

# 0402ESDA-AEC

## Automotive grade ESD suppressor



### Product features

- AEC-Q200 qualified
- Ultra-low capacitance (0.05 pF) ideal for high speed data applications
- Provides Electro Static Discharge (ESD) protection with fast response time (<1 ns) allowing equipment to pass IEC 61000-4-2 Level 4 test
- Single-line, bi-directional device
- Low leakage current (<0.1 nA typ.) reduces power consumption
- 0402 (1005 metric) compact design utilizes less board space

### Applications

- Infotainment and telematics
  - In-vehicle infotainment (IVI) and navigation
  - Audio subsystems
  - USB and Ethernet hubs
  - Active noise cancellation (ANC)
- High speed data ports and interface
  - RF Antenna
  - Ethernet
  - USB
  - HDMI
- Automotive body electronics
  - Central body control unit
  - Vehicle access control system
- Advanced driver assistance systems
  - Rear and front view cameras
  - Automatic parking control
  - Adaptive cruise control (ACC)
- Satellite navigation systems

### Ordering

- Specify part number and termination suffix (e.g. 0402ESDA-AEC1)  
0402ESDA-AEC=part number,  
1=Termination suffix

### Termination suffixes

- 1 (Dip termination, Packaged: Tape and reel, 10 000 parts per 7" diameter reel)

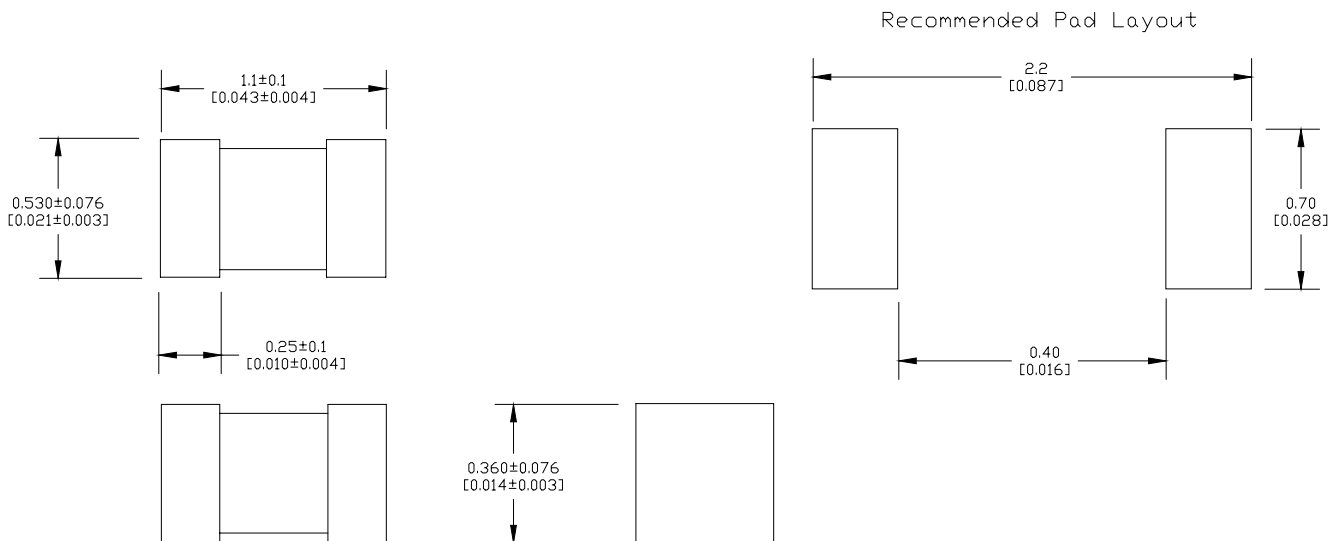
**Product specifications**

Part number <sup>4</sup>	Rated voltage (V <sub>dc</sub> ) maximum	Clamping voltage <sup>1</sup> (V) typical	Trigger voltage <sup>2</sup> (V) typical	Capacitance @ 1 MHz (pF) typical	Capacitance @ 1 MHz (pF) maximum	Attenuation change (0–6 GHz) (dB) typical	Leakage current @ 12 V <sub>dc</sub> (nA) typical	ESD capability IEC61000-4-2 Direct discharge (kV) typical	ESD capability IEC61000-4-2 Air discharge (kV) typical	ESD pulse withstand <sup>1,3</sup> typical
0402ESDA-AEC	30	35	300	0.05	0.15	-0.2	<0.1	8	15	>1000

1. Clamping voltage: Per IEC61000-4-2, Level 4 waveform (8 kV direct 30 A) measured 30 ns after initial pulse.
2. Trigger voltage: Trigger measurement made using Transmission Line Pulse (TLP) method.

3. Minor shifting in characteristics may be observed over multiple ESD pulses at very rapid rate.
4. Part Number Definition: 0402ESDA-AEC  
0402ESDA= Product code and size  
-AEC= Form designation

**Dimensions—mm [in]**



**Design considerations**

The location in the circuit for the 0402ESDA-AEC has to be carefully determined. For better performance, the device should be placed as close to the signal input as possible and ahead of any other component. Due to the high current associated with an ESD event, it is recommended to use a “0-stub” pad design (pad directly on the signal/data line and second pad directly on common ground).

**Environmental data**

---

Operating temperature: - 55 °C to +125 °C
Storage temperature (component): - 55 °C to +125 °C
Operational life: MIL-STD-202, method 108 (1000 hours at +125 °C, bias 85% of rated voltage)
Temperature cycling: JESD-22, method JA-104 (-55 °C to +125 °C, 1000 cycles)
High temperature exposure: MIL-STD-202, method 108 (1000 hours at +150 °C unpowered)

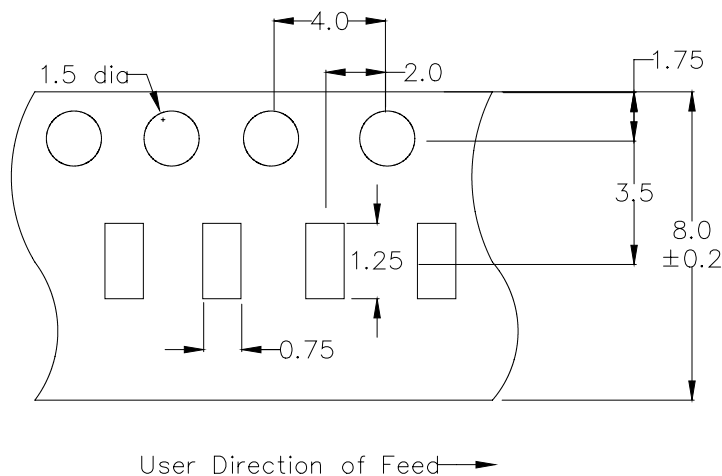
---

---

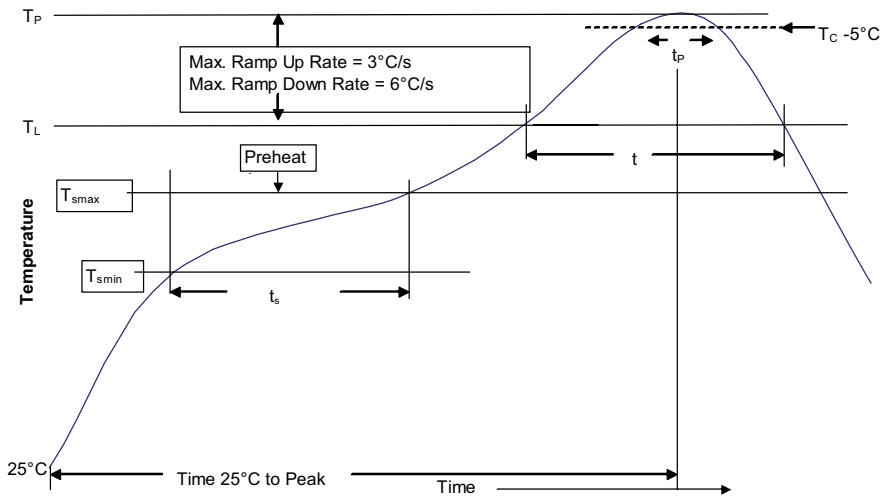
Mechanical shock: MIL-STD-202, method 213
Mechanical vibration: MIL-STD-202, method 204
Biased humidity: MIL-STD-202, method 103 (1000 hours at 85% RH/85 °C, 85% of rated voltage)
Endurance test: IEC6100-4-2 standard ESD pulse: 8 kV contact, 1000 pulses, 1 second interval
Solderability: J-STD-002, method B1

---

**Packaging information – mm**



**Solder reflow profile**



**Table 1 - Standard SnPb Solder ( $T_C$ )**

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5mm)	235°C	220°C
≥2.5mm	220°C	220°C

**Table 2 - Lead (Pb) Free Solder ( $T_C$ )**

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350 - 2000	Volume mm <sup>3</sup> >2000
<1.6mm	260°C	260°C	260°C
1.6 – 2.5mm	260°C	250°C	245°C
>2.5mm	250°C	245°C	245°C

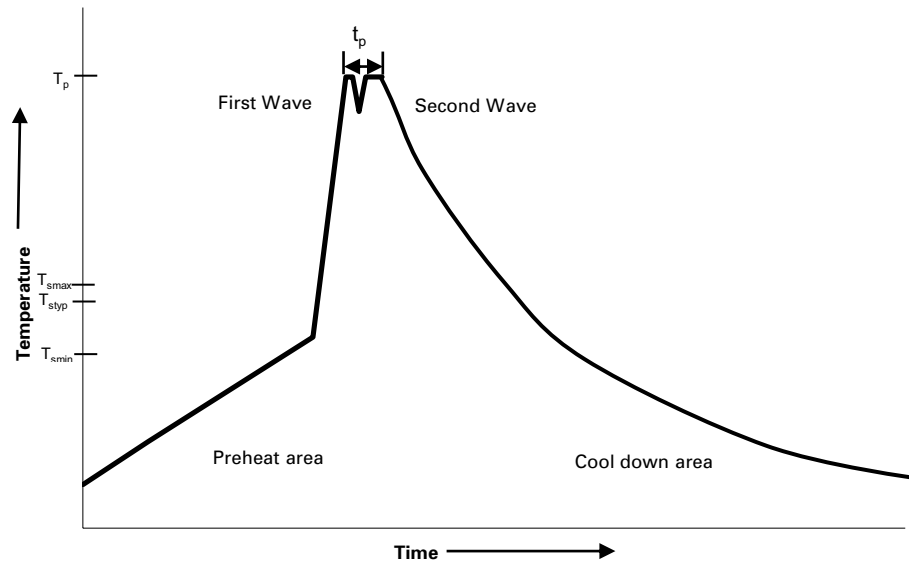
**Reference JDEC J-STD-020**

Profile Feature	Standard SnPb Solder	Lead (Pb) Free Solder
Preheat and Soak		
• Temperature min. ( $T_{smin}$ )	100 °C	150 °C
• Temperature max. ( $T_{smax}$ )	150 °C	200 °C
• Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 Seconds	60-120 Seconds
Average ramp up rate $T_{smax}$ to $T_p$	3 °C/ Second Max.	3 °C/ Second Max.
Liquidous temperature ( $T_L$ )	183 °C	217 °C
Time at liquidous ( $t_L$ )	60-150 Seconds	60-150 Seconds
Peak package body temperature ( $T_p$ )*	Table 1	Table 2
Time ( $t_p$ )** within 5 °C of the specified classification temperature ( $T_C$ )	20 Seconds**	30 Seconds**
Average ramp-down rate ( $T_p$ to $T_{smax}$ )	6 °C/ Second Max.	6 °C/ Second Max.
Time 25 °C to Peak Temperature	6 Minutes Max.	8 Minutes Max.

\* Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

\*\* Tolerance for time at peak profile temperature ( $t_p$ ) is defined as a supplier minimum and a user maximum.

### Wave solder profile



### Reference EN 61760-1:2006

Profile Feature	Standard SnPb Solder	Lead (Pb) Free Solder
Preheat	• Temperature min. ( $T_{smin}$ )	100 °C
	• Temperature typ. ( $T_{styp}$ )	120 °C
	• Temperature max. ( $T_{smax}$ )	130 °C
	• Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	70 seconds
$\Delta$ preheat to max Temperature	150 °C max.	150 °C max.
Peak temperature ( $T_p$ )*	235 °C – 260 °C	250 °C – 260 °C
Time at peak temperature ( $t_p$ )	10 seconds max 5 seconds max each wave	10 seconds max 5 seconds max each wave
Ramp-down rate	~ 2 K/s min ~3.5 K/s typ ~5 K/s max	~ 2 K/s min ~3.5 K/s typ ~5 K/s max
Time 25 °C to 25 °C	4 minutes	4 minutes

### Manual solder

350 °C, 4-5 seconds (by soldering iron), generally manual hand soldering is not recommended.

Life Support Policy: Eaton does not authorize the use of any of its products for use in life support devices or systems without the express written approval of an officer of the Company. Life support systems are devices which support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

Eaton reserves the right, without notice, to change design or construction of any products and to discontinue or limit distribution of any products. Eaton also reserves the right to change or update, without notice, any technical information contained in this bulletin.

**Eaton**  
**Electronics Division**  
1000 Eaton Boulevard  
Cleveland, OH 44122  
United States  
[www.eaton.com/electronics](http://www.eaton.com/electronics)

© 2018 Eaton  
All Rights Reserved  
Printed in USA  
Publication No. 10763 BU-MC18003  
January 2018

Eaton is a registered trademark.

All other trademarks are property of their respective owners.