Thermally Enhanced GaN Amplifier
500 W, 48 V, 3700 - 3980 MHz

WGC40680V1A
Rev. V1

Features

- GaN on SiC HEMT Technology
- Pulsed CW Performance: 3980 MHz, 48 V, 40 µs pulse width, 10% Duty Cycle, Combined Outputs
- Output Power @ P3dB = 500 W
- Efficiency @ P3dB = 58%
- Thermally Enhanced Package
- RoHS* Compliant

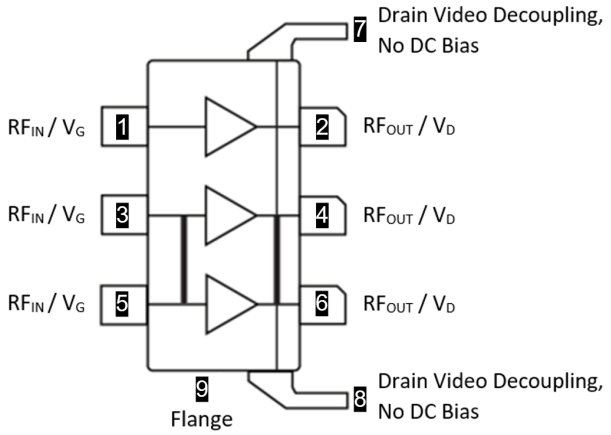
Applications

- Cellular, 5G Infrastructure

Description

The WGC40680 is a 500 W (P3dB) GaN on Silicon Carbide HEMT amplifier designed for use in multi-standard cellular power amplifier applications. It features high efficiency, and a thermally enhanced package with earless flange.

Functional Schematic



Typical RF Performance[1]

(Tested in Doherty application test circuit)

V_{DD} = 48 V, I_{DQ} = 280 mA, P_{OUT} = 47.5 dBm (56.2 W), TA = +25°C, Channel Bandwidth = 3.84 MHz, Peak/ Average = 10 dB @ 0.01% CCDF

Frequency (MHz)	Gain (dB)	Efficiency (%)	OPAR (dB)	ACPR (dBc)
3700	12.8	42.9	8.2	-30.7
3840	12.9	42.4	8.7	-31.5
3980	12.4	42.5	8.2	-30.7

1. Measurements taken with the device soldered to the Doherty application circuit.

Pin Configuration[2]

Pin #	Function
1, 3, 5	RF_{IN} / V_G
2, 4, 6	RF_{OUT} / V_D
7, 8	Drain Video Decoupling. No DC Bias
9	Flange

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

Ordering Information

Part Number	Package
WGC40680V1A-R0	50 piece reel
WGC40680V1A-R2	250 piece reel
LTAWGC40680-E1	Sample Board

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

RF Electrical Specifications[3]:
Freq. = 3980 MHz, V_{DD} = 48 V, I_{DQ} = 280 mA, P_{OUT} = 47.5 dBm (56.2 W), T_A = +25°C, Channel Bandwidth = 3.84 MHz, Peak/Average = 10 dB @ 0.01% CCDF

Parameter	Symbol	Min.	Typ.	Max.	Units
Gain	Gps	10.5	12.3	—	dB
Drain Efficiency	Eff	37	42.2	—	%
Adjacent Channel Power Ratio	ACPR	—	-26.7	-22.5	dBc
Output PAR @ 0.01% CCDF	OPAR	6.5	7.8	—	dB

3. Performance in MACOM Production Test Fixture

DC Electrical Characteristics: T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage	V_{GS} = -8 V, I_D = 10 mA	$V_{BR(DSS)}$	150	—	—	V
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	i_{DSS}	—	—	8.8	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 28 mA	$V_{GS(th)}$	-3.8	-2.6	-2.1	V

Recommended Operating Voltages

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Drain Operating Voltage	—	V_{DD}	0	—	50	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 280 mA	$V_{GS(Q)}$	-3.8	-2.9	-2.3	V

Absolute Maximum Ratings[4,5,6]

Parameter	Absolute Maximum
Drain Source Voltage	125 V
Gate Source Voltage	-10 V to +2 V
Operating Voltage	55 V
Gate Current	32 mA
Drain Current	12 A
Junction Temperature	+225°C
Storage Temperature	-65°C to +150°C

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. MACOM does not recommend sustained operation near these survivability limits.
6. Product's qualification was performed @ +225°C.

Thermal Characteristics[7]

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

7. Thermal resistance is calculated using a method that includes direct infrared measurement of die surface temperature and FEA simulation

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:

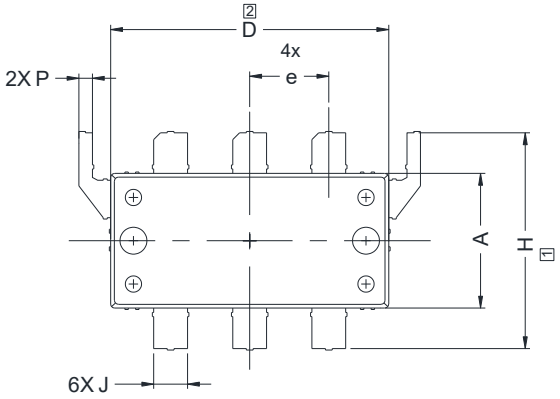
Static Sensitivity

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 devices.

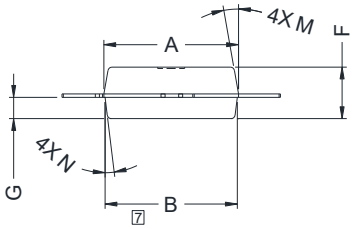
ESD Characteristics

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

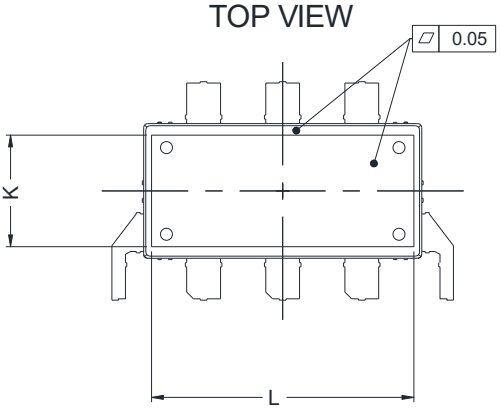
Lead-Free Outline Drawing PG-HB3SOF-8-4



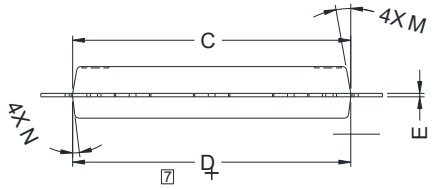
TOP VIEW



RIGHT SIDE VIEW



BOTTOM VIEW



FRONT VIEW

Remarks:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994
2. Mold/Dam Bar/Metal protrusion of 0.30mm max per side not included.
3. Metal protrusions are connected to source and shall not exceed 0.10mm max.
4. Fillets and radii:-
   Unless otherwise noted all radii are 0.30mm max.
5. Molded package Ra 1.2-1.6um.
6. All metal surfaces are tin plated, except area of cut.
7. Does not include Mold/Dam Bar and Metal protrusion.

	INCHES			MILLIMETERS		
DIM	MIN	TYP	MAX	MIN	TYP	MAX
A	0.390	0.392	0.394	9.91	9.96	10.01
B	0.383	0.385	0.387	9.73	9.78	9.83
C	0.808	0.810	0.812	20.52	20.57	20.62
D	0.808	0.810	0.812	20.52	20.57	20.62
E	0.007	0.010	0.013	0.17	0.25	0.33
F	0.148	0.150	0.152	3.76	3.81	3.86
G	0.060	0.062	0.064	1.52	1.57	1.62
H	0.624	0.628	0.632	15.86	15.96	16.06
J	0.096	0.098	0.100	2.45	2.50	2.55
K	-	0.325	-	-	8.25	-
L	-	0.764	-	-	19.40	-
M	-	10°±1°	-	-	10°±1°	-
N	-	7°±1°	-	-	7°±1°	-
P	0.037	0.039	0.041	0.95	1.00	1.05
e	-	0.230	-	-	5.85	-