

1.本站收集的数据手册和产品资料都来自互联网,版权归原作者所有。如读者和版权方有任 何异议请及时告之,我们将妥善解决。

本站提供的中文数据手册是英文数据手册的中文翻译,其目的是协助用户阅读,该译文无法自动跟随原稿更新,同时也可能存在翻译上的不当。建议读者以英文原稿为参考以便获得更精准的信息。

3.本站提供的产品资料,来自厂商的技术支持或者使用者的心得体会等,其内容可能存在描 叙上的差异,建议读者做出适当判断。

4.如需与我们联系,请发邮件到marketing@iczoom.com,主题请标有"数据手册"字样。

Read Statement

1. The datasheets and other product information on the site are all from network reference or other public materials, and the copyright belongs to the original author and original published source. If readers and copyright owners have any objections, please contact us and we will deal with it in a timely manner.

2. The Chinese datasheets provided on the website is a Chinese translation of the English datasheets. Its purpose is for reader's learning exchange only and do not involve commercial purposes. The translation cannot be automatically updated with the original manuscript, and there may also be improper translations. Readers are advised to use the English manuscript as a reference for more accurate information.

3. All product information provided on the website refer to solutions from manufacturers' technical support or users the contents may have differences in description, and readers are advised to take the original article as the standard.

4. If you have any questions, please contact us at marketing@iczoom.com and mark the subject with "Datasheets".

GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Features

- GaN on SiC D-Mode Transistor Technology
- Unmatched, Ideal for Pulsed Applications
- 50 V Typical Bias, Class AB
- Common-Source Configuration
- Thermally-Enhanced 3 x 6 mm 14-Lead DFN
- MTTF = 600 years (T_J < 200°C)
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant
- MSL-1

Description

The MAGX-000035-01500P is a GaN on SiC unmatched power device offering the widest RF frequency capability, most reliable high voltage operation, lowest overall power transistor size, cost and weight in a "TRUE SMT" plastic-packaging technology.

Use of an internal stress buffer technology allows reliable operation at junction temperatures up to 200°C. The small package size and excellent RF performance make it an ideal replacement for costly flanged or metal-backed module components.

Ordering Information^{1,2}

Part Number	Package
MAGX-000035-01500P	Bulk Packaging
MAGX-000035-0150TP	250 Piece Reel
MAGX-000035-PB1PPR	Sample Board

1. Reference Application Note M513 for reel size information.

 When ordering sample evaluation boards, choose a standard frequency range indicated on page 4 or specify a desired custom range. Custom requests may increase lead times.





Functional Schematic



Pin Configuration³

Pin No.	Function	Pin No.	Function
1	No Connection	8	No Connection
2	No Connection	9	No Connection
3	V _{GG} /RF _{IN}	10	No Connection
4	V _{GG} /RF _{IN}	11	V _{DD} /RF _{OUT}
5	V_{GG}/RF_{IN}	12	No Connection
6	No Connection	13	No Connection
7	No Connection	14	No Connection
		15	Paddle ⁴

3. MACOM recommends connecting unused package pins to ground.

4. The exposed pad centered on the package bottom must be connected to RF and DC ground.

Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Typical Performance⁵: V_{DD} = 50 V, I_{DQ} = 35 mA, T_A = 25°C

Parameter	30 MHz	1 GHz	2.5 GHz	3.5 GHz	Units
Gain	25	23	17	14	dB
Saturated Power (P _{SAT})	18	16.5	15	14	W
Power Gain at P _{SAT}	22	18	14	11	dB
PAE @ P _{SAT}	75	68	60	55	%

5. Typical RF performance measured in M/A-COM Technology Solutions RF evaluation boards. See recommended tuning solutions on page 4.

Electrical Specifications: Freq. = 1.6 GHz, $T_A = 25^{\circ}C$, $Z_0 = 50 \Omega$

Parameter	Test Conditions	Symbol	Min.	Тур.	Max.	Units
RF FUNCTIONAL TESTS						
CW Output Power (P2.5 dB)	V_{DD} = 36 V, I_{DQ} = 35 mA	P _{OUT}	-	7	-	W
Pulsed Output Power (P2.5 dB) 1 ms and 10% Duty Cycle	V_{DD} = 50 V, I_{DQ} = 35 mA	P _{OUT}	12.5	17	-	W
Pulsed Power Gain (P2.5 dB)	V_{DD} = 50 V, I_{DQ} = 35 mA	G _P	17	19.5	-	dB
Pulsed Drain Efficiency (P2.5 dB)	V_{DD} = 50 V, I_{DQ} = 35 mA	η _D	55	65	-	%
Load Mismatch Stability (P2.5 dB)	V_{DD} = 50 V, I_{DQ} = 35 mA	VSWR-S	-	5:1	-	-
Load Mismatch Tolerance (P2.5 dB)	V_{DD} = 50 V, I_{DQ} = 35 mA	VSWR-T	-	10:1	-	-

Electrical Characteristics: T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Тур.	Max.	Units
DC CHARACTERISTICS			•	•		
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 175 V	I _{DS}	-	-	1.0	mA
Gate Threshold Voltage	V_{DS} = 5 V, I _D = 2 mA	$V_{GS \ (th)}$	-5	-3	-2	V
Forward Transconductance	$V_{DS} = 5 V, I_D = 500 mA$	G _M	0.35	-	-	S
DYNAMIC CHARACTERISTICS						
Input Capacitance	V_{DS} = 0 V, V_{GS} = -8 V, F = 1 MHz	C _{ISS}	-	4.2	-	pF
Output Capacitance	V_{DS} = 50 V, V_{GS} = -8 V, F = 1 MHz	C _{oss}	-	1.8	-	pF
Reverse Transfer Capacitance	$V_{DS} = 50 \text{ V}, V_{GS} = -8 \text{ V}, \text{ F} = 1 \text{ MHz}$	C _{RSS}	-	0.2	-	pF

2

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Absolute Maximum Ratings ^{6,7,8,9,10}

Parameter	Absolute Max.
Input Power	P_{OUT} - G_P + 2.5 dBm
Drain Supply Voltage, V_{DD}	+65 V
Gate Supply Voltage, V_{GG}	-8 V to 0 V
Supply Current, IDD	800 mA
Power Dissipation, CW @ 85°C	13 W
Power Dissipation (P _{AVG}), Pulsed @ 85°C	17 W
Junction Temperature ¹¹	200°C
Operating Temperature	-40°C to +95°C
Storage Temperature	-65°C to +150°C

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

7. M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.

8. For saturated performance it is recommended that the sum of $(3 * V_{DD} + abs (V_{GG})) \le 175 V$.

9. CW operation at V_{DD} voltages above 36 V is not recommended.

Operating at nominal conditions with T_J ≤ 200°C will ensure MTTF > 1 x 10⁶ hours. Junction temperature directly affects device MTTF and should be kept as low as possible to maximize lifetime.

11. Junction Temperature $(T_J) = T_C + \Theta_{JC} * ((V * I) - (P_{OUT} - P_{IN}))$

Typical CW thermal resistance $(\Theta_{JC}) = 15.7^{\circ}C/W$ a) For T_C = 83°C, T_J = 200°C @ 36 V, 398 mA, P_{OUT} = 7.2 W, P_{IN} = 0.22 W Typical transient thermal resistances: b) 300 µs pulse, 10% duty cycle, $\Theta_{JC} = 5.33^{\circ}C/W$ For T_C = 83°C, T_J = 170°C @ 50 V, 603 mA, P_{OUT} = 14.3 W, P_{IN} = 0.41 W

c) 1 ms pulse, 10% duty cycle, $\Theta_{JC} = 5.85^{\circ}C/W$ For T_C = 83°C, T_J = 172°C @ 50 V, 576 mA, P_{OUT} = 14.0 W, P_{IN} = 0.41 W

d) 1 ms pulse, 20% duty cycle, Θ_{JC} = 6.81°C/W For T_C = 83°C, T_J = 186°C @ 50 V, 570 mA, P_{OUT} = 13.8 W, P_{IN} = 0.41 W



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Evaluation Board Details and Recommended Tuning Solutions



Parts measured on evaluation board (8-mils thick RO4003C). Electrical and thermal ground is provided using copper-filled via hole array (not pictured), and evaluation board is mounted to a metal plate.

Matching is provided using lumped elements as shown at left. Recommended tuning solutions for 3 frequency ranges are detailed in the parts list below.

Bias Sequencing

Turning the device ON

- 1. Set V_G to the pinch-off (V_P), typically -5 V.
- 2. Turn on V_D to nominal voltage (50 V).
- 3. Increase V_{GS} until the I_{DS} current is reached.
- 4. Apply RF power to desired level.

Turning the device OFF

- 1. Turn the RF power off.
- 2. Decrease V_G down to $V_{P_{-}}$
- 3. Decrease V_D down to 0 V.
- 4. Turn off V_G .

Parts List (N/A = not applicable for this tuning solution)

Part	Frequency = 1.6 GHz	Frequency = 2.2 - 2.5 GHz	Frequency = 2.6 - 3.6 GHz
C1	0402 27 pF, ±5%, 200 V, ATC	0402 18 pF, ±5%, 200 V, ATC	0402 18 pF, ±5%, 200 V, ATC
C2	0603, 5.6 pF, ±0.1 pF, 250 V, ATC	0402, 2.2 pF, ±0.1pF, 200 V, ATC	0402, 1.2 pF, ±0.1 pF, 200 V, ATC
C3	0603, 18 pF, ±10%, 250 V, ATC	N/A	N/A
C4	0805, 1000 pF, 100 V, 5%, AVX	0805, 1000 pF, 100 V, 5%, AVX	0805, 1000 pF, 100 V, 5%, AVX
C5	0505, 2.2 pF, ±5%, 250 V, ATC (Vertical)	0603, 0.8 pF, ±0.1 pF, 250 V, ATC	N/A
C6	N/A	0603, 1.5 pF, ±0.1 pF, 250 V, ATC	0402, 1.0 pF, ±0.1 pF, 200 V, ATC
C7	0505, 36 pF, ±5%, 250 V, ATC (Vertical)	0402 18 pF, ±5%, 200 V, ATC	0402 18 pF, ±5%, 200 V, ATC
C8	0505, 18 pF, ±5%, 250 V, ATC	0402 10 pF, ±5%, 200 V, ATC	N/A
C9	0805, 1000 pF, 100 V, 5%, AVX	0805, 1000 pF, 100 V, 5%, AVX	0805, 1000pF, 100V, 5%, AVX
C10	1210, 1 µF, 100 V, 20%, ATC	1210, 1 μF, 100 V, 20%, ATC	1210, 1 μF, 100 V, 20%, ATC
C11	N/A	0402, 3.9 pF, ±0.1 pF, 200 V, ATC	0402, 2.0 pF, ±0.1 pF, 200 V, ATC
C12	N/A	0402, 3.9 pF, ±0.1 pF, 200 V, ATC	0402, 2.0 pF, ±0.1 pF, 200 V, ATC
C13	N/A	N/A	0402 10 pF, ±5%, 200 V, ATC
R1	12 Ω, 0603, 5%	200 Ω, 0603, 5%	100 Ω, 0603, 5%
R2	1.2 Ω, 0603, 5%	1.0 Ω, 0603, 5%	1.0 Ω, 0603, 5%
R3	1.2 Ω, 0603, 5%	9.1 Ω, 0603, 5%	9.1 Ω, 0603, 5%
L1	0603 HP, 5.1 nH, 5%	0402, 0.8 nH,10%	Shorting tab
L2	0603 HP, 24 nH, 5%	0603, 1.8 nH, 10%	Shorting tab
L3	N/A	N/A	0603, 10nH, 10%

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit www.macom.com for additional data sheets and product information.



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Lead-Free 3x6 mm 14-Lead DFN[†]



[†] Reference Application Note S2083 for lead-free solder reflow recommendations. Meets JEDEC moisture sensitivity level 1 requirements. Plating is Ni/Pd/Au.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Nitride Devices and Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1B devices.

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Applications Section

S-Parameter Data: $T_A = 25^{\circ}C$, $V_{DD} = +50 V$, $I_{DQ} = 35 mA$





M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Applications Section

Thermal Performance: Freq. = 1.6 GHz, T_c = 85°C, V_{DD} = +50 V, I_{DQ} = 25 mA, Z_0 = 50 Ω

Power (Output & Dissipated) vs. Transient Junction Temperature, Pulse Duration and Duty Cycle



Pulse Width (µs), Duty Cycle (%)

Pulse Width, Duty Cycle	100 μs, 10%	100 μs, 20%	300 μs, 10%	300 µs, 20%	500 μs, 10%	500 μs, 20%	1000 μs, 10%	1000 μs, 20%	8000 μs, 9.2%
Power Dissipation (W)	15.6	15.1	16.3	15.9	15.2	15.1	15.2	15.1	16.5
1.6 GHz Р _{оит} (W)	14.5	14.4	14.3	14	14.4	13.9	14	13.8	13.3
Max. Transient Junction Temp. (°C)	131.9	148.3	169.6	185.9	165.1	180.2	172	185.9	182

Junction temperature measured using High-Speed Transient (HST) temperature detection microscopy.

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.



Rev. V4

GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Applications Section

Typical Performance Curves (reference 1.6 GHz parts list):

1.6 GHz, 1 ms Pulse, 10% Duty Cycle, V_{DD} = +50 V, T_A = 25°C, Z_0 = 50 Ω

Gain vs. Input Power



Output Power vs. Input Power



PAE vs. Input Power



M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit www.macom.com for additional data sheets and product information.



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Applications Section

Pulsed OIP3 data Pulse width 8.28 ms, Duty cycle 9% V_{DD} = 50 V, I_{DQ} = 70 mA, Freq = 1.62 GHz, 1 MHz spacing on tones

P _{iN} (dBm)	P _{o∪⊤} per tone (dBm)	OIP3 (dBm)
8	31.1	46
9	32.0	47
10	32.9	50
11	33.7	50
12	34.5	47

Typical Performance Curves (reference 2.2 - 2.5 GHz parts list):

2.2 - 2.5 GHz, CW, V_{DD} = 28 V, I_{DQ} = 35 mA, T_A = 25°C, Z_0 = 50 Ω

Gain vs. Input Power

Output Power vs. Input Power



M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit www.macom.com for additional data sheets and product information.



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

Applications Section

Typical Performance Curves (reference 2.6 - 3.6 GHz parts list):

2.6 - 3.6 GHz, 3 ms Pulse, 10% Duty Cycle, V_{DD} = 50 V, I_{DQ} = 35 mA, T_A = 25°C, Z_0 = 50 Ω

Gain vs. Frequency



P_{SAT} vs. Frequency



Small Signal Gain vs. Frequency



PAE vs. Frequency



M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.



GaN Wideband 15 W Pulsed Transistor in Plastic Package DC - 3.5 GHz

Rev. V4

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.

¹¹

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit www.macom.com for additional data sheets and product information.