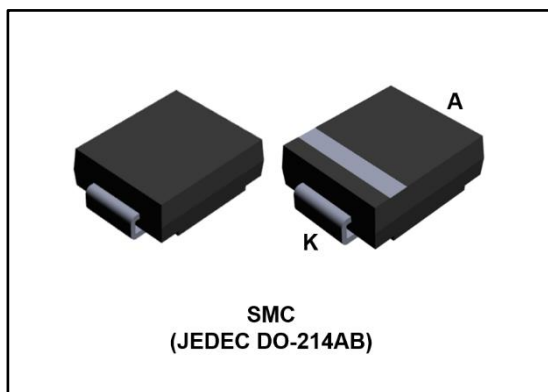


## Transil™ TVS for IEC 61000-4-5 compliance

Datasheet - production data



### Features

- Peak pulse current: 500 A (1.2/50  $\mu$ s, 8/20  $\mu$ s)
- Stand-off voltage range: from 24 V to 33 V
- Unidirectional types: STIEC45-xxAS
  - Reverse: Clamping starts at  $V_{BR}$
  - Forward: Clamping starts around 0.6 V
- Bidirectional types: STIEC45-xxACS
  - Clamping starts at  $V_{BR}$  on both directions
- Low leakage current
  - 0.2  $\mu$ A at 25 °C
  - 1  $\mu$ A at 85 °C
- Operating  $T_j$  max: 150 °C
- High peak current capability at  $T_j$  max: 410 A, 8/20  $\mu$ s
- JEDEC registered package outline
- RoHS2 compliant

### Complies with the following standards

- IEC 61000-4-2 level 4
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- IEC 61000-4-5
  - Level 4: 4 kV with  $R = 12 \Omega$  (334 A) common mode
  - Level 2: 1 kV with  $R = 2 \Omega$  (500 A) differential mode

- MIL STD 883G, method 3015-7 Class 3B
  - 25 kV HBM (human body model)
- Resin meets UL 94, V0
- MIL-STD-750, method 2026 solderability
- EIA-481 and IEC 60286-3 packing
- IPC 7531 footprint

### Description

The STIEC45 Transil series has been designed to protect DC power supply lines according to IEC 61000-4-5. This device protects circuits against electrical fast transients (EFT) according to IEC 61000-4-4 and ETS EN 300 386.

Protection against electrostatic discharges is provided according to IEC 61000-4-2 and MIL STD 883 Method 3015.

Planar technology makes these devices suitable for high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time.

The STIEC45 device is packaged in SMC (SMC footprint in accordance with IPC 7351 standard).

Transil is a trademark of STMicroelectronics

Table 1: Device summary

| Order codes unidirectional | $V_{RM}$ (V) | Order codes bidirectional |
|----------------------------|--------------|---------------------------|
| STIEC45-24AS               | 24           | STIEC45-24ACS             |
| STIEC45-26AS               | 26           | STIEC45-26ACS             |
| STIEC45-28AS               | 28           | STIEC45-28ACS             |
| STIEC45-30AS               | 30           | STIEC45-30ACS             |
| STIEC45-33AS               | 33           | STIEC45-33ACS             |

# 1 Characteristics

**Table 2: Absolute maximum ratings (limiting values at  $T_{amb} = 25\text{ °C}$  unless otherwise specified)**

| Symbol    | Parameter                                           |                                 | Value       | Unit               |
|-----------|-----------------------------------------------------|---------------------------------|-------------|--------------------|
| $I_{pp}$  | Peak pulse current (8/20 $\mu\text{s}$ )            | $T_j \text{ initial} = T_{amb}$ | 500         | A                  |
| $T_{stg}$ | Storage temperature range                           |                                 | -65 to +150 | $^{\circ}\text{C}$ |
| $T_j$     | Operating junction temperature range                |                                 | -55 to +150 | $^{\circ}\text{C}$ |
| $T_L$     | Maximum lead temperature for soldering during 10 s. |                                 | 260         | $^{\circ}\text{C}$ |

**Table 3: Thermal resistances**

| Symbol        | Parameter                                                        | Value | Unit                 |
|---------------|------------------------------------------------------------------|-------|----------------------|
| $R_{th(j-l)}$ | Junction to leads                                                | 15    | $^{\circ}\text{C/W}$ |
| $R_{th(j-a)}$ | Junction to ambient on printed circuit on recommended pad layout | 90    | $^{\circ}\text{C/W}$ |

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

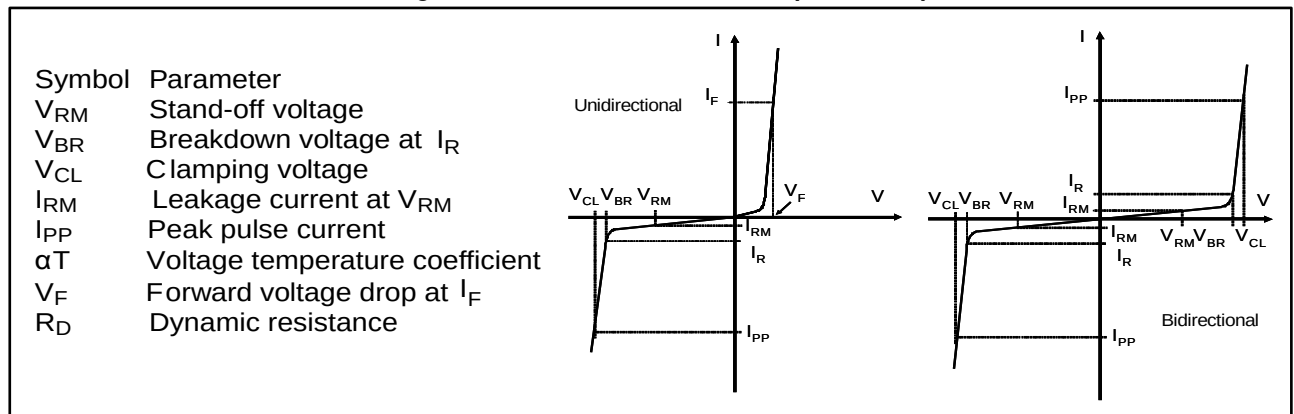


**Table 4: Electrical characteristics ( $T_{amb} = 25\text{ °C}$ )**

| Order code       | $I_{RM}$ at $V_{RM}$  |                       |    | $V_{BR}$ at $I_R^{(1)}$ |      |      |    | $V_{CL}$ at $I_{PP}^{(2)}$ 1.2/50 $\mu\text{s}$ - 8/20 $\mu\text{s}$ |     | $R_D^{(3)}$ 8/20 $\mu\text{s}$ | $\alpha T^{(4)}$         |
|------------------|-----------------------|-----------------------|----|-------------------------|------|------|----|----------------------------------------------------------------------|-----|--------------------------------|--------------------------|
|                  | 25 $^{\circ}\text{C}$ | 85 $^{\circ}\text{C}$ |    | Min.                    | Typ. | Max. |    | Max.                                                                 |     | Typ.                           | Max.                     |
|                  | $\mu\text{A}$         |                       | V  | V                       |      |      | mA | V                                                                    | A   | $\Omega$                       | 10-4/ $^{\circ}\text{C}$ |
| STIEC45-24AS/ACS | 0.2                   | 1                     | 24 | 26.7                    | 28.2 | 29.5 | 1  | 42                                                                   | 500 | 0.025                          | 9.6                      |
| STIEC45-26AS/ACS | 0.2                   | 1                     | 26 | 28.9                    | 30.3 | 31.9 | 1  | 45                                                                   | 500 | 0.026                          | 9.7                      |
| STIEC45-28AS/ACS | 0.2                   | 1                     | 28 | 31.1                    | 32.6 | 34.3 | 1  | 49                                                                   | 500 | 0.029                          | 9.8                      |
| STIEC45-30AS/ACS | 0.2                   | 1                     | 30 | 33.3                    | 35   | 36.8 | 1  | 55                                                                   | 500 | 0.036                          | 9.9                      |
| STIEC45-33AS/ACS | 0.2                   | 1                     | 33 | 36.7                    | 38.6 | 40.6 | 1  | 59                                                                   | 500 | 0.036                          | 10                       |

**Notes:**

(1) Pulse test :  $t_p < 50\text{ ms}$ .

(2) Surge capability given for both directions (unidirectional and bidirectional types).

(3) To calculate maximum clamping voltage at other surge levels:  $V_{CLmax} = R_D \times I_{PP} + V_{BRmax}$

(4) To calculate  $V_{BR}$  versus junction temperature:  $V_{BR}$  at  $T_j = V_{BR}$  at  $25\text{ °C} \times (1 + \alpha T \times (T_j - 25))$

## 1.1 Characteristics (curves)

Figure 2: Pulse form

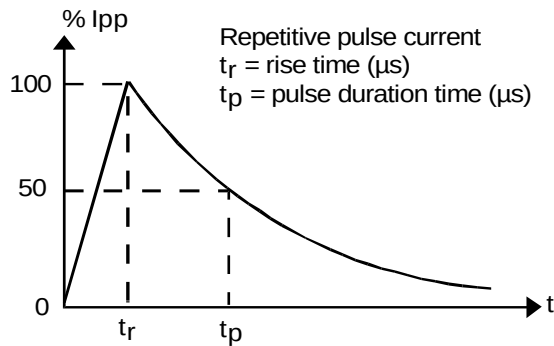
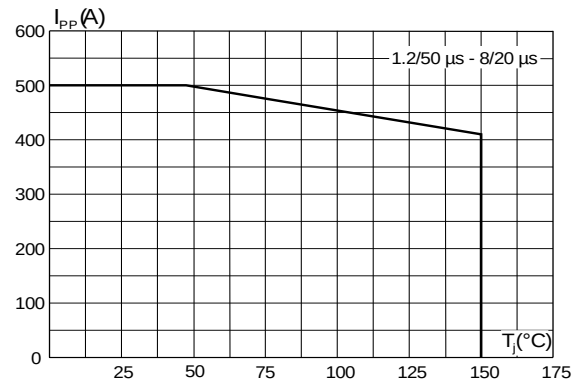
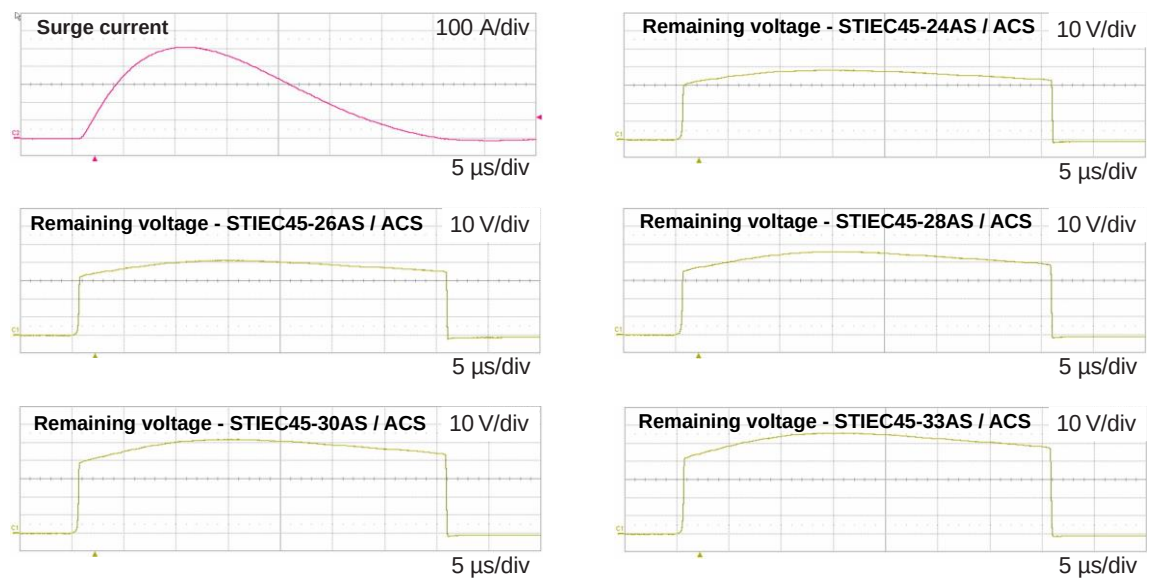


Figure 3: Peak pulse current versus initial junction temperature

Figure 4: Clamping voltage at 500 A (1.2/50  $\mu\text{s}$  - 8/20  $\mu\text{s}$ )

## Characteristics

## STIEC45-xxAS, STIEC45-xxACS

**Figure 5: Junction capacitance versus reverse applied voltage (unidirectional devices)**

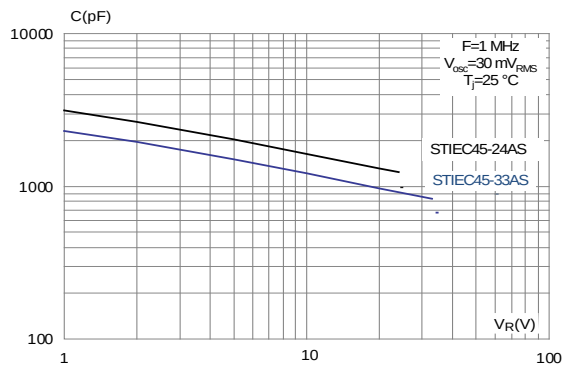


**Figure 6: Junction capacitance versus reverse applied voltage (bidirectional devices)**

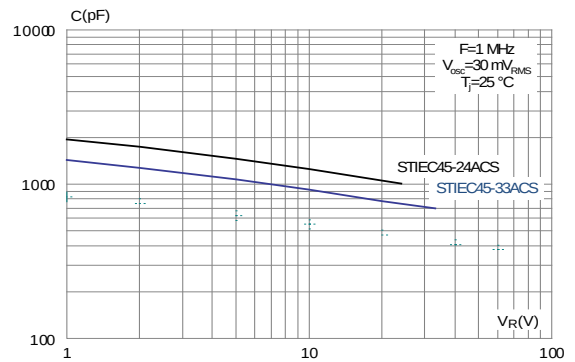


**Figure 7: Peak forward voltage drop versus peak forward current (unidirectional devices)**

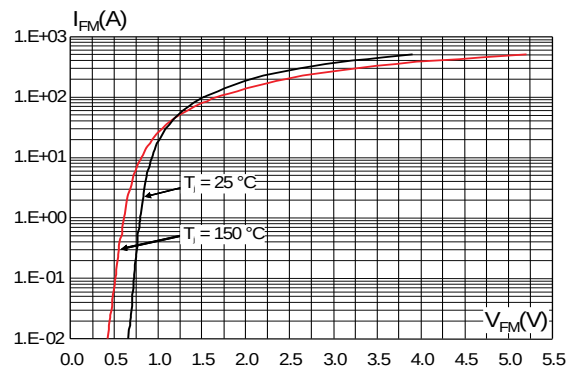


**Figure 8: Leakage current versus junction temperature**

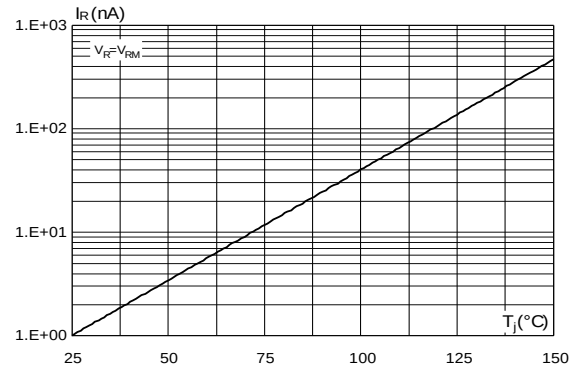


**Figure 9: Relative variation of thermal impedance, junction to ambient, versus pulse duration**

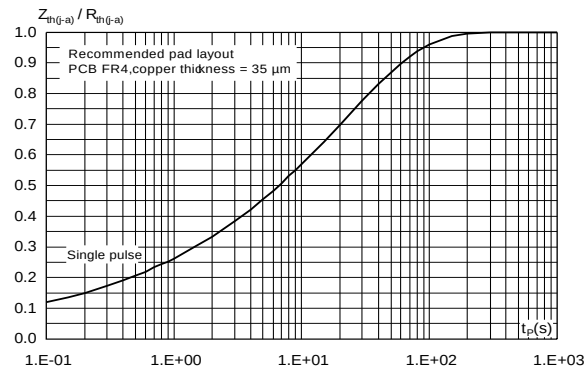
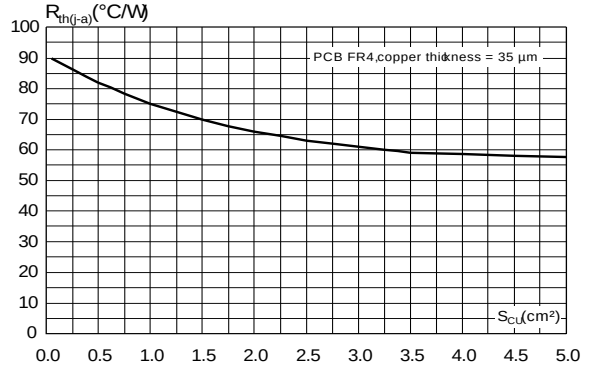


**Figure 10: Thermal resistance junction to ambient versus copper surface under each lead**



## 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 SMC package information

Figure 11: SMC package outline

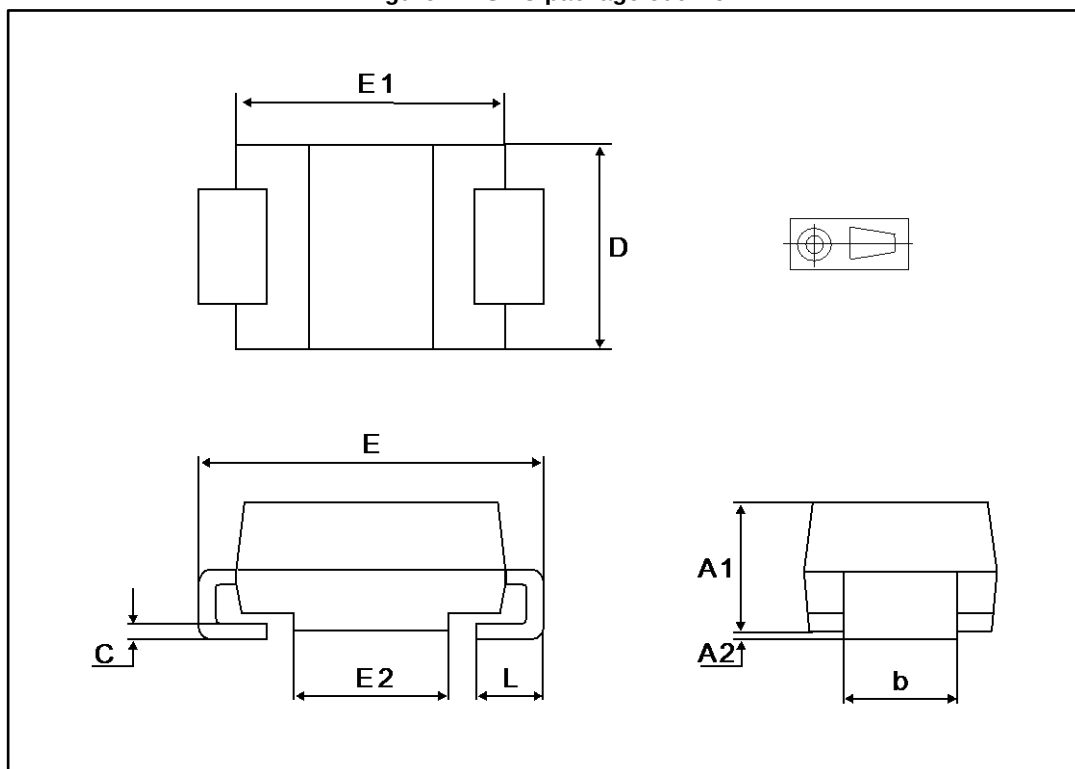
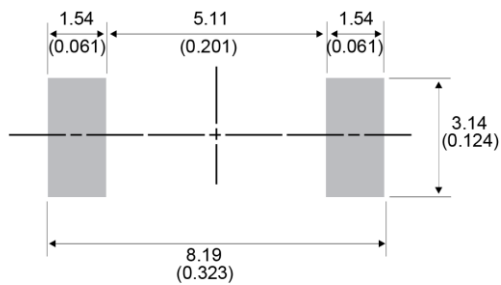
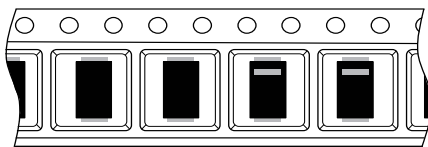


Table 5: SMC package mechanical data

| Ref. | Dimensions  |      |        |       |
|------|-------------|------|--------|-------|
|      | Millimeters |      | Inches |       |
|      | Min.        | Max. | Min.   | Max.  |
| A1   | 1.90        | 2.45 | 0.075  | 0.096 |
| A2   | 0.05        | 0.20 | 0.002  | 0.008 |
| b    | 2.90        | 3.20 | 0.114  | 0.126 |
| c    | 0.15        | 0.40 | 0.006  | 0.016 |
| D    | 5.55        | 6.25 | 0.218  | 0.246 |
| E    | 7.75        | 8.15 | 0.305  | 0.321 |
| E1   | 6.60        | 7.15 | 0.260  | 0.281 |
| E2   | 4.40        | 4.70 | 0.173  | 0.185 |
| L    | 0.75        | 1.50 | 0.030  | 0.060 |

**Figure 12: Footprint recommendation, dimensions in mm (inches)****Figure 13: Marking layout**

E : ECOPACK grade  
 XXXX : Marking  
 Z : Manufacturing location  
 Y : Year  
 WW : week

**Figure 14: 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

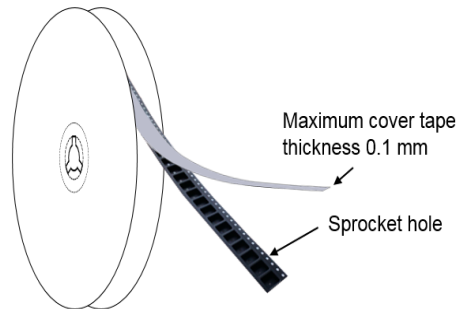
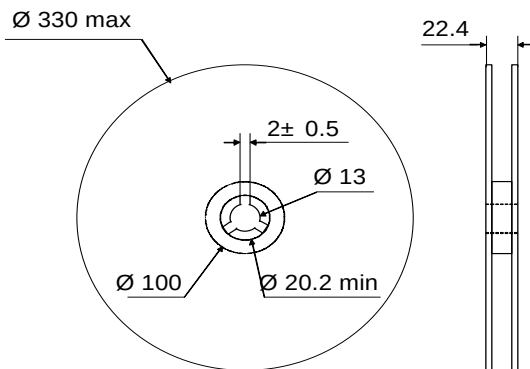
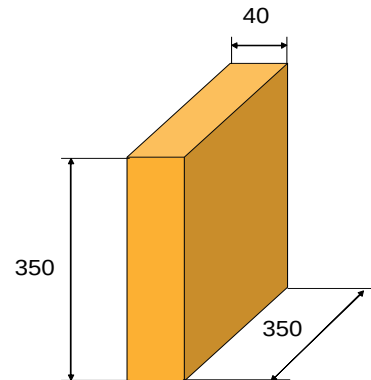
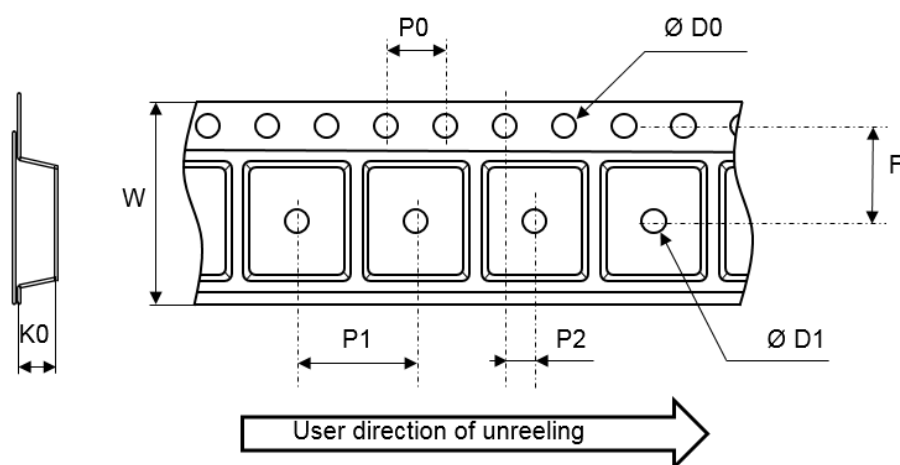
**Figure 15: Tape and reel orientation****Figure 16: 13" reel dimensions (mm)****Figure 17: Inner box dimensions (mm)**

Figure 18: Tape and reel outline

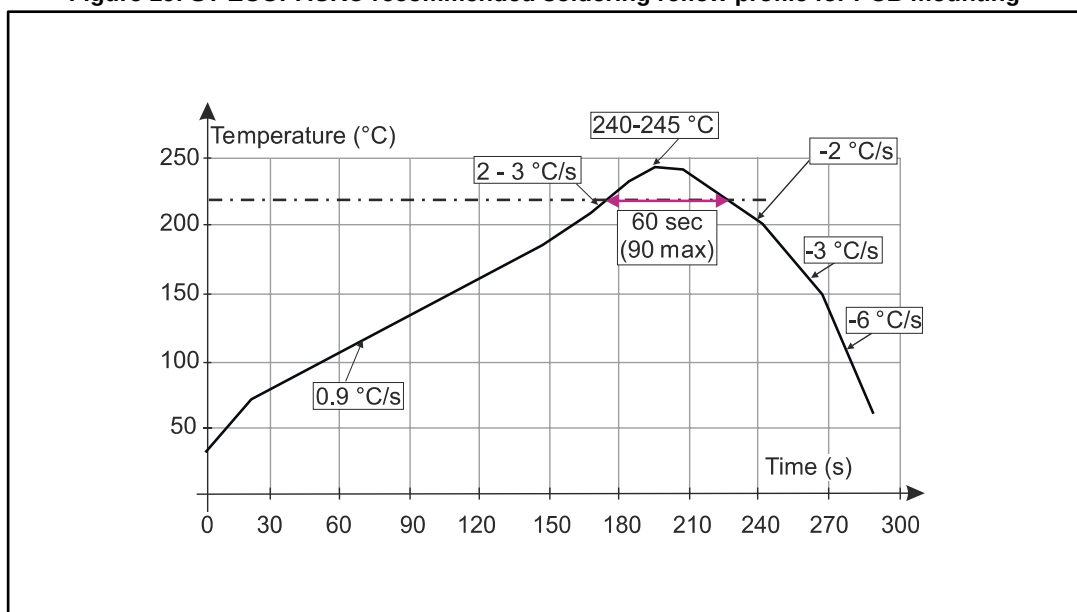


Note: Pocket dimensions are not on scale  
Pocket shape may vary depending on package

Table 6: Tape and reel mechanical data

| Ref. | Dimensions  |      |      |
|------|-------------|------|------|
|      | Millimeters |      |      |
|      | Min.        | Typ. | Max. |
| Ø D0 | 1.4         | 1.5  | 1.6  |
| Ø D1 | 1.5         | -    | -    |
| F    | 7.4         | 7.5  | 7.6  |
| K0   | 2.39        | 2.49 | 2.59 |
| P0   | 3.9         | 4.0  | 4.1  |
| P1   | 7.9         | 8    | 8.1  |
| P2   | 1.9         | 2    | 2.1  |
| W    | 15.7        | 16   | 16.3 |

Figure 19: 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 20: Ordering information scheme

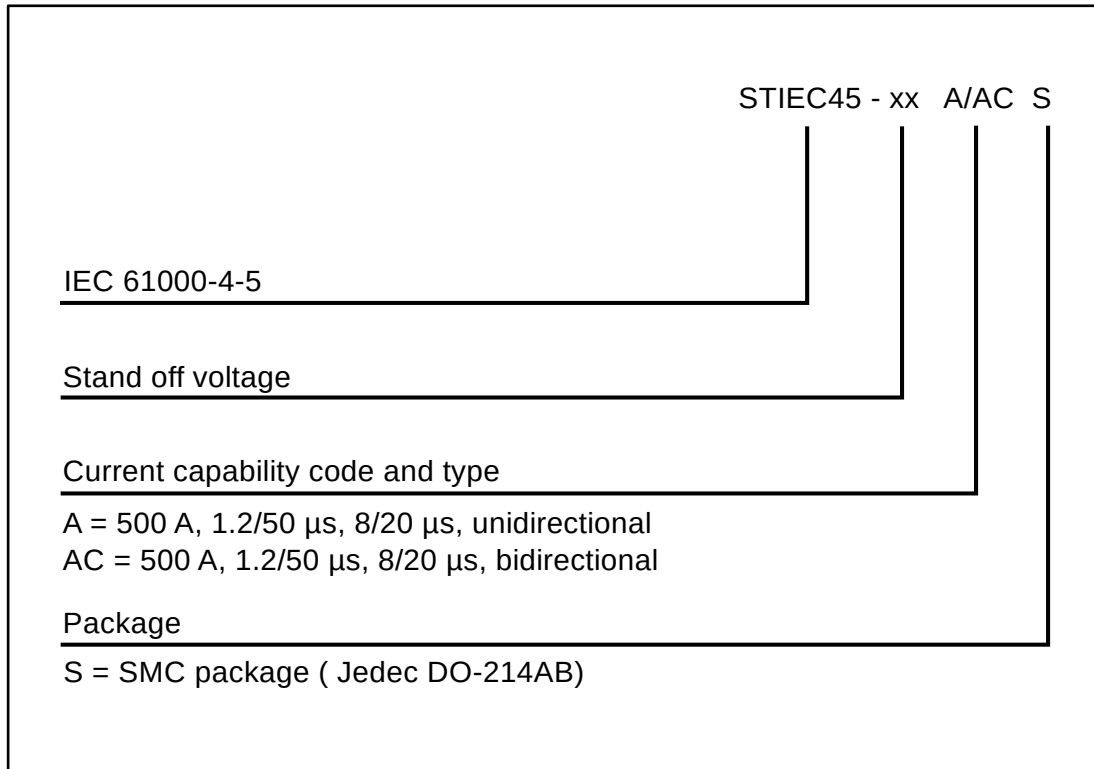


Table 7: Ordering information

| Order code    | Marking | Package | Weight | Base qty. | Delivery mode |
|---------------|---------|---------|--------|-----------|---------------|
| STIEC45-24AS  | 4524A   | SMC     | 0.25 g | 2500      | Tape and reel |
| STIEC45-26AS  | 4526A   |         |        |           |               |
| STIEC45-28AS  | 4528A   |         |        |           |               |
| STIEC45-30AS  | 4530A   |         |        |           |               |
| STIEC45-33AS  | 4533A   |         |        |           |               |
| STIEC45-24ACS | 4524C   |         |        |           |               |
| STIEC45-26ACS | 4526C   |         |        |           |               |
| STIEC45-28ACS | 4528C   |         |        |           |               |
| STIEC4530ACS  | 4530C   |         |        |           |               |
| STIEC45-33ACS | 4533C   |         |        |           |               |

## 4 Revision history

**Table 8: Document revision history**

| Date        | Revision | Changes                                                                          |
|-------------|----------|----------------------------------------------------------------------------------|
| 07-Dec-2017 | 1        | First issue                                                                      |
| 11-Jan-2017 | 2        | Added bidirectional types and updated stand-off voltage range from 24 V to 68 V. |
| 13-Nov-2017 | 3        | Updated SMC package information. Updated $V_{RM}$ range from 24 V to 33 V.       |

## 5 Disclaimer

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