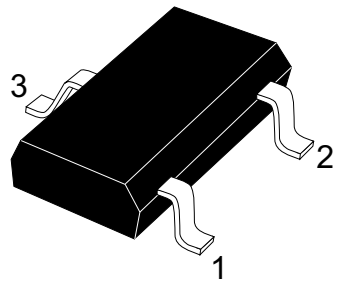
# ESDCAN0x-2BWY

## Automotive dual-line Transil™, transient voltage suppressor (TVS) for CAN bus

**Datasheet - production data**




SOT323-3L

## Features

- Dual-line ESD and EOS protection
- Stand-off voltage
  - ESDCAN02-2BWY: 26.5 V
  - ESDCAN03-2BWY: 24 V
- Bidirectional device
- Max pulse power: 250 W (8/20 µs)
- Low clamping factor $V_{CL}$ / $V_{BR}$
- Low leakage current
- ECOPACK®2 compliant component
- AEC-Q101 qualified

### Complies with the following standards

- ISO 10605 - C = 150 pF, R = 330 Ω:
  - ±30 kV (air discharge)
  - ±30 kV (contact discharge)
- ISO 10605 - C = 330 pF, R = 330 Ω:
  - ±30 kV (air discharge)
  - ±30 kV (contact discharge)
- ISO 7637-3:
  - Pulse 3a: $V_s$ = -150 V
  - Pulse 3b: $V_s$ = +100 V

## Application

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

## Description

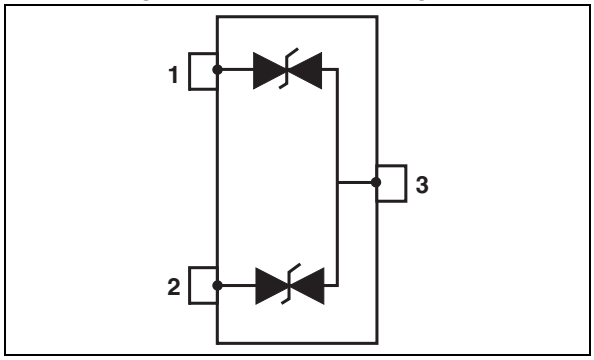
The ESDCAN02-2BWY and ESDCAN03-2BWY are a dual-line Transil specifically designed for the protection of the automotive CAN bus lines against electrostatic discharge (ESD).

Its improved parameters versus other solutions on the market make it compliant with all key interfaces in automotive: CAN-FD, LIN, FlexRay, MOST, SENT, etc.

**Table 1. Device summary**

| Order code | $V_{RM}$ | Package |
|---|---|---|
| ESDCAN02-2BWY | 26.5 V | SOT323-3L |
| ESDCAN03-2BWY | 24 V | |

**Figure 1. Functional diagram**




TM: Transil is a trademark of STMicroelectronics

# 1 Characteristics

**Table 2. Absolute maximum ratings ($T_{amb}$ = 25°C)**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{PP}$ | Electrostatic discharge capability | ISO 10605 - C = 150 pF, R = 330 Ω:<br>Contact discharge<br>Air discharge | <br>30<br>30 | kV |
| | | ISO 10605 - C = 330 pF, R = 330 Ω:<br>Contact discharge<br>Air discharge | <br>30<br>30 | |
| | | HBM MIL STD 883 | 30 | |
| $P_{PP}$ | Peak pulse power dissipation (8/20 µs) | $T_j$ initial = $T_{amb}$ | 250 | W |
| $I_{PP}$ | Peak pulse current (8/20 µs) | | 3.7 | A |
| $T_j$ | Operating junction temperature range | | -55 to +175 | °C |
| $T_{stg}$ | Storage temperature range | | -55 to +175 | °C |

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

| Symbol | | Parameter |
|---|---|---|
| $V_{BR}$ | = | Breakdown voltage |
| $V_{RM}$ | = | Stand-of 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 |

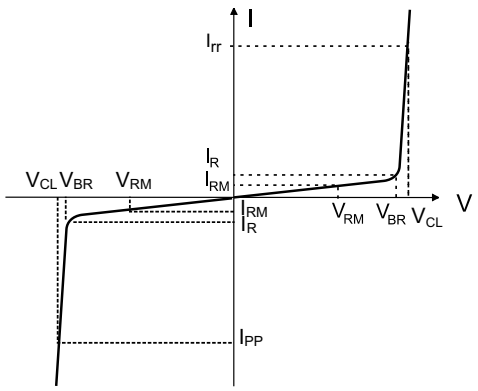


**Table 3. Electrical characteristics (values, $T_{amb}$ = 25 °C)**

| Symbol | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{RM}$ | ESDCAN02-2BWY | | | | 26.5 | V |
| | ESDCAN03-2BWY | | | | 24 | |
| $V_{BR}$ | $I_R$ = 1 mA, ESDCAN02-2BWY | | 28.5 | | | V |
| | $I_R$ = 1 mA, ESDCAN03-2BWY | | 26.5 | | | |
| $I_{RM}$ | $V_{RM}$ = 24 V | $T_j$ = 25 °C | | | 10 | nA |
| | $V_{RM}$ = 5V | | | | 1 | |
| | $V_{RM}$ = 24 V | $T_j$ = 125 °C | | | 50 | |
| | $V_{RM}$ = 5V | | | | 10 | |
| $V_{CL}$ | ISO 7637-3 Pulse 3a ($U_s$ = -150 V) | ESDCAN02-2BWY | -39 | | | V |
| | ISO 7637-3 Pulse 3b ($U_s$ = +100 V) | | | | 39 | |
| | IEC 61000-4-5 (8/20 µs), $I_{PP}$ = 1 A | | | | 37 | |
| | IEC 61000-4-5 (8/20 µs), $I_{PP}$ = 3A | | | | 44 | |
| $V_{CL}$ | ISO 7637-3 Pulse 3a ($U_s$ = -150 V) | ESDCAN03-2BWY | -37 | | | V |
| | ISO 7637-3 Pulse 3b ($U_s$ = +100 V) | | | | 37 | |
| | IEC 61000-4-5 (8/20 µs), $I_{PP}$ = 1 A | | | | 35 | |
| | IEC 61000-4-5 (8/20 µs), $I_{PP}$ = 3A | | | | 41 | |
| C | $V_R$ = 0 V DC, f = 1 MHz | | | 3 | 3.5 | pF |
| ΔC | Capacitance difference between both line versus ground | | | 0.01 | 0.08 | pF |
| $\alpha T^{(1)}$ | Voltage temperature coefficient | | | | 9 | $10^{-4}$/°C |

1. $V_{BR}$ at $T_j$ = $V_{BR}$ at 25°C x (1 + αT x ($T_j$ – 25))

**Figure 3. Peak pulse current versus initial junction temperature (maximum values)**

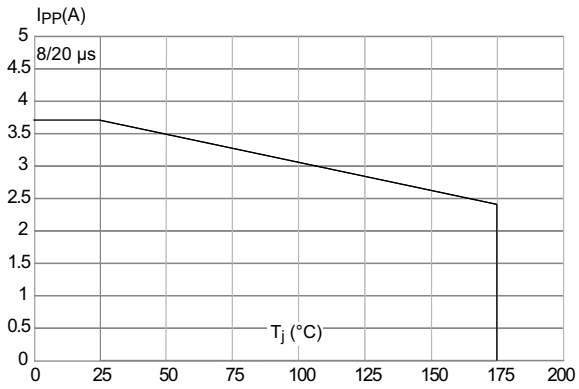



**Figure 4. Junction capacitance versus reverse voltage applied**

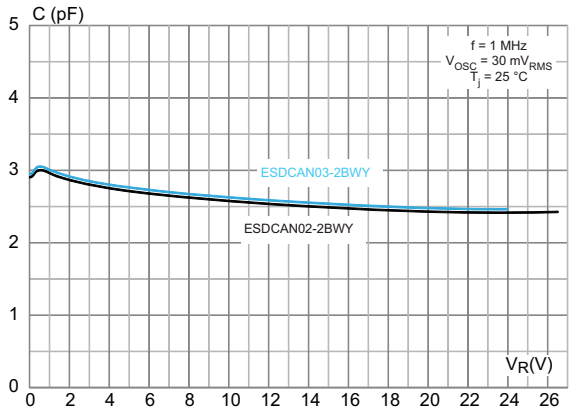



**Figure 5. Peak pulse current versus clamping voltage ESDCAN02-2BWY**

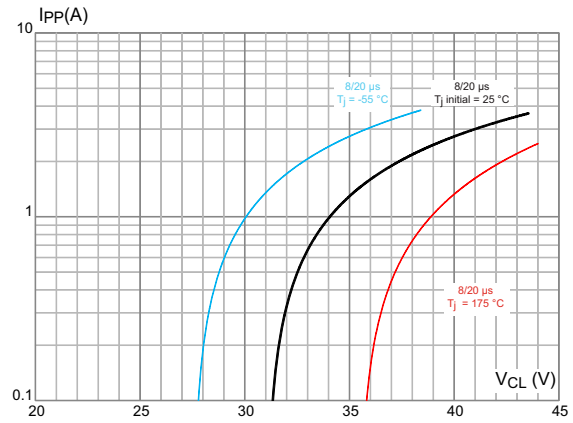



**Figure 6. Peak pulse current versus clamping voltage ESDCAN03-2BWY**

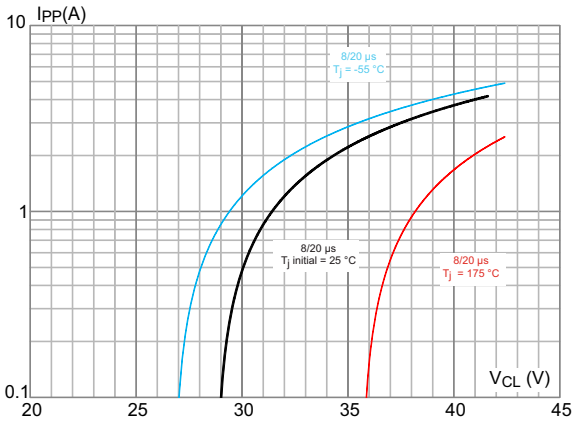



**Figure 7. ESD response to ISO 10605 - C = 150 pF, R = 330 Ω (+8 kV contact) ESDCAN03-2BWY**

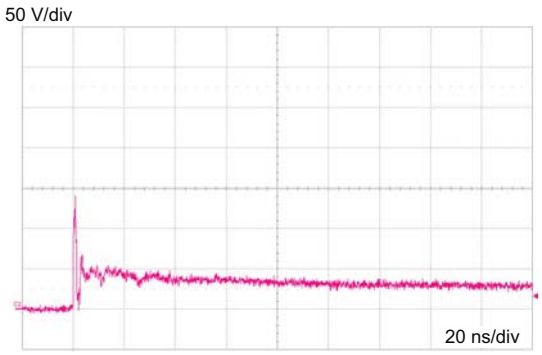



**Figure 8. ESD response to ISO 10605 - C = 150 pF, R = 330 Ω (-8 kV contact) ESDCAN03-2BWY**

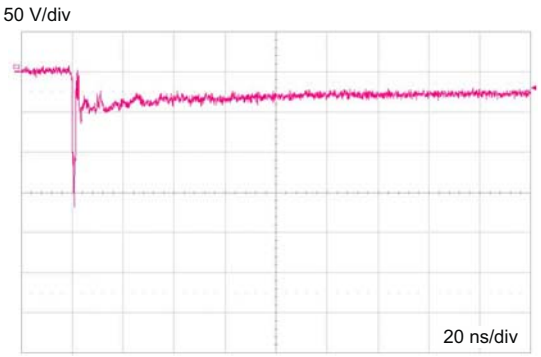


**Figure 9. Response to ISO 7637-3 Pulse 3a (Us = -150 V) ESDCAN03-2BWY**

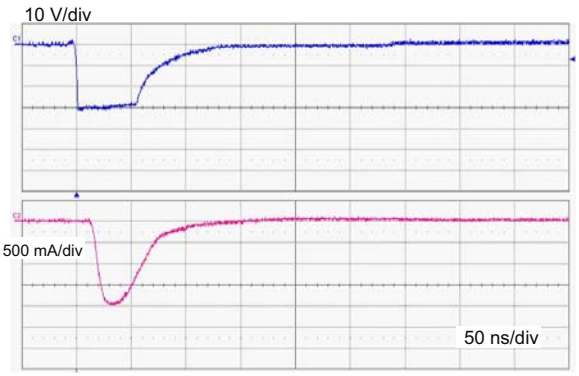



**Figure 10. Response to ISO 7637-3 Pulse 3b (Us = +100 V) ESDCAN03-2BWY**

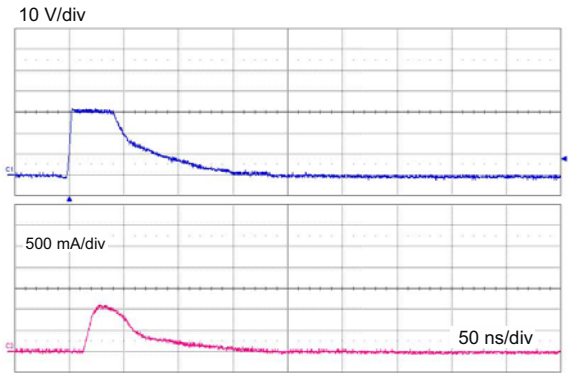



**Figure 11. Leakage current versus junction temperature**

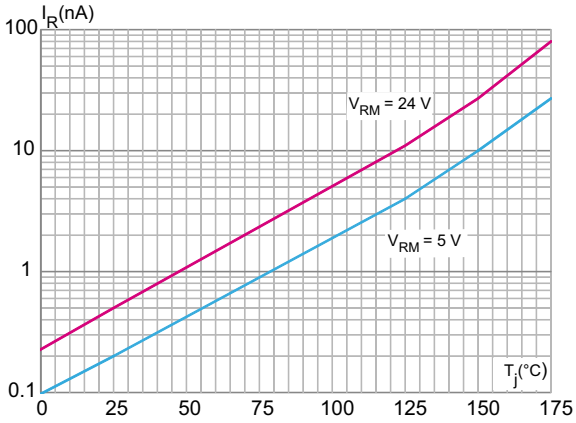



**Figure 12. S21 attenuation**

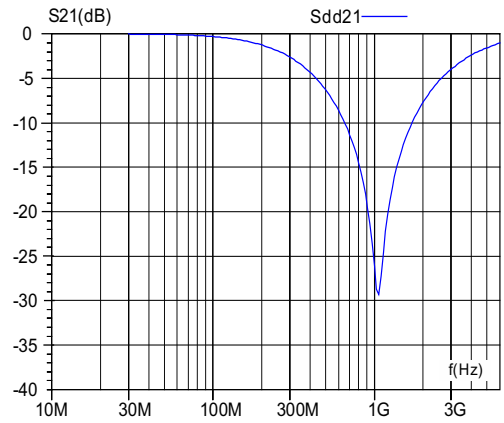
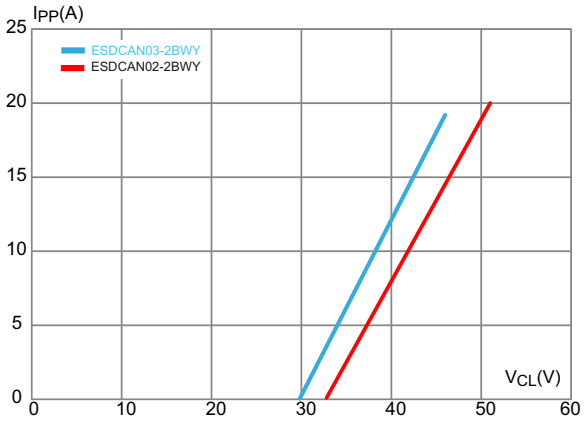



**Figure 13. TLP**



# 2 Package information

- Epoxy meets UL94, V0
- Lead-free packages

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 14. SOT323-3L package outline**

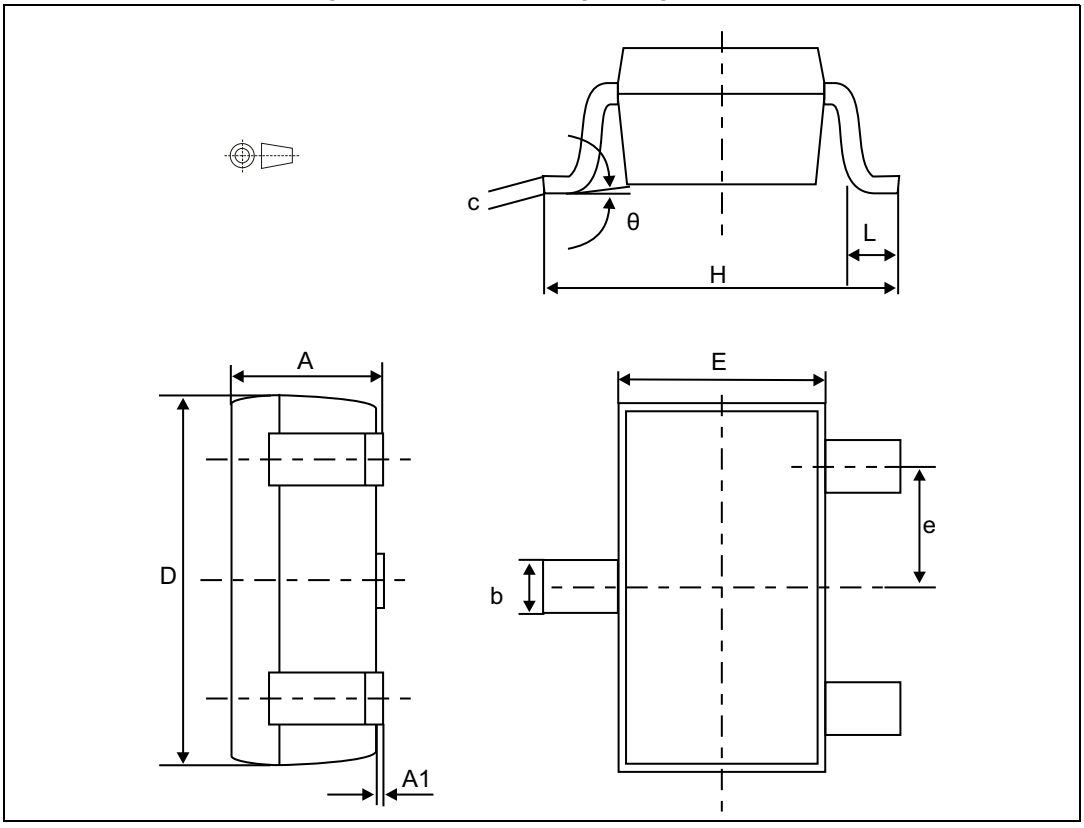
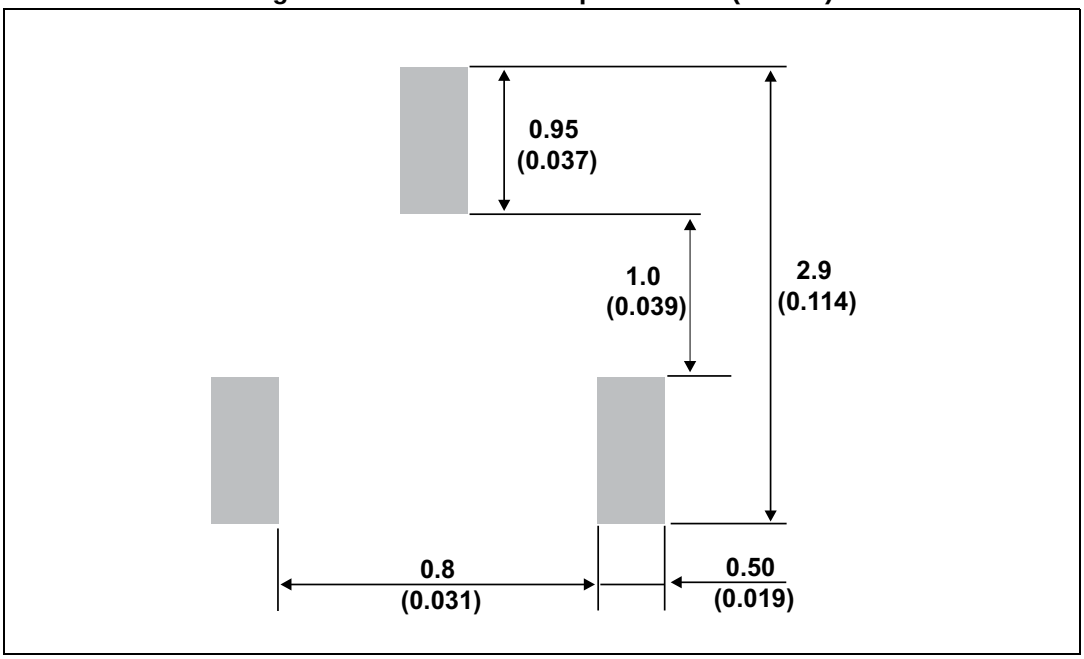


**Table 4. SOT323-3L package mechanical data**

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches[1] | | |
| | Typ. | Min. | Max. | Typ. | Min. | Max. |
| A | 0.8 | | 1.1 | 0.031 | | 0.043 |
| A1 | 0.0 | | 0.1 | 0.000 | | 0.003 |
| b | 0.25 | | 0.4 | 0.0098 | | 0.0157 |
| c | 0.1 | | 0.26 | 0.003 | | 0.0102 |
| D | 1.8 | 2.0 | 2.2 | 0.070 | 0.078 | 0.086 |
| E | 1.15 | 1.25 | 1.35 | 0.0452 | 0.0492 | 0.0531 |
| e | | 0.65 | | | 0.0255 | |
| H | 1.8 | 2.1 | 2.4 | 0.070 | 0.082 | 0.094 |
| L | 0.1 | 0.2 | 0.3 | 0.003 | 0.007 | 0.011 |
| Θ | 0 | | 30° | 0 | | 30° |

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

**Figure 15. SOT323-3L footprint in mm (inches)**

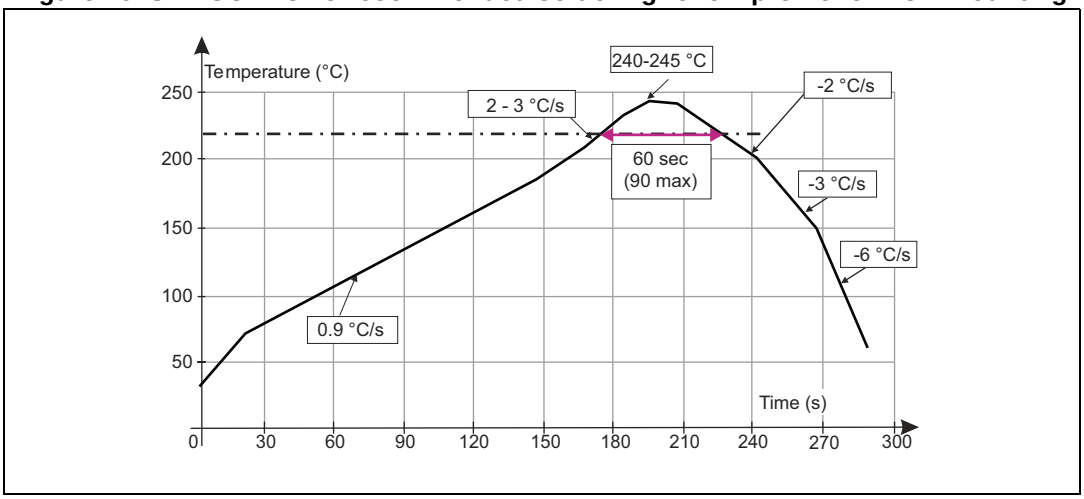


## 2.2 PCB design preference

1. To control the solder paste amount, the closed via is recommended instead of open vias.
2. The position of tracks and open vias in the solder area should be well balanced. The symmetrical layout is recommended, in case any tilt phenomena caused by asymmetrical solder paste amount due to the solder flow away.

## 2.3 Reflow profile

**Figure 16. ST ECOPACK® recommended soldering reflow profile for PCB mounting**




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

# 3 Ordering information

**Figure 17. Ordering information scheme**

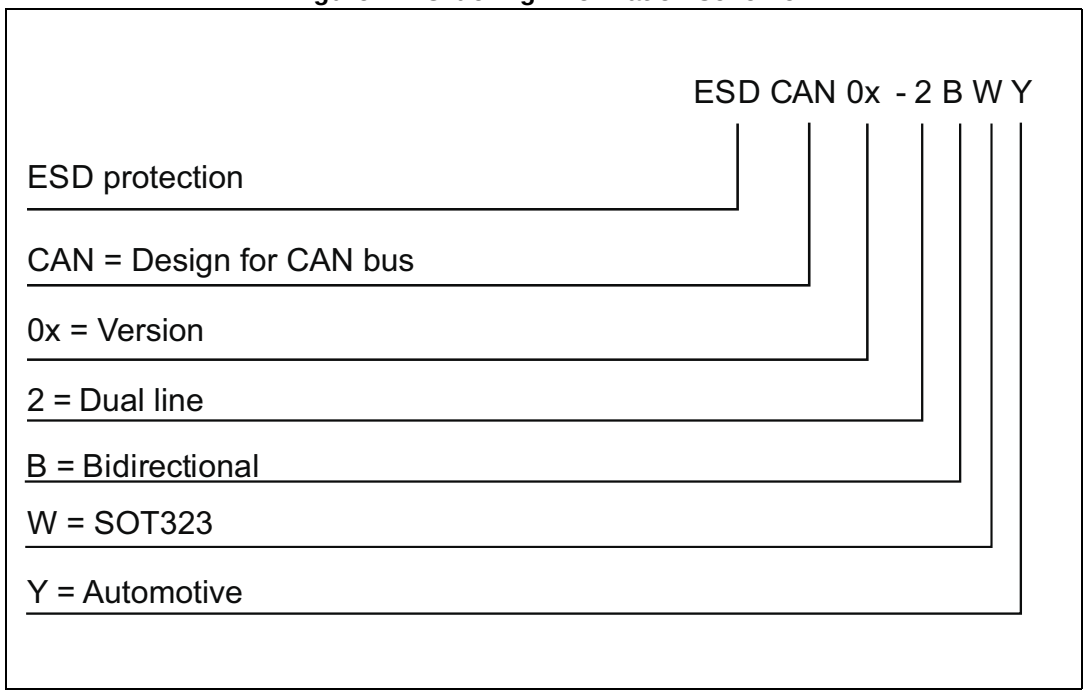



**Table 5. Ordering information**

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| ESDCAN02-2BWY | C02 | SOT323-3L | 6.58 mg | 3000 | Tape and reel |
| ESDCAN03-2BWY | C03 | SOT323-3L | 6.58 mg | 3000 | Tape and reel |

# 4 Revision history

**Table 6. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 11-Apr-2015 | 1 | First issue. |
| 30-Sep-2015 | 2 | Updated *Figure 3*. |