

## Transient Voltage Suppressors

### Features

- Capacitance (45 pF Max, I/O to GND)
- Protection for the Following IEC Standards:  
IEC 61000-4-2 (Level 4)
- Low ESD Clamping Voltage
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

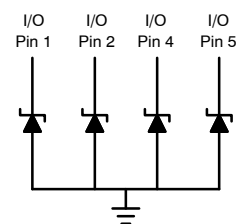
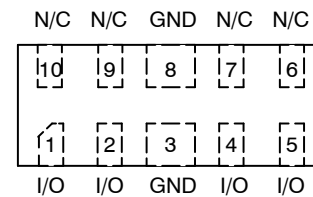


DFN-10 Pin Configuration

### Typical Applications

- LED PROTECTION
- Set Top Box
- Industrial Equipment
- OLED Panels
- LCD Televisions
- Vcc Protection

### PIN CONFIGURATION AND SCHEMATIC



Pins 3, 8

Note: Common GND - Only Minimum of 1 GND connection required

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Operating Junction Temperature Range	$T_J$	-55 to +125	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{stg}}$	-55 to +150	$^\circ\text{C}$
Lead Solder Temperature - Maximum (10 Seconds)	$T_L$	260	$^\circ\text{C}$
IEC 61000-4-2 Contact (ESD)	ESD	$\pm 30$	kV
IEC 61000-4-2 Air (ESD)	ESD	$\pm 30$	kV

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### ORDERING INFORMATION

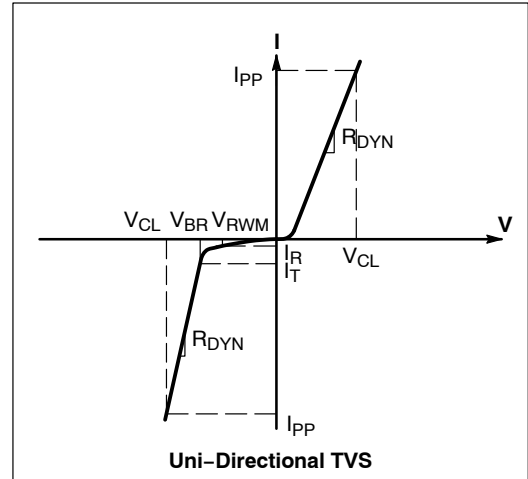
Device	Package	Shipping
ESD0524CR	DFN10 (Pb-Free)	3000 / Tape & Reel

### ELECTRICAL CHARACTERISTICS

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter
$I_{PP}$	Maximum Peak Pulse Current
$V_C$	Clamping Voltage @ $I_{PP}$
$V_{RWM}$	Working Peak Reverse Voltage
$I_R$	Maximum Reverse Leakage Current @ $V_{RWM}$
$V_{BR}$	Breakdown Voltage @ $I_T$
$I_T$	Test Current
$R_{DYN}$	Dynamic Resistance

\*See Application Note AND8308/D for detailed explanations of datasheet parameters.

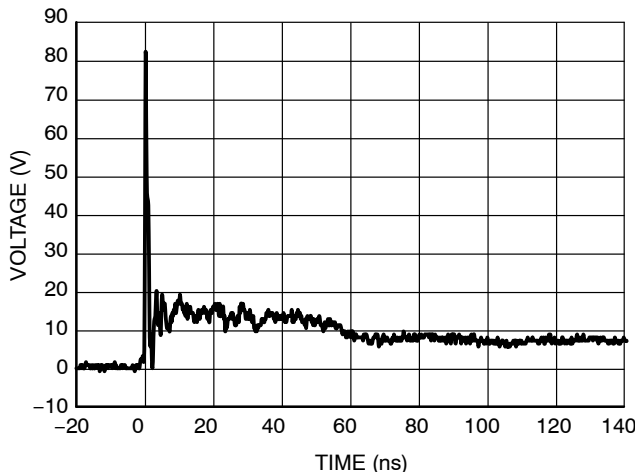


### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

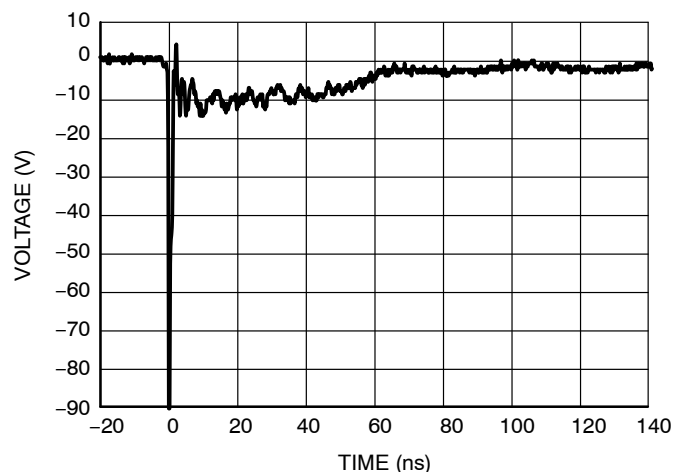
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	$V_{RWM}$	I/O Pin to GND			3.3	V
Breakdown Voltage	$V_{BR}$	$I_T = 1\text{ mA}$ , I/O Pin to GND	4.0	5.0		V
Reverse Leakage Current	$I_R$	$V_{RWM} = 3.3\text{ V}$ , I/O Pin to GND			1.0	$\mu\text{A}$
Clamping Voltage (Note 1)	$V_C$	IEC61000-4-2, $\pm 8\text{ kV}$ Contact	See Figures 1 and 2			V
Clamping Voltage TLP (Note 2) See Figures 5 through 6	$V_C$	$I_{PP} = 8\text{ A}$ $I_{PP} = -8\text{ A}$	IEC 61000-4-2 Level 2 equivalent ( $\pm 4\text{ kV}$ Contact, $\pm 4\text{ kV}$ Air)		10.2 -4.5	V
		$I_{PP} = 16\text{ A}$ $I_{PP} = -16\text{ A}$	IEC 61000-4-2 Level 4 equivalent ( $\pm 8\text{ kV}$ Contact, $\pm 15\text{ kV}$ Air)		13.7 -8.1	
Junction Capacitance	$C_J$	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ between I/O Pins and GND			45	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- For test procedure see Figures 3 and 4 and application note AND8307/D.
- ANSI/ESD STM5.5.1 - Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model.  
TLP conditions:  $Z_0 = 50\ \Omega$ ,  $t_p = 100\text{ ns}$ ,  $t_r = 4\text{ ns}$ , averaging window;  $t_1 = 30\text{ ns}$  to  $t_2 = 60\text{ ns}$ .



**Figure 1. IEC61000-4-2 +8 kV Contact Clamping Voltage**



**Figure 2. IEC61000-4-2 -8 kV Contact Clamping Voltage**

IEC 61000-4-2 Spec.

Level	Test Voltage (kV)	First Peak Current (A)	Current at 30 ns (A)	Current at 60 ns (A)
1	2	7.5	4	2
2	4	15	8	4
3	6	22.5	12	6
4	8	30	16	8

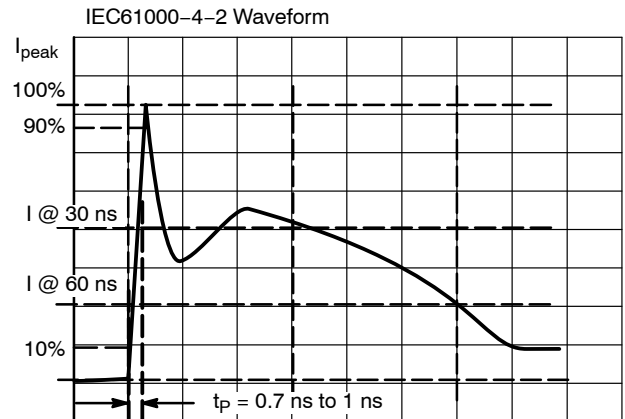


Figure 3. IEC61000-4-2 Spec

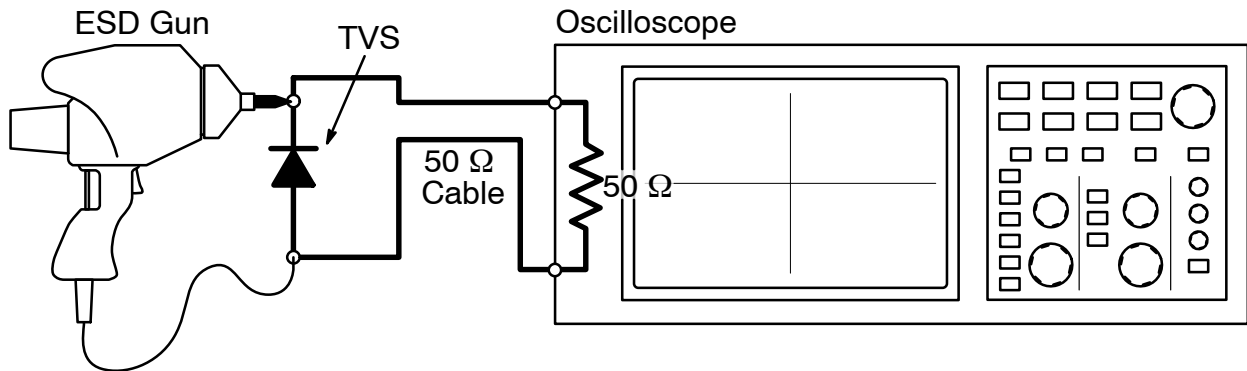


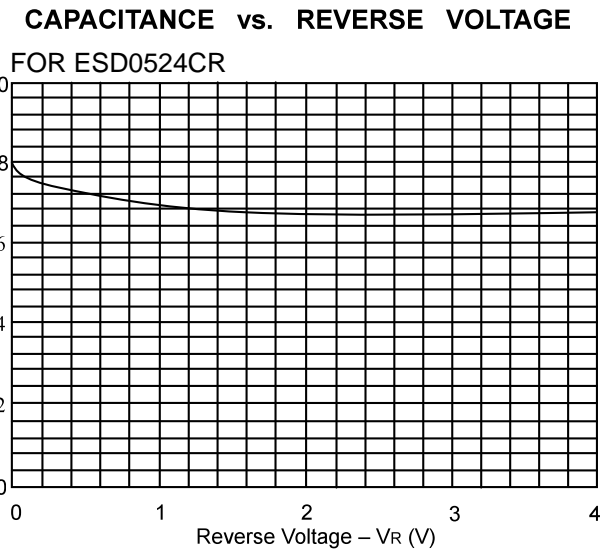
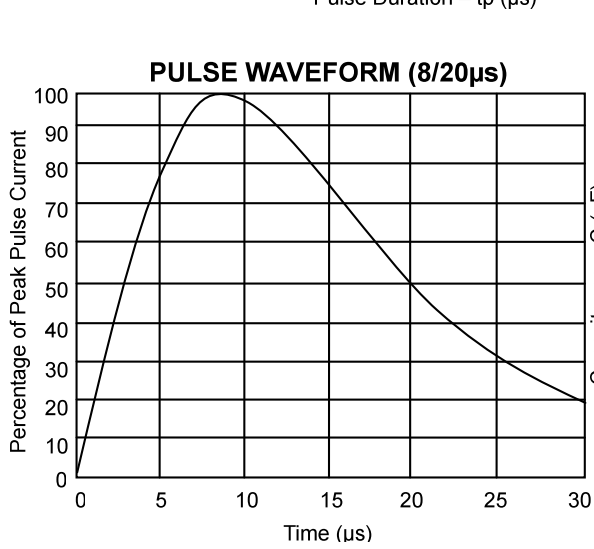
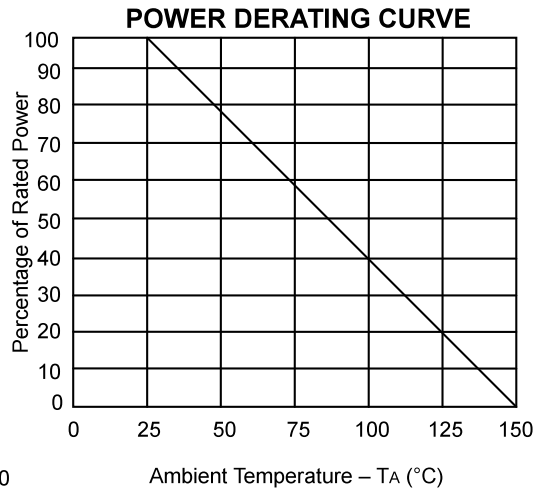
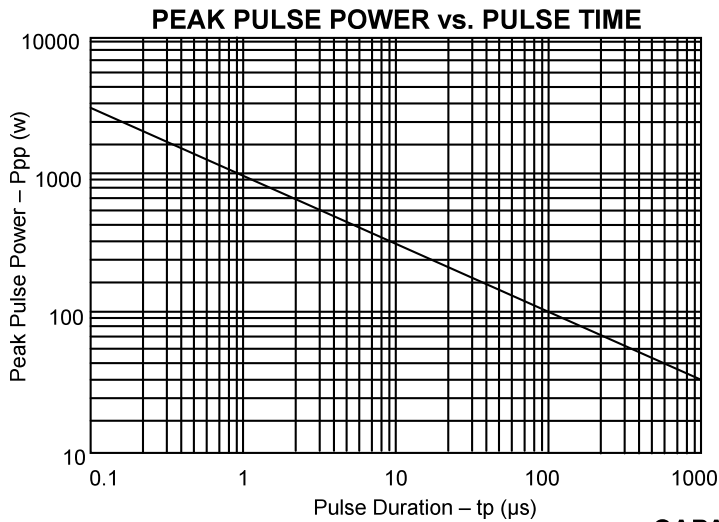
Figure 4. Diagram of ESD Clamping Voltage Test Setup

The following is taken from Application Note AND8308/D – Interpretation of Datasheet Parameters for ESD Devices.

### ESD Voltage Clamping

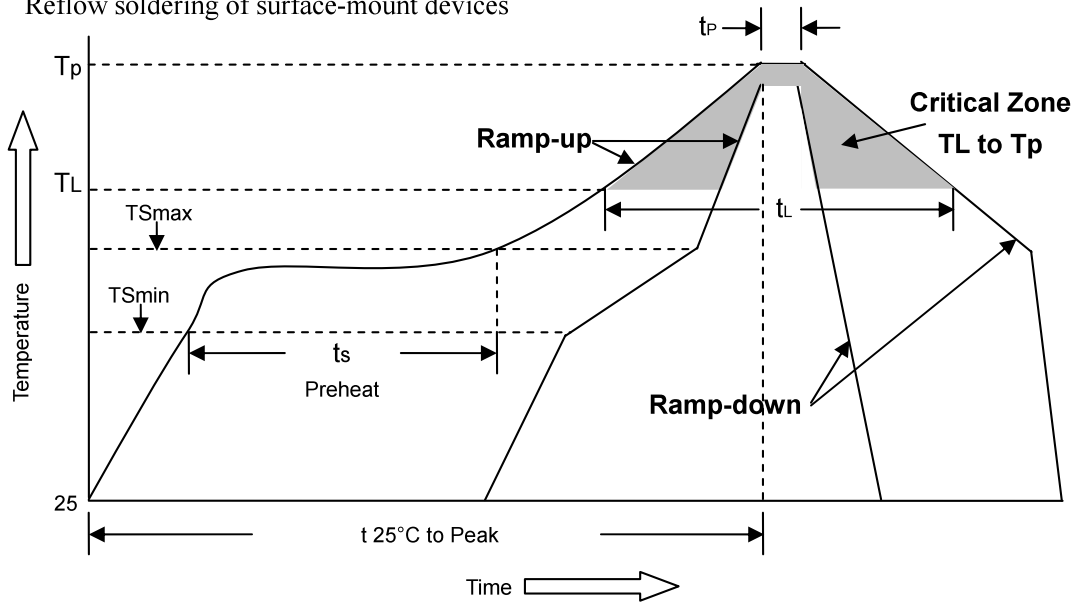
For sensitive circuit elements it is important to limit the voltage that an IC will be exposed to during an ESD event to as low a voltage as possible. The ESD clamping voltage is the voltage drop across the ESD protection diode during an ESD event per the IEC61000-4-2 waveform. Since the IEC61000-4-2 was written as a pass/fail spec for larger

## Electrical Characteristics Graphs



## Soldering Method for Products

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

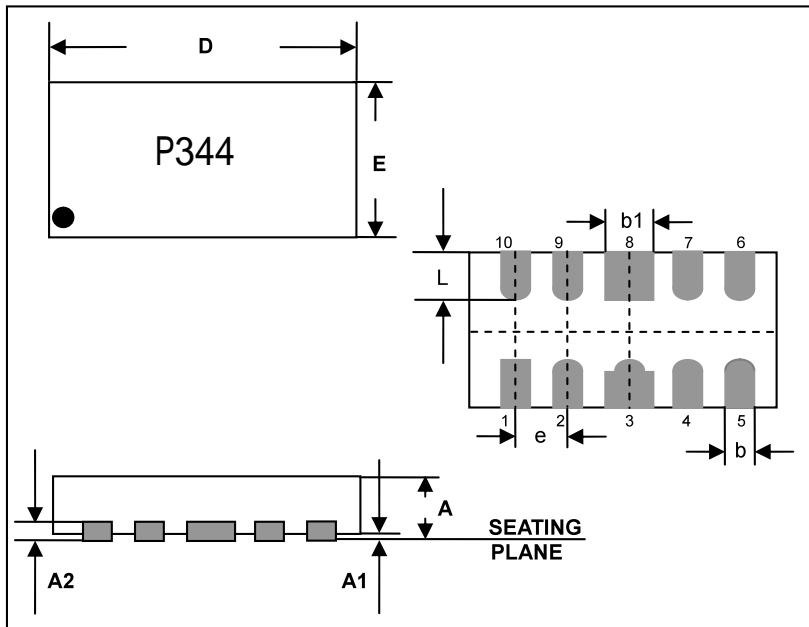


Profile Feature	Pb-Free Assembly
Average ramp-up rate (TL to TP)	<3°C/sec
Preheat <ul style="list-style-type: none"> <li>- Temperature Min (TSmin)</li> <li>- Temperature Max (TSmax)</li> <li>- Time (min to max) (ts)</li> </ul>	150°C 200°C 60~180sec
TSmax to TL <ul style="list-style-type: none"> <li>- Ramp-up Rate</li> </ul>	<3°C/sec
Time maintained above: <ul style="list-style-type: none"> <li>- Temperature (TL)</li> <li>- Time (tl)</li> </ul>	220°C 50~145sec
Peak Temperature (Tp)	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (tp)	20~40sec
Ramp-down Rate	<6°C/sec
Time 25°C to peak Temperature	<8 minutes

### Flow (wave) soldering (solder dipping)

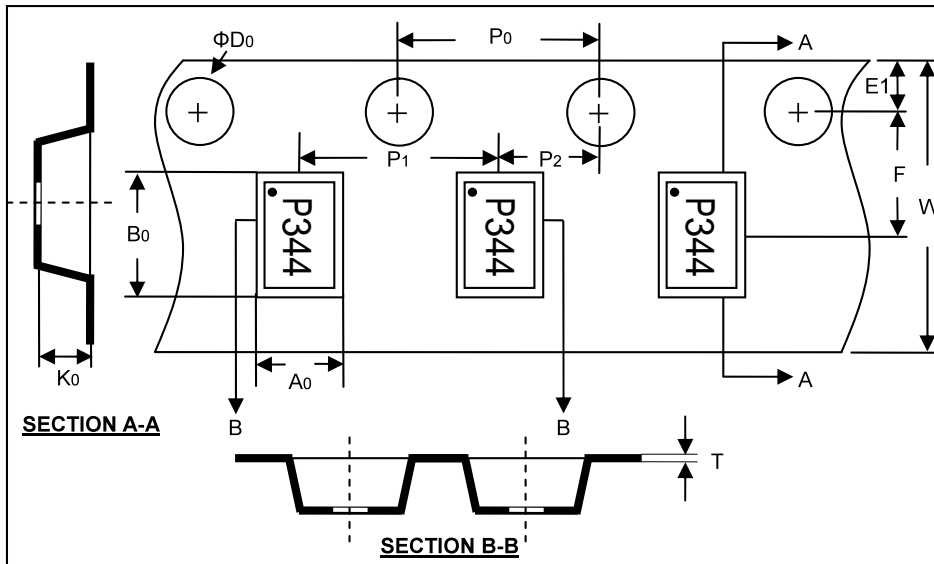
Products	Dipping time
Pb devices	5sec±1sec
Pb-Free devices	5sec±1sec

## DFN-10 Dimension Drawing

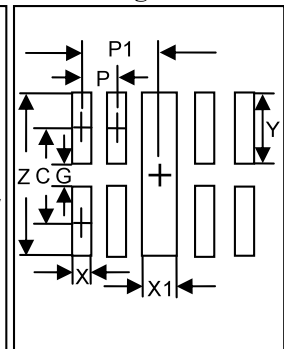


Dim	Dimensions			
	Inches		mm	
	Min	Max	Min	Max
A	0.020	0.026	0.50	0.65
A1	0.000	0.002	0.00	0.05
A2	0.005		0.13	
b	0.006	0.010	0.15	0.25
b1	0.014	0.018	0.35	0.45
D	0.094	0.102	2.40	2.60
E	0.035	0.043	0.90	1.10
e	0.020 BSC		0.050 BSC	
L	0.012	0.017	0.30	0.43

## 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	

## Marking Code

Part Number	Device Marking
ESD0524CR	P344

## Ordering Information

Part Number	Lead Finish	Qty Per Reel	Reel Size
ESD0524CR	Pb-Free	3000	7 inch

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