

WSGPA01

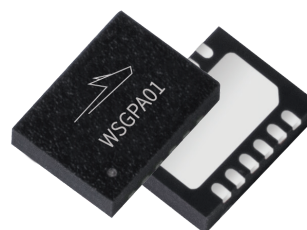
10 W, 5 GHz, GaN on SiC General Purpose Power Amplifier

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 Wolfspeed 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 $T_{AMBIENT} = 25^{\circ}\text{C}$ unless otherwise indicated

RoHS
COMPLIANT

Absolute Maximum Ratings (Case Temperature $T_{CASE} = 25^{\circ}C$)

| 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 | 12 | A |
| Operating Voltage | V_{DD} | 55 | V |
| Junction Temperature | T_J | 225 | $^{\circ}C$ |
| Storage Temperature Range | T_{STG} | -65 to +150 | $^{\circ}C$ |

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 | $V_{GS} = -8V, I_D = 10mA$ | $V_{(BR)DSS}$ | 150 | — | — | V |
| Drain-Source Leakage Current | $V_{GS} = -8V, V_{DS} = 50V$ | I_{GSS} | — | — | -0.5 | mA |
| Gate Threshold Voltage | $V_{DS} = 10V, I_D = 1.2mA$ | $V_{GS(th)}$ | -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 | $V_{DS} = 48V, I_D = 25mA$ | $V_{GS(Q)}$ | -3.45 | -2.9 | -2.45 | V |

Thermal Characteristics

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

Moisture Sensitivity Level

| Level | Test Standard | Package Temperature | Unit |
|-------|---------------------|---------------------|-------------|
| 3 | IPC/JEDEC J-STD-020 | 260 | $^{\circ}C$ |

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 Wolfspeed production test fixture)

$V_{DD} = 48\text{ V}$, $I_{DQ(MAIN)} = 25\text{ mA}$, $P_{OUT} = 26.5\text{ dBm}$, $f = 3600\text{ MHz}$, 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/WSGPA01V1-16 | 3.4–3.6 GHz Evaluation Board |
| FXA/WSGPA01V1-17 | 3.6–3.8 GHz Evaluation Board |
| FXA/WSGPA01V1-18 | 3.7–3.98 GHz Evaluation Board |

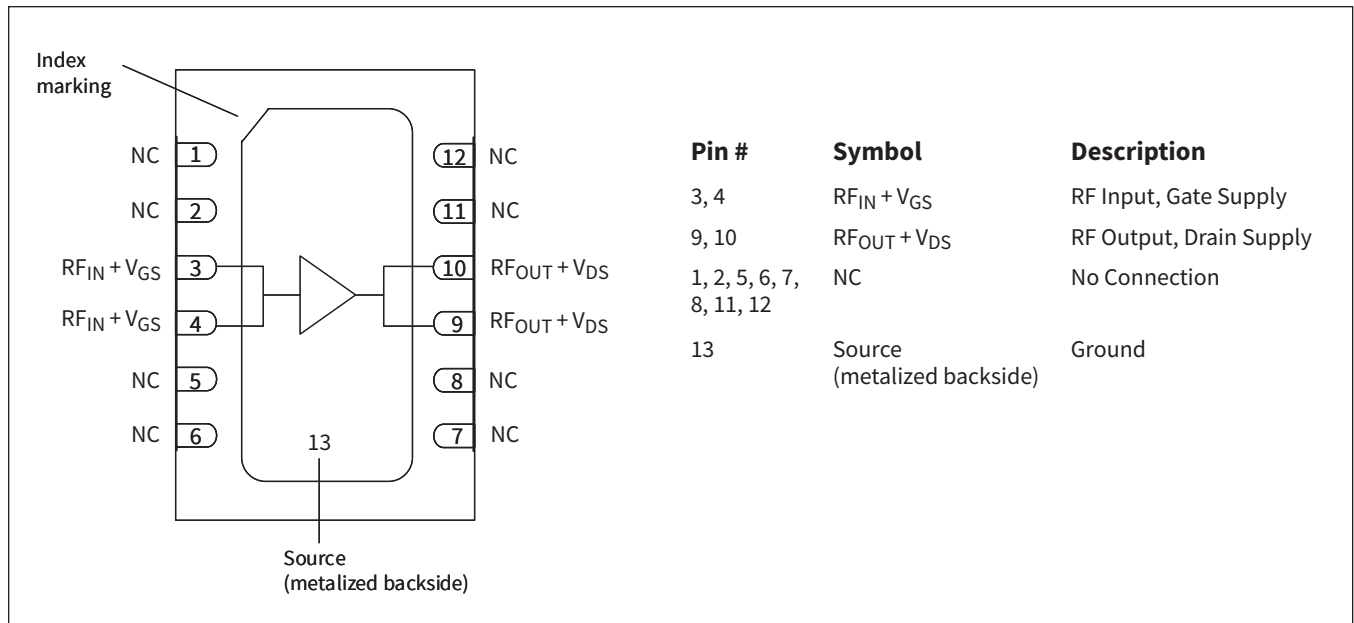
Evaluation Boards

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

$V_{DD} = 48\text{ V}$, $I_{DQ} = 25\text{ mA}$, 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/WSGPA01V1-16 | 3.4–3.6 GHz | 26.5 | 19 | 18.2 | 9.2 | -45.4 | -44.7 |
| FXA/WSGPA01P3-17 | 3.6–3.8 GHz | 26.5 | 19.2 | 18.2 | 9.2 | -44.9 | -44.3 |
| FXA/WSGPA01P3-18 | 3.7–3.98 GHz | 26.5 | 17.5 | 16.8 | 9.1 | -46.3 | -45.2 |

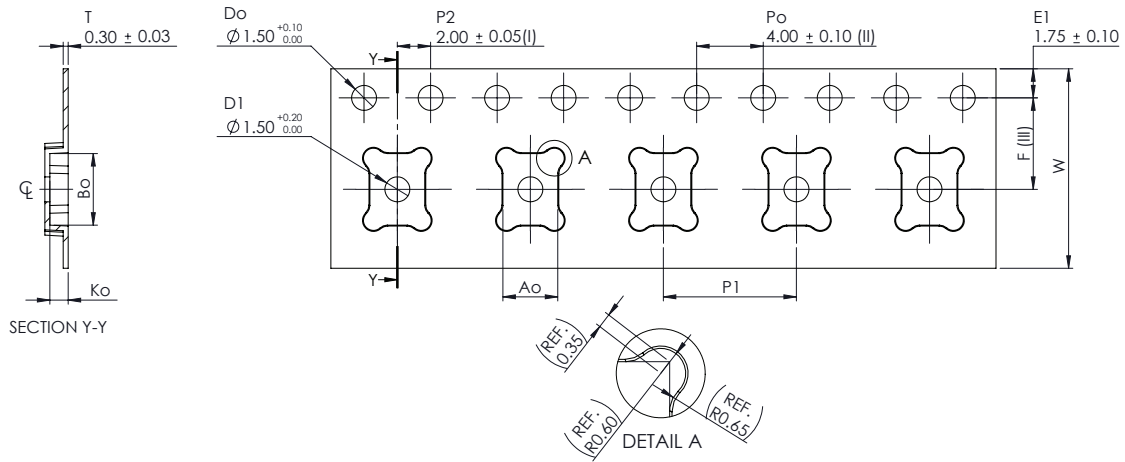
Pinout Diagram (top view)



Bias Sequencing

| Bias ON | Bias OFF |
|---|--|
| 1. Ensure RF is turned off | 1. Turn RF off |
| 2. Apply pinch-off voltage of -5 V to the gate | 2. Apply pinch-off voltage to the gate |
| 3. Apply nominal drain voltage | 3. Turn-off drain voltage |
| 4. Bias gate to desired quiescent drain current | 4. Turn-off gate voltage |
| 5. Apply RF | |

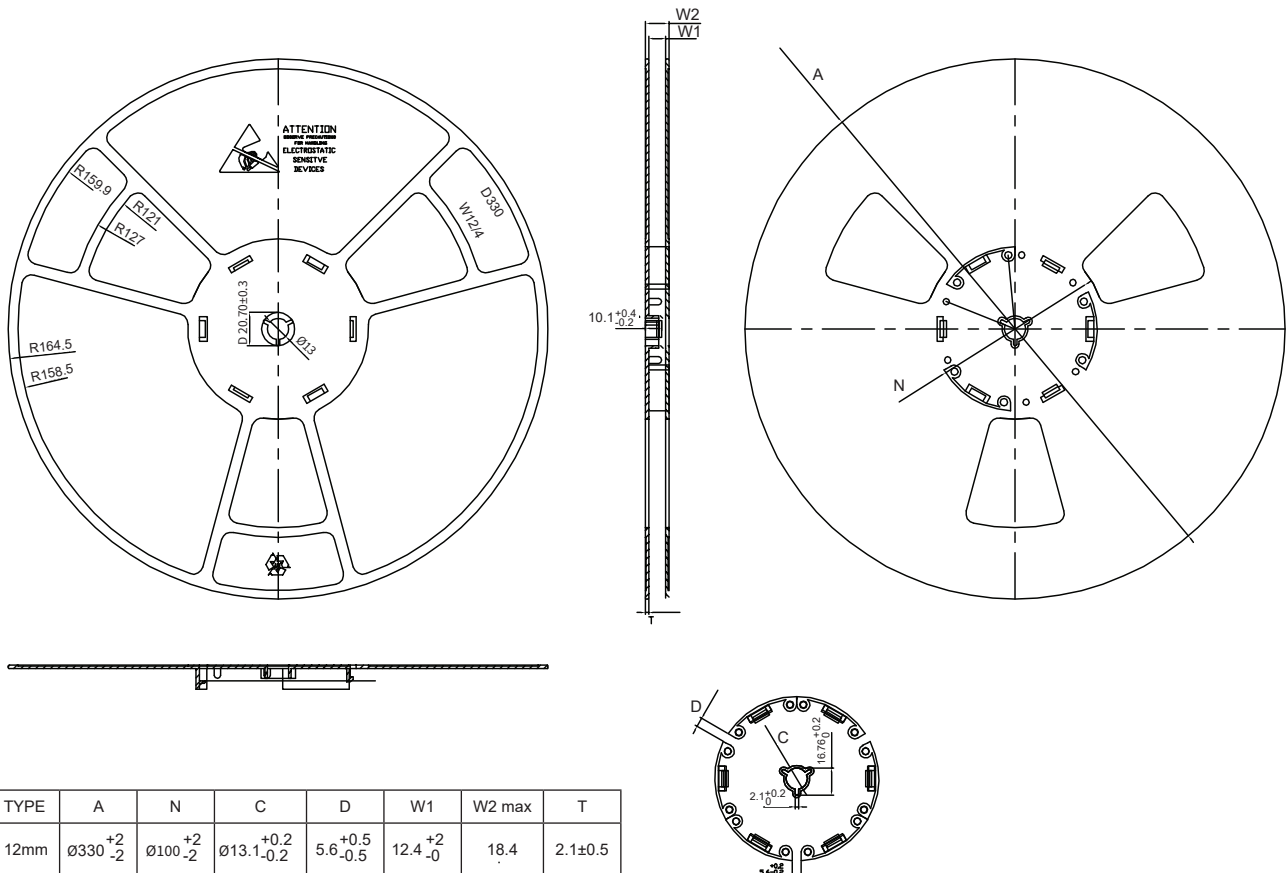
Tape and Reel Information



| | | |
|----|-------|---------------|
| 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.

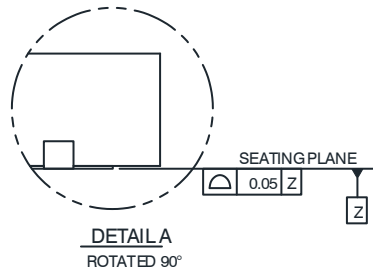
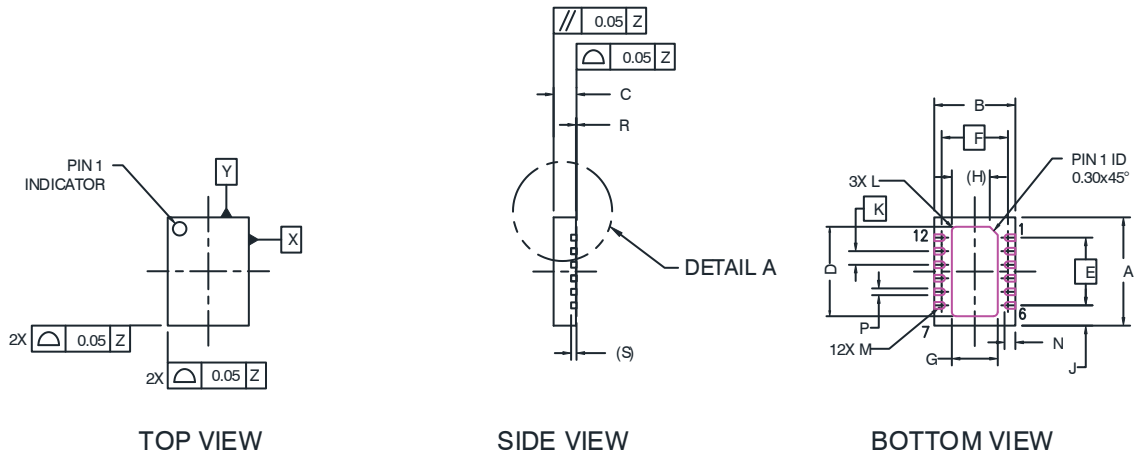
ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED.



| 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



| 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:

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



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Notes & Disclaimer

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