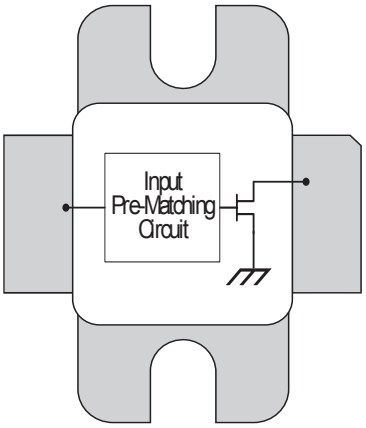
P-Band, GaN/SiC, RF Power Transistor

420-450 MHz | 250W typ | 75% Efficiency typ | 24 dB Gain typ | 50 V | 100µs Pulse Length, 10% Duty Cycl5

IGN0450M250 is a high power GaN-on-SiC RF power transistor that has been designed to suit the unique needs of P band radar systems. It operates over the full 420-450 MHz frequency range. Under 100µs, 10% duty cycle pulse conditions, it supplies a minimum of 250 W of peak output power, with typically >24 dB of gain and 75% 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 >250W
- Pre-matched Input Impedance
- Exceptionally High Efficiency - up to 80%
- 100% RF Tested Under 100µs, 10% duty cycle pulse conditions
- RoHS and REACH Compliant
- Full Non-Linear Electrothermal Model Available for Download from www.integratech.com



APPLICATIONS

- P-band Radar Systems

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	18	A	25 °C
DC Gate Current	I_G	3.6	mA	25 °C
RF Input Power	$P_{RF,IN}$	4	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 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		-2.7		V	V_{DS} = 50V, I_{DS} = 40mA

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

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
RF Input Power	$P_{IN, RF}$	0.8	1.0	1.25	W	P_{OUT} = 250W f = 420, 450 MHz 100µs pulse length, 10% duty cycle V_{DS} = 50V, I_{DS} = 20mA,
Gain	G	23	24	25	dB	
Drain Efficiency	η	70	72	85	%	
Pulse Droop	D	-0.4	-0.25	+0.2	dB	
Load Mismatch Stability	VSWR-S	2:1				
VSWR Withstand	VSWR-LMT	3:1				

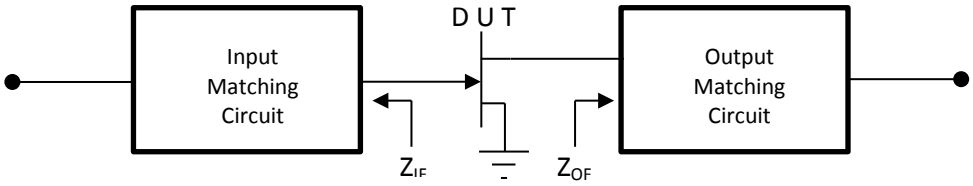
Note: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured for the ELM pulse train.

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

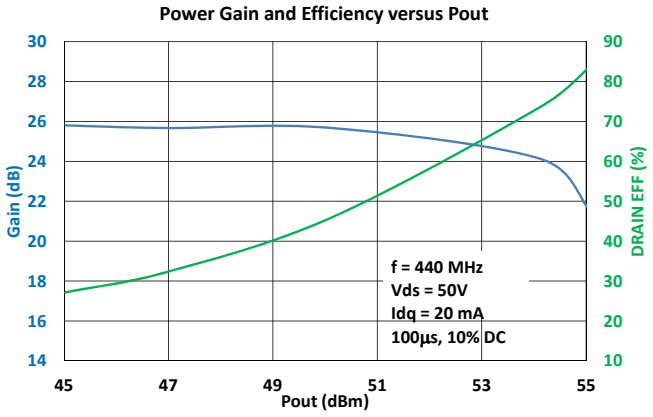
Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Peak Thermal Resistance, Junction to Case	$R_{TH(JC)}$			0.9	°C/W	P_{OUT} = 250W f = 420, 450 MHz 100µs pulse length, 10% duty cycle V_{DS} = 50V, I_{DS} = 20mA

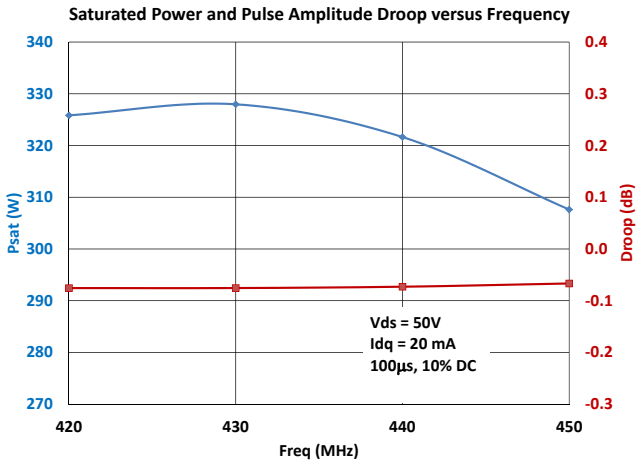
Table 5. Optimum Source & Load Impedances (Case temperature = 25 °C unless otherwise stated)

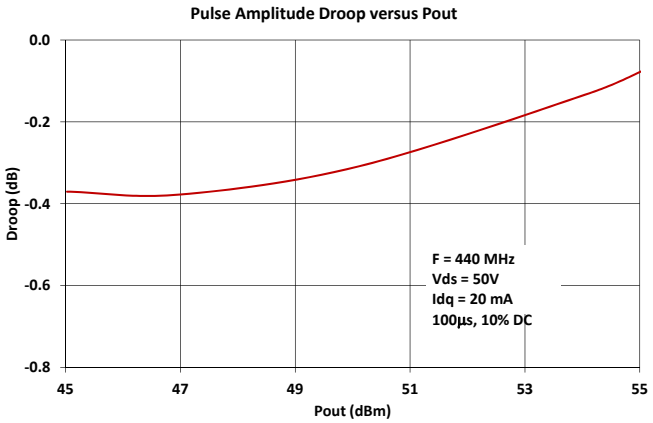
Frequency (MHz)	Z_{IF}	Z_{OF} Fundamental	Z_{OF} Second Harmonic	Z_{OF} Third Harmonic	Units	Test Conditions
420	2.7 - j 0.2	6.0 + j 3.5	0.8 + j 21.4	3.6 + j 100	Ω	P_{OUT} = 250W 100µs pulse length, 10% duty cycle V_{DS} = 50V, I_{DS} = 20mA
450	2.6 + j 0.6	4.7 + j 4.4	0.6 + j 25.3	19.4 + j 227	Ω	

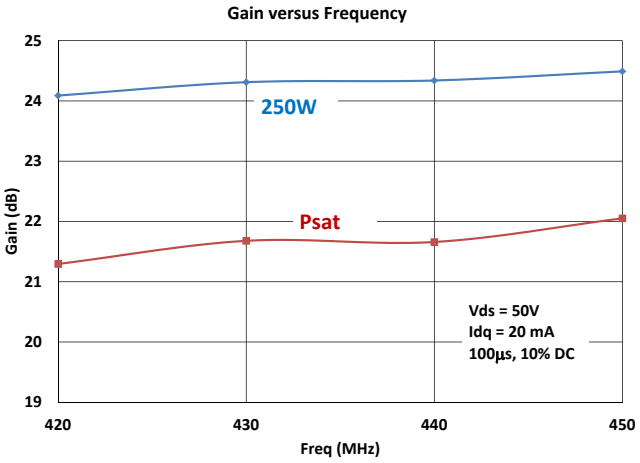


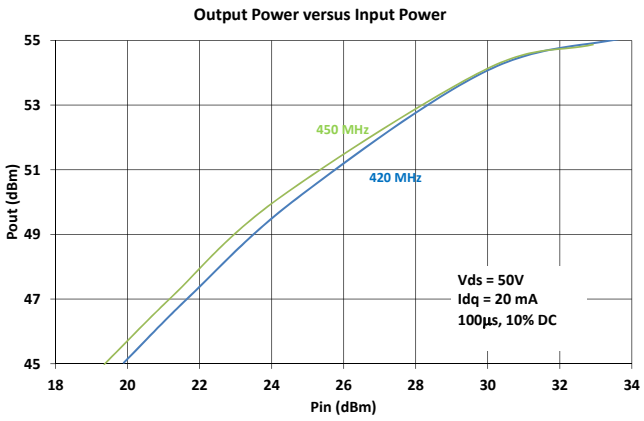
TYPICAL PERFORMANCE

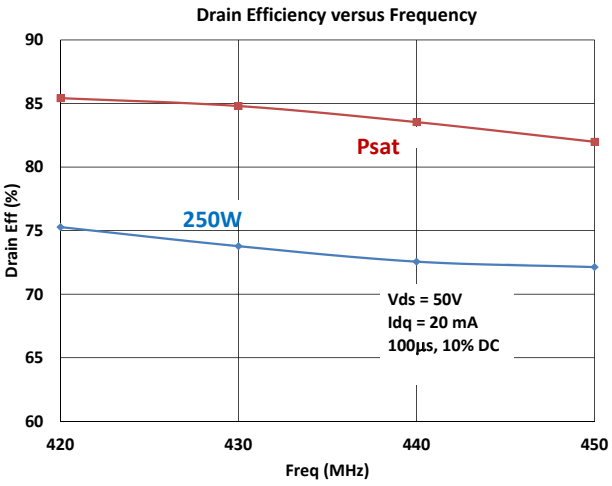




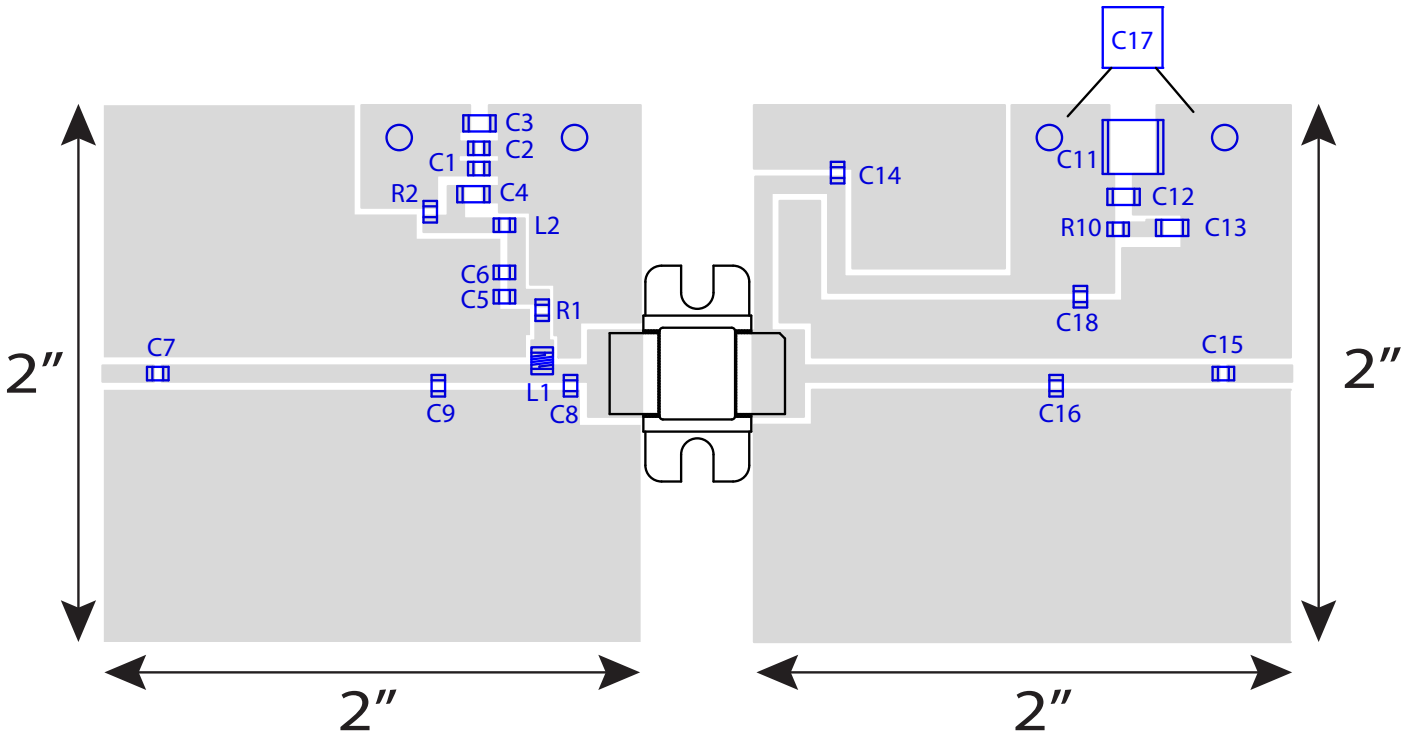








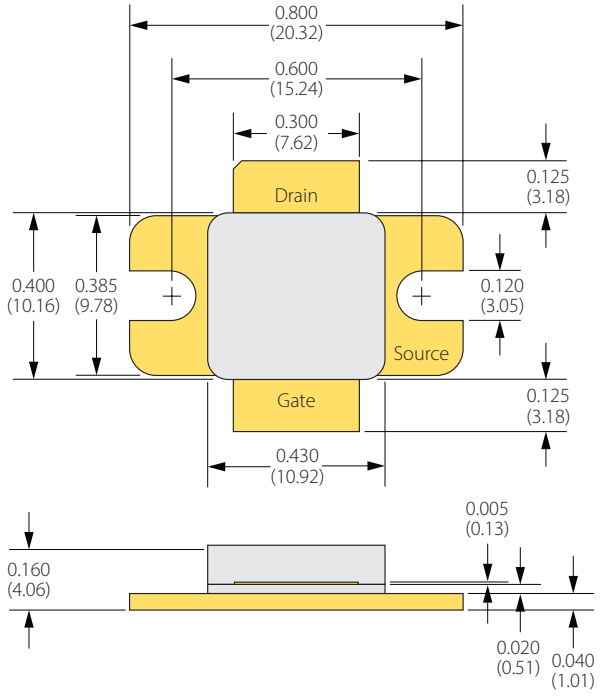
TEST FIXTURE



Bill of Materials for IGN0450M250 Test Fixture

Designator	Description	Part Number
C1, C4, C13	CAP 0.1μF, 0805, 50V	C0805C104K5RACTU
C2,C5, C7, C14, C15, C18	CAP 240pF, 0805, 5%	ATC600F24JT250XT
C3, C12	CAP 1μF, 1206, 50V, X7R	C1206C105K5RACTU
C6	CAP 1000pF, 0805, 50V	C0805C102M5RACTU
C8, C16	CAP 15pF,	ATC600F240FT250XT
C9	CAP 24pF, 0805, 1%	UPJ1J680MPD6TD
C11	CAP 10μF, 2220, 100V, X7R	C2220X106K5RACTU
C17	CAP 4700μF, Electrolytic, 63V, 20%, Mounted Externally	UVR1J472MRD6
L1	IND , 39nH, 1008	1008CS-390XJLB
L2	IND, FB, 120Ω, 0805, 5A	ILHB0805ER121V
R1, R10	RES, 5.1 OHM, 0805, 1/8W, 1%	ERJ-6GEYJ5R1V
R2	RES, 200 OHM, 0805, 1/8W, 1	ERJ-6ENF2000V
PC Board Type	ROGERS RO4350B-03011, 30mil, 1/1oz. Copper	

PACKAGE PL44C1



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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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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