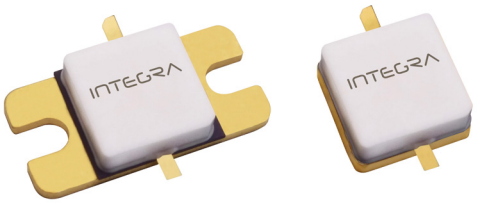
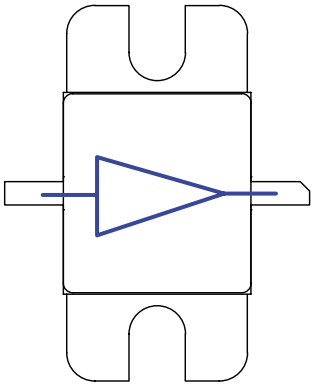
# Wideband, GaN/SiC, RF Power Amplifier

**0.5 - 4.0 GHz | 90 - 16 W typ | 65 - 13% Efficiency typ | 15 - 11 dB Gain typ | 100V | 150µs Pulse Width, 30% Duty Cycle**

IGW4000 is a high power GaN-on-SiC RF distributed power amplifier that has been designed to suit the needs of radar and electronic warfare systems as well as general-purpose broad-band applications. It operates over the entire 0.5 - 4.0 GHz frequency range. Under 150µs, 30% Duty Cycle pulse conditions, it supplies typically >80W with 50% efficiency and 14dB gain over 0.5 - 1.5 GHz with useful performance up to 4 GHz. The amplifier is fully matched to 50Ω over the entire 0.5 - 4.0 GHz frequency range. It operates from a 100 V supply voltage. For optimal thermal efficiency, the amplifier is housed in a metal-based package with an epoxy-sealed ceramic lid.



## FEATURES

- GaN on SiC HEMT Technology
- Fully matched to 50Ω at the input and output
- 100% RF Tested Under 150µs Pulse Width, 30% Duty Cycle pulse conditions
- RoHS and REACH Compliant

## APPLICATIONS

- Radar and EW Systems
- General-Purpose Wideband Amplifier Applications

### Table 1. Absolute Maximum Ratings (Not Simultaneous)

| Parameter | Symbol | Value | Units | Test Conditions |
|---|---|---|---|---|
| DC Drain-Source Voltage | $V_{DS}$ | 350 | V | 25 °C |
| DC Gate-Source Voltage | $V_{GS}$ | -8 to +1.0 | V | 25 °C |
| DC Drain Current | $I_D$ | 2 | A | 25 °C |
| DC Gate Current | $I_G$ | 1 | mA | 25 °C |
| RF Input Power | $P_{RF,IN}$ | 4 | W | 25 °C |
| Operating Channel Temperature | $T_{CH}$ | -55 to +225 | °C | |
| Storage Temperature | $T_{STG}$ | -55 to +150 | °C | |
| Soldering Temperature | $T_{SOLDER}$ | 260 for 60s | °C | |

**Note: Operation outside the limits given in this table may cause permanent damage to the Amplifier**

### Table 2. DC Electrical Characteristics (Case temperature = 25 °C unless otherwise stated)

| Parameter | Symbol | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Gate Pinch-Off Voltage | $V_P$ | -5.0 | | | V | $V_{DS}$ = 100V, $I_{DS}$ = 1mA |
| Quiescent Gate Voltage | $V_Q$ | | -2.8 | | V | $V_{DS}$ = 100V, $I_{DS}$ = 100mA |

### Table 3. RF Electrical Characteristics 100% Tested in Production (Case temperature = 30 °C unless otherwise stated)

| Frequency (GHz) | Typical Pout (W) | Typical Efficiency (%) | Typpical Gain (dB) | Typical IRL (dB) | Second Harmonic (dBc) | Test Conditions |
|---|---|---|---|---|---|---|
| **0.5** | 94 | 67 | 15 | 11 | -17 | 150µs Pulse Length, 30% Duty Cycle<br>$V_{DS}$ = 100V, $I_{DS}$ = 100mA |
| **1.0** | 96 | 50 | 14 | 14 | -17 | |
| **2.0** | 31 | 21 | 13 | 16 | -14 | |
| **3.0** | 30 | 21 | 13 | 12 | -25 | |
| **4.0** | 16 | 13 | 11 | 13 | -25 | |

**Note: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured.**

### Table 4. Thermal Resistance (Tested, Case temperature = 50 °C unless otherwise stated)

| Parameter | Symbol | Typ | Units | Test Conditions |
|---|---|---|---|---|
| **Thermal Resistance, Channel to Case** | $R_{TH}$ | 1.5 | °C/W | Dissipated Power = 117W<br>150µs Pulse Length, 30% Duty Cycle<br>$V_{DS}$ = 100V |

## TYPICAL PERFORMANCE

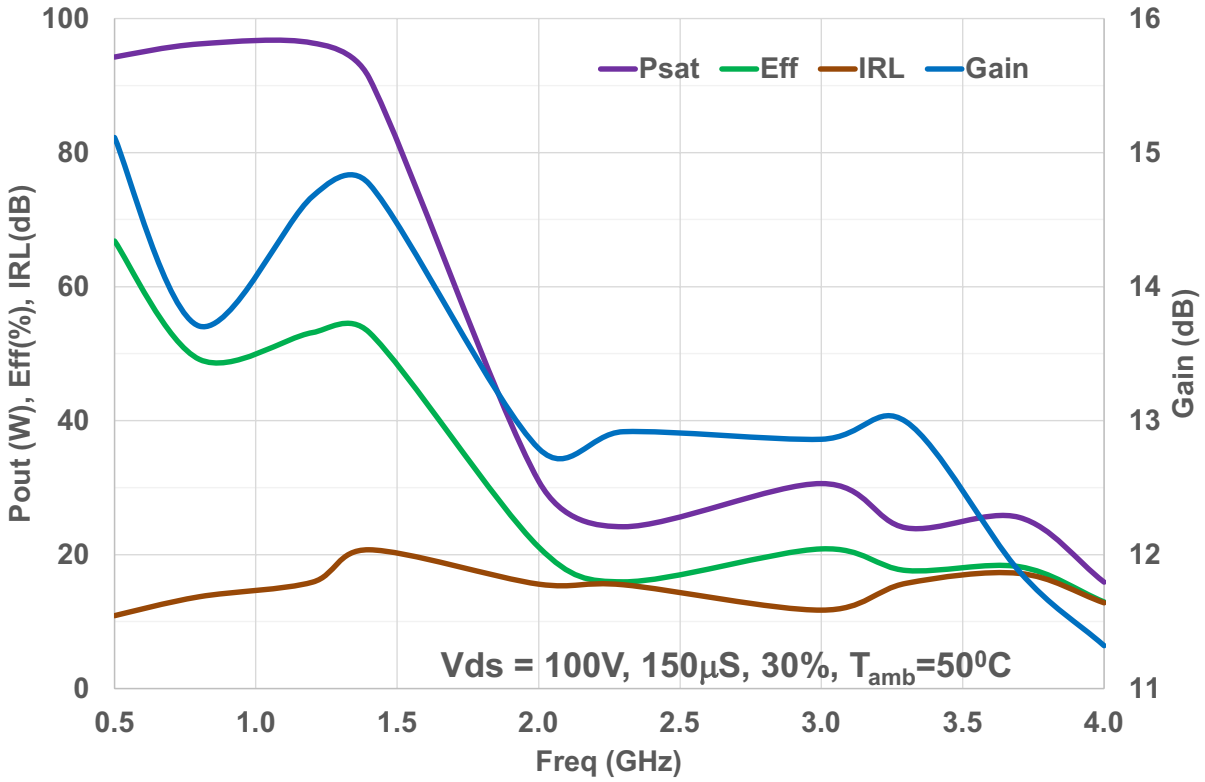
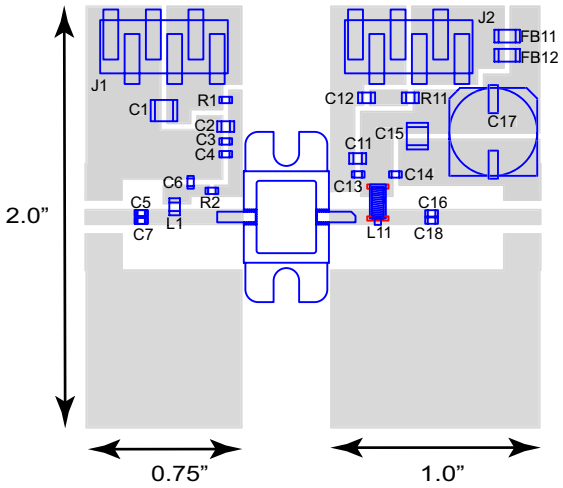



Figure 1

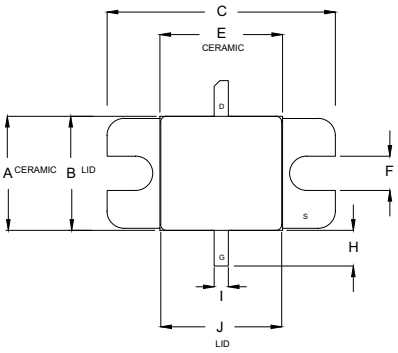
## TEST FIXTURE




### Bill of Materials for IGW4000 Test Fixture

| Designator | Description | Quantity | Part Number |
|---|---|---|---|
| C1 | CAP 4.7μF, 1210, 25V, X7R | 1 | C1210C475K3RACTU |
| C2 | CAP 0.1μF, 0805, 100V, X7R | 1 | C2012CX7R2A104K125 |
| C3, C4, C6, C13, C14 | CAP 100pF, 250V, 0603 | 5 | 600S101FT250XT |
| C5, C7, C16, C18 | CAP 100pF, 250V, 0603, Edge Mount | 4 | 600S101FT250XT |
| C11, C12 | CAP 0.068μF, 0805, 250V | 2 | C0805C683KARACAUTO |
| C15 | CAP 0.1μF, 1210, 200V, X7R | 1 | 1210CC104MAT2A |
| C17 | CAP 33μF, 160V, Electolytic | 1 | ULT2C330MNL1GS |
| L1 | IND 470nH, 0805 | 1 | CC-0805LS-471 |
| L11 | IND 105nH, 0.1 OHM, 3A | 1 | MK13T30.045HRS-8IC |
| FB11, FB12 | IND FB, 33 OHM, 5A, 1206 | 2 | BLM31PG330SN1L |
| R1, R2 | RES, 5.11 OHM, 0603 | 2 | MK13T30.045HRS-8IC |
| R11 | RES, 10 OHM, 0805 | 1 | CRCW080510R0JNEA |
| PC Board Type | AGC/Nelco MW4000 31mil, 1/1oz. Copper | 2 | |

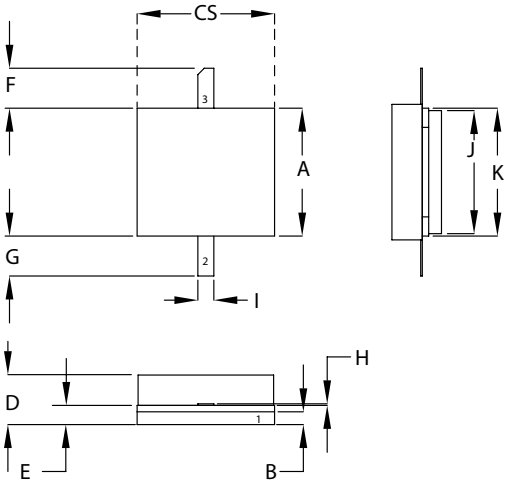
## PACKAGE PL44C2CPC




| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.395 | 0.405 | 10.033 | 10.287 |
| B | 0.396 | 0.404 | 10.059 | 10.261 |
| C | 0.795 | 0.805 | 20.193 | 20.447 |
| E | 0.425 | 0.435 | 10.795 | 11.049 |
| F | 0.115 | 0.125 | 2.921 | 3.175 |
| H | 0.110 | 0.140 | 2.794 | 3.556 |
| I | 0.045 | 0.055 | 1.143 | 1.397 |
| J | 0.420 | 0.428 | 10.668 | 10.871 |
| K | 0.035 | 0.045 | 0.889 | 1.143 |
| L | 0.018 | 0.022 | 0.457 | 0.559 |
| M | 0.595 | 0.605 | 15.113 | 15.367 |
| N | 0.125 | 0.157 | 3.175 | 3.987 |

| PIN SCHEDULE | |
|---|---|
| D | DRAIN |
| S | SOURCE |
| G | GATE |

## IGW4000




| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.395 | 0.405 | 10.03 | 10.28 |
| B | 0.035 | 0.045 | 0.88 | 1.14 |
| CS | 0.425 | 0.435 | 10.79 | 11.05 |
| D | 0.147 | 0.163 | 3.73 | 4.14 |
| E | 0.053 | 0.067 | 1.35 | 1.70 |
| F | 0.110 | 0.140 | 2.79 | 3.55 |
| G | 0.110 | 0.140 | 2.79 | 3.55 |
| H | 0.004 | 0.007 | 0.101 | 0.177 |
| I | 0.045 | 0.055 | 1.14 | 1.39 |
| J | 0.380 | 0.390 | 9.65 | 9.90 |
| K | 0.395 | 0.405 | 10.03 | 10.28 |

| PIN SCHEDULE | |
|---|---|
| 1 | SOURCE |
| 2 | GATE |
| 3 | DRAIN |

## IGW4000S

## ESD & MSL Rating

| Parameter | Rating | Standard |
|---|---|---|
| **ESD Human Body Model (HBM)** | TBD | ESDA/JEDEC JS-001-2012 |
| **ESD Charged Device Model (CDM)** | TBD | JEDEC JESD22-C101F |
| **Moisture Sensitivty Level (MSL)** | Unlimited Shelf Life | IPC/JEDEC J-STD-020 |

## RoHS Compliance

Integra Technologies, Inc declares that its GaN and LDMOS Transistor Products comply with EU Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS2), as adopted by EU member states on January 2, 2013 and amended on March 31, 2015 by EU Directive 2015/863/EU.

## REACH Compliance

Integra Technologies supports EU Regulation number 1907/2006 concerning the Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) as these apply to Integra semiconductor products, development tools, and shipping packaging.

In support of the REACH regulation, Integra will:

- Inform customers and recipients of Integra product if they contain any substances that are of very high concern (SVHC) per the European Chemical Agency (ECHA) website.
- Notify ECHA if any Integra product that contains any SVHCs which exceed guidelines for REACH chemicals by weight per part number and for total content weight per year for all products produced in or imported to the European market.
- Cease shipments of product containing REACH Annex XIV substances until authorization has been obtained.
- Cease shipment of product containing REACH Annex XVII chemicals when restrictions apply.

Integra has evaluated its materials, BOMs, and product specifications and product and has determined that this transistor conforms to all REACH and SVHC regulations and guidelines. Integra has implemented actions and control programs that will assure continued compliance.

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**DATA SHEET STATUS**
Advanced Specification - This data sheet contains Advanced specifications.
Preliminary Specification - This data sheet contains specifications based on preliminary measurements and data.
Final Specification - This data sheet contains final product specifications.
**MAXIMUM RATINGS** Stress above one or more of the maximum ratings may cause permanent damage to the device. These are maximum ratings only operation of the device at these or at any other conditions above those given in the characteristics sections of the specification is not implied. Exposure to maximum values for extended periods of time may affect device reliability.

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