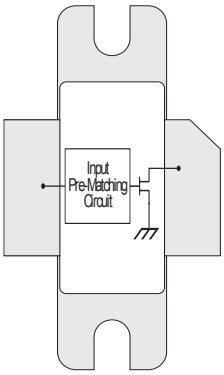
L-Band, GaN/SiC, RF Power Transistor

1030 and 1090 MHz | 1250 W typ | 85% Efficiency typ | 17 dB Gain typ | 50 V | Mode S ELM

IGN1011L1200 is a high power GaN-on-SiC RF power transistor that has been designed to suit the unique needs of IFF/SSR avionics systems. It operates at both 1030 and 1090 MHz. Under ELM Mode S [48x (32µs on, 18µs off), 6.4% Long Term Duty Cycle] pulse conditions, it supplies a minimum of 1200 W of peak output power, with typically >17 dB of gain and 85% efficiency. 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 >1200 W
- Pre-matched Input Impedance
- Exceptionally High Efficiency - up to 85%
- Capable of withstanding 10:1 VSWR mismatch
- 100% RF Tested Under Mode S ELM pulse conditions
- RoHS and REACH Compliant



APPLICATIONS

- L-band Avionics IFF & SSR Systems
- Suitable for both uplink and downlink (Transponder)
- Also suitable for Standard Mode S applications

Table 1. Absolute Maximum Ratings (Not Simultaneous)

Parameter	Symbol	Value	Units	Test Conditions
DC Drain-Source Voltage	V_{DS}	180	V	25 °C
DC Gate-Source Voltage	V_{GS}	-8 to +1.0	V	25 °C
DC Drain Current	I_D	81	A	25 °C
DC Gate Current	I_G	81	mA	25 °C
RF Input Power	$P_{RF,IN}$	32	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 transistor

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} = 50V, I_{DS} = 1mA
Quiescent Gate Voltage	V_Q		-2.8		V	V_{DS} = 50V, I_{DS} = 160mA

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

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
RF Input Power	$P_{IN, RF}$	19	25	30	W	P_{OUT} = 1200W f = 1030, 1090 MHz Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4% V_{DS} = 50V, I_{DS} = 160mA,
Gain	G	16	16.8	18	dB	
Drain Efficiency	η	60	75	90	%	
Pulse Droop	D	-0.7	-0.5	+0.2	dB	
Load Mismatch Stability	VSWR-S	2:1				

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

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

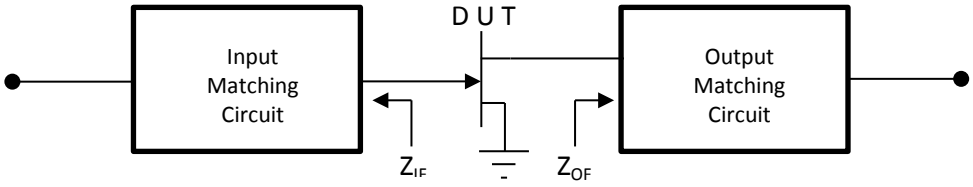
Parameter	Symbol	Typ	Units	Test Conditions
Thermal Resistance, Channel to Case	R_{TH}	0.28	°C/W	Dissipated Power = 500W

Table 5. VSWR Withstand (Case temperature = 30 °C unless otherwise stated)

Parameter	Min	Typ	Test Conditions
VSWR Withstand	VSWR-LMT	10:1	P_{OUT} = 1200W f = 1030, 1090 MHz Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4%. V_{DS} = 50V, I_{DS} = 160mA

Table 6. Optimum Source & Load Impedances (Case temperature = 25 °C unless otherwise stated)

Frequency (MHz)	Z_{IF}	Z_{OF} Fundamental	Z_{OF} Second Harmonic	Units	Test Conditions
1030	1.9 - j 1.7	0.9 + j 0.15	0.4 + j 5.6	Ω	P_{OUT} = 1200W f = 1030, 1090 MHz Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4% V_{DS} = 50V, I_{DS} = 160mA
1090	1.9 - j 1.2	0.85 + j 0.2	0.7 + j 6.8	Ω	



TYPICAL PERFORMANCE

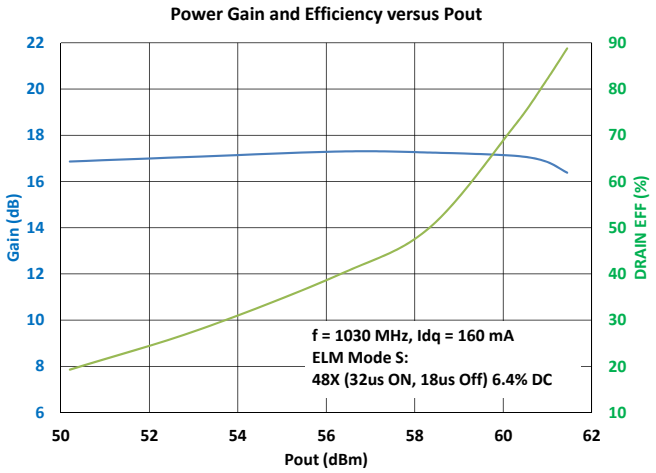


Figure 1

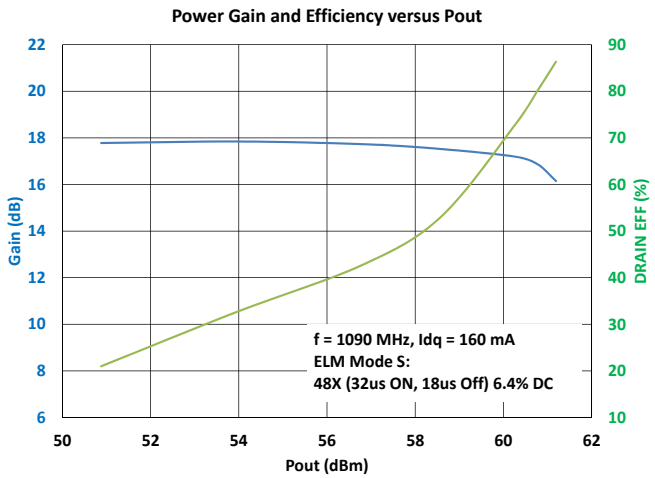


Figure 2

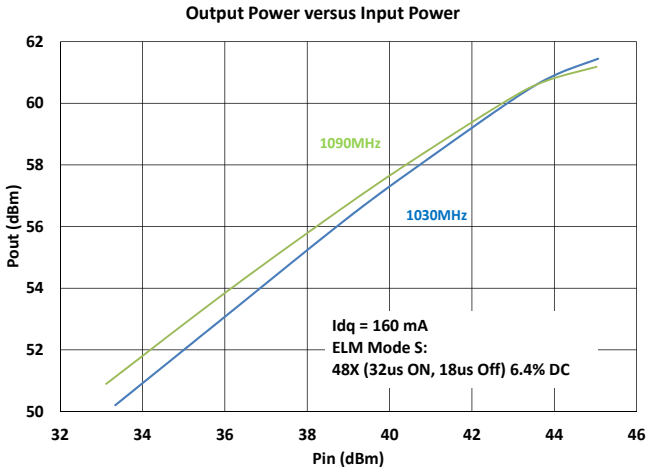


Figure 3

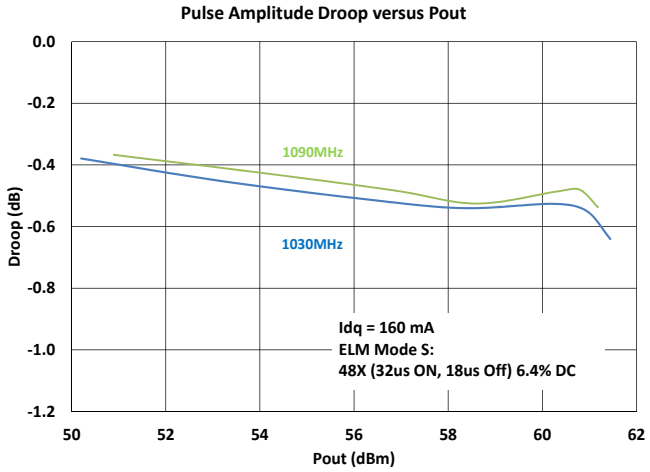
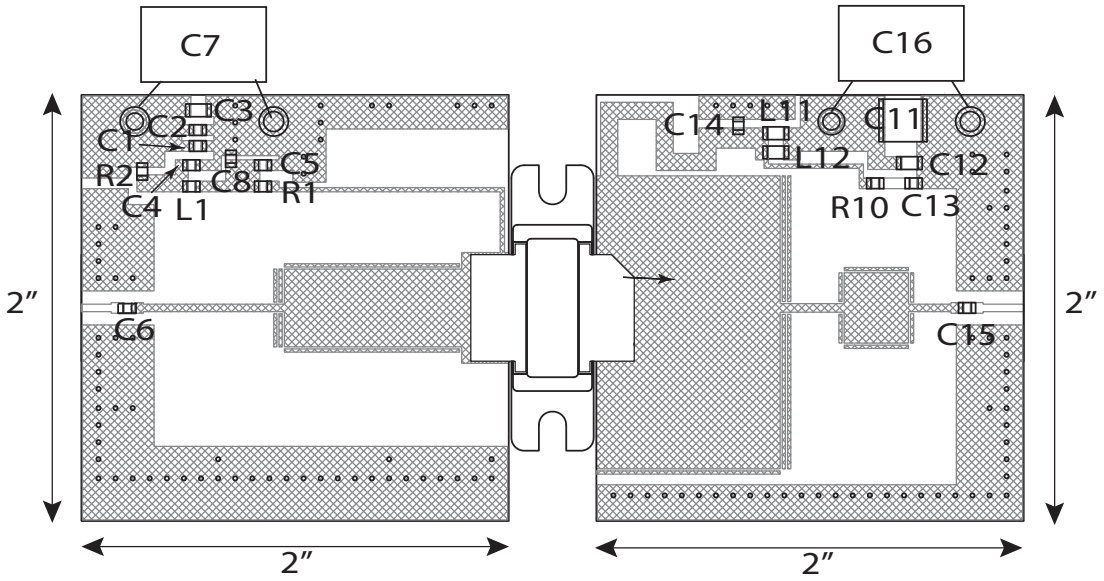


Figure 4

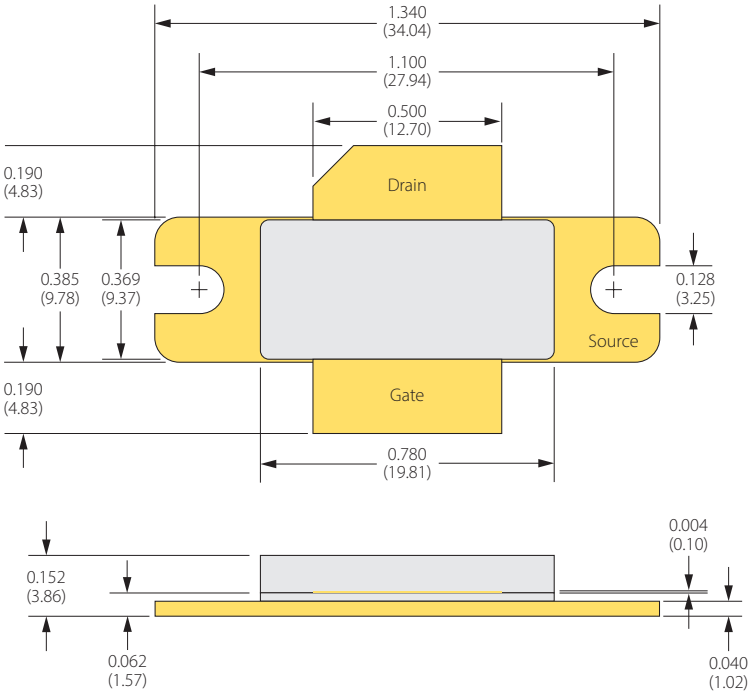
TEST FIXTURE



Bill of Materials for IGN1011L1200 Test Fixture

Designator	Description	Part Number
C1, C4, C13	CAP 0.1µF, 0805, 50V	C0805C104K5RACTU
C2	CAP 33pF	ATC600F330
C5 ,C6, C14, C15	CAP 33pF, Edge Mounted	ATC600F330
C3, C12	CAP 1µF, 1206	C1206C105K5RACTU
C11	CAP 10µF, 2220, 50V, X7R	C2220X106K5RACTU
C7, C16	CAP Electrolytic, 68µF, 63V (mounted external to pcb)	UPJ1J680MPD6TD
C8	CAP 1000pF, 0805, 50V, X7R	C0805C102M5RACTU
L1	IND, FB, 120 OHM, 0805, 5A	ILHB0805ER121V
L11, L12	IND , FB, 33 OHM, 1206, 6A	BLM31PG330SN1L
R1, R10	RES, 15R0, 0805	ERJ-6ENF15R0V
R2	RES, 100 OHM, 0805	ERJ-6ENF1000V
PC Board Type	ROGERS RT6006, 25mil, 1/1oz. Copper	

PACKAGE PL84A1



Dimensions: Inches (mm)

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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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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