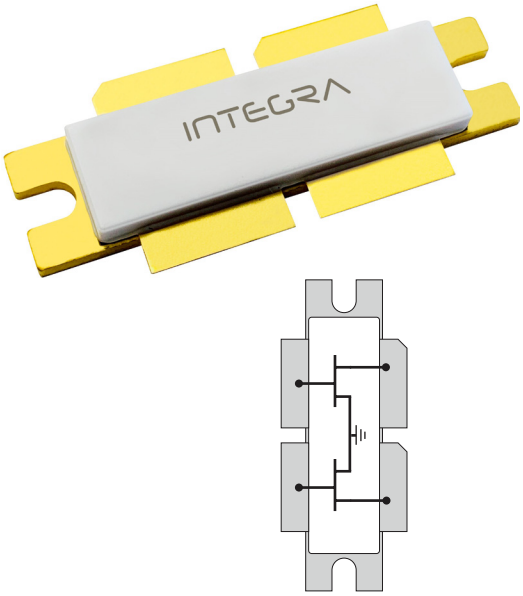
P-Band, GaN/SiC, RF Power Transistor

410 - 450 MHz | 6.5 kW typ | 80% Efficiency typ | 21.5dB Gain typ | 120 V | 250μs Pulse Length, 5% Duty Cycle

IGN0450M6000 is high power GaN-on-SiC RF power transistor that has been designed specifically for use in P-band radar systems. It operates over the full bandwidth of 410 - 450 MHz. It supplies a minimum of 6kW of peak output power, with typically 20 dB of associated gain and 75% efficiency. It operates from a 120 V supply voltage.



FEATURES

- GaN on SiC HEMT Technology
- Output Power >6 kW
- Pre-matched Input Impedance
- High Efficiency - up to 80%
- 100% RF Tested
- RoHS and REACH Compliant

APPLICATIONS

- P-band Radar Systems

Table 1. RF Electrical Characteristics (Case temperature = 30+/-2 °C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Gain	G	17	20	23	dB	P_{OUT} = 6kW f = 410, 430, 450 MHz 250μs pulse length, 5% duty cycle V_{DS} = 120V, I_{dq} = 75mA per side
Drain Efficiency	η	65	75	85	%	
Pulse Droop	D	-0.6	-0.45	+0.1	dB	
Input Return Loss	IRL	7	12	20	dB	

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

Table 2. Absolute Maximum Ratings (Not Simultaneous)

Parameter	Symbol	Value	Units	Test Conditions
DC Drain-Source Voltage	V_{DS}	250	V	25 °C
DC Gate-Source Voltage	V_{GS}	-8 to +1.0	V	25 °C
DC Drain Current per side	I_D	78	A	25 °C
DC Gate Current per side	I_G	7.8	mA	25 °C
RF Input Power	$P_{RF,IN}$	12	W	25 °C
Operating Channel Temperature	T_{CH}	-55 to +225	°C	
Storage Temperature	T_{STG}	-62 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 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} = 120V, I_{DS} = 1mA
Quiescent Gate Voltage	V_Q		-3.0		V	V_{DS} = 120V, I_{DS} = 75mA per side

Table 4. Thermal Resistance (Case temperature = 50 °C unless otherwise stated)

Parameter	Symbol	Typ	Test Conditions
Peak Thermal Resistance, Channel to Case	R_{TH}	0.075	P_{DISS} = 2000W 250µs pulse length, 5% duty cycle V_{DS} = 120V

Table 5. Test Fixture Source & Load Impedances

Frequency (MHz)	Z_{IF}	Z_{OF}	Units	Test Conditions
410	4.75 - j 1.47	4.37 + j 2.57	Ω	P_{OUT} = 6kW 250µs pulse length, 5% duty cycle V_{DS} = 120V, I_{DS} = 75mA per side
430	4.43 - j 0.73	4.52 + j 2.46	Ω	
450	4.30 + j 0.09	4.39 + j 2.32	Ω	

Note: Source and load impedances are terminal to ground and are measured looking into the test fixture with an identical signal simultaneously applied to both terminals i.e. even mode excitation.

TYPICAL PERFORMANCE

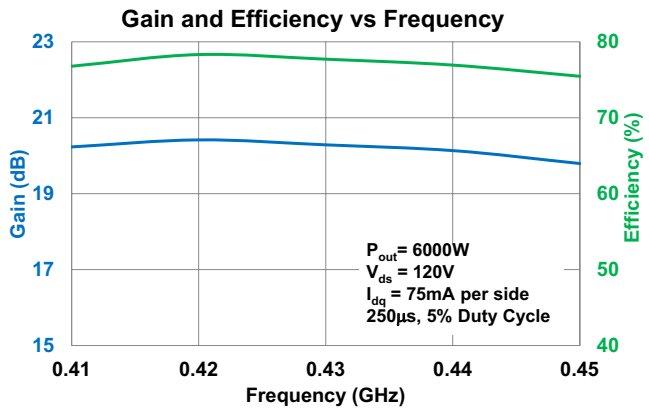


Figure1

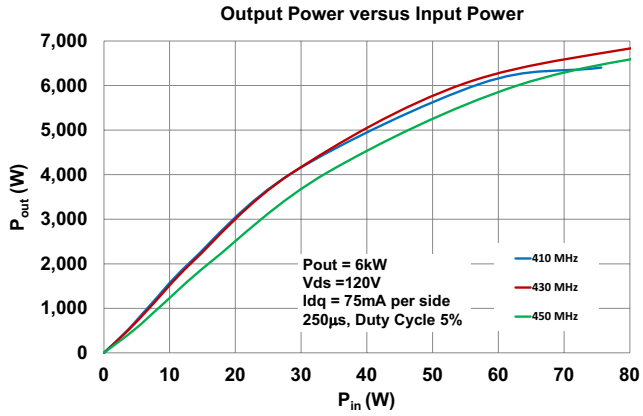


Figure 2

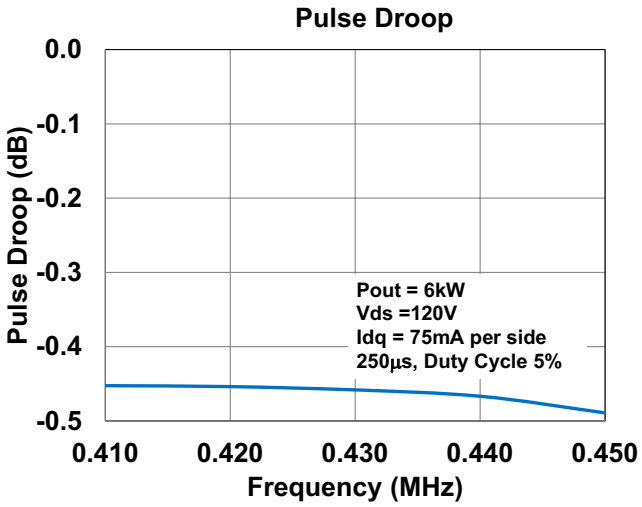


Figure 3

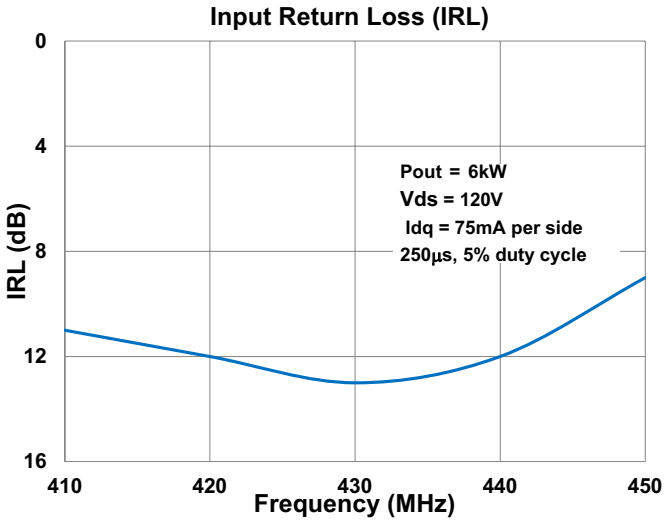
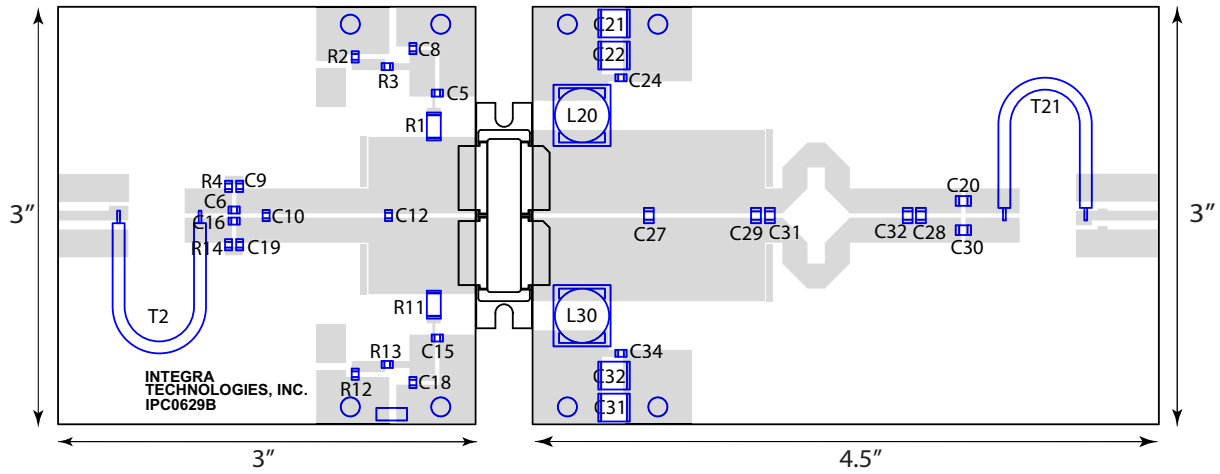


Figure 4

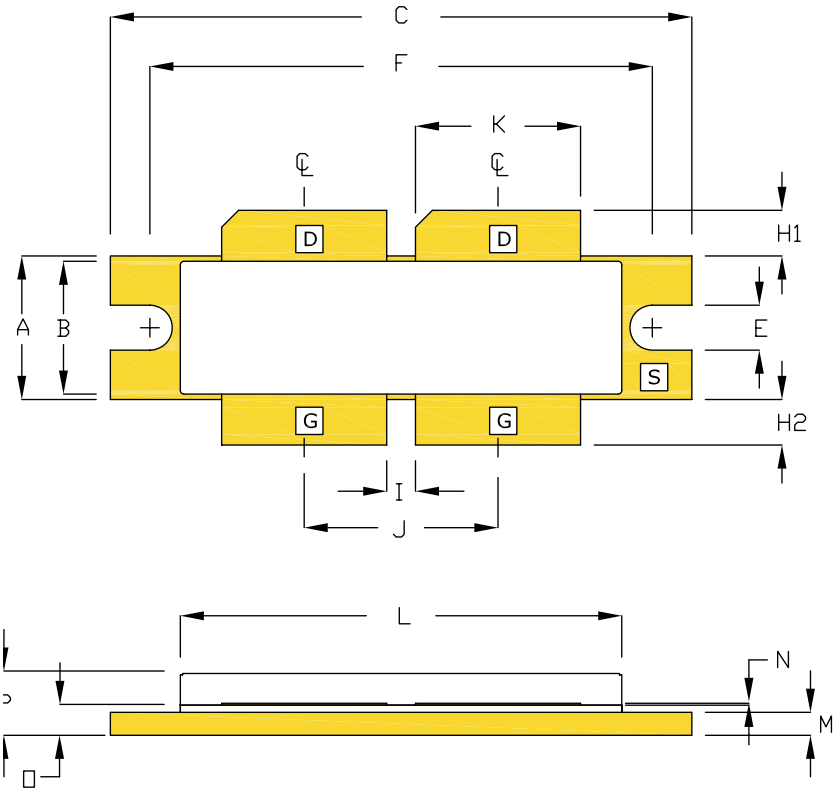
TEST FIXTURE



Bill of Materials for IGN0450M6000 Test Fixture

Designator	Description	Quantity	Part Number
C5, C6, C15, C16, C24, C34	CAP 240pF, 0805	6	600F241JT250XT
C8, C9, C18, C19	CAP 1000pF, 100V, 0805	4	08051A102J4T2A
C10	CAP 12pF, 0805	1	600F120FT250XT
C12	CAP 20pF, 0805	1	600F200FT250XT
C20, C30	CAP 470pF, 1111	2	800B471JT200XT
C21, C22, C31, C32	CAP 2.2µF, 250V, 2220, X7R	4	C5750X7T2E225K250KA
C27	CAP 24pF, 1111	1	800B240FT500XT
C28	CAP 10pF, 1111	1	800B100FT500XT
C29	CAP 22pF, 1111	1	800B220FT500XT
C31	CAP 2pF, 1111	1	800B2R0FT500XT
C32	CAP 1pF, 1111	1	800B1R0FT500XT
L20, L30	IND 46nH, 1010VS	2	1010VS-46NMEB
R1, R11	RES 10 OHM, 2010	2	CRCW201010R0FKEFH
R2, R12	RES 100 OHM, 0805	2	ERJ-6ENF1000V
R3, R13	RES 5.1 OHM, 0805	2	ERJ-6GEYJ5R1V
R4, R14	RES 22 OHM, 0805	2	ERJ-6GEYJ220V
T2, T21	Coaxial Balun, 2.10″, RG402	2	
PC Board Type	ROGERS RO4003, 32 mil, 1/1 oz. Copper	2	

PACKAGE PL124A1



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.395	0.405	10.03	10.29
B	0.366	0.374	9.29	9.49
C	1.615	1.625	41.02	41.27
E	0.120	0.130	3.05	3.30
F	1.395	1.405	35.43	35.69
H1	0.120	0.130	3.05	3.30
H2	0.120	0.130	3.05	3.30
I	0.075	0.085	1.90	2.16
J	0.535	0.545	13.59	13.84
K	0.455	0.465	11.55	11.81
L	1.218	1.242	30.93	31.54
M	0.059	0.069	1.499	1.752
N	0.004	0.007	0.10	0.18
□	0.079	0.089	2.00	2.26
P	0.165	0.188	4.19	4.77

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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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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