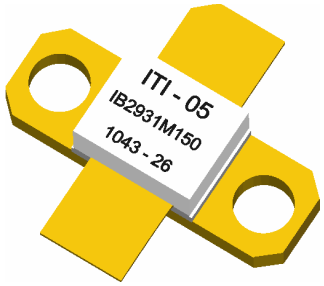
Part Number: IB2931M150

Integra
TECHNOLOGIES, INC.

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
- 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 Marking
  - – 5° Increment Marking
- US Patent Number
  - – 6181200
  - – 6331931

TYPICAL DATA TYPICAL DATA TYPICAL DATA TYPICAL DATA

Freq (GHz)	PW (us)	Duty (%)	Vcc (V)	P_{IN} (W)	P_{REF} (W)	IRL (dB)	IRL (P-F)	P_{OUT} (W)	P_{OUT} (P-F)	G_P (dB)	OPC (dB)	OPC (P-F)	OPF (dB)	OPF (P-F)	I_C (A)	n_C (%)	n_C (P-F)	d - IP (deg)	IP (var) (P-F)	Droop (dB)	Droop (P-F)	VSWR 1.5:1	VSWR 1.5:1 (P-F)	VSWR 2:1	VSWR 2:1 (P-F)
2.900	100	10	36.0	22.4	--	--	–	183	--	--	0.09	P	–	--	--	--	–	--	--	--	--	--	--	--	--
2.900	100	10	36.0	20.0	0.78	-14	P	180	P	9.5	--	--	0.51	P	12.40	40	P	--	--	-0.40	P	--	--	P	P
2.900	100	10	36.0	23.5	--	--	–	–	--	--	--	--	–	--	--	--	–	--	--	--	--	S	P	--	--
3.000	100	10	36.0	22.4	--	--	–	199	--	--	0.11	P	–	--	--	--	–	--	--	--	--	--	--	--	--
3.000	100	10	36.0	20.0	0.31	-18	P	194	P	9.9	--	--	–	--	12.20	44	P	1	P	-0.50	P	--	--	P	P
3.000	100	10	36.0	23.5	--	--	–	–	--	--	--	--	–	--	--	--	–	--	--	--	--	S	P	--	--
3.100	100	10	36.0	22.4	--	--	–	181	--	--	0.21	P	–	--	--	--	–	--	--	--	--	--	--	--	--
3.100	100	10	36.0	20.0	1.11	-13	P	172	P	9.4	--	--	–	--	10.90	44	P	--	--	-0.30	P	--	--	P	P
3.100	100	10	36.0	23.5	--	--	–	–	--	--	--	--	–	--	--	--	–	--	--	--	--	S	P	--	--

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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=100µs, DF=10%.
BD	Continuous Power Dissipation, Peak	P_D	--	475	W	PW=100µs, DF=10%, T_F=25°C.
BD	Storage Temperature Range	T_{STG}	-55	+150	°C	--
BD	Operating Junction Temperature Range	T_J	-55	+200	°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	°C/W	V_{CC}=36V, PW=100µs, DF=10%, T_F=25±5°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±5°C.
100%	Zero Base Voltage Collector Leakage Current	I_{CES}	--	7.5	mA	V_{CE}=40V, V_{BE}=0V, T_F=25±5°C.
100%	DC Current Gain	H_{FE}	10	100	--	V_{CE}=5V, I_C=0.1A, T_F=25±5°C.

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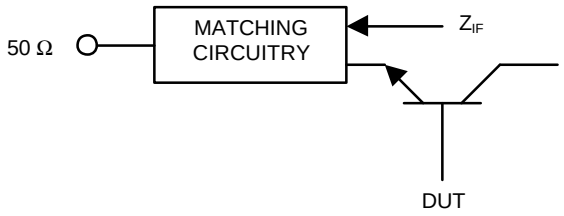
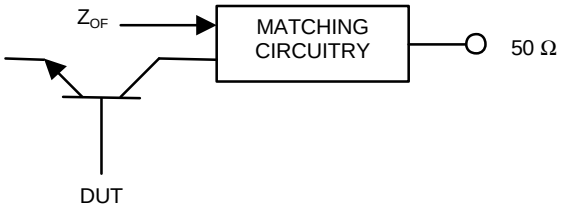
RF ELECTRICAL CHARACTERISTICS

Screen	Parameter	Symbol	Min	Max	Units	Test Conditions
100%	Input Return Loss	IRL	7	--	dB	V_{CC}=36V, PW=100µs, DF=10%, T_F=25±5°C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.
100%	Output Power	P_O	150	--	W	V_{CC}=36V, PW=100µs, DF=10%, T_F=25±5°C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.
100%	Collector Efficiency ($P_O/I_C/V_{CC}$)	N_C	38	--	%	V_{CC}=36V, PW=100µs, DF=10%, T_F=25±5°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=100µs, DF=10%, T_F=25±5°C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.
100%	Output Power Flatness =10*LOG(P_{OMAX}/P_{OMIN})	OPF	--	0.75	dB	Calculate from P_O at each frequency F.
100%	Output Power Compression =10*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=100µs, DF=10%, T_F=25±5°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=100µs, DF=10%, T_F=25±5°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 = Pre test P_O±10W.
BD	Pulse Risetime	RT	--	150	ns	V_{CC}=36V, PW=100µs, DF=10%, T_F=25±5°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_{IF} (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		

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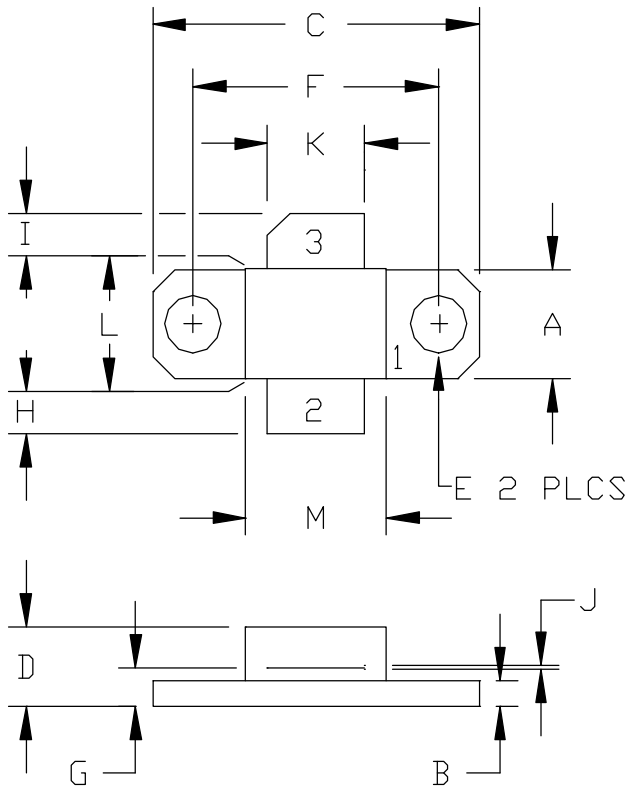
PACKAGE DIMENSIONAL OUTLINE DRAWING



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

DOCUMENT NUMBER: IB2931M150	REV: A
SHEET NAME: 06-OUTLINE	REV: NC

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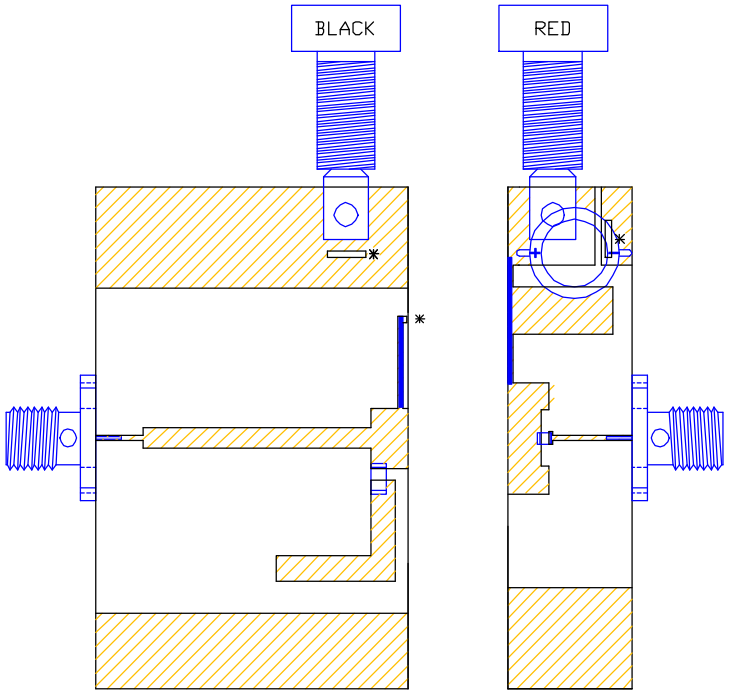
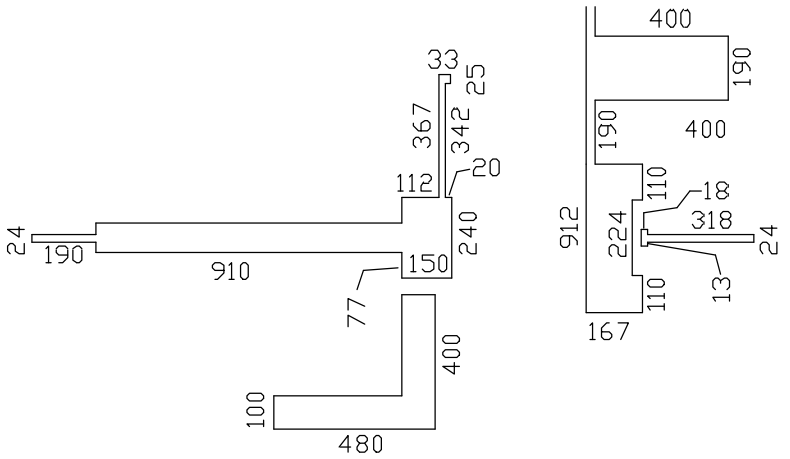
BROADBAND RF TEST FIXTURE



PARTS LIST

PC Board Type: ROGERS RO3010 .025"
Input PC Board Carrier: -04 (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 - 39pF
Chip Resistor: 24 ohm, MSI #WA57
Elect. Capacitor: 68uF / 63V
Bias Line Wires: 2 plcs
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")

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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.

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TEL：021-28311762 56703037 13701955389 FAX：021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

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