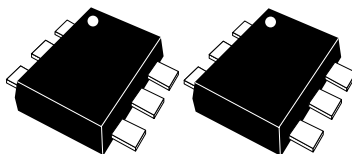
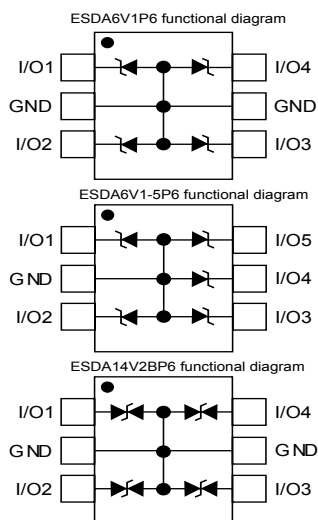


## 4 and 5 line ESD protection in SOT666



SOT-666IP

SOT-666



### Features

- 4 / 5 unidirectional (ESDA6V1P6 and ESDA6V1-5P6) and bidirectional (ESDA14V2BP6 and ESDA25-4BP6) Transil functions
- Breakdown voltage:
  - $V_{BR} = 6.1 \text{ V min.}, 14.2 \text{ V min. and } 25 \text{ V min.}$
- Low leakage current:
  - $< 500 \text{ nA}$  (ESDA6V1P6 / ESDA6V1-5P6)
  - $< 1 \mu\text{A}$  (ESDA14V2BP6 and ESDA25-4BP6)
- Very small PCB area  $< 2.6 \text{ mm}^2$
- Benefits:
  - High ESD protection level
  - High integration
  - Suitable for high density boards
- Complies with the standard IEC 61000-4-2 level 4:
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- Complies with MIL STD 883E - method 3015-7: Class3
  - 25 kV (human body model)

### Applications

Where ESD and EOS transient overvoltage protection in susceptible equipment is required, such as:

- Computers
- Servers
- Printers
- Communication systems and cellular phones
- Video equipment

These devices are particularly adapted to the protection of symmetrical signals.

### Description

The ESDAxxxP6 are monolithic arrays designed to protect up to 5 lines against ESD transients.

These devices are ideal where board space saving and reduced line capacitance are required.

Product status link

[ESDAxxxP6](#)

# 1 Characteristics

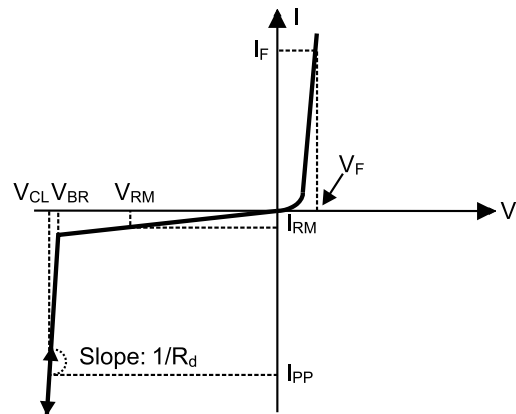
**Table 1. Absolute ratings ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

| Symbol    | Parameter   | Value   | Unit               |   |
|-----------|---|---|--------------------|---|
| $V_{PP}$  | Peak pulse voltage  | IEC 61000-4-2 level 4 standard:                 |                    |   |
|           |   | Contact discharge                               | $\pm 15$           |   |
|           |   | Air discharge                                   | $\pm 8$            |   |
|           |   | IEC 61000-4-2 level 4 standard for ESDA6V1-5P6: |                    |   |
|           | Contact discharge   | $\pm 20$  | kV                 |   |
|           | Air discharge   | $\pm 25$  |                    |   |
| $P_{PP}$  | Peak pulse power dissipation (8/20 $\mu\text{s}$ ) <sup>(1)</sup> , $T_j$ initial = $T_{amb}$ | ESDA6V1P6 / ESDA6V1-5P6                         | 150                | W |
|           |   | ESDA14V2BP6 / ESDA25-4BP6                       | 50                 |   |
| $T_{stg}$ | Storage temperature range   | -55 to +150                                     | $^{\circ}\text{C}$ |   |
| $T_j$     | Operating junction temperature range  | -40 to +150                                     | $^{\circ}\text{C}$ |   |
| $T_L$     | Maximum lead temperature for soldering during 10 s at 5 mm for case                           | 260   | $^{\circ}\text{C}$ |   |

1. for a surge greater than the maximum values, the diode will fail in short-circuit.

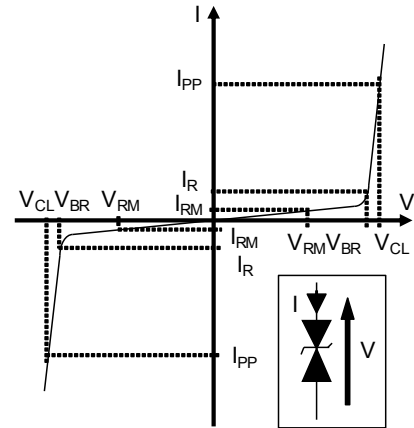
**Figure 1. Electrical characteristics (definitions)**

| Symbol     | Parameter                  |
|------------|----------------------------|
| $V_{BR}$   | Breakdown voltage          |
| $I_{RM}$   | Leakage current @ $V_{RM}$ |
| $V_{RM}$   | Stand-off voltage          |
| $V_{CL}$   | Clamping voltage           |
| $I_{PP}$   | Peak pulse current         |
| $I_F$      | Forward current            |
| $V_F$      | Forward voltage            |
| $R_d$      | Dynamic impedance          |
| $C_{LINE}$ | Line capacitance           |



**Figure 2. Electrical characteristics (definitions)**

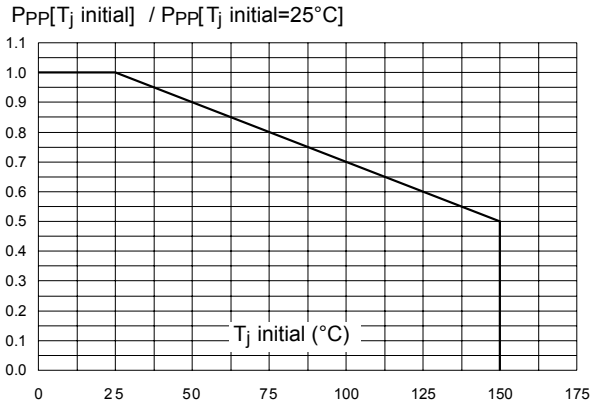
| Symbol   | Parameter                    |
|----------|------------------------------|
| $V_{BR}$ | = Breakdown voltage          |
| $V_{CL}$ | = Clamping voltage           |
| $I_{RM}$ | = Leakage current @ $V_{RM}$ |
| $V_{RM}$ | = Stand-off voltage          |
| $I_{PP}$ | = Peak pulse current         |
| $R_D$    | = Dynamic resistance         |
| $I_R$    | = Breakdown current          |


**Table 2. Electrical characteristics - values ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

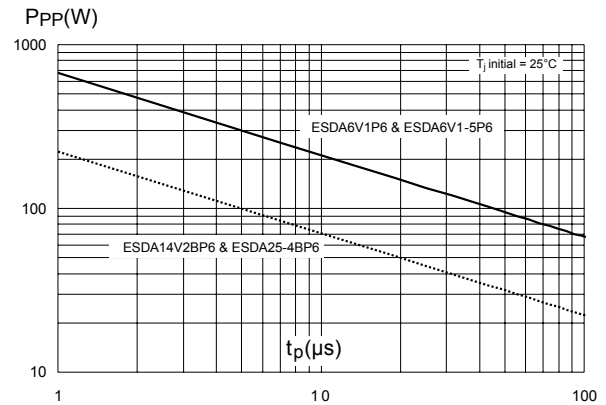
| Order code  | $V_{BR}$ at $I_R$ |      | $I_{RM}$ at $V_{RM}$ |               | $R_d$    | $\alpha T$         | $C_{line}$  |    |
|-------------|-------------------|------|----------------------|---------------|----------|--------------------|-------------|----|
|             | Min.              | Max. | Max.                 |               | Max.     | Typ.               | Typ. at 0 V |    |
|             | V                 | V    | mA                   | $\mu\text{A}$ | $\Omega$ | $10^{-4}/\text{C}$ | pF          |    |
| ESDA6V1P6   | 6.1               | 7.2  | 1                    | 0.5           | 3        | 1.5                | 4           | 70 |
| ESDA6V1-5P6 |                   |      |                      |               |          |                    |             |    |
| ESDA14V2BP6 | 14.2              | 18   | 1                    | 1             | 12       | 1.5                | 5.8         | 25 |
| ESDA25-4BP6 | 25                | 30   | 1                    | 1             | 24       | 1.7                | 7.3         | 22 |

## 1.1 Characteristics (curves)

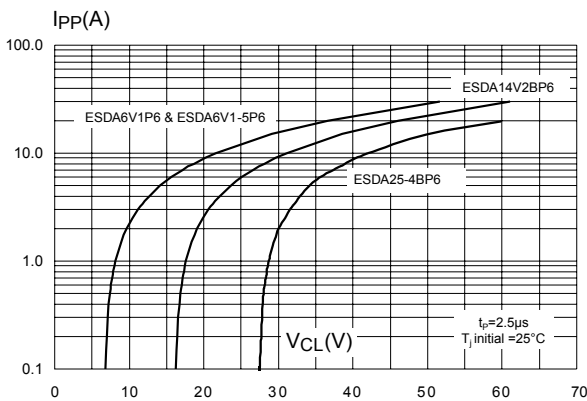
**Figure 3. Peak power dissipation versus initial junction temperature**



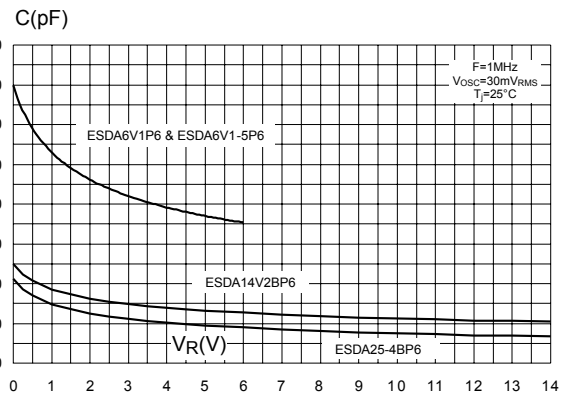
**Figure 4. Peak pulse power versus exponential pulse duration ( $T_j$  initial = 25° C)**



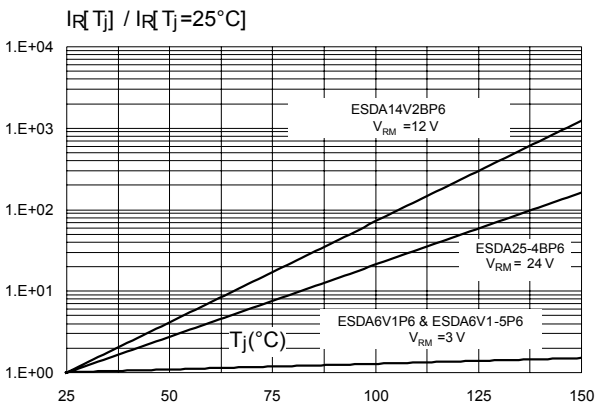
**Figure 5. Clamping voltage versus peak pulse current ( $T_j$  initial = 25° C, rectangular waveform,  $t_p = 2.5 \mu s$ )**



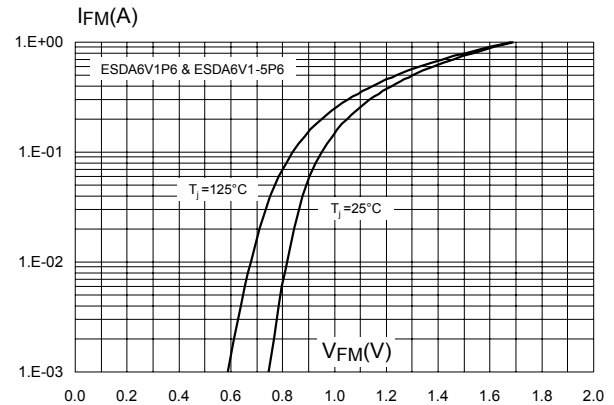
**Figure 6. Junction capacitance versus reverse applied voltage (typical values)**



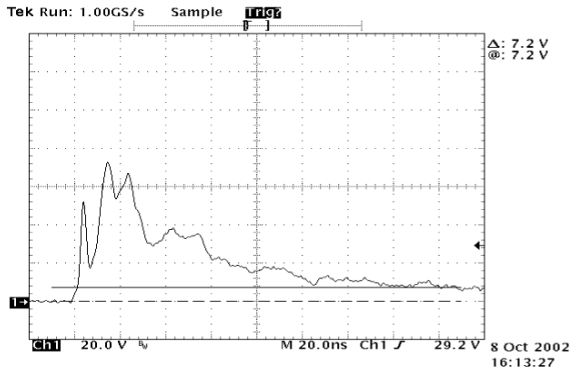
**Figure 7. Relative variation of leakage current versus junction temperature (typical values)**



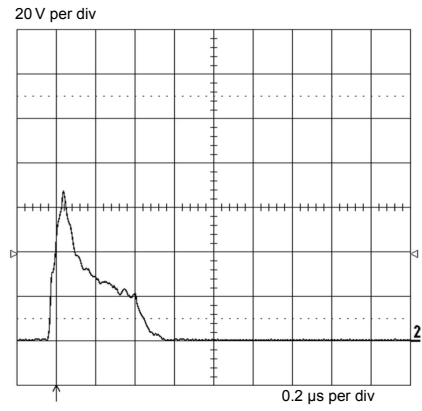
**Figure 8. Peak forward voltage drop versus peak forward current (typical values)**



**Figure 9. ESD response at  $V_{PP} = 15$  kV air discharge (ESDA6V1-5P6)**



**Figure 10. ESD response at  $V_{PP} = 15$  kV air discharge (ESDA25-4BP6)**



## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 SOT-666 package information

Figure 11. SOT-666 package outline

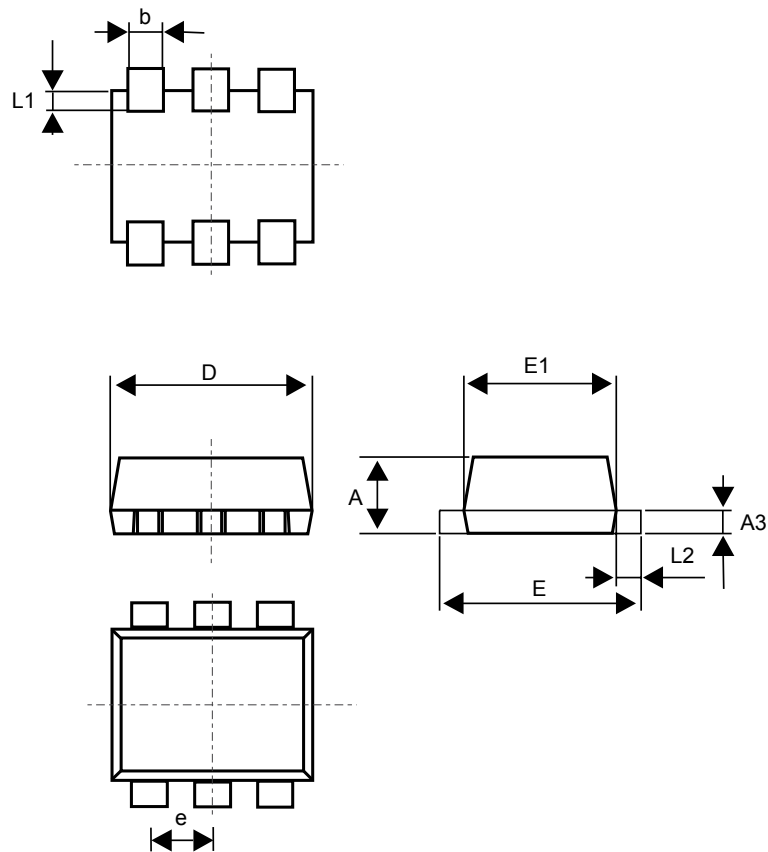
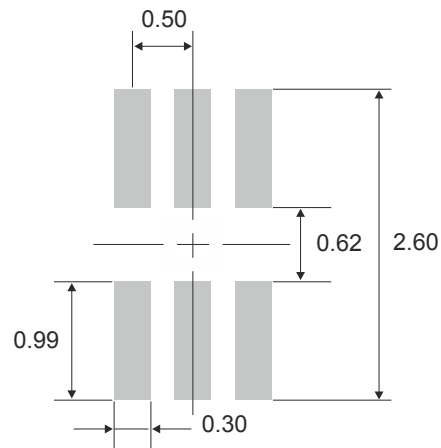


Table 3. SOT-666 package mechanical data

| Ref. | Dimensions  |      |      |                       |       |       |
|------|-------------|------|------|-----------------------|-------|-------|
|      | Millimeters |      |      | Inches <sup>(1)</sup> |       |       |
|      | Min.        | Typ. | Max. | Min.                  | Typ.  | Max.  |
| A    | 0.45        |      | 0.62 | 0.018                 |       | 0.025 |
| A3   | 0.08        |      | 0.18 | 0.003                 |       | 0.007 |
| b    | 0.17        |      | 0.34 | 0.007                 |       | 0.013 |
| D    | 1.50        |      | 1.70 | 0.059                 |       | 0.067 |
| E    | 1.50        |      | 1.70 | 0.059                 |       | 0.067 |
| E1   | 1.10        |      | 1.30 | 0.043                 |       | 0.051 |
| e    |             | 0.50 |      |                       | 0.020 |       |
| L1   |             | 0.19 |      |                       | 0.007 |       |
| L2   | 0.10        |      | 0.30 | 0.004                 |       | 0.012 |

1. Value in inches are converted from mm and rounded to 4 decimal digits

Figure 12. Footprint recommendations, dimensions in mm



## 2.2 SOT-666IP package information

Figure 13. SOT-666IP package outline

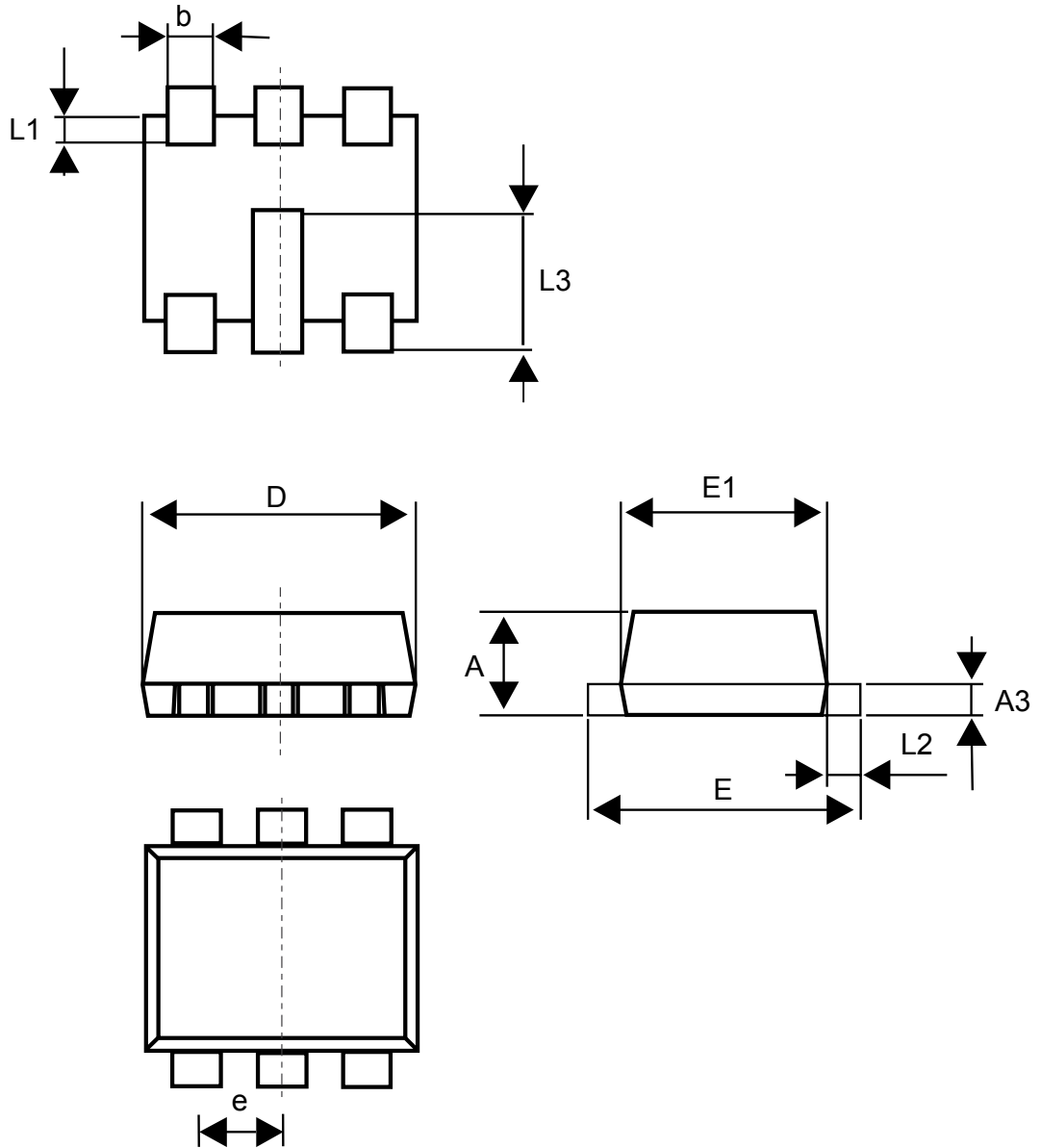
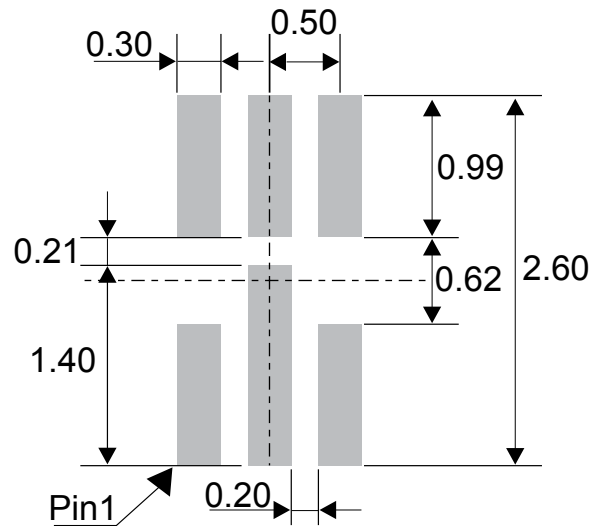




Table 4. SOT-666IP package mechanical data

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 0.45        |      | 0.62 | 0.018  |       | 0.025 |
| A3   | 0.08        |      | 0.18 | 0.003  |       | 0.007 |
| b    | 0.17        |      | 0.34 | 0.007  |       | 0.013 |
| D    | 1.50        |      | 1.70 | 0.059  |       | 0.067 |
| E    | 1.50        |      | 1.70 | 0.059  |       | 0.067 |
| E1   | 1.10        |      | 1.30 | 0.043  |       | 0.051 |
| e    |             | 0.50 |      |        | 0.020 |       |
| L1   |             | 0.19 |      |        | 0.007 |       |
| L2   | 0.10        |      | 0.30 | 0.004  |       | 0.012 |
| L3   |             | 0.60 |      |        | 0.024 |       |

Figure 14. Footprint recommendations, dimensions in mm



### 3 Ordering information

**Table 5. Ordering information**

| Order code  | Marking | Package   | Weight | Base qty. | Delivery mode |
|-------------|---------|-----------|--------|-----------|---------------|
| ESDA6V1P6   | B       | SOT-666IP | 2.9 mg | 3000      | Tape and reel |
| ESDA6V1-5P6 | C       |           |        |           |               |
| ESDA14V2BP6 | A       | SOT-666   |        |           |               |
| ESDA25-4BP6 | V       |           |        |           |               |

## Revision history

**Table 6. Document revision history**

| Date        | Version | Changes   |
|-------------|---------|---|
| 07-Feb-2006 | 1       | ESDA6V1P6, ESDA6V1-5P6 and ESDA14V2BP6: datasheets merged. ECOPACK statement added. Some curves combined. |
| 26-Jun-2006 | 2       | Reformatted to current standards. Modified package information to show both SOT-666 and SOT-666IP.        |
| 22-May-2007 | 3       | Added product ESDA25-4BP6.  |
| 25-Sep-2019 | 4       | Updated <a href="#">Table 1</a> and title description.  |
| 22-Jun-2020 | 5       | Updated <a href="#">Table 2</a> .   |
| 26-Aug-2022 | 6       | Updated <a href="#">Table 2</a> .   |

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