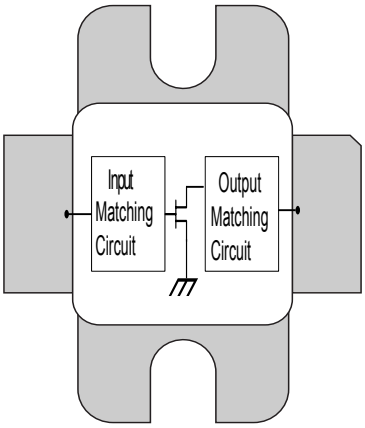
S-Band, GaN/SiC, RF Power Transistor

2.7 - 2.9 GHz | 400 W typ | 63% Efficiency typ | 18dB Gain typ | 50 V | 100µs Pulse Length, 10% Duty Cycle

IGN2729M400R2 and IGN2929M400R2S are high power GaN-on-SiC RF power transistors that have been designed to suit the unique needs of modern radar systems. They supply 400W of peak output power, with typically >18 dB of gain and 63% 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 400W
- Pre-matched Input and Output Impedances
- High Efficiency - 63% typical
- Capable of Withstanding 10:1 VSWR Mismatch
- 100% RF Tested Under 100µs, 10% duty cycle pulse conditions
- RoHS and REACH Compliant
- Full non-linear electrothermal model available, please contact the factory



APPLICATIONS

- S-band Radar Systems

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

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
RF Input Power	$P_{IN, RF}$	4	6.3	8	W	P_{OUT} = 400W f = 2.7, 2.8, 2.9 GHz 100µs pulse length, 10% duty cycle V_{DS} = 50V, I_{DS} = 60mA
Gain	G	17	18	20	dB	
Drain Efficiency	η	60	63	75	%	
Pulse Droop	D	-0.5	-0.25	+0.2	dB	
Input Return Loss	IRL	7	12	18	dB	
Load Mismatch Stability	VSWR-S	3:1				

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

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} = 60mA

Table 3. Absolute Maximum Ratings (Not Simultaneous)

Parameter	Symbol	Value	Units	Test Conditions
DC Drain-Source Voltage	V_{DS}	160	V	25 °C
DC Gate-Source Voltage	V_{GS}	-8 to +1.5	V	25 °C
DC Drain Current	I_D	54	A	25 °C
DC Gate Current	I_G	5.4	mA	25 °C
RF Input Power	$P_{RF,IN}$	10	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 4. Thermal Resistance (Case temperature = 85 °C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Peak Thermal Resistance, Channel to Case	R_{TH}		0.33		°C/W	P_{DISS} = 235W 100µs pulse length, 10% duty cycle V_{DS} = 50V

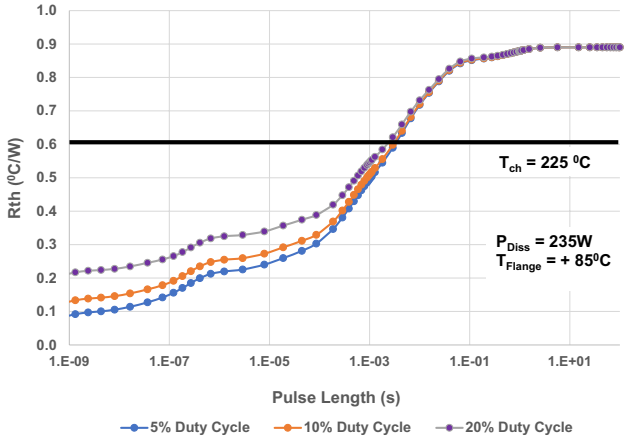
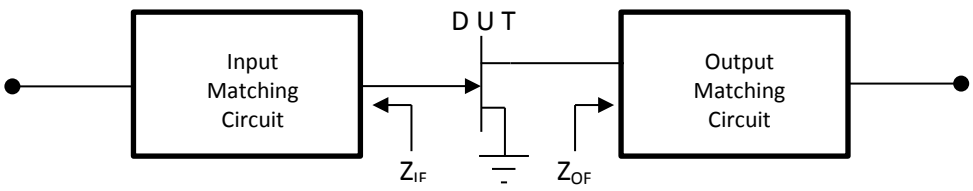


Table 5. Optimum Source & Load Impedances (Case temperature = 25 °C unless otherwise stated)

Frequency (GHz)	Z_{IF}	Z_{OF} Fundamental	Z_{OF} Second Harmonic	Units	Test Conditions
2.7	2.5 - j 5.3	2.95 - j 2.9	2.2 + j 5.95	Ω	P_{OUT} = 400W 100µs Pulse length, 10% Duty Cycle V_{DS} = 50V, I_{DS} = 60mA
2.8	2.4 - j 4.8	2.95 - j 2.6	2.0 + j 7.45	Ω	
2.9	2.4 - j 4.3	3.0 - j 2.25	2.5 + j 9.0	Ω	



TYPICAL PERFORMANCE

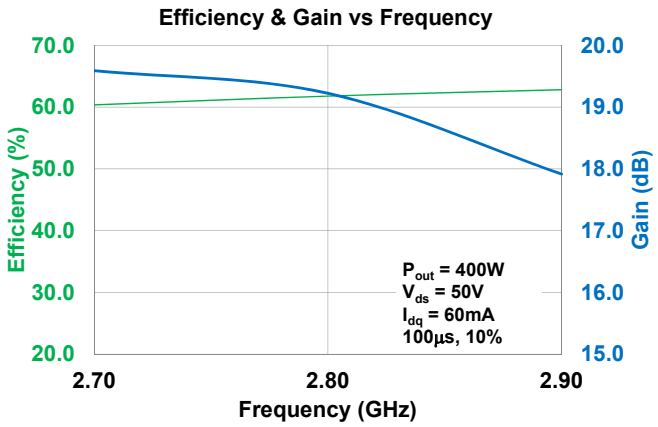


Figure 1.

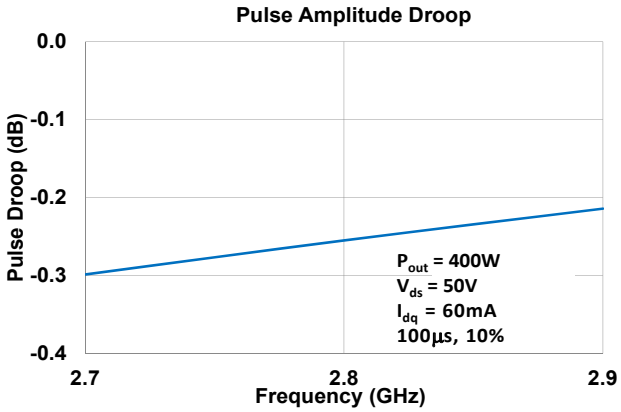


Figure 2.

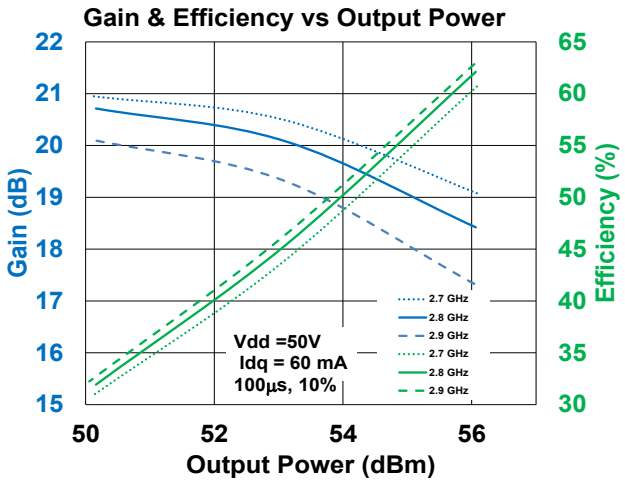


Figure 3.

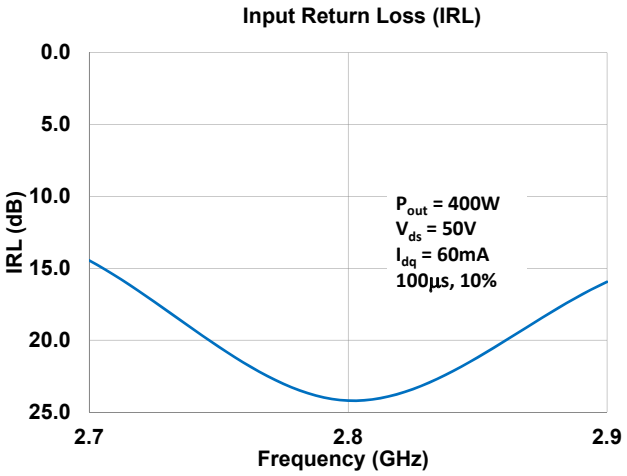
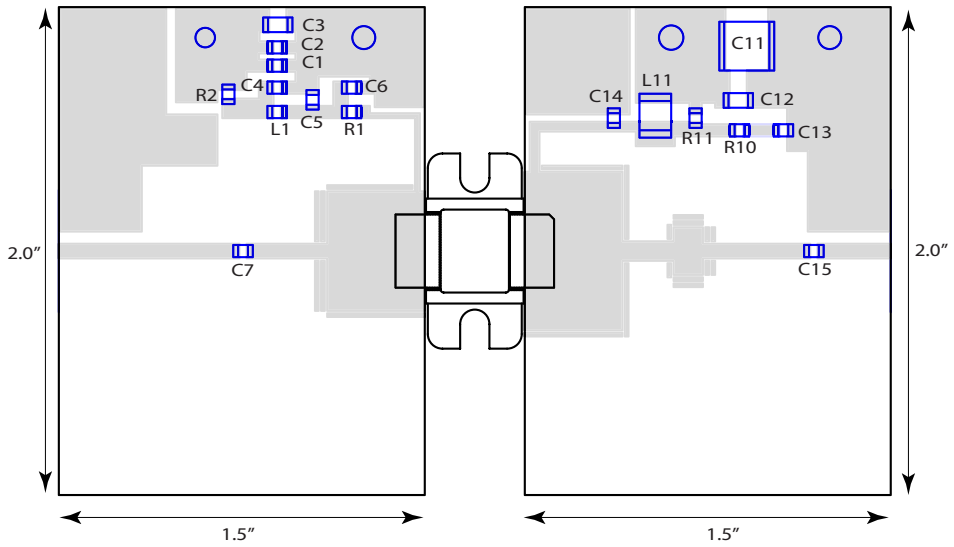


Figure 4.

TEST FIXTURE



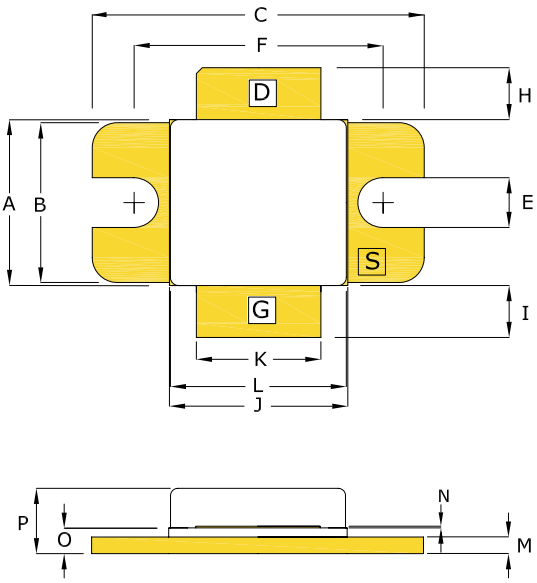
Note: It is recommended that a 4700µF 63V electrolytic capacitor be connected between ground and the positive supply terminal of the test fixture, and placed as close as possible to the test fixture, in order to minimise pulse droop.

Note: Please contact the factory for the latest update to this CAD file and its BOM.

Bill of Materials for IGN2729M400R2 Test Fixture

Designator	Description	Part Number
C1, C4, C13	CAP 0.1µF, 0805 50V	C0805C104K5RACTU
C2	CAP 10pF	600F100JT250XT
C3, C12	CAP 1µF, 1206	C1206C105K5RACTU
C5	CAP 1000pF, 0805	C0805C102M5RACTU
C6, C7, C15	CAP 10pF, Edge Mount	600F100JT250XT
C11	CAP 10µF, 2220, X7R, 50V	C2220X106K5RACTU
C14	CAP 5.6pF, Edge Mount	600F5R6CT250T
L1	IND FB, 120 OHM, 0805 5A	ILHB0805ER121V
L11	IND 5N5, 1508	1508-5N5JLB
R1, R10, R11	RES 10, 0805	ERJ-6ENF2000V
R2	RES 200, 0805	ERJ-6ENF10R0V
PC Board Type	ROGERS R04350B-03011, 30mil, 1/1oz. Copper	

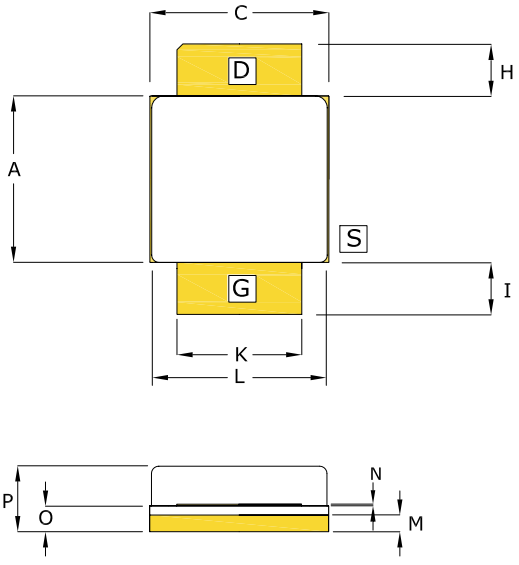
PACKAGE PL44C1



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.395	0.405	10.03	10.29
B	0.380	0.390	9.65	9.91
C	0.795	0.805	20.19	20.45
E	0.115	0.125	2.92	3.18
F	0.595	0.605	15.11	15.37
H	0.110	0.140	2.79	3.56
I	0.110	0.140	2.79	3.56
J	0.425	0.435	10.80	11.05
K	0.295	0.305	7.49	7.75
L	0.420	0.428	10.67	10.87
M	0.035	0.045	0.89	1.14
N	0.004	0.007	0.10	0.18
□	0.053	0.067	1.35	1.70
P	0.143	0.179	3.63	4.55

PIN SCHEDULE	
D	DRAIN
S	SOURCE
G	GATE

BOLT-DOWN FLANGE OPTION
IGN2729M400R2



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.393	0.408	9.97	10.35
B	--	--	--	--
C	0.423	0.438	10.73	11.11
E	--	--	--	--
F	--	--	--	--
H	0.110	0.140	2.79	3.56
I	0.110	0.140	2.79	3.56
J	--	--	--	--
K	0.295	0.305	7.49	7.75
L	0.420	0.428	10.67	10.87
M	0.035	0.045	0.89	1.14
N	0.004	0.007	0.10	0.18
□	0.053	0.067	1.35	1.70
P	0.143	0.179	3.63	4.55

PIN SCHEDULE	
D	DRAIN
S	SOURCE
G	GATE

EARLESS FLANGE OPTION
IGN2729M400R2S

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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