

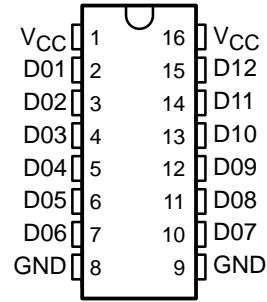
# SN74S1051

## 12-BIT SCHOTTKY BARRIER DIODE BUS-TERMINATION ARRAY

SDLS018A – SEPTEMBER 1990 – REVISED AUGUST 1997

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

D OR N PACKAGE  
(TOP VIEW)

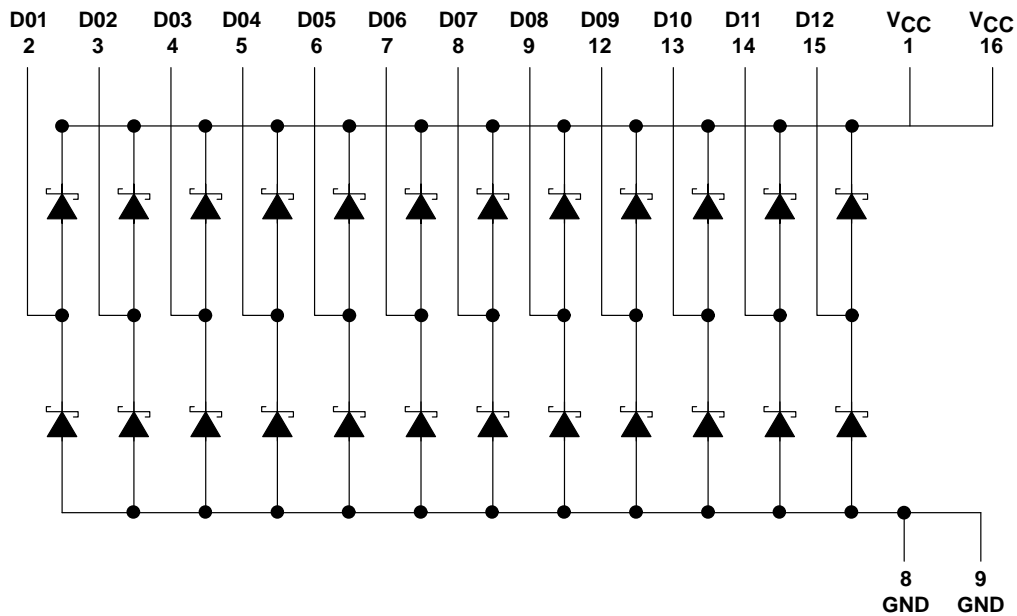


### description

This Schottky barrier diode bus-termination array is designed to reduce reflection noise on memory bus lines. This device consists of a 12-bit high-speed Schottky diode array suitable for clamping to V<sub>CC</sub> and/or GND.

The SN74S1051 is characterized for operation from 0°C to 70°C.

### schematic diagrams



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1997, Texas Instruments Incorporated

**SN74S1051**  
**12-BIT SCHOTTKY BARRIER DIODE**  
**BUS-TERMINATION ARRAY**

SDLS018A – SEPTEMBER 1990 – REVISED AUGUST 1997

**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 $V_{CC}$ .....	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, $T_{stg}$ .....	-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  $t_w \leq 100 \mu s$ , duty cycle  $\leq 20\%$ .

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 $V_{CC}$	$I_F = 18 \text{ mA}$	0.85	1.05	V	
			$I_F = 50 \text{ mA}$	1.05	1.3		
		From GND	$I_F = 18 \text{ mA}$	0.75	0.95		
			$I_F = 50 \text{ mA}$	0.95	1.2		
$V_{FM}$	Peak forward voltage		$I_F = 200 \text{ mA}$	1.45		V	
$I_R$	Static reverse current	To $V_{CC}$	$V_R = 7 \text{ V}$			5	$\mu A$
		From GND			5		
$C_t$	Total capacitance	$V_R = 0 \text{ V}, f = 1 \text{ MHz}$		8	16	pF	
		$V_R = 2 \text{ V}, f = 1 \text{ MHz}$		4	8		

§ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ C$ .

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 $I_F$ current = 1 A,	See Note 3	0.8	2	mA	
		Total $I_F$ current = 198 mA,	See Note 3	0.02	0.2		

§ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ C$ .

NOTE 3:  $I_x$  is measured under the following conditions with one diode static, all others switching:

Switching diodes:  $t_w = 100 \mu s$ , duty cycle = 20%

Static diode:  $V_R = 5 \text{ V}$

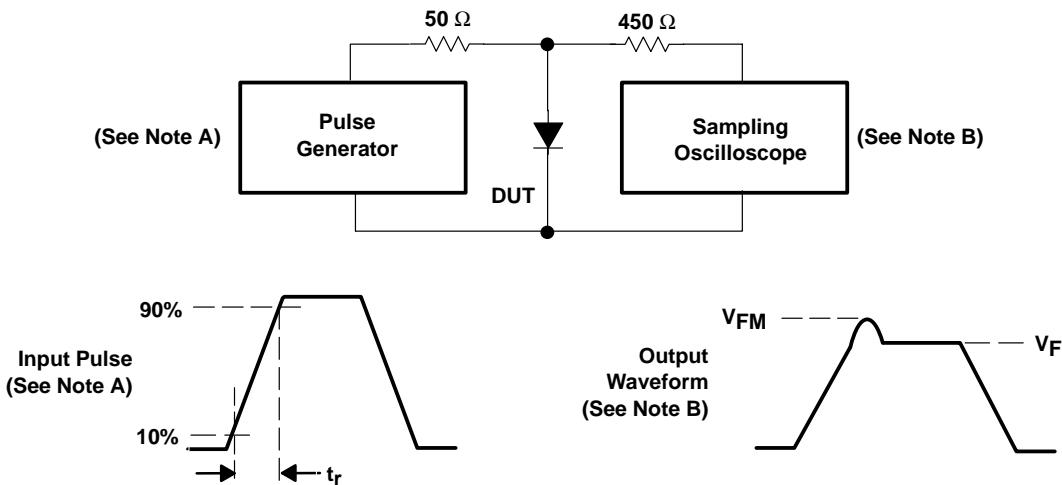
The static diode input current is the internal crosstalk current  $I_x$ .

**switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figures 1 and 2)**

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

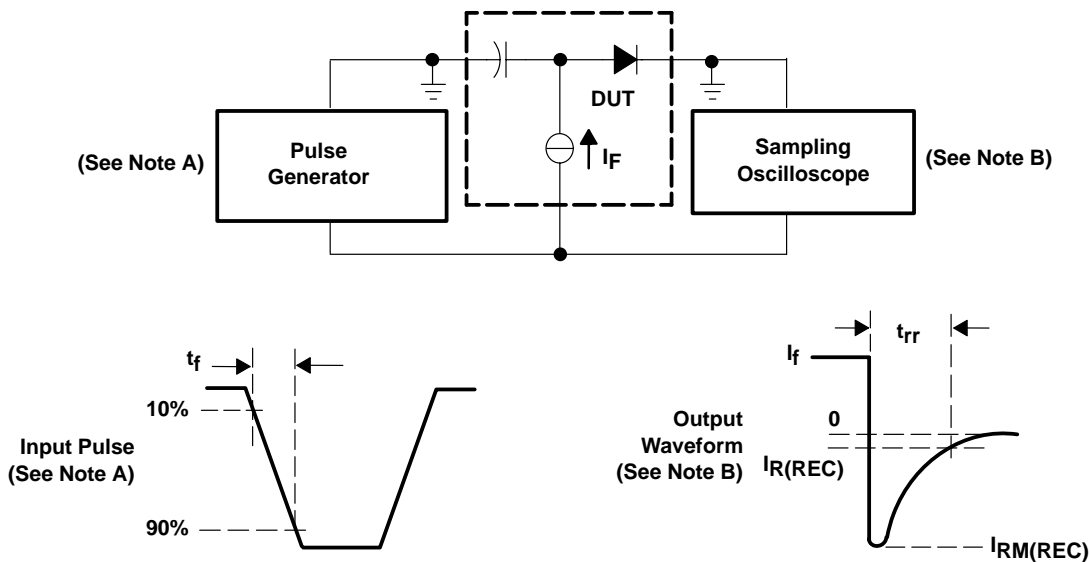


**PARAMETER MEASUREMENT INFORMATION**



- NOTES: A. The input pulse is supplied by a pulse generator having the following characteristics:  $t_r = 20$  ns,  $Z_O = 50 \Omega$ , freq = 500 Hz, duty cycle = 1%.
- B. The output waveform is monitored by an oscilloscope having the following characteristics:  $t_r \leq 350$  ps,  $R_i = 50 \Omega$ ,  $C_i \leq 5$  pF.

**Figure 1. Forward Recovery Voltage**



- NOTES: A. The input pulse is supplied by a pulse generator having the following characteristics:  $t_f = 0.5$  ns,  $Z_O = 50 \Omega$ ,  $t_w \geq 50$  ns, duty cycle = 1%.
- B. The output waveform is monitored by an oscilloscope having the following characteristics:  $t_r \leq 350$  ps,  $R_i = 50 \Omega$ ,  $C_i \leq 5$  pF.

**Figure 2. Reverse Recovery Time**

# SN74S1051 12-BIT SCHOTTKY BARRIER DIODE BUS-TERMINATION ARRAY

SDLS018A – SEPTEMBER 1990 – REVISED AUGUST 1997

## APPLICATION INFORMATION

Large negative 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 diode termination array helps suppress negative 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 reduce negative transients, but they also can 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 negative transients is explained in the following figures. The diode conducts current when the voltage reaches a negative value large enough for the diode to turn on. Suppression of negative transients is tracked by the current-voltage characteristic curve for that diode. Typical current-versus-voltage curves for the SN74S1051 are shown in Figures 3 and 4.

To illustrate how the diode arrays act to reduce negative transients at the end of a transmission line, the test setup in Figure 5 was evaluated. The resulting waveforms with and without the diode are shown in Figure 6.

The maximum effectiveness of the diode arrays in suppressing negative transients occurs when the diode arrays are placed at the end of a line and/or the end of a long stub branching off a main transmission line. The diodes also can be used to reduce the negative 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.

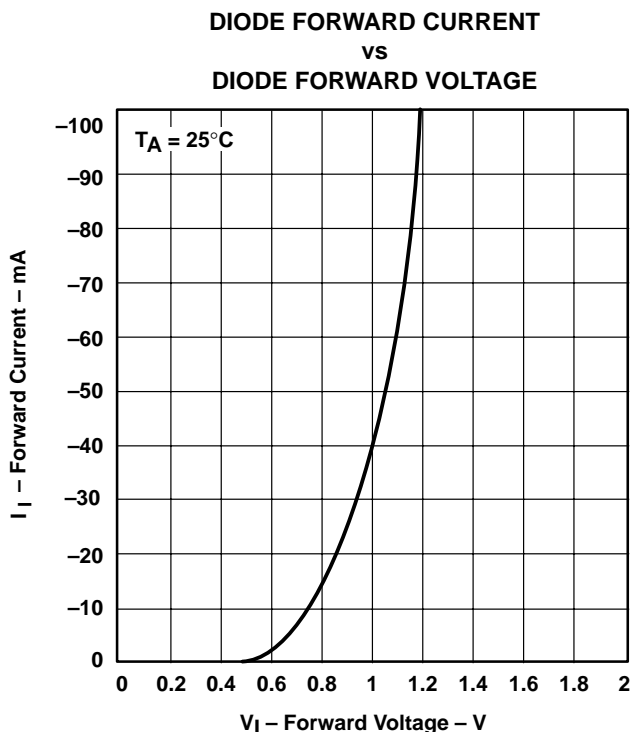
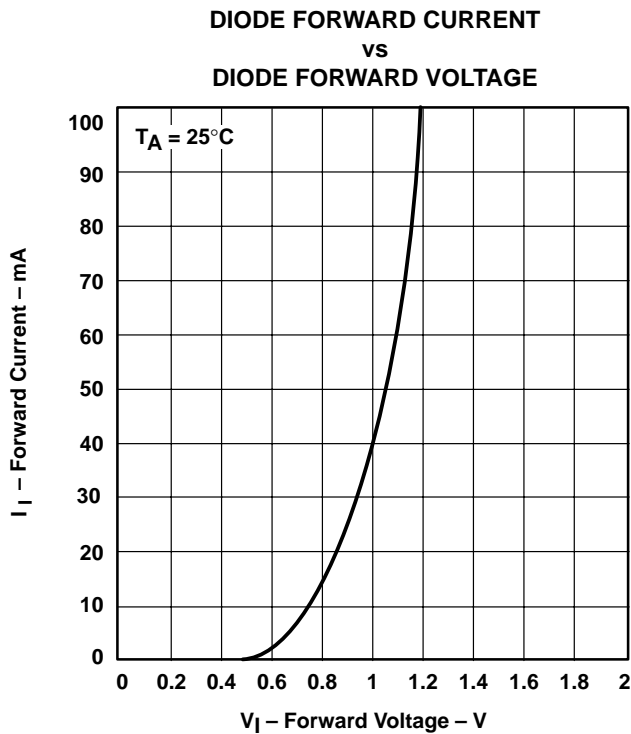


Figure 3. Typical Input Current vs Input Voltage  
(Lower Diode)



**Figure 4. Typical Input Current vs Input Voltage  
(Upper Diode)**

APPLICATION INFORMATION

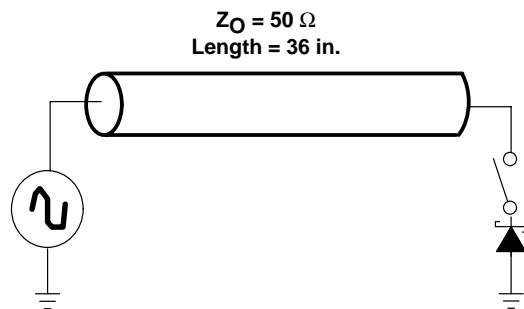


Figure 5. Diode Test Setup

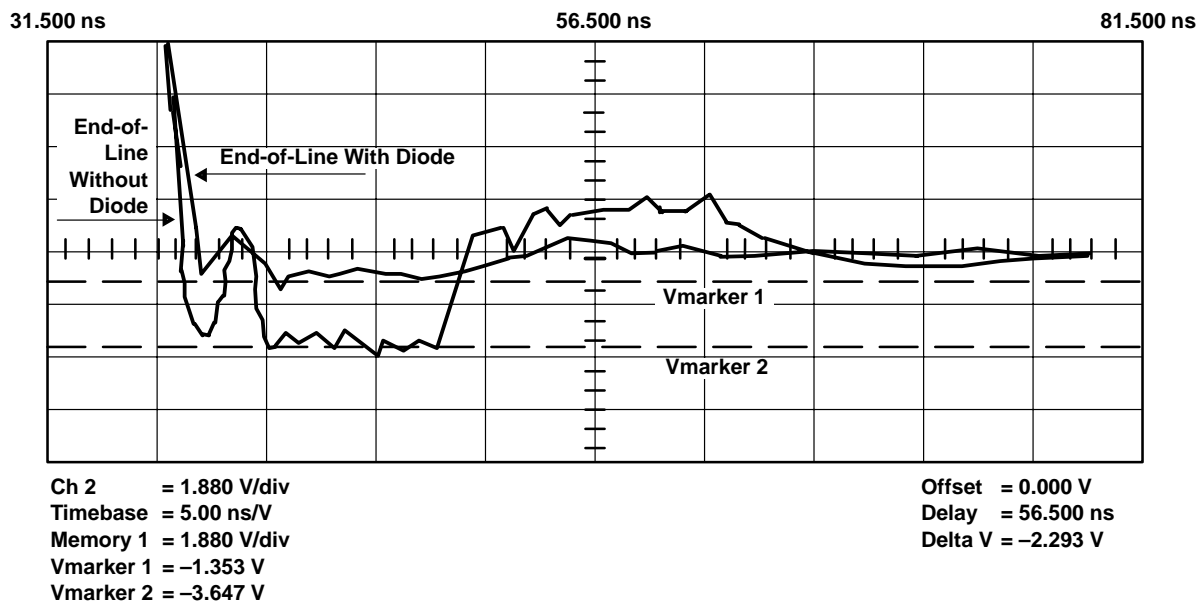


Figure 6. Oscilloscope Display

## **IMPORTANT NOTICE**

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

**TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.**

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.