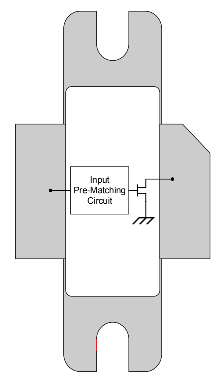
P-Band, GaN/SiC, RF Power Transistor

400-450 MHz | 1kW typ | 75% Efficiency typ | 20 dB Gain typ | 50 V | 300μs Pulse Length, 10% Duty Cycle

IGN0450M850 and IGN0450M850S are high power GaN-on-SiC RF power transistors that have been designed to suit the unique needs of P band radar systems. They operate over the full 400-450 MHz frequency range. Under 300μs, 10% duty cycle pulse conditions, they supply a minimum of 850 W of peak output power, with typically >20 dB of gain and 75% efficiency. They operate from a 50 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 >850W
- Pre-matched Input Impedance
- Exceptionally High Efficiency - up to 78%
- 100% RF Tested Under 300μs, 10% duty cycle pulse conditions
- RoHS and REACH Compliant
- IGN0450M850 has a bolt-down flange, IGN0450M850S is the earless flange option



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 ºC
DC Gate-Source Voltage	V_{GS}	-8 to +1.0	V	25 ºC
DC Drain Current	I_D	50	A	25 ºC
DC Gate Current	I_G	12	mA	25 ºC
RF Input Power	$P_{RF,IN}$	15	W	25 ºC
Operating Channel Temperature	T_J	-55 to +200	ºC	
Storage Temperature	T_{STG}	-55 to +150	ºC	
Soldering Temperature	T_{SOLDER}	260 for 60s	ºC	

Note: Operation outside the limits given in this table may cause permanent damage to the transistor

Table 2. DC Electrical Characteristics (Case temperature = 25 ºC 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		-2.9		V	V_{DS} = 50V, I_{DS} = 150mA

Table 3. RF Electrical Characteristics (Case temperature = 30 ⁰C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
RF Ouput Power	$P_{OUT, RF}$	850	1000	1150	W	P_{IN} = 9W f = 400, 425, 450 MHz 300µs pulse length, 10% duty cycle V_{DS} = 50V, I_{DS} = 150mA,
Gain	G	19.8	20.5	21.8	dB	
Drain Efficiency	η	70	75	85	%	
Pulse Droop	D	-0.4	-0.1	+0.2	dB	
Load Mismatch Stability	VSWR-S	2:1				
VSWR Withstand	VSWR-LMT	3:1				

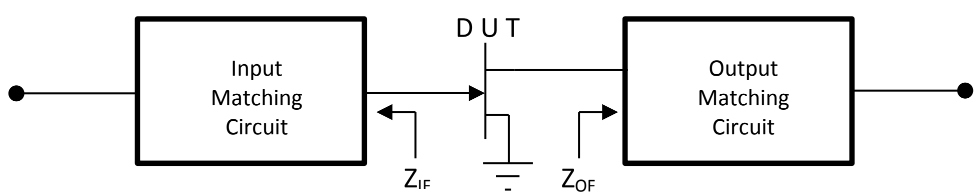
Note: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured.

Table 4. Thermal Resistance (Case temperature = 25 ⁰C unless otherwise stated)

Parameter	Symbol	Min	Typ	Test Conditions
Peak Thermal Resistance, Channel to Case	R_{TH}		TBD	P_{diss} = 364W 300µs pulse length, 10% duty cycle V_{DS} = 50V

Table 5. Optimum Source & Load Impedances (Case temperature = 25 ⁰C unless otherwise stated)

Frequency (MHz)	Z_{IF}	Z_{OF} Fundamental	Units	Test Conditions
400	1.3 - j 1.0	1.4 + j 0.4	Ω	P_{OUT} = 850W 300µs pulse length, 10% duty cycle V_{DS} = 50V, I_{DS} = 150mA
425	1.0 - j 0.2	1.4 + j 0.5	Ω	
450	0.8 + j 0.6	1.2 + j 0.6	Ω	



TYPICAL PERFORMANCE

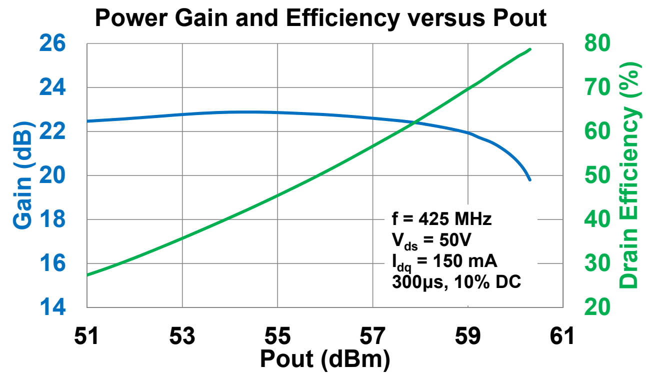


Figure 1

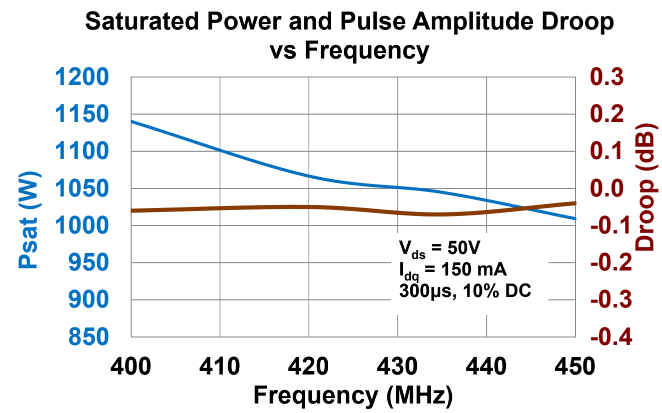


Figure 2

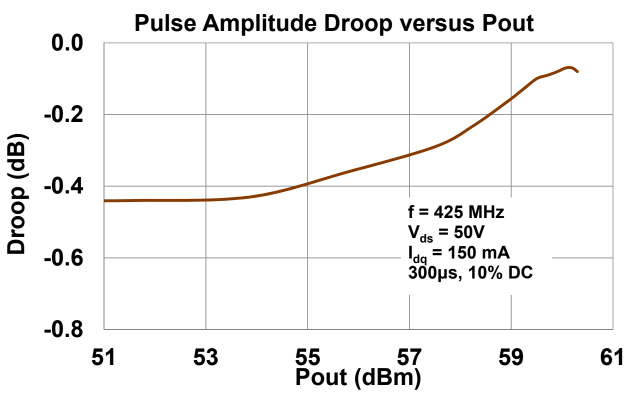


Figure 3

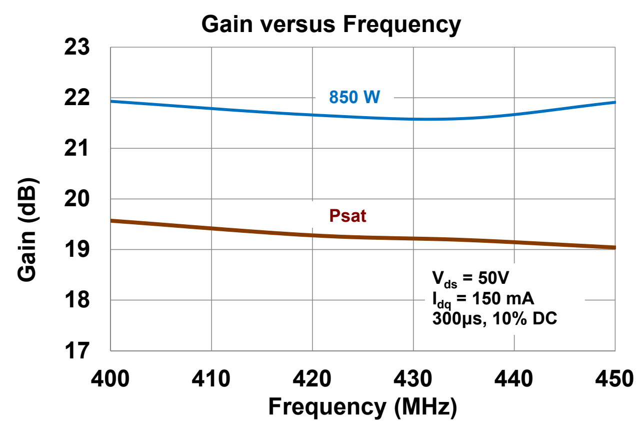


Figure 4

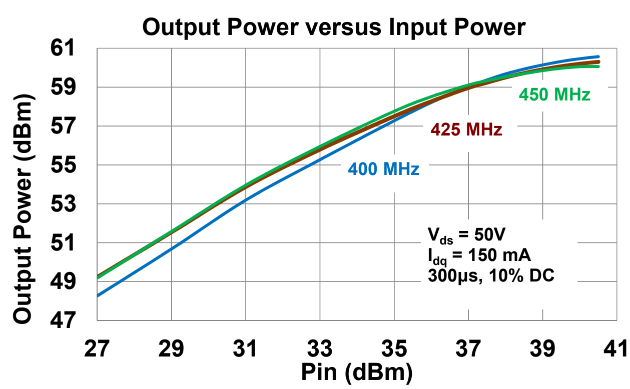


Figure 5

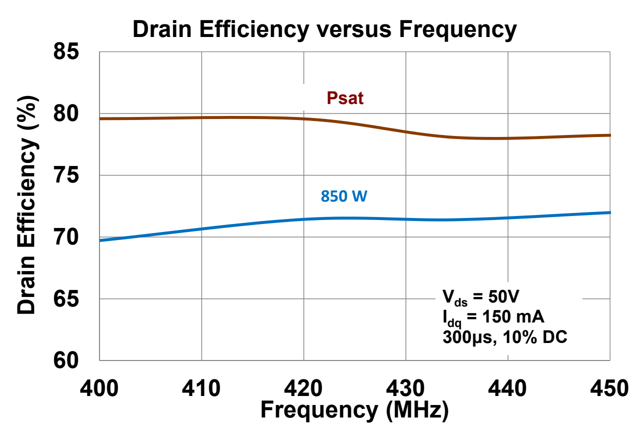


Figure 6

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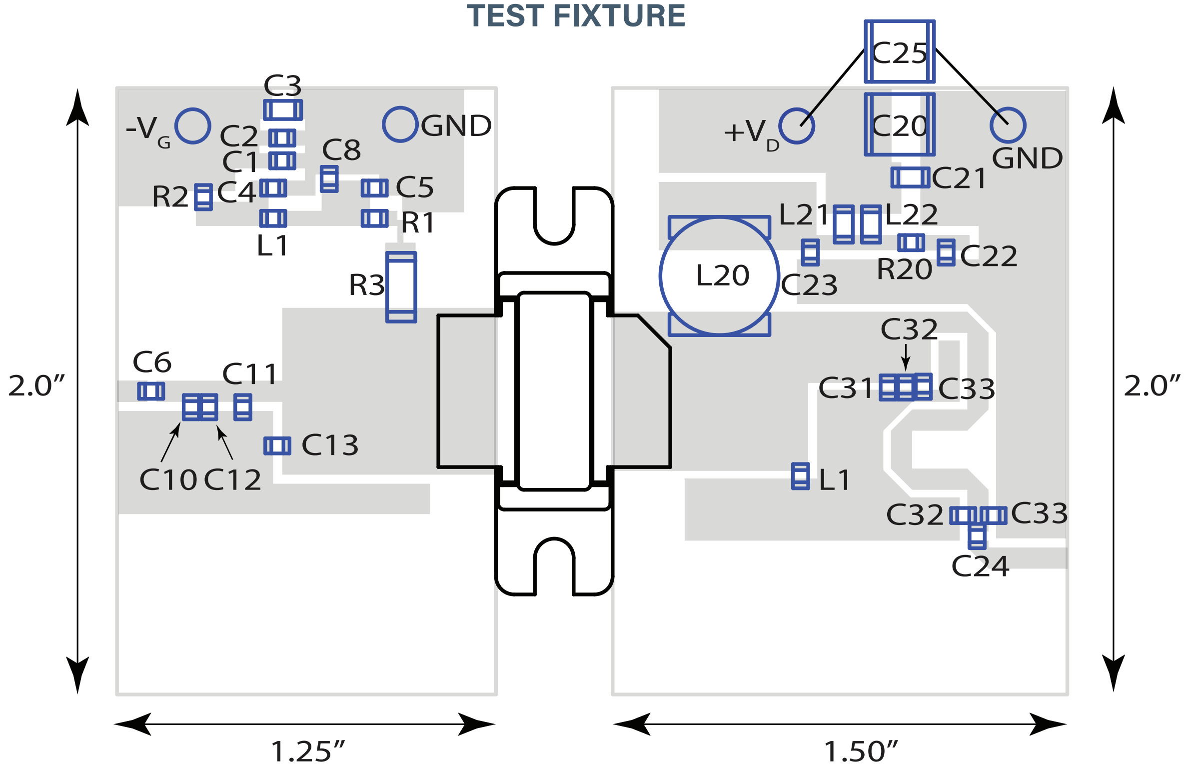
RF POWER DEVICES

TEST FIXTURE



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Bill of Materials for IGN450M850 Test Fixture

Designator	Description	Part Number
C1, C4, C22	CAP 0.1µF, 0805, 50V	C0805C104K5RACTU
C2	CAP 240pF	ATC600F241
C3, C21	CAP 1µF, 1206, 50V, X7R	C1206C105K5RACTU
C5, C6, C23, C24	CAP 240pF, Edge Mount	ATC600F241
C8	CAP 1000pF, 0805, 50V X7R	C08051A102J4T2A
C10	CAP 15pF	ATC600F150
C11	CAP 30pF	ATC600F300
C12	CAP 3.3pF	ATC600F3R3
C13	CAP 3.0pF	ATC600F3R0
C20	CAP 10µF, 2220, 50V, X7R	CGA9N3X7R1H106K230KB
C25	CAP 68µF, 63V, Electrolytic	UPW1J680MPD
C30	CAP 47pF,	ATC600F470
C31	CAP 39pF	ATC600F390
C32	CAP 2pF	ATC600F2R0
C33, C35	CAP 4.7pF	ATC600F4R7
C34	CAP 10pF	ATC600F100
L1	IND, FB, 120 OHM, 0805, 5A	ILHB0805ER121V
L20	IND 46nH,	COILCRAFT 1010VS-46NMEB
L21, L22	IND, FB, 33 OHM, 1206, 6A	BLM31PG330SN1L
R1	RES 0 OHM, 0805	ERJ-2GEOR00X
R2	RES 100 OHM, 0805	ERJ-2RKF1000X
R3	RES 10 OHM, 2010	ERJ-2RKF10R0X
R20	RES 15 OHM, 0805	ERJ-2GEJ150X
PC Board Type	ROGERS RO4003 32mil, 1/1oz. Copper	

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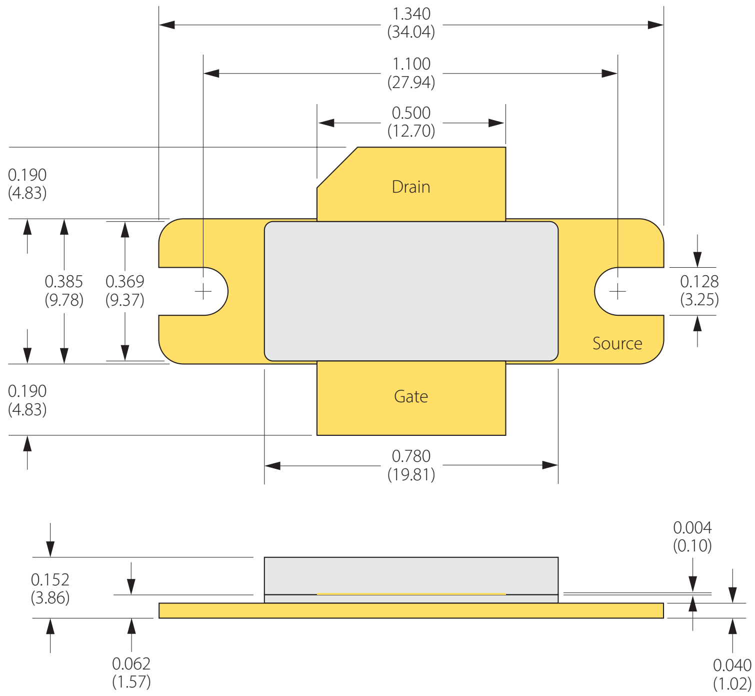
RF POWER DEVICES

PACKAGE PL84A1



Dimensions: Inches (mm)

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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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