High Power RF GaN Amplifier
125 W, 48 V, 2496 - 2690 MHz

MACOM PURE CARBIDE™

WSDC2642-V1
Rev. V1

Features

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

7.0 x 6.5 mm DFN

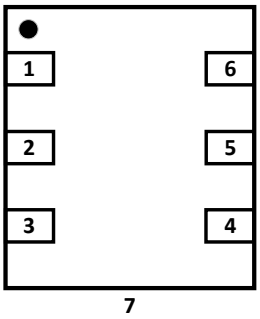
Applications

- Point-to-Point
- Infrastructure

Description

The WSDC2642 GaN on Silicon Carbide HEMT amplifier designed for base station applications. The device is optimized for the frequency band of 2496 to 2690 MHz. This device supports pulsed and linear operation. Product is housed in an over-molded 7.0 x 6.5 mm DFN package.

Functional Schematic



Typical RF Performance

V_{DS} = 46 V, I_{DQm} = 100 mA, V_{GSpk} = -4.2 V
P_{OUT} = 41.7 dBm, T_A = 25°C
Note: Performance in MACOM Doherty Application Fixture. Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

Frequency (MHz)	G_P (dB)	η_D (%)	OPAR (dB)	ACPR (dBc)
2496	17.4	57.7	8.83	-27.1
2593	17.4	57.1	8.94	-28.8
2690	17.3	56.8	8.89	-29.3

Pin Configuration

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

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

Ordering Information

Part Number	Package
WSDC2642-V1-R00A	Bulk Quantity
WSDC2642-V1-R3K	Tape and Reel[1] (3k pieces)
FXA-WSDC2642V1-1	Sample Board, 2496 - 2690 MHz

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

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

RF Electrical Characterization: Performance in MACOM Doherty Application Fixture

T_A = 25°C, V_{DS} = 46 V, I_{DQm} = 100 mA, V_{GSPK} = -4.2 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	2690 MHz, P_{OUT} = 41.7 dBm	Gp	—	17.3	—	dB
Drain Efficiency	2690 MHz, P_{OUT} = 41.7 dBm	η	—	56.8	—	%
Output CCDF @ 0.01%	2690 MHz, P_{OUT} = 41.7 dBm	PAR	—	8.9	—	dB
Adjacent Channel Power	2690 MHz, P_{OUT} = 41.7 dBm	ACP	—	-29.0	—	dBc
Input Return Loss	2690 MHz, P_{OUT} = 41.7 dBm	IRL	—	-15.8	—	dB
Gain Flatness	2690 MHz, P_{OUT} = 41.7 dBm	G_F	—	0.7	—	dB
Gain Variation (-25°C to +105°C)	2690 MHz, P_{OUT} = 41.7 dBm	ΔG	—	0.02	—	dB/°C
Power Variation (-25°C to +105°C)	2690 MHz, P_{OUT} = 41.7 dBm	ΔP_{3dB}	—	0.008	—	dB/°C
Ruggedness: Output Mismatch	All phase angles	Ψ	VSWR =4:1, No Device Damage			

RF Electrical Test Specifications: Performance in MACOM Doherty Production Test Fixture

T_A = 25°C, V_{DS} = 48 V, I_{DQm} = 60 mA, V_{GSPK} = -4.2 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	2690 MHz, P_{OUT} = 41.7 dBm	Gp	11	13.2	—	dB
Drain Efficiency	2690 MHz, P_{OUT} = 41.7 dBm	η	36	42.2	—	%
Output CCDF @ 0.01%	2690 MHz, P_{OUT} = 41.7 dBm	PAR	5.5	6.6	—	dB
Adjacent Channel Power	2690 MHz, P_{OUT} = 41.7 dBm	ACP	—	-32.8	-24	dBc

DC Electrical Characteristics: T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Main Amplifier						
Drain-Source Breakdown Voltage	V_{GS} = -8 V, I_D = 2.45 mA	V_{BDS}	-	150	-	V
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{GLK}	-1.0	-	-	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	-1.4	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 6.1 mA	V_T	-3.8	-2.8	-2.1	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 60 mA	V_{GSQ}	-3.6	-3.0	-2.1	V
Peak Amplifier						
Drain-Source Breakdown Voltage	V_{GS} = -8 V, I_D = 5.28 mA	V_{BDS}	-	150	-	V
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{GLK}	-2.1	-	-	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	-2.1	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 10 mA	V_T	-3.8	-2.3	-2.03	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 132 mA	V_{GSQ}	-3.6	-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_D = 60 mA	V	-3.6	-3.0	-2.1

ESD Characteristics

Parameter	Class	Standard
Human Body Model (HBM)	1B	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[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 (Main), I_G	6.2 mA
Gate Current (Peak), I_G	13.2 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

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} < 55V will ensure MTTF > 2.51 x 10^6 hours.
8. Operating at nominal conditions with $T_{CH} \leq 225°C$ 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} = 48 V T_C=85°C, T_{CH} = 225°C	R_{θ}(IR)	6.46	°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

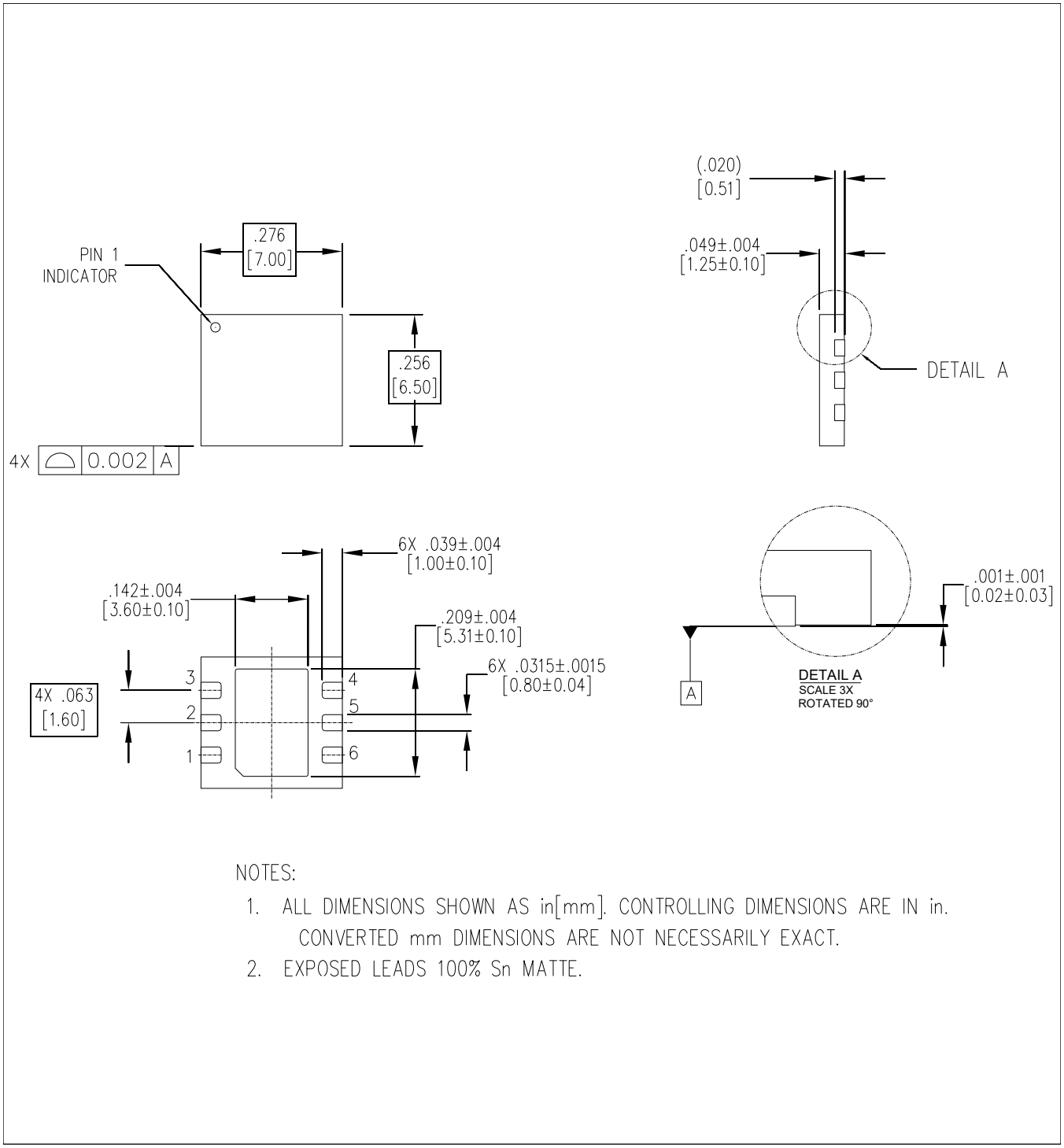
Handling Procedures

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.

Lead-Free 7.0 x 6.5 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.