

## IEEE 1284 Parallel Port ESD/EMI/Termination Network

### Features

- 17 EMI filters
- 17 ESD protectors yielding protection to 30kV contact discharge, per IEC 61000-4-2 specification
- 17 terminators with choice of resistor values
- 28-pin QSOP package

### Applications

- Parallel Ports of PCs, printers, peripherals, and Set-Top Boxes

### Product Description

The PACSZ1284 combines EMI filtering, ESD protection, and signal termination in a single QSOP package for parallel port interfaces complying to the IEEE 1284 standard.

The PACSZ1284 provides a complete parallel port termination solution. It integrates the equivalent of 60 discrete components, making it ideal for space critical applications. The pins of the device which connect to the parallel port are protected to 30kV contact discharge, well beyond Level 4 of the IEC 61000-4-2 specification. All other pins are ESD-protected for contact discharges up to 8kV per IEC 61000-4-2.

There are three available values for pull-up resistor R1. For the PACSZ1284-01, R1 = 1kΩ; for the PACSZ1284-02, R1 = 2.2kΩ; for the PACSZ1284-04, R1 = 4.7kΩ.

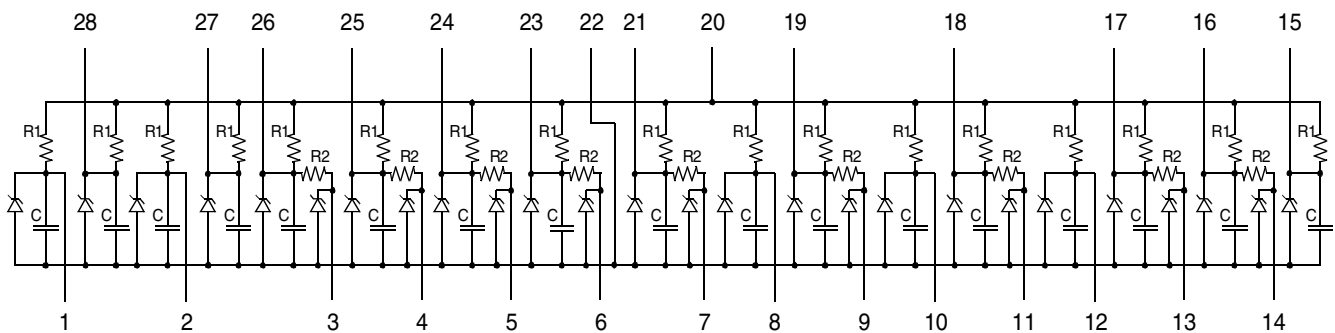
P/Active® technology provides high reliability and low cost through manufacturing efficiency. The PACSZ1284 is silicon-based and has the same reliability characteristics as today's integrated circuits.

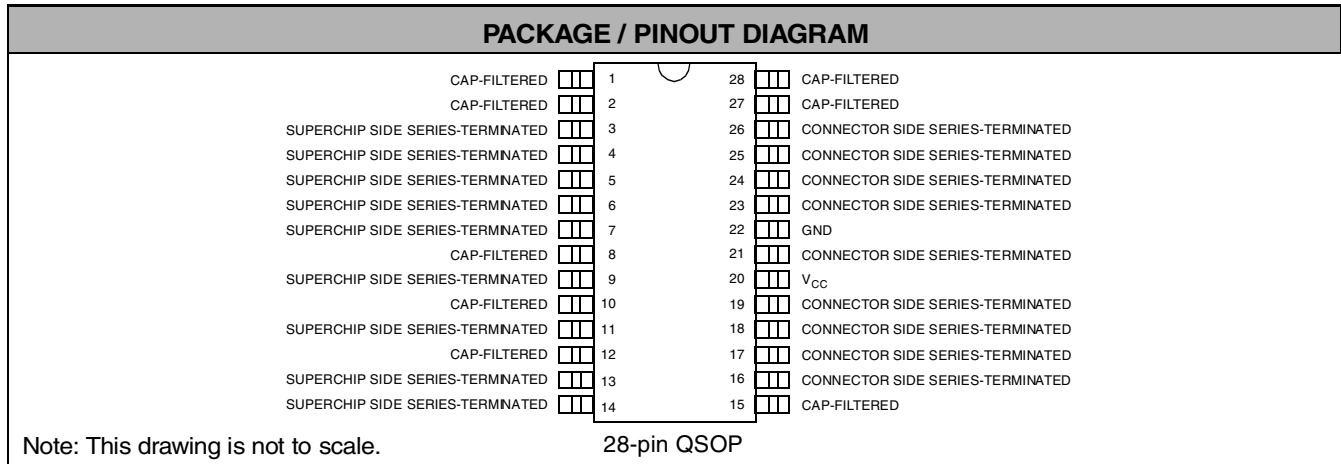
### Electrical Schematic

<b>PACSZ1284-01</b>
R1 = 1kΩ
R2 = 33Ω
C = 150pF

<b>PACSZ1284-02</b>
R1 = 2.2kΩ
R2 = 33Ω
C = 150pF

<b>PACSZ1284-04</b>
R1 = 4.7kΩ
R2 = 33Ω
C = 150pF





<b>PIN DESCRIPTIONS</b>		
LEADS	NAME	DESCRIPTION
1,2,8,10, 12,15, 27,28	Capacitor-filtered	IEEE 1284 signals which require no series termination.
3-7, 9,11, 13,14	Super I/O Chip side series-terminated	IEEE 1284 signals on the Super I/O Chip side which require series termination.
16-19, 21, 23-26	Parallel Port connector side series-terminated	IEEE 1284 signals on the Parallel Port Connector side which require series termination.
20	V <sub>CC</sub>	Supply rail for the device
22	GND	Ground reference for the device

### Ordering Information

<b>STANDARD VALUES</b>			
RC Code	R1 (Ω)	R2 (Ω)	C (pF)
01	1.0k	33	150
02	2.2k	33	150
04	4.7k	33	150

<b>PART NUMBERING INFORMATION</b>				
RC Code	Pins	Package	Ordering Part Number <sup>1</sup>	Part Marking
01	28	QSOP	PACSZ128401Q	PACSZ128401Q
02	28	QSOP	PACSZ128402Q	PACSZ128402Q
04	28	QSOP	PACSZ128404Q	PACSZ128404Q

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



## Specifications

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNITS
V <sub>CC</sub> Voltage	5.5	V
Input Voltage Range, no clamping	-0.4 to 5.5	V
Storage Temperature Range	-40 to +150	°C
Power Dissipation per Resistor	0.1	W
Package Power Dissipation	1.0	W

### STANDARD OPERATING CONDITIONS

PARAMETER	RATING	UNITS
V <sub>CC</sub> Voltage	5.0	V
Operating Temperature	-40 to +85	°C

### ELECTRICAL OPERATING CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
TOL <sub>R</sub>	Absolute Resistance Tolerance	Measured at T <sub>A</sub> =25°C			±20	%
TOL <sub>C</sub>	Absolute Capacitance Tolerance	Measured at 1MHz, 2.5VDC, T <sub>A</sub> =25°C			±20	%
I <sub>LEAK</sub>	Leakage current to GND	Measured at 5.0VDC, T <sub>A</sub> =25°C		1	10	μA
V <sub>ESDi</sub>	ESD protection, input pins	Pins 3,4,5,6,7,9,11,13, & 14, per IEC 61000-4-2 specification, Notes 1,2,3	±8			kV
V <sub>ESD</sub>	ESD protection, connector pins	Pins 1,2,8,10,12,15,16,17,18,19, 21,23,24,25,26,27, & 28, per IEC 61000-4-2 specification Notes 1,2,4	±30			kV
V <sub>CLAMP</sub>	Clamping voltage under ESD discharge	ESD applied to connector pin, measured at corresponding input pin; +8kV discharge, Human Body Model Notes 1,2		8.3		V
		ESD applied to connector pin, measured at corresponding input pin; -8kV discharge, Human Body Model; Notes 1,2		-2.7		V

Note 1: Guaranteed by design and characterization.

Note 2: ESD voltage applied between Input/Connector pins and ground, one pin at a time.

Note 3: Pins 3-7, 9, 11, 13, and 14 typically connect to the I/O pins of a Super I/O chip.

Note 4: Pins 1, 2, 8, 10, 12, 15-19, 21, and 23-28 typically connect to the Parallel Port connector.



## Performance Information

### Filter Capacitors

The IEEE 1284 specification requires both termination and EMI filtering on a total of 17 lines. Basic filtering is provided through the presence of a capacitor on all signal lines. The filter capacitor is the junction capacitance of an ESD diode. The typical capacitance at a reverse voltage of 2.5V is 150pF. This diode capacitance is somewhat voltage dependent. See [Figure 1](#).

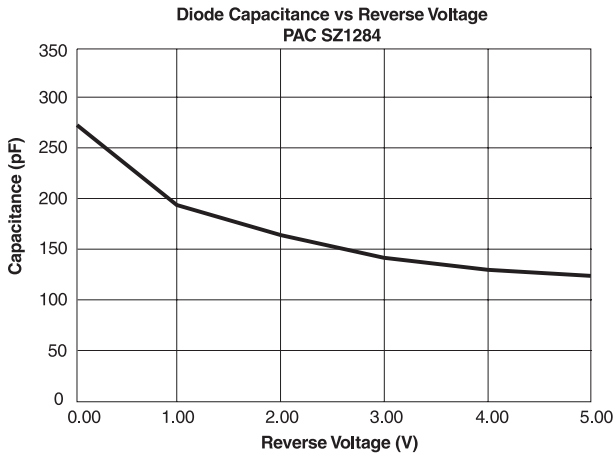


Figure 1. Diode Capacitance vs. Reverse Voltage

The higher speed Data and Strobe lines (9 in total) require an additional series resistor termination for proper operation, while the eight (8) Status lines do not. See [Table 1 on page5](#).

### Filter Insertion Loss

[Figure 2](#) shows the typical Insertion Loss graphs of the PACSZ1284 for Data and Strobe signals. The curves are dependent on the physical location of the filter elements with respect to the ground terminal of this device. These graphs are measured in a 50Ω environment on a Hewlett Packard HP 8753C Analyzer. The signal source is introduced at the resistor input and the output is measured at the corresponding protection diode. The actual pins measured are labeled in the [Figure 2](#) graph.

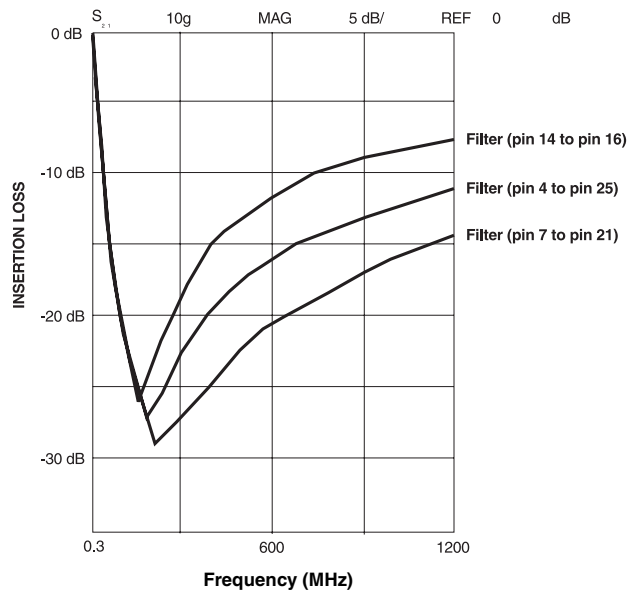


Figure 2. Typical Filter Insertion Loss

## Application Information

### Termination Considerations

The IEEE 1284 specification requires both termination and EMI filtering on a total of 17 signal lines. Control and Status lines (8 in total) only require a pull-up resistor and a filter capacitor. The Data lines and Strobe also require a series termination resistor in addition to the pull-up resistors and filter capacitors. See [Table 1](#), in conjunction with the schematic diagram on page 1.

**Table 1: IEEE 1284 Termination Requirements**

SIGNAL TERMINATION REQUIREMENTS	
Signal Name	Series Termination
Data1 - Data8	Yes
Strobe	Yes
Init	Not Required
AutoFeedXT	Not Required
Selectin	Not Required
ACK	Not Required
Busy	Not Required
Paper Empty	Not Required
Select	Not Required
Fault	Not Required

### Interfacing to IEEE 1284 Connectors

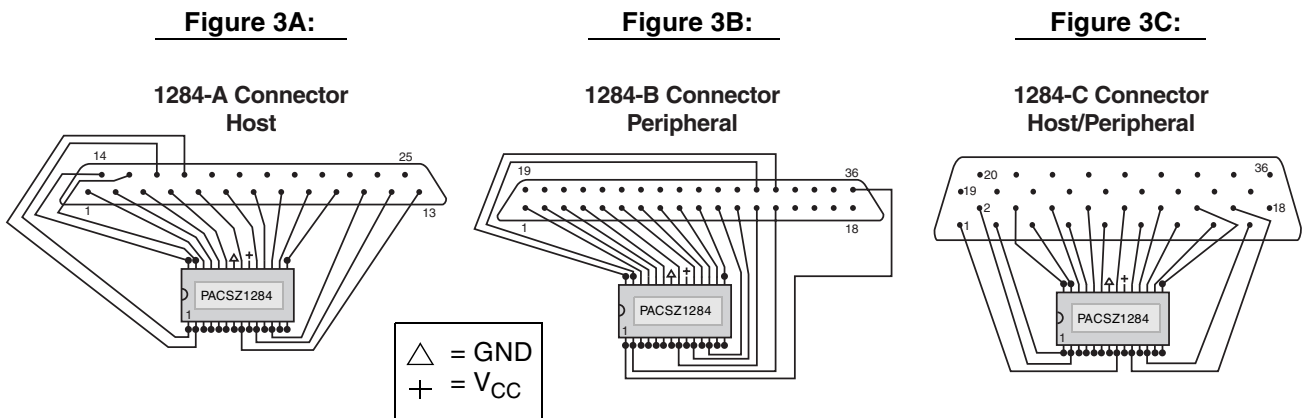
IEEE 1284 defines three interface connectors:

- 1284 A is a 25-pin DB series connector which is the de facto PC standard for the host connection.
- 1284 B is a 36-pin, 0.085 inch centerline connector used on the peripheral device.
- 1284 C is a new 36-pin, 0.050 inch centerline connector which can be used for both host and peripheral.

[Figure 3A](#) shows a possible hook-up between the 1284-A connector on a PC motherboard and the PACSZ1284, illustrating how the pin configuration of the PACSZ1284 allows for easy interconnect between the two. The dotted I/O signals of the PACSZ1284 will typically be connected to a Super I/O chip on the motherboard.

[Figure 3B](#) shows a possible hook-up between the 1284-B connector on a peripheral and the PACSZ1284.

[Figure 3C](#) shows a possible hook-up between the 1284-C connector and the PACSZ1284.



**Figure 3. Example Connections of IEEE 1284 Connectors with PACSZ1284**

## Application Information (continued)

Table 2 provides the IEEE 1284 signal assignments for the three connectors, and example PACSZ1284 pin connections.

When connecting a 1284-A host to a 1284-B peripheral, the “Peripheral Logic High” signal is not used.

Similarly, when a 1284-A host is connected to a 1284-C peripheral, the “Peripheral Logic High” and “Host Logic High” are not used. These two signals are optionally used to detect a “Power Off” or “Cable Disconnect” state for host and peripheral, respectively.

**Table 2: IEEE 1284 Connector Pinouts and PACSZ1284 Connection Guidelines**

PACSZ1284 PIN TYPE	1284-A 25-PIN DSUB		1284-B 36-PIN CHAMP		1284-C 36-PIN HIGH DENSITY	
	SIGNAL	PIN	SIGNAL	PIN	SIGNAL	PIN
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	STROBE	1	STROBE	1	STROBE	15
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	Data 1	2	Data 1	2	Data 1	6
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	Data 2	3	Data 2	3	Data 2	7
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	Data 3	4	Data 3	4	Data 3	8
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	Data 4	5	Data 4	5	Data 4	9
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	Data 5	6	Data 5	6	Data 5	10
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	Data 6	7	Data 6	7	Data 6	11
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	Data 7	8	Data 7	8	Data 7	12
P-Port conn. side, series-terminated (16-19, 21, or 23-26)	Data 8	9	Data 8	9	Data 8	13
Capacitor-filtered (1, 2, 8, 10, 12, 15, 27, or 28)	ACK	10	ACK	10	ACK	3
Capacitor-filtered (1, 2, 8, 10, 12, 15, 27, or 28)	BUSY	11	BUSY	11	BUSY	1
Capacitor-filtered (1, 2, 8, 10, 12, 15, 27, or 28)	PError	12	PError	12	PError	5
Capacitor-filtered (1, 2, 8, 10, 12, 15, 27, or 28)	Select	13	Select	13	Select	2
Capacitor-filtered (1, 2, 8, 10, 12, 15, 27, or 28)	AUTOFD	14	AUTOFD	14	AUTOFD	17
Capacitor-filtered (1, 2, 8, 10, 12, 15, 27, or 28)	FAULT	15	FAULT	32	FAULT	4
Capacitor-filtered (1, 2, 8, 10, 12, 15, 27, or 28)	INIT	16	INIT	31	INIT	14
Capacitor-filtered (1, 2, 8, 10, 12, 15, 27, or 28)	Selectin	17	Selectin	36	Selectin	16
	Ground	18	Ground	19	Ground	19
	Ground	19	Ground	20	Ground	20
	Ground	20	Ground	21	Ground	21
	Ground	21	Ground	22	Ground	22
	Ground	22	Ground	23	Ground	23
	Ground	23	Ground	24	Ground	24
	Ground	24	Ground	25	Ground	25
	Ground	25	Ground	26	Ground	26
			Ground	27	Ground	27
			Ground	28	Ground	28
			Ground	29	Ground	29
			Ground	30	Ground	30
			Not Defined	33	Ground	31
			Not Defined	34	Ground	32
			Not Defined	35	Ground	33
			Not Defined	15	Ground	34
			Logic Ground	16	Ground	35
			Chassis GND	17	Not Required	36
			Peripheral Logic	18	Host Logic High	18



## Mechanical Details

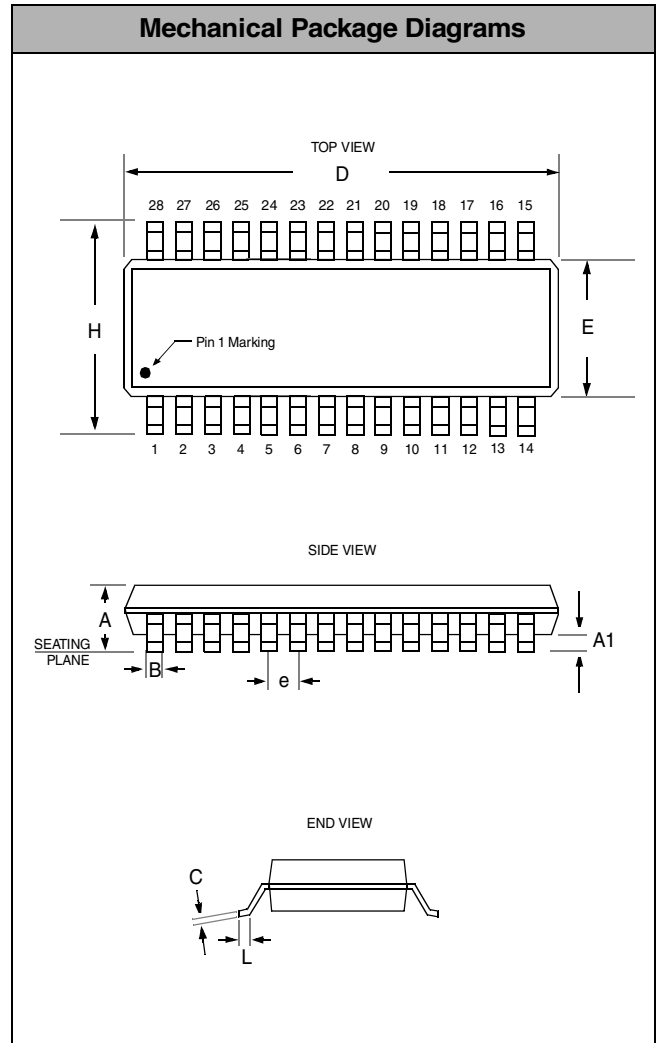
### QSOP Mechanical Specifications:

PACSZ1284 devices are packaged in 28-pin QSOP packages. Dimensions are presented below.

For complete information on the QSOP-28 package, see the California Micro Devices QSOP Package Information document.

PACKAGE DIMENSIONS				
Package	QSOP (JEDEC name is SSOP)			
Pins	28			
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	9.80	9.98	0.386	0.393
E	3.81	3.98	0.150	0.157
e	0.64 BSC		0.025 BSC	
H	5.79	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
# per tube	50 pieces*			
# per tape and reel	2500 pieces			
<b>Controlling Dimensions: inches</b>				

\* This is an approximate amount which may vary.



Package Dimensions for QSOP-28