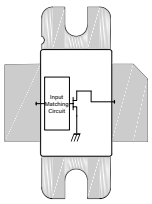
L-Band, GaN/SiC, RF Power Transistor

1025 - 1150 MHz | 2000 W typ | 62% Efficiency typ | 18 dB Gain typ | 65V | 32µs Pulse Length, 4% Duty Cycle

IGN1012S2000 is a high power GaN-on-SiC RF power transistor that has been designed to suit the unique needs of TACAN, DME and IFF/SSR avionics systems. Under 32µs, 4% duty cycle pulse conditions, it supplies 2000 W of peak output power, with typically 18dB of associated gain and 62% efficiency. It operates from a 65V 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 >2000 W
- Pre-matched Input Impedance
- High Efficiency - typically 62%
- 100% RF Tested
- RoHS and REACH Compliant

APPLICATIONS

- TACAN and DME Systems
- IFF/SSR Systems

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

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Gain	G	15	18	20	dB	P_{OUT} = 2000W f = 1025, 1090, 1150 MHz 32µs pulse length, 4% duty cycle V_{DS} = 65V, I_{DQ} = 100mA
Drain Efficiency	η	50	62	80	%	
Pulse Droop	D	-0.4	-0.1	0.2	dB	
Input Return Loss	IRL	8	14	18	dB	

Note 1: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured.

Table 2. RF Characterization – Mismatch Ruggedness (Case temperature = 30 °C unless otherwise stated)

Parameter	Symbol	Typ	Test Conditions
Impedance Mismatch Ruggedness	VSWR	5:1	P_{OUT} = 2000W f = 1025, 1090, 1150 MHz 32µs pulse length, 4% duty cycle V_{DS} = 65V, I_{DQ} = 100mA

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} = 65V, I_{DS} = 1mA
Quiescent Gate Voltage	V_Q		-2.8		V	V_{DS} = 65V, I_{DS} = 100mA

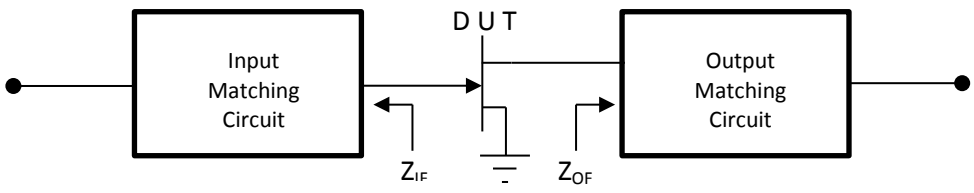
Table 4. Absolute Maximum Ratings (Not Simultaneous)

Parameter	Symbol	Value	Units	Test Conditions
DC Drain-Source Voltage	V_{DS}	150	V	25 °C
DC Gate-Source Voltage	V_{GS}	-8 to +1.0	V	25 °C
DC Drain Current	I_D	72	A	25 °C
DC Gate Current	I_G	7.2	mA	25 °C
RF Input Power	$P_{RF,IN}$	70	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 5. Test Fixture Source & Load Impedances

Frequency (MHz)	Z_{IF}	Z_{OF}	Units	Test Conditions
1025	0.7 - j 0.8	1.2 - j 0.3	Ω	P_{OUT} = 2000W 32µs pulse length, 4% duty cycle V_{DS} = 65V, I_{DQ} = 100mA
1090	0.7 - j 0.5	1.1 - j 0.3	Ω	
1150	0.7 - j 0.2	1.0 - j 0.2	Ω	



TYPICAL RF PERFORMANCE

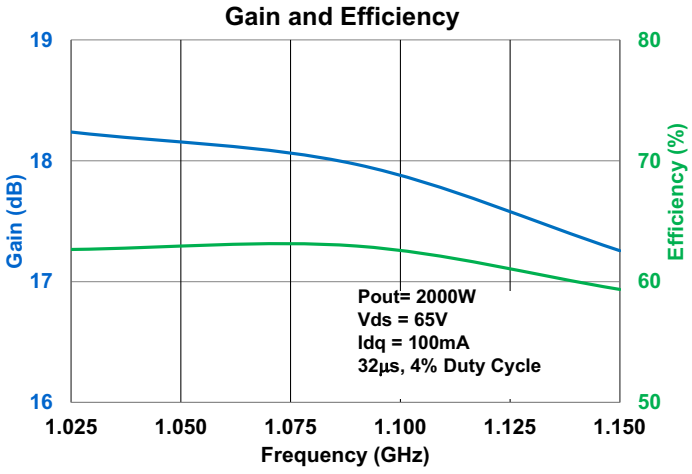


Figure 1

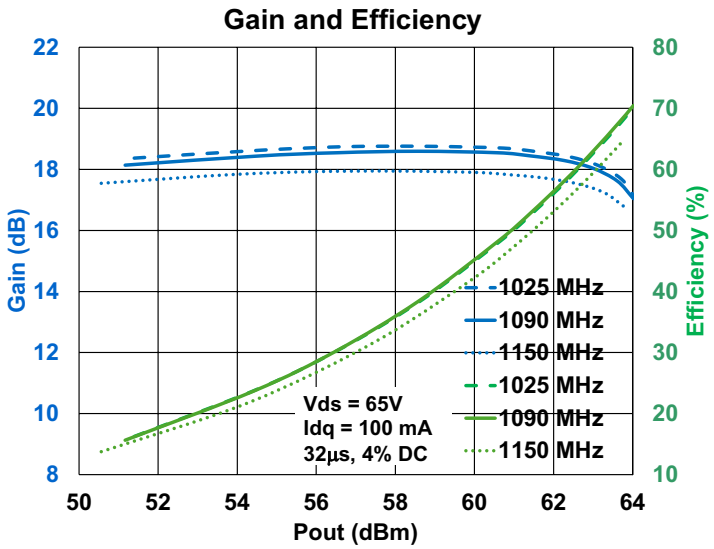
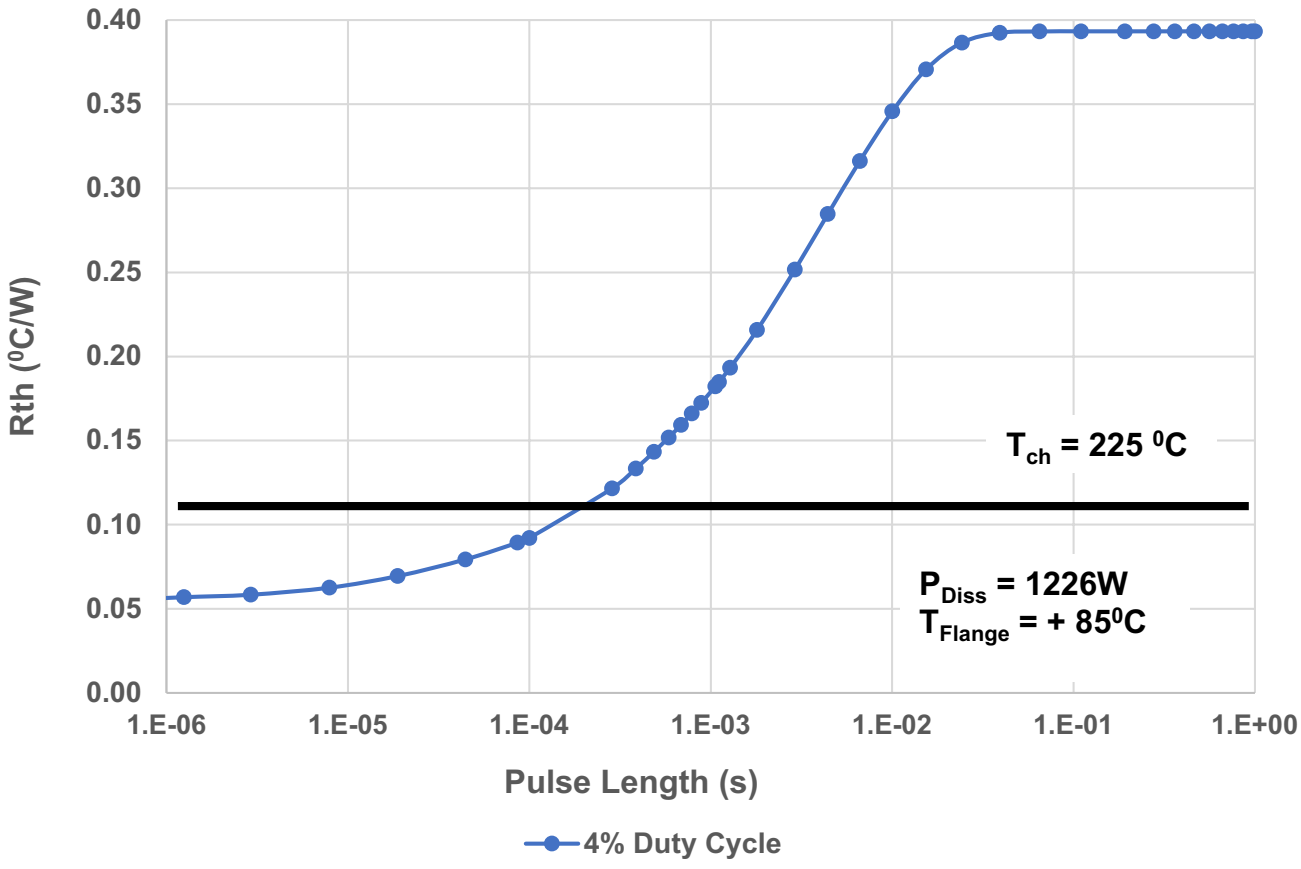


Figure 2

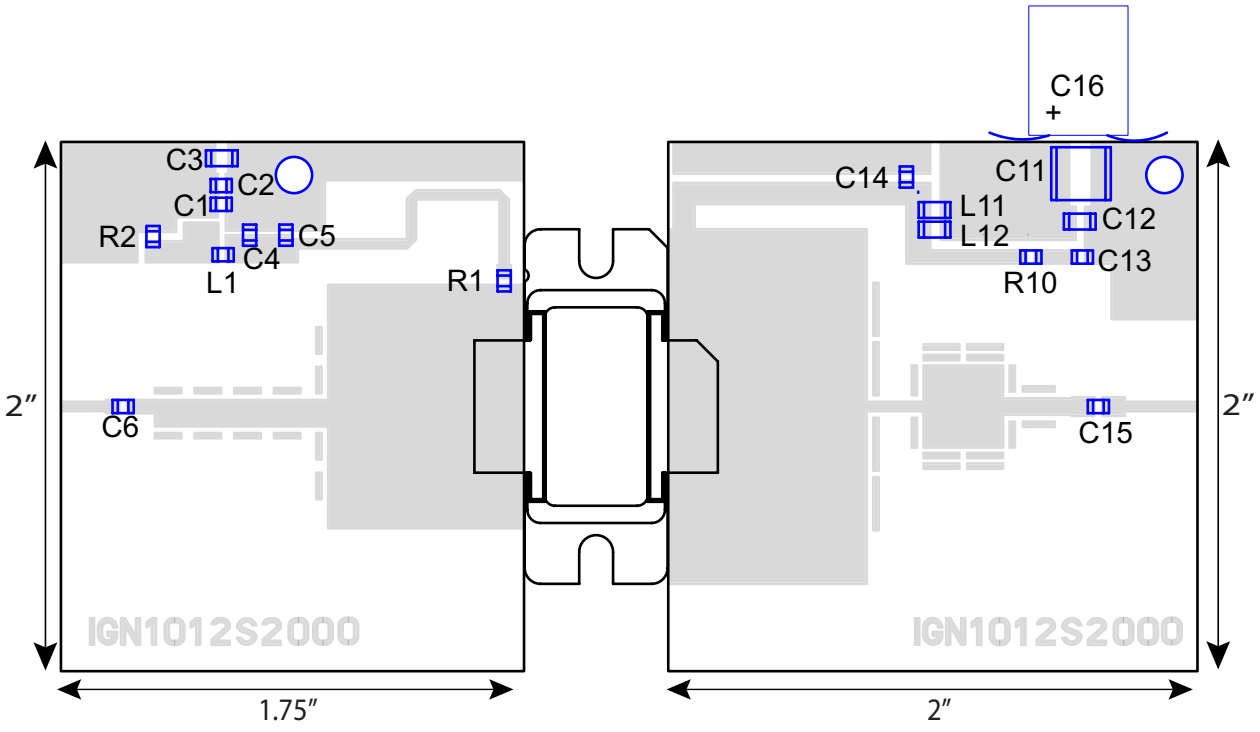
TYPICAL THERMAL PERFORMANCE

Table 6. Thermal Resistance (Case temperature = 85 ^{0}C unless otherwise stated)

Parameter	Symbol	Typ	Units	Test Conditions
Peak Thermal Resistance Channel to Case per side	R_{TH}	0.08	^{0}C/W	P_{diss} = 1226W 32µs pulse length, 4% duty cycle V_{DS} = 65V



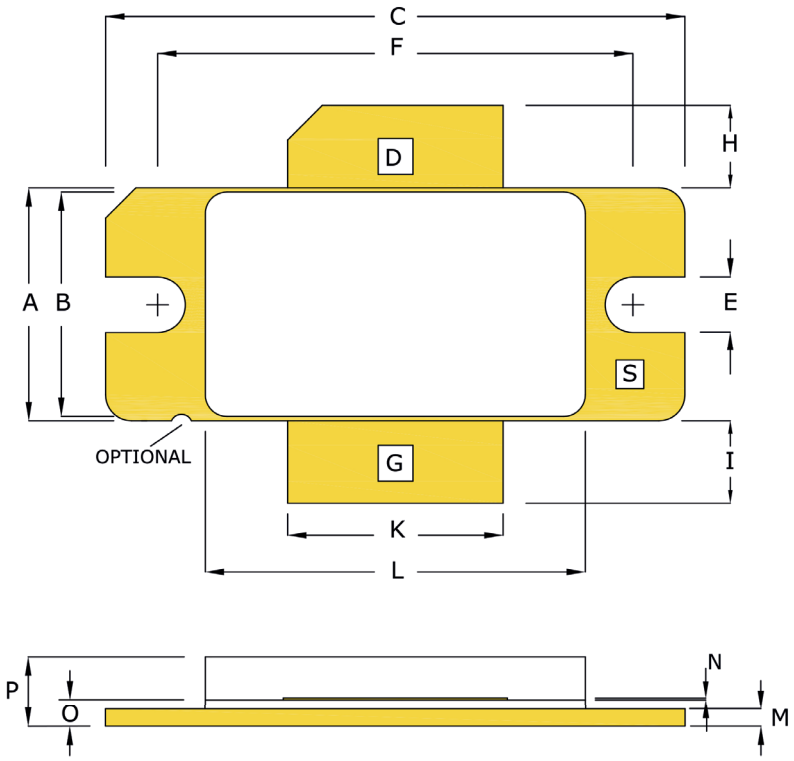
TEST FIXTURE



Bill of Materials for IGN1012S2000 Test Fixture

Designator	Description	Quantity
C1, C13	CAP 0.1μF, 100V, 0805	2
C2, C5, C6, C14	CAP 33pF, 100V, 0805	4
C3, C12	CAP 1μF, 100V, 1206	2
C4	CAP 1000pF, 50V, 0805, X7R	1
C11	CAP 10μF, 100V, 2220, X7R	1
C15	CAP 150pF, 0805, Edge Mount	1
C16	CAP 100μF (optional)	1
L1	IND FB 120Ω, 0805, 5A	1
L11, L12	IND FB 1206, 6A, 33 OHM	1
R1, R10	RES 10 OHM, 0805	2
R2	RES 100 OHM, 0805	1
PC Board Type	ROGERS RT6006, 25mil, 1/1oz. Copper	2

PACKAGE PL95A1



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.537	0.543	13.64	13.79
B	0.515	0.525	13.08	13.34
C	1.337	1.343	33.96	34.11
E	0.123	0.133	3.12	3.38
F	1.095	1.105	27.81	28.07
H	0.175	0.205	4.45	5.21
I	0.175	0.205	4.45	5.21
J	--	--	--	--
K	0.495	0.505	12.57	12.83
L	0.871	0.889	22.12	22.58
M	0.036	0.044	0.91	1.12
N	0.003	0.006	0.08	0.15
Q	0.059	0.065	1.50	1.65
P	0.154	0.182	3.91	4.62

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 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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