

**S-Band Radar Transistor**

The high power pulsed radar transistor device part number IB2226M160 is designed for S-Band radar systems operating over the instantaneous bandwidth of 2.25-2.55 GHz. While operating in class C mode this common base device supplies a minimum of 160 watts of peak pulse power under the conditions of 200µs pulse width and 10% duty cycle. All devices are 100% screened for large signal RF parameters, including power gain compression. Excellent spectral stability into output mismatch over a broad input power range make it ideal for use in reliable high power solid state transmitters.



**Silicon Bipolar**

- Ultra-high  $f_T$

**Class C Operation**

- High Efficiency

**Common Base Configuration**

- Single Power Supply

**Gold Metal**

- Maximum Reliability

**Emitter Ballasting**

- Optimum Thermal Distribution

**Internal Impedance Matching**

- Ease of Use
- Ultra-low Loss Design

**Be0 Package**

- Unmatched Thermal Reliability

**RF Test Fixture**

- Broadband
- Matched to 50Ω
- Long-term Correlation
- 100% Device RF Screening
- No External Tuning Allowed

**Insertion Phase Marketing**

- No External Tuning Allowed

**US Patent Number**

- 6181200
- 6331931

*PRELIMINARY DATA*

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Lot/SN	Freq (MHz)	P <sub>out</sub> (W)	P <sub>out +1</sub> (W)	I <sub>c</sub> (A)	RL (dB)	G (dB)	N <sub>c</sub> (%)	ΔG (dB)	Drp	VSWR	
										1.5:1	2.1
D1359-01	2250	<b>178.4</b>	<b>188.2</b>	8.02	17.00	9.73	62%		0	S	P
	2400	<b>200.5</b>	<b>205.5</b>	10.3	13.00	10.23	54%	0.51	0.5	S	P
	2550	<b>182.5</b>	<b>186.3</b>	9.36	23.30	9.83	54%		0.3	S	P

V<sub>CC</sub>=38V, Pulse=200µs, 10%

**MAXIMUM RATINGS**

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
BD	Collector-Emitter Voltage	$V_{CES}$	70	--	V	$I_C=20mA$ .
BD	Emitter-Base Voltage	$V_{EBO}$	3.0	--	V	$I_B=10mA$ .
BD	Collector Current, Peak	$I_C$	--	15.0	A	--
BD	Continuous Power Dissipation, Peak	$P_D$	--	500	W	$PW=PW1, DF=DF1, T_F=25^{\circ}C$ .
BD	Operating Temperature	$T_{OP}$	-30	+50	$^{\circ}C$	$V_{CC}=38V, PW=200\mu s, DF=10\%, TF=30\pm 5^{\circ}C, PIN=25.5W, F=2.25-2.40-2.55GHz$ .
BD	Storage Temperature	$T_{STG}$	-65	+200	$^{\circ}C$	--
Note	Screen 'BD' = parameter qualified By Design.					

**THERMAL CHARACTERISTICS**

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
BD	Thermal Resistance	$R_{TH(JC)}$	--	0.5	$^{\circ}C/W$	$V_{CC}=38V, PW=200\mu s, DF=10\%, TF=30\pm 5^{\circ}C, PIN=25.5W, F=2.25-2.40-2.55GHz$ .
Note	Screen 'BD' = parameter qualified By Design.					

**PROCESSING SPECIFICATIONS**

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
100%	DC Wafer Probe	--	--	--	--	Per Integra specification.
Q1	Wafer DC and RF Qualification	--	--	--	--	Per Integra specification.
LM	Wire Bond Strength	--	--	--	--	Line monitor per Integra specification.
100%	Pre-cap visual inspection	--	--	--	--	Per Integra specification.
100%	Gross leak test	--	--	--	--	MIL-STD-750D, Method 1071.6, Test Condition C.
Note	Screen 'Q1' = parameter is qualified by assembly and test of 3 pieces minimum per wafer.					
Note	Screen 'LM' = parameter is qualified by assembly line monitor.					

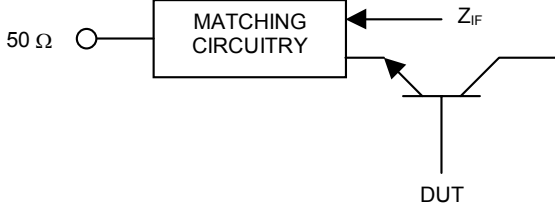
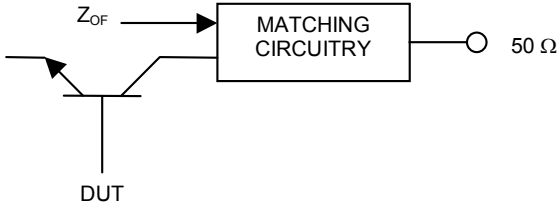
**DC ELECTRICAL CHARACTERISTICS**

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
100%	Collector-Emitter Breakdown Voltage	$BV_{CES}$	70	--	V	$I_C=40mA$ .
100%	Zero Base Voltage Collector Leakage Current	$I_{CES}$	--	5.0	mA	$V_{CE}=30V$ .
100%	DC Current Gain	$H_{FE}$	10	100	--	$V_{CE}=5V, I_C=0.1A, T_F=25\pm 5^{\circ}C$ .

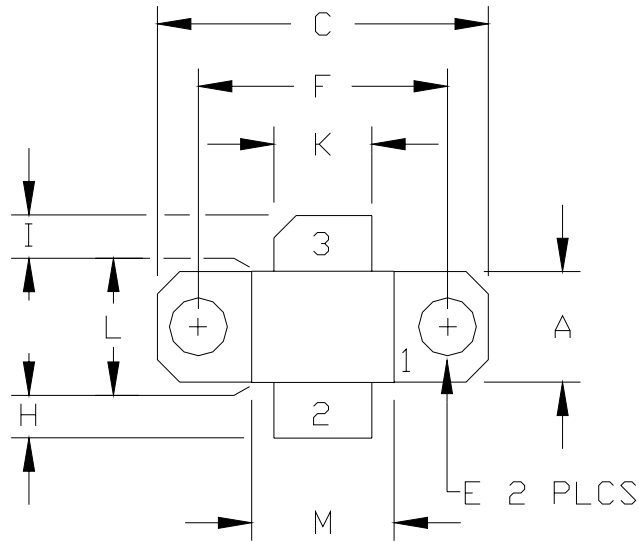
**RF ELECTRICAL CHARACTERISTICS**

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
100%	Input Return Loss	IRL	9	--	dB	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz.
100%	Output Power	P <sub>o</sub>	160	--	W	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz.
100%	Power Gain	G <sub>p</sub>	7.98	--	dB	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz.
100%	Collector Efficiency (P <sub>o</sub> /I <sub>c</sub> V <sub>cc</sub> )	N <sub>c</sub>	38	--	%	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz.
100%	Pulse Amplitude Droop	D	--	0.7	dB	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz. Measure at 5 and 195μs.
100%	Gain Flatness	GF		1.3	dB	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz.
100%	Delta Insertion Phase Variation	d-IP	±20	--	Deg	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz.
100%	Stability versus load VSWR	VSWR-S	1.5:1	--	--	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz..
100%	+1dB Overdrive	OD	Stable	--	--	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=32.1W, F=2.25-2.40-2.55GHz..
100%	Ruggedness	VSWR-T	2:1	--	--	V <sub>cc</sub> =38 V, PW=200μs, DF=10%, TF=30±5°C, PIN=25.5W, F=2.25-2.40-2.55GHz..
Note	V1 = 38V; PW = 200μs; DF1 = 10%; P <sub>IN</sub> = 25.5W; F1 = 2.25 GHz, F2 = 2.40 GHz, F3 = 2.55 GHz.					
Note	Screen 'BD' = parameter qualified By Design.					

**BROADBAND RF TEST FIXTURE IMPEDANCE CHARACTERISTICS**

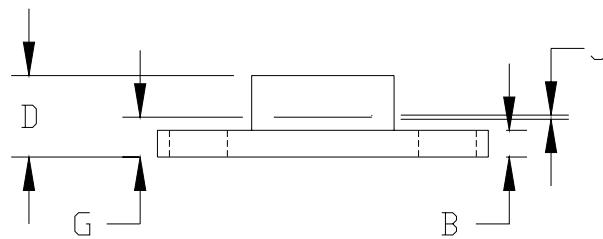
Frequency (MHz)	Z <sub>IF</sub> (Ω)	Z <sub>OF</sub> (Ω)
2.25	3.7-j4.6	1.8-j3.9
2.40	2.9-j3.1	1.7-j3.3
2.55	2.7-j1.5	1.6-j2.8
Impedance Definition		

**PACKAGE DIMENSIONAL OUTLINE DRAWING**



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.243	0.253	6.17	6.43
B	0.055	0.065	1.40	1.65
C	0.739	0.749	18.77	19.02
D	0.165	0.185	4.19	4.70
E	0.125	0.135	3.18	3.43
F	0.555	0.565	14.10	14.35
G	0.082	0.092	2.08	2.34
H	0.070	0.125	1.78	3.18
I	0.070	0.125	1.78	3.18
J	0.004	0.006	0.10	0.15
K	0.215	0.225	5.46	5.72
L	0.245	0.255	6.22	6.48
M	0.315	0.325	8.00	8.26

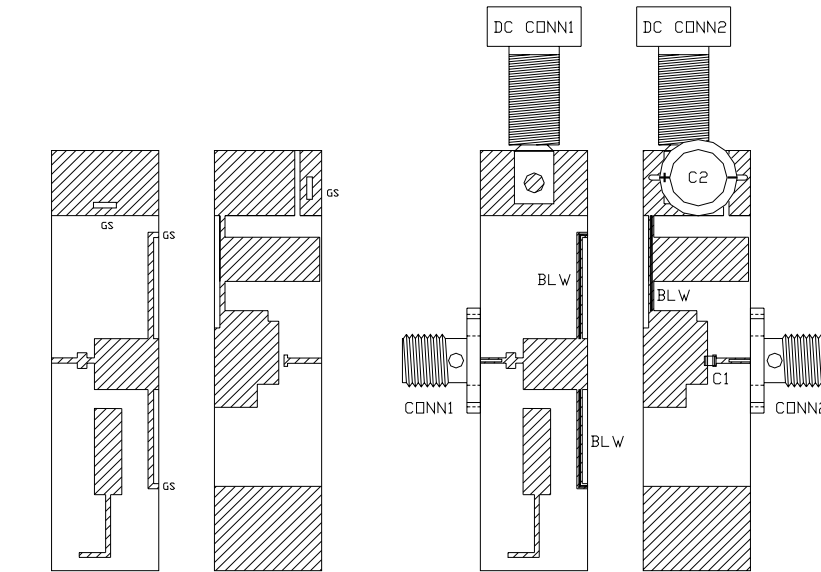
PIN SCHEDULE	
1	BASE
2	EMITTER
3	COLLECTOR



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DOCUMENT NUMBER: IB2226M160	REV: PR1
SHEET NAME: 06-OUTLINE	REV: NC

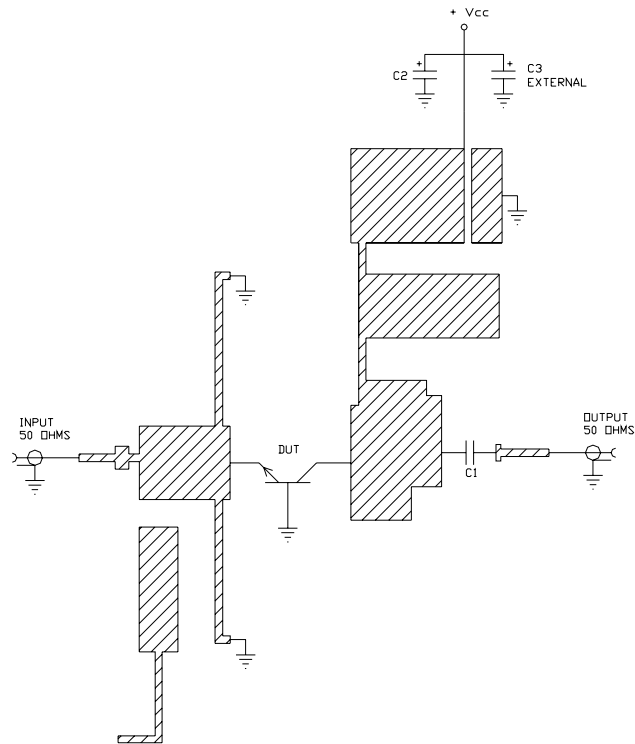
**BROADBAND RF TEST FIXTURE**



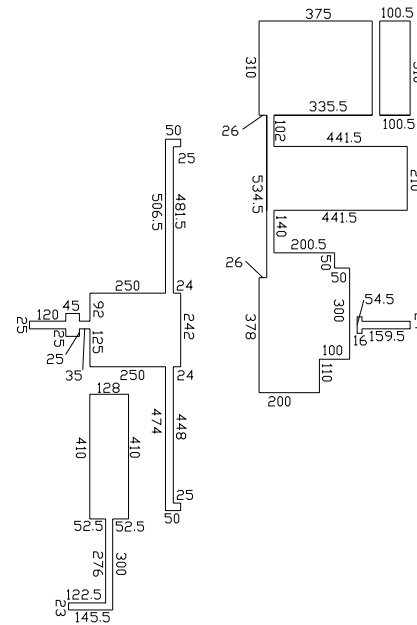
COMPONENT	DESCRIPTION
DUT	TRANSISTOR #IB2226M160, MOUNT HARD TO THE RIGHT
PC BOARD	ROGERS RT6010.2LM 1oz. Cu BOTH SIDES
C1	CHIP CAPACITOR, TYPE ATC100A, 39 pF
C2	ELECTROLYTIC CAPACITOR, 68uF / 6.3V
C3 - NOT SHOWN	ELECTROLYTIC CAPACITOR, 4700uF / 50V
GS	GROUND SHIM, COPPER, TH=0.001"
CONN1, CONN2	SMA CONNECTOR, TYPE QS #2052-5636-02
INPUT PC BOARD CARRIER	2 INCH BRASS - 01
OUTPUT PC BOARD CARRIER	2 INCH BRASS - 01
TRANSISTOR CARRIER	2 INCH COPPER - 01
TRANSISTOR CLAMP	NORYL CLAMP -01
HEATSINK	2 INCH HEATSINK - 09
DC CONN1	BANANA JACK, BLACK
DC CONN2	BANANA JACK, RED
BLW	BIAS LINE WIRE - COPPER - 0.022" DIA TYPICAL
NOTE	FIXTURE HARDWARE DRAWINGS AVAILABLE ON REQUEST

**ASSEMBLY AND PARTS LIST**

**BROADBAND RF TEST FIXTURE**



ELECTRICAL SCHEMATIC



CIRCUIT DIMENSIONS IN MILS

**CIRCUIT DIMENSIONS**

**DEFINITIONS**

<b>Data Sheet Status</b>	
Proposed Specification	This data sheet contains proposed specifications.
Preliminary Specification	This data sheet contains specifications based on preliminary measurements and data.
Product Specification	This data sheet contains final product specifications.
<b>Maximum Ratings</b>	
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.	

**WARNING**

<b>Product and environmental safety - toxic materials</b>
This product contains beryllium oxide. The product is entirely safe provided that the BeO base is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with general or domestic waste.

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