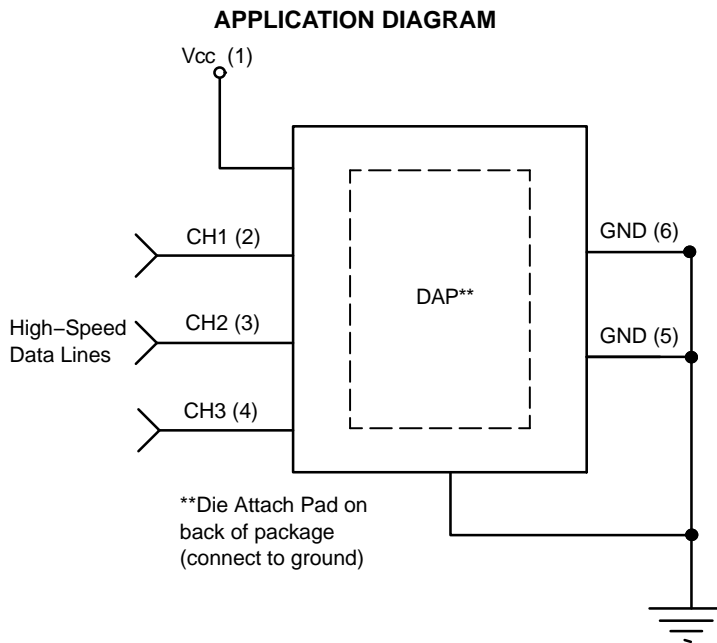


# ESD7124

## 4-Channel Low Capacitance Dual-Voltage ESD and Surge Protection Array

### Features

- 3 Channels of Low Voltage ESD Protection
- 1 Channel of High Voltage ESD Protection
- Provides ESD Protection to IEC61000-4-2 Level 4:  $\pm 25$  kV Contact Discharge
- IEC 61000-4-5 (lighting)
- Low Channel Input Capacitance
- High Voltage Zener Diode Protects Supply Rail up to 100 A (8/20  $\mu$ s)
- These Devices are Pb-Free and are RoHS Compliant



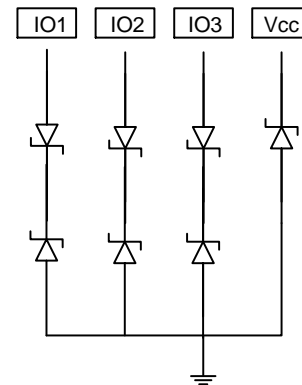
**ON Semiconductor®**

<http://onsemi.com>



**UDFN-6  
D4 SUFFIX  
CASE 517CS**

### BLOCK DIAGRAM



### MARKING DIAGRAM



AD = Specific Device Code  
M = Date Code  
■ = Pb-Free Package

### ORDERING INFORMATION

Device	Package	Shipping†
ESD7124MUTBG	UDFN-6 (Pb-Free)	3000/Tape & Reel

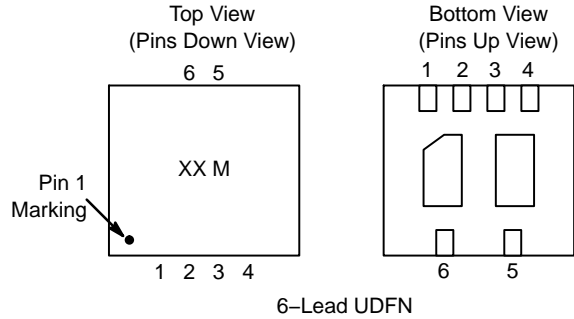
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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**Table 1. PIN DESCRIPTIONS**

4-Channel, 6-Lead, UDFN-8 Package			
Pin	Name	Type	Description
1	V <sub>CC</sub>	HV V <sub>DD</sub>	HV ESD Channel
2	CH1	I/O	LV Low-capacitance ESD Channel
3	CH2	I/O	LV Low-capacitance ESD Channel
4	CH3	I/O	LV Low-capacitance ESD Channel
5	GND		Ground
6	GND		Ground

**PACKAGE / PINOUT DIAGRAMS**



**SPECIFICATIONS**

**Table 2. ABSOLUTE MAXIMUM RATINGS**

Parameter	Rating	Units
Operating Temperature Range	-55 to +125	°C
Storage Temperature Range	-65 to +150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**Table 3. ELECTRICAL CHARACTERISTICS**

Device Name	Reverse Working Voltage	Breakdown Voltage V <sub>br</sub> (V)		Reverse Current Leakage I <sub>r</sub> (μA)	R <sub>dyn</sub>	Junction Capacitance C <sub>j</sub> (pF)	
	V <sub>rwm</sub> (V)	at 1 mA		at V <sub>rwm</sub>	Ω	V <sub>r</sub> = 0 V, f = 1 MHz	
	Max	Min	Typ	Max	Typ	Typ	Max
Pin2-4 (LV)	3.3	5.5	6.5	1	1	0.35	0.5
Pin1 (HV)	12	13.3	14	1			

Device Name	Clamping Voltage V <sub>c</sub> (V) t <sub>p</sub> = 8 x 20 μs		Max Ratings t <sub>p</sub> = 8 x 20 μs	
	I <sub>pp</sub> = 1 A	I <sub>pp</sub> = 16 A	I <sub>pp</sub> (A)	V <sub>c</sub> @ Max I <sub>pp</sub> (V)
	Typ	Typ	Max	Max
Pin1 (HV)	15	16	100	27
Pin2-4 (LV)	9.5			

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Clamping Voltage TLP (Note 1) All Devices Pin2-4(LV) See Figures 3 - 6	V <sub>C</sub>	I <sub>PP</sub> = ±8 A } IEC 61000-4-2 Level 2 equivalent (±4 kV Contact, ±4 kV Air) I <sub>PP</sub> = ±16 A } IEC 61000-4-2 Level 4 equivalent (±8 kV Contact, ±15 kV Air)		16.8		V
				24.9		

1. ANSI/ESD STM5.5.1 – Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model.  
TLP conditions: Z<sub>0</sub> = 50 Ω, t<sub>p</sub> = 100 ns, t<sub>r</sub> = 4 ns, averaging window; t<sub>1</sub> = 30 ns to t<sub>2</sub> = 60 ns.

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## TYPICAL CHARACTERISTICS

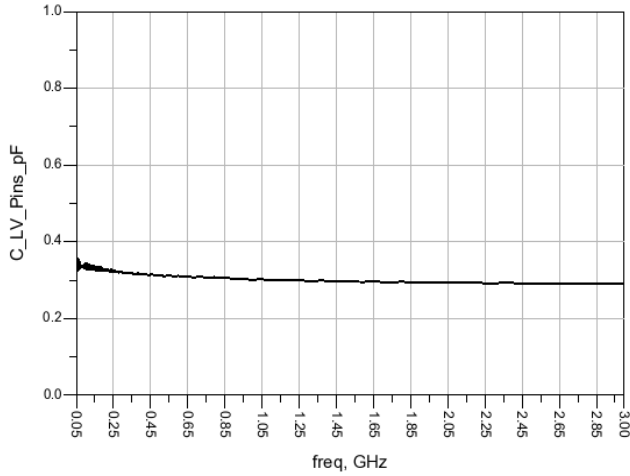


Figure 1. Capacitance Over Frequency

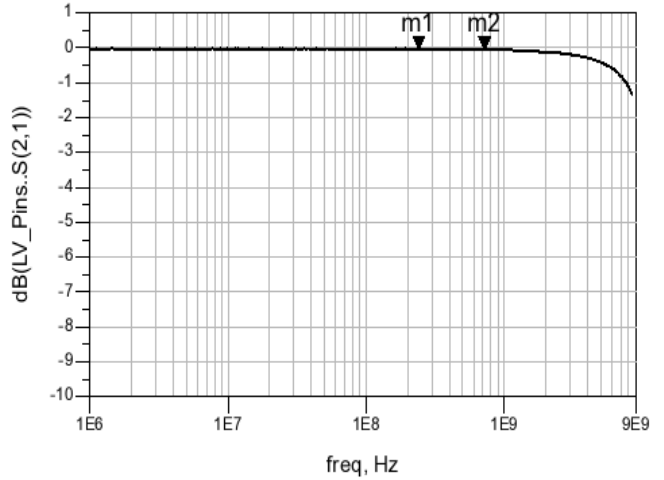


Figure 2. Insertion Loss

Interface	Data Rate (Mb/s)	Fundamental Frequency (MHz)	3 <sup>rd</sup> Harmonic Frequency (MHz)	ESD7124 Insertion Loss (dB)
USB 2.0	480	240 (m1)	720 (m2)	m1 = 0.031 m2 = 0.047

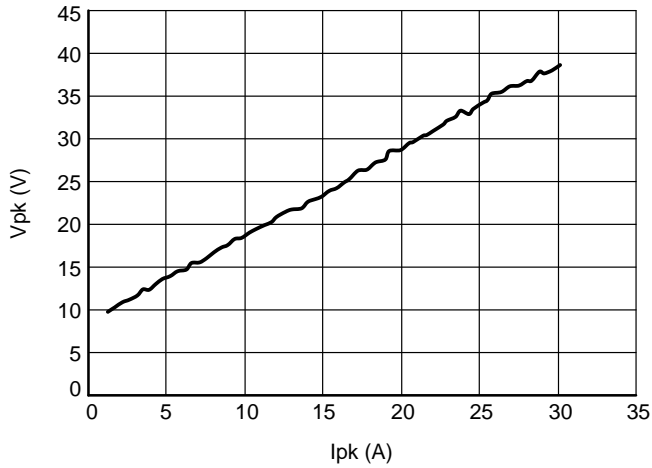


Figure 3. Positive TLP I-V Curve

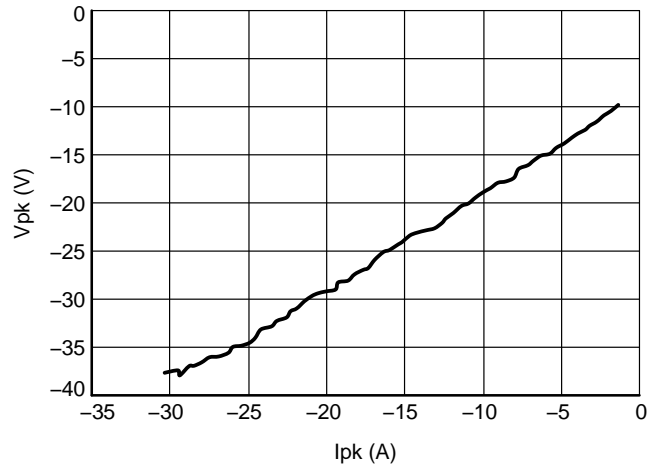
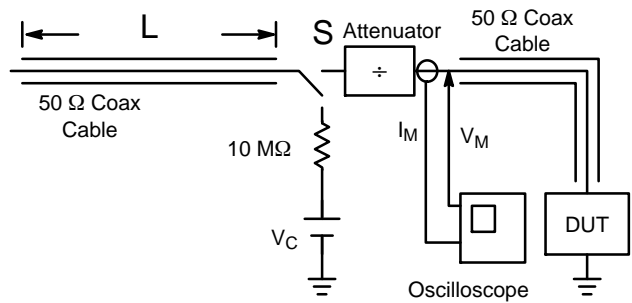


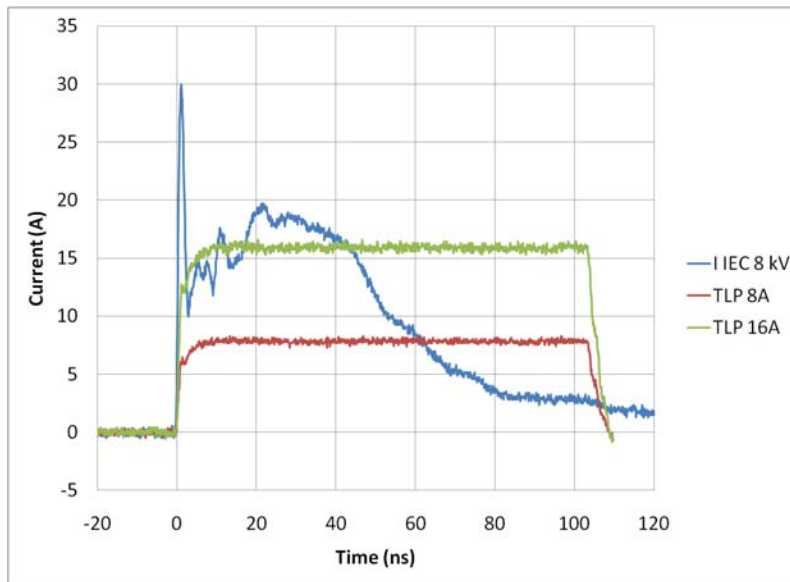
Figure 4. Negative TLP I-V Curve

**Transmission Line Pulse (TLP) Measurement**

Transmission Line Pulse (TLP) provides current versus voltage (I–V) curves in which each data point is obtained from a 100 ns long rectangular pulse from a charged transmission line. A simplified schematic of a typical TLP system is shown in Figure 5. TLP I–V curves of ESD protection devices accurately demonstrate the product’s ESD capability because the 10s of amps current levels and under 100 ns time scale match those of an ESD event. This is illustrated in Figure 6 where an 8 kV IEC 61000–4–2 current waveform is compared with TLP current pulses at 8 A and 16 A. A TLP I–V curve shows the voltage at which the device turns on as well as how well the device clamps voltage over a range of current levels. For more information on TLP measurements and how to interpret them please refer to AND9007/D.



**Figure 5. Simplified Schematic of a Typical TLP System**

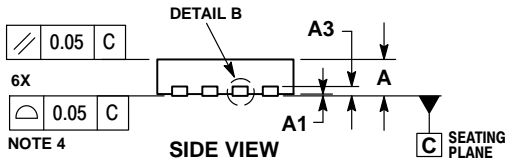
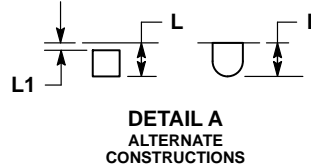
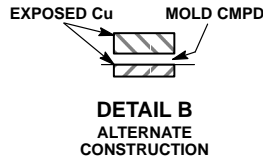
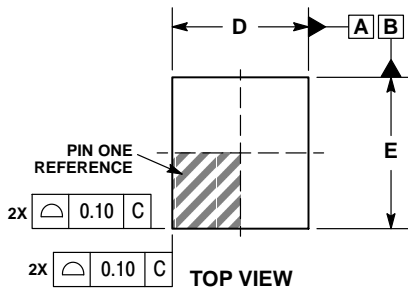


**Figure 6. Comparison Between 8 kV IEC 61000–4–2 and 8 A and 16 A TLP Waveforms**

# ESD7124

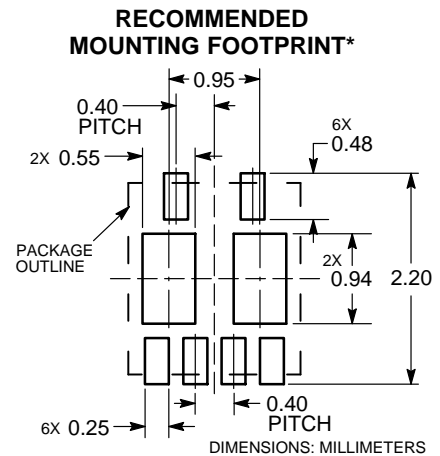
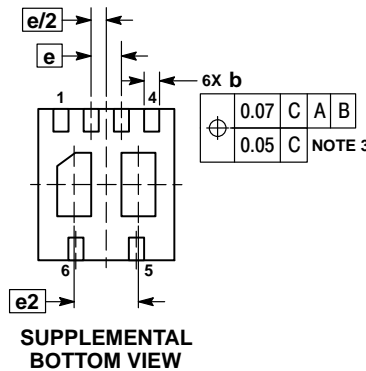
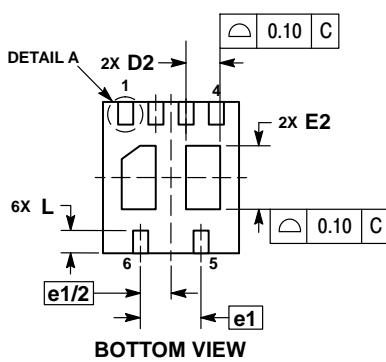
## PACKAGE DIMENSIONS

UDFN6, 1.8x2, 0.4P  
CASE 517CS  
ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION b APPLIES TO PLATED TERMINALS AND IS MEASURED BETWEEN 0.15 AND 0.30mm FROM THE TERMINAL TIP.
  4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.125 REF	
b	0.15	0.25
D	1.80 BSC	
D2	0.35	0.55
E	2.00 BSC	
E2	0.74	0.94
e	0.40 BSC	
e1	0.80 BSC	
e2	0.95 BSC	
L	0.20	0.40
L1	---	0.15



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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