GaN on SiC Transistor
9.5 W, 48 V, Up to 5000 MHz

MACOM PURE CARBIDE

WSGPC04-V1
Rev. V4

Features

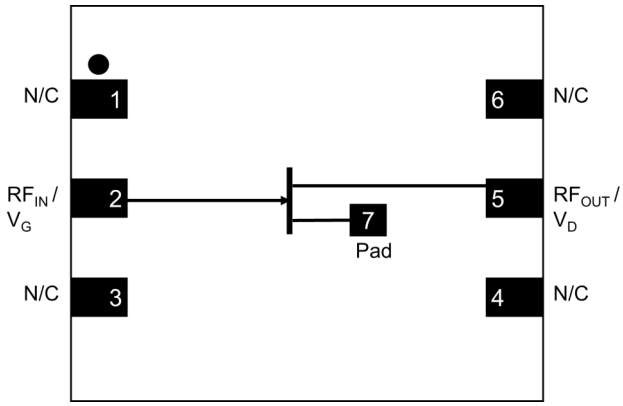
- Optimized for Cellular Base Station Applications
- Designed for Digital Predistortion Error Correction Systems
- High Terminal Impedances for Broadband Performance
- 48 V Capable Operation
- 100% RF Tested
- RoHS* Compliant

4.0 x 4.5 mm DFN

Description

The WSGPC04 GaN on SiC HEMT designed for base station applications and optimized for 2496 - 2690 MHz modulated signal operation. This device supports pulsed and linear operation with peak output power levels to 9.5 W (39.8 dBm) in an 4.0 x 4.5 mm DFN package.

Functional Schematic



Typical RF Performance

- WCDMA 3GPP TM1 64 DPCH 9.9 dB PAR @ 0.01% CCDF, V_{DS} = 48 V, I_{DQ} = 15 mA, T_A = 25°C, P_{OUT} = 24 dBm

Frequency (MHz)	G_P (dB)	η_D (%)	OPAR (dB)	ACPR (dBc)
2496	19.3	13	10.3	-40
2690	18.1	12	10.2	-43

Pin Configuration

Pin #	Function
1,3,4,6[1]	No Connection[1]
2	RF Input / Gate
5	RF Output / Drain
7	Ground / Source

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

Ordering Information

Part Number	Package
WSGPC04-V1-R3K	3000 Piece Reel
FXA-WSGPC04V1-1	Driver Sample Board (tuned for 2496-2690 MHz)
FXA-WSGPC04V1-2	Driver Sample Board (tuned for 2110-2170 MHz and 1805-1880 MHz)

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

RF Electrical Characteristics: T_A = 25°C, V_{DS} = 48 V, I_{DQ} = 15 mA
Note: Performance in MACOM Single-ended Class-AB Evaluation Test Fixture, 50 Ω system.

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Small Signal Gain	Pulsed[2], 2690 MHz	-	18	-	dB
Saturation Output Power	Pulsed[2], 2690 MHz	-	38	-	dBm
Power Gain	WCDMA[3], 2690 MHz, P_{OUT} = 24 dBm	-	18.8	-	dB
Drain Efficiency	WCDMA[3], 2690 MHz, P_{OUT} = 24 dBm	-	12.1	-	%
Output CCDF @ 0.01%	WCDMA[3], 2690 MHz, P_{OUT} = 24 dBm	-	10.1	-	dB
Adjacent Channel Power	WCDMA[3], 2690 MHz, P_{OUT} = 24 dBm	-	-43	-	dBc
Input Return Loss	WCDMA[3], 2690 MHz, P_{OUT} = 24 dBm	-	-14.9	-	dB
Ruggedness: Output Mismatch	All Phase Angles	VSWR = 5:1, No Device Damage			

RF Electrical Characteristics: T_A = 25°C, V_{DS} = 48 V, I_{DQ} = 15 mA
Note: Performance in MACOM Single-ended Class-AB Production Test Fixture, 50 Ω system.

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Power Gain	LTE[4], 2690 MHz, P_{OUT} = 24 dBm	15.5	17.6	-	dB
Drain Efficiency	LTE[4], 2690 MHz, P_{OUT} = 24 dBm	12.5	14.7	-	%
Output CCDF @ 0.01%	LTE[4], 2690 MHz, P_{OUT} = 24 dBm	6.5	7.2	-	dB
Adjacent Channel Power Ratio	LTE[4], 2690 MHz, P_{OUT} = 24 dBm	-	-38	-34	dBc
Input Return Loss	LTE[4], 2690 MHz, P_{OUT} = 24 dBm	-	-13.7	-6	dB

2. Pulse details: 20 µs pulse width, 0.2 ms period, 10% Duty Cycle
3. Modulated Signal: 3.84 MHz, WCMDA 3GPP TM1 64 DPCH, 9.9 dB PAR @ 0.01% CCDF
4. LTE Signal: 20 MHz, 8 dB PAR @ 0.01% CCDF

DC Electrical Characteristics: T_A = 25°C

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	-	-	0.53	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 150 V	-0.41	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 1.2 mA	-3.8	-2.6	-2.1	V

Recommended Operating Voltages

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Drain Operating Voltage	—	0	-	50	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 15 mA	-3.6	-2.6	-2.1	V

Absolute Maximum Ratings[5,6]

Parameter	Absolute Maximum
Drain Source Voltage, V_{DS}	150 V
Gate Source Voltage, V_{GS}	-10 V to +2 V
Operating Voltage	55 V
Gate Current I_G	1.2 mA
Drain Current, I_D	0.41 A
Junction Temperature	+225°C
Channel Operating Temperature	-40°C to +225°C
Storage Temperature	-65°C to +150°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.

Thermal Characteristics[7]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance using Finite Element Analysis	V_{DS} = 48 V T_C=107°C,T_{CH} = 225°C	R_{θ}(FEA)	14.6	°C/W
Thermal Resistance using Infrared Measurement of Die Surface Temperature	V_{DS} = 48 V T_C=107°C,$T_{SURFACE}$ = 200°C	R_{θ}(IR)	11.5	°C/W

7. 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

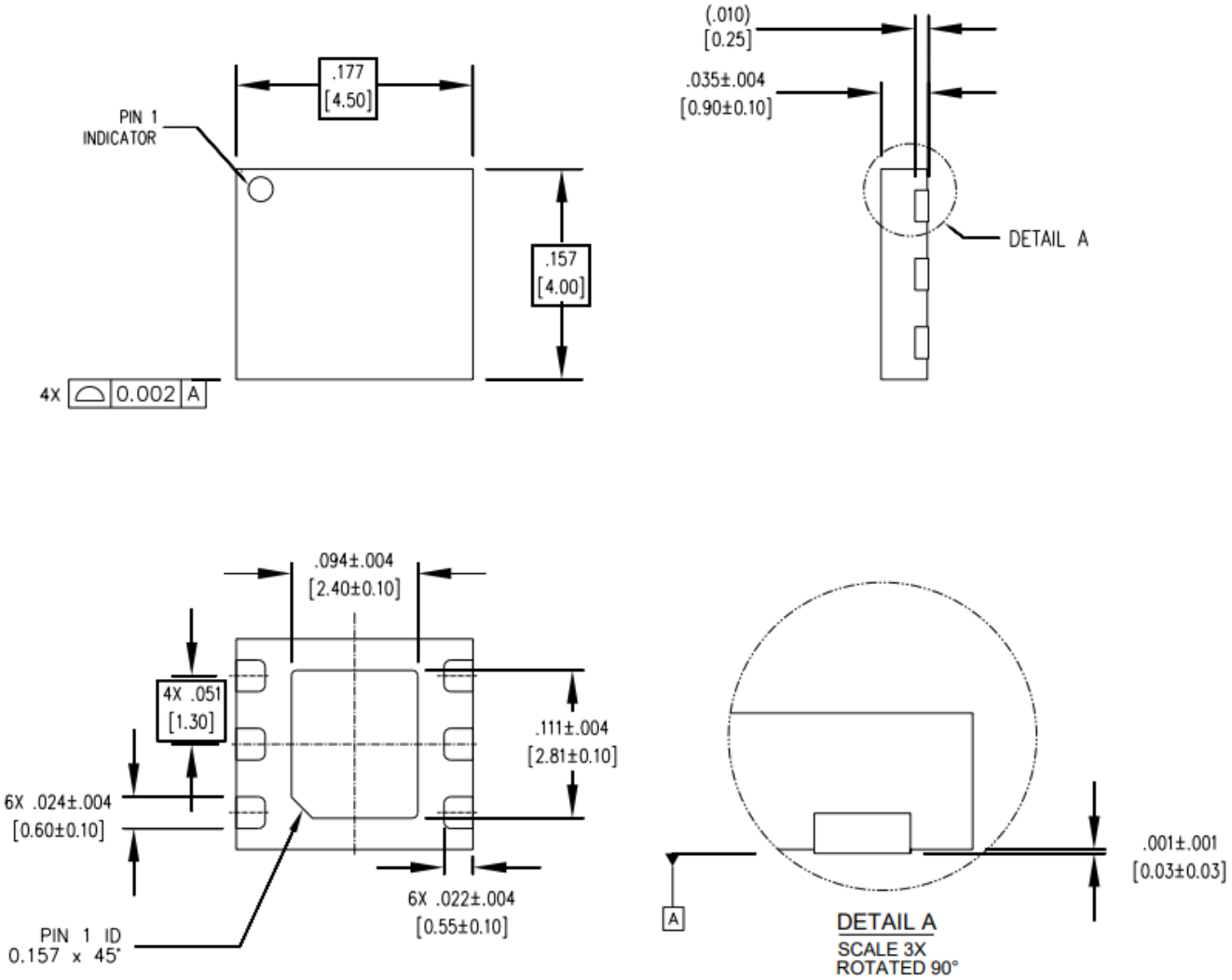
Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Human Body Model (per JS-001) Class 1A devices.

Lead-Free 4.0 x 4.5 mm 6-Lead 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.

† Meets JEDEC moisture sensitivity level (MSL) 3 requirements.
Plating is Sn.