

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)

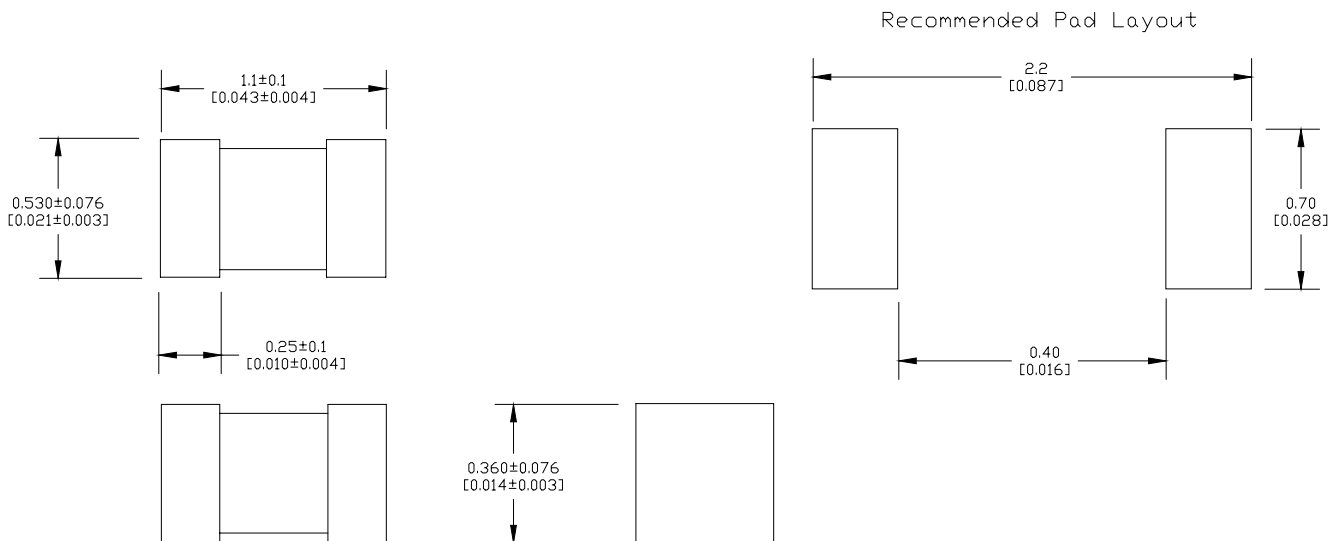
Product specifications

| Part number ⁴ | Rated voltage (V _{dc}) maximum | Clamping voltage ¹ (V) typical | Trigger voltage ² (V) typical | Capacitance @ 1 MHz (pF) typical | Capacitance @ 1 MHz (pF) maximum | Attenuation change (0–6 GHz) (dB) typical | Leakage current @ 12 V _{dc} (nA) typical | ESD capability IEC61000-4-2 Direct discharge (kV) typical | ESD capability IEC61000-4-2 Air discharge (kV) typical | ESD pulse withstand ^{1,3} 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

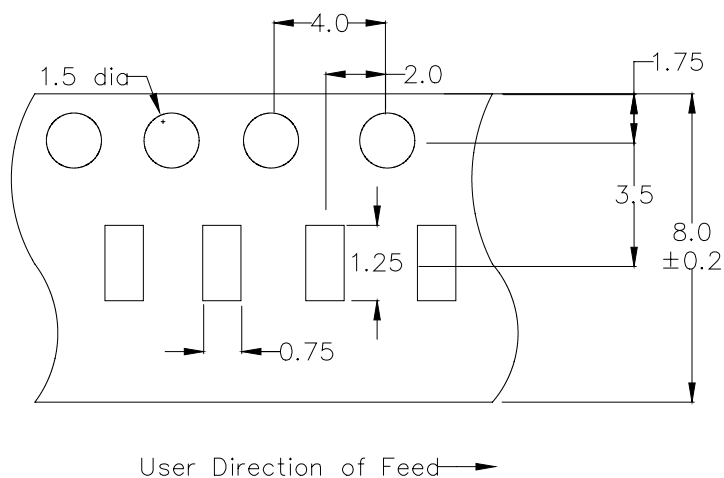
Mechanical vibration: MIL-STD-202, method 204

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

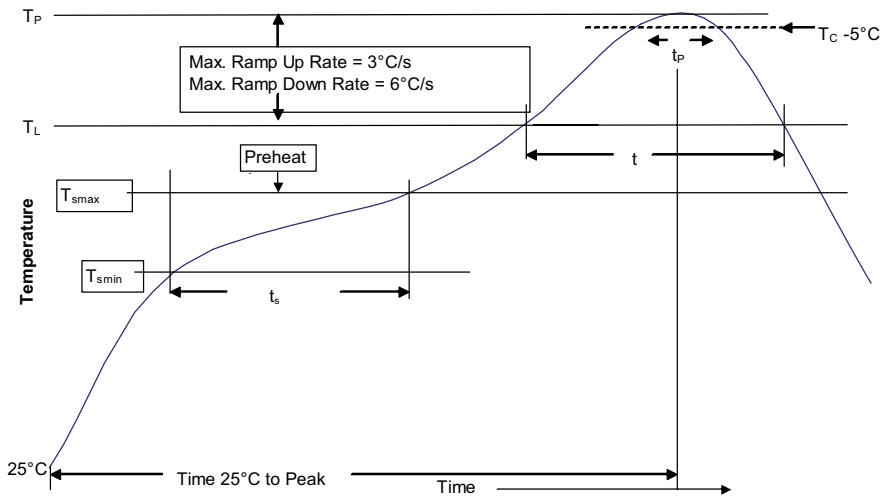


Table 1 - Standard SnPb Solder (T_C)

| Package Thickness | Volume mm ³ <350 | Volume mm ³ ≥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 ³ <350 | Volume mm ³ 350 - 2000 | Volume mm ³ >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 |

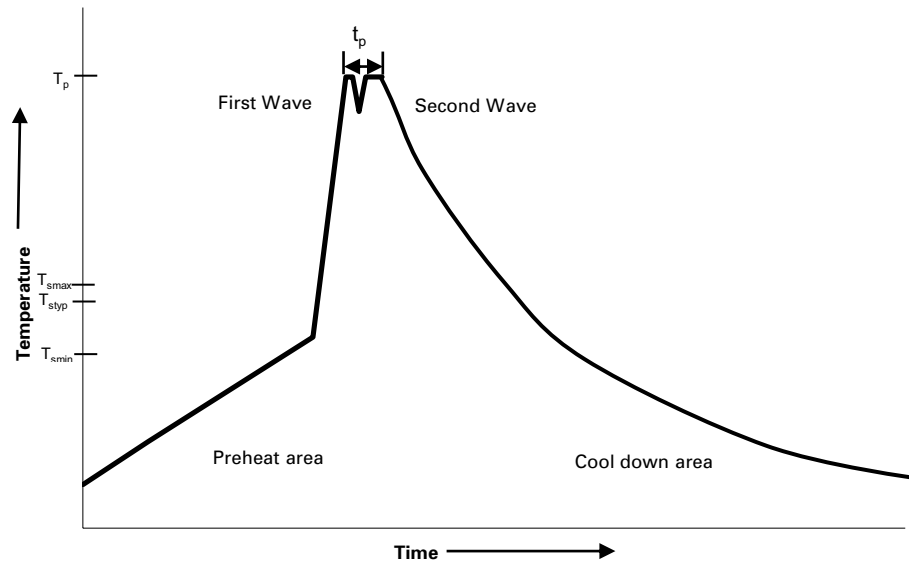
Reference JDEC J-STD-020

| 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 |
| Δ 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.

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