



## VGA PROTECTION AND TERMINATION NETWORK

### Features

- 7 channel ESD protection
- 15KV ESD protection (HBM)
- 8KV contact, 15KV air discharge ESD protection per IEC 1000-4-2 (Level 4)
- Low loading capacitance, 4.5pF typical

### Application

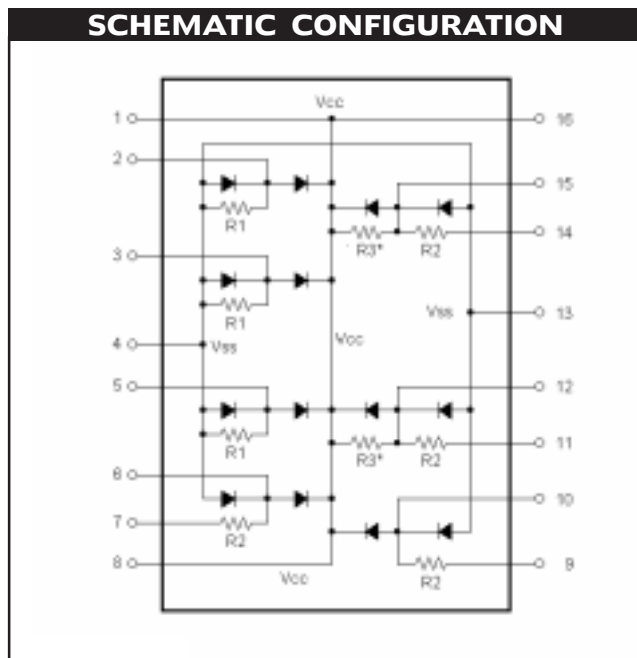
- ESD protection for VGA (video) port in PCs and notebooks.

### Product Description

The PAC VGA-100/101 acts as a transmission line terminating and ESD protection device. It provides 75 Ohm parallel terminations for the R, G, B lines and series terminations for the Horizontal and Vertical Sync lines and two monitor ID lines which provide 'Plug and Play' logic signals. In addition, all interface lines provide Level 4 ESD protection per the IEC1000-4-2 contact discharge Specification. The PAC VGA-100 provides internal pull-up resistors for the two monitor ID lines. The PAC VGA-101 omits these internal pull-ups so that different pull-up resistor values can be added externally.

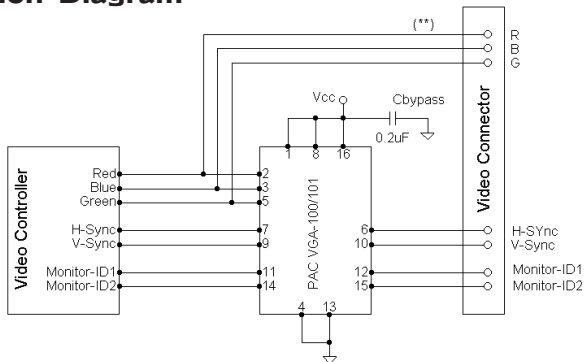
ABSOLUTE MAXIMUM RATINGS	
Diode Forward DC Current (Note 1)	20mA
Storage Temperature	-65°C to 150°C
Operating Temperature Range	0°C to 70°C
DC Voltage at any Channel Input	$V_N - 0.5V$ to $V_P + 0.5V$

Note 1: Only one diode conducting at a time.



R1 = 75Ω, R2 = 33Ω, R3 = 2.2KΩ (VGA-100 only)  
 (\*) R3 Removed (VGA-101 only)

### Typical Connection Diagram



(\*\*) For best ESD protection, minimize trace lengths between PAC VGA-100/101 and the video connector.



STANDARD SPECIFICATIONS			
Parameter	Min.	Typ.	Max.
Operating Supply Voltage ( $V_P - V_N$ )			5.5V
R/G/B termination resistor (R1) tolerance			$\pm 5\%$
Series termination resistor (R2) tolerance			$\pm 5\%$
Monitor ID pull-up resistor resistor (R3) tolerance			$\pm 10\%$
Diode Forward Voltage, $I_F = 20\text{mA}$ , $T = 25^\circ\text{C}$	0.65V		0.95V
Diode reverse breakdown voltage, $T = 25^\circ\text{C}$			
Top Diode (Cathode to $V_P$ )	17.0V		
Bottom Diode (Anode to $V_N$ )	25.0V		
ESD Protection			
Peak Discharge Voltage at pins 7, 9, 11 and 14 Human Body Model, Method 3015 (Note 6)	-4KV		+4KV
Peak Discharge Voltage at pins 2, 3, 5, 6, 10, 12, 15 In-system (Note 2)			
Human Body Model, Method 3015 (Notes 3, 4)	-15KV		+15KV
Contact Discharge per IEC 1000-4-2 (Note 5)	-8KV		+8KV
Channel Clamp Voltage @ 15KV ESD HBM, $T = 25^\circ\text{C}$ at pins 2, 3, 5, 6, 10, 12, 15. (Notes 3, 4)			
Positive transients			$V_P + 13.0\text{V}$
Negative transients			$V_N - 13.0\text{V}$
Channel Leakage Current, $T = 25^\circ\text{C}$		0.1 $\mu\text{A}$	1.0 $\mu\text{A}$
Channel Input Capacitance (Measured @ 1 MHz) at pins 2, 3, 5, 6, 10, 12, 15. $V_P = 5\text{V}$ , $V_N = 0\text{V}$ , $V_{\text{INPUT}} = 2.5\text{V}$		4.5pF	7pF
Package Power Rating QSOP Package			800mW

Note 2: From I/O pins to  $V_P$  or  $V_N$  only.  $V_P$  bypassed to  $V_N$  with 0.2  $\mu\text{F}$  ceramic capacitor.

Note 3: Human Body Model per MIL-STD-883, Method 3015,  $C_{\text{Discharge}} = 100\text{pF}$ ,  $R_{\text{Discharge}} = 1.5\text{K}\Omega$ ,  $V_P = 5\text{V}$ ,  $V_N = \text{GND}$ .

Note 4: This parameter is guaranteed by characterization.

Note 5: Standard IEC1000-4-2 with  $C_{\text{Discharge}} = 150\text{pF}$ , and  $R_{\text{Discharge}} = 330\Omega$ ,  $V_P = 5\text{V}$ ,  $V_N = \text{GND}$ .

Note 6: These pins are not connected directly to the video connector, and therefore are not subject to direct ESD strikes.

Application Information: See California Micro Devices' Application Note AP-209 "Design Considerations for ESD Protection"

STANDARD PART ORDERING INFORMATION				
Package		Ordering Part Number		
Pins	Style	Tubes	Tape & Reel	Part Marking
16	QSOP	PACVGA-100/T	PACVGA-100/R	PACVGA100
16	QSOP	PACVGA-101/T	PACVGA-101/R	PACVGA101