

S-Band, GaN/SiC, RF Power Transistor

3.1 - 3.5 GHz | 13 W typ | 50% Efficiency typ | 16dB Gain typ | 46 V | 3ms Pulse Length, 30% Duty Cycle

IGN3135L12 and IGN3135L12S are high power GaN-on-SiC RF power transistors that have been designed for modern long pulse, high duty cycle radar systems. They supply a minimum of 12W of peak output power, with typically >16dB of gain and 50% efficiency. They operate from a 46 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 >12W
- Pre-Matched input impedance
- High Efficiency - 50% typical
- 100% RF Tested under 3ms, 30% duty cycle pulse conditions
- RoHS and REACH Compliant

APPLICATIONS

- S-band Radar Systems

Table 1. Absolute Maximum Ratings (Not Simultaneous)

Parameter	Symbol	Value	Units	Test Conditions
DC Drain-Source Voltage	V_{DS}	100	V	25 °C
DC Gate-Source Voltage	V_{GS}	-8 to +1.5	V	25 °C
DC Drain Current	I_D	1.8	A	25 °C
DC Gate Current	I_G	1.8	mA	25 °C
RF Input Power	P_{RFIN}	0.8	W	25 °C
Operating Junction Temperature	T_J	-55 to +200	°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 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	-4.0	-3.0	-2.5	V	$V_{DS} = 46V, I_{DS} = 2mA$
Quiescent Gate Voltage	V_Q		-2.5		V	$V_{DS} = 46V, I_{DS} = 25mA$

Table 3. RF Electrical Characteristics (Case temperature = 30 °C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
RF Output Power	$P_{OUT,RF}$	12	13	15	W	$P_{IN} = 0.3W$ $f = 3.1, 3.3, 3.5 \text{ GHz}$ 3ms pulse length, 30% duty cycle $V_{DS} = 46V, I_{DS} = 25mA$
Gain	G	16.0	16.4	17.0	dB	
Drain Efficiency	η	45	50	60	%	
Pulse Droop	D	-0.7	-0.1	+0.3	dB	
Input Return Loss	IRL	7	12	30	dB	
Load Mismatch Stability	VSWR-S	2:1				$P_{OUT} = 12W$ $f = 3.1, 3.3, 3.5 \text{ GHz}$ 3ms pulse length, 30% duty cycle $V_{DS} = 46V, I_{DS} = 25mA$
VSWR Withstand	VSWR-LMT	3:1				

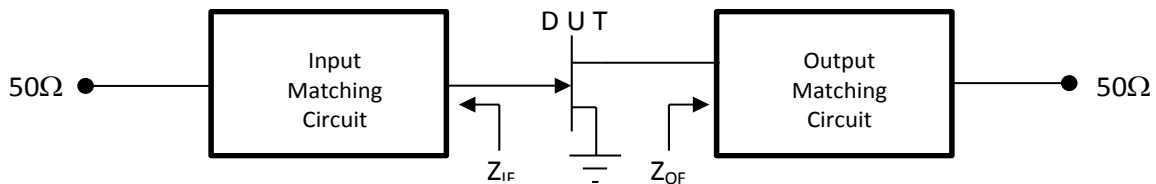
Note: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured.

Table 4. Thermal Resistance (Case temperature = 25 °C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Peak Thermal Resistance, Junction to Case	$R_{TH(JC)}$			10.0	°C/W	$P_{IN} = 0.3W$ $f = 3.1, 3.3, 3.5 \text{ GHz}$ 3ms pulse length, 30% duty cycle $V_{DS} = 46V, I_{DS} = 25mA$

Table 5. Matching Circuit Impedances (Case temperature = 25 °C unless otherwise stated)

Frequency (GHz)	Z_{IF}	Z_{OF}	Units	Test Conditions
3.1	4.7 - j 4.0	27 + j 6.5	Ω	$P_{IN} = 0.3W$ 3ms Pulse length, 30% Duty Cycle $V_{DS} = 46V, I_{DS} = 25mA$
3.3	4.0 - j 3.0	36 + j 7.0	Ω	
3.5	3.5 - j 1.0	49 + j 0.0	Ω	



TYPICAL PERFORMANCE

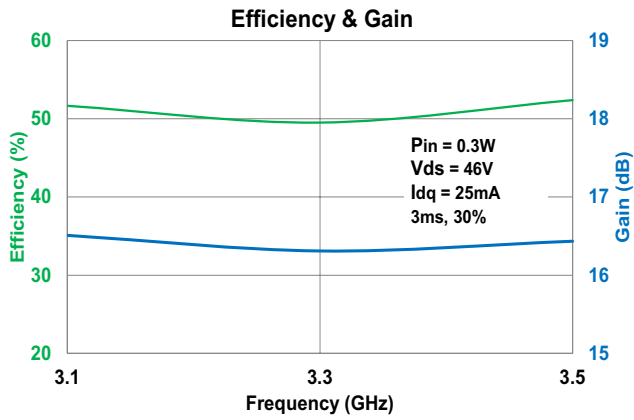


Figure 1

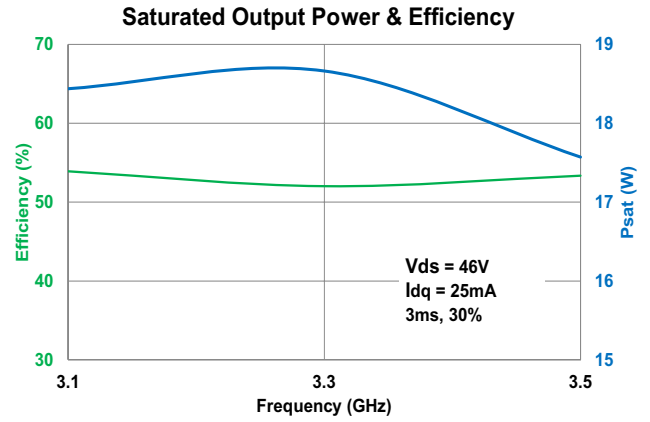


Figure 2

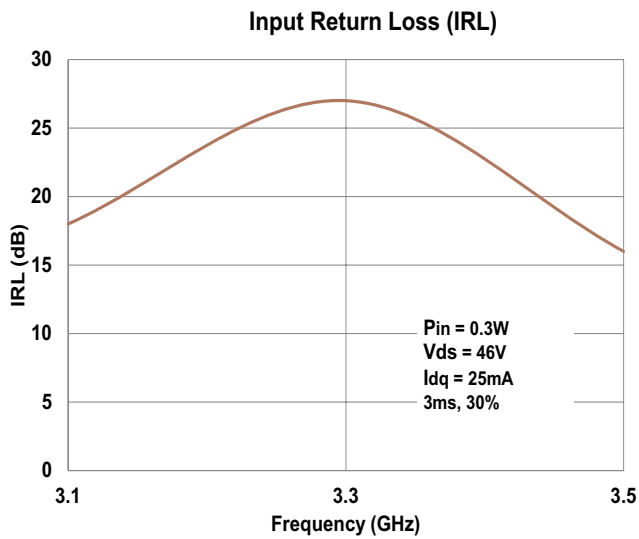


Figure 3

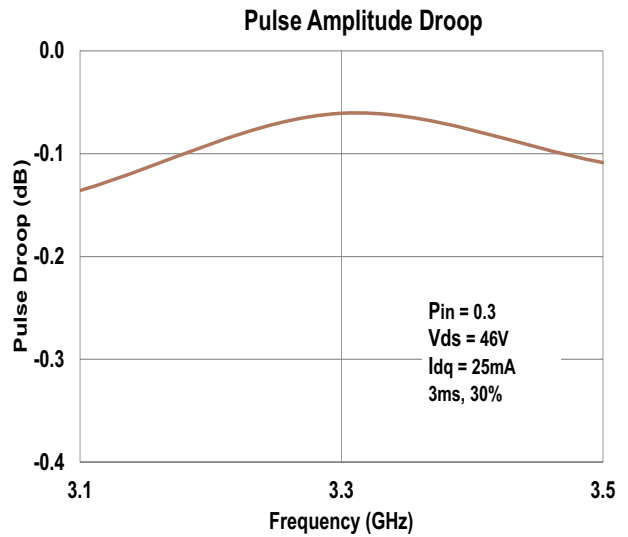
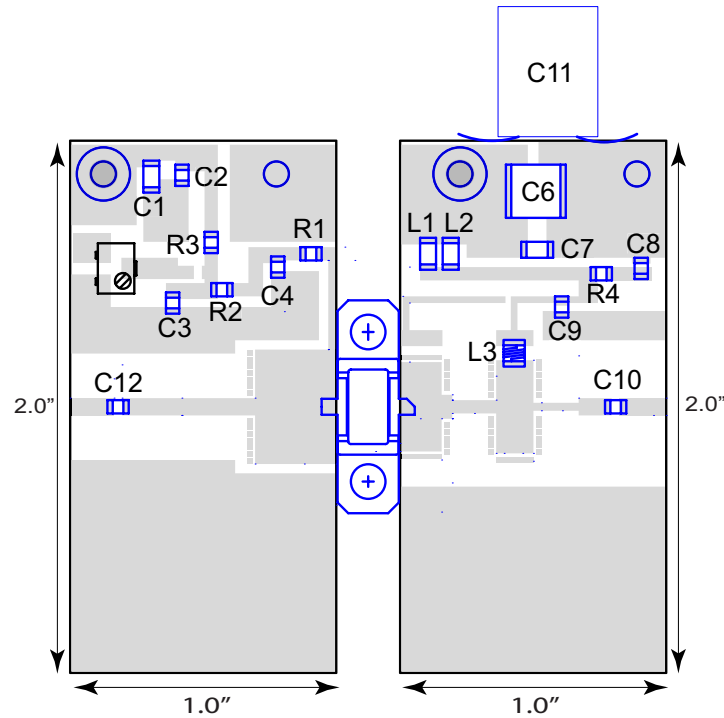


Figure 4

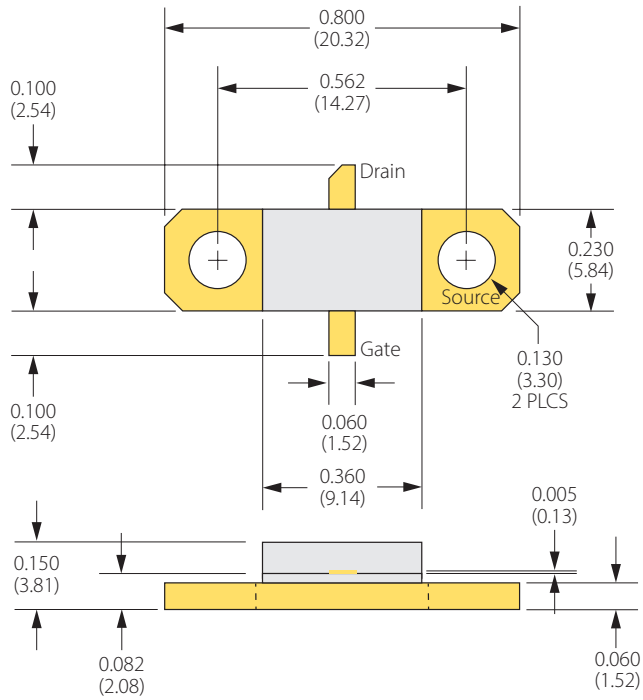
TEST FIXTURE



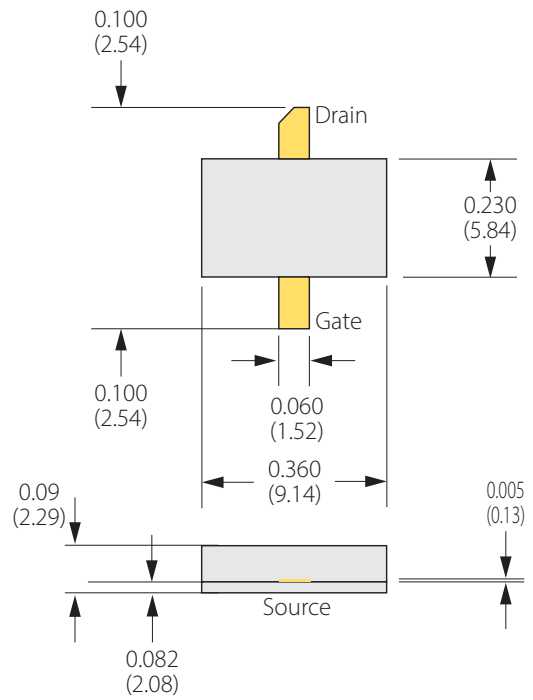
Bill of Materials for IGN3135L12 Test Fixture

Designator	Description	Quantity	Part Number
C1, C7	CAP 1 μ F, 1206, 100V, X7R	2	GRM31CR72A105KA01L
C2, C3, C8	CAP 0.1 μ F, 0805, 100V	3	C0805C104K1RAL
C4, C9	CAP 5.6pF, 0805	2	ATC600F5R6CT
C6	CAP 10 μ F, 2220, X7R, 50V	1	C575X7R1H106M
C10, C12	CAP 12pF, 0805	2	ATC600F120CT
C11	CAP 68 μ F, 63V	1	140-XRL63V68
L2, L2	IND FB 33 Ω @100MHz, 1206, 6A	2	BLM31PG330S
L3	IND 22nH, 0908	1	0908SQ-22NGL
R1, R2, R4	RES 10 Ω , 0805	3	
R3	RES 470 Ω , 0805	1	
PC Board	Rogers 30 mils, 1oz/1oz Copper	2	RO4350B-03011

PACKAGE PL32A2



**BOLT-DOWN FLANGE OPTION
IGN3135L12**



**EARLESS FLANGE OPTION
IGN3135L12S**

Dimensions: Inches (mm)

ESD 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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