ASIM

ESD0524PA

4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

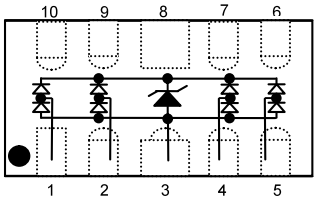
Description

Dual-rail **clamp diodes** are designed to provide ESD protection for high speed data interfaces. They are ideal for protecting systems with high data and clock rates or for circuits requiring low capacitive loading.

The ESD0524PA consists of four pairs of diodes in series, and a TVS diode is embedded inside the package. It has a typical capacitance of only 0.30pF between I/O pins. This allows it to be used on circuits operating in excess of 3GHz without signal attenuation. They are designed for easy PCB layout by allowing the traces to run straight through the device. The combination of small size, low capacitance, and high level of ESD protection becomes a flexible solution for applications such as HDMI, MDDI and Serial ATA.

Ultra Low Capacitance Series TVS

DFN-10 Pin Configuration



Pin	Description
1, 2, 4 and 5	Input Lines
6, 7, 9 and 10	Output Lines
3 and 8	Ground

Features

* Dual-Rail Clamp technology
* DFN-10 package
* Bi-Directional protection
* Protects four data lines
* Low input capacitance 0.3pF typical (I/O to IO)
* Working voltage: 5V
* Low clamping factor Vcl/Vbr
* Low leakage current
* Full RoHS compliance
* Complies with the following standards:
  - IEC 61000-4-2 (ESD) Air-15kv, Contact-8kv

Mechanical Characteristics

* Molded DFN-10 package
* Available in Lead-Free Pure-Tin Plating
* Solder Reflow Temp: Pure-Tin (Sn), 260-270ºC
* Consult Factory for Leaded Device Availability
* Flammability Rating UL 94V-0
* 8mm Tape and Reel per EIA Standard 481
* Device Marking: Marking Code,
  Pin one defined by DOT

Applications

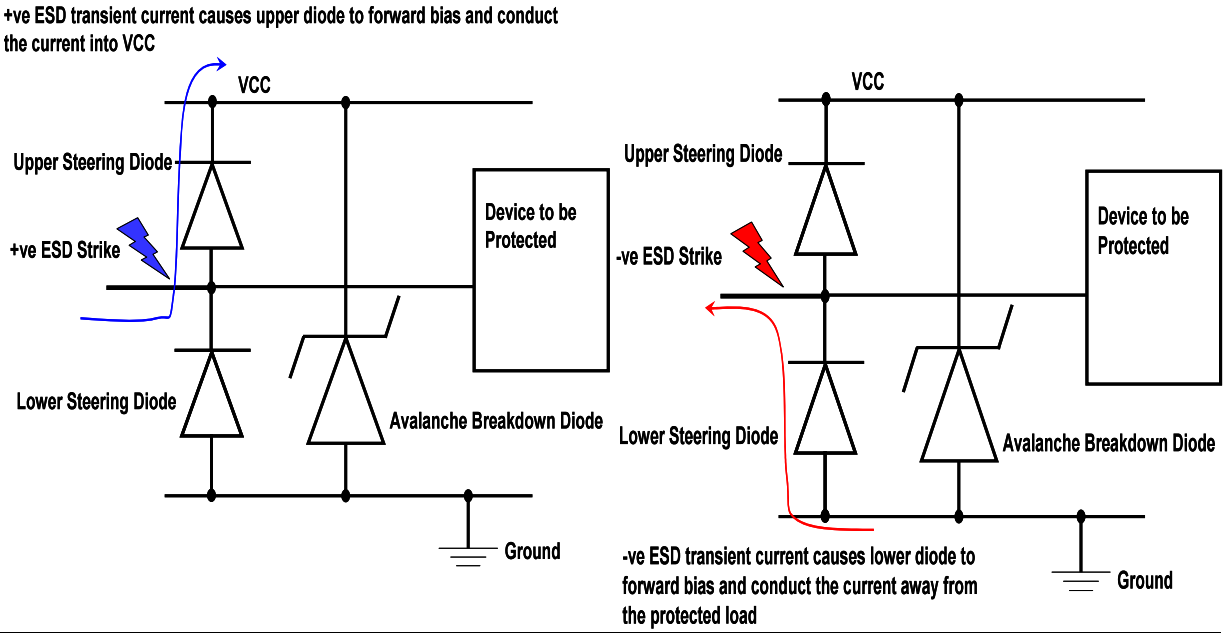
* HDMI Port Protection
* DVI Port Protection
* VGA and SCART Ports Protection
* MDDI Ports Protection
* Notebook Computers
* Set Top Boxes and Digital TV
* Serial ATA and PCI Express

4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

Absolute Maximum Ratings @ 25ºC unless otherwise specified			
Parameter	**Symbol**	**Value**	**Units**
Peak Pulse Power; pulse waveform = 8/20µs	Ppp	150	W
Peak Pulse Current; pulse waveform = 8/20µs	Ipp	5	A
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	Vpp	±15 ±8	kV
Operating Temperature	Tj	-55 to 125	ºC
Storage Temperature	Tstg	-55 to 150	ºC

Note: For a surge greater than maximum values, the diode will fail in short-circuit.

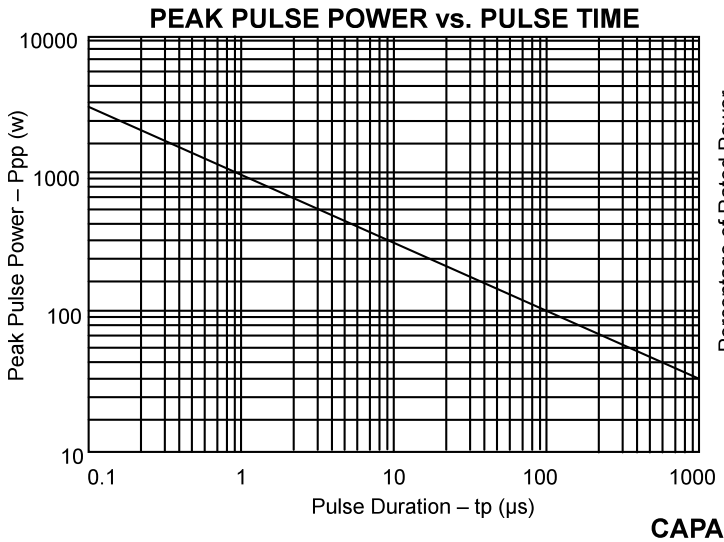
Dual-Rail Clamp Diode Protection

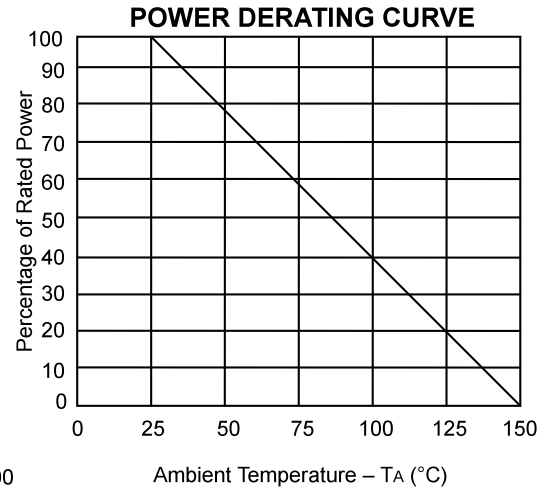


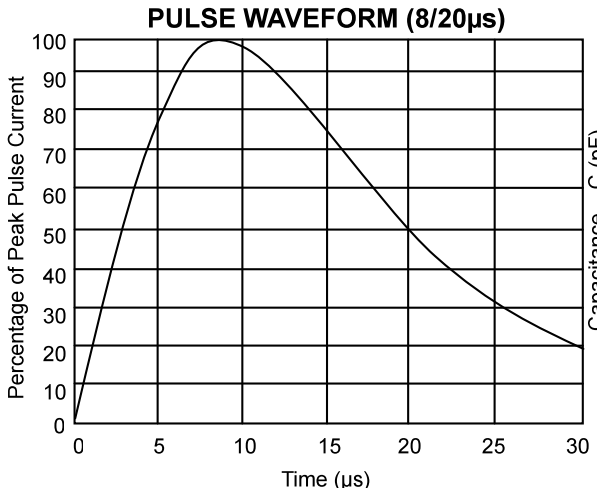
Electrical Characteristics @ 25ºC unless otherwise specified						
Parameter	**Symbol**	**Conditions**	**Minimum**	**Typical**	**Maximum**	**Units**
Stand-off Voltage	Vwm	Any I/O to ground			5.0	V
Breakdown Voltage	Vbr	It=1mA, Any I/O to ground	6.0			V
Leakage Current	Ir	Vwm=5V Any I/O to ground			1	µA
Clamping Voltage	Vc	Ipp=1A, Tp=8/20µs Any I/O to ground			15.0	V
Junction Capacitance	Cj	Vr=0V, f=1MHz I/O to I/O		0.3	0.4	
		Vr=0V, f=1MHz I/O to Gnd			0.5pF	

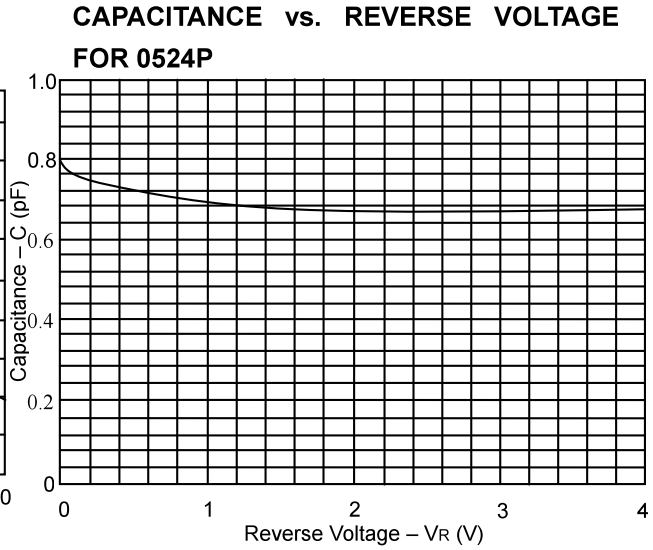
4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

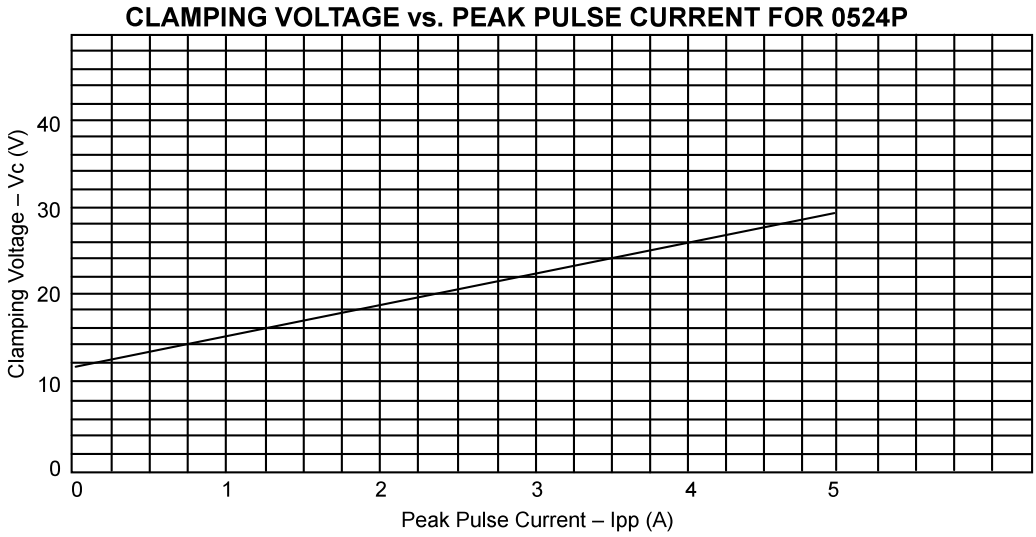
Electrical Characteristics Graphs











4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

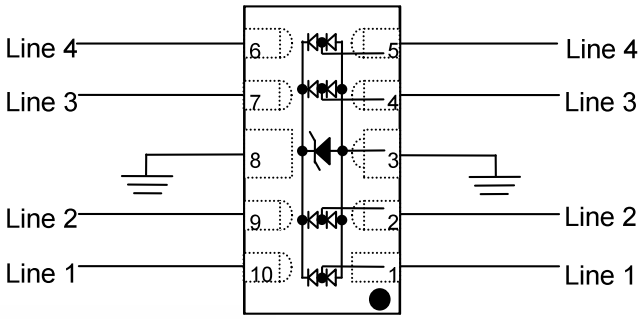
Applications Information

The ESD0524PA is designed for have ease of PCB layout by allowing the traces to run straight through the device. The PCB traces can be used to connect the pin pairs for each line. For example line 1 enters at Pin 1 and exits at Pin 10 and the PCB trace connects Pin 1 and 10 together. Ground is connected at pins 3 and 8. Note that one large ground pad should be used in lieu of two separate pads.

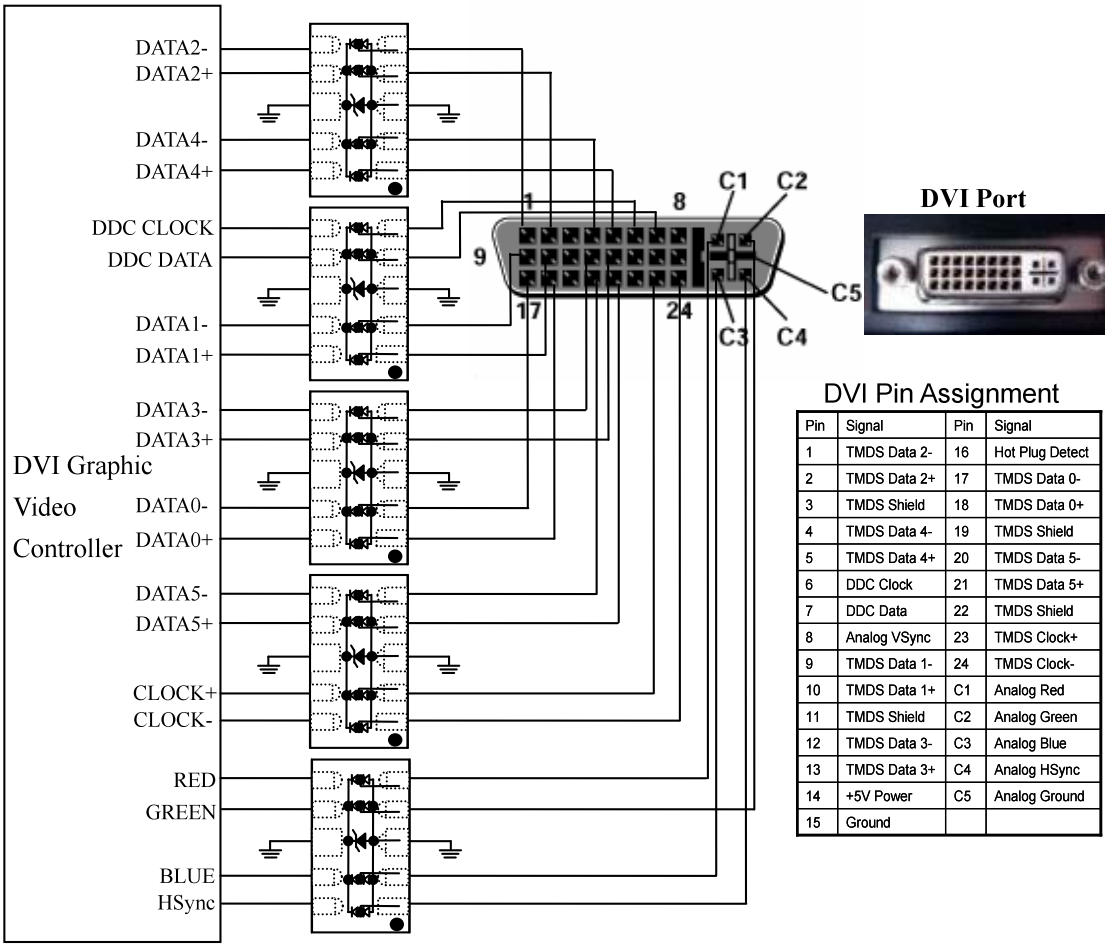
Flow through layout protection

Circuit connectivity is as follows:

- Line 1 is connected to Pin 1 and 10
- Line 2 is connected to Pin 2 and 9
- Line 3 is connected to Pin 4 and 7
- Line 4 is connected to Pin 5 and 6
- Pin 3 and 8 are connected to Ground



0524P on DVI Port Application



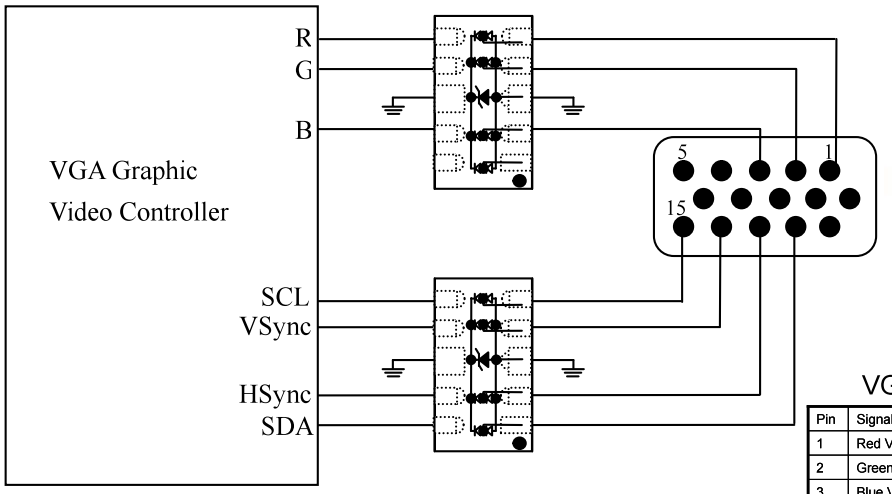
DVI Port

DVI Pin Assignment

Pin	Signal	Pin	Signal
1	TMDS Data 2-	16	Hot Plug Detect
2	TMDS Data 2+	17	TMDS Data 0-
3	TMDS Shield	18	TMDS Data 0+
4	TMDS Data 4-	19	TMDS Shield
5	TMDS Data 4+	20	TMDS Data 5-
6	DDC Clock	21	TMDS Data 5+
7	DDC Data	22	TMDS Shield
8	Analog VSync	23	TMDS Clock+
9	TMDS Data 1-	24	TMDS Clock-
10	TMDS Data 1+	C1	Analog Red
11	TMDS Shield	C2	Analog Green
12	TMDS Data 3-	C3	Analog Blue
13	TMDS Data 3+	C4	Analog HSync
14	+5V Power	C5	Analog Ground
15	Ground		

4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

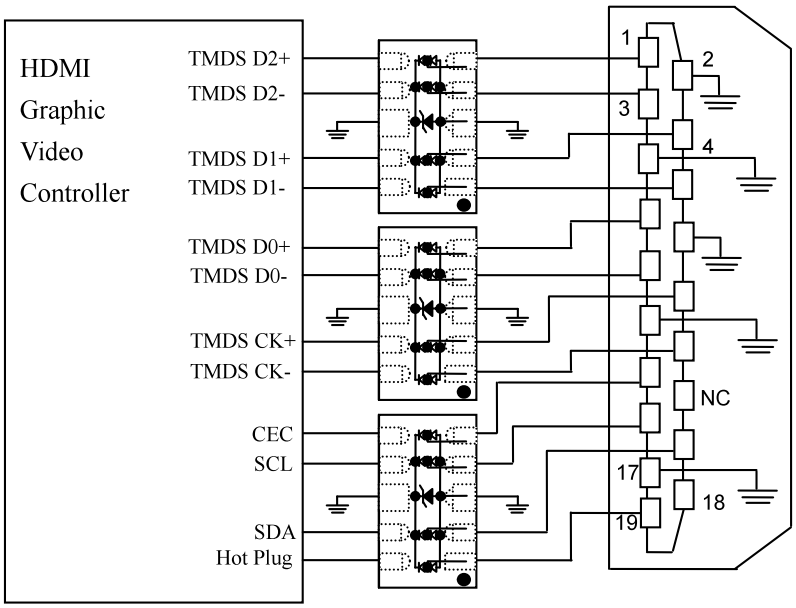
0524P on VGA Port Application



VGA Pin Assignment

Pin	Signal	Pin	Signal
1	Red Video	9	NC
2	Green Video	10	Sync Ground
3	Blue Video	11	Ground
4	Ground	12	SDA (Serial Data)
5	DDC (Display Data Channel) Ground	13	Horizontal Sync
6	Red Ground	14	Vertical Sync
7	Green Ground	15	SCL (Serial Clock)
8	Blue Ground		

0524P on HDMI Port Application

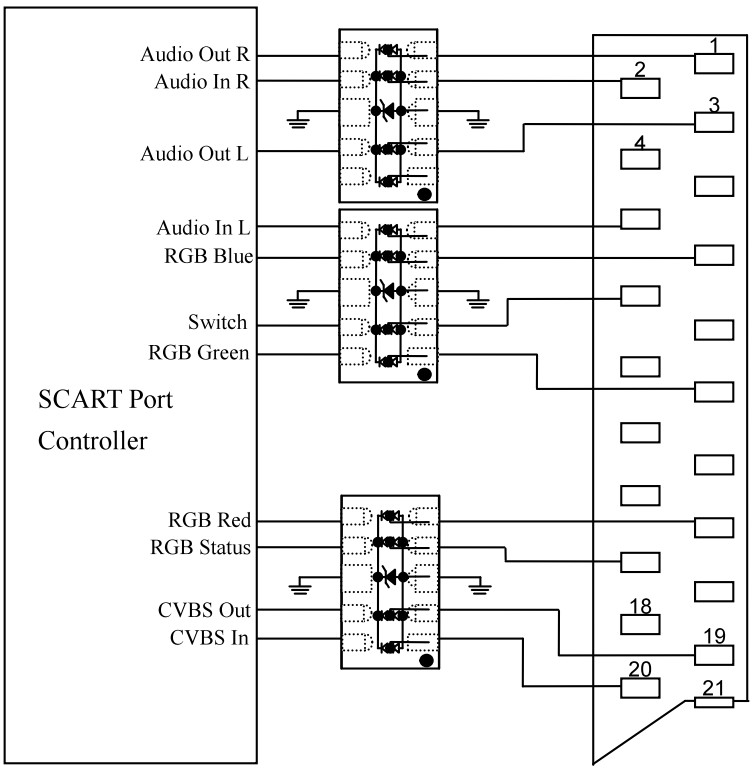


HDMI Pin Assignment

Pin	Signal	Pin	Signal
1	TMDS Data 2+	11	TMDS Shield
2	TMDS Shield	12	TMDS Clock-
3	TMDS Data 2-	13	CEC
4	TMDS Data 1+	14	NC
5	TMDS Shield	15	SCL
6	TMDS Data 1-	16	SDA
7	TMDS Data 0+	17	TMDS Shield
8	TMDS Shield	18	+5V Power
9	TMDS Data 0-	19	Hot Plug Detect
10	TMDS Clock+		

4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

0524P on Scart Port Application

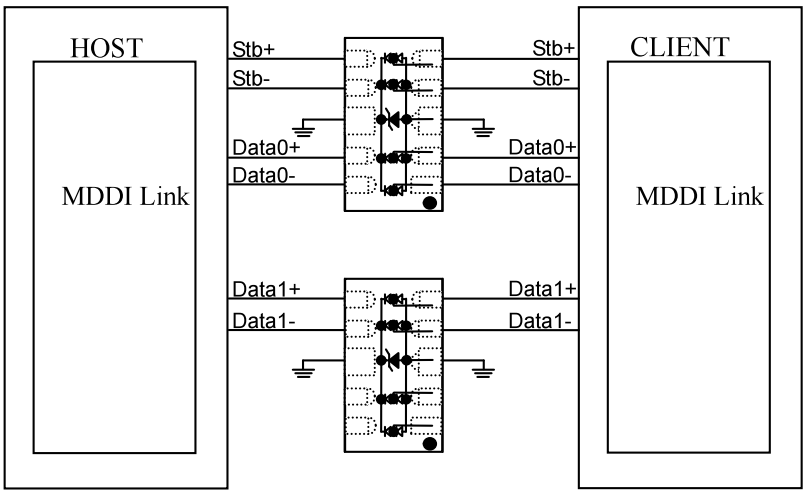


SCART Port

Scart Pin Assignment

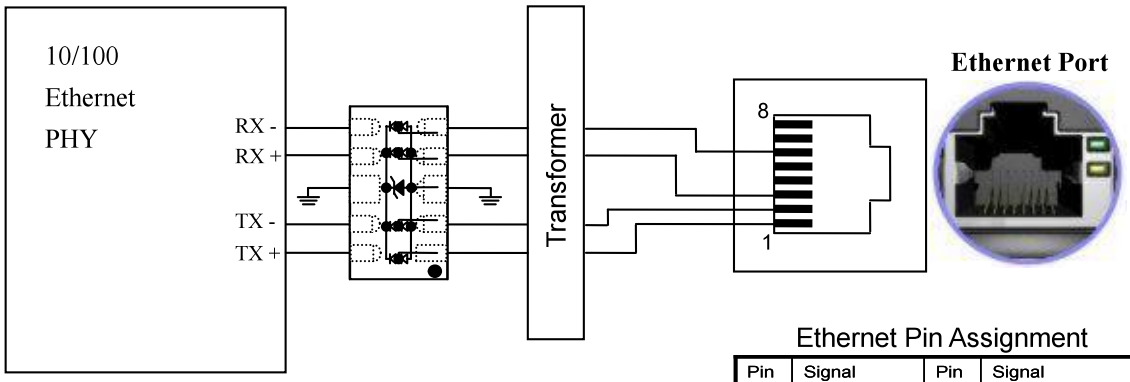
Pin	Signal	Pin	Signal
1	Audio Out R	12	N.C
2	Audio In R	13	Red Gnd
3	Audio Out L	14	RGB Status Gnd
4	Audio Gnd	15	RGB Red
5	Blue Gnd	16	RGB Status
6	Audio in L	17	CVBS Out Gnd
7	RGB Blue	18	CVBS In Gnd
8	Switch	19	CVBS Out
9	Green Gnd	20	CVBS In
10	N.C	21	Gnd
11	RGB Green		

0524P on MDDI (Type 2) Application



4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

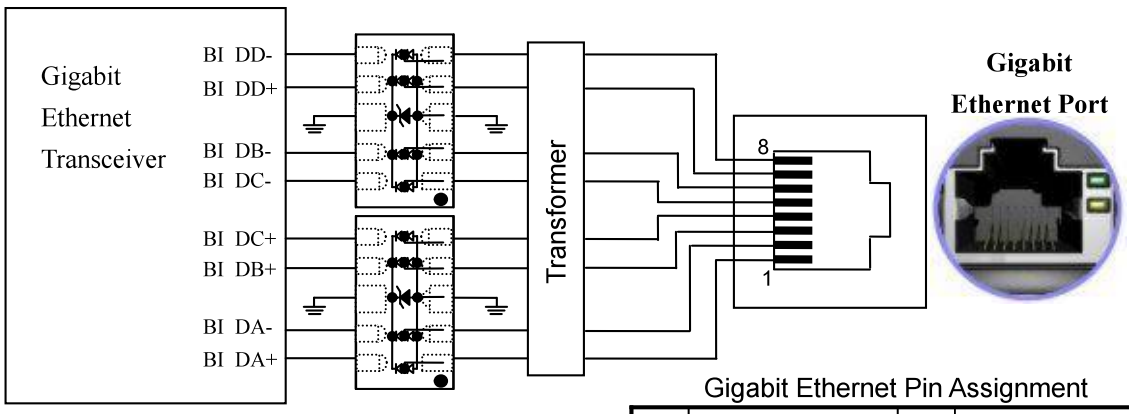
0524P on 10/100 Base Ethernet Port Application



Ethernet Pin Assignment

Pin	Signal	Pin	Signal
1	TX +	5	N.C
2	TX -	6	RX -
3	RX +	7	N.C
4	N.C	8	N.C

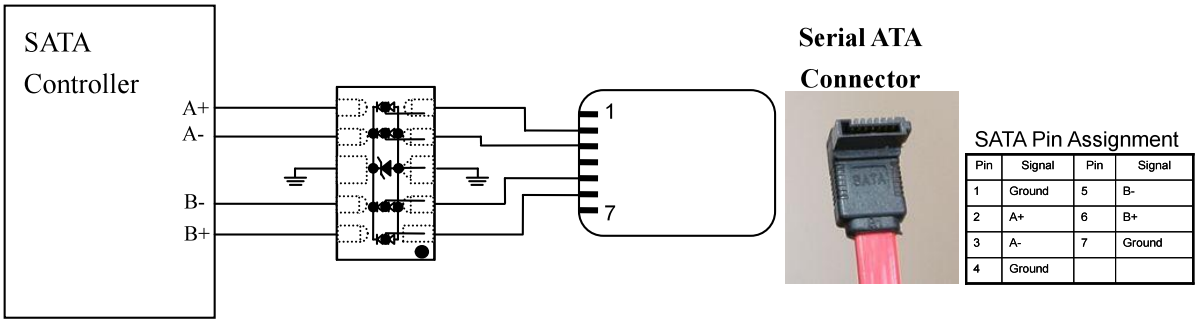
0524P on Gigabit Ethernet Port Application



Gigabit Ethernet Pin Assignment

Pin	Signal	Pin	Signal
1	Bi-directional Pair A+	5	Bi-directional Pair C-
2	Bi-directional Pair A-	6	Bi-directional Pair B-
3	Bi-directional Pair B+	7	Bi-directional Pair D+
4	Bi-directional Pair C+	8	Bi-directional Pair D-

0524P on Serial ATA Port Application



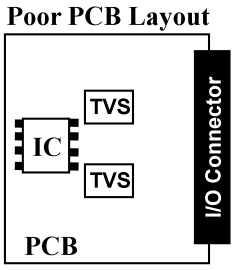
SATA Pin Assignment

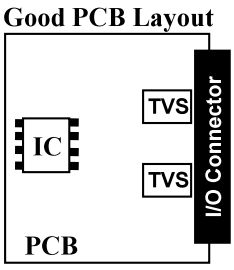
Pin	Signal	Pin	Signal
1	Ground	5	B-
2	A+	6	B+
3	A-	7	Ground
4	Ground		

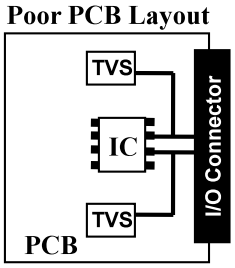
Circuit Board Layout Recommendations

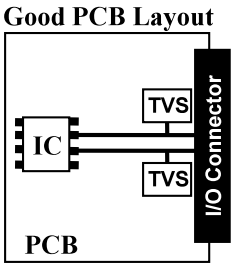
Good circuit board layout is critical for creating an effective surge suppression circuit. The following PCB guidelines are recommended to enhance the performance of a TVS device:

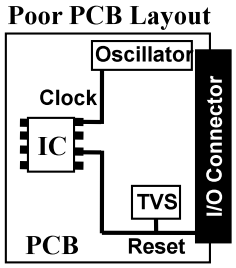
- Place the TVS near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the TVS and the protected line.
- The ESD transient return path to ground should be kept as short as possible.
- Place a TVS and decoupling capacitor between power and ground of components that may be vulnerable to electrostatic discharges to the ground plane.
- Minimize all conductive loops including power and ground loops.
- Use multilayer boards when possible.
- Minimize interconnecting line lengths.
- Never run critical signals near board edges.
- Fill unused portions of the PCB with ground plane.

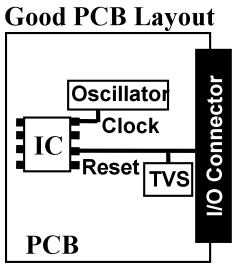












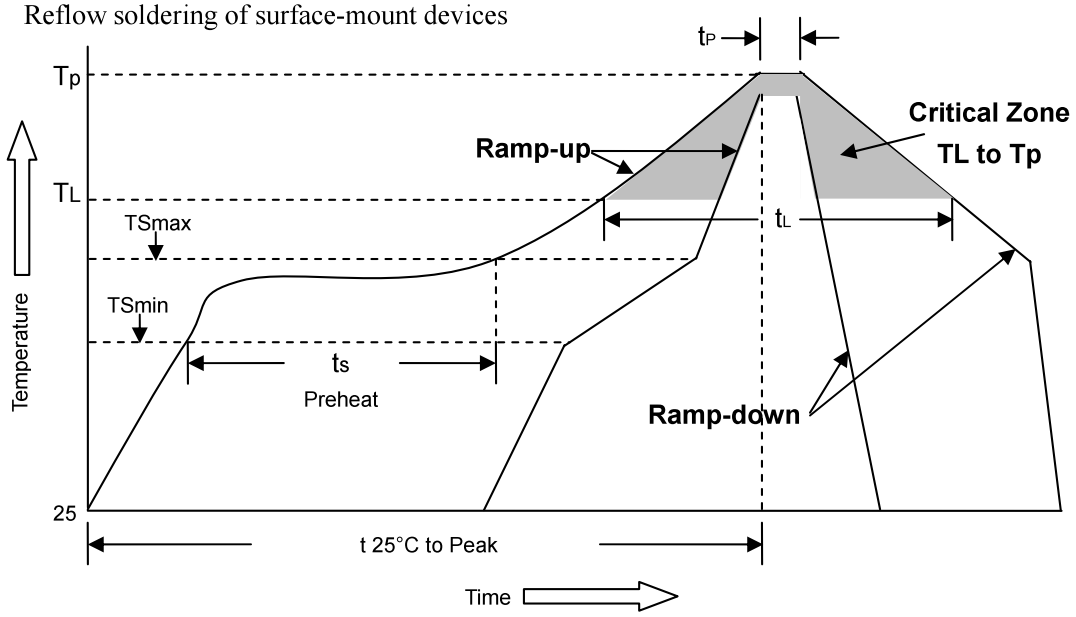
Matte Tin Lead Finish

Matte tin has become the industry standard lead-free replacement for SnPb lead finishes. A matte tin finish is composed of 100% tin solder with large grains. Since the solder volume on the leads is small compared to the solder paste volume that is placed on the land pattern of the PCB, the reflow profile will be determined by the requirements of the solder paste. Therefore, these devices are compatible with both lead-free and SnPb assembly techniques. Unlike other lead-free compositions, matte tin does not have any added alloys that can cause degradation to solder joint.

4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

Soldering Method for Products

1. Storage environment: Temperature = 10ºC~35ºC Humidity = 65%±15%
2. Reflow soldering of surface-mount devices



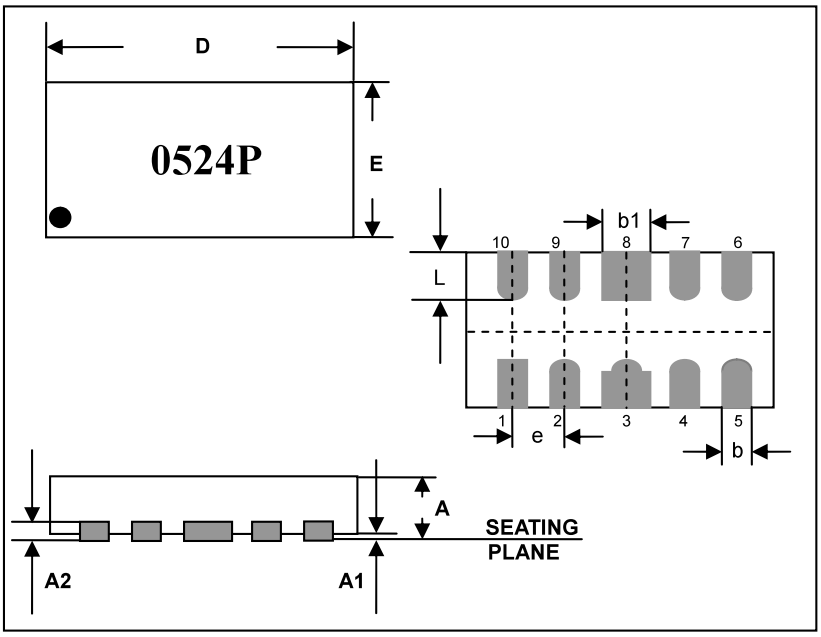
Profile Feature	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3ºC/sec
Preheat - Temperature Min (T_{Smin}) - Temperature Max (T_{Smax}) - Time (min to max) (t_s)	 150ºC 200ºC 60~180sec
T_{Smax} to T_L - Ramp-up Rate	 <3ºC/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 220ºC 50~145sec
Peak Temperature (T_P)	260ºC +0/-5ºC
Time within 5ºC of actual Peak Temperature (t_P)	20~40sec
Ramp-down Rate	<6ºC/sec
Time 25ºC to peak Temperature	<8 minutes

Flow (wave) soldering (solder dipping)

Products	Dipping time
Pb devices	5sec±1sec
Pb-Free devices	5sec±1sec

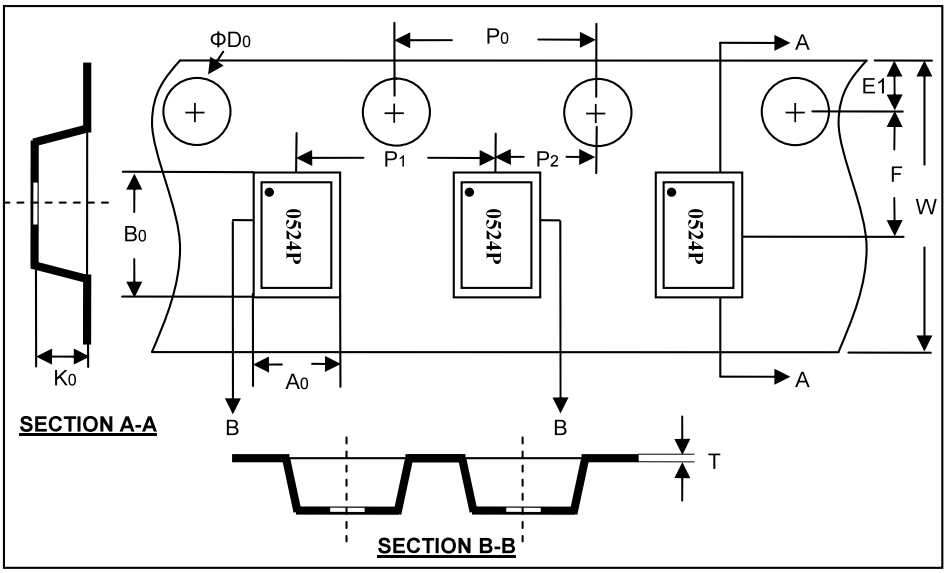
4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

DFN-10 Dimension Drawing

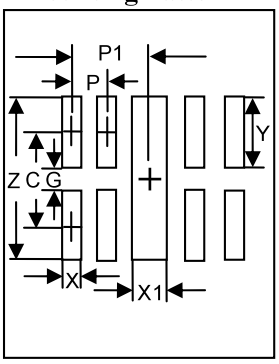


Dimensions				
Dim	Inches		mm	
	Min	Max	Min	Max
A	0.020	0.026	0.50	0.65
A1	0.000	0.002	0.00	0.05
A2	0.005		0.13	
b	0.006	0.010	0.15	0.25
b1	0.014	0.018	0.35	0.45
D	0.094	0.102	2. 40	2.60
E	0.035	0.043	0.90	1.10
e	0.020 BSC		0.050 BSC	
L	0.012	0.017	0.30	0.43

DFN-10 Carrier Dimension



Mounting Pattern



Typical		
Dim	MM	Inches
Z	1.55	0.061
C	0.88	0.035
G	0.20	0.008
Y	0.68	0.027
X	0.20	0.008
X1	0.40	0.016
P	0.50	0.020
P1	1.00	0.039

Dimensions in mm.

Reel Dia.	Tape Width	A0	B0	K0	T	D0
178mm (7”)	8mm	1.23±0.05	2.70±0.05	0.70±0.05	0.35±0.05	1.50±0.10
P0	P1	P2	E1	F	W	
4.00±0.10	4.00±0.10	2.00±0.05	1.75±0.10	3.50±0.05	8.00±0.30	

4 Channel Ultra Low Capacitance Dual-Rail Clamp Array for ESD Protection

Marking Code

Part Number	Device Marking
ESD0524PA	0524P

Ordering Information

Part Number	Lead Finish	Qty Per Reel	Reel Size
ESD0524PA	Pb-Free	6000	7 inch

Please Read Carefully

Information in this document is provided solely in connection with Asim products. Asim reserves the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All Asim products are sold pursuant to Asim's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the Asim products and services described herein, and Asim assumes no liability whatsoever relating to the choice, selection or use of the Asim products and services described herein.

No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by Asim for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.