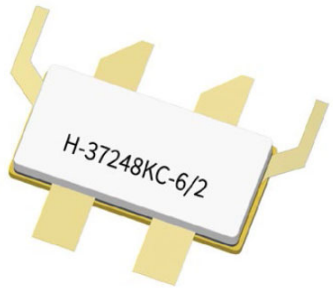
High Power RF GaN Amplifier
450 W, 48 V, 3700 - 4000 MHz

MACOM PURE CARBIDE

GTRB424908FC
Rev. V1

Features

- GaN on SiC HEMT Technology
- Designed for Asymmetrical Doherty Application
- 47.5 dBm Average Output Power
- 450 W Peak Output Power
- Input and Output Pre-matched Device
- Low Thermal Resistance
- 100% DC and RF Tested
- RoHS* Compliant



H-37248KC-6/2

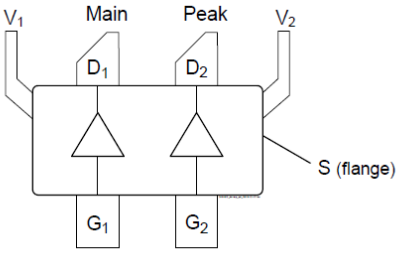
Applications

- Infrastructure

Description

The GTRB424908FC is a GaN on Silicon Carbide HEMT Amplifier designed for use in multi-standard cellular power amplifier applications. The device is optimized for the frequency band of 3700 to 4000 MHz. Product features high efficiency, and a thermally-enhanced package with earless flange.

Functional Schematic



Typical Doherty Performance:

V_{DS} = 48 V, I_{DQm} = 250 mA, V_{GSpk}= -5 V P_{OUT} = 47.5 dBm, T_A = 25°C
Note: Performance in MACOM Doherty Application Fixture. Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

Frequency (MHz)	Gain (dB)	Efficiency (%)	Output PAR (dB)	ACPR (dBc)
3700	12.4	42.4	8.2	-33.7
3800	12.7	40.4	8.5	-38.0
3900	12.8	40.7	8.6	-35.8
4000	12.4	41.7	8.5	-32.5

Pin Configuration

Pin #	Pin Name	Function
G1	RF_{IN} / V_{G1}	RF Input / Gate (Main)
D1	RF_{OUT} / V_{D1}	RF Output / Drain (Main)
G2	RF_{IN} / V_{G2}	RF Input / Gate (Peak)
D2	RF_{OUT} / V_{D2}	RF Output / Drain (Peak)
V1, V2	VBW Lead	Drain Video Decoupling. No DC Bias
S	Flange[2]	Ground / Source

2. The flange on the package bottom must be connected to RF, DC and thermal ground.

Ordering Information

Part Number	Package
GTRB424908FC-V1-R2	250 pc Tape and Reel[1]
GTRB424908FC-V1-R0	50 pc Tape and Reel[1]
LTAGTRB424908FC-E4	Sample Board

1. See application note AN-0004525 for Tape & Reel information.

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

RF Electrical Characterization:

T_A = 25°C, V_{DS} = 48 V, I_{DQm} = 250 mA, V_{GSpk} = -5 V
Note: Performance in MACOM Doherty Application Fixture. Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	4000 MHz, P_{OUT} = 47.5 dBm	Gp	—	12.4	—	dB
Drain Efficiency	4000 MHz, P_{OUT} = 47.5 dBm	η	—	41.7	—	%
Output CCDF @ 0.01%	4000 MHz, P_{OUT} = 47.5 dBm	PAR	—	8.5	—	dB
Adjacent Channel Power	4000 MHz, P_{OUT} = 47.5 dBm	ACP	—	-32.5	—	dBc
Input Return Loss	4000 MHz, P_{OUT} = 47.5 dBm	IRL	—	-13.3	—	dB
Gain Flatness	4000 MHz, P_{OUT} = 47.5 dBm	G_F	—	0.01	—	dB

RF Electrical Test Specifications:

P_{OUT} = 47.5 dBm, T_A = 25°C, V_{DS} = 48 V, I_{DQm} = 250 mA, V_{GSPK} = -5 V
Note: Performance in MACOM Doherty Production Test Fixture. Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

Parameter	Symbol	Frequency	Min.	Typ.	Max.	Units
Power Gain	Gp	4000 MHz	11.0	12.0	—	dB
Drain Efficiency	η	4000 MHz	35.0	42.0	—	%
Output CCDF @ 0.01%	PAR	4000 MHz	7.2	8.0	—	dB
Adjacent Channel Power	ACP	4000 MHz	—	-25.0	-20.0	dBc

DC Electrical Characteristics T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Main Amplifier						
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	—	—	4.4	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	-6.9	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 250 mA	V_T	-3.8	-3.1	-2.3	V
Peak Amplifier						
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	—	—	6.3	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	-9.9	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 360 mA	V_T	-3.8	-3.1	-2.3	V

Recommended Operating Voltages

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain Operating Voltage	—	V	—	50	—
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 250 mA	V	-3.6	-2.9	-2.1

Moisture Sensitivity Level

Level	Test Standard	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	°C

Absolute Maximum Ratings[3,4,5,6,7]

Parameter	Absolute Maximum
Drain Source Voltage, V_{DS}	125 V
Operating Voltage, V_{DS}	55 V
Gate Source Voltage, V_{GS}	-10 to 2 V
Gate Current (Main), I_G	25 mA
Gate Current (Peak), I_G	36 mA
Storage Temperature Range	-65°C to +150°C
Absolute Maximum Channel Temperature	+225°C

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. MACOM does not recommend sustained operation above maximum operating conditions.
5. Operating at drain source voltage V_{DS} < 55V will ensure MTTF > 2.51 x 10^6 hours.
6. Operating at nominal conditions with $T_{CH} \leq 225°C$ will ensure MTTF > 2.51 x 10^6 hours.
7. MTTF may be estimated by the expression MTTF (hours) = A $e^{[B + C/(T+273)]}$ where T is the channel temperature in degrees Celsius., A = 1.93, B = -45.31, and C = 29,585.

Thermal Characteristics[8]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance (main) using Finite Element Analysis, T_J	P_{DISS} = 100 W, T_C = 85°C, T_{CH} = 225°C	R_{Θ}	1.4	°C/W
Thermal Resistance (peak) using Finite Element Analysis, T_J	P_{DISS} = 134 W, T_C = 85°C, T_{CH} = 225°C	R_{Θ}	1.05	°C/W

8. Case temperature measured using thermocouple embedded in heat-sink. Contact local applications support team for more details on this measurement.

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

Gallium Nitride Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

H-37248KC-6/2 Package Dimensions

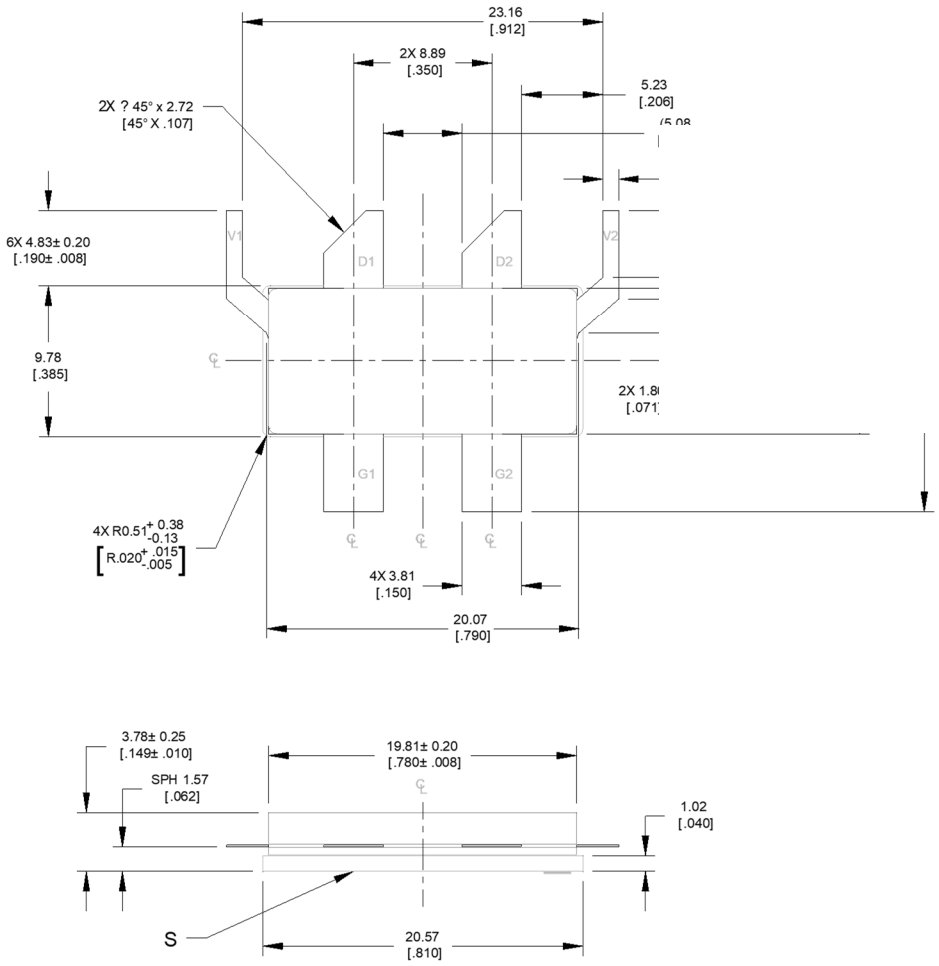


Diagram Notes – unless otherwise specified

1. Interpret dimensions and tolerance 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, V2 – drain video decoupling and no DC bias, 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]