High Power RF GaN Amplifier
60 W, 50 V, 4900 - 5000 MHz

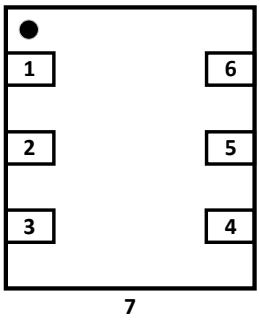
MACOM PURE CARBIDE

MAPC-C50060-AD
Rev. V3

Features

- GaN on SiC HEMT Technology
- Designed for Driver Application
- Average Output Power: 34.4 dBm
- Peak Output Power: 60 W
- Input Pre-matched Device
- Low Thermal Resistance
- 100% DC & RF Tested
- RoHS* Compliant

7.0 x 6.5 mm DFN



Applications

- Point-to-Point
- Infrastructure

Description

The MAPC-C50060-AD is a GaN on Silicon Carbide HEMT Amplifier designed for Driver applications. The device operates as Class-AB amplifier in the application fixture, and it is optimized for the frequency band of 4900 to 5000 MHz. Product is housed in an over-molded 7.0 x 6.5 mm DFN package.

Typical Driver Performance:

V_{DS} = 50 V, I_{DQtop} = 36 mA, I_{DQbot} = 36 mA,
V_{GSpk}= -2.855 V, P_{OUT} = 34.4 dBm, T_A = 25°C

Frequency (MHz)	Gain (dB)	Efficiency (%)	Output PAR (dB)	ACPR (dBc)
4900	15.19	16.71	9.78	-43.93
4950	15.08	17.19	9.84	-43.72
5000	14.92	17.79	9.64	-43.99

Note: Performance in MACOM Driver Application Fixture. Single Carrier- W-CDMA Channel Bandwidth 100 MHz, PAR 10 dB @ 0.01% CCDF.

Pin Configuration

Pin #	Pin Name	Function
1	RF_{IN} / V_{G1}	RF Input / Gate (Top)
2, 5	N/C	No Connection
3	RF_{IN} / V_{G2}	RF Input / Gate (Bottom)
4	RF_{OUT} / V_{D2}	RF Output / Drain (Bottom)
6	RF_{OUT} / V_{D1}	RF Output / Drain (Top)
7	Flange[2]	Ground / Source

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

Ordering Information

Part Number	Package
MAPC-C50060-AD000	Bulk Quantity
MAPC-C50060-ADTR1	Tape and Reel[2]
MAPC-C50060-ADSB1	Sample Board, 4900 - 5000 MHz

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

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

RF Electrical Characterization: in Application Fixture

T_A = 25°C, V_{DS} = 50 V, I_{DQtop} = 36 mA, I_{DQbot} = 36 mA, V_{GStop} = -2.87 V, V_{GSbot} = -2.87 V
Performance in MACOM Driver 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	4950 MHz, P_{OUT} = 34.4 dBm	Gp	—	15.08	—	dB
Drain Efficiency	4950 MHz, P_{OUT} = 34.4 dBm	η	—	17.19	—	%
Output CCDF @ 0.01%	4950 MHz, P_{OUT} = 34.4 dBm	PAR	—	9.84	—	dB
Adjacent Channel Power	4950 MHz, P_{OUT} = 34.4 dBm	ACP	—	-43.72	—	dBc
Input Return Loss	4950 MHz, P_{OUT} = 34.4 dBm	IRL	—	-16.24	—	dB
Gain Flatness	4950 MHz, P_{OUT} = 34.4 dBm	G_F	—	0.26	—	dB
Gain Variation (-40°C to +105°C)	4950 MHz, P_{OUT} = 34.4 dBm	ΔG	—	0.02	—	dB/°C
Power Variation (-40°C to +105°C)	4950 MHz	ΔP_{3dB}	—	0.001	—	dB/°C
Ruggedness: Output Mismatch	All Phase Angles	Ψ	VSWR = 4:1, No Device Damage			

RF Electrical Test Specifications: in Production Test Fixture

TA = 25°C, VDS = 48 V,I_{DQtop} = 36 mA, I_{DQbot} = 36 mA, V_{GStop} = -2.9 V, V_{GSbot} = -2.9 V
Performance in MACOM Doherty Production Test Fixture. LTE 20 MHz, PAR 10dB @ 0.01% CCDF.

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	3800 MHz, P_{OUT} = 34.4 dBm	Gp	6	7.4	—	dB
Drain Efficiency	3800 MHz, P_{OUT} = 34.4 dBm	η	9	10.4	—	%
Output CCDF @ 0.01%	3800 MHz, P_{OUT} = 34.4 dBm	PAR	7.5	8.3	—	dB
Adjacent Channel Power	3800 MHz, P_{OUT} = 34.4 dBm	ACP	—	-38.5	-33	dBc

DC Electrical Characteristics: T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Top Amplifier						
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	—	—	0.6	mA
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	I_{DLK}	—	—	1.4	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	-0.9	-—	—	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	I_{GLK}	-1.1	—	—	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 3.6mA	V_T	-3.8	-2.7	-2.1	V
Bottom Amplifier						
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	—	—	0.6	mA
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	I_{DLK}	—	—	1.4	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	-0.9	-—	—	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	I_{GLK}	-1.1	—	—	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 3.6mA	V_T	-3.8	-2.7	-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_D = 36 mA	V	-3.6	-2.81	-2.1

ESD Characteristics

Parameter	Class	Standard
Human Body Model (HBM)	1A	JEDEC JESD22 A114-D
Charge Device Model (CDM)	C2	JEDEC JESD22 C101-C

Moisture Sensitivity Level

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

Absolute Maximum Ratings[5,6,7,8.9]

Parameter	Absolute Maximum
Drain Source Voltage, V_{DS}	125 V
Gate Source Voltage, V_{GS}	-10 to 3 V
Gate Current (Top), I_G	22.1 mA
Gate Current (Bot), I_G	22.1 mA
Storage Temperature Range	-65°C to +150°C
Channel Operating Temperature Range, T_{CH}	-40°C to +225°C
Absolute Maximum Channel Temperature	+225°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation above maximum operating conditions.
7. Operating at drain source voltage V_{DS} < 55 V will ensure MTTF > 2.51 x 10^6 hours.
8. Operating at nominal conditions with T_{CH} ≤ 225°C will ensure MTTF > 2.51 x 10^6 hours.
9. 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* = 1.93, *B* = -45.31, and *C* = 29,585.

Thermal Characteristics[10]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance using Infrared Measurement of Die Surface Temperature	V_{DS} = 50 V T_C = 125°C, T_{CH} = 225°C	R_{θ}(IR)	8.32	°C/W

10. 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

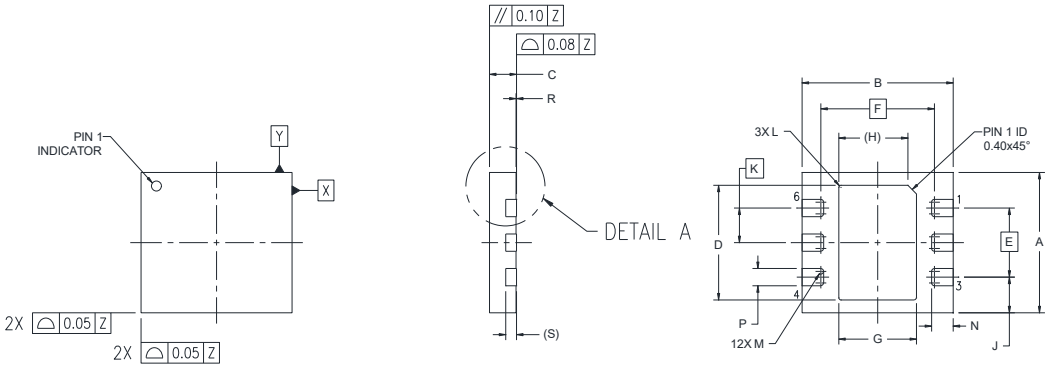
Handling Procedures

Please observe the following precautions to avoid damage:

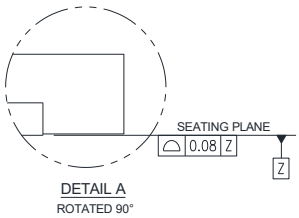
Static Sensitivity

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.

7.0 x 6.5 mm 6-Lead Package Dimensions



TOP VIEW SIDE VIEW BOTTOM VIEW



DIM	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.254	0.256	0.258	6.45	6.5	6.55
B	0.274	0.276	0.278	6.95	7	7.05
C	0.045	0.049	0.053	1.15	1.25	1.35
D	0.205	0.209	0.213	5.21	5.31	5.41
E	-	0.126	-	-	3.2	-
F	-	0.207	-	-	5.26	-
G	0.138	0.142	0.146	3.5	3.6	3.7
H	-	0.126	-	-	3.2	-
J	0.063	0.065	0.067	1.6	1.65	1.7
K	-	0.063	-	-	1.6	-
L	-	0.004	0.008	-	0.1	0.2
M	-	0.005	0.016	-	0.13	0.4
N	0.035	0.039	0.043	0.9	1	1.1
P	0.03	0.031	0.033	0.75	0.8	0.85
R	0	0.001	0.002	0	0.02	0.05
S	-	0.02	-	-	0.5	-
† Interpret dimensions and tolerances per ASME Y14.5M-1994.						