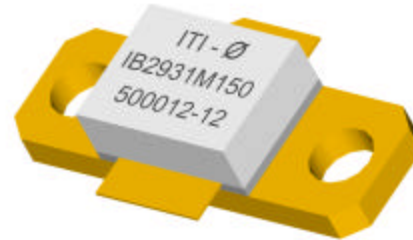


## S-Band Radar Transistor

The high power pulsed radar transistor part number IB2931M150 is designed for S-Band ATC radar systems operating over the instantaneous bandwidth of 2.9-3.1 GHz. While operating in class C mode this common base device supplies a minimum of 150 watts of peak pulse power under the conditions of 100µs 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
- BeO Package
  - Unmatched Thermal Reliability
- RF Test Fixture
  - Broadband
  - Matched to 50Ω
  - Long-term Correlation
  - 100% Device RF Screening
  - No External Tuning Allowed
- Insertion Phase Marking
  - 5° Increment Marking
- US Patent Number
  - 6181200
  - 6331931

### TYPICAL DATA    TYPICAL DATA    TYPICAL DATA    TYPICAL DATA

Test Sequence Name	Freq (GHz)	Vcc (V)	P <sub>IN</sub> (W)	IRL (dB)	P <sub>OUT</sub> (W)	G <sub>p</sub> (dB)	OPC (dB)	OPF (dB)	I <sub>c</sub> (A)	n <sub>c</sub> (%)	IP (deg)	Droop (dB)	VSWR 1.5:1	VSWR 2:1
OPV	2.900	36.0	22.4	--	180	--	0.09	--	--	--	--	--	--	--
Nominal	2.900	36.0	20.0	-10	177	9.5	--	0.46	12.30	40	222	-0.48	--	P
1.5:1 Stability/OD	2.900	36.0	23.5	--	--	--	--	--	--	--	--	--	S	--
OPV	3.000	36.0	22.4	--	180	--	0.23	--	--	--	--	--	--	--
Nominal	3.000	36.0	20.0	-13	171	9.3	--	--	11.80	40	66	-0.51	--	P
1.5:1 Stability/OD	3.000	36.0	23.5	--	--	--	--	--	--	--	--	--	S	--
OPV	3.100	36.0	22.4	--	171	--	0.32	--	--	--	--	--	--	--
Nominal	3.100	36.0	20.0	-16	159	9.0	--	--	10.30	43	278	-0.52	--	P
1.5:1 Stability/OD	3.100	36.0	23.5	--	--	--	--	--	--	--	--	--	S	--

**MAXIMUM RATINGS**

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
BD	Collector-Emitter Voltage	$V_{CES}$	--	70	V	$V_{BE}=0V$ .
BD	Emitter-Base Voltage	$V_{EBO}$	--	3.5	V	--
BD	Collector Current, Peak	$I_C$	--	15.5	A	PW=100 $\mu$ s, DF=10%.
BD	Continuous Power Dissipation, Peak	$P_D$	--	475	W	PW=100 $\mu$ s, DF=10%, $T_F=25^\circ C$ .
BD	Storage Temperature Range	$T_{STG}$	-55	+150	$^\circ C$	--
BD	Operating Junction Temperature Range	$T_J$	-55	+200	$^\circ C$	--
Note	Screen 'BD' = parameter qualified By Design.					

**THERMAL CHARACTERISTICS**

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
BD	Thermal Resistance	$R_{TH(JC)}$	--	0.30	$^\circ C/W$	$V_{CC}=36V$ , PW=100 $\mu$ s, DF=10%, $T_F=25\pm 5^\circ C$ , $P_{OUT}=160W$ .
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	$I_C=40mA$ , $V_{BE}=0V$ , $T_F=25\pm 5^\circ C$ .
100%	Zero Base Voltage Collector Leakage Current	$I_{CES}$	--	7.5	mA	$V_{CE}=40V$ , $V_{BE}=0V$ , $T_F=25\pm 5^\circ C$ .
100%	DC Current Gain	$H_{FE}$	10	100	--	$V_{CE}=5V$ , $I_C=0.1A$ , $T_F=25\pm 5^\circ C$ .

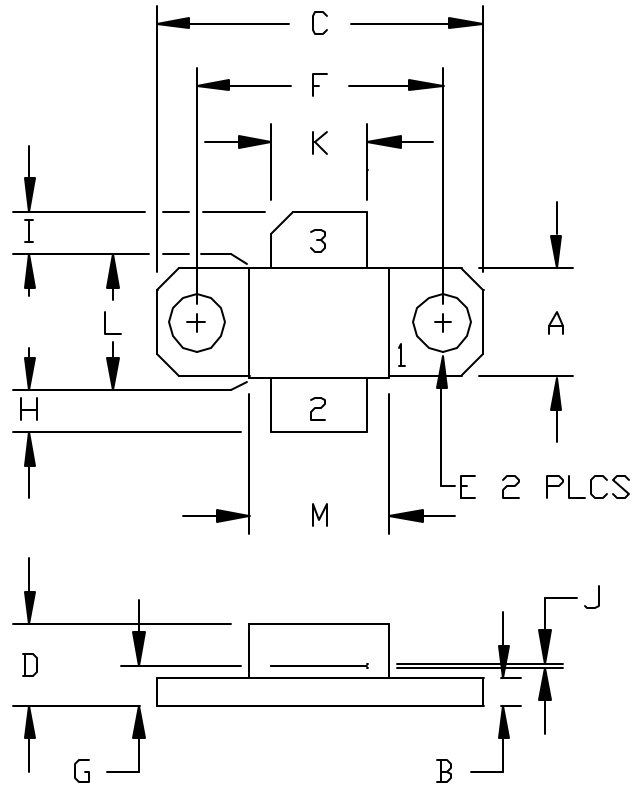
**RF ELECTRICAL CHARACTERISTICS**

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
100%	Input Return Loss	IRL	7	--	dB	$V_{CC}=36V, PW=100\mu s, DF=10\%, T_F=25\pm 5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$
100%	Output Power	$P_O$	150	--	W	$V_{CC}=36V, PW=100\mu s, DF=10\%, T_F=25\pm 5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$
100%	Collector Efficiency ( $P_O/I_C/V_{CC}$ )	$\eta_c$	38	--	%	$V_{CC}=36V, PW=100\mu s, DF=10\%, T_F=25\pm 5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$
100%	Pulse Amplitude Droop	D	--	0.6	dB	$V_{CC}=36V, PW=100\mu s, DF=10\%, T_F=25\pm 5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$
100%	Output Power Flatness = $10 \cdot \text{LOG}(P_{O\text{MAX}}/P_{O\text{MIN}})$	OPF	--	0.75	dB	Calculate from $P_O$ at each frequency F.
100%	Output Power Compression = $10 \cdot \text{LOG}(P_{OC}/P_O)$	OPC	+0.05	+0.45	dB	$P_{OC}$ measured with $P_{IN}$ increased by 0.5dB at $F=F1, F2, F3.$
100%	Insertion Phase	IP	-30	+30	Deg	$V_{CC}=36V, PW=100\mu s, DF=10\%, T_F=25\pm 5^\circ C, P_{IN}=P_{IN2}, F=F2,$ Mark in 5° increments.
100%	Stability into 1.5:1 VSWR with +0.7dB overdrive	VSWR-S	--	--	--	Repeat $P_O$ with $P_{IN}$ increased by 0.7dB. Rotate 1.5:1 output VSWR through 360° phase. No oscillatory or pulse break-up characteristics allowed on detected output pulse. All non-harmonically related signals must be at least -65 dBc.
100%	2:1 Load Mismatch Tolerance	LMT	--	--	--	$V_{CC}=36V, PW=100\mu s, DF=10\%, T_F=25\pm 5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ Rotate 2:1 output VSWR through 360° phase. Post test $P_O = \text{Pre test } P_O \pm 10W.$
BD	Pulse Risetime	RT	--	150	ns	$V_{CC}=36V, PW=100\mu s, DF=10\%, T_F=25\pm 5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ Measure between 10% and 90% detected power points.
Note	F1 = 2.90 GHz, F2 = 3.0 GHz, F3 = 3.10 GHz.					
Note	$P_{IN1} = 20W, P_{IN2} = 20W, P_{IN3} = 20W.$					
Note	$T_F =$ Device flange temperature.					
Note	Parts are binned and marked in 5 degree increments for Insertion Phase IP.					
Note	Screen 'BD' = parameter qualified By Design.					

**BROADBAND RF TEST FIXTURE IMPEDANCE CHARACTERISTICS**

Frequency (GHz)	$Z_F (W)$	$Z_{OF} (W)$
2.90	4.2 – j6.1	1.6 – j5.3
3.00	4.3 – j4.8	1.7 – j5.0
3.10	4.1 – j4.2	1.3 – j4.9
Impedance Definition		

**PACKAGE DIMENSIONAL OUTLINE DRAWING**



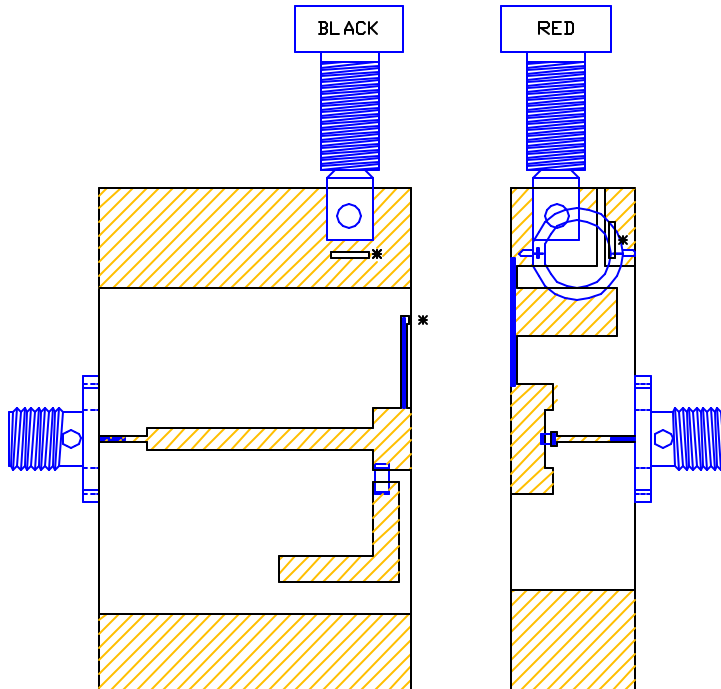
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.243	0.253	6.17	6.43
B	0.055	0.065	1.40	1.65
C	0.739	0.749	18.77	19.02
D	0.178	0.188	4.52	4.78
E	0.125	0.135	3.18	3.43
F	0.555	0.565	14.10	14.35
G	0.082	0.092	2.08	2.34
H	0.080	0.120	2.03	3.05
I	0.080	0.120	2.03	3.05
J	0.004	0.006	0.10	0.15
K	0.215	0.225	5.46	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

NOTICE TO PERSONS RECEIVING THIS DRAWING: INTEGRA TECHNOLOGIES, INC. CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREON. THIS DRAWING MAY NOT BE REPRODUCED NOR MAY IT BE USED TO MANUFACTURE ANYTHING SHOWN HEREON WITHOUT THE WRITTEN PERMISSION OF INTEGRA TECHNOLOGIES, INC.

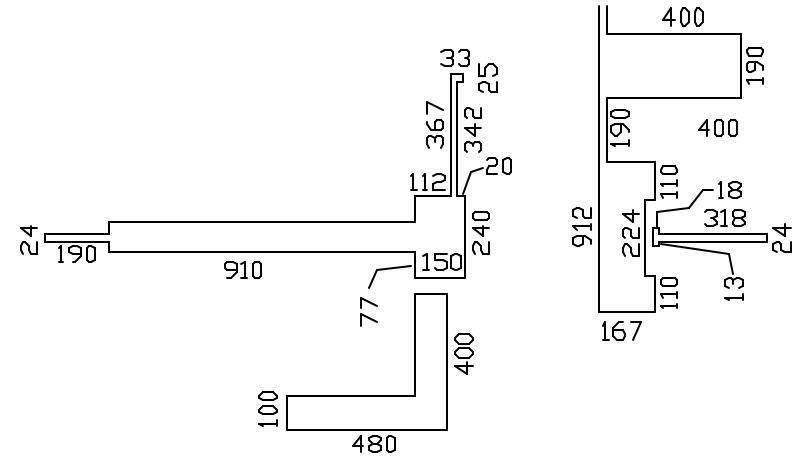
DOCUMENT NUMBER: <b>IB2931M150</b>	REV: <b>A</b>
SHEET NAME: <b>06-OUTLINE</b>	REV: <b>NC</b>

**BROADBAND RF TEST FIXTURE**



**PARTS LIST**

PC Board Type: ROGERS RD3010 .025"  
 Input PC Board Carrier: -D4 (1.25")  
 Output PC Board Carrier: -01 (0.5")  
 Transistor Carrier: -01 (P32)  
 Transistor Clamp: -01 (P32)  
 Heatsink: -09  
 RF Connector: OS #2052-5636-02  
 Chip Capacitor: ATC100A - 33pF  
 Chip Resistor: 24 ohm, MSI #WA57  
 Elect. Capacitor: 68uF / 63V  
 Bias Line Wires: 2 p/c  
 Grounds: 3 places - \*  
 Banana Jack Red - 1 place  
 Banana Jack Black - 1 place



**ASSEMBLY AND PARTS LIST**

**CIRCUIT DIMENSIONS IN MILS (1 MIL = 0.001")**

**DEFINITIONS**

**Data Sheet Status**

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.

**Maximum Ratings**

Stress above one or more of the maximum ratings may cause permanent damage to the device. These are maximum ratings only and 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**

**Product and environmental safety - toxic materials**

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.

**DISCLAIMER**

Integra Technologies Inc. reserves the right to make changes without further notice to any products herein. Integra Technologies Inc. makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Integra Technologies Inc. assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. Integra Technologies Inc. products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Integra Technologies Inc. customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Integra Technologies Inc. for any damages resulting from such improper use or sale.