# RF GaN Transistor
# 7 W, 48 V, 5000 MHz

MACOM

MACOM PURE CARBIDE™

**MAPC-C38007-AD**
**Rev. V2**

## Features

- GaN on SiC HEMT Technology
- Designed for Digital Predistortion Error Correction Systems
- 7W Peak Output Power
- High Terminal Impedances for Broadband Performance
- 100% DC and RF Tested
- RoHS* Compliant


**4.0 x 4.5 mm DFN**

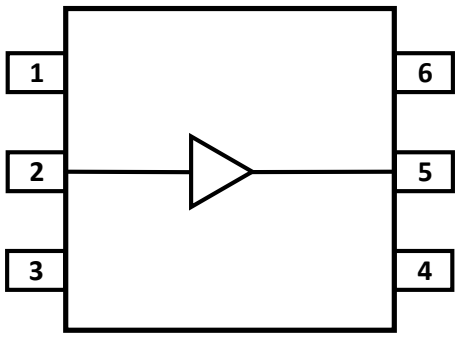
## Applications

- Point-to-Point
- Infrastructure

## Description

The MAPC-C38007-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 product is housed in a 4.0 x 4.5 mm DFN package.

## Functional Schematic




## Typical RF Performance:

$V_{DS}$ = 48 V, $I_{DQ}$ = 16 mA
$P_{OUT}$ = 26 dBm, $T_A$ = 25°C
Note: Performance in MACOM Class AB 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 | 18.0 | 15.5 | 9.6 | -41.0 |
| 3600 | 18.8 | 16.0 | 9.6 | -41.0 |
| 3800 | 18.2 | 15.0 | 9.6 | -41.0 |

## Pin Configuration

| Pin # | Pin Name | Function |
|---|---|---|
| 1,3,4,6 | N/C | No Connection |
| 2 | $RF_{IN}$ / $V_G$ | RF Input / Gate |
| 5 | $RF_{OUT}$ / $V_D$ | RF Output / Drain |
| 7/S | Pad[2] | Ground / Source |

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

## Ordering Information

| Part Number | Package |
|---|---|
| MAPC-C38007-ADTR1 | 3000 Piece Reel[1] |
| MAPC-C38007-ADSB1 | Sample Board |

1. See application note AN-0004525 for Tape & Reel information.

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

## RF Electrical Characterization:

$T_A$ = 25°C, $V_{DS}$ = 48 V, $I_{DQ}$ = 16 mA
Note: Performance in MACOM Class AB 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, $P_{OUT}$ = 26 dBm | Gp | — | 18.5 | — | dB |
| Drain Efficiency | 3600 MHz, $P_{OUT}$ = 26 dBm | η | — | 16.0 | — | % |
| Output CCDF @ 0.01% | 3600 MHz, $P_{OUT}$ = 26 dBm | PAR | — | 9.6 | — | dB |
| Adjacent Channel Power | 3600 MHz, $P_{OUT}$ = 26 dBm | ACP | — | -41.0 | — | dBc |
| Input Return Loss | 3600 MHz, $P_{OUT}$ = 26 dBm | IRL | — | -8 | — | dB |
| Gain Flatness | 3600 MHz, $P_{OUT}$ = 26 dBm | $G_F$ | — | 0.8 | — | dB |
| Gain Variation (-40°C to +105°C) | 3600 MHz, $P_{OUT}$ = 26 dBm | ΔG | — | 0.02 | — | dB/°C |
| Power Variation (-40°C to +105°C) | 3600 MHz, Pulsed 10% DC | $\Delta P_{3dB}$ | — | 0.004 | — | dB/°C |
| Ruggedness: Output Mismatch | All phase angles | Ψ | VSWR=10:1, No Device Damage | | | |

## RF Electrical Test Specifications:

$T_A$ = 25°C, $V_{DS}$ = 48 V, $I_{DQ}$ = 16 mA
Note: Performance in MACOM Class AB Production Test Fixture.
Single Carrier– LTE Channel Bandwidth 20 MHz, PAR 8dB @ 0.01% CCDF.

| Parameter | Test Conditions | Symbol | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Power Gain | 3800 MHz, $P_{OUT}$ = 26 dBm | Gp | 15.3 | 16.4 | — | dB |
| Drain Efficiency | 3800 MHz, $P_{OUT}$ = 26 dBm | η | 18 | 19.3 | — | % |
| Output CCDF @ 0.01% | 3800 MHz, $P_{OUT}$ = 26 dBm | PAR | 8.1 | 8.3 | — | dB |
| Adjacent Channel Power | 3800 MHz, $P_{OUT}$ = 26 dBm | ACP | — | -34.6 | -33.8 | dBc |

## DC Electrical Characteristics $T_A$ = 25°C

| Parameter | Test Conditions | Symbol | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Drain-Source Leakage Current | $V_{GS}$ = -8 V, $V_{DS}$ = 150 V | $I_{DLK}$ | - | - | 0.1 | mA |
| Gate-Source Leakage Current | $V_{GS}$ = -8 V, $V_{DS}$ = 150 V | $I_{GLK}$ | -0.06 | - | - | mA |
| Gate Threshold Voltage | $V_{DS}$ = 10 V, $I_D$ = 1 mA | $V_T$ | -3.8 | -2.8 | -2.1 | V |
| Gate Quiescent Voltage | $V_{DS}$ = 10 V, $I_D$ = 1 mA | $V_{GSQ}$ | -3.6 | -3.2 | -2.1 | V |
| On Resistance | $V_{DS}$ = 0.1 V, $V_{GS}$ = 0 V, $I_D$ = 0.1 mA | $R_{ON}$ | - | 3.65 | - | Ω |

## Recommended Operating Voltages

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| Drain Operating Voltage | — | V | — | — | 50 |
| Gate Quiescent Voltage | $V_{DS}$ = 48 V, $I_D$ = 16 mA | V | -3.8 | -2.8 | -2.1 |

## 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, $V_{DS}$ | 125 V |
| Gate Source Voltage, $V_{GS}$ | -10 to 3 V |
| Gate Current, $I_G$ | 4.9 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 | +250°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 > 1 x $10^6$ hours.
6. Operating at nominal conditions with $T_{CH} \leq 220°C$ will ensure MTTF > 1 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 | $V_{DS}$ = 48 V<br>$T_C$ = 125°C, $T_{CH}$ = 225°C | $R_{\theta}$(FEA) | 15.6 | °C/W |
| Thermal Resistance using Infrared Measurement of Die Surface Temperature | $V_{DS}$ = 48 V<br>$T_C$ = 125°C, $T_{SURFACE}$ = 200°C | $R_{\theta}$(IR) | 12.5 | °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

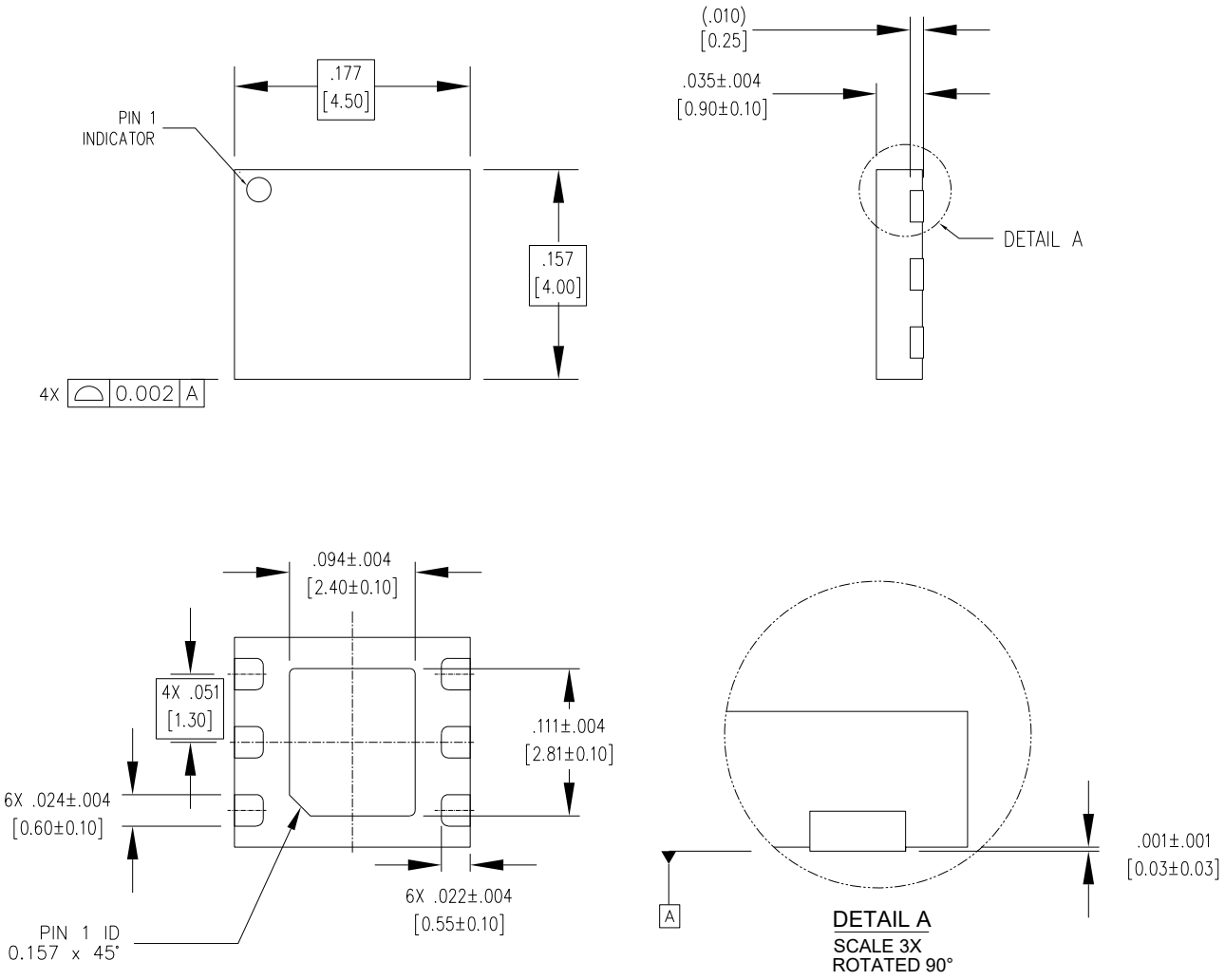
## Handling Procedures

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 HBM Class 1B and CDM Class C0b devices.

## Lead-Free 4.0 x 4.5 mm 6L 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 100% Sn MATTE.