

MACOM

MAPC-C15550-BS

Rev. V1

Features

- GaN on SiC HEMT Technology
- Pulsed CW Performance: 1520 MHz, 48 V, 10 µs Pulse Width, 10% Duty Cycle, Combined Outputs
- Output Power @ P4dB = 585 W
- Efficiency @ P4dB = 72%
- RoHS* Compliant

Description

The MAPC-C15550-BS is a 585 W (P3dB) GaN on Silicon Carbide HEMT amplifier designed for use in multi-standard cellular power amplifier applications. It features optimized operation from 1430 - 1520 MHz and a thermally-enhanced package with earless flange.

Typical RF Performance¹

 $V_{DD} = 48 \text{ V}, I_{DQ} = 600 \text{ mA},$ $P_{OUT} = 49.3 \text{ dBm} (56 \text{ W}), T_A = +25^{\circ}\text{C},$ Channel Bandwidth = 3.84 MHz, Peak/Average = 10 dB @ 0.01% CCDF

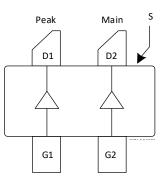
Frequency (MHz)	Gain (dB)	Efficiency (%)	OPAR (dB)	ACPR (dBc)
1430	15.6	55.2	8.2	-30.9
1475	16.1	55.2	8.6	-32.3
1520	15.9	56.2	8.3	-33.1

1. Measurements taken with the device soldered in an application test circuit.

Ordering Information

Part Number	Package
MAPC-C15550-BS000	50 piece reel
MAPC-C15550-BSTR1	250 piece reel
MAPC-C15550-BSSB1	Sample Board

Functional Schematic



Pin Configuration²

Pin #	Function		
D1	Drain Device 1 (Main)		
D2	Drain Device 2 (Peak)		
G1	Gate Device 1 (Main)		
G2	Gate Device 2 (Peak)		
S	Source (flange)		

2. Exposed metallization on the back side of the package.

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

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MAPC-C15550-BS

Rev. V1

Single-Carrier WCDMA Specifications³:

 V_{DD} = 48 V, P_{OUT} = 85.1 W avg, I_{DQ} = 600 mA, $V_{GS(PEAK)}$ = (V_{GS} at $I_{DQ(PEAK)}$ = 1000 mA) - 2.7 V, T_C = 25°C, f = 1520 MHz, 3GPP signal, 3.84 MHz channel bandwidth, Peak/Average = 10 dB @ 0.01% CCDF

Parameter		Min.	Тур.	Max.
Gain	dB	15.5	16.5	
Drain Efficiency	%	51	56.5	_
Adjacent Channel Power Ratio (ACPR)	dBc	_	-32.5	-29
Output PAR @ 0.01% CCDF	dB	7.2	7.9	—

3. Measurements taken in MACOM Production Test Fixture.

DC Characteristics

Parameter	Test Conditions	Units	Min.	Тур.	Max.
Drain-Source Breakdown Voltage	V _{GS} = -8 V, I _D = 10 mA Main, Peak	V	150	_	—
Drain-Source Leakage Current	V _{GS} = -8 V, V _{DS} = 10 V Main Peak	mA		_	4.4 8.8
Gate-Source Leakage Current	V _{GS} = -8 V, V _{DD} = 50 V Main Peak	mA		_	-6.9 -13.9
Gate Threshold Voltage	V_{DS} = 10 V, I_{D} = 25 mA, Main V_{DS} = 10 V, I_{D} = 50 mA, Peak	V	-3.8	-3.0	-2.3

Recommended Operating Voltages

Parameter	Test Conditions	Units	Min.	Тур.	Max.
Drain Operating Voltage	—	V	0	—	50
Gate Quiescent Voltage	V _{DS} = 48 V, I _D = 600 mA	V	-3.5	-2.8	-2.0

²

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Rev. V1

Absolute Maximum Ratings^{4,5,6}

Parameter	Absolute Maximum
Drain Source Voltage	125 V
Gate Source Voltage	-10 V to +2 V
Operating Voltage	55 V
Gate Current Main Peak Drain Current Main	25 mA 50 mA 9.5 A
Peak	18.9 A
Junction Temperature Storage Temperature	+275°C -65°C to +150°C

4. Exceeding any one or combination of these limits may cause permanent damage to this device.

5. MACOM does not recommend sustained operation near these survivability limits.

6. Product's qualification were performed @ +225°C. Operation @ T_J (+275°C) reduces median time to failure.

Thermal Characteristics

Parameter	Test Conditions	Units	Min.	Тур.	Max.
Thermal Resistance (R _{θJC}) Main Peak	T _C = +85°C, 97 W DC T _C = +85°C, 144 W DC	°C/W	_	1.4 1.0	_

Handling Procedures

electronic

and CDM Class C3 devices.

Static Sensitivity

damage:

These

Please observe the following precautions to avoid

devices

electrostatic discharge (ESD) and can be damaged

by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1B

are

sensitive

to

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

3

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Load Pull Performance: Pulsed CW Signal: 160 µs, 10% Duty Cycle

Main Side:

		Maximum Output Power						
		V _{DS} = 48 V, I _{DQ} = 250 mA, T _C = 25°C, P3dB, Class AB						
Frequency (MHz)	Z _{SOURCE} (Ω)	Z _{LOAD} (Ω)	Gain (dB)	Р _{оит} (dBm)	Р _{оит} (W)	η _Ρ (%)		
1430	2.2–j6.7	4.0-j1.5	18.1	55.2	328	74.6		
1475	1.9-j7.4	3.8-j2.2	17.7	55.1	327	71.2		
1520	3.1-j7.7	3.9-j2.1	17.5	55.1	323	74.6		

		Maximum Drain Efficiency V_{DS} = 48 V, I_{DQ} = 250 mA, T_C = 25°C, P3dB, Class AB					
Frequency (MHz)	Z _{SOURCE} (Ω)	Z _{LOAD} (Ω)	Gain (dB)	Р _{оит} (dBm)	Р _{оит} (W)	η⊳ (%)	
1430	2.2–j6.7	2.7+j2.3	19.3	52.8	188	86.9	
1475	1.9-j7.4	3.0+j1.8	19.6	53.1	205	86.8	
1520	3.1-j7.7	2.8+j1.1	18.6	53.4	219	86.7	

Peak Side:

		Maximum Output Power						
		V _{DS} = 48 V, V _{GS(PEAK)} = -5 V, T _C = 25°C, P3dB, Class C						
Frequency (MHz)	Z _{SOURCE} (Ω)	Z _{LOAD} (Ω)	Gain (dB)	P _{3dB} (dBm)	P _{3dB} (W)	η _D (%)		
1430	1.2-j5.9	1.7-j1.6	15.7	57.6	574	73.7		
1475	1.3-j6.2	1.6-j2	15.5	57.5	566	68.3		
1520	2.9-j6.7	1.3-j2.1	14.2	57.4	547	67.3		

		Maximum Drain Efficiency						
		V _{DS} = 48 V, V _{GS(PEAK)} = -5 V, T _C = 25°C, P3dB, Class C						
Frequency (MHz)	Z _{SOURCE} (Ω)	Z _{LOAD} (Ω)	Gain (dB)	P _{3dB} (dBm)	P _{3dB} (W)	η₀ (%)		
1430	1.2 - j5.9	1.7+j0.3	17.1	55.3	336	87.1		
1475	1.3-j6.2	2.2+j0	16.2	55.5	356	86.7		
1520	2.9-j6.7	1.7+j0.1	14.9	54.9	310	87.0		

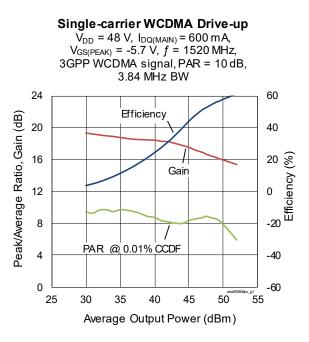
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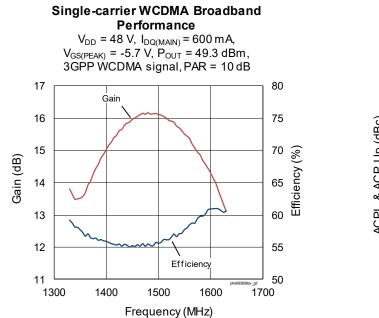
MAPC-C15550-BS Rev. V1

Typical Performance Curves: Data taken in evaluation board

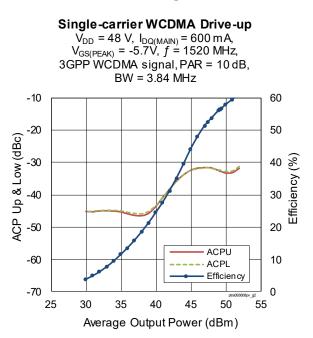
Single-Carrier WCDMA Drive-up @ 1520 MHz



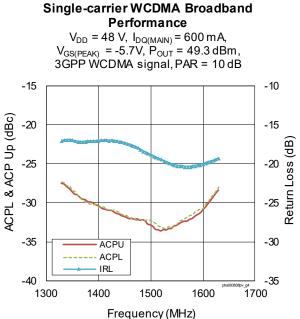
Single-Carrier WCDMA Broadband



Single-Carrier WCDMA Drive-up @ 1520 MHz



Single-Carrier WCDMA Broadband



5

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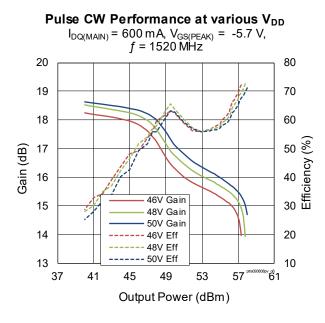
For further information and support please visit: <u>https://www.macom.com/support</u>



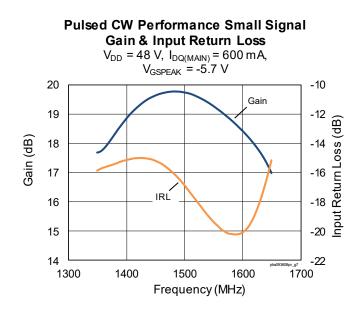
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Typical Performance Curves: Data taken in evaluation board

Pulsed CW Performance at various V_{DD} @ 1520MHz



Small Signal CW Gain & Input Return Loss



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6

GaN Amplifier 585 W, 48 V, 1430 - 1520 MHz



RO4350, 20 MIL

C203

C206

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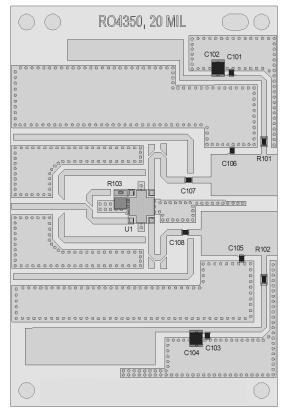
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Rev. V1

MACOM PURE CARBIDE

Evaluation Board: 1430 - 1520 MHz





Component	Description	Manufacturer	Manufacturer P/N
nput	1		
C101, C103, C107, C108	Capacitor, 18 pF	ATC	ATC600F180JT250XT
C102, C104	Capacitor, 10 µF, 50 V	Taiyo Yuden	UMK325C7106MM-T
C105, C106	Capacitor, 2.4 pF	ATC	ATC600F2R4BT250XT
R101, R102	5.6 ohms	Yageo	RC0805JR-075R6L
U1	Hybrid Coupler	Anaren	X3C14F1-03S
R103	Resistor, 50 ohms	Richardson	C8A50Z4B
utput			
C201, C204, C210, C211, C213	Capacitor, 18 pF	ATC	ATC600F180JT250XT
C202, C205, C215	Capacitor, 10 µF, 100 V	Murata	GRM32EC72A106KE05
C203, C206	Capacitor, 470 µF, 100 V	Cornell Dubilier Electronics (CDE)	SEK471M050ST
C207	Capacitor, 0.5 pF	ATC	ATC600F0R5BT250XT
C208	Capacitor, 2.0 pF	ATC	ATC600F2R0BT250XT
C209	Capacitor, 5.6 pF	ATC	ATC600F5R6CT-ND
C212	Capacitor, 8.2 pF	ATC	ATC600F8R2BT250XT
C214	Capacitor, 1.5 pF	ATC	ATC600F1R5BT250XT

7

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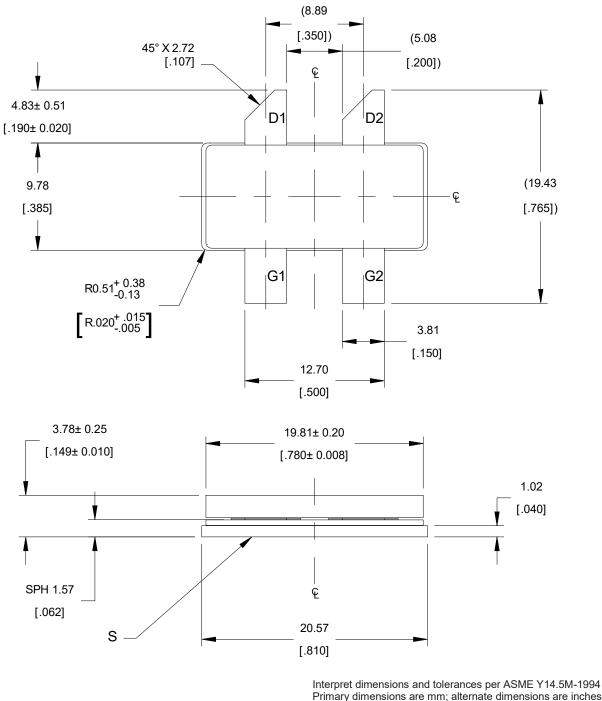


MACOM PURE CARBIDE

MAPC-C15550-BS

Rev. V1

Lead-Free Outline Drawing H-37265J-2



Primary dimensions and tolerances per ASME Y 14.5M-1994 Primary dimensions are mm; alternate dimensions are inches All tolerances \pm 0.127 [0.005] Lead thickness: 0.13 \pm 0.05 mm [0.005 \pm 0.002 inch]

Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch]

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