Thermally Enhanced GaN on SiC Amplifier
70 W, 48 V, 2.496 - 2.690 GHz

MACOM PURE CARBIDE

WSDC2640-V1
Rev. V1

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

7.0 x 6.5 mm DFN

Description

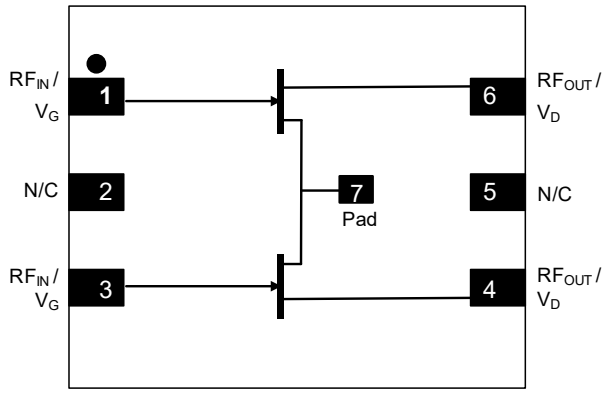
The WSDC2640 GaN on SiC HEMT amplifier designed for base station applications and optimized for 2.496 - 2.690 GHz modulated signal operation. This device supports pulsed and linear operation with peak output power levels to 70 W (48.5 dBm) in a 6.5 x 7.0 mm DFN package.

Typical RF Performance

- WCDMA 3GPP TM1 64 DPCH 9.9 dB PAR @ 0.01% CCDF, V_{DS} = 46 V, I_{DQCAR} = 40 mA, V_{GSPK} = -5.2 V, T_A = 25°C, P_{OUT} = 39.5 dBm.

Frequency (GHz)	G_P (dB)	η_D (%)	OPAR (dB)	ACPR (dBc)
2.496	16.7	56	8.5	-27
2.593	17.0	57	8.5	-29
2.690	16.5	58	8.4	-28

Functional Schematic



Pin Configuration

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

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

Ordering Information

Part Number	Package
WSDC2640-V1-R3K	3000 Piece Reel
FXA-WSDC2640V1-1	Sample Board (tuned for 2.3-2.4 GHz)
FXA-WSDC2640V1-2	Sample Board (tuned for 2.496-2.690 GHz)

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

RF Electrical Characteristics: T_A = 25°C, V_{DS} = 46 V, I_{DQCAR} = 40 mA, V_{GSPK} = -5.2 V
Note: Performance in MACOM Evaluation Test Fixture, 50 Ω system.

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Small Signal Gain	Pulsed[2], 2.6 GHz	dB	-	18.8	-
Saturation Output Power	Pulsed[2], 2.6 GHz	dBm	-	48.5	-
Drain Efficiency at Saturation	Pulsed[2], 2.6 GHz	%	-	64	-
Power Gain	WCDMA[3], 2.6 GHz, P_{OUT} = 39.5 dBm	dB	-	16.8	-
Drain Efficiency	WCDMA[3], 2.6 GHz, P_{OUT} = 39.5 dBm	%	-	57	-
Output CCDF @ 0.01%	WCDMA[3], 2.6 GHz, P_{OUT} = 39.5 dBm	dB	-	8.5	-
Adjacent Channel Power	WCDMA[3], 2.6 GHz, P_{OUT} = 39.5 dBm	dBc	-	-28	-
Input Return Loss	WCDMA[3], 2.6 GHz, P_{OUT} = 39.5 dBm	dB	-	-20	-
Ruggedness: Output Mismatch	All Phase Angles	VSWR = 4:1, No Device Damage			

RF Electrical Characteristics: T_A = 25°C, V_{DS} = 48 V, I_{DQCAR} = 40 mA, V_{GSPK} = -4.8 V
Note: Performance in MACOM Doherty Production Test Fixture, 50 Ω system.

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Power Gain	LTE[4], 2.6 GHz, P_{OUT} = 39.5 dBm	dB	12	13	-
Drain Efficiency	LTE[4], 2.6 GHz, P_{OUT} = 39.5 dBm	%	45	50	-
Output CCDF @ 0.01%	LTE[4], 2.6 GHz, P_{OUT} = 39.5 dBm	dB	5.5	6.5	-
Adjacent Channel Power Ratio	LTE[4], 2.6 GHz, P_{OUT} = 39.5 dBm	dBc	-	-23	-19
Input Return Loss	LTE[4], 2.6 GHz, P_{OUT} = 39.5 dBm	dB	-	-15	-7

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
Carrier Amplifier					
Drain-Source Leakage Current	V_{GS} = - 8 V, V_{DS} = 150 V	-	-	1.62	mA
Gate-Source Leakage Current	V_{GS} = - 8 V, V_{DS} = 150 V	-1.25	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 3.7 mA	-3.8	-2.8	-2.1	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 40 mA	-3.6	-2.4	-2.1	V
Peaking Amplifier					
Drain-Source Leakage Current	V_{GS} = - 8 V, V_{DS} = 150 V	-	-	2.70	mA
Gate-Source Leakage Current	V_{GS} = - 8 V, V_{DS} = 150 V	-2.09	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 6.1 mA	-3.8	-2.8	-2.1	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 60 mA	-3.6	-2.4	-2.1	V

Recommended Operating Voltages

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Drain Operating Voltage	—	0	-	50	V
Carrier Amplifier					
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 40 mA	-3.6	-2.4	-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 (Carrier), I_G	3.7 mA
Drain Current (Carrier), I_D	1.2 A
Gate Current (Peaking), I_G	6.1 mA
Drain Current (Peaking), I_D	2.1 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.

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:

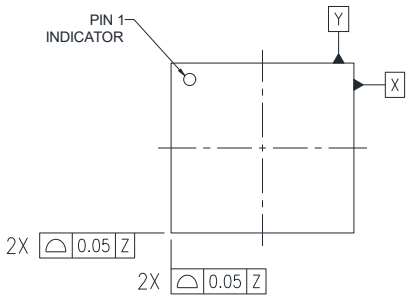
Static Sensitivity

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 devices.

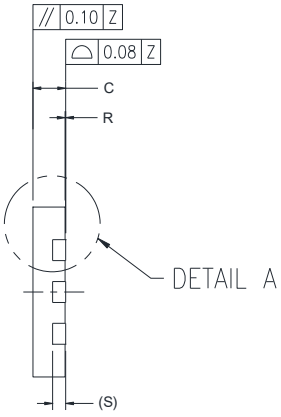
ESD Characteristics

Test Methodology	Test Conditions
Charge Device Model (per JS-002)	C2B

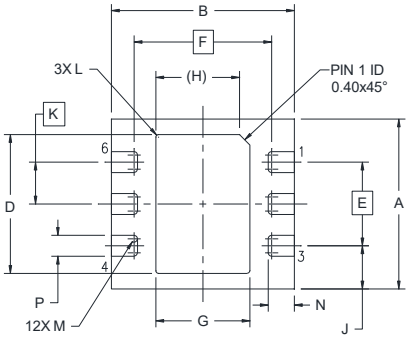
Lead-Free 7.0 x 6.5 mm 6-Lead Package Dimensions†



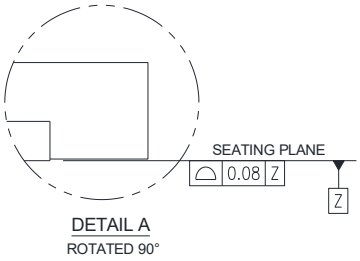
TOP VIEW



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.

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