

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

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:

$V_{DS} = 50\text{ V}$, $I_{DQm} = 40\text{ mA}$, $V_{GSpk} = -4.9\text{ V}$
 $P_{OUT} = 40\text{ dBm}$, $T_A = 25^\circ\text{C}$

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

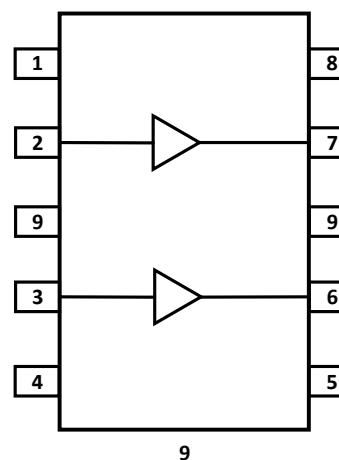
Part Number	Package
MAPC-C38075-ADTR1	3000 pcs tape & reel ¹
MAPC-C38075-ADSB1	Sample Board

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



7 x 10 mm DFN

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.

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

RF GaN Amplifier

70 W, 48 V, 3400 - 3800 MHz



MACOM PURE CARBIDE™

MAPC-C38075-AD

Rev. V2

RF Electrical Characterization:

$T_A = 25^\circ\text{C}$, $V_{DS} = 50\text{ V}$, $I_{DQM} = 40\text{ mA}$, $V_{GSpk} = -4.9\text{ V}$

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

RF Electrical Test Specifications:

$T_A = 25^\circ\text{C}$, $V_{DS} = 48\text{ V}$, $I_{DQM} = 24\text{ mA}$, $V_{GSpk} = -4.4\text{ V}$

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, $P_{OUT} = 38.5\text{ dBm}$	Gp	11.9	13.3	—	dB
Drain Efficiency	3800 MHz, $P_{OUT} = 38.5\text{ dBm}$	η	40.0	44.5	—	%
Output CCDF @ 0.01%	3800 MHz, $P_{OUT} = 38.5\text{ dBm}$	PAR	6.5	7.6	—	dB
Adjacent Channel Power	3800 MHz, $P_{OUT} = 38.5\text{ dBm}$	ACP	—	-40.6	-27	dBc

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

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Main Amplifier						
Gate-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 50\text{ V}$	I_{GLK}	-0.56	—	—	mA
Gate-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 150\text{ V}$	I_{GLK}	-0.74	—	—	mA
Drain-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 10\text{ V}$	I_{DLK}	—	—	0.38	mA
Drain-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 150\text{ V}$	I_{DLK}	—	—	0.96	mA
Gate Threshold Voltage	$V_{DS} = 10\text{ V}, I_D = 2.4\text{ mA}$	V_T	-3.8	-2.9	-2.1	V
Peak Amplifier						
Gate-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 50\text{ V}$	I_{GLK}	-1.13	—	—	mA
Gate-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 150\text{ V}$	I_{GLK}	-1.49	—	—	mA
Drain-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 10\text{ V}$	I_{DLK}	—	—	0.76	mA
Drain-Source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 150\text{ V}$	I_{DLK}	—	—	1.92	mA
Gate Threshold Voltage	$V_{DS} = 10\text{ V}, I_D = 4.8\text{ mA}$	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	$V_{DS} = 48\text{ V}, I_{DQm} = 24\text{ mA}$	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	$^\circ\text{C}$

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

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation above maximum operating conditions.
- Operating at drain source voltage $V_{DS} < 55V$ will ensure $MTTF > 2.51 \times 10^6$ hours.
- Operating at nominal conditions with $T_{CH} \leq 220^\circ C$ will ensure $MTTF > 2.51 \times 10^6$ hours.
- MTTF may be estimated by the expression $MTTF \text{ (hours)} = A e^{[B + C/(T+273)]}$ where T is the channel temperature in degrees Celsius., $A = 1.34$, $B = -31.81$, and $C = 22,397$.

Thermal Characteristics⁸

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

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

Bias Sequencing

Bias ON

- Ensure RF is turned off
- Apply pinch-off voltage of -5 V to the gate
- Apply nominal drain voltage
- Bias gate to desired quiescent drain current
- Apply RF

Bias OFF

- Turn RF off
- Apply pinch-off voltage to the gate
- Turn-off drain voltage
- Turn-off gate voltage

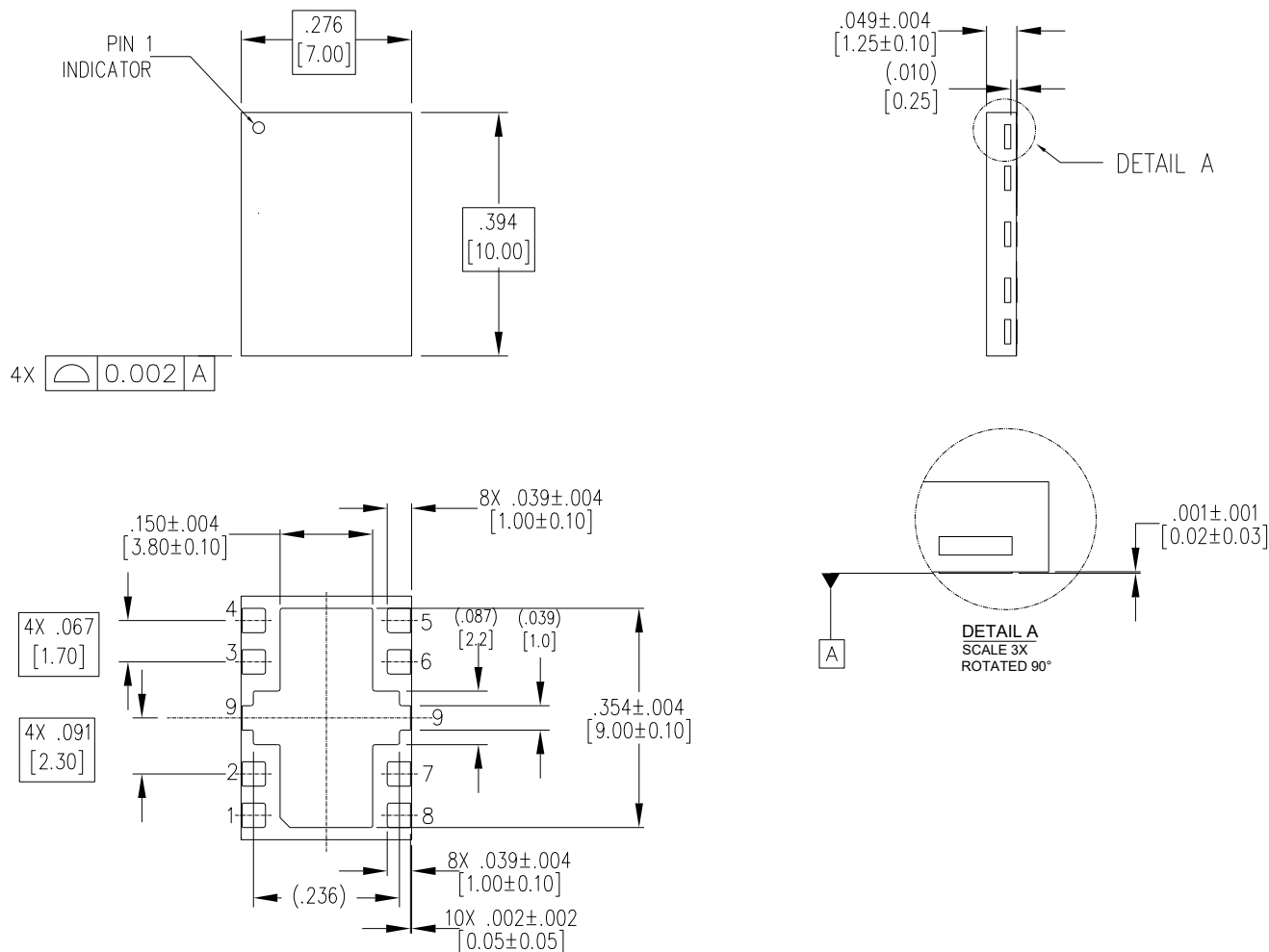
Handling Procedures

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.

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