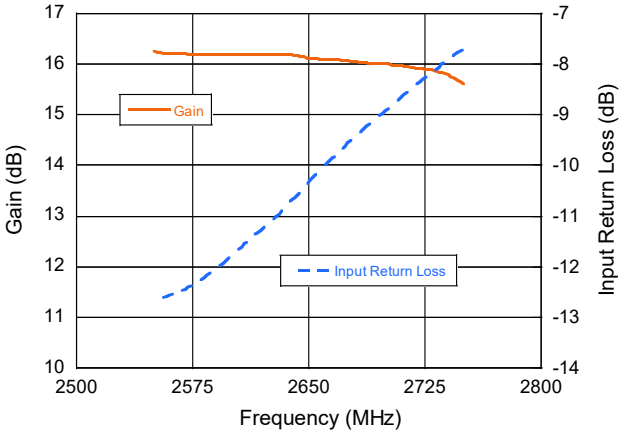
Pulsed CW Performance



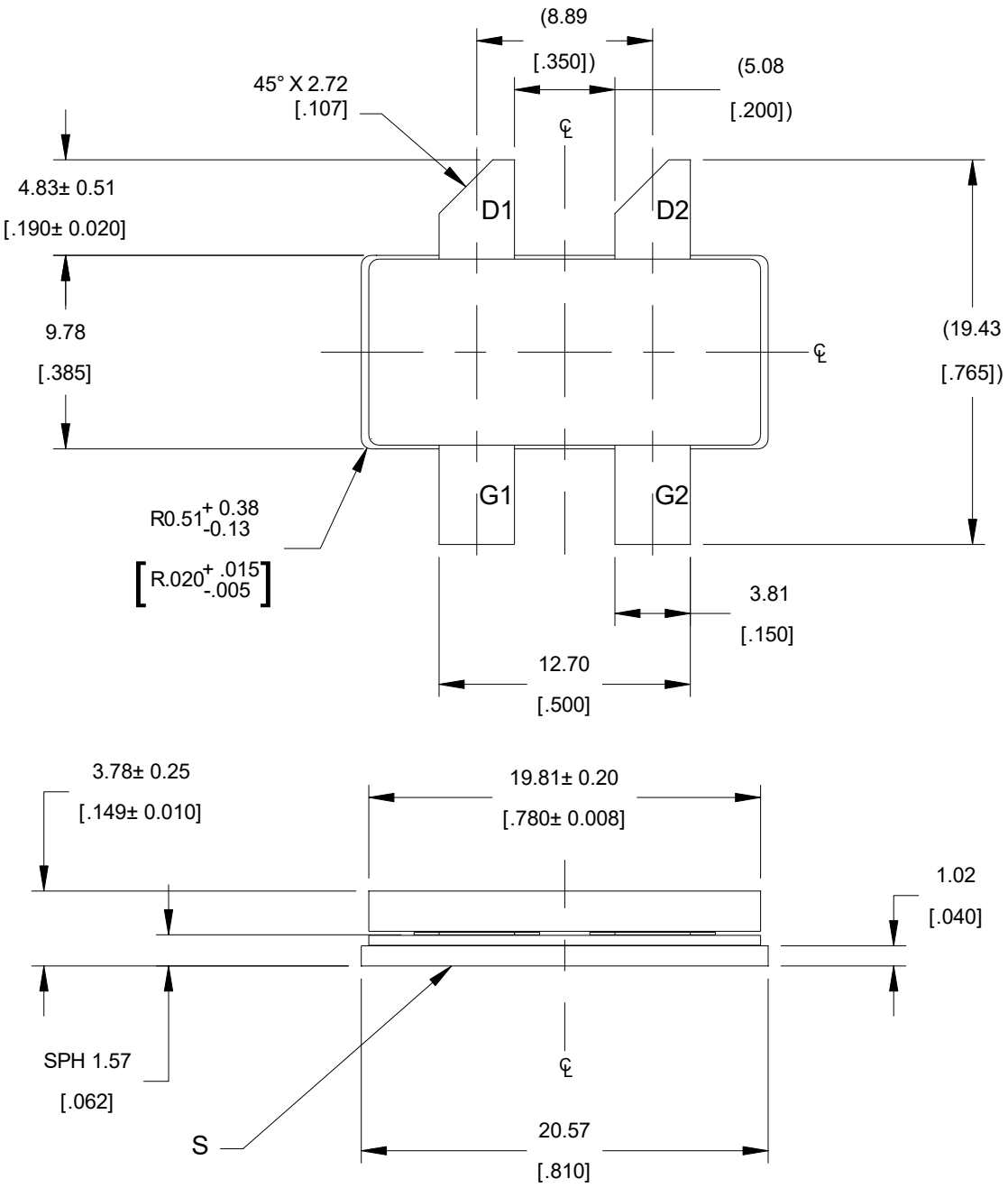
Pulsed CW Performance at various V_{DD} @ 2690 MHz



Small Signal CW Gain & Input Return Loss



Lead-Free Outline Drawing H-37248C-4



Interpret dimensions and tolerances per ASME Y14.5M-1994
Primary dimensions are mm; alternate dimensions are inches
All tolerances ± 0.127 [0.005]
Lead thickness: 0.13 ± 0.05 mm [0.005 ± 0.002 inch]
Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch]