

# S-Band, GaN/SiC, RF Power Transistor

2.6 - 3.1 GHz | 1400 W | 55% Efficiency typ | 13.5 dB Gain typ | 100 V | 10µs Pulse Length, 1% Duty Cycle

IGN2631S1400 and IGN2631S1400S are high power GaN-on-SiC RF power transistors. They operate over 2.6 - 3.1 GHz. Under 10µs, 1% duty cycle pulse conditions they supply a minimum of 1400 W of peak output power, with typically 13.5 dB of associated gain and 55% efficiency. They operate from a 100 V supply voltage. For optimal thermal efficiency, the transistors are housed in a metal-based package with an epoxy-sealed ceramic lid.



## FEATURES

- GaN on SiC HEMT Technology
- Output Power >1400 W
- Pre-matched Input Impedance
- High Efficiency - up to 60%
- RoHS and REACH Compliant

## APPLICATIONS

- S-band radar

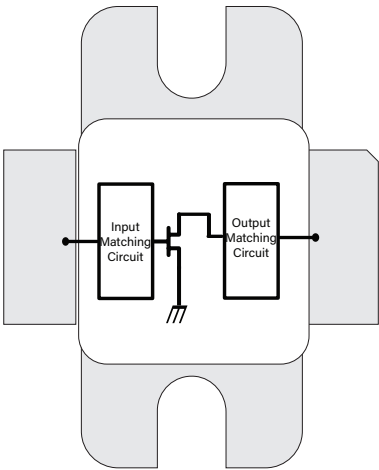


Table 1. RF Electrical Characteristics (Case temperature = 30 °C unless otherwise stated)

| Parameter                         | Symbol   | Min  | Typ  | Max  | Units | Test Conditions                                                                                     |
|-----------------------------------|----------|------|------|------|-------|-----------------------------------------------------------------------------------------------------|
| Gain                              | G        | 11   | 13.5 | 16   | dB    | $P_{OUT} = 1400W$<br>$f = 2.6, 2.85, 3.1 \text{ GHz}$<br>$V_{DS} = 100V, I_{DQ} = 50mA$<br>10µs, 1% |
| Drain Efficiency During the Pulse | $\eta$   | 50   | 55   | 65   | %     |                                                                                                     |
| Input Return Loss                 | IRL      | 7    | 17   | 25   | dB    |                                                                                                     |
| Pulse Droop                       | D        | -0.2 | -0.5 | -0.8 | dB    |                                                                                                     |
| Load Mismatch Stability           | VSWR-S   | 2:1  |      |      |       |                                                                                                     |
| VSWR Withstand                    | VSWR-LMT | 5:1  |      |      |       |                                                                                                     |

Note: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured.  
Note: IGN2631S1400 was tested with the gate bias pulsed in synch with the RF signal to minimise dissipated power in the RF-off state.

**Table 2. Absolute Maximum Ratings (Not Simultaneous)**

| Parameter                     | Symbol       | Value       | Units | Test Conditions |
|-------------------------------|--------------|-------------|-------|-----------------|
| DC Drain-Source Voltage       | $V_{DS}$     | 300         | V     | 25 °C           |
| DC Gate-Source Voltage        | $V_{GS}$     | -8 to +1    | V     | 25 °C           |
| DC Drain Current              | $I_D$        | 45          | A     | 25 °C           |
| DC Gate Current               | $I_G$        | 45          | mA    | 25 °C           |
| RF Input Power                | $P_{RF,IN}$  | 150         | W     | 25 °C           |
| Operating Channel Temperature | $T_{CH}$     | -55 to +225 | °C    |                 |
| Storage Temperature           | $T_{STG}$    | -55 to +110 | °C    |                 |
| Soldering Temperature         | $T_{SOLDER}$ | 260 for 60s | °C    |                 |

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

**Table 3. DC Electrical Characteristics (Case temperature = 25 °C unless otherwise stated)**

| Parameter              | Symbol       | Min | Typ  | Max | Units | Test Conditions                |
|------------------------|--------------|-----|------|-----|-------|--------------------------------|
| Drain Leakage Current  | $I_{DS-OFF}$ |     |      | 9   | mA    | $V_{DS} = 100V, V_{GS} = -6V$  |
| Quiescent Gate Voltage | $V_Q$        |     | -3.8 |     | V     | $V_{DS} = 100V, I_{DS} = 50mA$ |

TYPICAL PERFORMANCE

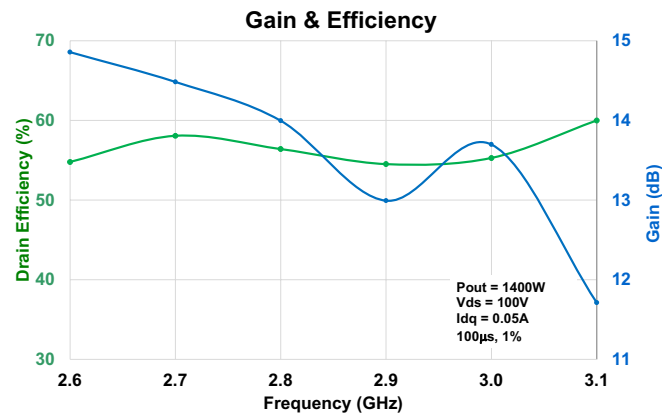


Figure 1.

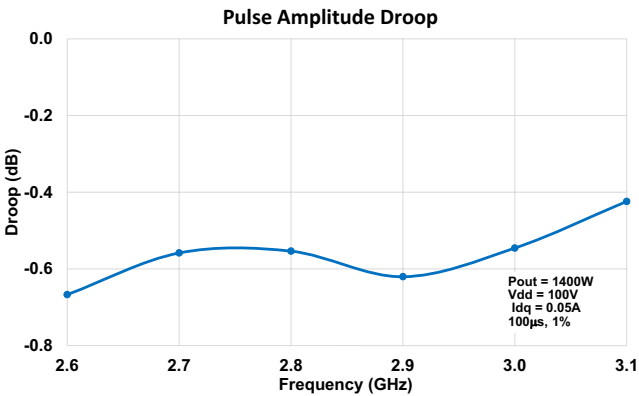


Figure 2.

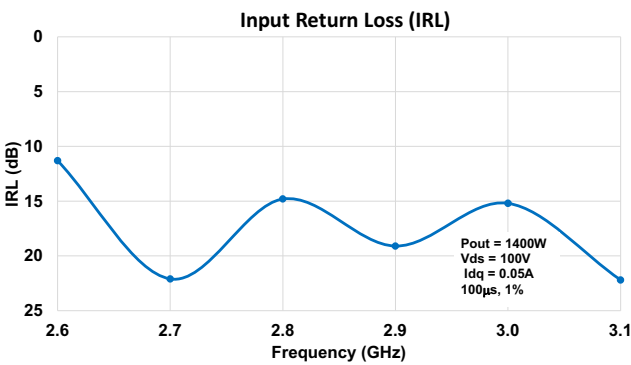


Figure 3.

## TYPICAL THERMAL PERFORMANCE

Table 4. Thermal Resistance (Case temperature = 85 °C unless otherwise stated)

| Parameter                                | Symbol   | Typ  | Units | Test Conditions                                                                                 |
|------------------------------------------|----------|------|-------|-------------------------------------------------------------------------------------------------|
| Peak Thermal Resistance, Channel to Case | $R_{TH}$ | 0.12 | °C/W  | $P_{DISS} = 1145\text{ W}$<br>10 $\mu$ s Pulse length, 1% Duty Cycle<br>$V_{DS} = 100\text{ V}$ |

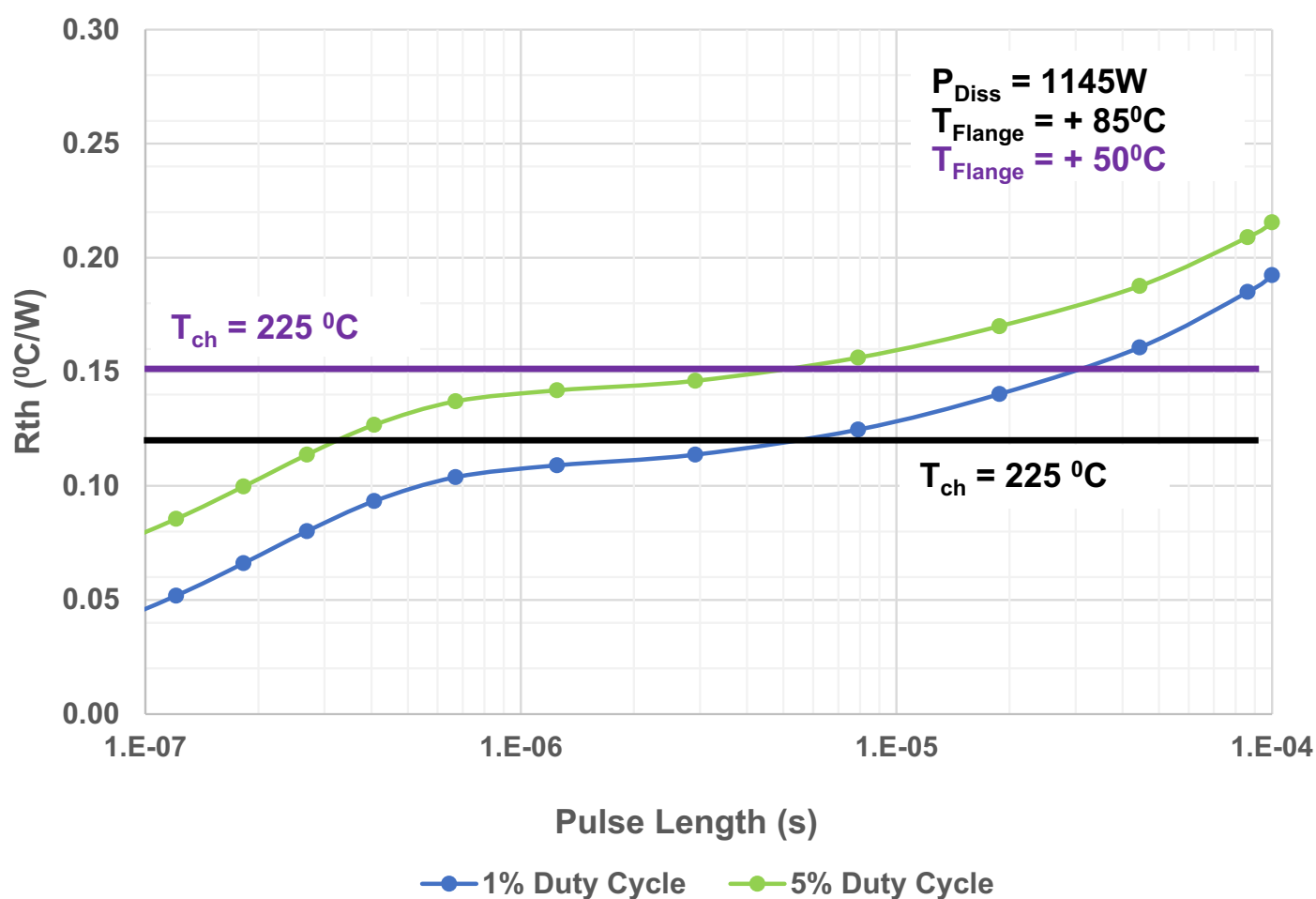
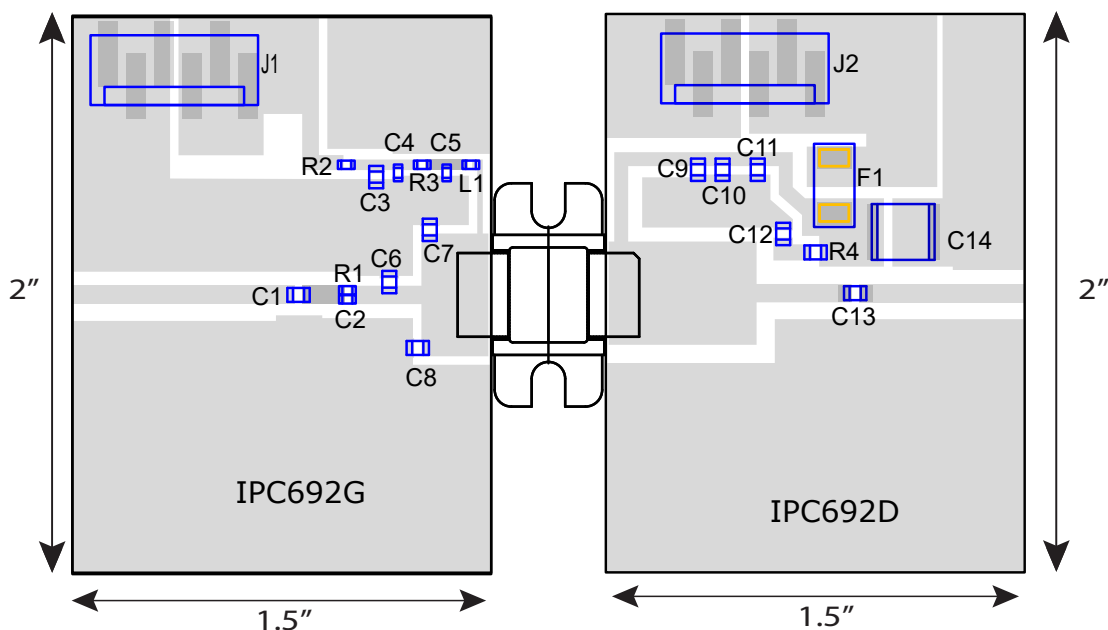


Figure 4. (Data obtained by FEA analysis)

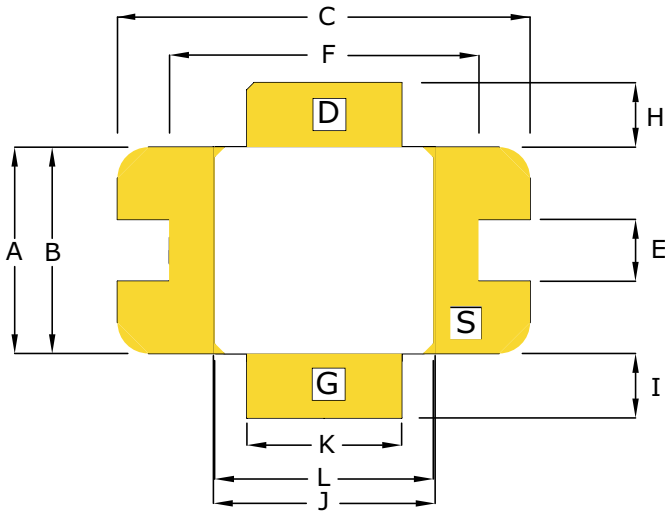
### TEST FIXTURE



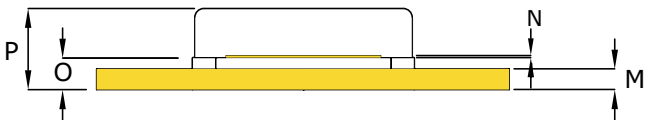
### Bill of Materials for IGN2631S1400 Test Fixture

| Designator    | Description            | Quantity |
|---------------|------------------------|----------|
| C1, C9, C13   | CAP 18pF, 0805, 250V   | 3        |
| C2            | CAP 18pF, 0603, 250V   | 1        |
| C3            | CAP 1000pF, 0805, 100V | 1        |
| C4            | CAP 100pF, 0603, 250V  | 1        |
| C5            | CAP 10pF, 0603, 250V   | 1        |
| C6            | CAP 0.5pF, 0805, 250V  | 1        |
| C7, C8        | CAP 0.7pF, 0805, 250V  | 2        |
| C10           | CAP 100pF, 0805, 250V  | 1        |
| C11, C12      | CAP 0.1μF, X7R, 100V   | 2        |
| C14           | CAP 10μF, 2220, 100V   | 1        |
| F1            | FUSE 10A               | 1        |
| R2, R3        | RES 5.1 OHM, 0603      | 2        |
| R4            | RES, 10 OHM, 0805      | 1        |
| PC Board Type | RF-35TC-0300-E-C1/C1   | 2        |

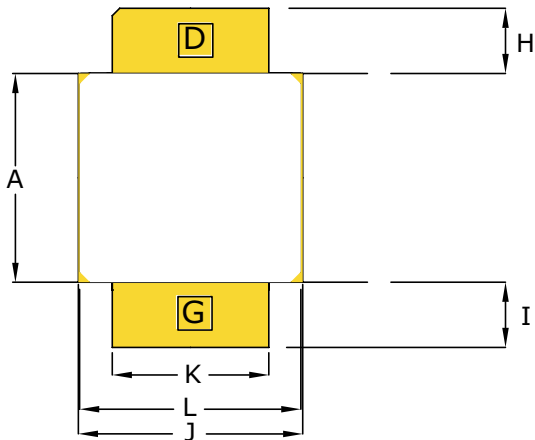
PACKAGE PL44E1 FLANGED AND EARLESS VERSIONS



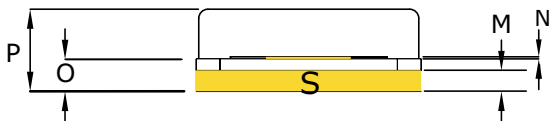
| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.395  | 0.405 | 10.03       | 10.29 |
| B   | 0.395  | 0.405 | 10.03       | 10.29 |
| C   | 0.795  | 0.805 | 20.19       | 20.45 |
| E   | 0.115  | 0.125 | 2.92        | 3.18  |
| F   | 0.595  | 0.605 | 15.11       | 15.37 |
| H   | 0.110  | 0.140 | 2.79        | 3.56  |
| I   | 0.110  | 0.140 | 2.79        | 3.56  |
| J   | 0.425  | 0.435 | 10.80       | 11.05 |
| K   | 0.295  | 0.305 | 7.49        | 7.75  |
| L   | 0.420  | 0.428 | 10.67       | 10.87 |
| M   | 0.035  | 0.045 | 0.89        | 1.14  |
| N   | 0.004  | 0.007 | 0.10        | 0.18  |
| O   | 0.055  | 0.069 | 1.40        | 1.75  |
| P   | 0.143  | 0.179 | 3.63        | 4.55  |



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



| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.392  | 0.408 | 9.96        | 10.36 |
| H   | 0.110  | 0.140 | 2.79        | 3.56  |
| I   | 0.110  | 0.140 | 2.79        | 3.56  |
| J   | 0.422  | 0.438 | 10.72       | 11.13 |
| K   | 0.295  | 0.305 | 7.49        | 7.75  |
| L   | 0.420  | 0.428 | 10.67       | 10.87 |
| M   | 0.035  | 0.045 | 0.89        | 1.14  |
| N   | 0.004  | 0.007 | 0.10        | 0.18  |
| O   | 0.055  | 0.069 | 1.40        | 1.75  |
| P   | 0.143  | 0.179 | 3.63        | 4.55  |



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

### 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 Sensitivity 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.

### Disclaimer

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#### DEFINITIONS:

##### 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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