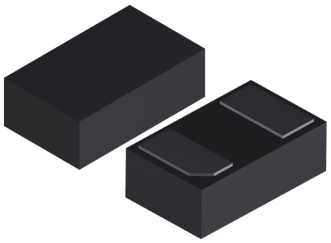
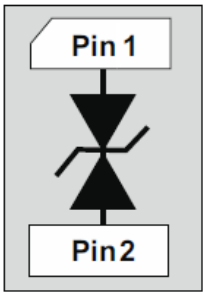
# ESDAXLC6-1BT2Y

Datasheet

## Automotive single line ESD protection for high speed lines in 0402



SOD882T(0402)
(QFN-2L 1.0 x 0.6 x 0.35)




| Product status link |
| --- |
| ESDAXLC6-1BT2Y |

## Features

- AEC-Q101 qualified
- Flow-through routing to keep signal integrity
- Ultra large bandwidth: 12 GHz
- Ultra low capacitance: 0.4 pF
- Extended operating junction temperature range: -55 °C to 150 °C
- RoHS compliant
- Complies with ISO 10605 - C = 150 pF, R = 330 Ω
  - ±16 kV (contact discharge)
  - ±30 kV (air discharge)
- Complies with ISO 10605 - C = 330 pF, R = 330 Ω
  - ±12 kV (contact discharge)
  - ±30 kV (air discharge)
- Complies with ISO 7637-3:
  - pulse 3a: $V_s$ = -150 V
  - pulse 3b: $V_s$ = +150 V
  - pulse 2a: $V_s$ = ±85 V

## Application

The ESDAXLC6-1BT2Y is designed to protect against electrostatic discharge on automotive circuits such as:

- APIX
- LVDS & digital video interface
- Ethernet and BroadrReach
- USB 2.0 and USB 3.0
- High speed communication buses
- RF front-end

## Description

The ESDAXLC6-1BT2Y is an ESD device designed for high-speed lines protection.

# 1 Characteristics

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

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{PP}$ | Peak pulse voltage | ISO10605 / IEC 61000-4-2 (C = 150 pF, R = 330 Ω): | | kV |
| | | Contact discharge | 16 | |
| | | Air discharge | 30 | |
| | | ISO10605 (C = 330 pF, R = 330 Ω) | | |
| | | Contact discharge | 12 | |
| | | Air discharge | 30 | |
| $P_{PP}$ | Peak pulse power dissipation (8/20 µs) | | 40 | W |
| $I_{PP}$ | Peak Pulse current (8/20 µs) | | 1.3 | A |
| $T_{stg}$ | Storage temperature range | | -65 to +150 | °C |
| $T_j$ | Operating junction temperature range | | -55 to +150 | °C |
| $T_L$ | Maximum lead temperature for soldering during 10 s | | 260 | °C |

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

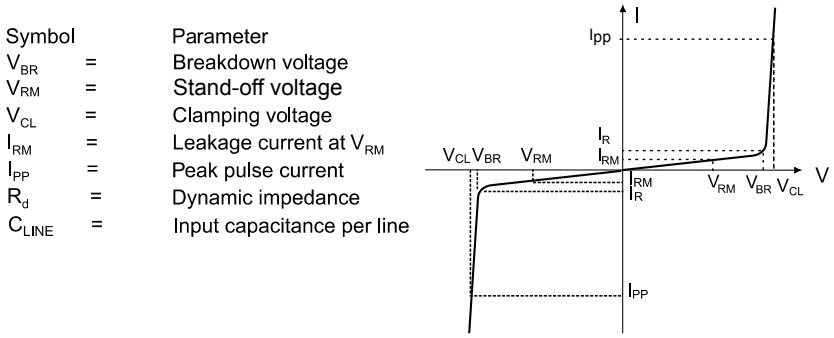



**Table 2. Electrical characteristics (values) ($T_{amb}$ = 25° C)**

| Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $V_{BR}$ | $I_R$ = 1 mA | 6 | 9 | 11 | V |
| $I_R$ | $V_R$ = 3 V | | | 50 | nA |
| $V_{CL}$ | $I_{PP}$ = 1 A, 8/20 µs | | | 17 | V |
| | ISO 10605- C = 150 pF, R = 330 Ω<br>+8 kV contact discharge, measured at 30 ns | | 37 | | |
| | TLP, pulse duration 100 ns, 16 A | | 41 | | |
| $R_d$ | TLP, pulse duration 100 ns, 16 A | | 2 | | Ω |
| $C_{I/O-GND}$ | $V_{I/O}$ = 0 V, 200 MHz < f < 3 GHz, $V_{OSC}$ = 30 mV | | 0.4 | 0.5 | pF |
| $f_C$ | $S_{21}$ = -3 dB | | 12 | | GHz |

## 1.1 Characteristics (curves)

**Figure 2. Leakage current versus junction temperature**

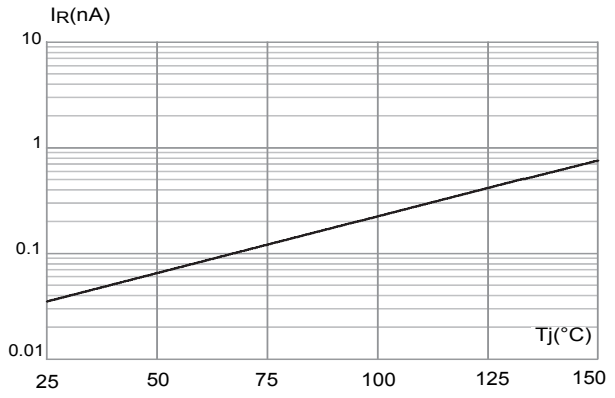



**Figure 3. Junction capacitance versus reverse applied voltage**

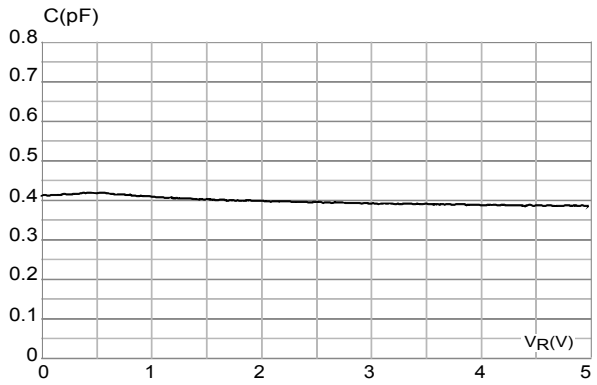



**Figure 4. TLP**

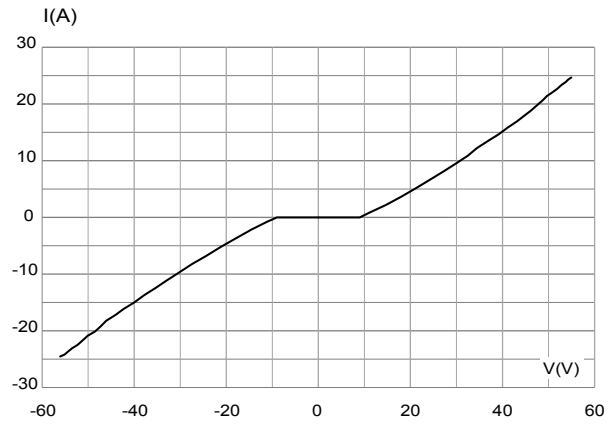



**Figure 5. S21 attenuation**

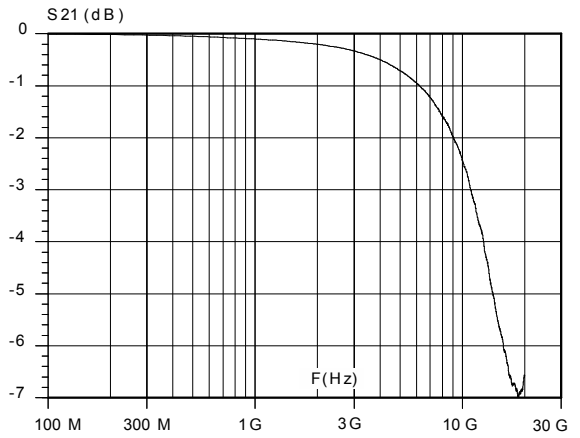



**Figure 6. ESD response to ISO 10605 - C = 150 pF, R = 330 Ω (-8 kV contact discharge)**

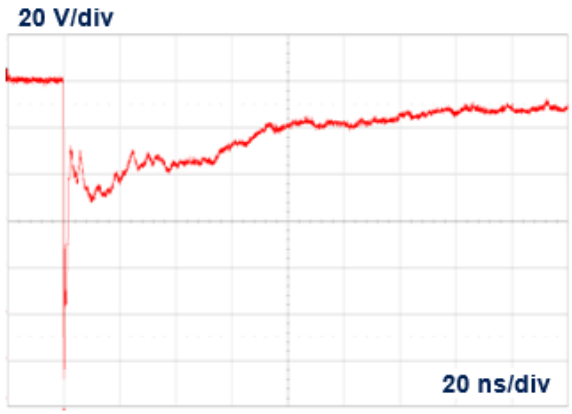



**Figure 7. ESD response to ISO 10605 - C = 150 pF, R = 330 Ω (+8 kV contact discharge)**

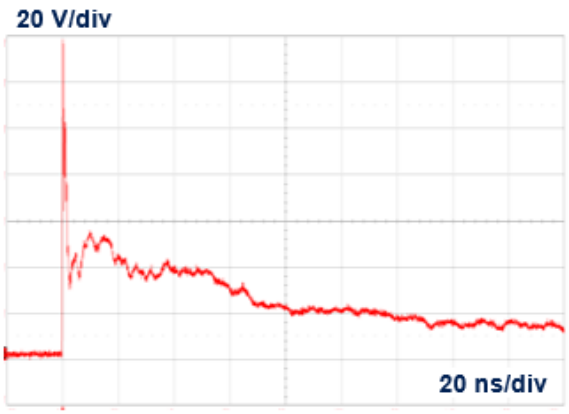


Figure 8. ESD response to ISO 7637-3 pulse 3a: -150 V

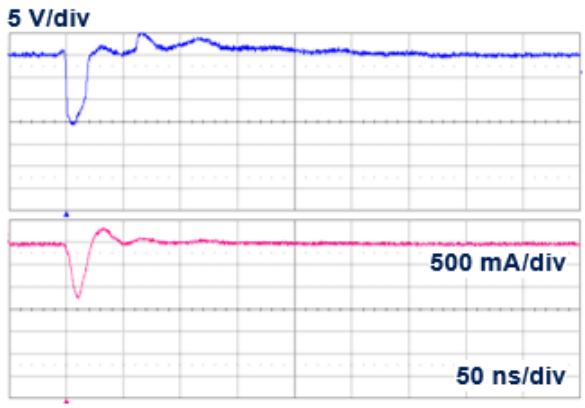



Figure 9. ESD response to ISO 7637-3 pulse 3b: +150 V

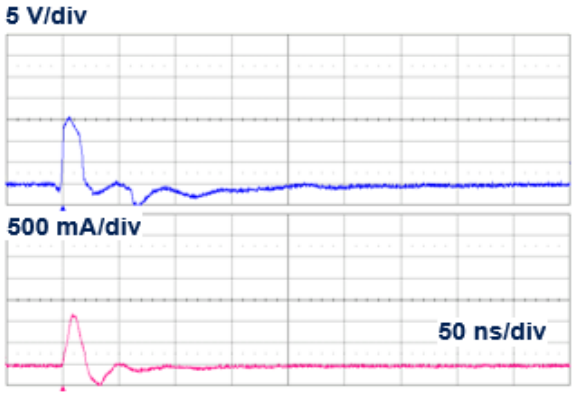



Figure 10. ESD response to ISO 7637-3 pulse 2a: -85 V

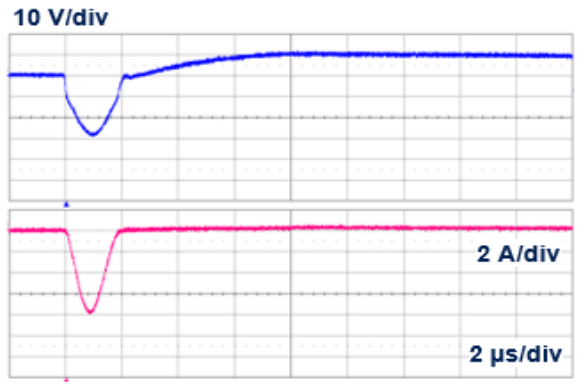



Figure 11. ESD response to ISO 7637-3 pulse 2a: +85 V

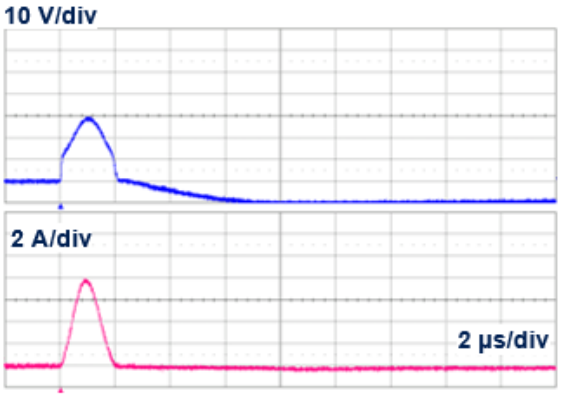



Figure 12. H2 harmonic versus input power at 710 MHz

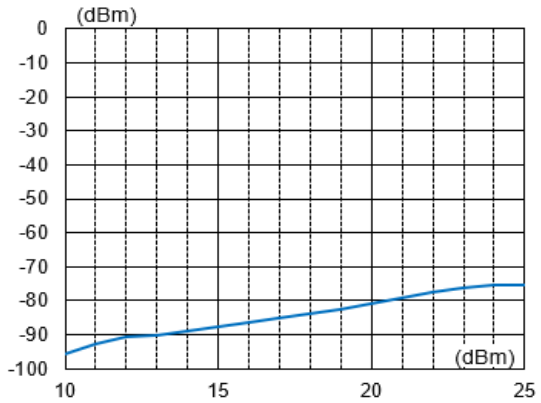



Figure 13. H3 harmonic versus input power at 710 MHz

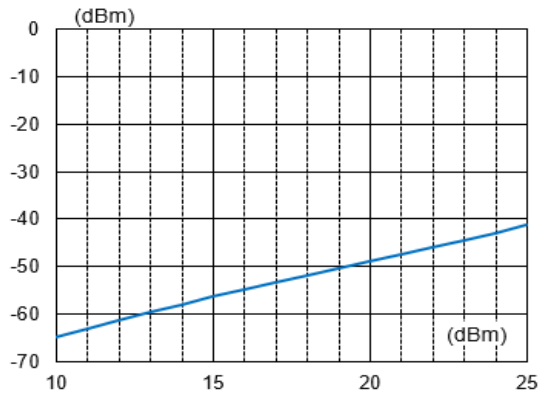


**Figure 14. H2 harmonic versus input power at 824 MHz**

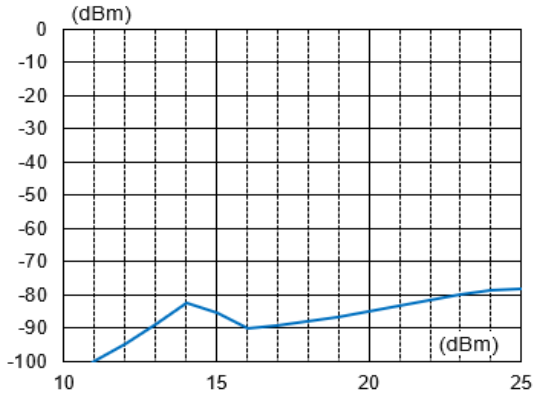



**Figure 15. H3 harmonic versus input power at 824 MHz**

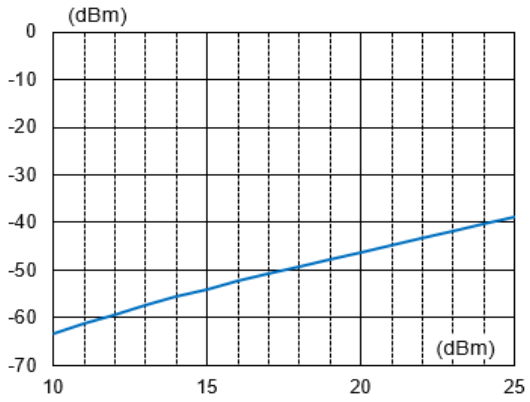



**Figure 16. H2 harmonic versus input power at 2400 MHz**

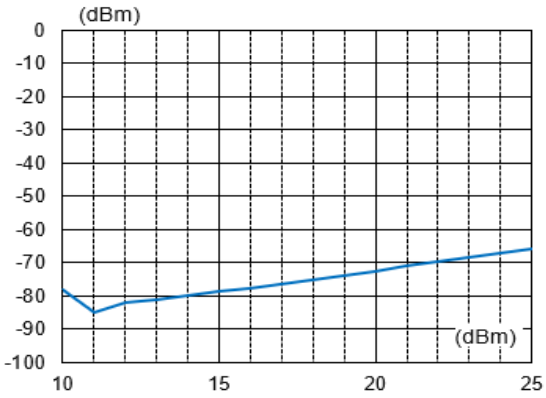
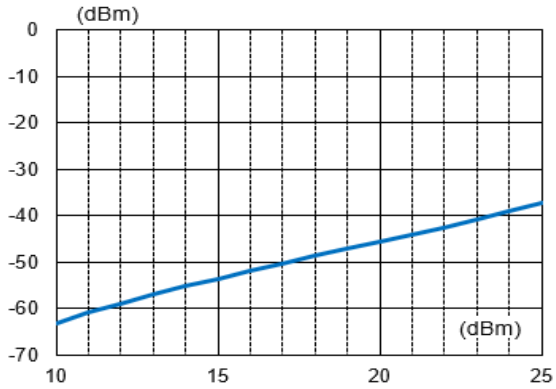



**Figure 17. H3 harmonic versus input power at 2400 MHz**



# 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 Package information

**Figure 18. Package outline**

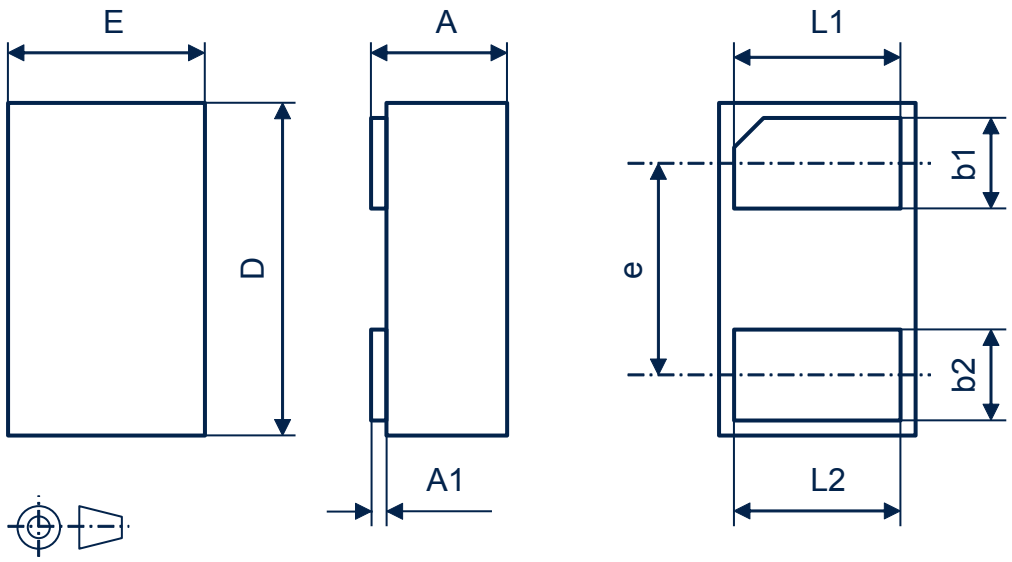
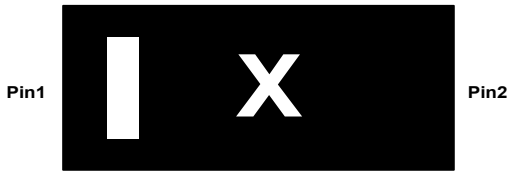



**Table 3. Package mechanical data**

| Ref. | Dimensions | | |
|---|---|---|---|
| | Millimeters | | |
| | Min. | Typ. | Max. |
| A | 0.30 | | 0.40 |
| A1 | 0.00 | | 0.05 |
| L1 | 0.45 | 0.50 | 0.55 |
| L2 | 0.45 | 0.50 | 0.55 |
| D | 0.95 | 1.00 | 1.05 |
| E | 0.55 | 0.60 | 0.65 |
| e | 0.60 | 0.65 | 0.70 |
| b1 | 0.20 | 0.25 | 0.30 |
| b2 | 0.20 | 0.25 | 0.30 |

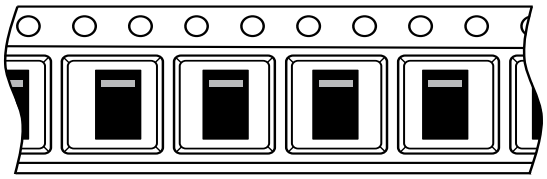
## 2.2 Packing and marking information

**Figure 19. Marking layout**




**X: Refer to ordering information table for marking.**

**Figure 20. Package orientation in reel**



Taped according to EIA-481

Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package
On bidirectional devices, marking and logo may be not always in the same direction

**Figure 21. Tape leader and trailer dimensions**

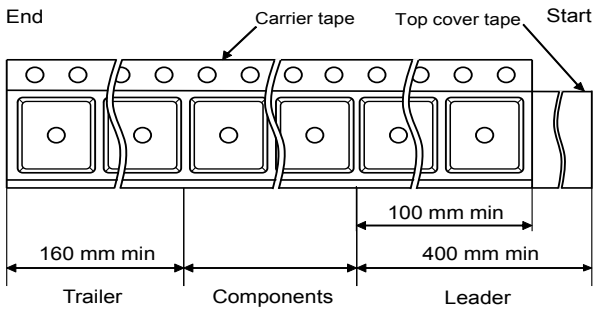



**Figure 22. Tape and reel orientation**

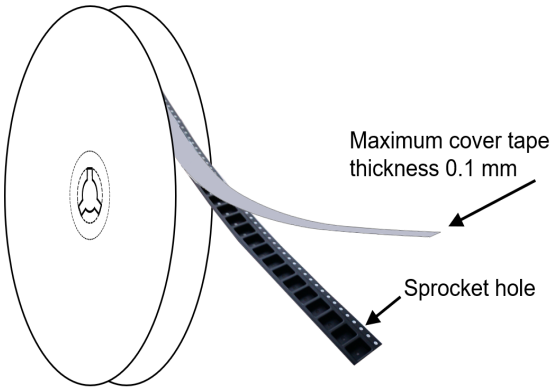



**Figure 23. Reel dimensions (mm)**

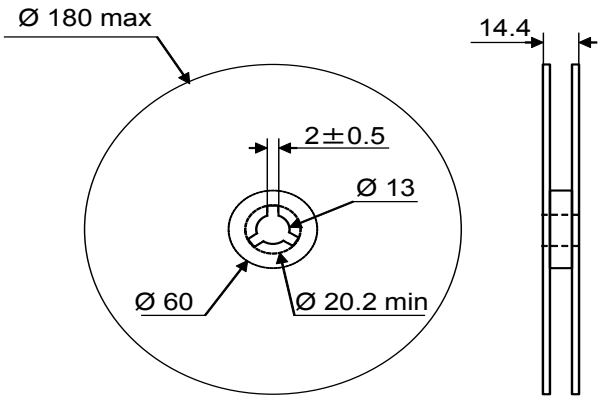



**Figure 24. Inner box dimensions (mm)**

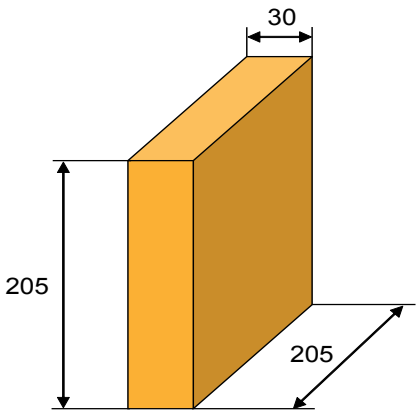
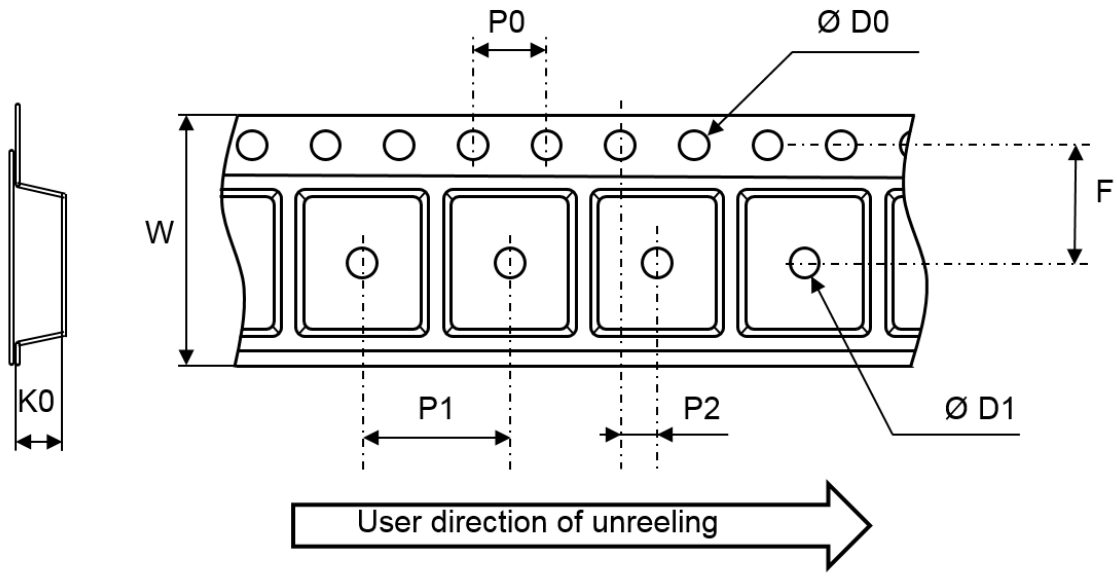


Figure 25. **Tape outline**




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

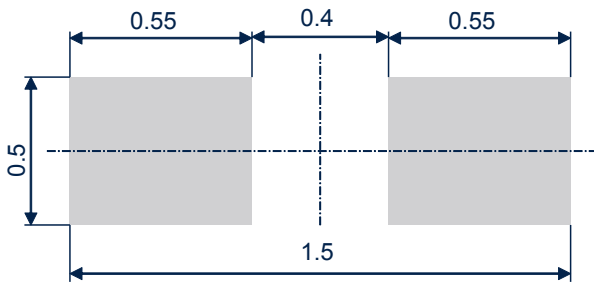
Table 4. **Tape and reel mechanical data**

| Ref. | Dimensions | | |
|---|---|---|---|
| | Millimeters | | |
| | Min. | Typ. | Max. |
| D0 | 1.45 | 1.5 | 1.6 |
| D1 | 0.35 | | |
| F | 3.45 | 3.5 | 3.55 |
| K0 | 0.42 | 0.47 | 0.52 |
| P0 | 3.9 | 4 | 4.1 |
| P1 | 1.95 | 2 | 2.05 |
| P2 | 1.95 | 2 | 2.05 |
| W | 7.9 | 8 | 8.3 |

# 3 Assembly recommendations

## 3.1 Recommended footprint

**Figure 26. Recommended footprint in mm**

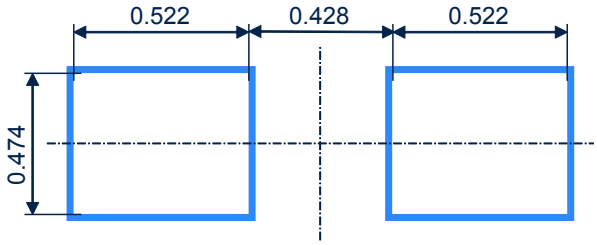



*Note: Solder mask defined (SMD) recommended.*

## 3.2 Stencil opening design

Stencil opening thickness: 75 µm / 3 mils

**Figure 27. Stencil opening recommendations**




## 3.3 Solder paste

1. Halide-free flux, qualification ROL0 according to ANSI/J-STD-004.
2. “No clean” solder paste recommended.
3. Tack force high enough to resist component displacement during PCB movement.
4. Particles size 20-38 µm per IPCJ STD-005.

## 3.4 Placement

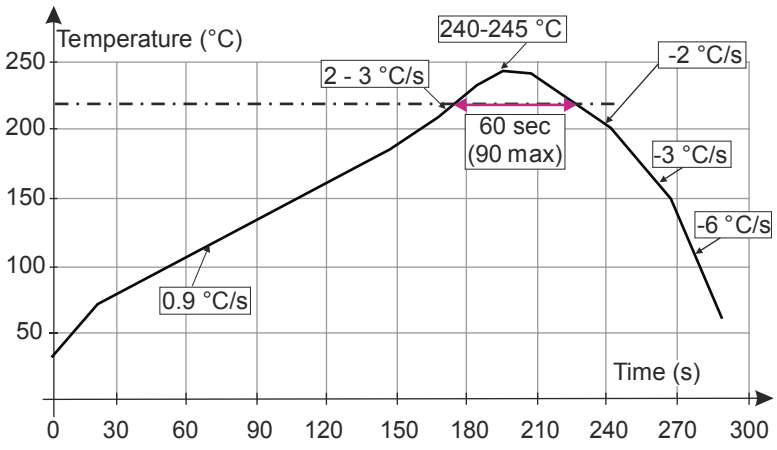
1. It is recommended to use leads recognition instead of package outline for accurate placement on footprint with adequate resolution tool.
2. Tolerance of ±50 µm (25% offset allowed on the smallest dimension of the smallest pad) is recommended.
3. 1.0 N placement force is recommended. Too much placement force can lead to squeezed out solder paste and cause solder joints to short. Too low placement force can lead to insufficient contact between package and solder paste that could cause open solder joints or badly centered packages.
4. For assembly, a perfect supporting of the PCB (all the more on flexible PCB) is recommended during solder paste printing, pick and place and reflow soldering by using optimized tools.

## 3.5 PCB design preference

1. Any via around or inside the footprint area must be closed to avoid solderpaste migration in the via.
2. Position and dimensions of the tracks should be well balanced. A symmetrical layout is recommended to prevent assembly troubles.

## 3.6 Reflow profile

**Figure 28. ST ECOPACK recommended soldering reflow profile for PCB mounting**




*Note: Minimize air convection currents in the reflow oven to avoid component movement. $O_2$ rate inside the oven must be below 500 ppm. Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.*

# 4 Ordering information

Figure 29. **Ordering information scheme**

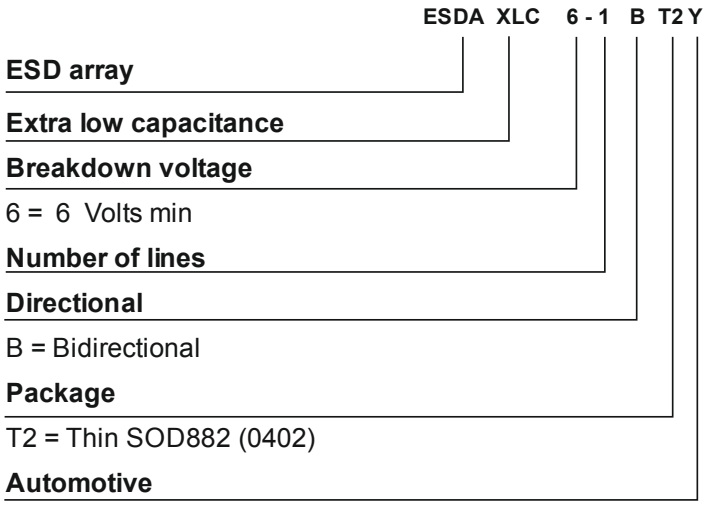



Table 5. **Ordering information**

| Order code | Marking[1] | Package | Weight | Base qty. | Delivery mode |
|---|---|---|---|---|---|
| ESDAXLC6-1BT2Y | U | SOD882T (0402) | 0.80 mg | 12000 | Tape and reel |

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

## Revision history

Table 6. **Document revision history**

| Date | Version | Changes |
|---|---|---|
| 03-Nov-2014 | 1 | Initial release. |
| 03-May-2021 | 2 | Updated SOD882T (0402) package information.<br>Minor text changes. |