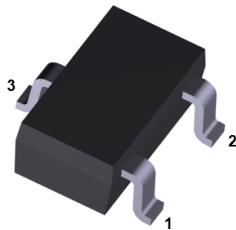
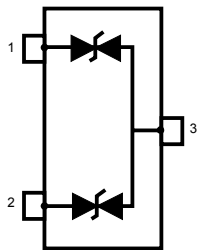


## Automotive dual-line TVS in SOT23-3L for CAN bus




**SOT23-3L**  
(Jedec TO-236)


**Product status link**

[ESDCAN01-2BLY](#), [ESDCAN24-2BLY](#),  
[ESDCAN04-2BLY](#), [ESDCAN06-2BLY](#)

**Features**

- AEC-Q101 qualified 
- Dual-line ESD and EOS protection
- Breakdown voltage:  $V_{BR}$ 
  - ESDCAN01-2BLY: 25 V
  - ESDCAN24-2BLY: 27 V
  - ESDCAN04-2BLY: 27.5 V
  - ESDCAN06-2BLY: 38 V
- Bidirectional device
- Max pulse power up to 230 W (8/20  $\mu$ s)
- Low clamping factor  $V_{CL} / V_{BR}$
- **ECOPACK2** 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 for 12 V system))
- IEC 61000-4-4 (EFT)
  - 4 kV
- ISO 10605 C = 150 pF, R = 330  $\Omega$ , exceeds level 4:
  - $\pm 30$  kV (Contact and air discharge)
- ISO 10605 C = 330 pF, R = 330  $\Omega$  exceeds level 4:
  - $\pm 30$  kV (Contact and air discharge)
- ISO 10605 C = 330 pF, R = 2 k $\Omega$  exceeds level 4:
  - $\pm 30$  kV (Contact and air discharge)
- ISO 7637-3:
  - Pulse 3a: -150 V
  - Pulse 3b: +150 V
  - Pulse 2a: +/- 85 V

**Description**

These dual-line CAN transceiver protection devices (TVS) protect both CAN H and CAN L signals of automotive CAN PHY against ISO 7637-3 transients and ESD (electrostatic discharge).

ESDCAN series complies with all the physical layer constraints (jump start, reverse polarity, ...) without compromising the low clamping voltage for an efficient CAN bus protection (controller area network) or LIN bus protection (local interconnect network).

The low line capacitance versions make them compliant with CAN-FD and high speed buses like FlexRay, USB, and even the future CAN XL.

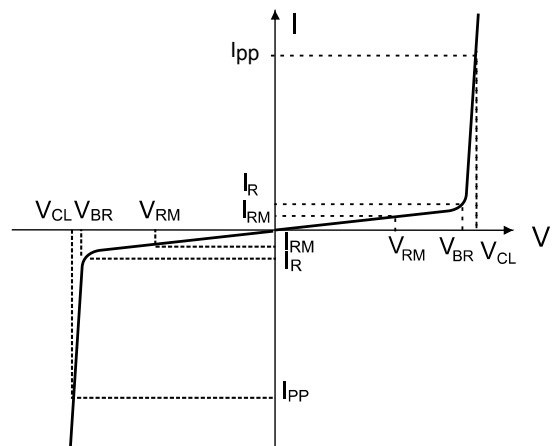
# 1 Characteristics

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

Symbol	Parameter		Value	Unit	
$V_{PP}$	Peak pulse voltage	ISO 10605 - C = 150 pF, R = 330 $\Omega$ : Contact and air discharge	30	kV	
		ISO 10605 - C = 330 pF, R = 330 $\Omega$ : Contact and air discharge	ESDCAN24-2BLY ESDCAN01-2BLY ESDCAN04-2BLY		30
		ISO 10605 - C = 330 pF, R = 330 $\Omega$ : Contact discharge	ESDCAN06-2BLY		22
		Air discharge			30
		ISO 10605 - C = 330 pF, R = 2 k $\Omega$ : Contact and air discharge			30
$I_{PP}$	Peak pulse current (8/20 $\mu\text{s}$ )	ESDCAN24-2BLY ESDCAN01-2BLY	5.5	A	
		ESDCAN04-2BLY	3.7		
		ESDCAN06-2BLY	3		
$T_j$	Operating junction temperature range		-40 to +150	$^{\circ}\text{C}$	
$T_{stg}$	Storage temperature range		-55 to +150	$^{\circ}\text{C}$	

**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 $\mu\text{s}$ )		C		$\Delta C^{(1)}$	$\alpha T^{(2)}$
			Min.	Max.		3a at -150 V min.	3b at +150 V max.	Max.		Typ.	Max.	Typ.	Typ.
	$\mu\text{A}$	V	V		mA	V		V	A	pF		pF	$10^{-4}/^{\circ}\text{C}$
ESDCAN24-2BLY	0.1	24	27	32	1	-40	40	43	5	-	30	0.1	9
ESDCAN01-2BLY	0.1	24	25	30	1	-35	35	40	5	-	30	0.1	9
ESDCAN04-2BLY	0.05	25.5	27.5	30.7	1	-35	35	43	3	17	19	0.1	9
ESDCAN06-2BLY	0.1	35	38	42.2	1	-44	44	59	3	13	15	0.1	9

1.  $\Delta C$  : 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

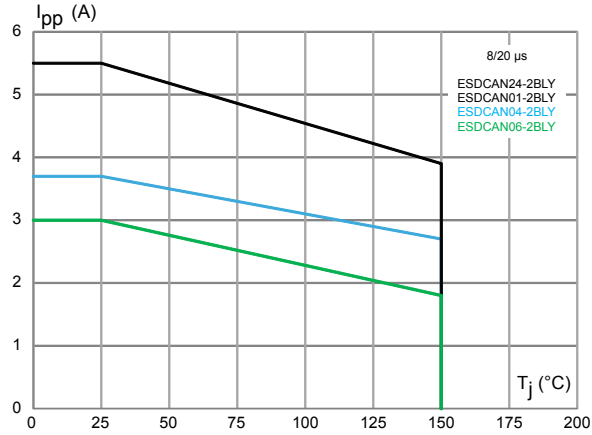


Figure 3. Maximum peak pulse current versus exponential pulse duration

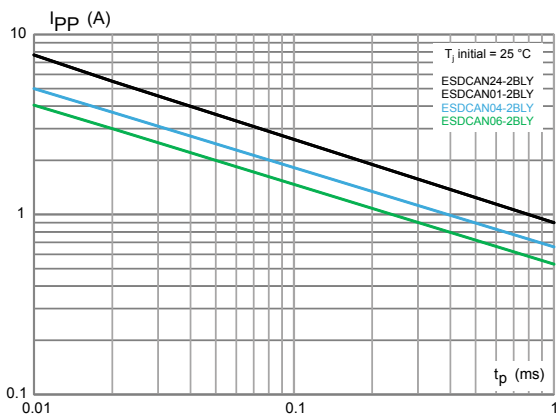


Figure 4. Clamping voltage versus peak pulse current

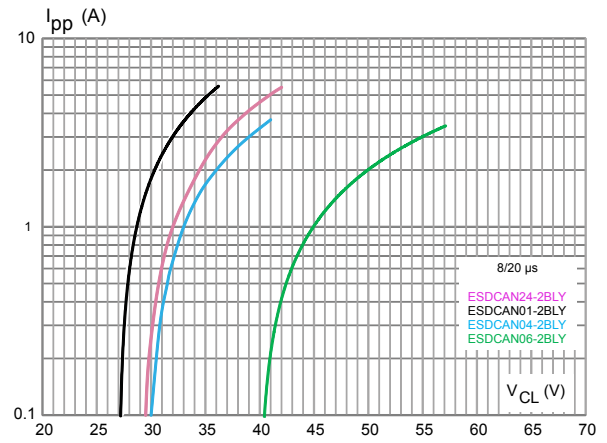


Figure 5. Junction capacitance versus reverse voltage

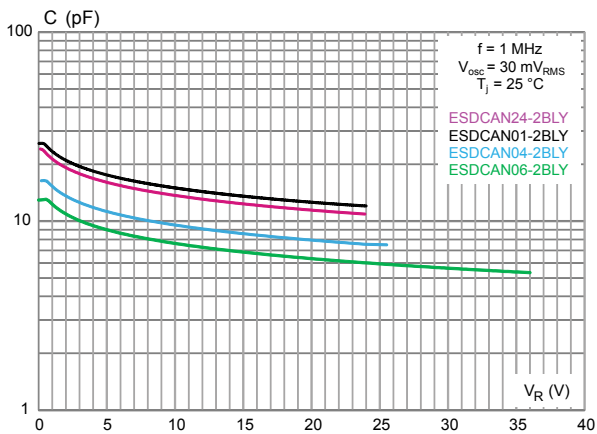
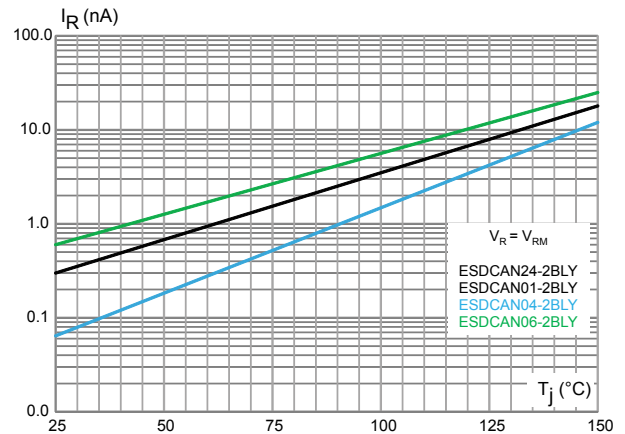
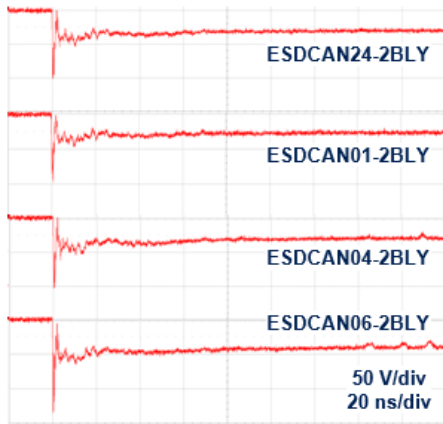


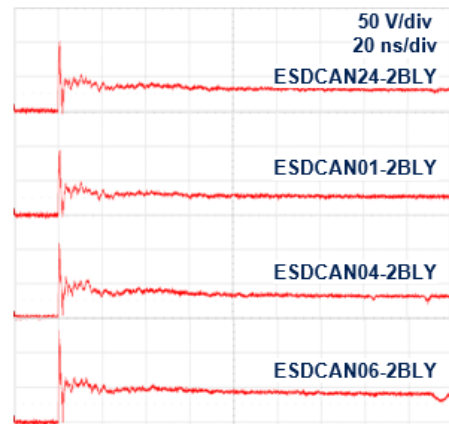
Figure 6. Leakage current versus junction temperature



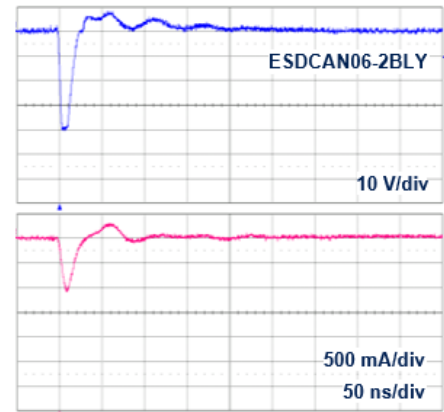
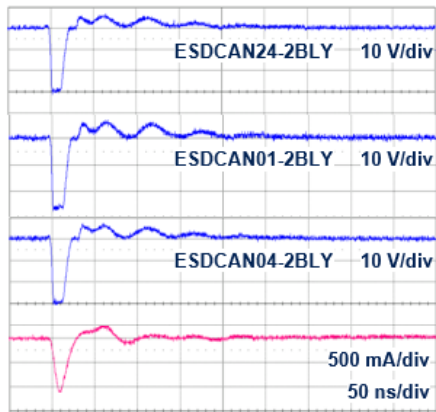
**Figure 7. Response to ISO 10605 -C = 150 pF, R = 330 Ω (-8 kV contact)**



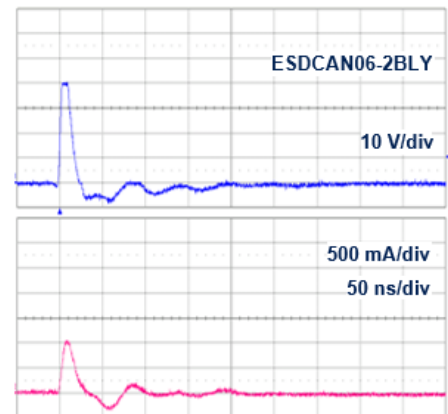
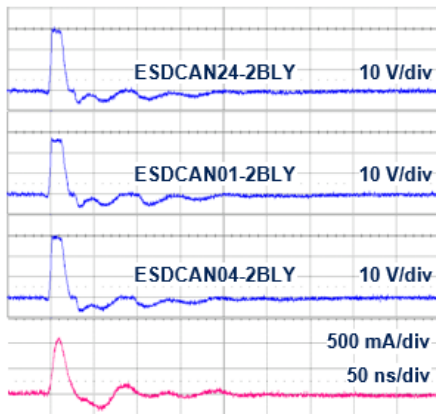
**Figure 8. Response to ISO 10605 - C = 150 pF, R = 330 Ω (+8 kV contact )**



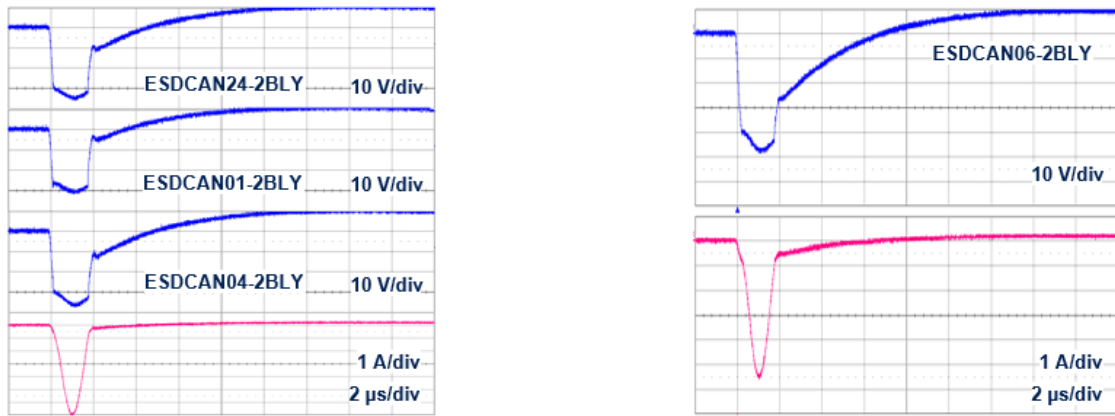
**Figure 9. Response to ISO 7637-3 Pulse 3a: -150 V**



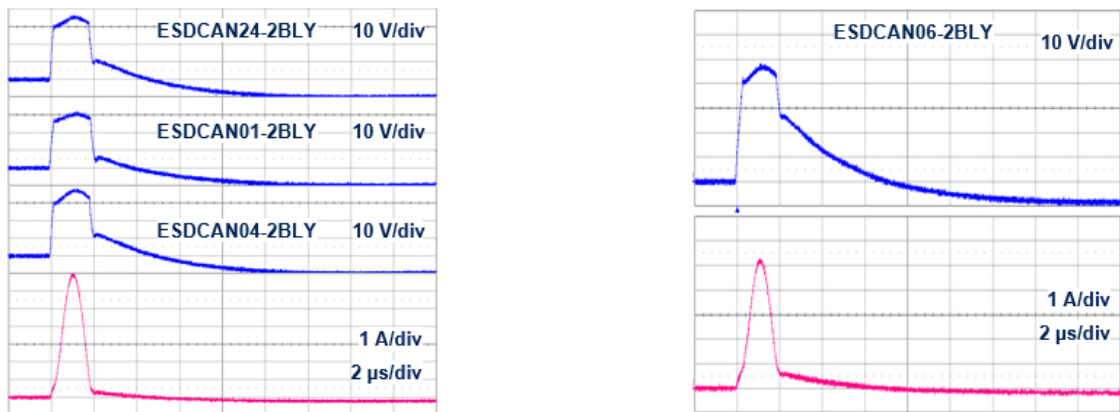
**Figure 10. Response to ISO 7637-3 Pulse 3b : +150 V**



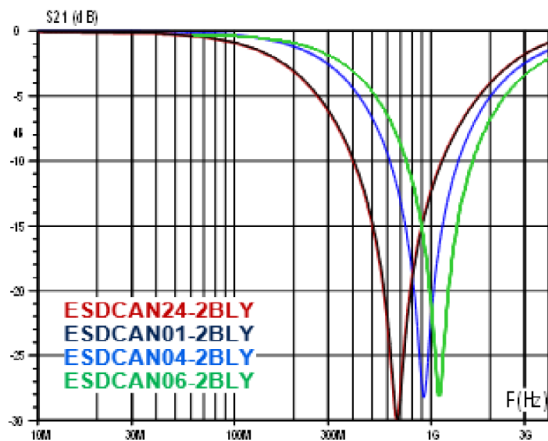
**Figure 11. Response to ISO 7637-3 pulse 2a: -85 V**



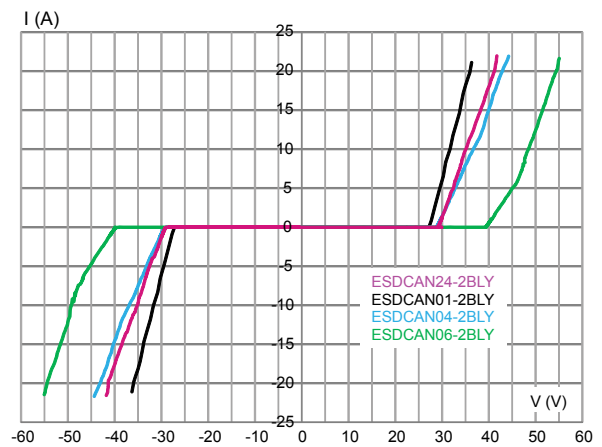
**Figure 12. Response to ISO 7637-3 pulse 2a: +85 V**



**Figure 13. S21 attenuation**



**Figure 14. TLP**

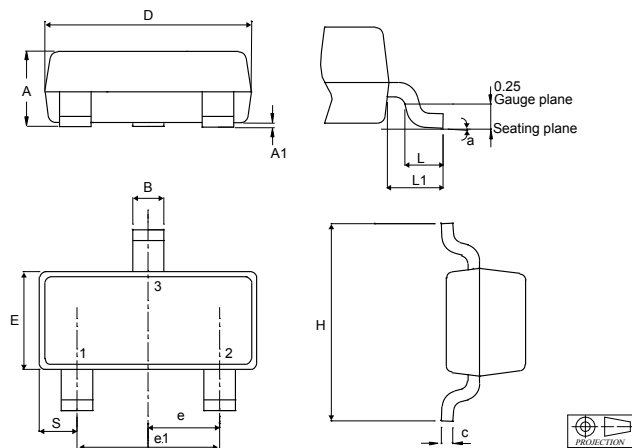


## 2 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 SOT23-3L package information

**Figure 15. SOT23-3L package outline**

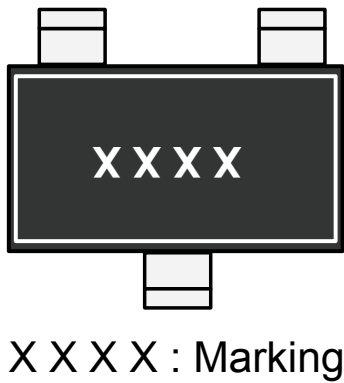


**Table 3. SOT23-3L package mechanical data**

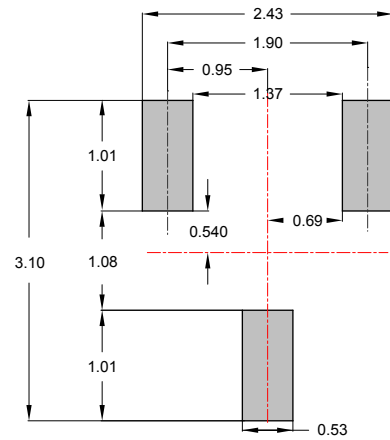
Ref.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.89		1.25	0.0350		0.050
A1	0.00		0.15	0.0000		0.006
B	0.30		0.51	0.011		0.021
C	0.085		0.20	0.003		0.008
D	2.75		3.04	0.108		0.120
E	1.20		1.75	0.047		0.069
e	0.85	0.95	1.05	0.033	0.037	0.042
e1	1.70	1.90	2.10	0.066	0.075	0.083
H	2.10		3.00	0.082		0.119
L	0.25		0.61	0.009		0.025
L1		0.55			0.022	
S	0.35		0.65	0.013		0.026
a	0°		8°	0°		8°

1. Dimension in inches are given for reference only.

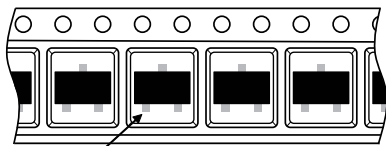
**Figure 16. SOT23-3L marking**



**Figure 17. SOT23-3L footprint in mm**



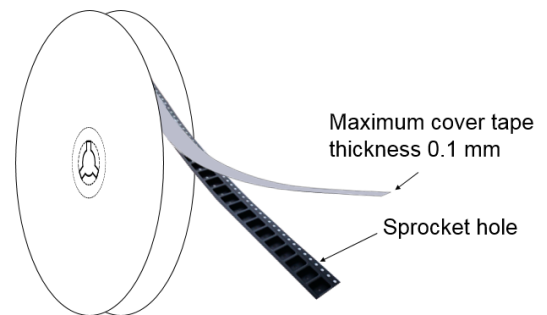
**Figure 18. Package orientation in reel**



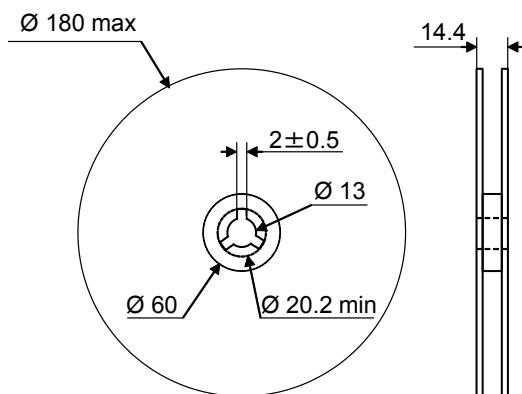
Pin 1 located according to EIA-481

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**

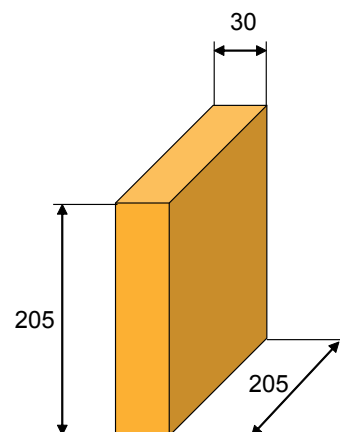
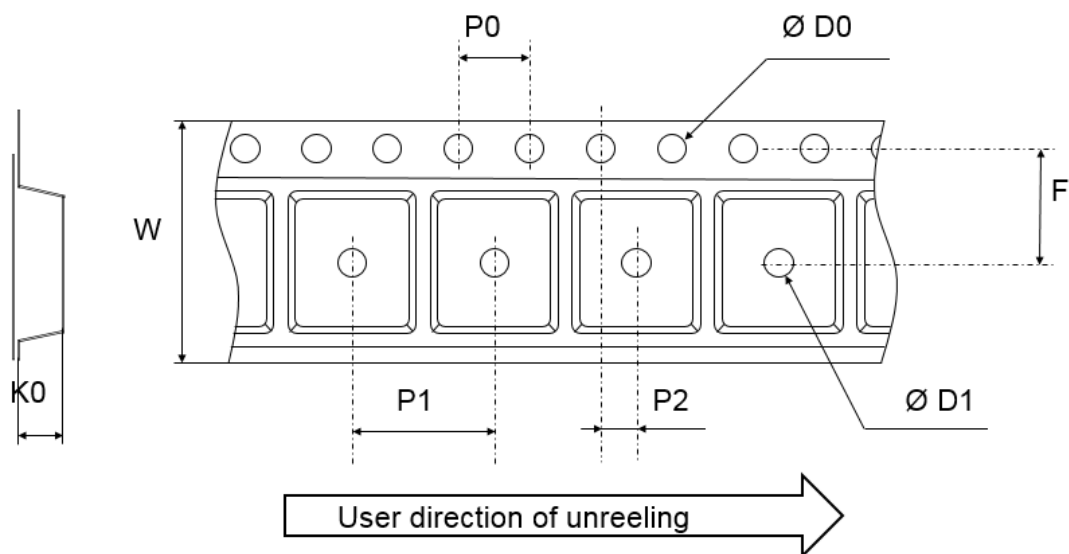




Figure 22. Tape outline



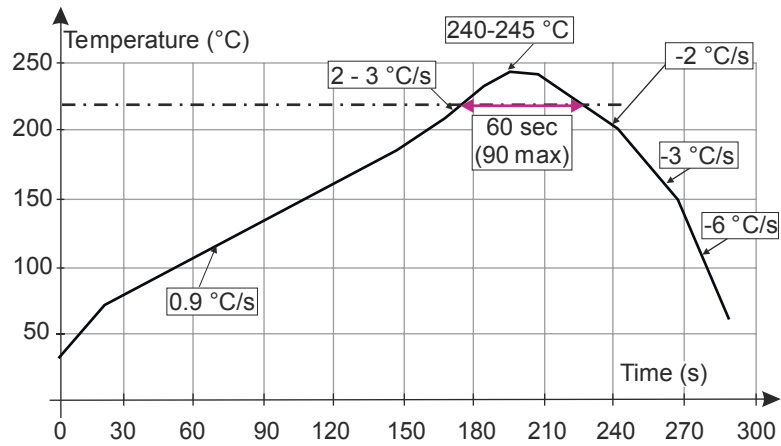
Note: Pocket dimensions are not on scale  
Pocket shape may vary depending on package

Table 4. Tape dimension values

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
D0	1.45	1.5	1.6
D1	1		
F	3.45	3.5	3.55
K0	1.3	1.4	1.5
P0	3.9	4.0	4.1
P1	3.9	4.0	4.1
P2	1.95	2.0	2.05
W	7.9	8	8.3

### 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

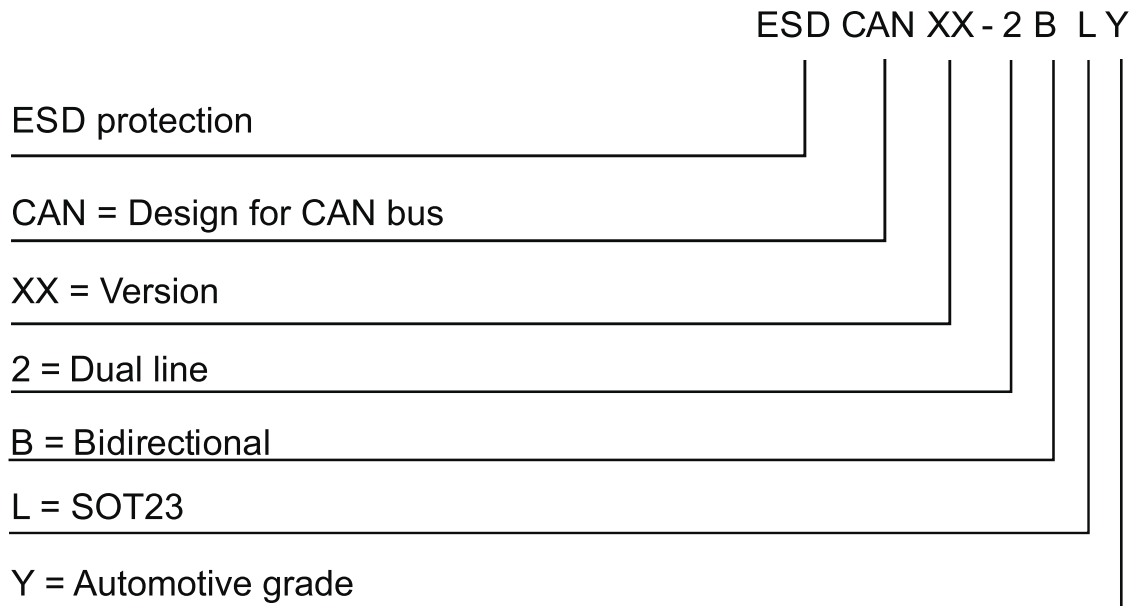


Table 5. Ordering information

Order code	Marking <sup>(1)</sup>	Package	Weight	Base qty.	Delivery mode
ESDCAN24-2BLY	EL24	SOT23-3L	9.8 mg	3000	Tape and reel
ESDCAN01-2BLY	EN24				
ESDCAN04-2BLY	EC24				
ESDCAN06-2BLY	EC35				

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

## Revision history

**Table 6. Document revision history**

Date	Revision	Changes
13-Jul-2015	1	First issue.
04-Oct-2018	2	Added RPN ESDCAN04-2BLY and ESDCAN06-2BLY. Updated cover page, <a href="#">Section 1 Characteristics</a> and <a href="#">Section 1.1 Characteristics (curves)</a> . Added Packing and marking information.
05-Apr-2019	3	Added typical pitch in <a href="#">Table 3</a> and updated <a href="#">Figure 17</a> .
21-Jul-2022	4	Updated <a href="#">Features</a> , <a href="#">Description</a> and <a href="#">Table 1</a> .

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