

## 74F1071

### 18-Bit Undershoot/Overshoot Clamp and ESD Protection Device

#### General Description

The 'F1071 is an 18-bit undershoot/overshoot clamp which is designed to limit bus voltages and also to protect more sensitive devices from electrical overstress due to electrostatic discharge (ESD). The inputs of the device aggressively clamp voltage excursions nominally at 0.5V below and 7V above ground.

#### Features

- 18-bit array structure in 20-pin package
- Fast bipolar voltage clamping action
- Dual center pin grounds for min inductance
- Robust design for ESD protection
- Low input capacitance
- Optimum voltage clamping for 5V CMOS/TTL applications

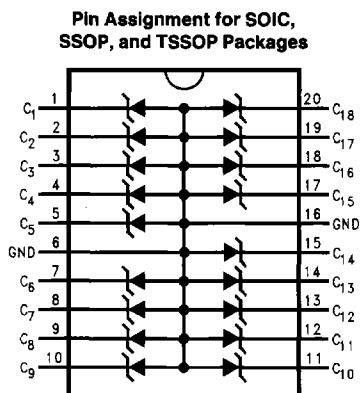
**Ordering Code:** See Section 11

Commercial	Package Number	Package Description
74F1071SC (Note 1)	M20B	20-Lead Molded Small Outline, JEDEC
74F1071MSA (Note 1)	MSA20	20-Lead Molded Shrink Small Outline, EIAJ Type II
74F1071MTC (Notes 1, 2)	MTC20	20-Lead Molded Thin Shrink Small Outline, JEDEC

**Note 1:** Devices also available in 13" reel. Use suffix = SCX and MSAX, or MTCX respectively.

**Note 2:** Consult National Semiconductor Customer Support Center for availability.

#### Connection Diagram



TL/F/11685-1

**Note:** Simplified Component Representation

**Absolute Maximum Ratings** (Note 1)

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-65°C to +125°C
Junction Temperature under Bias	
Ceramic Package	-65°C to +175°C
Plastic Package	-65°C to +150°C
Input Voltage (Note 2)	-0.5V to +6V
Input Current (Note 2)	-200 mA to +50 mA
ESD (Note 3)	
Human Body Model	
(MIL-STD-883D method 3015.7)	± 10 kV
IEC 801-2	± 6 kV
Machine Model (EIAJIC-121-1981)	± 2 kV
DC Latchup Source Current (JEDEC Method 17)	± 500 mA
Package Power Dissipation @ +70°C	
SOIC Package	800 mW

**Recommended Operating Conditions**

Free Air Ambient Temperature	
Commercial	0°C to +70°C
Reverse Bias Voltage	
Commercial	0V to 5.25 V <sub>DC</sub>
Thermal Resistance ( $\theta_{JA}$ in Free Air)	
SOIC Package	100°C/W
SSOP Package	110°C/W

**Note 1:** Absolute maximum ratings are DC values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 2:** Voltage ratings may be exceeded if current ratings and junction temperature and power consumption ratings are not exceeded.

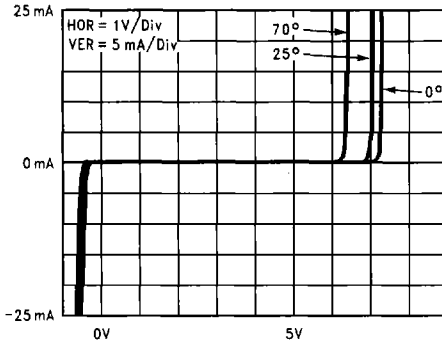
**Note 3:** ESD Rating for Direct contact discharge using ESD Simulation Tester. Higher rating may be realized in the actual application.

**Electrical Characteristics**

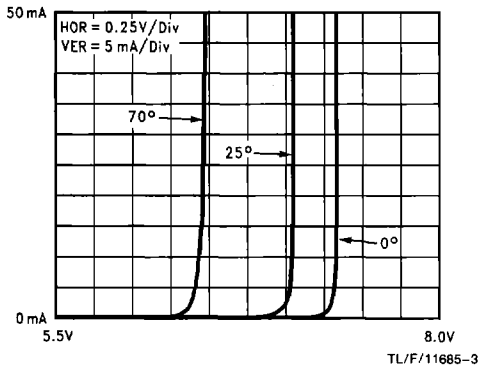
Symbol	Parameter	74F1071 T <sub>A</sub> = +25°C			74F1071 T <sub>A</sub> = 0°C to +70°C		Units	Conditions
		Min	Typ	Max	Min	Max		
I <sub>IH</sub>	Input High Current		1.5	10		50	μA	V <sub>IN</sub> = 5.25V; Untested Input @ GND V <sub>IN</sub> = 5.5V; Untested Input @ GND
			3	20		100		
V <sub>Z</sub>	Reverse Voltage	6.6	6.9	7.2	5.9	7.7	V	I <sub>Z</sub> = 1 mA; Untested Inputs @ GND I <sub>Z</sub> = 50 mA; Untested Inputs @ GND
			7.1	7.5		8.0		
V <sub>F</sub>	Forward Voltage	-0.3	-0.6	-0.9	-0.3	-0.9	V	I <sub>F</sub> = -18 mA; Untested Inputs @ 5V I <sub>F</sub> = -200 mA; Untested Inputs @ 5V
		-0.5	-1.1	-1.5	-0.5	-1.5		
I <sub>CT</sub>	Adjacent Input Crosstalk			3			%	
C <sub>IN</sub>	Input Capacitance (small signal @ 1 MHz)		25				pF	V <sub>BIAS</sub> = 0 V <sub>DC</sub> V <sub>BIAS</sub> = 5 V <sub>DC</sub>
			13					

**Electrical Characteristics** (Continued)

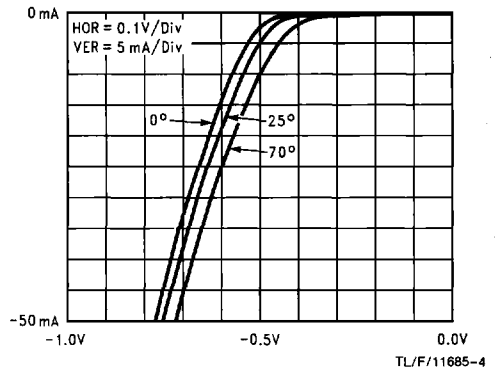
**Typical Forward and Reverse V/I Characteristics**



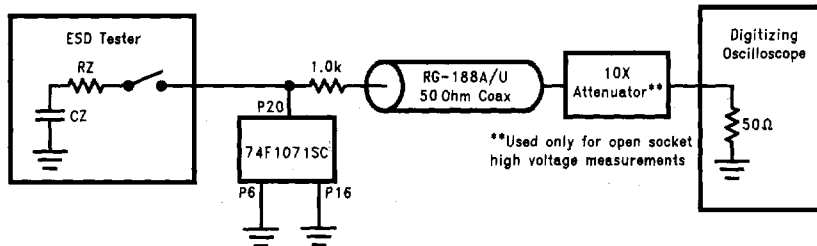
**Typical Reverse Conduction Characteristics**



**Typical Forward Conduction Characteristics**



**Electrical Characteristics** (Continued)

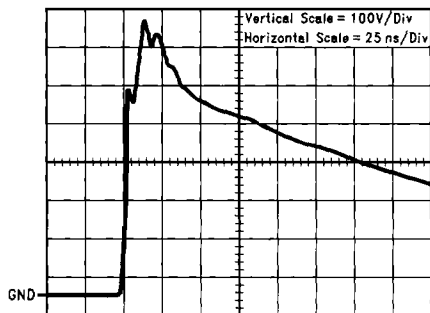


TL/F/11685-5

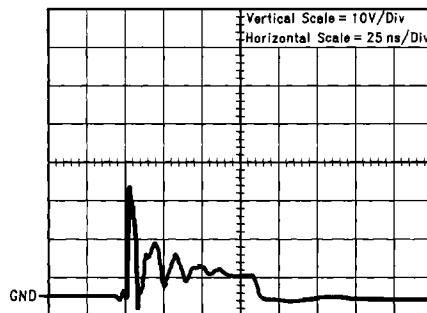
ESD Network	CZ	RZ
Human Body Model	100 pF	1500Ω
IEC 801-2	150 pF	330Ω

Simulated ESD Voltage Clamping Test Circuit

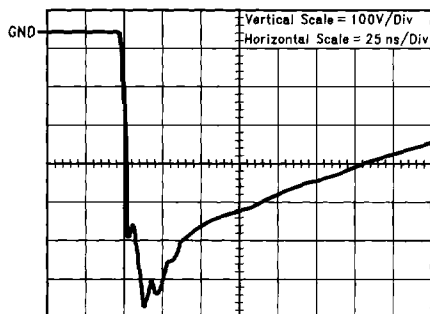
**Unclamped + 1 KV ESD Voltage Waveform (IEC801-2 Network)**



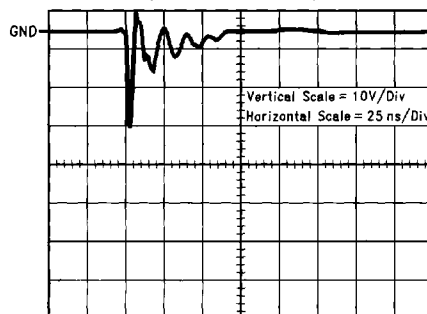
**Clamped + 1 KV ESD Voltage Waveform (IEC801-2 Network)**



**Unclamped - 1 KV ESD Voltage Waveform (IEC801-2 Network)**

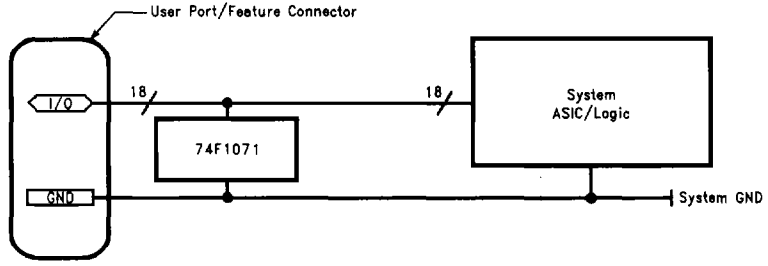


**Clamped - 1 KV ESD Voltage Waveform (IEC801-2 Network)**



TL/F/11685-6

### Typical Application



74F1071 ESD Protection of ASIC on User Port

TL/F/11685-7