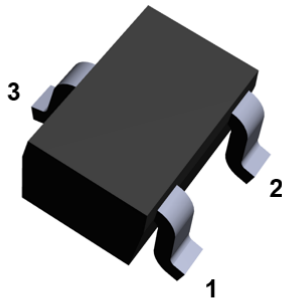
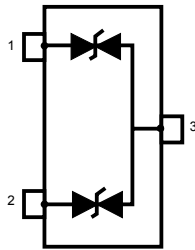


Automotive dual-line TVS in SOT323-3L for CAN bus




SOT323-3L
(Jedec SC-70)



Product status link

| | |
|---------------|---|
| ESDCANxx-2BWY | ESDCAN02-2BWY , ESDCAN03-2BWY , ESDCAN04-2BWY , ESDCAN05-2BWY , ESDCAN06-2BWY |
|---------------|---|

Features

- AEC-Q101 qualified 
- Dual-line ESD and EOS protection
- Breakdown voltage, V_{BR} :
 - ESDCAN02-2BWY: 28.5 V
 - ESDCAN03-2BWY: 26.5 V
 - ESDCAN04-2BWY: 27.5 V
 - ESDCAN05-2BWY: 39 V
 - ESDCAN06-2BWY: 38 V
- Bidirectional device
- Max pulse power up to 170 W (8/20 μ s)
- Low clamping factor V_{CL} / V_{BR}
- Low leakage current
- ECOPACK[®]2 ROHS compliant component

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- IPC7531 footprint and JEDEC registered package
- ISO 16750-2 (Jump start and reversed battery tests)
- ISO 10605 - C = 150 pF, R = 330 Ω , exceeds level 4:
 - ± 30 kV (air discharge)
 - ± 30 kV (contact discharge)
- ISO 10605 - C = 330 pF, R = 330 Ω exceeds level 4:
 - ± 30 kV (air discharge)
 - ± 30 kV (contact discharge)
- ISO 7637-3:
 - Pulse 3a: -150 V
 - Pulse 3b: +150 V
 - Pulse 2a: +/- 85 V

Applications

Automotive controller area network (CAN) bus lines where electrostatic discharges and other transients must be suppressed. These product are compliant with most of automotive interfaces.

Description

These devices are dual-line transient voltage suppressor (TVS) specifically designed for the protection of automotive CAN bus lines against electrostatic discharge (ESD).

Their improved parameters make them compliant with all key drivers in automotive: CAN-FD, LIN, FlexRay, MOST, SENT, USB, etc.

1 Characteristics

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

| Symbol | Parameter | | Value | Unit | |
|-----------|--------------------------------------|---|--------------------------------|--------------------|----|
| V_{PP} | Peak pulse voltage | ISO 10605 - C = 150 pF, R = 330 Ω : Contact discharge | 30 | kV | |
| | | Air discharge | 30 | | |
| | | ISO 10605 - C = 330 pF, R = 330 Ω : Contact discharge | ESDCAN02-2BWY ESDCAN03-2BWY | | 30 |
| | | Air discharge | ESDCAN04-2BWY | | 30 |
| | | ISO 10605 - C = 330 pF, R = 330 Ω : Contact discharge | ESDCAN05-2BWY ESDCAN06-2BWY | | 22 |
| | | Air discharge | | | 22 |
| I_{PP} | Peak pulse current (8/20 μ s) | ESDCAN02-2BWY ESDCAN03-2BWY ESDCAN04-2BWY | 3.7 | A | |
| | | ESDCAN05-2BWY ESDCAN06-2BWY | 3 | | |
| T_j | Operating junction temperature range | | -55 to +175 | $^{\circ}\text{C}$ | |
| T_{stg} | Storage temperature range | | -55 to +175 | $^{\circ}\text{C}$ | |

Figure 1. Electrical characteristics (definitions)

| Symbol | Parameter |
|--------------|-----------------------------|
| V_{BR} = | Breakdown voltage |
| V_{RM} = | Stand-off voltage |
| V_{CL} = | Clamping voltage |
| I_{RM} = | Leakage current at V_{RM} |
| I_{PP} = | Peak pulse current |
| R_d = | Dynamic impedance |
| C_{LINE} = | Input capacitance per line |

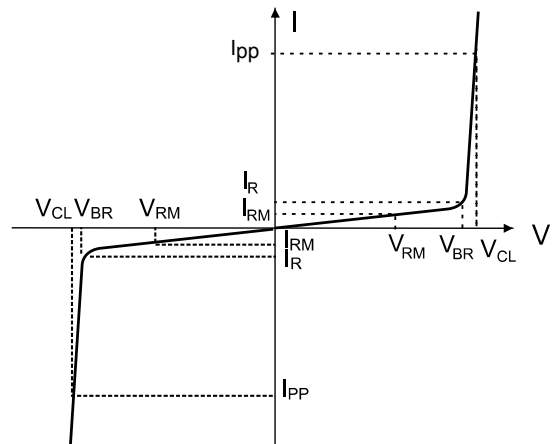


Table 2. Electrical characteristics (values, $T_{amb} = 25\text{ }^{\circ}\text{C}$)

| Order code | I_{RM} max. at V_{RM} | | V_{BR} at I_R | | | V_{CL} Pulse ISO7637-3 | | V_{CL} at I_{PP} (8/20 μs) | | C | | $\Delta C^{(1)}$ | $\alpha T^{(2)}$ |
|---------------|---------------------------|------|-------------------|------|----|--------------------------|-------------------|--|---|------|------|------------------|----------------------------|
| | μA | V | Min. | Max. | mA | 3a at -150 V min. | 3b at +150 V max. | Max. | A | Typ. | Max. | Typ. | Typ. |
| | | | V | | | V | | V | | pF | | pF | $10^{-4}/^{\circ}\text{C}$ |
| ESDCAN02-2BWY | 0.01 | 26.5 | 28.5 | 31.7 | 1 | -36 | 36 | 44 | 3 | 3 | 3.5 | 0.01 | 9 |
| ESDCAN03-2BWY | 0.01 | 24 | 26.5 | 29.7 | 1 | -34 | 34 | 41 | 3 | 3 | 3.5 | 0.01 | 9 |
| ESDCAN04-2BWY | 0.05 | 25.5 | 27.5 | 30.7 | 1 | -35 | 35 | 43 | 3 | 17 | 19 | 0.1 | 9 |
| ESDCAN05-2BWY | 0.1 | 36 | 39 | 43.3 | 1 | -45 | 45 | 61 | 3 | 3 | 3.5 | 0.01 | 9 |
| ESDCAN06-2BWY | 0.1 | 35 | 38 | 42.2 | 1 | -44 | 44 | 59 | 3 | 13 | 15 | 0.1 | 9 |

1. ΔC : capacitance variation between IO1 and IO2 versus GND

2. to calculate V_{BR} versus T_j : V_{BR} at $T_j = V_{BR}$ at $25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_j - 25))$

1.1 Characteristics (curves)

Figure 2. Maximum peak current versus initial junction temperature

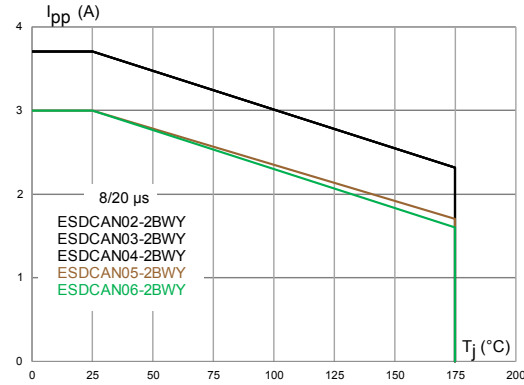


Figure 3. Maximum peak pulse current versus exponential pulse duration

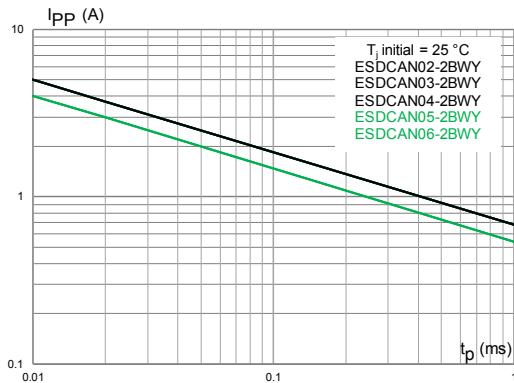


Figure 4. Peak pulse current versus clamping voltage

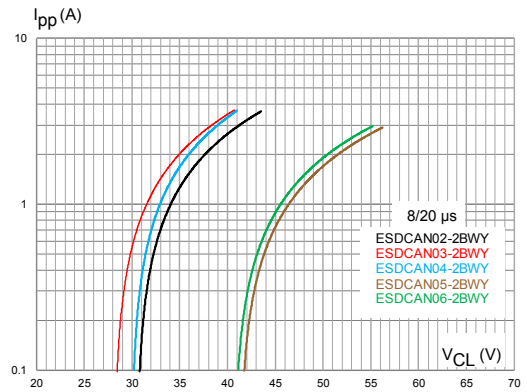


Figure 5. Junction capacitance versus reverse applied voltage

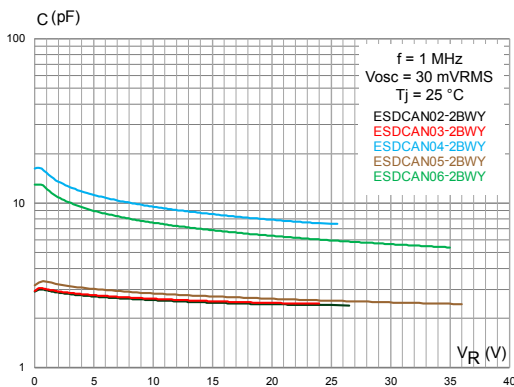


Figure 6. Leakage current versus junction temperature

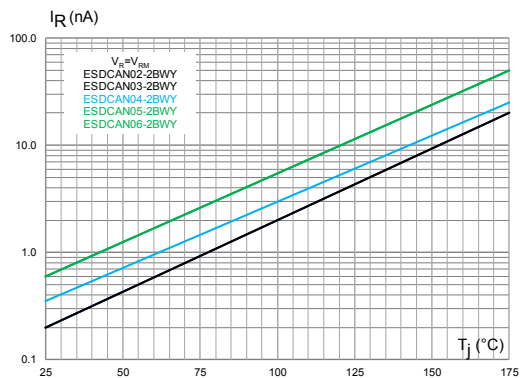


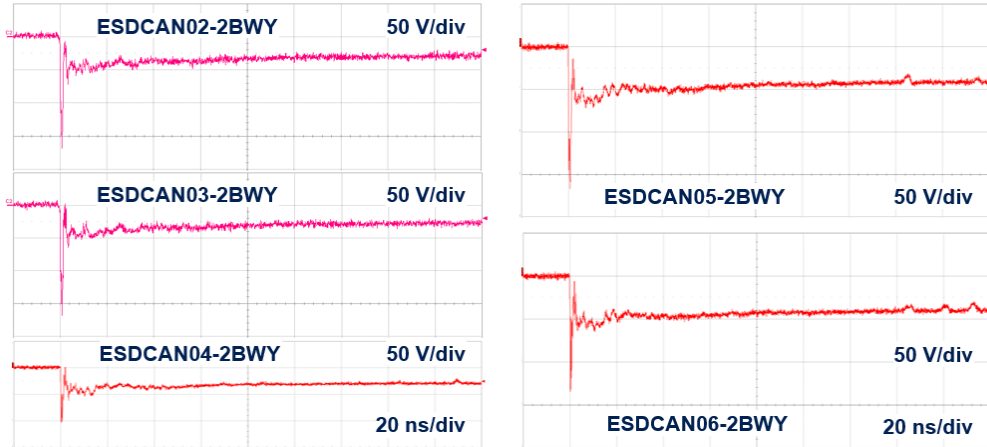
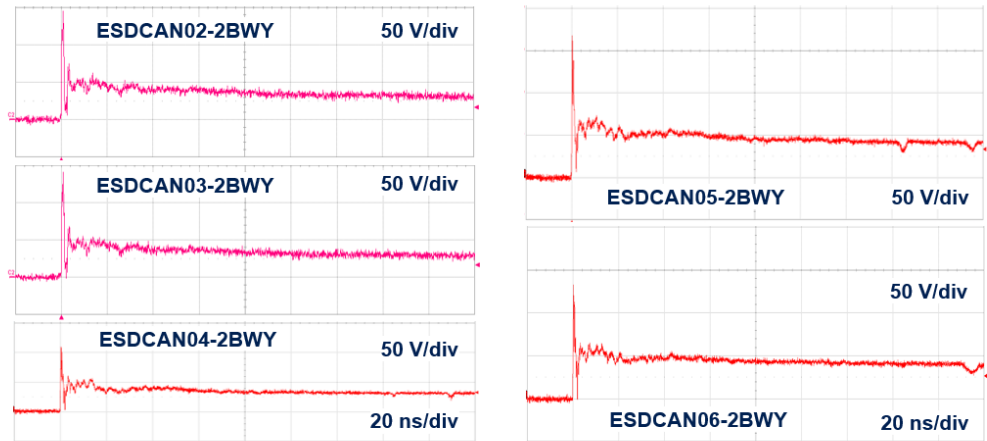
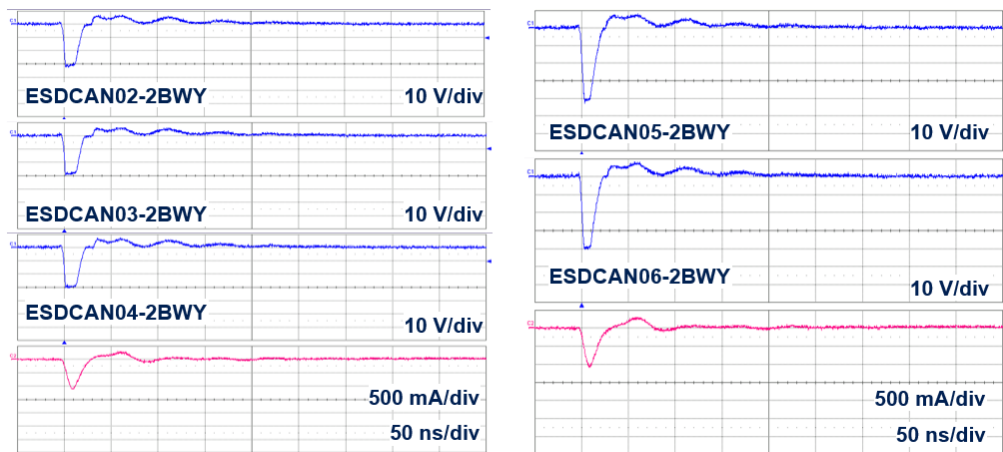
Figure 7. Response to ISO 10605 -C = 150 pF, R = 330 Ω (-8 kV contact)

Figure 8. Response to ISO 10605 - C = 150 pF, R = 330 Ω (+8 kV contact)

Figure 9. Response to ISO 7637-3 Pulse 3a: -150 V


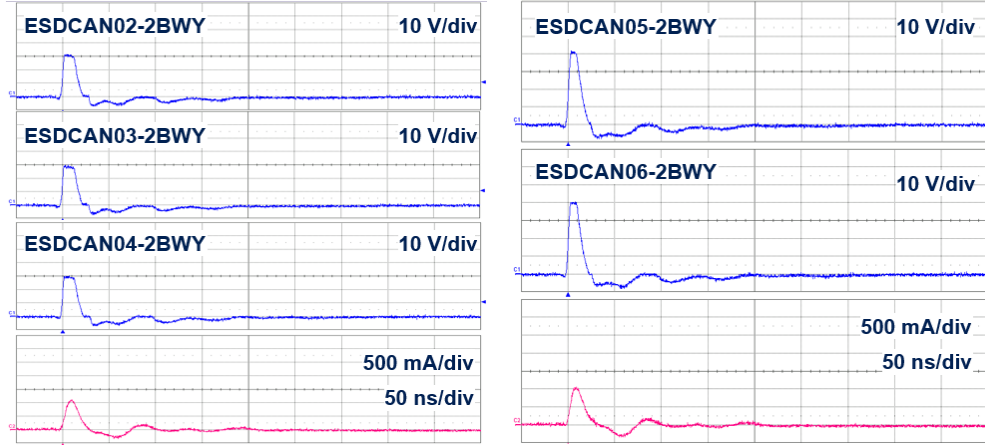
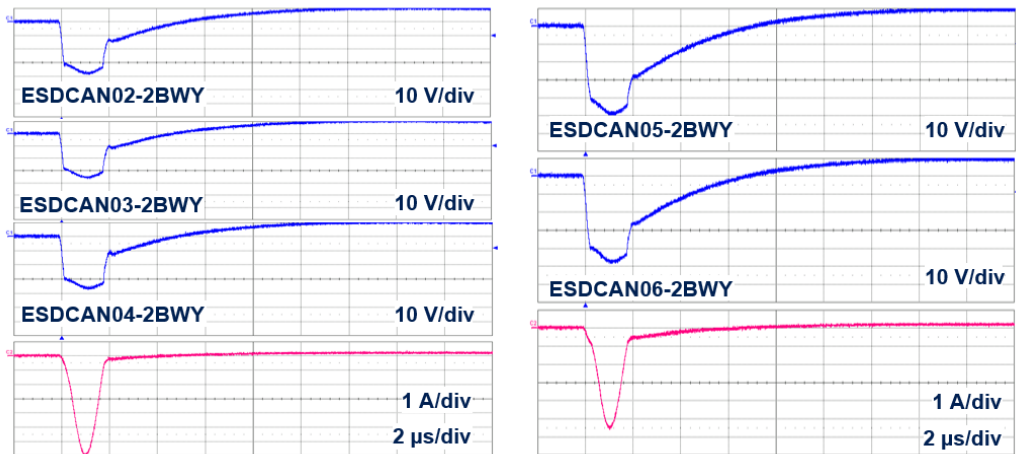
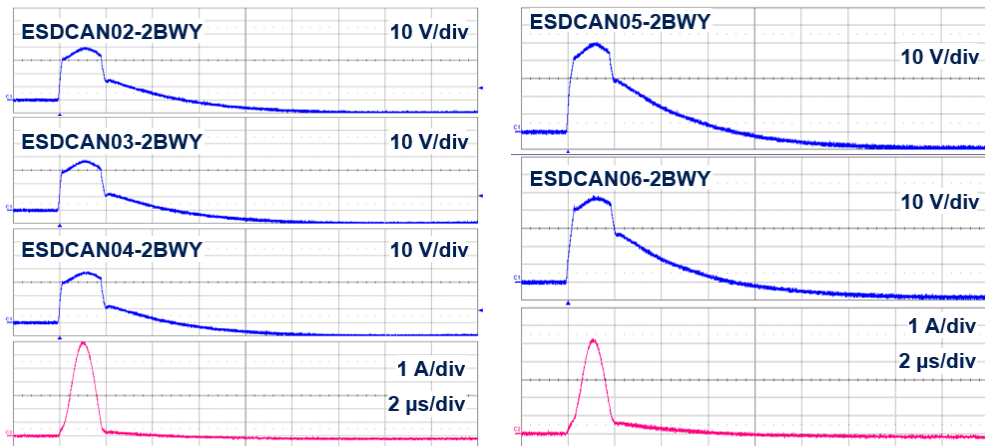
Figure 10. Response to ISO 7637-3 Pulse 3b : +150 V

Figure 11. Response to ISO 7637-3 pulse 2a: -85 V

Figure 12. Response to ISO 7637-3 pulse 2a: +85 V


Figure 13. S21 attenuation

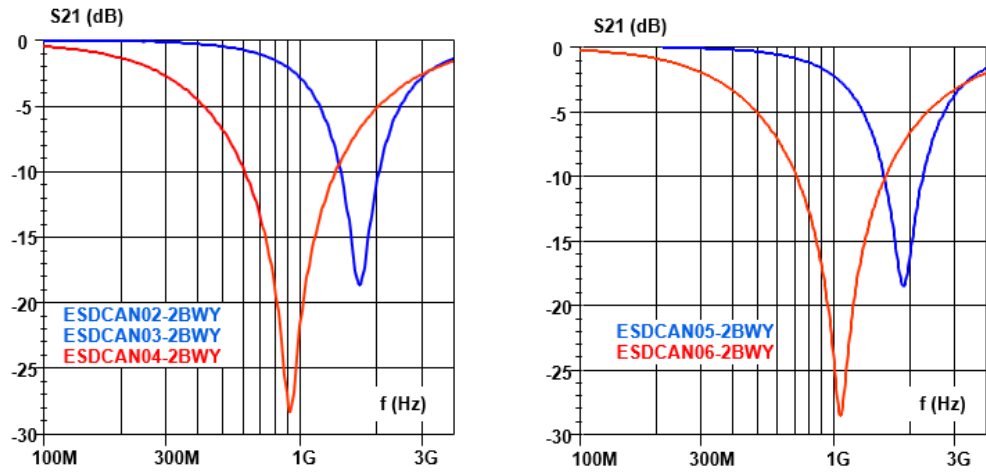
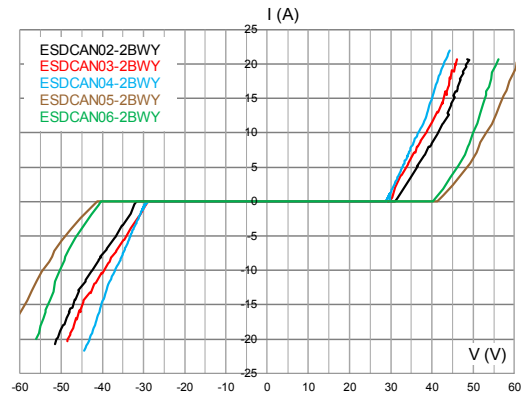


Figure 14. TLP



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. ECOPACK® is an ST trademark.

2.1 SOT323-3L package information

Figure 15. SOT323-3L package outline

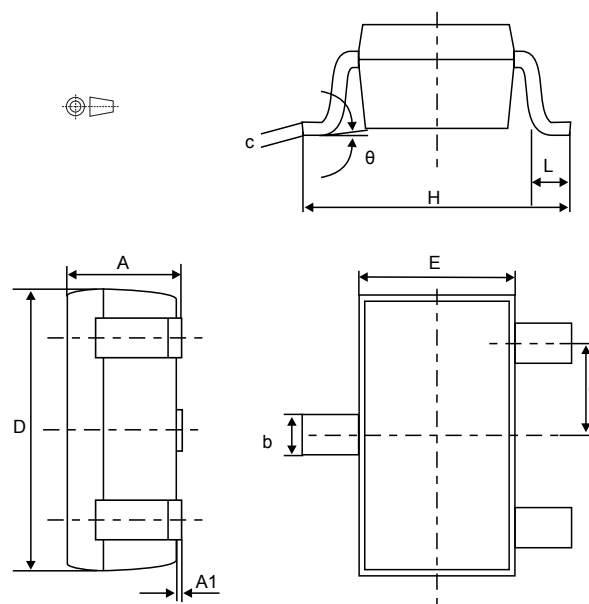
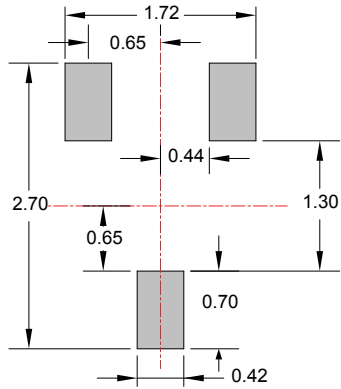
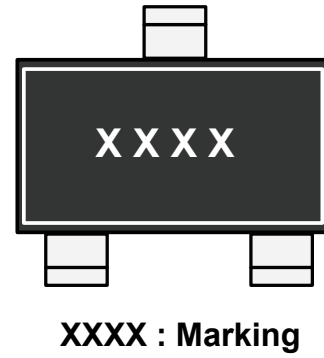
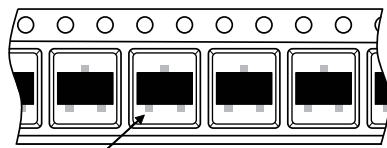


Table 3. SOT323-3L package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|------|------|-----------------------|-------|-------|
| | Millimeters | | | Inches ⁽¹⁾ | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 0.80 | | 1.10 | 0.031 | | 0.044 |
| A1 | 0.00 | | 0.10 | 0.000 | | 0.004 |
| b | 0.25 | | 0.40 | 0.009 | | 0.016 |
| c | 0.10 | | 0.26 | 0.003 | | 0.011 |
| D | 1.80 | 2.00 | 2.20 | 0.070 | 0.079 | 0.087 |
| E | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.054 |
| e | 0.60 | 0.65 | 0.70 | 0.023 | 0.026 | 0.028 |
| H | 1.80 | 2.10 | 2.40 | 0.070 | 0.083 | 0.095 |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| θ | | 0 | 30° | | 0 | 30° |

1. Values in inches are converted from mm and rounded to 3 decimal digits

2.2 Packing information

Figure 16. SOT323-3L footprint in mm (inches)

Figure 17. SOT323-3L marking

Figure 18. Package orientation in reel


Pin 1 located according to EIA-481

Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

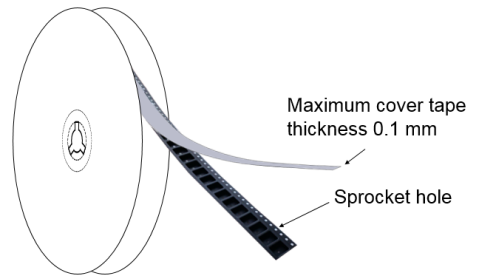
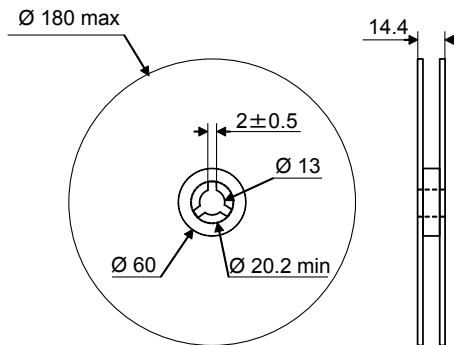
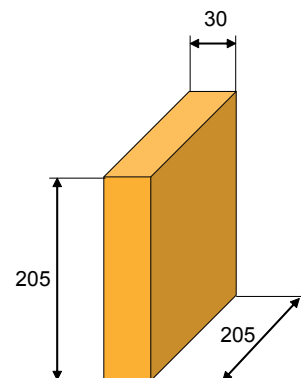
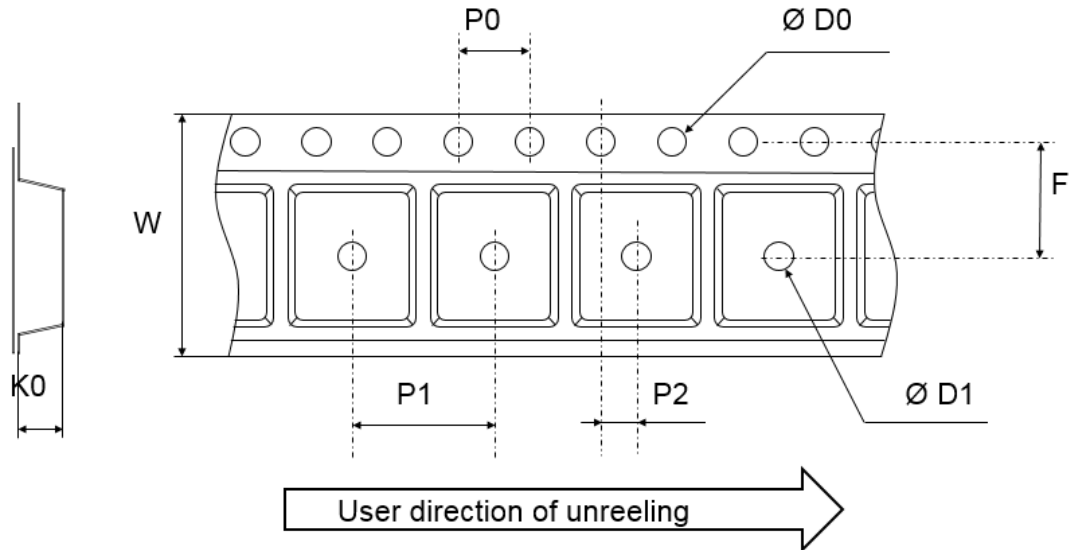
Figure 19. Tape and reel orientation

Figure 20. 7" reel dimension values

Figure 21. Inner box dimension values


Figure 22. Tape outline


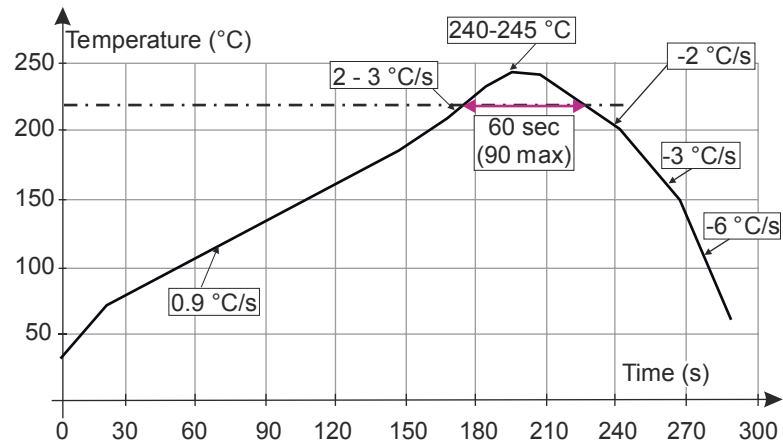
Note: Pocket dimensions are not on scale
 Pocket shape may vary depending on package

Table 4. Tape dimension values

| Ref. | Dimensions | | |
|------|-------------|------|------|
| | Millimeters | | |
| | Min. | Typ. | Max. |
| D0 | 1.50 | 1.55 | 1.6 |
| D1 | 1.00 | | |
| F | 3.45 | 3.50 | 3.55 |
| K0 | 1.12 | 1.22 | 1.32 |
| P0 | 3.90 | 4.00 | 4.10 |
| P1 | 3.90 | 4.00 | 4.10 |
| P2 | 1.95 | 2.00 | 2.05 |
| W | 7.90 | 8.00 | 8.30 |

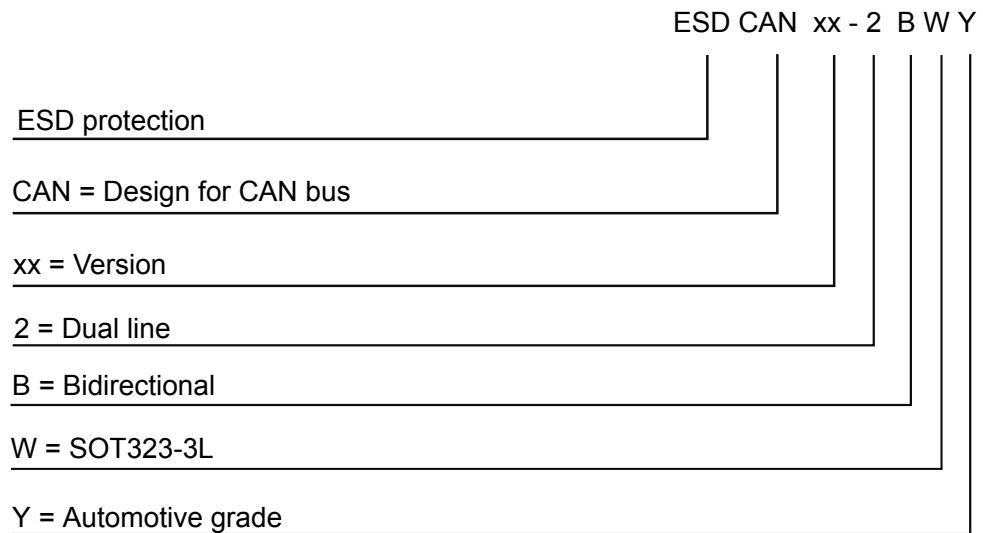
3 Reflow profile

Figure 23. ST ECOPACK[®] recommended soldering reflow profile for PCB mounting



Note: Minimize air convection currents in the reflow oven to avoid component movement. Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.

4 Ordering information

Figure 24. Ordering information scheme

Table 5. Ordering information

| Order code | Marking ⁽¹⁾ | Package | Weight | Base qty. | Delivery mode |
|---------------|------------------------|-----------|---------|-----------|---------------|
| ESDCAN02-2BWY | C02 | SOT323-3L | 6.58 mg | 3000 | Tape and reel |
| ESDCAN03-2BWY | C03 | | | | |
| ESDCAN04-2BWY | C04 | | | | |
| ESDCAN05-2BWY | C05 | | | | |
| ESDCAN06-2BWY | C06 | | | | |

1. The marking can be rotated by multiples of 90° to differentiate assembly location

Revision history

Table 6. Document revision history

| Date | Revision | Changes |
|-------------|----------|-------------------------------------|
| 17-Oct-2018 | 1 | First issue. |
| 13-Nov-2018 | 2 | Updated product name on cover page. |

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