

MOTOROLA
Semiconductors

BOX 20912 • PHOENIX, ARIZONA 85036

1N5158 thru 1N5160
(Formerly M4L3052 thru M4L3054)
1N5779 thru 1N5793

PNPN 4-LAYER DIODES

... two terminal, fast-switching devices specifically designed for low voltage applications such as logic circuits, pulse generators, memory and relay drivers, relay replacements, alarm circuits, multivibrators, ring counters, and telephone switching circuits. These devices feature:

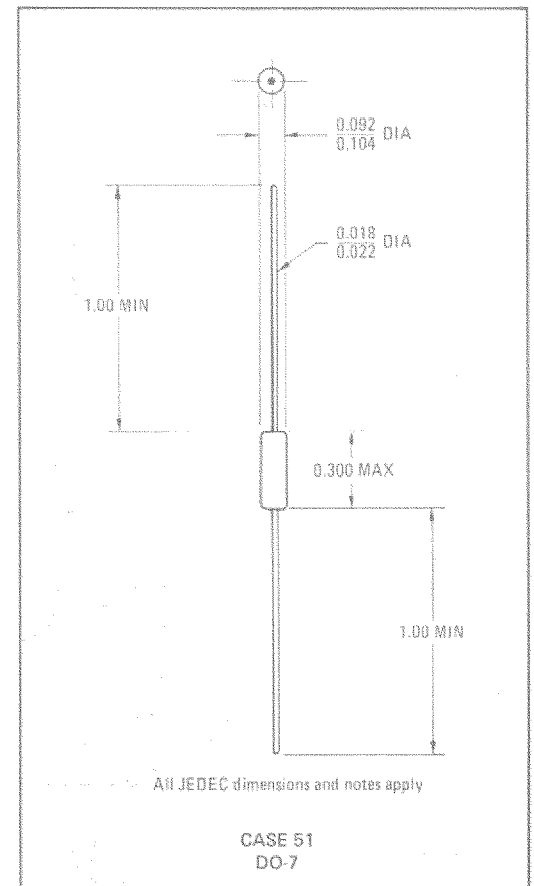
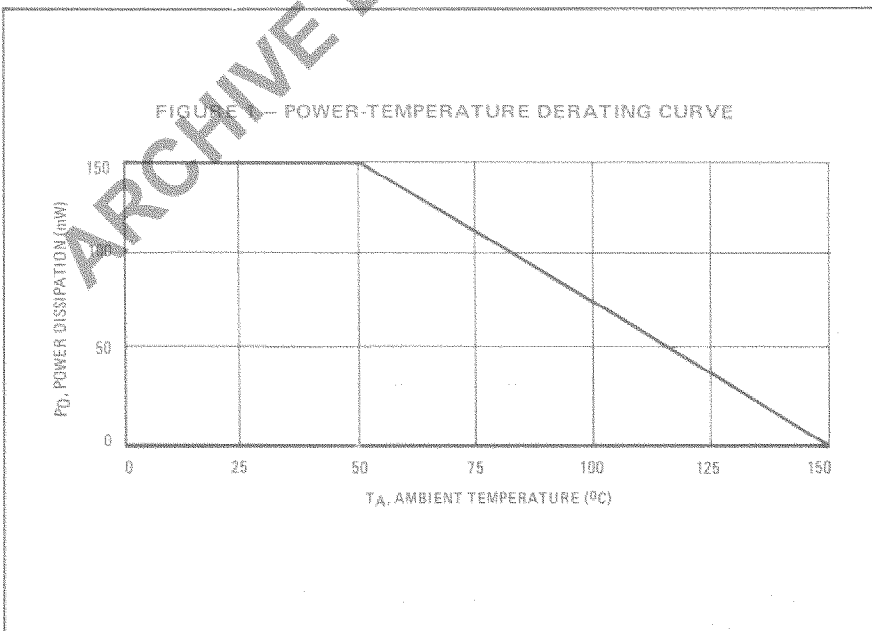
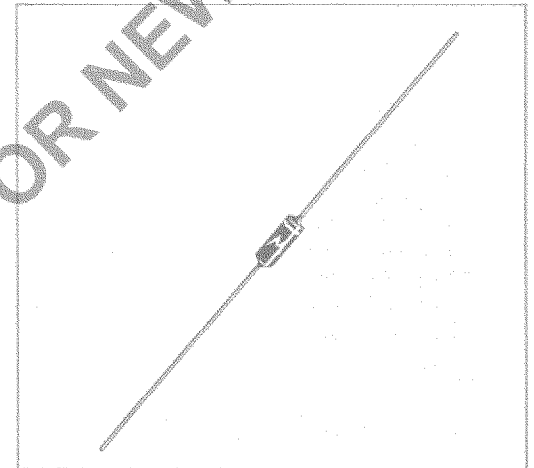
- Low Breakover (Switching) Voltage – 10 to 15-Volt Ratings
- Fast Switching Speeds – $t_{on} = 75 \text{ ns}$ (Typ)
 $t_{off} = 250 \text{ ns}$ (Typ)
- Low Junction Capacitance – 45 pF (Typ)
- Low Breakover Currents
- Subminiature Glass Package

**EPITAXIAL
4-LAYER DIODES**
10-15 VOLTS
150 mW

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
*Reverse Voltage 1N5158, 1N5782, 1N5788 1N5159, 1N5783, 1N5789 1N5160, 1N5784, 1N5790 1N5779, 1N5785, 1N5791 1N5780, 1N5786, 1N5792 1N5781, 1N5787, 1N5793	V_{RM}	10 11 12 13 14 15	Volts
*Continuous Forward Current	I_F	150	mA
*Steady State Power Dissipation @ $T_A = 50^\circ\text{C}$ Derate above 50°C	P_D	150 1.5	mW mW/ $^\circ\text{C}$
*Peak Pulse Current (50 μs maximum pulse width)	I_{pulse}	10	Amps
*Operating Junction Temperature Range	T_J	-65 to +150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +175	$^\circ\text{C}$

*Indicates JEDEC Registered Data



ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
*Forward Switching Voltage 1N5158, 1N5782, 1N5788 1N5159, 1N5783, 1N5789 1N5160, 1N5784, 1N5790 1N5779, 1N5785, 1N5791 1N5780, 1N5786, 1N5792 1N5781, 1N5787, 1N5793	V_S	8.0 9.0 10 11 12 13	— — — — — —	10 11 12 13 14 15	Volts
*Forward Switching Current 1N5158 thru 1N5160, 1N5779 thru 1N5781 1N5782 thru 1N5793	I_S	—	5.0 10	50 100	μA
*Forward Off-State Current ($V_F = 0.75 \times V_S$)	I_{FM}	—	1.0	5.0	μA
*Reverse Current ($V_R = V_{RM}$)	I_{RM}	—	2.0	10	μA
*Holding Current 1N5158 thru 1N5160, 1N5779 thru 1N5781 1N5782 thru 1N5787 1N5788 thru 1N5793	I_H	1.0 10 0.1	4.0 — —	20 50 2.0	mA
*Forward On Voltage ($I_F = 150 \text{ mAdc}$)	V_F	—	1.0	1.5	Volts
*Critical Rate of Rise of Applied Forward Voltage ($V_S = 6.0 \text{ Vdc}$) ($V_S = 6.75 \text{ Vdc}$) ($V_S = 7.5 \text{ Vdc}$) ($V_S = 8.25 \text{ Vdc}$) ($V_S = 9.0 \text{ Vdc}$) ($V_S = 9.75 \text{ Vdc}$)	dv/dt	— — — — — —	— — — — — —	0.1 0.1 0.1 0.1 0.1 0.1	$\text{V}/\mu\text{s}$
Junction Capacitance (AC Voltage = 10 mV, $V_F = 0$, $f = 100 \text{ kHz}$)	C_J	—	45	—	pF
Turn-On Time (Figure 2)	t_{on}	—	75(1)	—	ns
Turn-Off Time (Figure 3)	t_{off}	—	250(1)	—	ns

*Indicates JEDEC Registered Data. (1) Time depends on a wide variety of circuit conditions. Consult manufacturer for further information.

FIGURE 2 — TURN-ON TIME TEST CIRCUIT

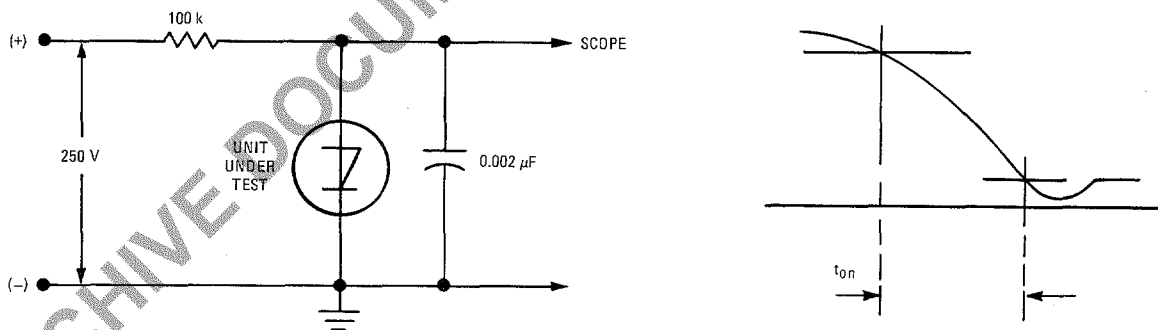


FIGURE 3 — TURN-OFF TIME TEST CIRCUIT

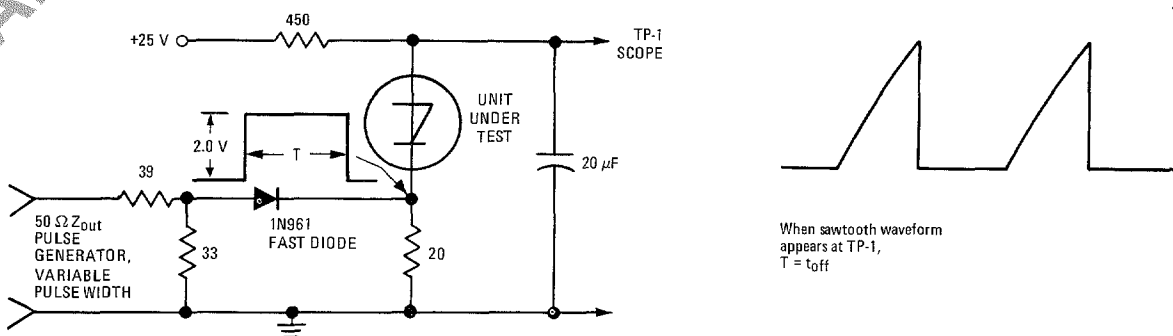


FIGURE 4 – TYPICAL FORWARD CONDUCTION CHARACTERISTICS

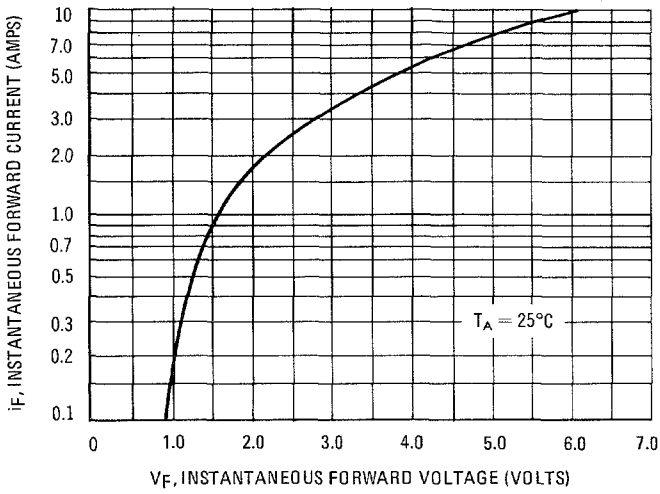
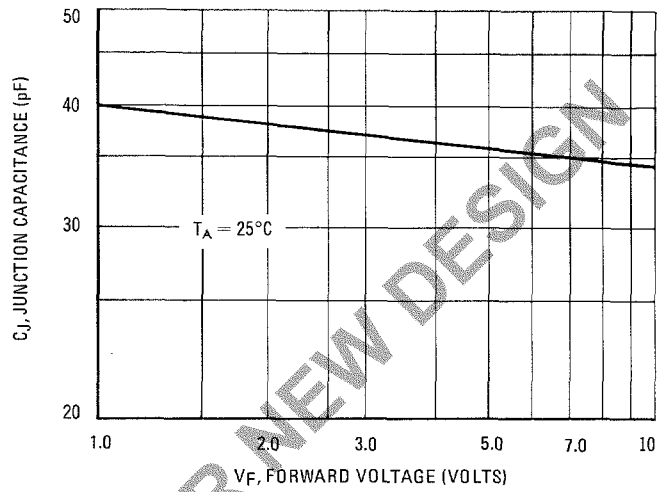


FIGURE 5 – TYPICAL CAPACITANCE



TYPICAL DC CHARACTERISTICS versus TEMPERATURE
(NORMALIZED to 25°C VALUE)

FIGURE 6 – FORWARD BREAKOVER VOLTAGE

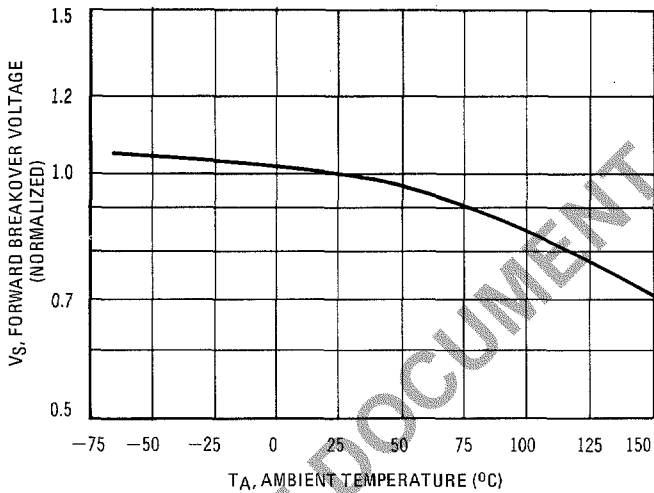


FIGURE 7 – REVERSE BLOCKING VOLTAGE

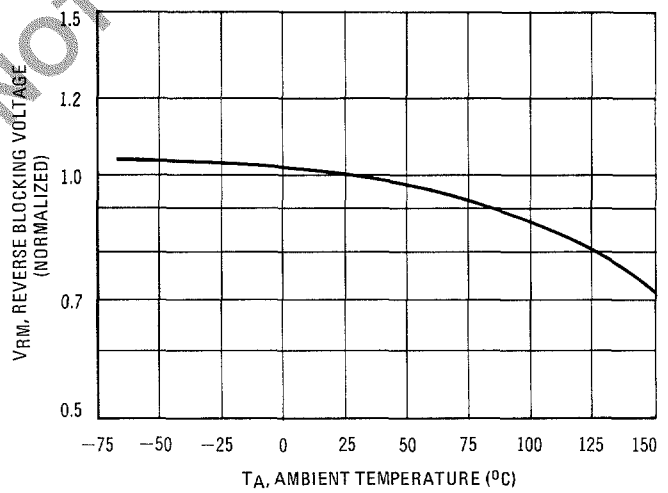


FIGURE 8 – FORWARD BREAKOVER CURRENT

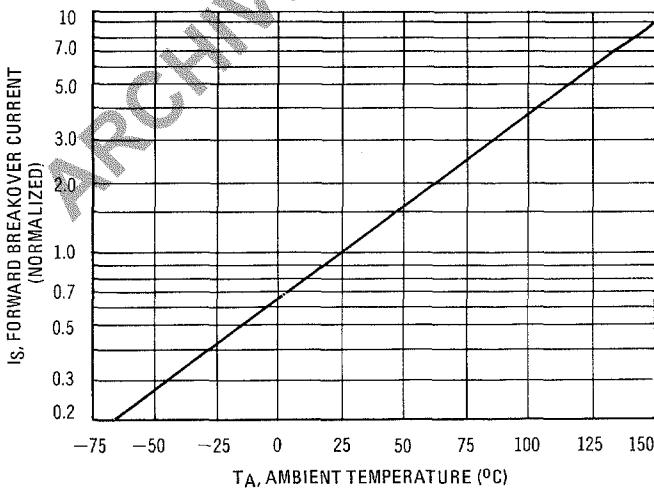
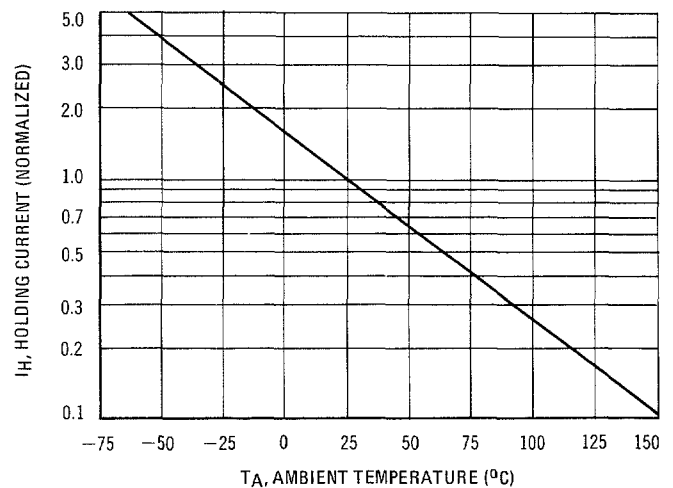
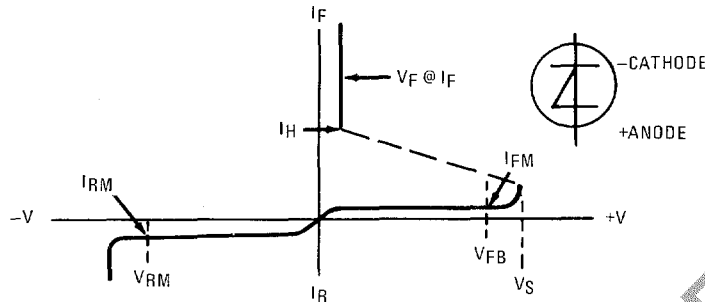


FIGURE 9 – HOLDING CURRENT



4-LAYER DIODE SYMBOLS AND DEFINITIONS



dv/dt FORWARD VOLTAGE APPLICATION RATE (V/ μ s) — The rate of rise of forward voltage.

I_S FORWARD BREAKOVER (SWITCHING) CURRENT — The value of anode current at the instant the device switches from the blocking to the "on" state, specified at a particular junction temperature.

I_F FORWARD CURRENT — The continuous or DC value of forward current during the "on" state.

I_{FM} PEAK FORWARD BLOCKING CURRENT — The peak anode current when the 4-layer diode is in the "off" state for a stated anode-to-cathode voltage and junction temperature.

I_H HOLDING CURRENT — That value of forward anode current below which the 4-layer diode switches from the conducting state to the forward blocking condition.

I_{pulse} PEAK PULSE CURRENT — The peak repetitive current that can flow through the device for the time duration stated.

I_{RM} PEAK REVERSE BLOCKING CURRENT — The peak current when the 4-layer diode is in the reverse blocking state for a stated anode-to-cathode voltage and junction temperature.

P_D STEADY STATE POWER DISSIPATION

T_A AMBIENT TEMPERATURE

T_J JUNCTION TEMPERATURE

T_{stg} STORAGE TEMPERATURE

t_{on} TURN-ON TIME — The time interval between the 90% point (90% of forward blocking voltage) and the point 10% above the "on" voltage under stated conditions.

t_{off} TURN-OFF TIME — The time interval required for the device to regain control of its forward blocking characteristic after interruption of forward anode current.

V_S FORWARD BREAKOVER (SWITCHING) VOLTAGE — The positive anode voltage with respect to cathode required to switch the device from the high impedance blocking state to the low impedance "on" state, specified at a particular junction temperature.

V_F FORWARD VOLTAGE — The forward voltage across the device in the "on" state under stated conditions of current and temperature.

V_{FB} FORWARD BLOCKING VOLTAGE — The anode-to-cathode voltage when the 4-layer diode is in the "off" state.

V_{RM} PEAK REVERSE VOLTAGE — The maximum allowable instantaneous value of reverse voltage (repetitive or continuous DC) which can be applied to the device at a stated temperature without damage to the device.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed all glass case
 DIMENSIONS: JEDEC DO-7 Outline
 FINISH: All external surfaces are corrosion resistant with readily solderable leads.
 POLARITY: Cathode end indicated by color band.
 WEIGHT: 0.2 grams (approx.)
 MOUNTING POSITION: Any



MOTOROLA Semiconductor Products Inc.

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