WSGPA01

10 W, 5 GHz, GaN on SiC General Purpose Power Amplifier

Description

The WSGPA01 is a GaN on SiC Discrete General Purpose Amplifier (GPA) designed for applications up to 5 GHz. The device operates from supply voltages up to 50 V and can achieve a P_{3dB} of 10 W. It is housed in a 3 mm X 4 mm DFN package. While it is designed for communications infrastructure applications with crest factor reduced and digitally pre-distorted LTE or 5G NR signals, it may be suitable for other applications at frequencies up to 5 GHz, restricted only by its maximum operating conditions.

Features

- GaN on SiC HEMT technology
- Operating frequency : up to 5 GHz
- P_{3dB} : up to 10 W
- Supply voltage : up to 50 V
- Maximum junction temperature : 225 °C
- Pb-free and RoHS compliant

WSGPA01
Package PG-DFN-3x4-1

RF Performance

Typical Single-carrier WCDMA Performance (tested in the test fixture)
V_{DD} = 48 V, I_{DQ} = 25 mA, P_{OUT} = 26.5 dBm, channel bandwidth = 3.84 MHz, input PAR = 10 dB @ 0.01% CCDF

Frequency	P_{OUT} (dBM)	Gain (dB)	Efficiency (%)	ACPR – (dBc)	ACPR + (dBc)	PAR (dB)
3400 MHz	26.5	16.1	16.9	–47.8	–48.6	9.3
3600 MHz	26.5	16.0	15.7	–49.1	–49.9	9.4
3800 MHz	26.5	15.7	16.5	–46.9	–47.2	9.3

All published data at $T_{AMBIENT}$ = 25°C unless otherwise indicated

RoHS compliant

Rev. 03, 2023-07-27

Absolute Maximum Ratings (Case Temperature T_{CASE} = 25 °C)

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DSS}	125	V
Gate-source Voltage	V_{GS}	–10 to +2	V
Gate Current	I_G	1.2	mA
Drain Current	I_D	400	mA
Operating Voltage	V_{DD}	55	V
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C

Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.

DC Characteristics

Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS} = –8 V, I_D = 10 mA	$V_{(BR)DSS}$	150	—	—	V
Drain-Source Leakage Current	V_{GS} = –8 V, V_{DS} = 50 V	I_{GSS}	—	—	–0.5	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 1.2 mA	$V_{GS(th)}$	–3.8	–3.1	–2.3	V

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Drain Operating Voltage		V_{DD}	0	—	50	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 25 mA	$V_{GS(Q)}$	–3.45	–2.9	–2.45	V

Thermal Characteristics

Characteristics	Symbol	Value	Unit
Thermal Resistance (T_{CASE} = 105°C, P_{OUT} = 26.5 dBM CW)	$R_{\theta JC}$	10.1	°C/W

Moisture Sensitivity Level

Level	Test Standard	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	°C

ESD Characteristics

Parameter	Class	Standard
Human Body Model (HBM)	Class 1A	ANSI/ESDA/JEDEC JS-001
Charge Device Model (CDM)	Class C2b	ANSI/ESDA/JEDEC JS-002

RF Characteristics

Single-carrier WCDMA Performance (tested in the production test fixture)

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 25 mA, P_{OUT} = 26.5 dBm, f = 3600 MHz, channel bandwidth = 3.84 MHz, input PAR = 10 dB @ 0.01% CCDF

Characteristics	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	14.8	16.3	—	dB
Drain Efficiency	η_D	14	18.2	—	%
Adjacent Channel Power Ratio	ACPR	—	–45.4	–41	dBc
Output PAR @ 0.01% CCDF	OPAR	8	9.1	—	dB

Ordering Information

Order Code	Description
WSGPA01-V1-R1	330 mm (13") Reel 100 pcs
WSGPA01-V1-R7	330 mm (13") Reel 750 pcs
WSGPA01-V1-R3K	330 mm (13") Reel 3,000 pcs
FXA/WSGPA01V1-19	2.496–2.690 GHz Evaluation Board
FXA/WSGPA01V1-14	3.3-3.7 GHz Evaluation Board
FXA/WSGPA01V1-15	3.4-3.8 GHz Evaluation Board
FXA/WSGPA01V1-18	3.7-3.98 GHz Evaluation Board

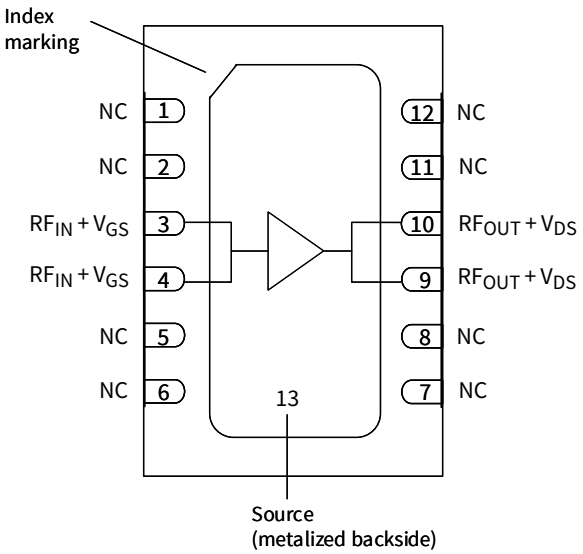
Evaluation Boards

Single-carrier WCDMA Performance (tested in the test fixture)

V_{DD} = 48 V, I_{DQ} = 25 mA, channel bandwidth = 3.84 MHz, input PAR = 10 dB @ 0.01% CCDF

Part Number	Frequency	Typical RF Performance					
		P_{OUT} (dBm)	Eff (%)	Gain (dB)	PAR (dB)	ACPR– (dBc)	ACPR+ (dBc)
FXA/WSGPA01V1-19	2.496–2.690 GHz	25	17.1	19.4	8.5	–36.7	–36.9
FXA/WSGPA01V1-14	3.3-3.7 GHz	26.5	18	16	8.9	–45.1	–45.8
FXA/WSGPA01V1-15	3.4-3.8 GHz	26.5	15.7	16	9.4	–49.9	–49.1
FXA/WSGPA01P3-18	3.7-3.98 GHz	26.5	17.5	16.8	9.1	–46.3	–45.2

Pinout Diagram (top view)



Pin #	Symbol	Description
3, 4	$RF_{IN} + V_{GS}$	RF Input, Gate Supply
9, 10	$RF_{OUT} + V_{DS}$	RF Output, Drain Supply
1, 2, 5, 6, 7, 8, 11, 12	NC	No Internal Connection
13	Source (metalized backside)	Ground

Bias Sequencing

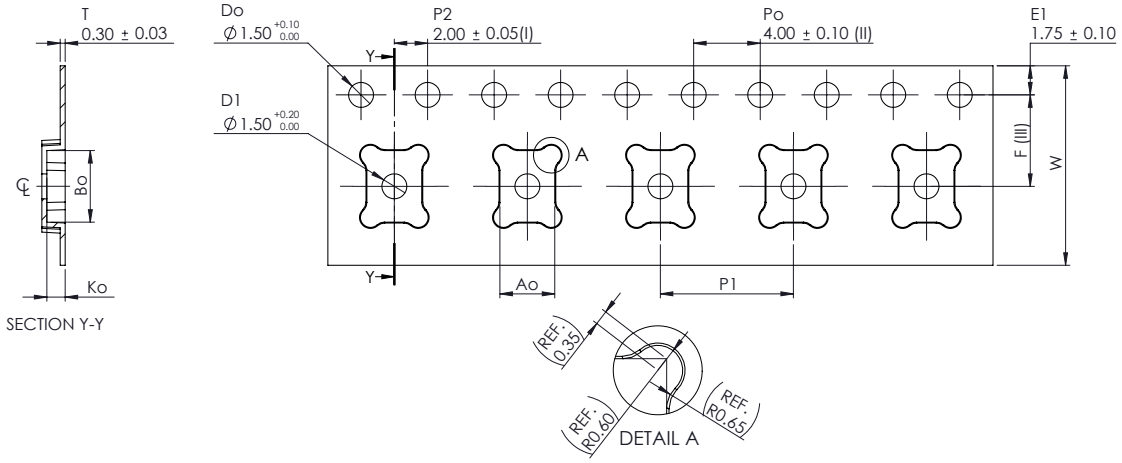
Bias ON

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

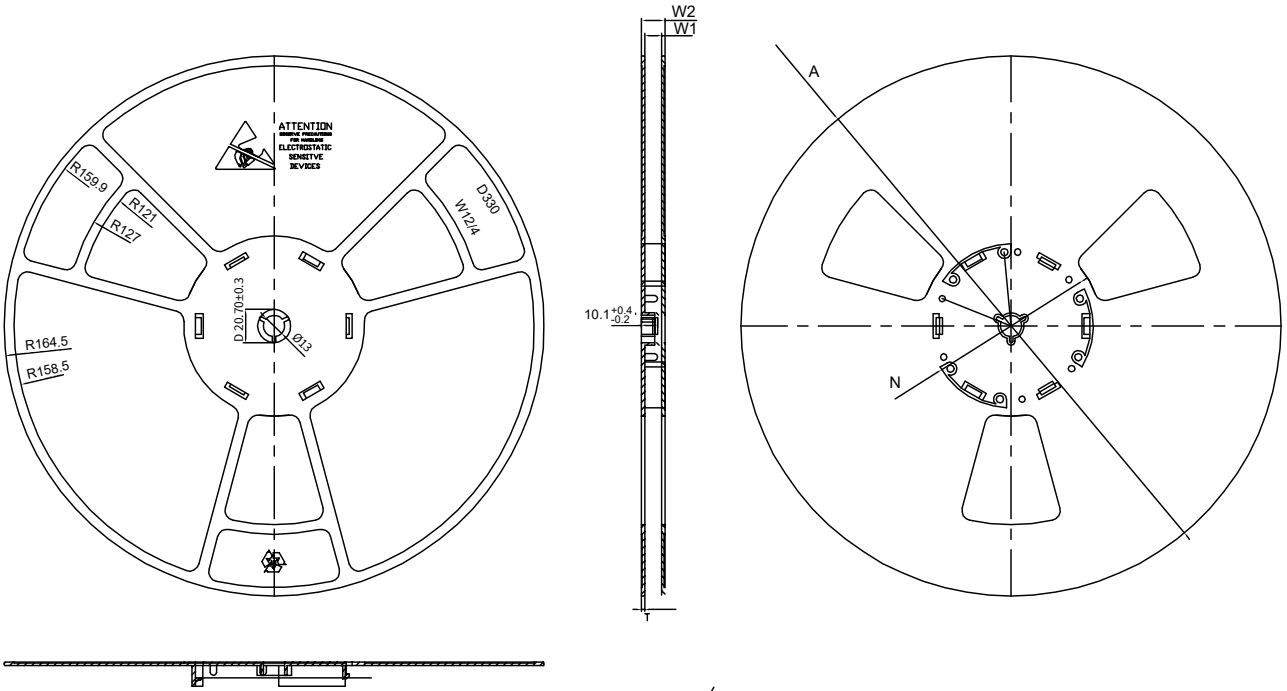
Tape and Reel Information

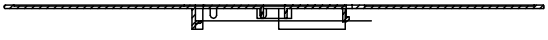


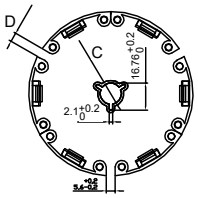
Ao	3.30	+/- 0.10
Bo	4.30	+/- 0.10
Ko	1.10	+/- 0.10
F	5.50	+/- 0.05
P1	8.00	+/- 0.10
W	12.00	+0.30 / -0.10

(I) Measured from centerline of sprocket hole to centerline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20.
(III) Measured from centerline of sprocket hole to centerline of pocket.
(IV) Other material available.
(V) Typical SR of form tape to be 10^4 < SR < 10^{10} OHM.
(VI) Dimension with ( ) is used for design reference purposes.
No measurement required.

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED.



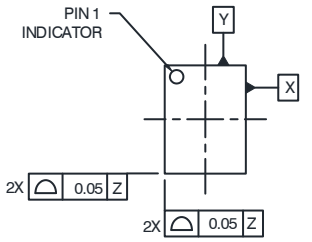




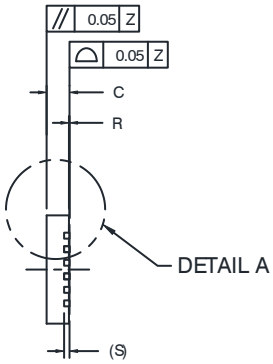
TYPE	A	N	C	D	W1	W2 max	T
12mm	Ø330 +2 -2	Ø100 +2 -2	Ø13.1 +0.2 -0.2	5.6 +0.5 -0.5	12.4 +2 -0	18.4	2.1±0.5

Package Outline Specifications

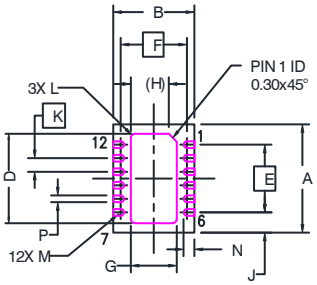
Package PG-DFN-3x4-1



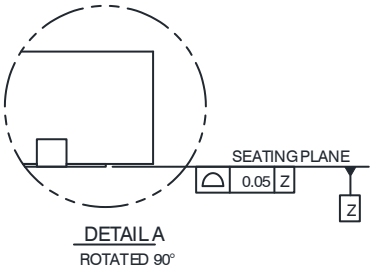
TOP VIEW



SIDE VIEW



BOTTOM VIEW



DIM	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	.156	.157	.159	3.95	4.00	4.05
B	.116	.118	.120	2.95	3.00	3.05
C	.031	.033	.035	0.80	0.85	0.90
D	.124	.130	.134	3.15	3.30	3.40
E	—	.098	—	—	2.50	—
F	—	.096	—	—	2.45	—
G	.061	.067	.071	1.55	1.70	1.80
H	—	.055	—	—	1.40	—
J	.028	.030	.032	0.70	0.75	0.81
K	—	.020	—	—	0.50	—
L	.004	.006	.008	0.10	0.15	0.20
M	.004	.005	.006	0.090	0.125	0.150
N	.012	.016	.020	0.30	0.40	0.50
P	.007	.010	.012	0.18	0.25	0.30
R	.000	.001	.002	0.00	0.02	0.05
S	—	.008	—	—	0.20	—

Diagram Notes–unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.

Notes & Disclaimer

These materials are provided in connection with MACOM’s products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM 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.