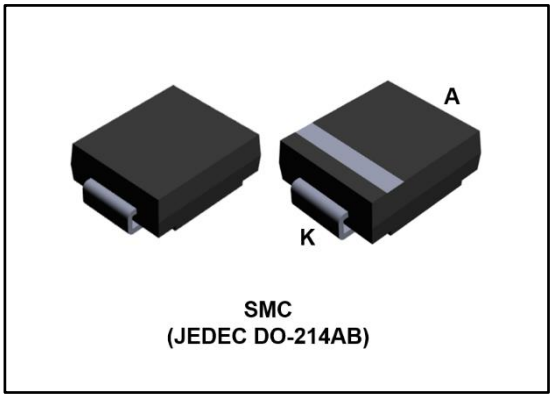
STIEC45-xxAS, STIEC45-xxACS

Transil™ TVS for IEC 61000-4-5 compliance

Datasheet - production data



SMC
(JEDEC DO-214AB)

Features

- Peak pulse current: 500 A (1.2/50 µs, 8/20 µs)
- 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 µA at 25 °C
  - 1 µA at 85 °C
- Operating T_j max: 150 °C
- High peak current capability at T_j max: 410 A, 8/20 µs
- 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 Ω (334 A) common mode
  - Level 2: 1 kV with R = 2 Ω (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

This is information on a product in full production.

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1 Characteristics

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

Symbol	Parameter		Value	Unit
I_{pp}	Peak pulse current (8/20 µs)	T_j initial = T_{amb}	500	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

Table 3: Thermal resistances

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

Figure 1: Electrical characteristics (definitions)

Symbol Parameter
V_{RM} Stand-off voltage
V_{BR} Breakdown voltage at I_R
V_{CL} Clamping voltage
I_{RM} Leakage current at V_{RM}
I_{PP} Peak pulse current
αT Voltage temperature coefficient
V_F Forward voltage drop at I_F
R_D Dynamic resistance

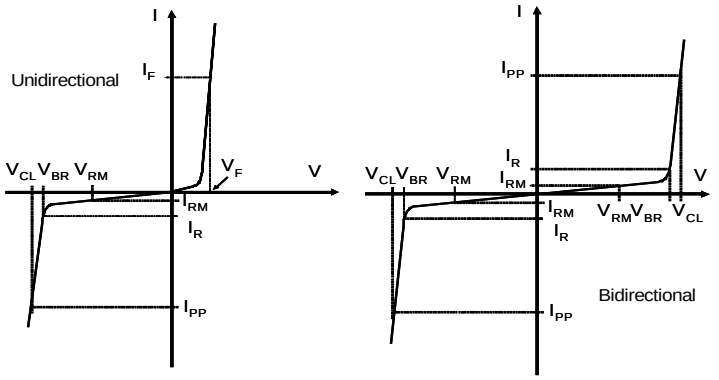

Table 4: Electrical characteristics (T_{amb} = 25 °C)

Order code	I_{RM} at V_{RM}			V_{BR} at I_R(1)				V_{CL} at I_{PP}(2) 1.2/50 µs - 8/20 µs		R_D(3) 8/20 µs	αT (4)
	25 °C	85 °C		Min.	Typ.	Max.		Max.		Typ.	Max.
	µA		V	V			mA	V	A	Ω	10-4/ °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 ms.

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

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

(4)To calculate V_{BR} versus junction temperature: V_{BR} at T_j = V_{BR} at 25 °C x (1 + αT x (T_j – 25))

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1.1 Characteristics (curves)

Figure 2: Pulse form

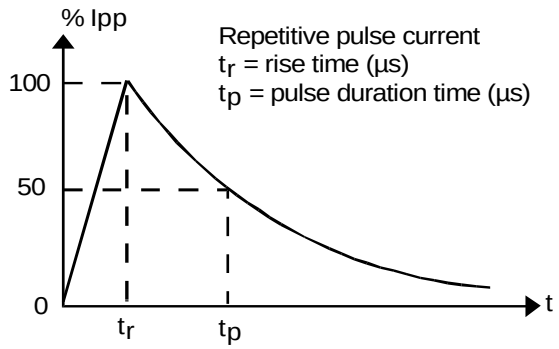

Figure 3: Peak pulse current versus initial junction temperature

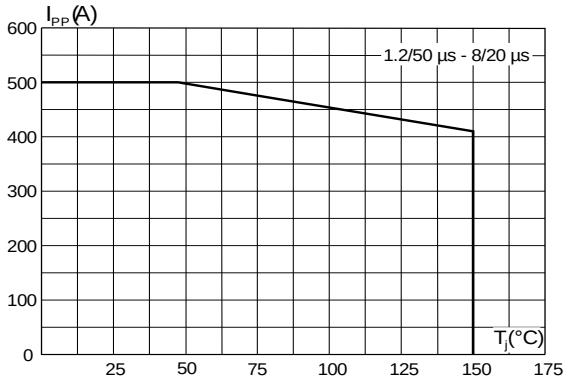

Figure 4: Clamping voltage at 500 A (1.2/50 µs - 8/20 µs)

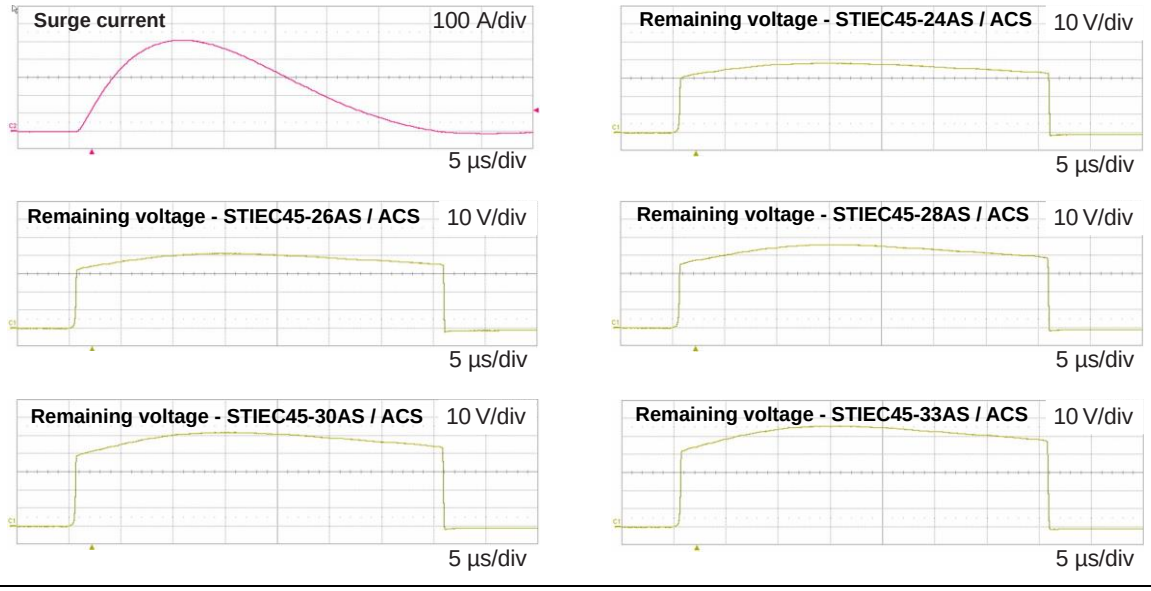

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Figure 5: Junction capacitance versus reverse applied voltage (unidirectional devices)

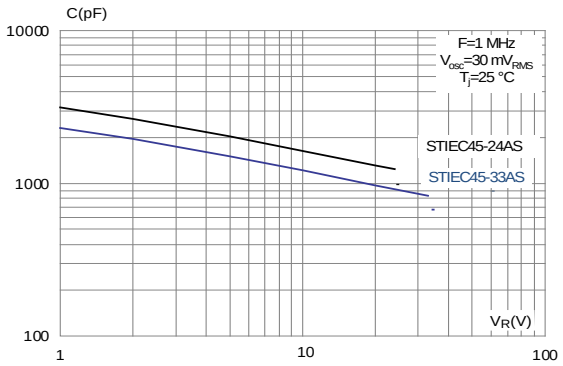


Figure 6: Junction capacitance versus reverse applied voltage (bidirectional devices)

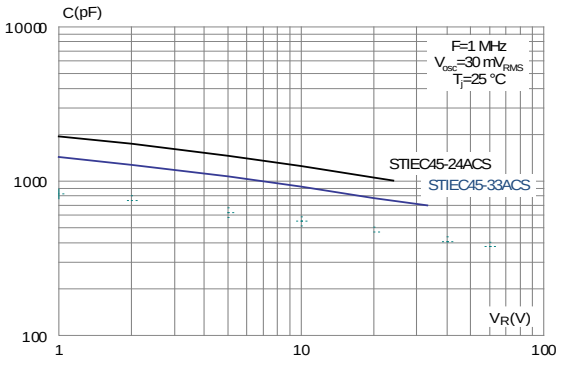


Figure 7: Peak forward voltage drop versus peak forward current (unidirectional devices)

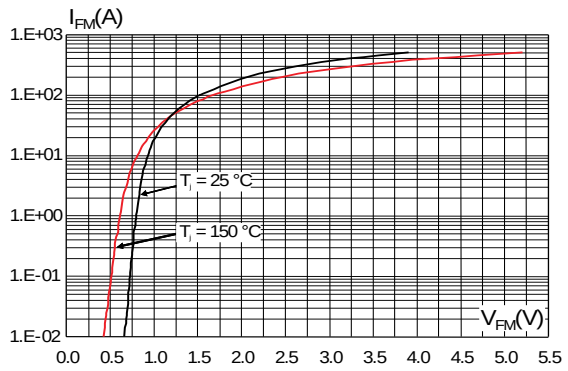


Figure 8: Leakage current versus junction temperature

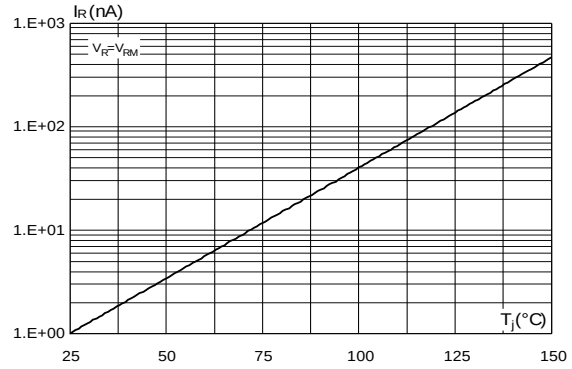


Figure 9: Relative variation of thermal impedance, junction to ambient, versus pulse duration

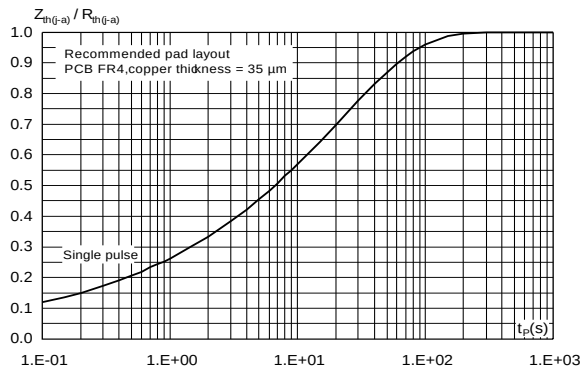
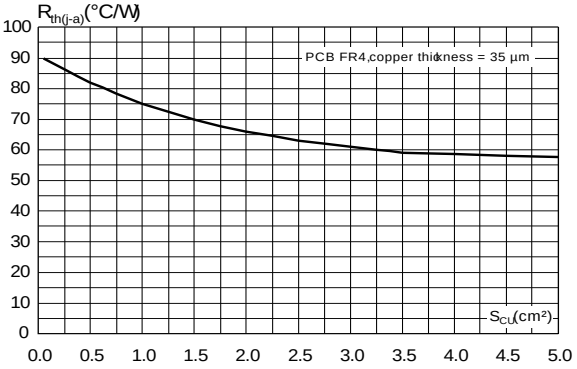


Figure 10: Thermal resistance junction to ambient versus copper surface under each lead



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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 SMC package information

Figure 11: SMC package outline

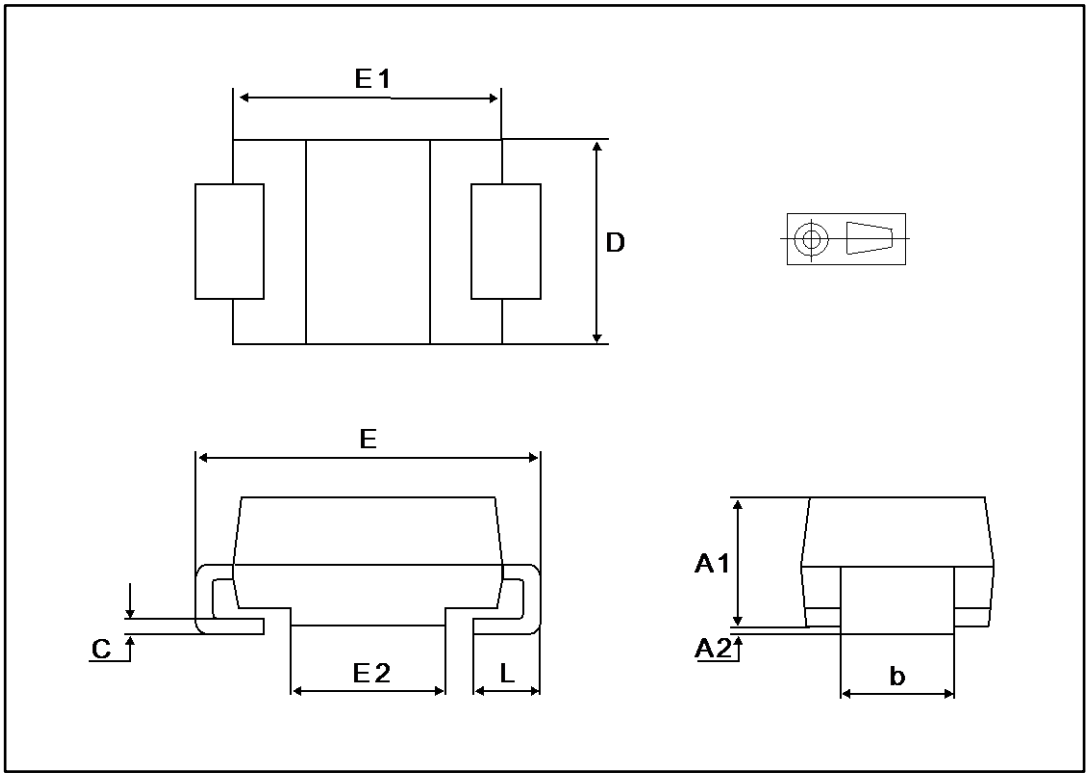

Table 5: SMC package mechanical data

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

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Figure 12: Footprint recommendation, dimensions in mm (inches)

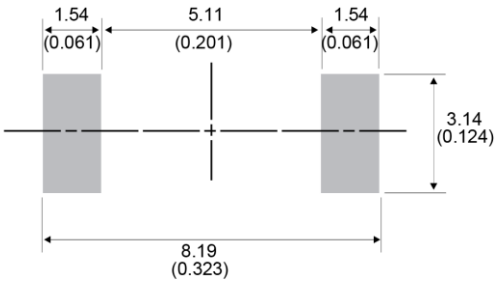
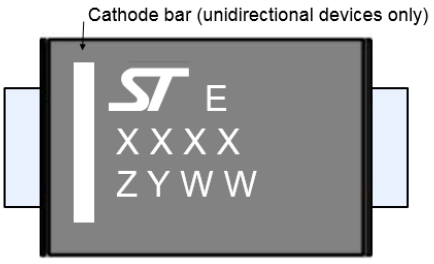
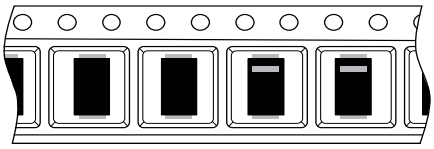


Figure 13: Marking layout



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

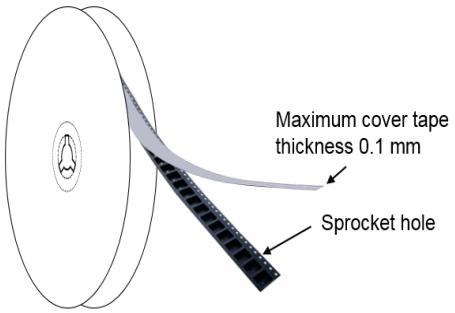


Figure 16: 13''reel dimensions (mm)

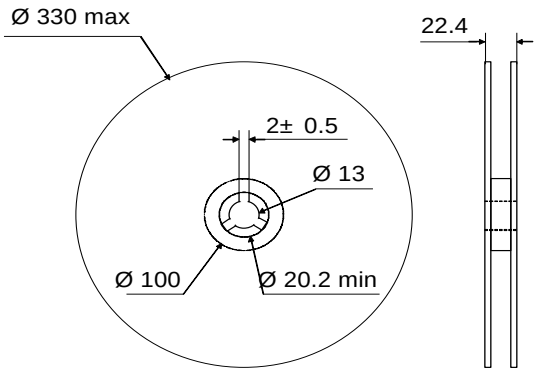


Figure 17: Inner box dimensions (mm)

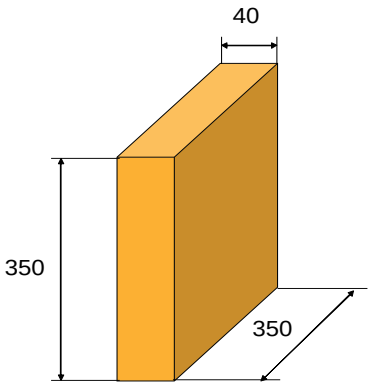


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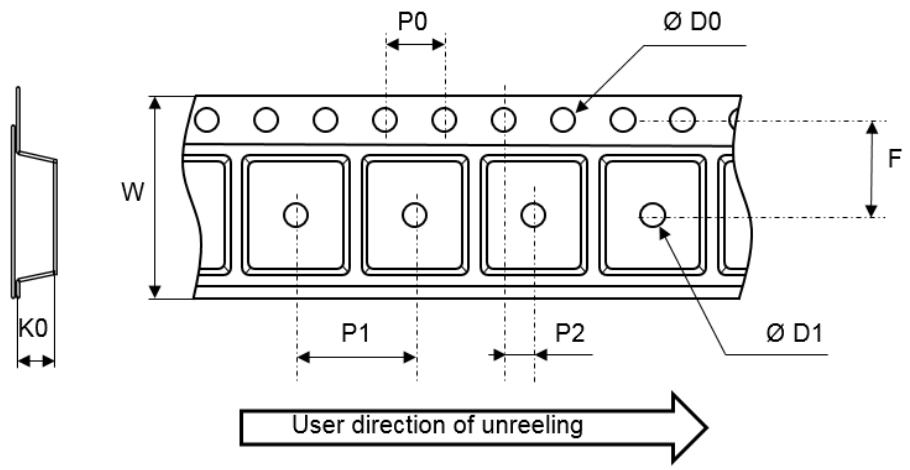
Figure 18: Tape and reel outline



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

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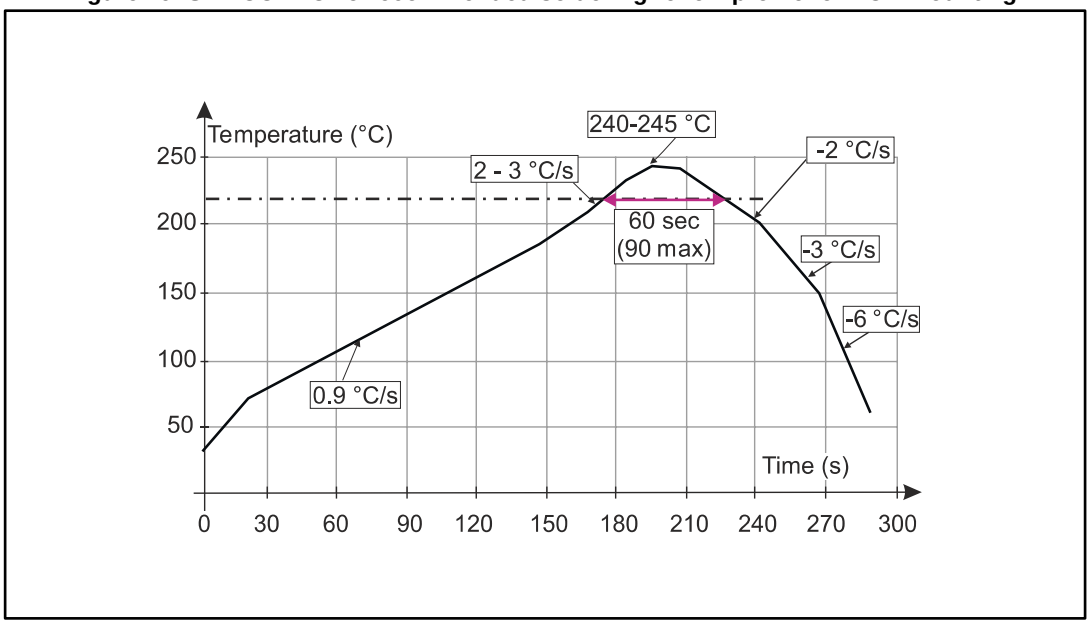
Figure 19: ST ECOPACK® recommended soldering reflow profile for PCB mounting



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

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3 Ordering information

Figure 20: Ordering information scheme

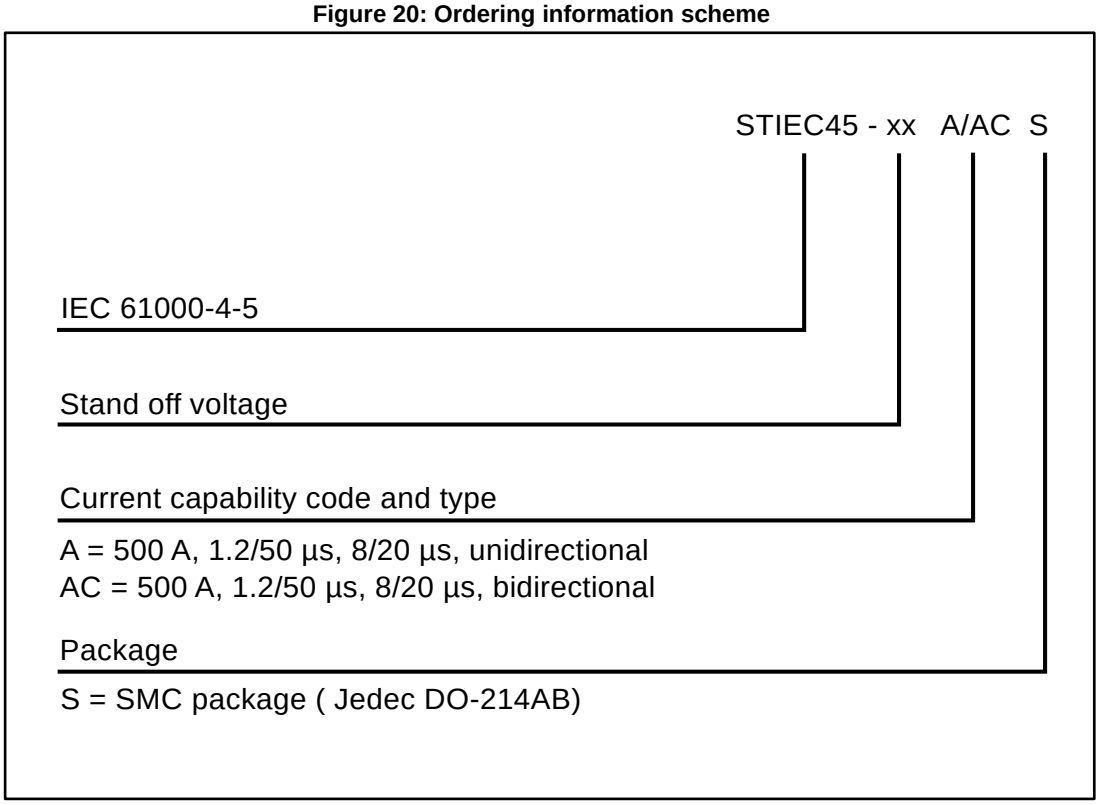

Table 7: Ordering information

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				

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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.

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