RF GaN Amplifier
70 W, 48 V, 3400 - 3800 MHz

MACOM PURE CARBIDE™

MAPC-C38075-AD
Rev. V2

Features

- GaN on SiC HEMT Technology
- Designed for Digital Predistortion Error Correction Systems
- High Terminal Impedances for Broadband Performance
- 48 V Capable Operation
- 100% DC and RF Tested
- RoHS* Compliant

7 x 10 mm DFN

Applications

- Infrastructure

Description

The MAPC-C38075-AD is a GaN on Silicon Carbide HEMT designed for base station applications. The circuit is optimized for modulated signal operation within the 3400 - 3800 MHz frequency band. This device supports pulsed and linear operation with peak output power levels of up to 70 W (48.5 dBm) in a 7 x 10 mm DFN package.

Typical RF Performance:

V_{DS} = 50 V, I_{DQm} = 40 mA, V_{GSpk} = -4.9 V
P_{OUT} = 40 dBm, T_A = 25°C
Note: Performance in MACOM Application Fixture.
Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

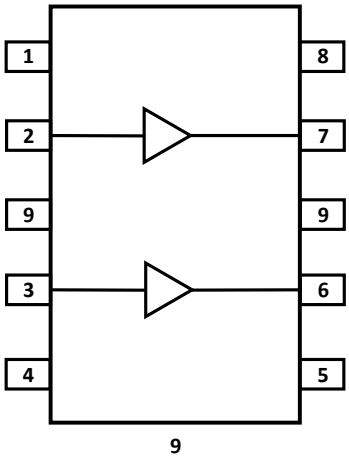
Frequency (MHz)	Gain (dB)	Efficiency (%)	Output PAR (dB)	ACPR (dBc)
3450	14.2	52.0	7.9	-27.0
3600	14.1	53.0	7.8	-27.5
3800	13.9	51.5	8.0	-27.0

Ordering Information

Part Number	Package
MAPC-C38075-ADTR1	3000 pcs tape & reel[1]
MAPC-C38075-ADSB1	Sample Board

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

Functional Schematic



Pin Configuration

Pin #	Pin Name	Function
1,4,5,8	N/C	No Connection
2	RF_{IN} / V_G	RF Input / Gate (Main)
7	RF_{OUT} / V_D	RF Output / Drain (Main)
3	RF_{IN} / V_G	RF Input / Gate (Peak)
6	RF_{OUT} / V_D	RF Output / Drain (Peak)
9	GND / Pad[2]	Ground / Source

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 Characterization:

T_A = 25°C, V_{DS} = 50 V, I_{DQm} = 40 mA, V_{GSpk} = -4.9 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	3600 MHz, P_{OUT} = 40 dBm	Gp	—	14.1	—	dB
Drain Efficiency	3600 MHz, P_{OUT} = 40 dBm	η	—	53.0	—	%
Output CCDF @ 0.01%	3600 MHz, P_{OUT} = 40 dBm	PAR	—	7.8	—	dB
Adjacent Channel Power	3600 MHz, P_{OUT} = 40 dBm	ACP	—	-27.5	—	dBc
Input Return Loss	3600 MHz, P_{OUT} = 40 dBm	IRL	—	-14	—	dB
Gain Flatness	3600 MHz, P_{OUT} = 40 dBm	G_F	—	0.4	—	dB
Gain Variation (-40°C to +105°C)	3600 MHz, P_{OUT} = 40 dBm	ΔG	—	0.02	—	dB/°C
Ruggedness: Output Mismatch	All phase angles	Ψ	VSWR = 6:1, No Device Damage			

RF Electrical Test Specifications:

T_A = 25°C, V_{DS} = 48 V, I_{DQm} = 24 mA, V_{GSpk} = -4.4 V
Note: Performance in MACOM Doherty Production Test Fixture.
LTE 20 MHz, PAR 8 dB @ 0.01% CCDF.

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	3800 MHz, P_{OUT} = 38.5 dBm	Gp	11.9	13.3	—	dB
Drain Efficiency	3800 MHz, P_{OUT} = 38.5 dBm	η	40.0	44.5	—	%
Output CCDF @ 0.01%	3800 MHz, P_{OUT} = 38.5 dBm	PAR	6.5	7.6	—	dB
Adjacent Channel Power	3800 MHz, P_{OUT} = 38.5 dBm	ACP	—	-40.6	-27	dBc

DC Electrical Characteristics T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Main Amplifier						
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	-0.56	—	—	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	I_{GLK}	-0.74	—	—	mA
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	—	—	0.38	mA
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	I_{DLK}	—	—	0.96	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 2.4 mA	V_T	-3.8	-2.9	-2.1	V
Peak Amplifier						
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	-1.13	—	—	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	I_{GLK}	-1.49	—	—	mA
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	—	—	0.76	mA
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	I_{DLK}	—	—	1.92	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 4.8 mA	V_T	-3.8	-3.0	-2.1	V

Recommended Operating Voltages

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain Operating Voltage	—	V	—	50	—
Gate Quiescent Voltage	V_{DS} = 48 V, I_{DQm} = 24 mA	V	-3.6	-2.8	-2.1

ESD Characteristics

Parameter	Class	Standard
Human Body Model (HBM)	1A	ANSI/ESDA/JEDEC JS-001
Charge Device Model (CDM)	C3	ANSI/ESDA/JEDEC JS-002

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}	150 V
Drain Operating Voltage, V_{DS}	55 V
Gate Source Voltage, V_{GS}	-10 to 3 V
Gate Current (Main), I_G	14.7 mA
Gate Current (Peak), I_G	29.4 mA
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 +225°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 $T_{CH} \leq 220°C$ 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 = 1.34, B = -31.81, and C = 22,397.

Thermal Characteristics[8]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance using Finite Element Analysis	V_{DS} = 50 V T_C = 125°C, T_{CH} = 225°C	R_{θ}(FEA)	7.3	°C/W
Thermal Resistance using Infrared Measurement of Die Surface Temperature	V_{DS} = 50 V T_C = 125°C, $T_{SURFACE}$ = 200°C	R_{θ}(IR)	5.9	°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

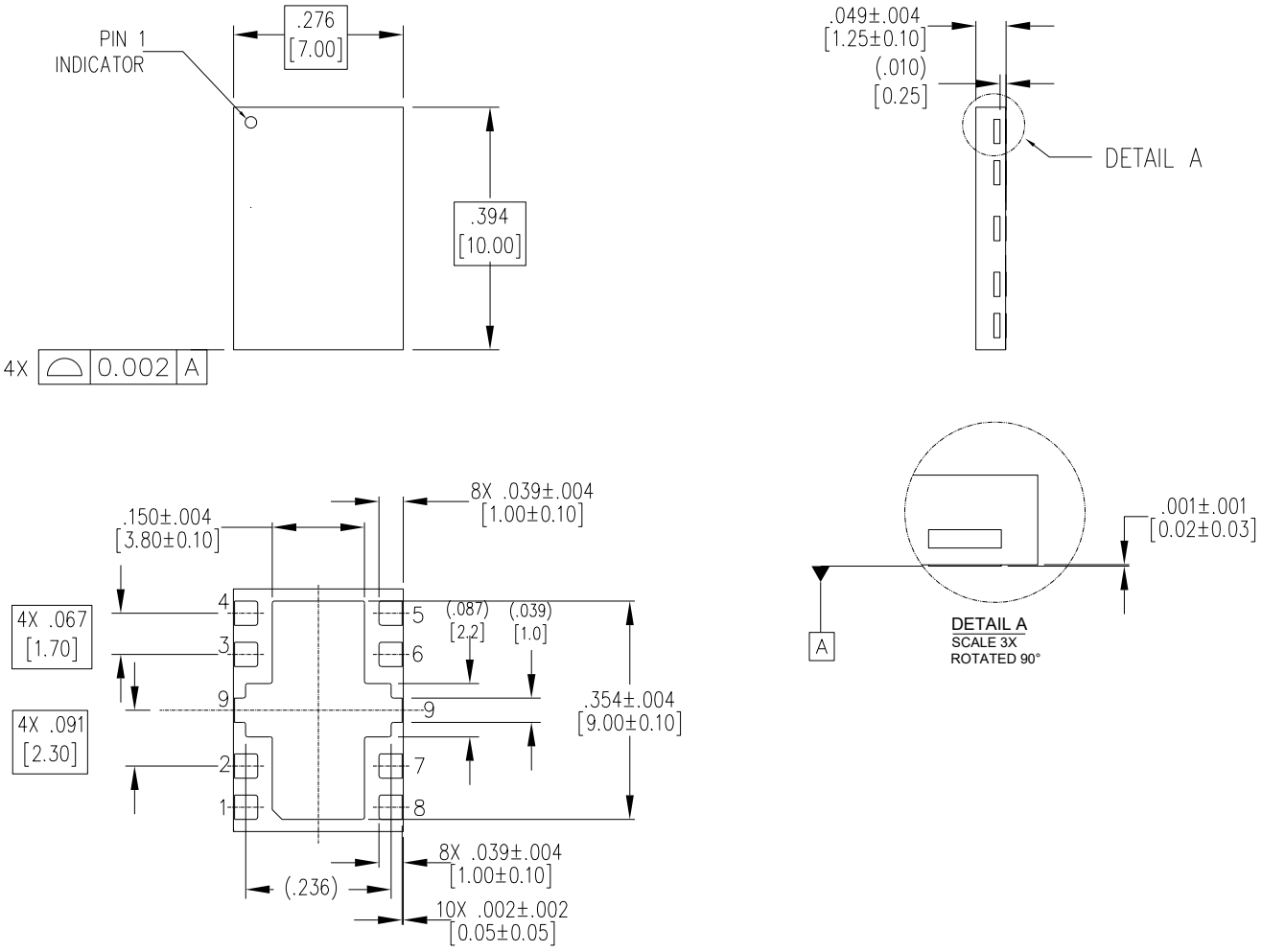
Handling Procedures

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.

Lead-Free 7 x 10 mm 10L Package Dimensions



NOTES:

1. ALL DIMENSIONS SHOWN AS in[mm]. CONTROLLING DIMENSIONS ARE IN in. CONVERTED mm DIMENSIONS ARE NOT NECESSARILY EXACT.
2. LEAD FINISH NiPdAu.