

L-Band, GaN/SiC, RF Power Transistor

1030 and 1090 MHz | 225 W | 50% Efficiency | 37dB Gain | 50 V | 32μs Pulse Length, 4% Duty Cycle

IGT1011S150 is a high power, two-stage RF power transistor that has two discrete GaN-on-SiC transistors inside a single package. It has been designed to suit the unique needs of IFF/SSR avionics systems. It operates at both 1030 and 1090 MHz. Under 32μs pulse length, 4% duty cycle pulse conditions, it supplies a minimum of 150 W of peak output power, with typically >37 dB of gain. It operates from a 50 V supply voltage. For optimal thermal efficiency, the transistor is housed in a metal-based package with an epoxy-sealed ceramic lid.

FEATURES

- GaN on SiC HEMT Technology
- Output Power >150 W
- Fully matched to 50 Ω Impedance at the input and output
- High Efficiency - up to 50%
- 100% RF Tested
- RoHS and REACH Compliant

APPLICATIONS

- L-band Avionics IFF & SSR Systems
- Suitable for both uplink and downlink (Transponder/Interrogator)

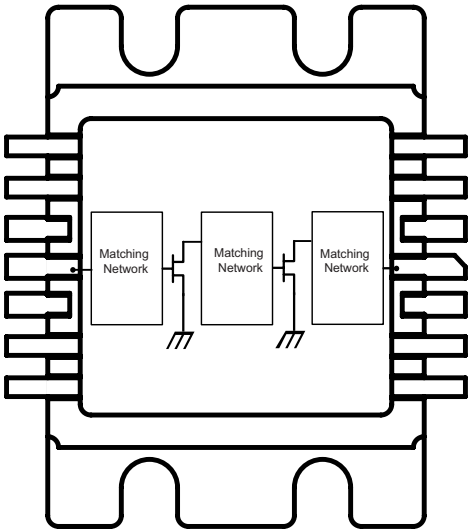
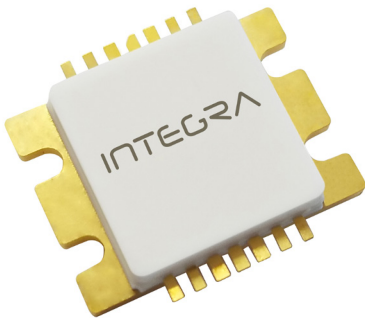


Table 1. RF Electrical Characteristics (Case temperature = 25 °C unless otherwise stated)

| Parameter | Symbol | Min | Typ | Max | Units | Test Conditions |
|-------------------------|----------|------|------|------|-------|--|
| Input Return Loss | IRL | 7 | 15 | 25 | dB | $P_{OUT} = 150W$ $f = 1030, 1090\text{ MHz}$ 32μs pulse length, 4% duty cycle $V_{DS} = 50V, I_{DQ1} = 2mA, I_{DQ2} = 12mA$ |
| Gain | G | 35 | 37 | 39 | dB | |
| Drain Efficiency | η | 40 | 45 | 50 | % | |
| Pulse Droop | D | -0.4 | -0.2 | +0.2 | dB | |
| Load Mismatch Stability | VSWR-S | 2:1 | | | | |
| VSWR Withstand | VSWR-LMT | 5:1 | | | | |

Table 2. Absolute Maximum Ratings (Not Simultaneous)

| Parameter | Symbol | Value | Units | Test Conditions |
|-------------------------------|--------------|-------------|-------|-----------------|
| DC Drain-Source Voltage | V_{DS} | 130 | V | 25 °C |
| DC Gate-Source Voltage | V_{GS} | -8 to +1.0 | V | 25 °C |
| DC Drain Current | I_D | 10 | A | 25 °C |
| DC Gate Current for FET 1 | I_G | 2 | mA | 25 °C |
| DC Gate Current for FET 2 | I_G | 12.5 | mA | 25 °C |
| RF Input Power | $P_{RF,IN}$ | 0.6 | 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 10s | °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 |
|------------------------|----------|------|------|-----|-------|---------------------------------------|
| Gate Pinch-Off Voltage | V_P | -5.0 | | | V | $V_{DS} = 50V, I_{DS} = 1mA$ |
| Quiescent Gate Voltage | V_{Q1} | | -2.5 | | V | $V_{DS} = 50V, I_{DS} = 2\text{ mA}$ |
| Quiescent Gate Voltage | V_{Q2} | | -2.7 | | V | $V_{DS} = 50V, I_{DS} = 12\text{ mA}$ |

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

| Parameter | Symbol | Min | Typ | Max | Units | Test Conditions |
|--|----------|-----|-----|-----|-------|---|
| Peak Thermal Resistance, Channel to Case | R_{TH} | | 0.3 | | °C/W | $P_{DISS} = 183W$ 32µs pulse length, 4% duty cycle $V_{DS} = 50V$ |

Table 5. Matching Network Source & Load Impedances (Case temperature = 25°C unless otherwise stated)

| Frequency (MHz) | Z_{IF} | Z_{OF} | Units | Test Conditions |
|-----------------|----------|----------|----------|---|
| 1030 | 50 + j0 | 50 + j0 | Ω | $P_{OUT} = 150W$ 32µs pulse length, 4% duty cycle $V_{DS} = 50V, I_{DS1} = 2mA, I_{DS2} = 12mA$ |
| 1090 | 50 + j0 | 50 + j0 | Ω | |

TYPICAL PERFORMANCE

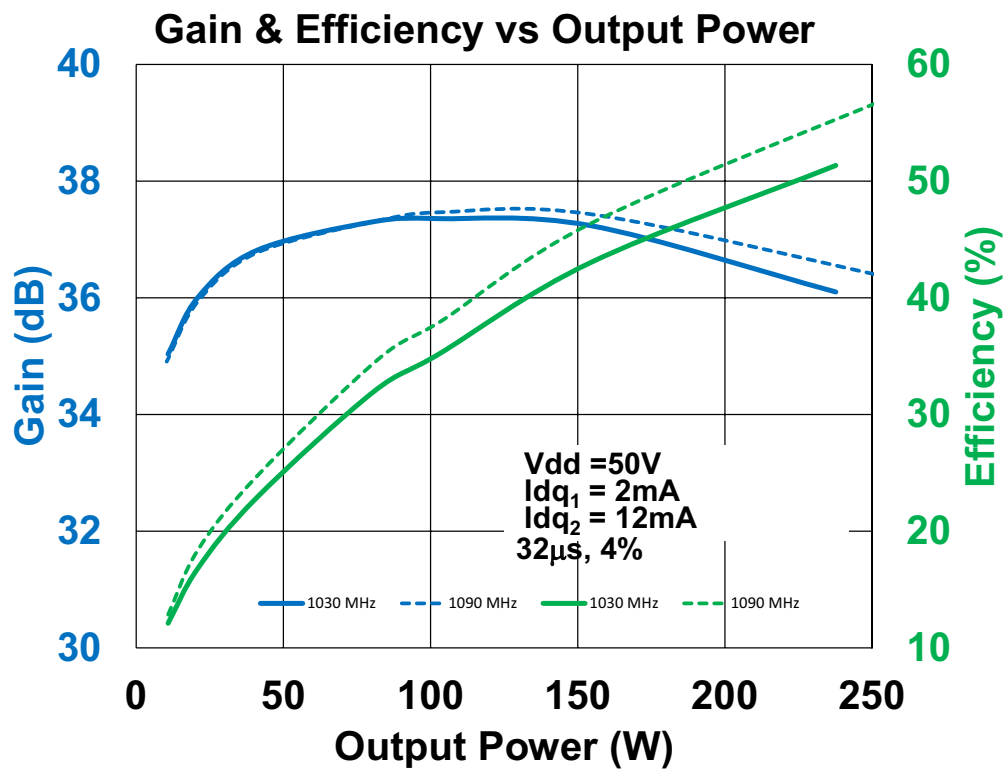
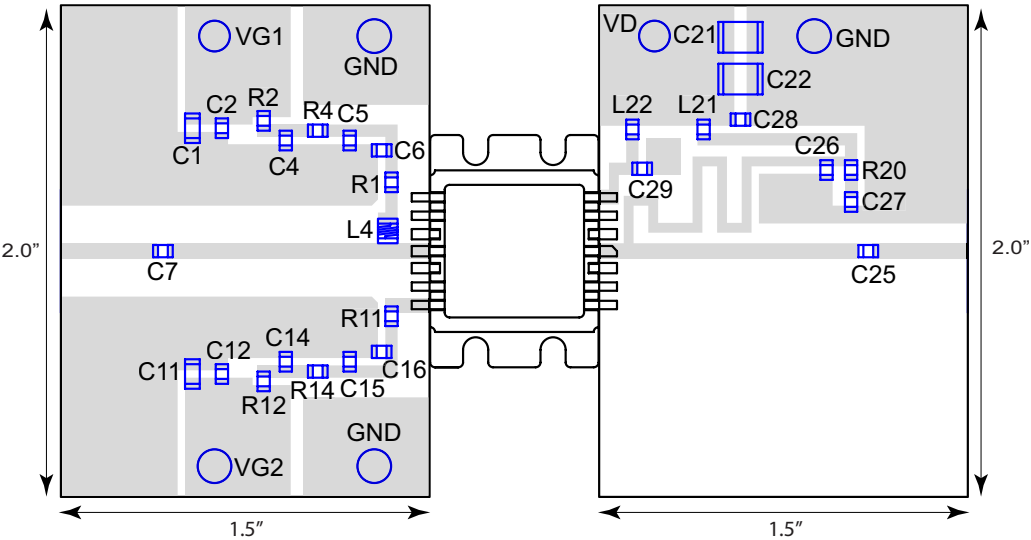


Figure 1

TEST FIXTURE

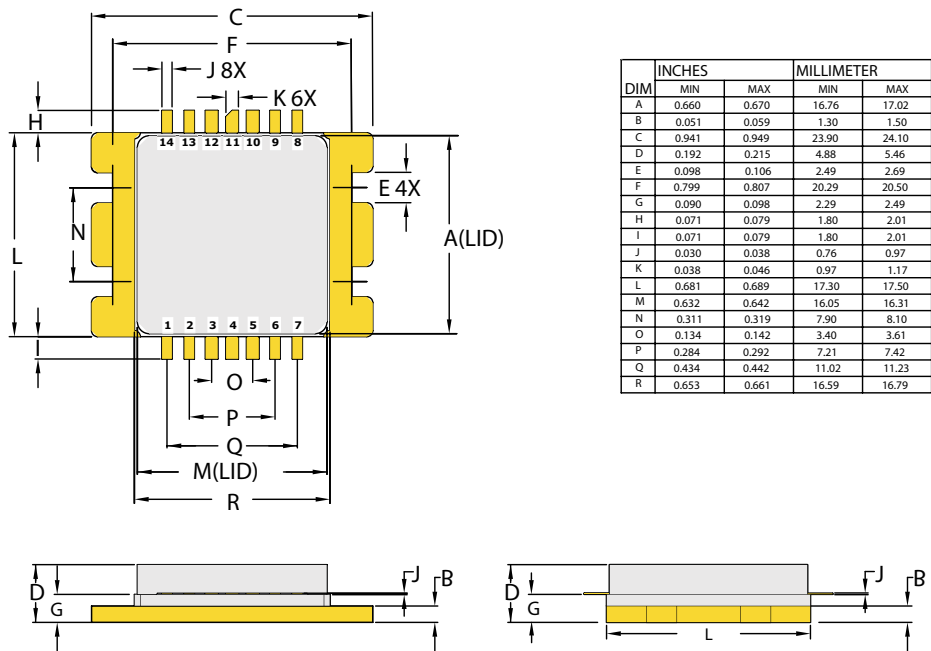


Note: it is recommended that a 4700µF 63V electrolytic capacitor be connected between ground and the positive supply terminal of the test fixture, and placed as close as possible to the test fixture, in order to minimise pulse droop.

Bill of Materials for IGT1011S150 Test Fixture

| Designator | Description | Part Number |
|----------------------------|--------------------------------|------------------|
| C1, C11 | CAP 1 μ F, 1206, 100V, X7R | 12061C105K4T2A |
| C2, C5, C12, C15, C28 | CAP 1000pF, 0805, 100V | 08051A102J4T2A |
| C4, C14, C27 | CAP 0.068pF, 250V, 0805, X7R | C0805C683KARAC#A |
| C6, C7, C16, C25, C26, C29 | CAP 33pF, 0805, 250V | ATC600F330 |
| C21, C22 | CAP 1 μ F, 1812, 200V, X7R | 18122C105KAT2A |
| L4 | IND 39nH 1008 | 18122C105KAT2A |
| L21, L22 | IND, FB, 38 OHM, 6A, 1206 | Z1206C380BPWST |
| R1, R11, R20 | RES, 5.1 OHM, 0805 | CRCW08055R1JNEA |
| R2, R12 | RES, 200 OHM, 0805 | CRCW0805200RFKTA |
| R4, R14 | RES, 0 OHM, 0805 | CRCW08050000ZSTA |
| PC BOARD | RO4350B 0.030", 1oz/1oz Copper | |

PACKAGE PFC77A1



PIN CONNECTIONS

| | |
|----|--------------|
| 1 | Unused |
| 2 | Unused |
| 3 | Ground |
| 4 | RF IN + VG1 |
| 5 | Ground |
| 6 | Unused |
| 7 | VG2 |
| 8 | Unused |
| 9 | Unused |
| 10 | Ground |
| 11 | RF OUT + VD2 |
| 12 | Ground |
| 13 | Unused |
| 14 | VD1 |

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.

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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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