

Thermally Enhanced GaN on SiC Amplifier

490 W, 48 V, 2.496 - 2.690 GHz



MACOM PURE CARBIDE™

WGC27550V1A

Rev. V2

Features

- Optimized for Cellular Base Station Applications
- Pulsed CW Performance, 2.960 GHz, 50 V, 10 μ s pulse width, 10% duty cycle, combined outputs
 - Output Power at P_4 dB = 490 W
 - Efficiency at P_4 dB = 58%
- 48 V Capable Operation
- 100% RF Tested
- RoHS* Compliant

Description

The WGC27550 is a 490 W (P_4 dB) GaN on SiC HEMT amplifier designed for use in multi-standard cellular power amplifier applications. It features high efficiency, and a thermally enhanced package with earless flange.

Typical RF Performance¹

(Tested in Doherty application test circuit)

- Single-carrier WCDMA, $V_{DD} = 48$ V, $I_{DQ} = 280$ mA, $P_{OUT} = 56.2$ W, $V_{GS(peak)} = -4.75$ V, Channel Bandwidth = 3.84 MHz, Peak/Average = 10 dB @ 0.01% CCDF

Frequency (GHz)	G_P (dB)	η_D (%)	OPAR (dB)	ACPR (dBc)
2.496	15.0	52.3	9.5	-30.5
2.593	15.7	51.2	9.5	-32.1
2.690	15.5	51.9	9.2	-33.0

1. Measurements taken with the device soldered to a heatsink of the Doherty application test circuit.

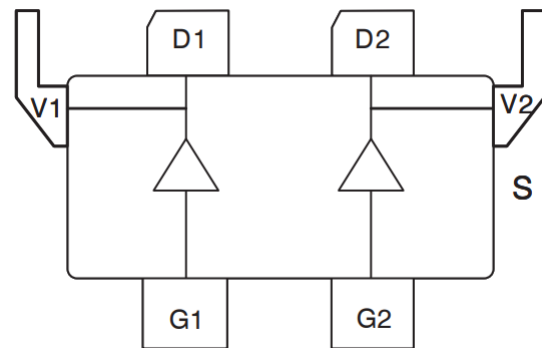
Ordering Information

Part Number	Package
WGC27550V1A-R0	50 piece reel
WGC27550V1A-R2	250 piece reel
LTA/WGC27550-E2	Sample Board (tuned for 2.496-2.690 GHz)



TO-248-6L

Functional Schematic



Pin Configuration²

Pin #	Function
D1	$RF_{OUT} / V_{D MAIN}$
D2	$RF_{OUT} / V_{D PEAK}$
G1	$RF_{IN} / V_{G MAIN}$
G2	$RF_{IN} / V_{G PEAK}$
V1	Drain Video Decoupling. No DC Bias
V2	Drain Video Decoupling. No DC Bias
S	Flange

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

¹ * Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Thermally Enhanced GaN on SiC Amplifier
490 W, 48 V, 2.496 - 2.690 GHz



MACOM PURE CARBIDE™

WGC27550V1A

Rev. V2

RF Electrical Characteristics: $T_A = 25^\circ\text{C}$, $V_{DS} = 48\text{ V}$, $I_{DQCAR} = 280\text{ mA}$, $V_{GSPK} = -4.75\text{ V}$
Note: Performance in MACOM Evaluation Test Fixture, 50 Ω system.

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Power Gain	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	—	15.4	—	dB
Drain Efficiency	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	—	51.9	—	%
Output CCDF @ 0.01%	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	—	9.2	—	dB
Adjacent Channel Power	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	—	-33.0	—	dBc
Input Return Loss	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	—	-17.9	—	dB
Ruggedness: Output Mismatch	All Phase Angles	VSWR = 10:1, No Device Damage			

RF Electrical Characteristics: $T_A = 25^\circ\text{C}$, $V_{DS} = 48\text{ V}$, $I_{DQCAR} = 280\text{ mA}$, $V_{GSPK} = -4\text{ V}$
Note: Performance in MACOM Doherty Production Test Fixture, 50 Ω system.

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Power Gain	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	12	13.5	—	dB
Drain Efficiency	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	41	47.5	—	%
Output CCDF @ 0.01%	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	6.8	7.5	—	dB
Adjacent Channel Power Ratio	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	—	-31.8	-25	dBc
Input Return Loss	WCDMA ³ , 2.6 GHz, $P_{OUT} = 56.2\text{ W}$	—	-22.8	-17	dB

3. Modulated Signal: 3.84 MHz, WCDMA 3GPP TM1 64 DPCH, 9.9 dB PAR @ 0.01% CCDF

DC Electrical Characteristics: $T_A = 25^\circ\text{C}$

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Carrier Amplifier					
Drain-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 100\text{ V}$	-	-	11.2	mA
Gate-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 100\text{ V}$	-8.7	-	-	mA
Gate Threshold Voltage	$V_{DS} = 10\text{ V}, I_D = 28\text{ mA}$	-3.8	-3.3	-2.1	V
Peaking Amplifier					
Drain-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 100\text{ V}$	-	-	20	mA
Gate-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 100\text{ V}$	-15	-	-	mA
Gate Threshold Voltage	$V_{DS} = 10\text{ V}, I_D = 56\text{ mA}$	-3.8	-3.3	-2.1	V

Recommended Operating Voltages

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Drain Operating Voltage	—	0	-	50	V
Carrier Amplifier					
Gate Quiescent Voltage	$V_{DS} = 48\text{ V}, I_D = 280\text{ mA}$	-3.6	-3.2	-2.1	V

Absolute Maximum Ratings^{7,8}

Parameter	Absolute Maximum
Drain Source Voltage, V_{DS}	125 V
Gate Source Voltage, V_{GS}	-10 V to +2 V
Operating Voltage	55 V
Gate Current (Carrier), I_G	28 mA
Drain Current (Carrier), I_D	9.49 A
Gate Current (Peaking), I_G	56 mA
Drain Current (Peaking), I_D	18.98 A
Junction Temperature	+225°C
Channel Operating Temperature	-40°C to +225°C
Storage Temperature	-65°C to +150°C

7. Exceeding any one or combination of these limits may cause permanent damage to this device.

8. MACOM does not recommend sustained operation near these survivability limits.

Thermal Characteristics¹⁰

Parameter	Test Conditions	Units	Typical
Thermal Resistance ($R_{\theta JC}$) Main Peak	$T_C = +85^\circ\text{C}$, $P_{DISS} = 123 \text{ W DC}$ $P_{DISS} = 157 \text{ W DC}$	$^\circ\text{C/W}$	1.2 0.7

Bias Sequencing

Bias ON

1. Ensure RF is turned off
2. Apply pinch-off voltage of -5V 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

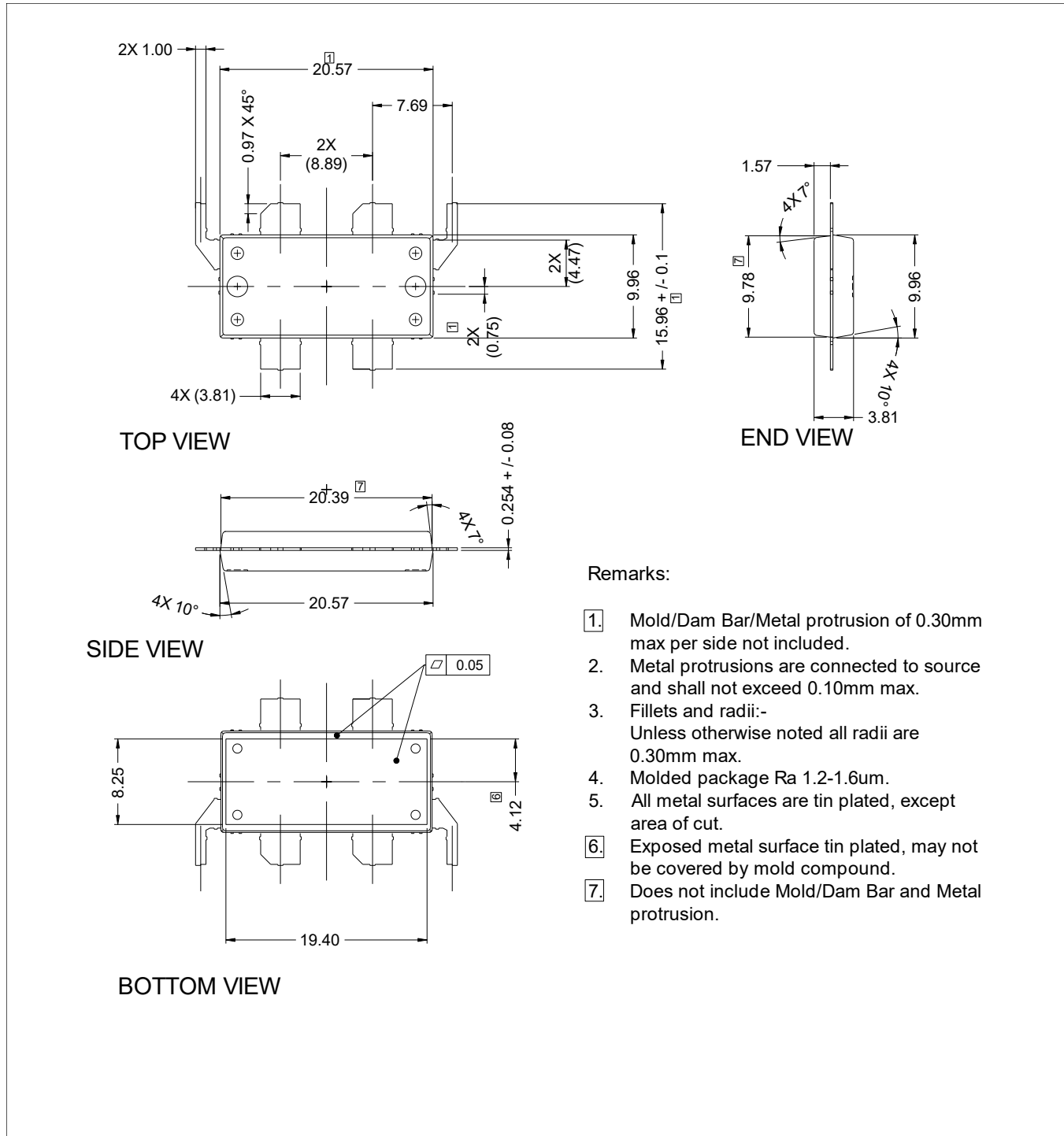
Handling Procedures

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 HBM Class 3A and CDM Class C3 devices.

Lead-Free TO248 6-Lead (PG-HB3SOF-6-1) Package Dimensions[†]



[†] Meets JEDEC moisture sensitivity level (MSL) 3 requirements.
Plating is Sn.

Thermally Enhanced GaN on SiC Amplifier

490 W, 48 V, 2.496 - 2.690 GHz



MACOM PURE CARBIDE™

WGC27550V1A

Rev. V2

MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.

These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.