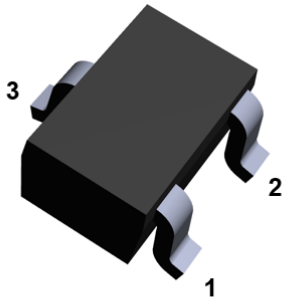
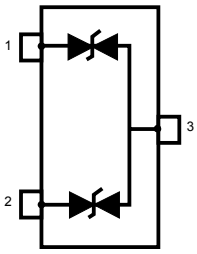
ESDCANxx-2BWY

Datasheet

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



SOT323-3L
(Jedec SC-70)



Product status link
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
- Max pulse power up to 170 W (8/20 µs)
- 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)
- IEC 61000-4-4 (EFT)
  - 4 kV
- ISO 10605 C = 150 pF, R = 330 Ω, exceeds level 4:
  - ±30 kV (contact and air discharge)
- ISO 10605 C = 330 pF, R = 2 kΩ exceeds level 4:
  - ±30 kV (contact and air discharge)
- ISO 10605 C = 330 pF, R = 330 Ω exceeds level 4:
  - ±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 °C)

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

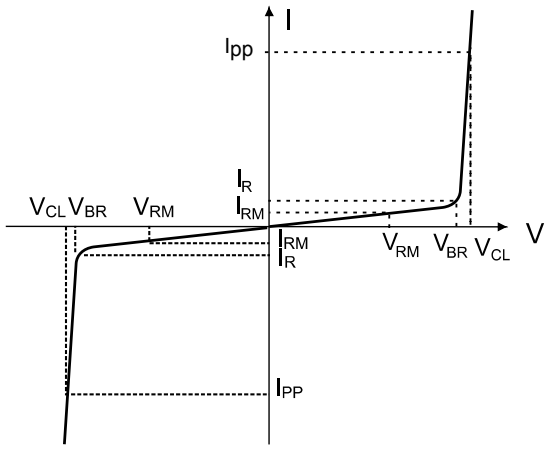


Table 2. Electrical characteristics (values, T_{amb} = 25 °C)

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		ΔC(1)	αT (2)
			Min.	Max.		3a at -150 V min.	3b at +150 V max.	Max.		Typ.	Max.	Typ.	Typ.
	µA	V	V		mA	V		V	A	pF		pF	10^{-4}/°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 °C x (1 + αT x (T_j - 25))*

1.1 Characteristics (curves)

Figure 2. Maximum peak current versus initial junction temperature

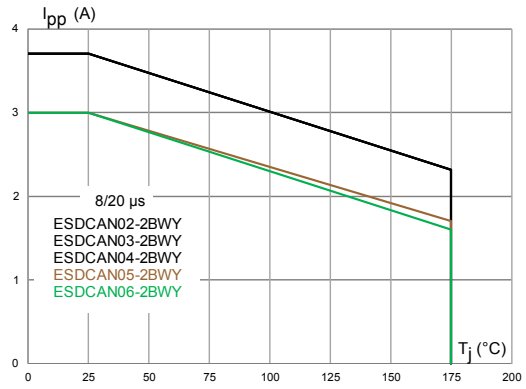


Figure 3. Maximum peak pulse current versus exponential pulse duration

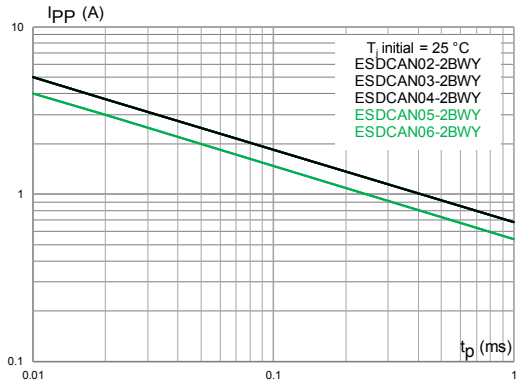


Figure 4. Peak pulse current versus clamping voltage

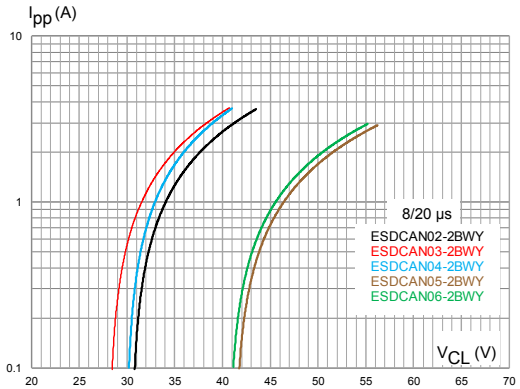


Figure 5. Junction capacitance versus reverse applied voltage

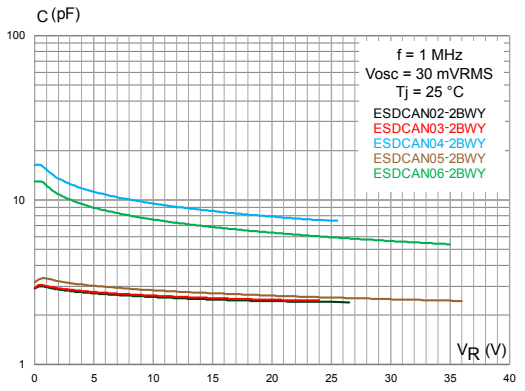


Figure 6. Leakage current versus junction temperature

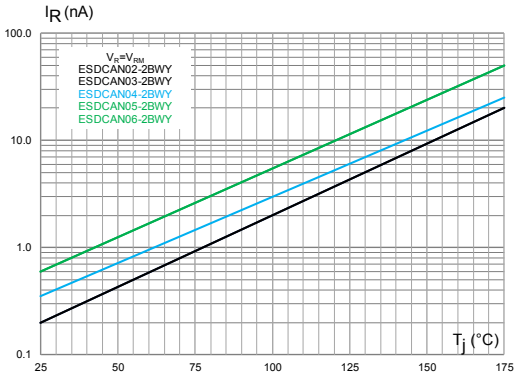


Figure 7. Response to ISO 10605 -C = 150 pF, R = 330 Ω (-8 kV contact)

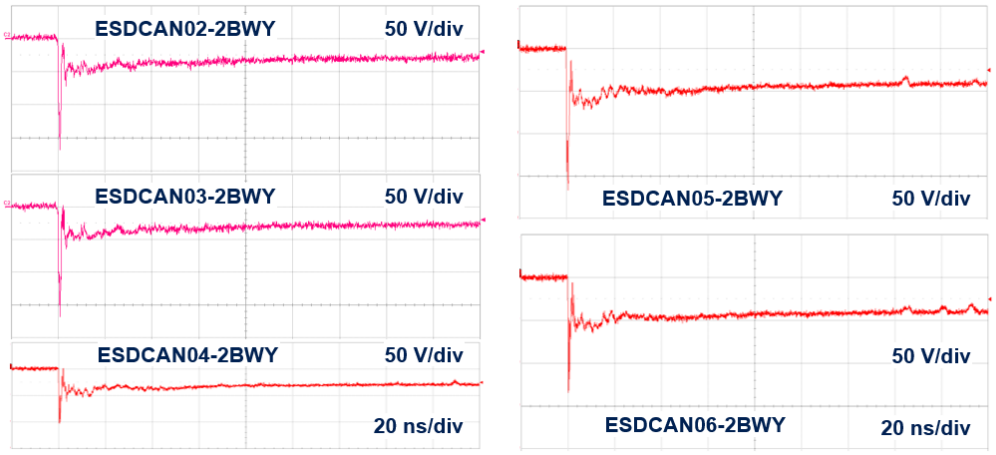


Figure 8. Response to ISO 10605 - C = 150 pF, R = 330 Ω (+8 kV contact)

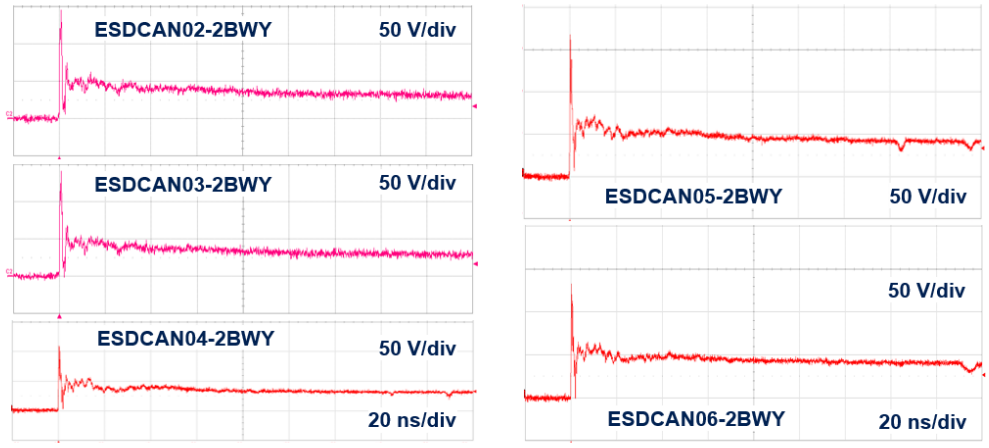


Figure 9. Response to ISO 7637-3 Pulse 3a: -150 V

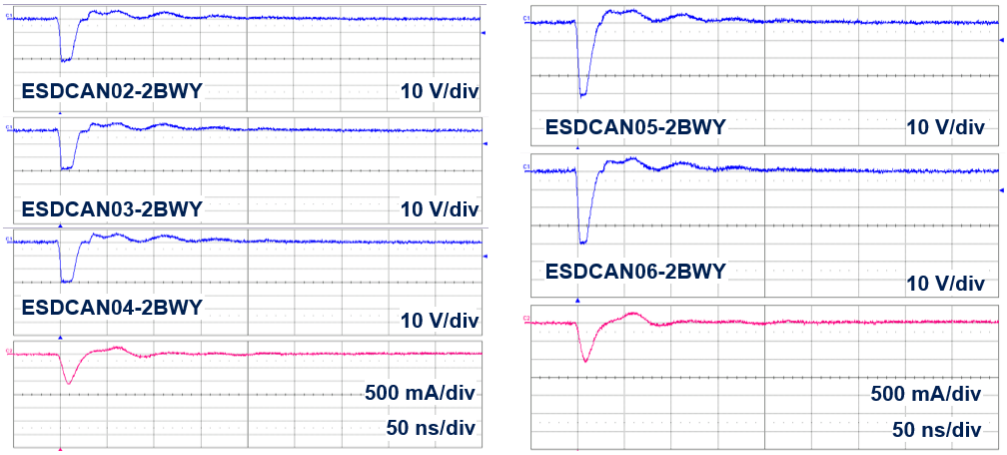


Figure 10. Response to ISO 7637-3 Pulse 3b : +150 V

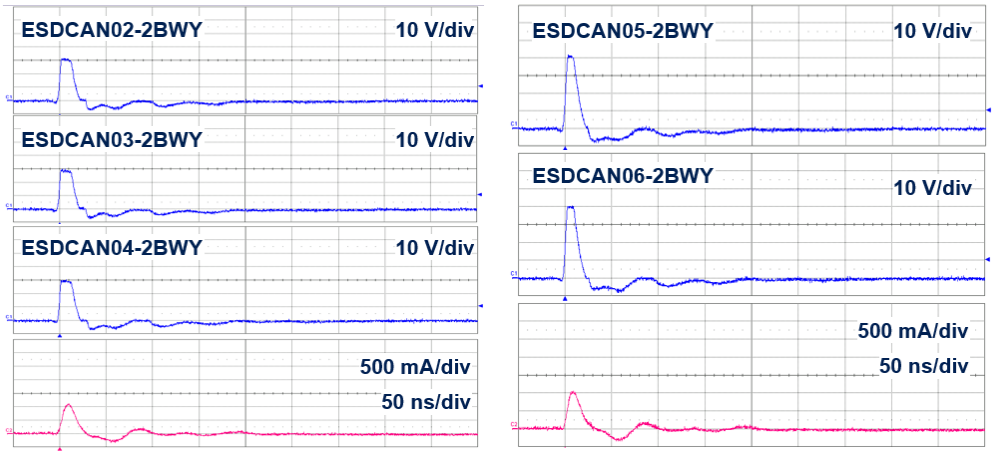


Figure 11. Response to ISO 7637-3 pulse 2a: -85 V

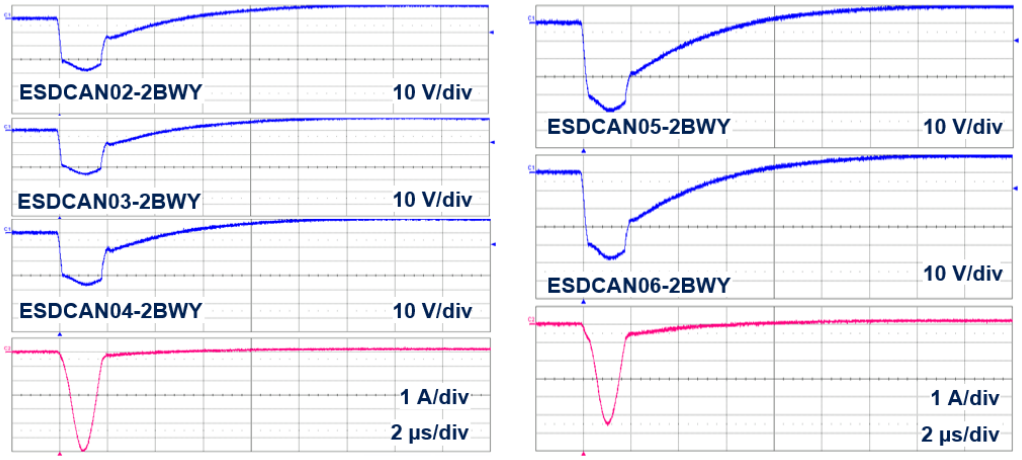


Figure 12. Response to ISO 7637-3 pulse 2a: +85 V

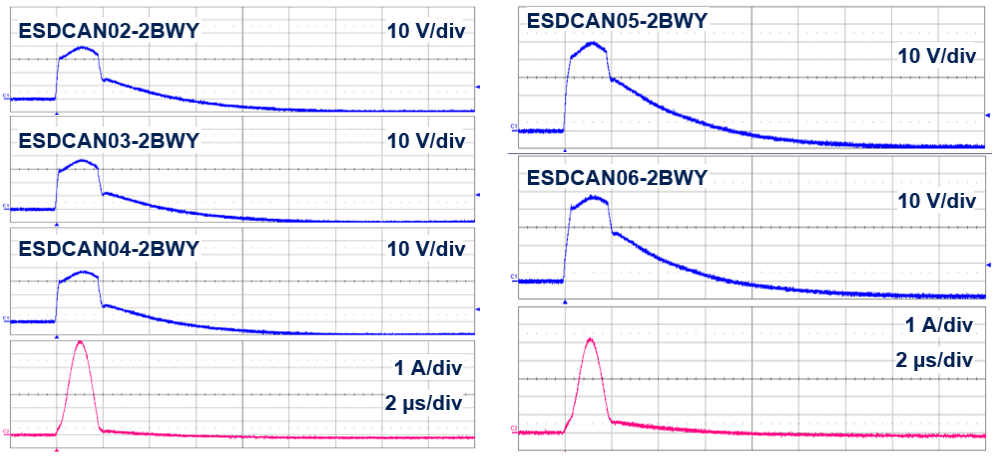


Figure 13. **S21 attenuation**

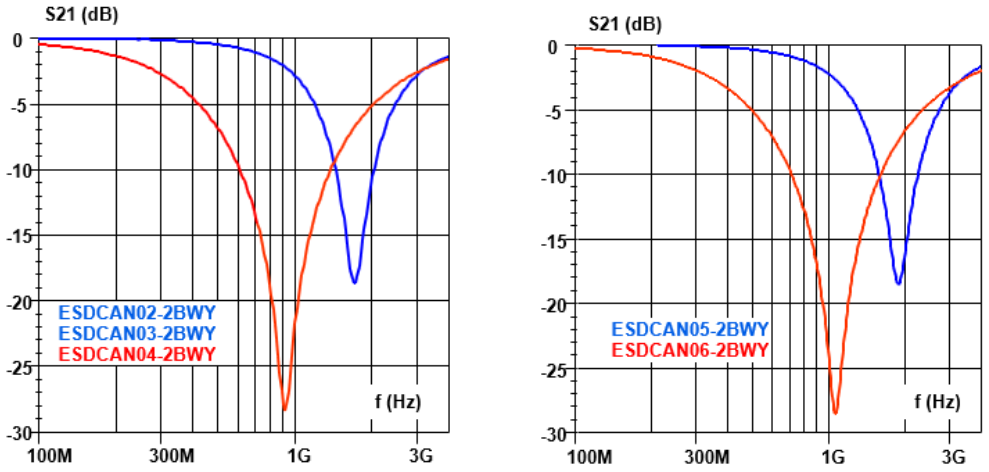
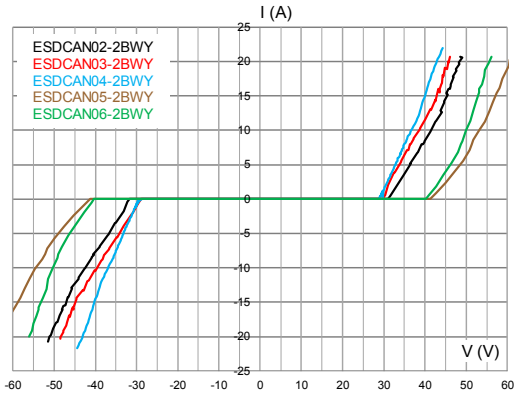


Figure 14. **TLP**



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

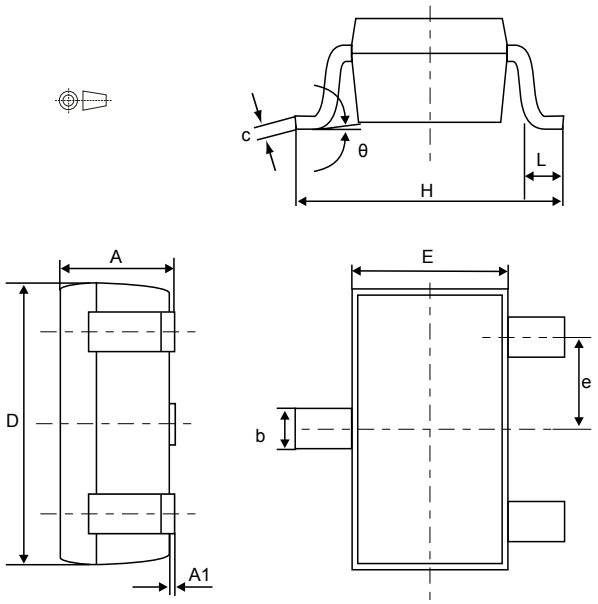


Table 3. SOT323-3L package mechanical data

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

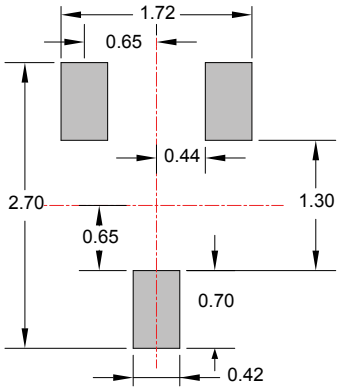


Figure 17. SOT323-3L marking

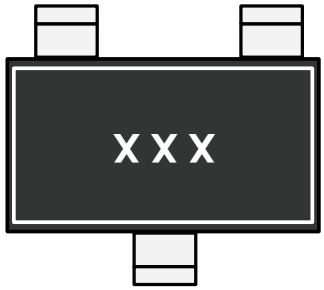
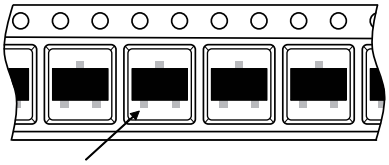


Figure 18. Package orientation in reel



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

Figure 19. Tape and reel orientation

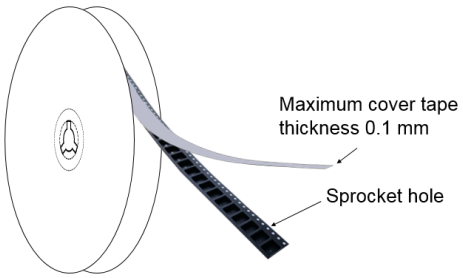


Figure 20. 7" reel dimension values

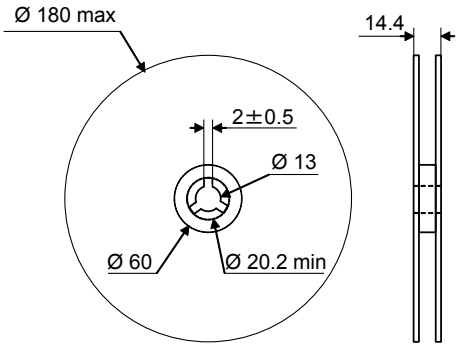


Figure 21. Inner box dimension values

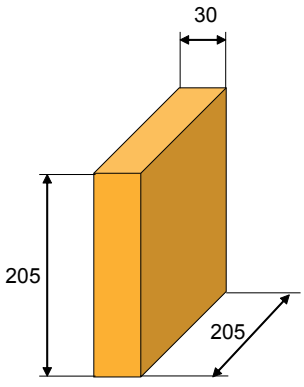
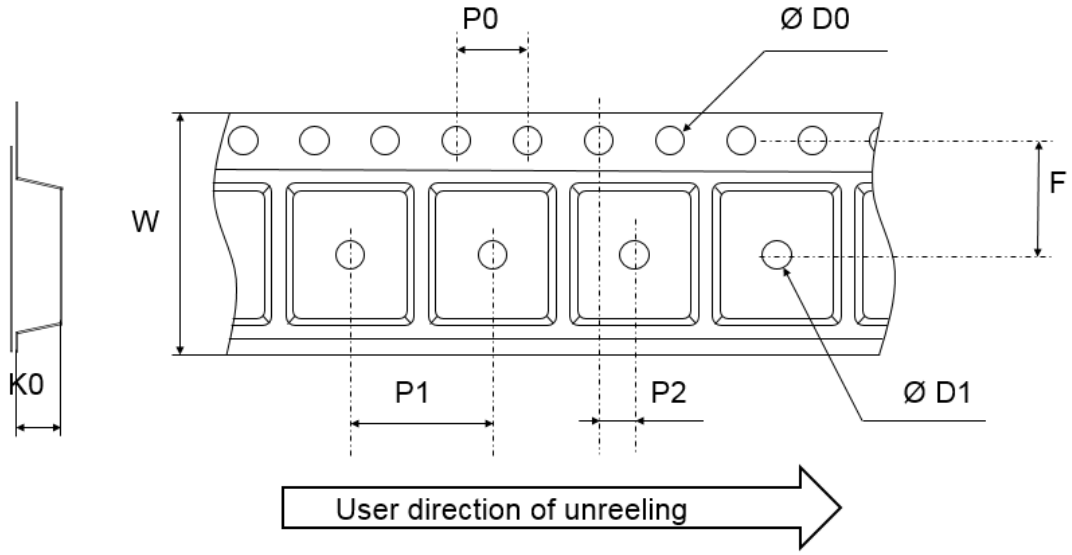


Figure 22. **Tape outline**



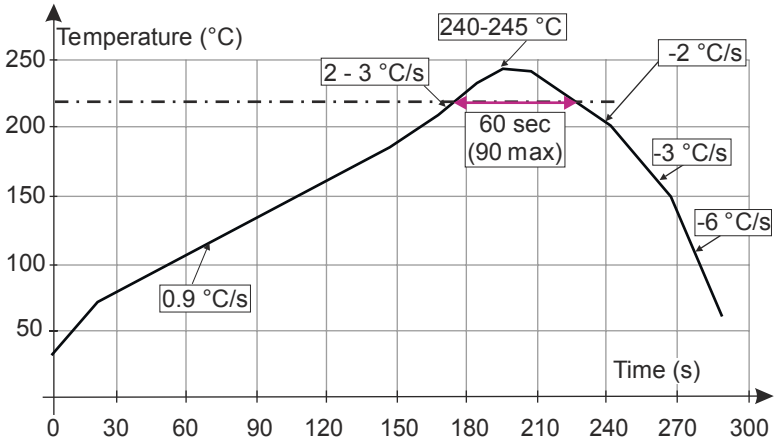
Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

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**

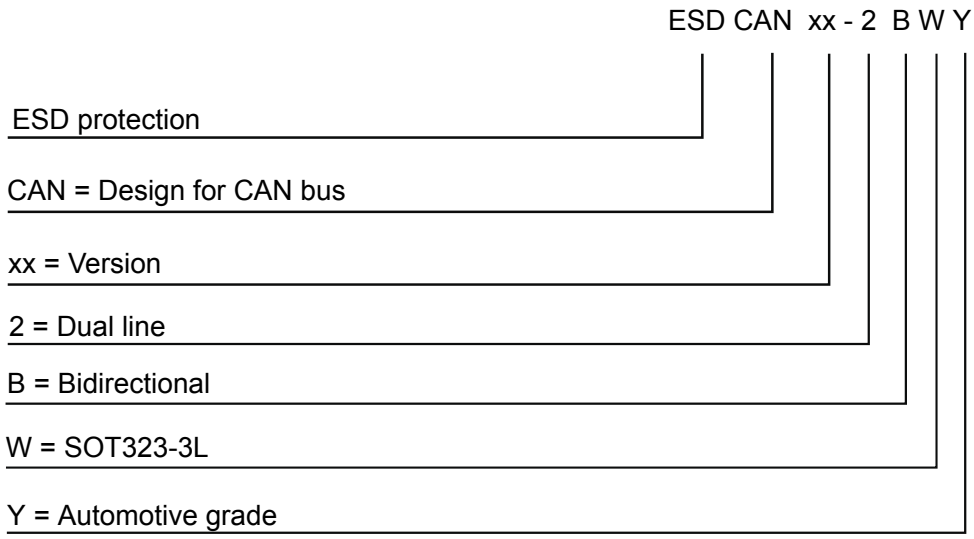


Table 5. **Ordering information**

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.
19-Jul-2022	3	Updated Description, Features and Table 1.

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