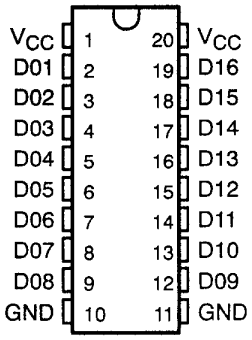
D3424, SEPTEMBER 1990

- **Designed to Reduce Reflection Noise**
- **Repetitive Peak Forward Current . . . 200 mA**
- **16-Bit Array Structure Suited for Bus-Oriented Systems**
- **Package Options Include Plastic "Small Outline" Packages and Standard Plastic 300-mil DIPs**

DW OR N PACKAGE

(TOP VIEW)

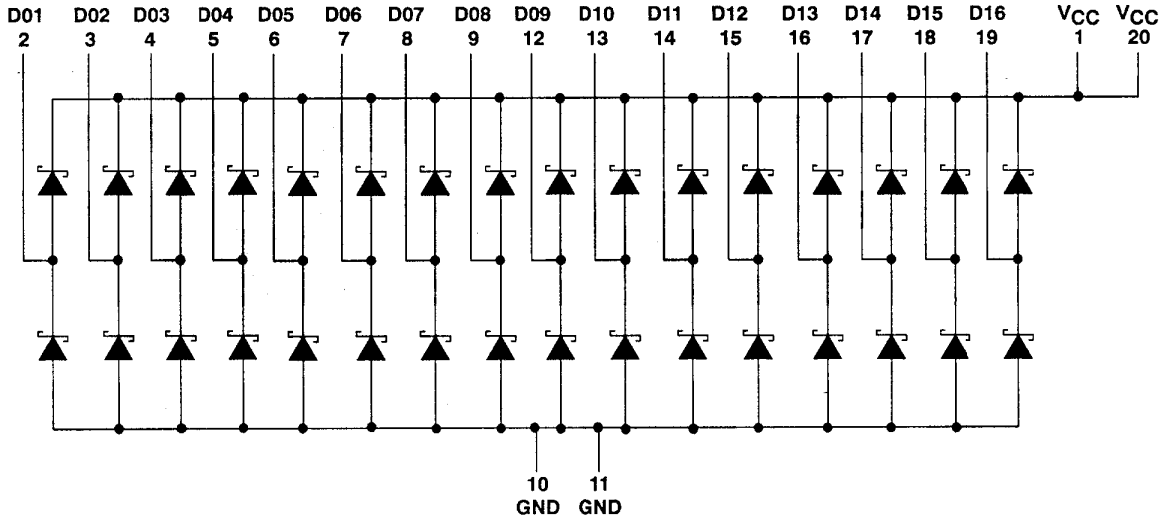


description

This Schottky barrier diode bus-termination array is designed to reduce reflection noise on memory bus lines. This device consists of a 16-bit high-speed Schottky diode array suitable for clamping to V_{CC} and/or GND.

The 74S1053 is characterized for operation from 0°C to 70°C.

schematic diagram



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Steady-state reverse voltage, V_R ..... 7 V
Continuous forward current, I_F: any D terminal from GND or to V_{CC} ..... 50 mA
total through all GND or V_{CC} terminals ..... 170 mA
Repetitive peak forward current‡, I_{FRM}: any D terminal from GND or to V_{CC} ..... 200 mA
total through all GND or V_{CC} terminals ..... 1 A
Continuous total power dissipation at (or below) 25°C free-air temperature (see Note 1) ..... 625 mW
Operating free-air temperature range ..... 0°C to 70°C
Storage temperature range ..... −65°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

‡ These values apply for $t_w \leq 100$ µs, duty cycle ≤ 20%.

NOTE 1: For operation above 25°C free-air temperature, derate linearly at the rate of 5 mW/°C.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

single-diode operation (see Note 2)

PARAMETER		TEST CONDITIONS		MIN	TYP§	MAX	UNIT
V_F	Static forward voltage	To V_{CC}	I_F = 18 mA		0.85	1.05	V
			I_F = 50 mA		1.05	1.3	
		From GND	I_F = 18 mA		0.75	0.95	V
			I_F = 50 mA		0.95	1.2	
V_{FM}	Peak forward voltage		I_F = 200 mA		1.45		V
I_R	Static reverse current	To V_{CC}	V_R = 7 V			5	µA
		From GND				5	
C_T	Total capacitance	V_R = 0,	f = 1 MHz		8	16	pF
		V_R = 2 V,	f = 1 MHz		4	8	

§ All typical values are at V_{CC} = 5 V, T_A = 25°C.

NOTE 2: Test conditions and limits apply separately to each of the diodes. The diodes not under test are open circuited during the measurement of these characteristics.

multiple-diode operation

PARAMETER		TEST CONDITIONS		MIN	TYP§	MAX	UNIT
I_X	Internal crosstalk current	Total I_F = 1 A,	See Note 3		0.8	2	mA
		Total I_F = 198 mA,	See Note 3		0.02	0.2	

§ All typical values are at V_{CC} = 5 V, T_A = 25°C.

NOTE 3: I_X is measured under the following conditions with one diode static and all others switching: switching diodes: t_w = 100 µs, duty cycle = 0.2; static diode: V_R = 5 V. The static diode's input current is the internal crosstalk current I_X.

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Note 4)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{rr}	Reverse recovery time	I_F = 10 mA, $I_{RM(REC)}$ = 10 mA, $i_{R(REC)}$ = 1 mA, R_L = 100 Ω		8	16	ns

NOTE 4: Load circuit and voltage waveforms are shown in Section 1.

TYPICAL APPLICATION INFORMATION

Large transients occurring at the inputs of memory devices (DRAMs, SRAMs, EPROMs, etc), or on the CLOCK lines of many clocked devices can result in improper operation of the devices. The SN74S1051 and SN74S1053 diode termination arrays help suppress transients caused by transmission line reflections, crosstalk, and switching noise.

Diode terminations have several advantages when compared to resistor termination schemes. Split resistor or Thevenin equivalent termination can cause a substantial increase in power consumption. The use of a single resistor to Ground to terminate a line usually results in degradation of the output high level, resulting in reduced noise immunity. Series damping resistors placed on the outputs of the driver will reduce transients, but they can also increase propagation delays down the line, as a series resistor reduces the output drive capability of the driving device. Diode terminations have none of these drawbacks.

The operation of the diode arrays in reducing transients is explained in the following figures. The diode conducts current whenever the voltage reaches a negative value large enough for the diode to turn on. Suppression of transients is tracked by the current-voltage characteristic curve for that diode. Typical current-voltage curves for the SN74S1051 / S1053 are shown in Figures 1 and 2.

To illustrate how the diode arrays act to reduce transients at the end of a transmission line, the test setup in Figure 3 was evaluated. The resulting waveforms with and without the diode are shown in Figure 4.

The maximum effectiveness of the diode arrays in suppressing transients occurs when they are placed at the end of a line and/or the end of a long stub branching off a main transmission line. The diodes can also be used to reduce the transients that occur due to discontinuities in the middle of a line. An example of this is a slot in a backplane that is provided for an add-on card.

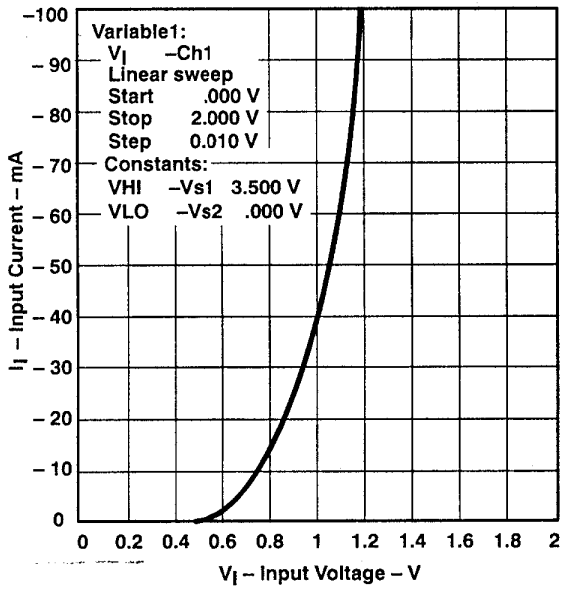


Figure 1. Typical Input Current vs Input Voltage (Lower Diode)

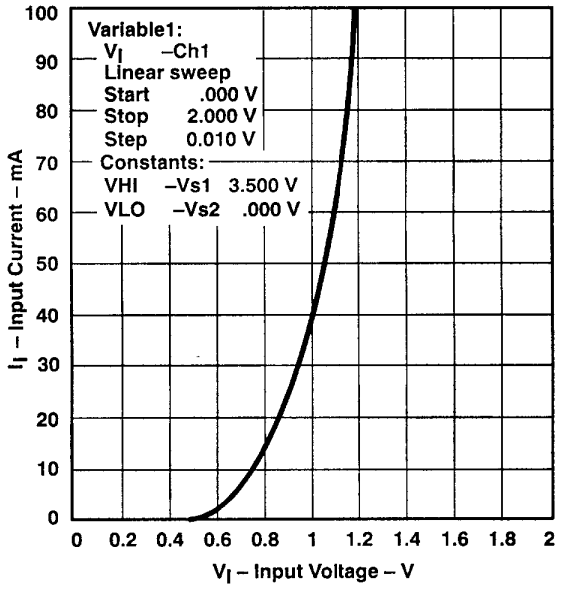


Figure 2. Typical Input Current vs Input Voltage (Upper Diode)

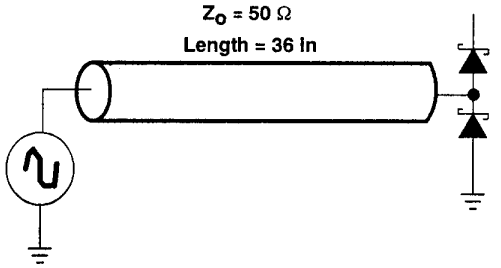


Figure 3. Diode Test Setup

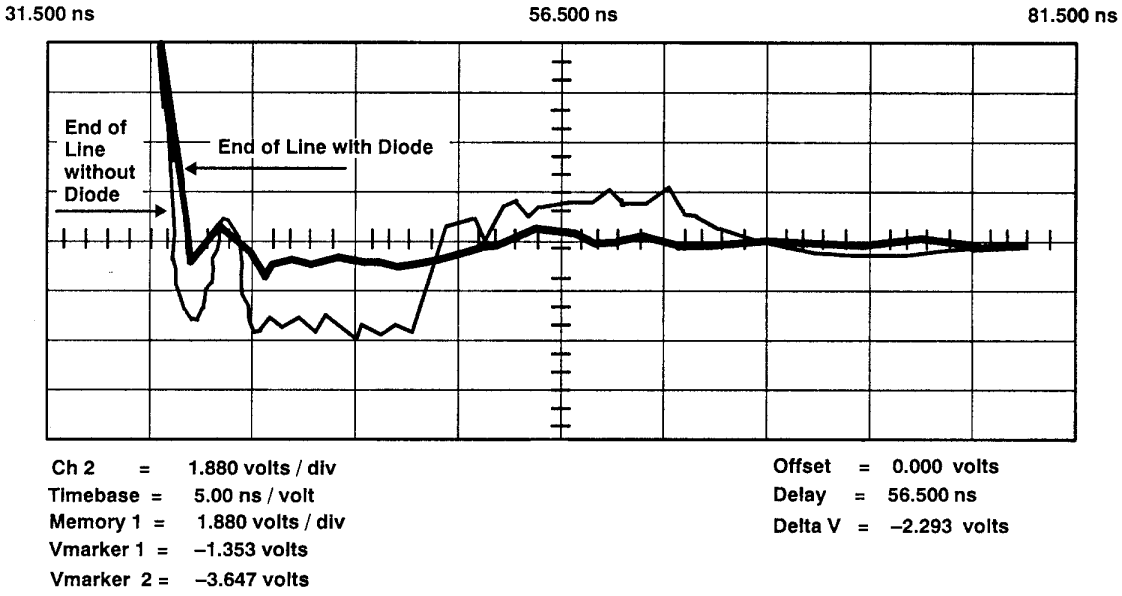


Figure 4. Scope Display