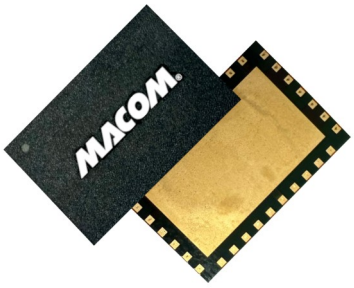
RF GaN Amplifier Module
60 W, 48 V, 3400 - 3800 MHz

MACOM PURE CARBIDE™

MAPC-C38060-AM
Rev. V1

Features

- GaN on SiC HEMT Technology
- 2-Stage Asymmetrical Doherty Amplifier
- Average Output Power: 39.5 dBm
- Peak Output Power: 60 W
- Input and Output: 50 Ω
- RF Input DC Blocked
- Integrated Power Management Bias Controller
- 100% DC and RF Tested
- RoHS* Compliant



LGA 8 x 12 mm

Applications

- Point-to-Point
- Infrastructure

Description

The MAPC-C38060-AM is a fully integrated 2-stage GaN on Silicon Carbide HEMT Amplifier module using all GaN technology. The device is optimized for the frequency band of 3400 to 3800 MHz.

The product features an over-molded thermally enhanced LGA package.

Typical Doherty Performance[1]

V_{DS} = 48 V
P_{OUT} = 39.5 dBm, T_a=25°C
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)
3400	31.0	46.0	8.0	-27.0
3600	32.4	45.3	7.8	-33.0
3800	32.7	45.0	8.0	-33.0

1. Measurements taken with device soldered in evaluation board for 3400 - 3800 MHz.

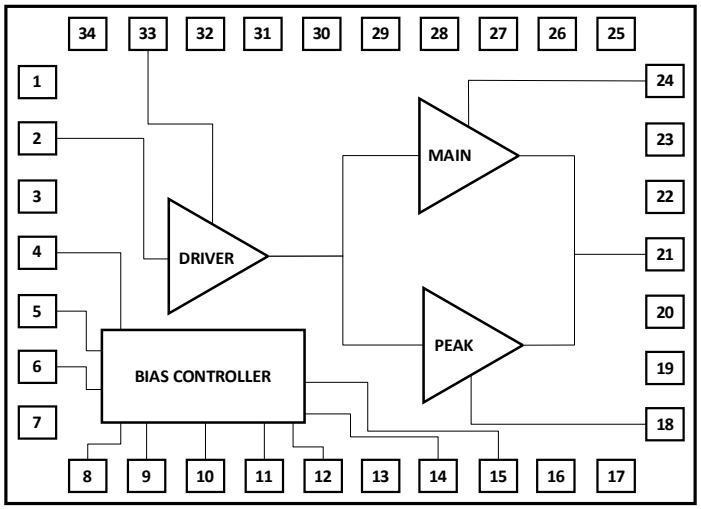
Ordering Information[2]

Part Number	Package
MAPC-C38060-AMTR1	3000 pc reel[2]
MAPC-C38060-AMSB1	Sample Board

2. See application note AN-0004525 for tape & reel information.

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

Functional Schematic



Pin Configuration[3]

Pin #	Pin Name	Function
1,3,7,13,19,20,22,23,25,27,32,Center Pad	GND	Ground
2	RF_{IN}	RF Input
4	PA enable	Enable the PA
5	I2C SDA	I2C data line
6	I2C SCL	I2C clock line
8	I2C A2	Device address line A2
9	I2C A1	Device address line A1
10	I2C A0	Device address line A0
11	PA GOOD	PA gate voltages stabilized
12	V neg	Master gate voltage
14	V +1.8 V	I2C bus logic supply
15	V +5 V ANA	Analog supply
16,17,26,28,29,30,31,34	NC	No Connect
18	VDD PA	Drain Voltage for peak
24	VDD PA	Drain Voltage for main
21	RF_{OUT}	RF Output
33	VDD PA	Drain Voltage for driver

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

RF Electrical Characterization[4] : P_{OUT} = 39.5 dBm, T_A = 25°C, V_{DS} = 48 V

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	3800 MHz[4]	Gp	—	32.5	—	dB
Drain Efficiency	3800 MHz[4]	η	—	45	—	%
Output CCDF @ 0.01%	3800 MHz[4]	PAR	—	8	—	dB
Adjacent Channel Power	3800 MHz[4]	ACP	—	-32	—	dBc
Input Return Loss	3800 MHz[4]	IRL	—	-10	—	dB
Gain Flatness	3800 MHz[4]	G_F	—	0.9	—	dB
Gain Variation (-25°C to +105°C)	3800 MHz[4]	ΔG	—	0.035	—	dB/°C
Power Variation (-25°C to +105°C)	Pulsed 10%DC	ΔP_{3dB}	—	0.01	—	dB/°C
Ruggedness: Output Mismatch	All phase angles	Ψ	VSWR =10:1,No Device Damage			

4. Performance in MACOM Application Fixture. Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

RF Electrical Test Specifications[5,6]: P_{OUT} = 39.5 dBm, T_A = 25°C, V_{DS} = 48 V

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	3800 MHz[5]	Gp	30	32.8	—	dB
Drain Efficiency	3800 MHz[5]	η	40	45.7	—	%
Output CCDF @ 0.01%	3800 MHz[5]	PAR	6.5	7.3	—	dB
Adjacent Channel Power	3800 MHz[5]	ACP	—	-28	-23	dBc
Peak Power	3800 MHz[6]	P_{5dB}	46.5	47.5	—	dB

5. Performance in MACOM Doherty Production Test Fixture. Single Carrier– LTE Channel Bandwidth 10 MHz, PAR 7.5 dB @ 0.01% CCDF.
6. Performance in MACOM Doherty Production Test Fixture. Pulsed CW, 10% Duty Cycle, 20 µs Pulse Width.

DC Electrical Characteristics: V_{GS} = -8 V, T_A = 25°C

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Total Drain-Source Leakage (I_{DLK})	V_{DS} = 10 V V_{DS} = 50 V V_{DS} = 100 V	mA	—	- 0.1 0.1 0.8	0.5 0.8 5.0

Recommended Operating Voltages

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain Operating Voltage	—	V	—	48	—-

Moisture Sensitivity Level

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

Absolute Maximum Ratings[7,8,9,10,11]

Parameter	Absolute Maximum
Drain Source Voltage, V_{DS}	100 V
Gate Source Voltage, V_{GS}	-10 to 3 V
Operating Voltage, V_{DS}	55 V
Storage Temperature Range	-65°C to +150°C
Case Operating Temperature Range	-40°C to +125°C
Channel Operating Temperature Range, T_{CH}	-40°C to +220°C
Absolute Maximum Channel Temperature	+250°C

7. Exceeding any one or combination of these limits may cause permanent damage to this device.
8. MACOM does not recommend sustained operation above maximum operating conditions.
9. Operating at drain source voltage V_{DS} < 55 V will ensure MTTF > 1 x 10^6 hours.
10. Operating at nominal conditions with $T_{CH} \leq 220°C$ will ensure MTTF > 1 x 10^6 hours.
11. 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 = 1.34, B = -31.81, and C = 22,397.

Thermal Characteristics[12]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance using Finite Element Analysis	V_{DS} = 48 V T_C = 125°C, T_{CH} = 225°C	R_q(FEA)	9.1	°C/W
Thermal Resistance using Infrared Measurement of Die Surface Temperature	V_{DS} = 48 V T_C = 125°C, $T_{SURFACE}$ = 200°C	R_q(IR)	6.9	°C/W

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

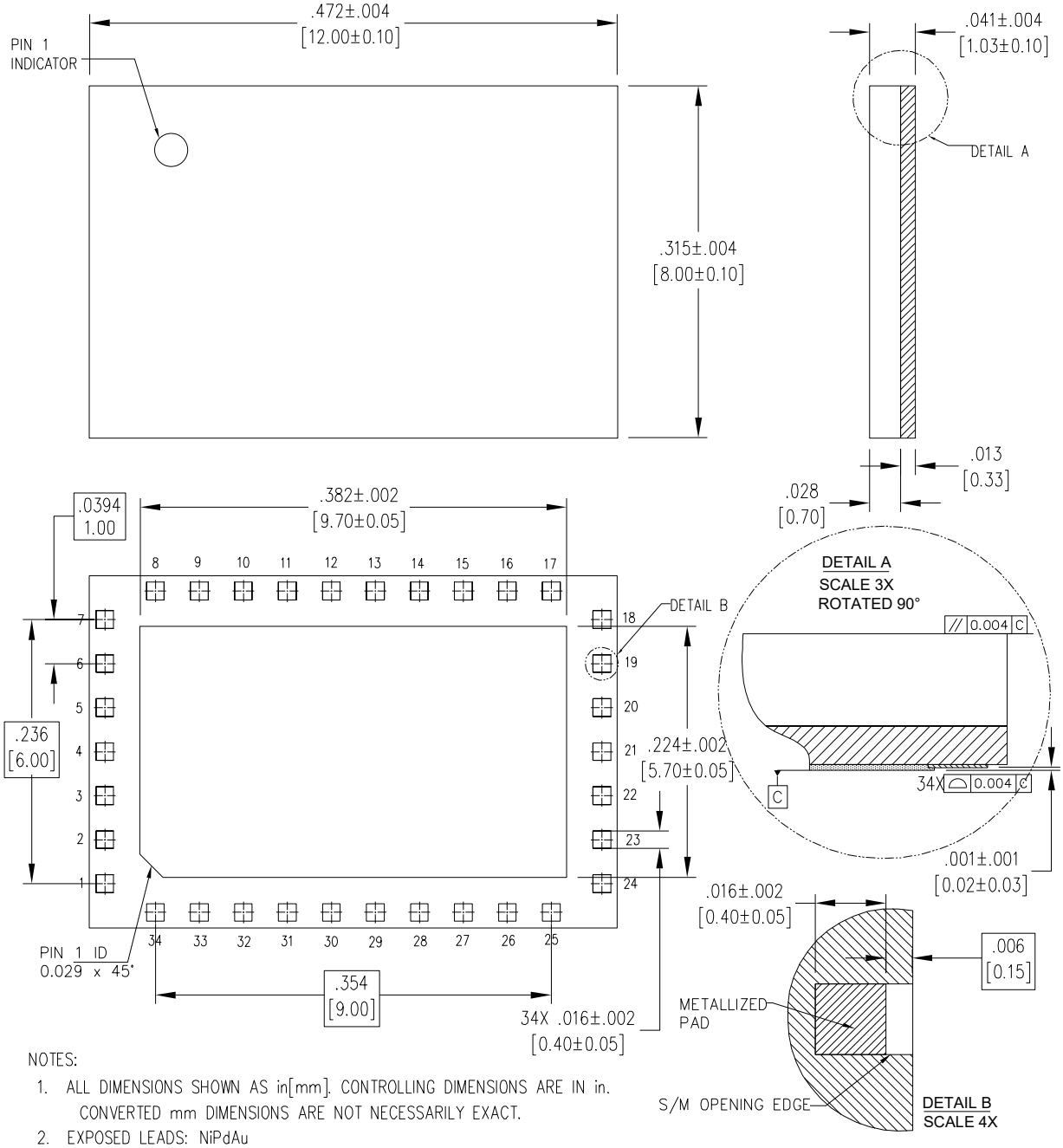
Handling Procedures

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.

Package Dimensions



NOTES:

1. ALL DIMENSIONS SHOWN AS in[mm]. CONTROLLING DIMENSIONS ARE IN in. CONVERTED mm DIMENSIONS ARE NOT NECESSARILY EXACT.
2. EXPOSED LEADS: NiPdAu