



VGA Port ESD Protection and Termination Network

Features

- Seven channel ESD protection
- ± 15 kV ESD protection per channel, connector side (HBM)
- ± 8 kV contact, 15 kV air discharge ESD protection per channel, connector side (IEC 61000-4-2 Level 4 standard)
- Low loading capacitance—4.5pF typical
- 16-pin QSOP package

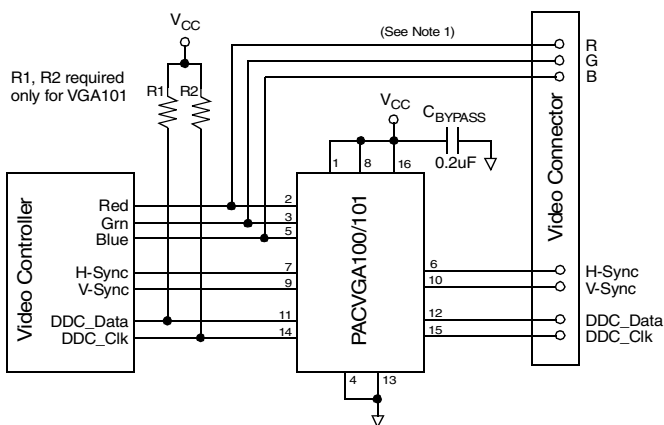
Applications

- ESD protection and termination resistors for VGA (video) port interfaces
- Desktop PCs
- Notebook computers
- LCD monitors

Product Description

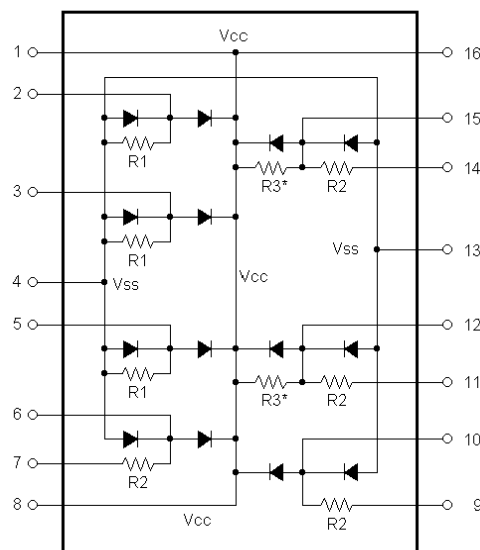
The PACVGA100/101 functions as a transmission line termination and ESD protection device for video applications. It provides 75 ohm parallel terminations for video R, G, and B lines and series terminations for the Horizontal Sync, Vertical Sync and the two DDC lines which serve as Plug and Play logic signals. In addition, all interface lines provide Level 4 ESD protection per the IEC 61000-4-2 contact discharge specification. The PACVGA100 provides internal pull-up resistors (R3) for the two DDC lines whereas the PACVGA101 omits these internal pull-ups so that different pull-up resistor values can be added externally.

Typical Application Circuit



Note 1: For best ESD protection, minimize R/G/B trace lengths between the PACVGA100/101 device and the video connector.

Simplified Electrical Schematic

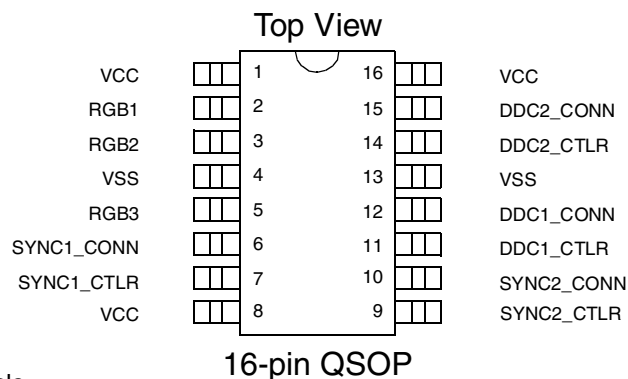


$R1 = 75\Omega$, $R2 = 33\Omega$
 $R3 = 2.2K\Omega$ (for PACVGA100 only)

* R3 omitted for PACVGA101



PACKAGE / PINOUT DIAGRAM



Note: This drawing is not to scale.

PIN DESCRIPTIONS

LEAD(s)	NAME	DESCRIPTION
1, 8, 16	V _{CC}	Positive voltage supply pins.
2	RGB1	RGB Video Protection Channel 1. Ties to one of the RGB video lines (for example, the Red signal) between the VGA controller device and the video connector.
3	RGB2	RGB Video Protection Channel 2. Ties to one of the RGB video lines (for example, the Blue signal) between the VGA controller device and the video connector.
4, 13	V _{SS}	Ground reference supply pin.
5	RGB3	RGB Video Protection Channel 3. Ties to one of the RGB video lines (for example, the Green signal) between the VGA controller device and the video connector.
6	SYNC1_CONN	Sync Signal Output 1. Ties to the video connector side of one of the sync lines (for example the Horizontal Sync signal).
7	SYNC1_CTLR	Sync Signal Input 1. Connects to the VGA Controller side of one of the sync lines (for example, the Horizontal Sync signal).
9	SYNC2_CTLR	Sync Signal Input 2. Connects to the VGA Controller side of one of the sync lines (for example, the Vertical Sync signal).
10	SYNC2_CONN	Sync Signal Output 2. Connects to the video connector side of one of the sync lines (for example, the Vertical Sync signal).
11	DDC1_CTLR	DDC Signal Input 1. Connects to the VGA Controller side of one of the DDC signals (for example, the bidirectional DDC_Data serial line).
12	DDC1_CONN	DDC Signal Output 1. Connects to the connector side of one of the DDC signals (for example, the bidirectional DDC_Data serial line).
14	DDC2_CTLR	DDC Signal Input 2. Connects to the VGA Controller side of one of the DDC signals (for example, the bidirectional DDC_Clk).
15	DDC2_CONN	DDC Signal Output 2. Connects to the connector side of one of the DDC signals (for example, the bidirectional DDC_Clk).



Ordering Information

PART NUMBERING INFORMATION			
Pins	Package	Ordering Part Number ¹	Part Marking
16	QSOP	PACVGA100	PACVGA100Q
16	QSOP	PACVGA101	PACVGA101Q

Note 1: Parts are shipped in Tape & Reel form unless otherwise specified.

Specifications

ABSOLUTE MAXIMUM RATINGS		
PARAMETER	RATING	UNITS
Supply Voltage ($V_{CC} - V_{SS}$)	6.0	V
Diode Forward DC Current (Note 1)	20	mA
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-65 to +150	°C
DC Voltage at any channel input	($V_{SS} - 0.5$) to ($V_{CC} + 0.5$)	V
Package Power Rating	800	mW

Note 1: Only one diode conducting at a time.

STANDARD OPERATING CONDITIONS		
PARAMETER	RATING	UNITS
Operating Temperature Range	-40 to +85	°C
Operating Supply Voltage ($V_{CC} - V_{SS}$)		
PACVGA100	5.0	V
PACVGA101	3.3 to 5.0	V



Specifications (cont'd)

ELECTRICAL OPERATING CHARACTERISTICS ¹						
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
TOL _R	Resistor Absolute Tolerance R/G/B Termination Resistor (R1) Series Termination Resistor (R2) DDC Pull-up Resistor (R3)				±5 ±5 ±10	% % %
TCR	Temperature Coefficient of Resistance (TCR)				±200	ppm/°C
V _F	Diode Forward Voltage	I _F = 20mA	0.65		0.95	V
V _{RB}	Diode Reverse Breakdown Voltage Top Diode (Cathode connected to V _{CC}) Bottom Diode (Anode connected to V _{SS})		17.0 25.0			V V
I _{LEAK}	Channel Leakage Current			±0.1	±1.0	μA
C _{IN}	Channel Input Capacitance at pins 2, 3, 5, 6, 10, 12 & 15	@ 1 MHz, V _P =5V, V _N =0V, V _{IN} =2.5V; Note 2 applies		4.5	6	pF
V _{ESD}	ESD Protection 1) Peak Discharge Voltage at pins 2, 3, 5, 6, 10, 12 & 15, in system a) Human Body Model, MIL-STD-883, Method 3015 b) Contact discharge per IEC 61000-4-2 2) Peak Discharge Voltage at pins 7, 9, 11 & 14 a) Human Body Model, MIL-STD-883, Method 3015	Note 3 Notes 2,4 Notes 2,5 Note 6 Notes 2,4	±15 ±8 ±4			kV kV kV
V _{CP}	Channel Clamp Voltage at pins 2, 3, 5, 6, 10, 12 & 15 Positive Transients Negative Transients	@ 15kV ESD HBM; Notes 2 & 4			V _P + 13.0 V _N - 13.0	V V

Note 1: All parameters specified at T_A=25°C unless otherwise noted.

Note 2: These parameters guaranteed by design and characterization.

Note 3: From I/O pins to V_P or V_N only; V_P bypassed to V_N with 0.2μF ceramic capacitor.

Note 4: Human Body Model per MIL-STD-883, Method 3015, C_{Discharge} = 100pF, R_{Discharge} = 1.5KΩ, V_P = 5.0V, V_N grounded.

Note 5: Standard IEC 61000-4-2 with C_{Discharge} = 150pF, R_{Discharge} = 330Ω, V_P = 5.0V, V_N grounded.

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



Mechanical Details

QSOP Mechanical Specifications

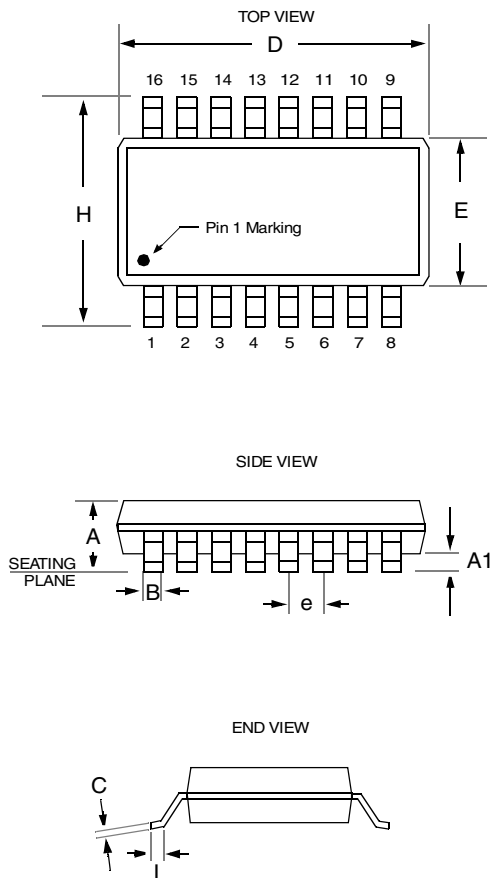
PACVGA100/101 devices are packaged in 16-pin QSOP packages. Dimensions are presented below.

For complete information on the QSOP-16 package, see the California Micro Devices QSOP Package Information document.

PACKAGE DIMENSIONS				
Package	QSOP (JEDEC name is SSOP)			
Pins	16			
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
B	0.20	0.30	0.008	0.012
C	0.18	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	3.81	3.98	0.150	0.157
e	0.64 BSC		0.025 BSC	
H	5.79	6.19	0.228	0.244
L	0.40	1.27	0.016	0.050
# per tube	100 pieces*			
# per tape and reel	2500 pieces			
Controlling dimension: inches				

* This is an approximate number which may vary.

Mechanical Package Diagrams



Package Dimensions for QSOP-16