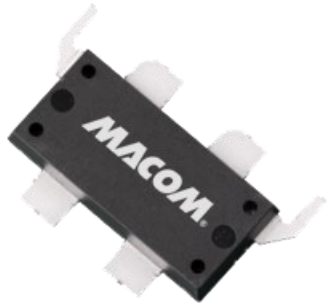
Thermally Enhanced GaN on SiC Amplifier
490 W, 48 V, 2.496 - 2.690 GHz

MACOM PURE CARBIDE

WGC27550V1A
Rev. V1

Features

- Optimized for Cellular Base Station Applications
- Typical pulsed CW performance, 2.960 GHz, 50 V, 10 µs pulse width, 10% duty cycle, combined outputs
  - Output power at P_4dB = 490 W
  - Efficiency at P_4dB = 58%
- 48 V Capable Operation
- 100% RF Tested
- RoHS* Compliant



TO-248-6L

Description

The WGC27550 is a 490 W (P_4dB) 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 Performance[1]

(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

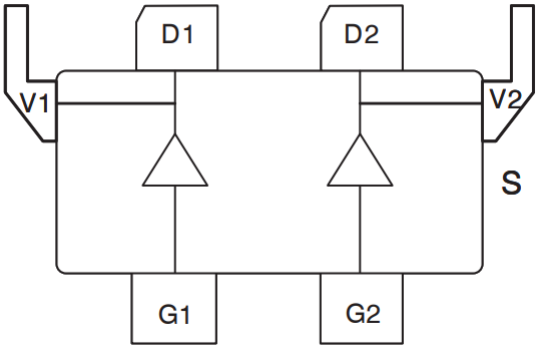
Frequency (GHz)	G_P (dB)	η_D (%)	OPAR (dB)	ACPR (dBc)
2.496	15.0	52.3	9.5	-30.5
2.593	15.7	51.2	9.5	-32.1
2.690	15.5	51.9	9.2	-33.0

Ordering Information

Part Number	Package
WGC27550V1A-R0	50 piece reel
WGC27550V1A-R2	250 piece reel
LTA/WGC27550-E1	Sample Board (tuned for 2.496-2.690 GHz)
LTA/WGC27550-E2	Sample Board (tuned for 2.515-2.675 GHz)

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

Functional Schematic



Pin Configuration[2]

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.

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

RF Electrical Characteristics: T_A = 25°C, V_{DS} = 48 V, I_{DQCAR} = 280 mA, V_{GSPK} = -4.75 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 W	-	15.4	-	dB
Drain Efficiency	WCDMA[3], 2.6 GHz, P_{OUT} = 56.2 W	-	51.9	-	%
Output CCDF @ 0.01%	WCDMA[3], 2.6 GHz, P_{OUT} = 56.2 W	-	9.2	-	dB
Adjacent Channel Power	WCDMA[3], 2.6 GHz, P_{OUT} = 56.2 W	-	-33.0	-	dBc
Input Return Loss	WCDMA[3], 2.6 GHz, P_{OUT} = 56.2 W	-	-17.9	-	dB
Ruggedness: Output Mismatch	All Phase Angles	VSWR = 10:1, No Device Damage			

RF Electrical Characteristics: T_A = 25°C, V_{DS} = 48 V, I_{DQCAR} = 280 mA, V_{GSPK} = -4 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 W	12	13.5	-	dB
Drain Efficiency	WCDMA[3], 2.6 GHz, P_{OUT} = 56.2 W	41	47.5	-	%
Output CCDF @ 0.01%	WCDMA[3], 2.6 GHz, P_{OUT} = 56.2 W	6.8	7.5	-	dB
Adjacent Channel Power Ratio	WCDMA[3], 2.6 GHz, P_{OUT} = 56.2 W	-	-31.8	-25	dBc
Input Return Loss	WCDMA[3], 2.6 GHz, P_{OUT} = 56.2 W	-	-22.8	-17	dB

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

DC Electrical Characteristics: T_A = 25°C

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Carrier Amplifier					
Drain-Source Leakage Current	V_{GS} = - 8 V, V_{DS} = 100 V	-	-	11.2	mA
Gate-Source Leakage Current	V_{GS} = - 8 V, V_{DS} = 100 V	-8.7	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 28 mA	-3.8	-3.3	-2.1	V
Peaking Amplifier					
Drain-Source Leakage Current	V_{GS} = - 8 V, V_{DS} = 100 V	-	-	20	mA
Gate-Source Leakage Current	V_{GS} = - 8 V, V_{DS} = 100 V	-15	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 56 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 V, I_D = 280 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 Characteristics[10]

Parameter	Test Conditions	Units	Typical
Thermal Resistance ($R_{\Theta JC}$) Main Peak	T_C = +85°C, P_{DISS} = 123 W DC P_{DISS} = 157 W DC	°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.

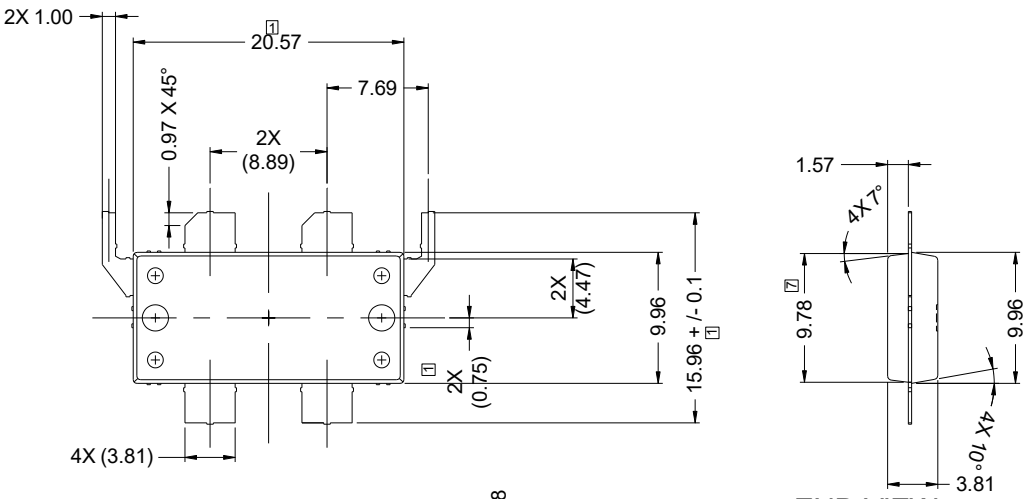
Static Sensitivity

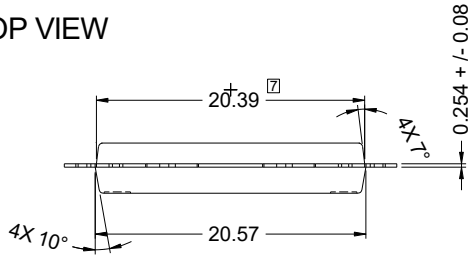
Gallium Nitride Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

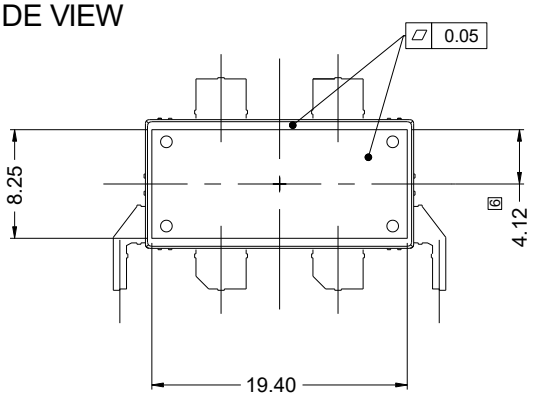
ESD Characteristics

Test Methodology	Test Conditions
Human Body Model (per JS-001)	3A
Charge Device Model (per JS-002)	C3

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







Remarks:

1. Mold/Dam Bar/Metal protrusion of 0.30mm max per side not included.
2. Metal protrusions are connected to source and shall not exceed 0.10mm max.
3. Fillets and radii:-
   Unless otherwise noted all radii are 0.30mm max.
4. Molded package Ra 1.2-1.6um.
5. All metal surfaces are tin plated, except area of cut.
6. Exposed metal surface tin plated, may not be covered by mold compound.
7. Does not include Mold/Dam Bar and Metal protrusion.

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