

MBT Series of PIN Switching Diodes are passivated epitaxial silicon devices. PIN Switching Diodes are designed to provide two impedance states, one approaching an open circuit (reverse bias), and the other a short circuit (forward bias).

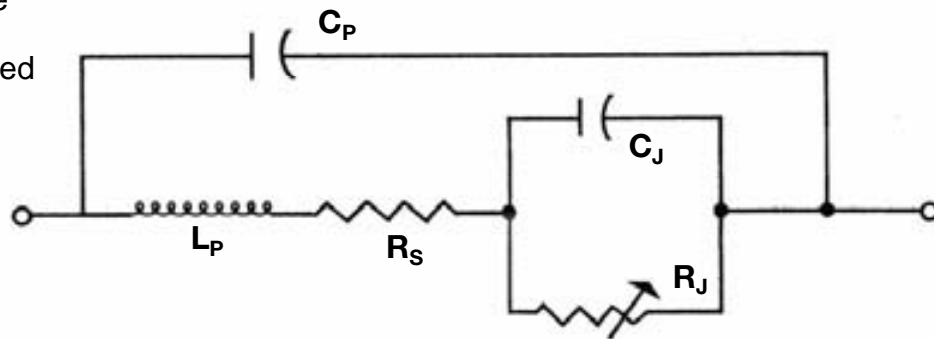
These devices are designed to cover a wide range of control applications that are in the category of RF switching, phase shifting, modulation, duplexing, limiting and pulse forming. The diodes in this series are housed in

hermetically sealed packages. The series can also be obtained in dice form.

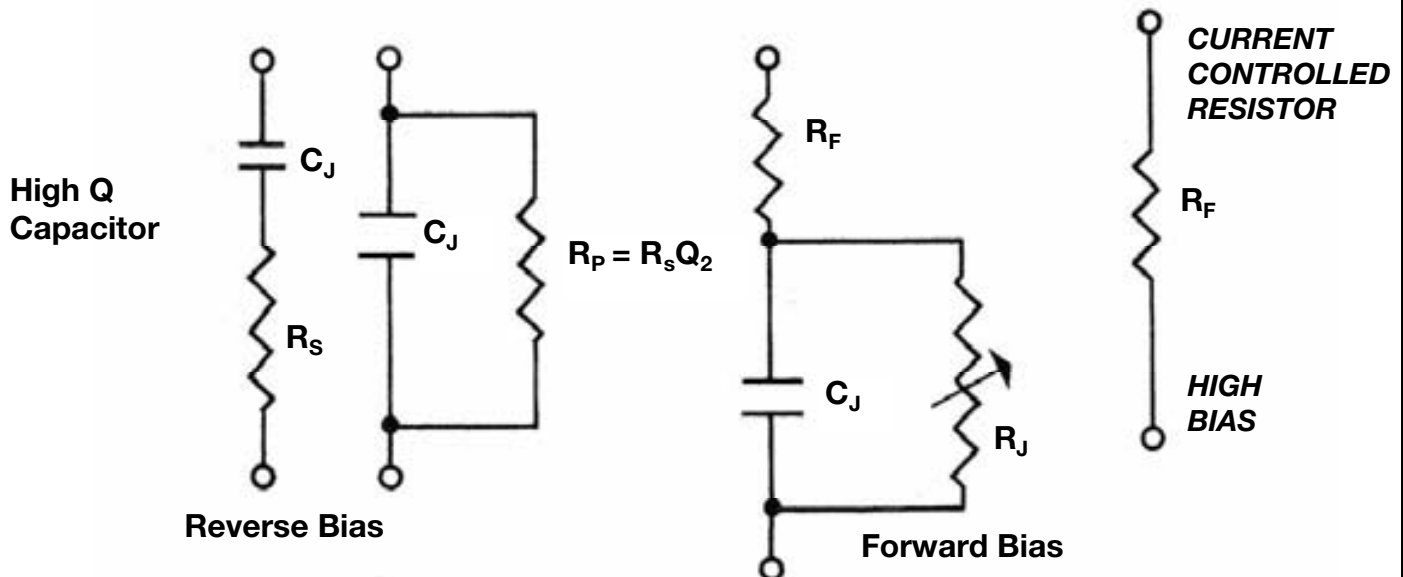
PIN JUNCTION EQUIVALENT CIRCUITS

The equivalent for a PIN JUNCTION is as follows:

C_P = Package Capacitance
 L_P = Package Inductance
 C_J = Junction Capacitance
 R_S = Series Resistance
 R_J = Conductivity Modulated Junction Resistance



The reverse and forward biased equivalent circuits for a PIN JUNCTION are as follows:



PIN SWITCHING DIODES

TYPE NUMBER	V_B Min ¹ @10 μ A (volts)	C_J -6 ² max. (PF)	R_S max ³ @20mA (ohms)	R_S max @100 mA (ohms)	T_L typ ⁴ (nsec)	T_S ⁵ 10-90%, 90-10%	O_R ⁶ max ($^{\circ}$ C/W)
FAST SWITCHING							
MBP70A	70	0.05	2.8	2.5	50	5	60
MBP70B	70	0.10	2.0	1.8	50	5	60
MBP70C	70	0.20	1.7	1.5	50	5	50
MBP70D	70	0.30	1.2	1.0	50	5	50
MBP100A	100	0.05	2.6	2.0	100	10	50
MBP100B	100	0.10	2.0	1.7	100	10	45
MBP100C	100	0.20	1.5	1.2	100	10	45
MBP100D	100	0.30	1.2	1.0	100	10	40
MBP200A	200	0.10	2.4	1.8	200	20	40
MBP200B	200	0.20	1.4	0.9	200	20	35
MBP200C	200	0.30	1.0	0.8	200	20	35
ULTRA FAST SWITCHING							
MBP30A	30	0.15	1.5		10	1 5	40
MBP30B	30	0.20	1.2		10	1 5	40
MBP30C	30	0.25	1.0		10	1 5	35
PRECISION ATTENUATOR							
		C_J -50 ^{typ}	R_S min @0.01 mA	R_S typ @20mA	R_S max @100mA	T_L min	
MBP150A	150	0.05	1000	2.5	2.0	500	25
MBP150B	150	0.10	600	2.0	1.5	500	20
MBP150C	150	0.15	500	1.1	1.2	500	15
MBP150D	150	0.20	400	1.5	1.0	500	12
MBP150E	150	0.25	350	1.2	0.8	500	10
MBP150F	150	0.30	300	1.0	0.6	500	9
MEDIUM POWER SWITCHING							
		C_J -50 ^{max}	R_S typ @20mA	R_S max @ 100 mA	T_L min		
MBP300A	300	0.05	3.0	1.7	600	300	25
MBP300B	300	0.10	2.0	1.2	800	400	20
MBP300C	300	0.30	1.5	0.6	1000	500	12
MBP300D	300	0.50	1.0	0.5	1000	500	10
MBP500A	500	0.10	2.0	1.2	1200	600	18
MBP500B	500	0.30	1.5	0.6	1200	600	10
MBP500C	500	0.50	1.0	0.5	1200	600	9

NOTES:

1. Breakdown voltage (V_B) is measured at 10 μ A of reverse bias current.
2. Junction capacitance is measured on a 1 MHz Boonton capacitance bridge.
3. Series resistance is measured at 1 GHz using transmission loss techniques.
4. Minority carrier lifetime is measured with $I_F = 10$ mA and $I_R = 6$ mA at the 90% recovery point.
5. Switching time is measured between $I_F = 10$ mA and $V_R = 10$ volts.
6. Thermal resistance is measured using ΔV_F versus T_{IME} in a thermal impedance meter and an infinite heat sink.
7. Available in various package styles.

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LIMITER DIODES

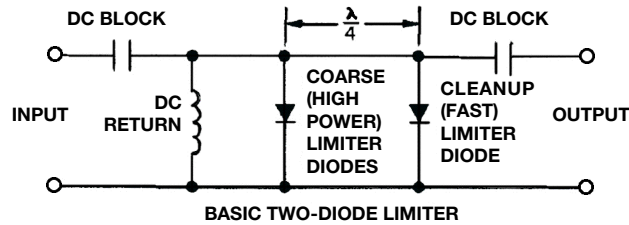
MLD series diodes are specially processed PIN diodes designed for use in passive or active limiters at frequencies through Ku band.

MBT limiter diodes are offered for flexibility in design of low (lowest V_B , fastest turn-on time), medium and high (highest V_B , slowest turn-on time) power limiters.

APPLICATIONS

A limiter diode is a power-sensitive variable attenuator that uses the non-linear properties of the diode to provide an impedance mismatch when sufficient amounts of RF power are incident on the device. The output

power is reduced to a level that will not overdrive a receiver, burn out a mixer, etc. Limiter diodes may be used in waveguides, coax, microstrip or stripline.



CHIP ELECTRICAL PARAMETERS

$T_A = 25^\circ\text{C}$

Type Number	V_b MIN (V)	C_{J0} TYP (pF)	C_{J6} MAX (pF)	R_s TYP @10mA (W)	T_L TYP (ns)	θ_p TYP ($^\circ\text{C/W}$)	θ_{cw} ($^\circ\text{C/W}$)
MLD5113	20	0.20	0.15	1.5	5	20	100
MLD5114	-	0.50	0.30	1.2	10	12	80
MLD5115	45	0.20	0.15	1.5	10	15	80
MLD5116	-	0.50	0.30	1.2	15	10	60
MLD5117	-	0.70	0.50	1.0	20	6	40
MLD5118	120	0.20	0.15	1.5	50	1.2	40
MLD5119	-	0.60	0.30	1.0	50	0.5	20
MLD5120	-	0.80	0.50	0.5	100	0.3	15
MLD5121	15	0.12	0.10	2.0	5	30	120
MLD5122	-	0.20	0.15	1.5	5	20	80
MLD5123	30	0.12	0.10	2.0	7	20	100
MLD5124	-	0.20	0.15	1.5	7	15	70

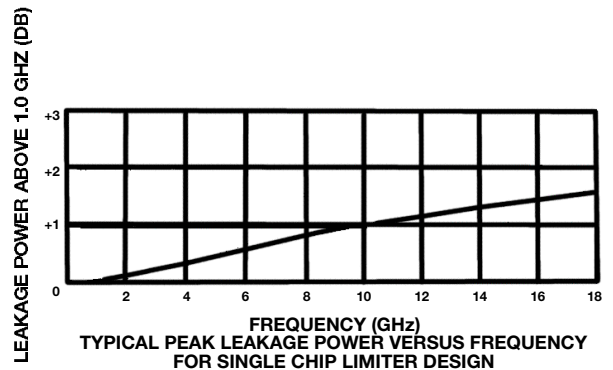
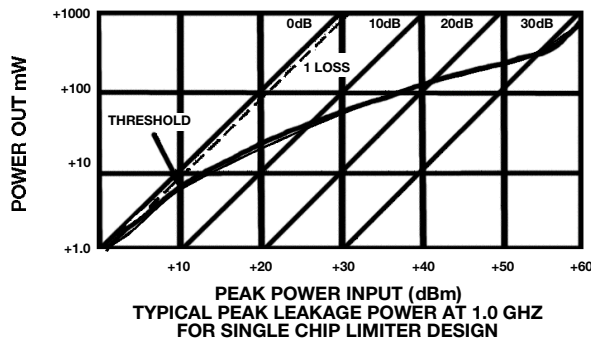
TYPICAL LIMITER PERFORMANCE RATINGS

$T_A = 25^\circ\text{C}$

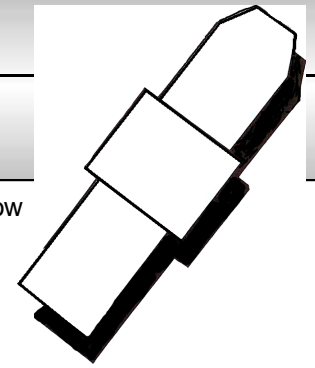
Type Number	PEAK P_{in} MAX (@ 1.0 μs) (dBm)	LEAKAGE P_{out} TYP (dBm)	THRESHOLD TYP (dBm)	INSERTION LOSS TYP (db)	CW POWER IN MAX (W)
MLD5113	+50	+22	+10	0.1	2
MLD5114	+53	+24	+10	0.2	3
MLD5115	+53	+27	+15	0.1	3
MLD5116	+56	+29	+15	0.2	4
MLD5117	+59	+31	+15	0.2	5
MLD5118	+60	+39	+20	0.1	5
MLD5119	+63	+41	+20	0.2	10
MLD5120	+66	+44	+20	0.2	15
MLD5121	+47	+19	+7	0.1	2
MLD5122	+50	+22	+7	0.1	3
MLD5123	+47	+24	+12	0.1	3
MLD5124	+50	+27	+12	0.1	4

Note: Available in various package styles.

PERFORMANCE



BEAM LEAD PIN DIODES



MBT's Planar Beam Lead PIN Diodes for use as series diodes up to 18 GHz in broadband multi-throw switches, phase shifters, limiters, attenuators and modulators for microstrip and stripline applications. Features include low capacitance, low series resistance, fast switching, and oxide passivation.

MBT's Mesa Beam Lead PIN Diodes for use as series diodes in the same applications with the increased switching speed similar to PIN chips.

MBT's Mesa Beam Lead PIN Diodes that have been designed for very low series resistance, low capacitance and very fast switching time. This series can also be used in the shunt configuration as well as the series configuration.

All of the Beam Lead PIN Diodes meet or exceed the Military Environmental Specifications of MIL-S-19500 and methods from MIL-STD-750 and/or customer specifications.

ABSOLUTE MAXIMUM RATINGS:

Storage Temperature: -65°C to +175°C

Operation Temperature: -65°C to +150°C

Power Dissipation: 250 mW

Beam Terminal Strength: Planar- 4 grams minimum / Mesa- 6 grams minimum

PLANAR BEAM LEAD PIN

TYPE NUMBER	V_B^1 MIN (VOLTS)	SERIES ² RESISTANCE R_S MAX (OHMS)	JUNCTION ³ CAPACITANCE C_J -50V, MAX (pF)	MINORITY ⁴ CARRIER LIFETIME T_L TYP (ns)	RF ⁵ SWITCHING TIME T_S , TYP (ns)
MBL5201	100	4.0	0.020	100	25
MBL5202	100	3.5	0.030	100	25
MBL5203	100	4.0	0.040	100	25
MBL5204	100	3.0	0.060	100	25

MESA BEAM LEAD PIN

TYPE NUMBER	BREAKDOWN ¹ VOLTAGE V_B MIN (VOLTS)	SERIES ² RESISTANCE R_S +50mA, MAX (OHMS)	JUNCTION ³ CAPACITANCE C_J -50V, MAX (pF)	MINORITY ⁴ CARRIER LIFETIME T_L TYP (ns)	RF ⁵ SWITCHING TIME, T_S (ns)
MBL5205	100	3.5	0.025	70	5ns OFF
MBL5206	100	3.0	0.030	70	5ns OFF
MBL5207	100	3.0	0.040	70	5ns OFF
MBL5208	100	2.5	0.060	70	5ns OFF

HIGH SPEED MESA BEAM LEAD PIN

TYPE NUMBER	BREAKDOWN ¹ VOLTAGE V_B MIN (VOLTS)	SERIES ² RESISTANCE R_S +50mA, MAX (OHMS)	JUNCTION ³ CAPACITANCE C_J -10V, MAX (pF)	MINORITY ⁴ CARRIER LIFETIME T_L TYP (ns)	RF ⁵ SWITCHING TIME, T_S , TYP (ns)
MBL5209	50	1.8	0.07	50	3
MBL5210	40	1.2	0.12	40	3
MBL5211	30	1.0	0.15	25	2

NOTES:

1. Breakdown voltage is measured at 10 μ A.
2. Series Resistance is calculated from insertion loss measurements at 3 GHz, 50mA.
3. Junction Capacitance is calculated from isolation measurements at 9 GHz.
4. Minority Carrier Lifetime is measured at $I_F=10mA$, $I_R=6mA$.
5. RF Switching Time is measured from RF transmission, 90% to 10%, in series configuration.
6. Available in package styles PS-6 and PS-7.