

Automotive quad Transil™ array for ESD protection

Datasheet – production data

Features

- 4 unidirectional Transil functions
- Low leakage current: I_R max. < 20 μ A at V_{RM}
- 400 W peak pulse power (8/20 μ s)

Benefits

- High EOS and ESD protection levels
- High integration
- Suitable for high density boards
- AEC-Q101 qualified

Complies with the following standards:

- ISO 10605: C = 150 pF, R = 330 Ω
 - 30 kV (air discharge)
 - 30 kV (contact discharge)
- ISO 10605: C = 330 pF, R = 330 Ω
 - 30 kV (air discharge)
 - 30 kV (contact discharge)
- ISO 7637-2
 - Pulse 1: $V_S = -100$ V
 - Pulse 2a: $V_S = +50$ V
 - Pulse 3a: $V_S = -150$ V
 - Pulse 3b: $V_S = +100$ V

Applications

Where ESD and EOS transient overvoltage protection in susceptible equipment is required, such as:

- Information - entertainment
- Signal communications
- Connectivity
- Comfort and convenience

TM: Transil is a trademark of STMicroelectronics.

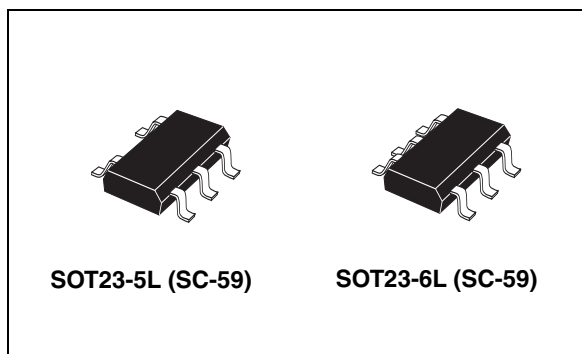


Figure 1. ESDA14V2SC5Y configuration

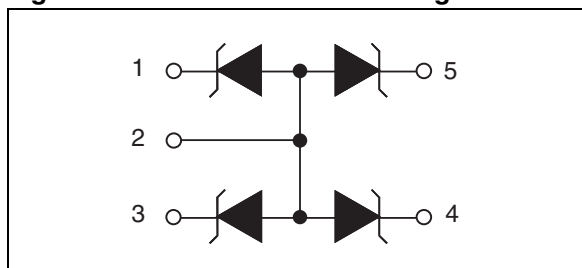
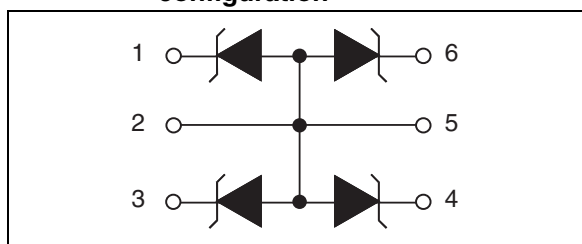


Figure 2. ESDA6V1SC6Y and ESDA25SC6Y configuration



Description

The ESDASCY devices are monolithic voltage suppressors designed to protect components which are connected to data and transmission lines against ESD.

They clamp the voltage just above the logic level supply for positive transients, and to a diode drop below ground for negative transient.

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	ISO10605 (C = 150 pF, R = 330 Ω)		
		Contact discharge	30	kV
		Air discharge	30	
		ISO10605 (C = 330 pF, R = 330 Ω)		
Contact discharge	30			
Air discharge	30			
P_{PP}	Peak pulse power (8/20 μ s)	ESDA5V3SC6Y, ESDA6V1SC6Y	400	W
		ESDA14V2SC5Y, ESDA25SC6Y	300	
I_{PP}	Peak pulse current (8/20 μ s)	ESDA5V3SC6Y	22	A
		ESDA6V1SC6Y	18	
		ESDA14V2SC5Y	14	
		ESDA25SC6Y	7	
T_j	Operating junction temperature range		-40 to 150	$^{\circ}\text{C}$
T_{stg}	Storage temperature range		-65 to +150	$^{\circ}\text{C}$
T_L	Maximum lead temperature for soldering during 10 s		260	$^{\circ}\text{C}$

For a surge greater than the maximum values, the diode will fail in short-circuit.

Figure 3. Electrical characteristics (definitions)

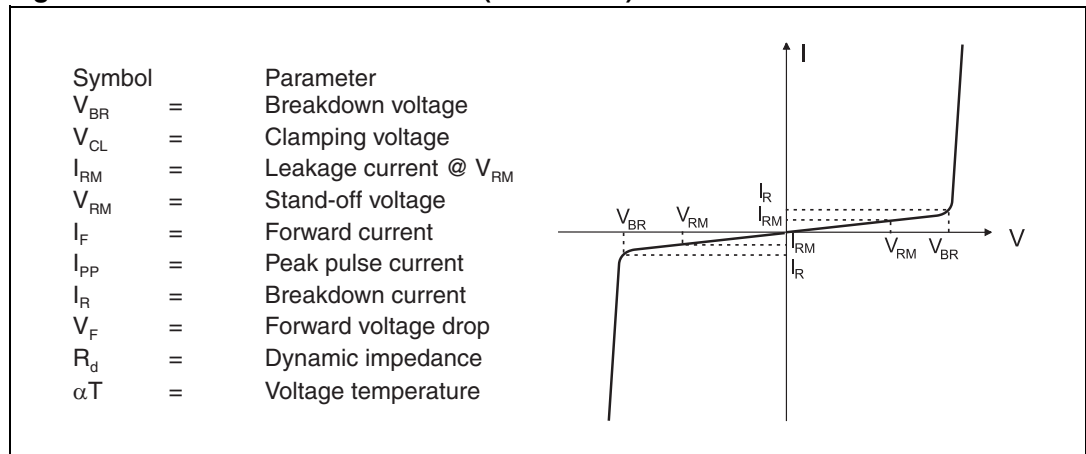


Table 2. Electrical characteristics - values ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Order code	$V_{BR} @ I_R$			$I_{RM} @ V_{RM}$		$V_{CL} @ I_{pp}^{(1)}$		$V_F @ I_F$		$R_d^{(2)}$	αT	$C_{line}^{(3)}$
	min.	max.		max.		typ.		max.		typ.	max.	typ.
	V	V	mA	μA	V	V	A	V	mA	$\text{m}\Omega$	$10^{-4}/\text{C}$	pF
ESDA5V3SC6Y	5.3	5.9	1	2	3	18	22	1.25	200	230	5	280
ESDA6V1SC6Y	6.1	7.2	1	20	5.2	22	18	1.25	200	350	6	190
ESDA14V2SC5Y	14.2	15.8	1	5	12	21	14	1.25	200	650	10	100
ESDA25SC6Y	25	30	1	1	24	30	10	1.2	10	1000	10	60

1. 8/20 μs waveform
2. Square pulse, $I_{pp} = 15\text{ A}$, $t_p = 2.5\text{ }\mu\text{s}$.
3. $\Delta V_{BR} = \alpha T * (T_{amb} - 25\text{ }^{\circ}\text{C}) * V_{BR}(25\text{ }^{\circ}\text{C})$

Figure 4. Pulse power versus initial junction temperature

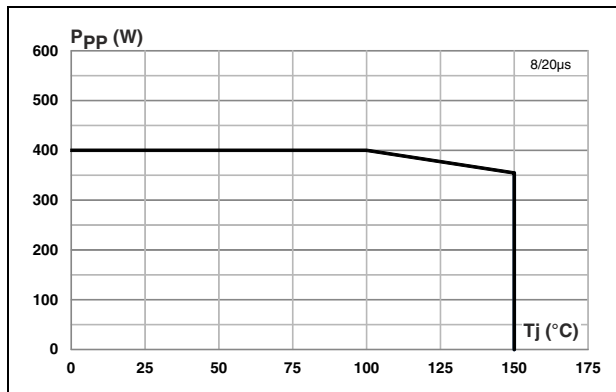


Figure 5. Peak pulse power versus exponential pulse duration (typical values)

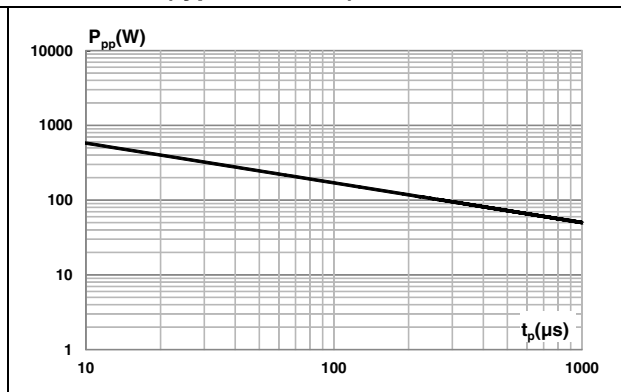


Figure 6. Clamping voltage versus peak pulse current (typical values, 8/20 μs waveform)

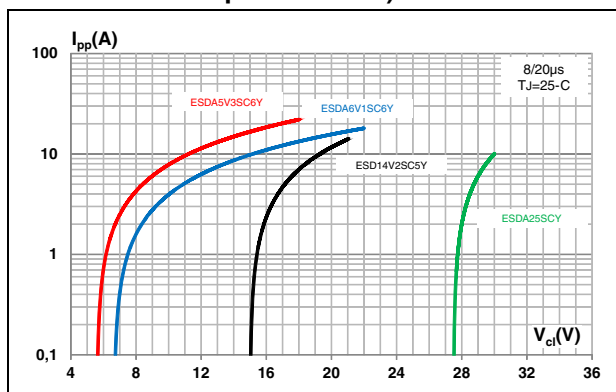
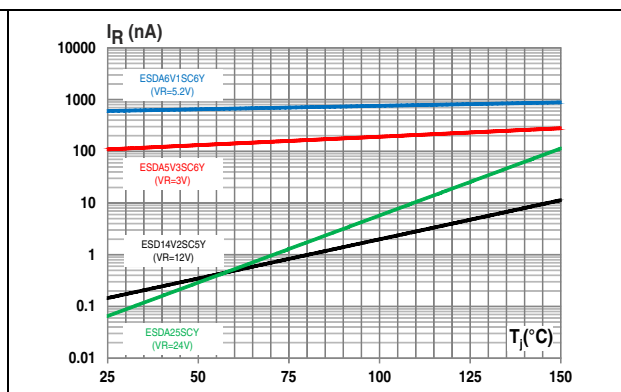


Figure 7. Leakage current versus junction temperature (typical values)



Note: ISO7637-2 pulse responses are not applicable for products with a breakdown voltage lower than the average battery voltage (13.5 V) like ESDA6V1SC6Y.

Figure 8. ISO7637-2 pulse 1 response ($V_S = -100\text{ V}$)

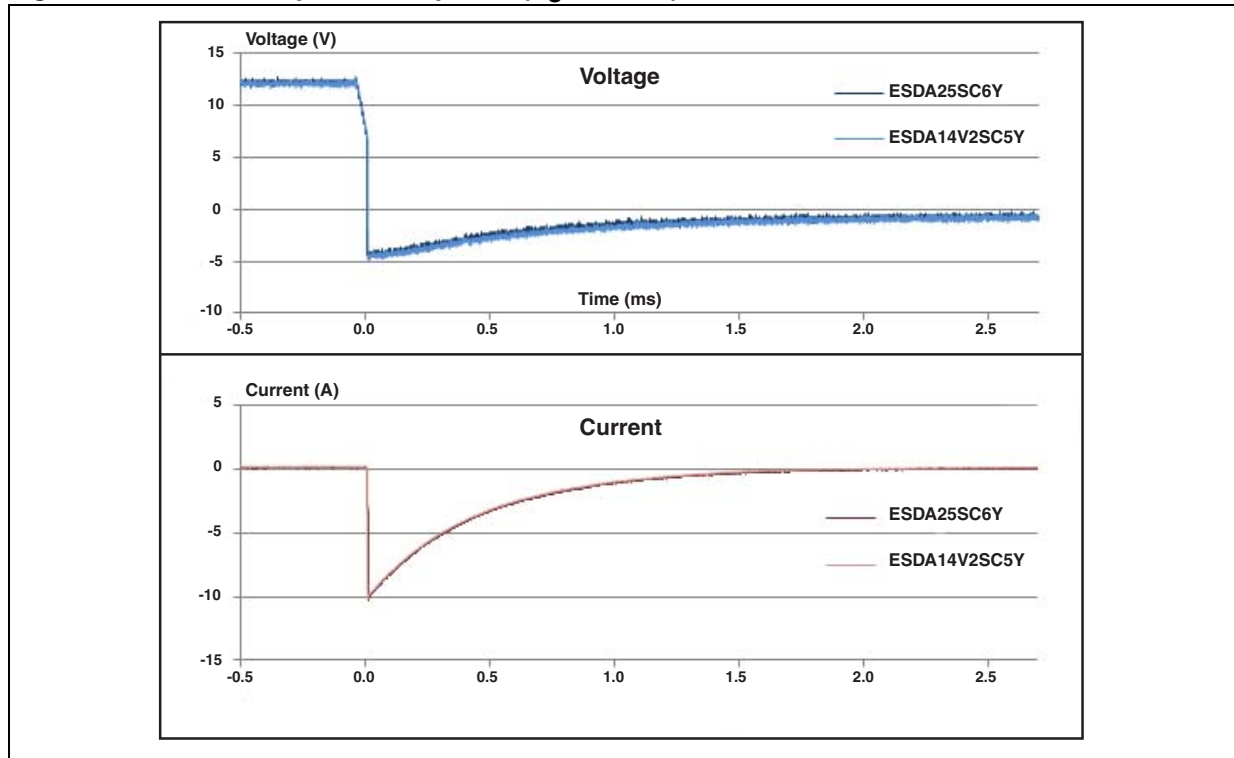


Figure 9. ISO7637-2 pulse 2a response ($V_S = 50\text{ V}$)

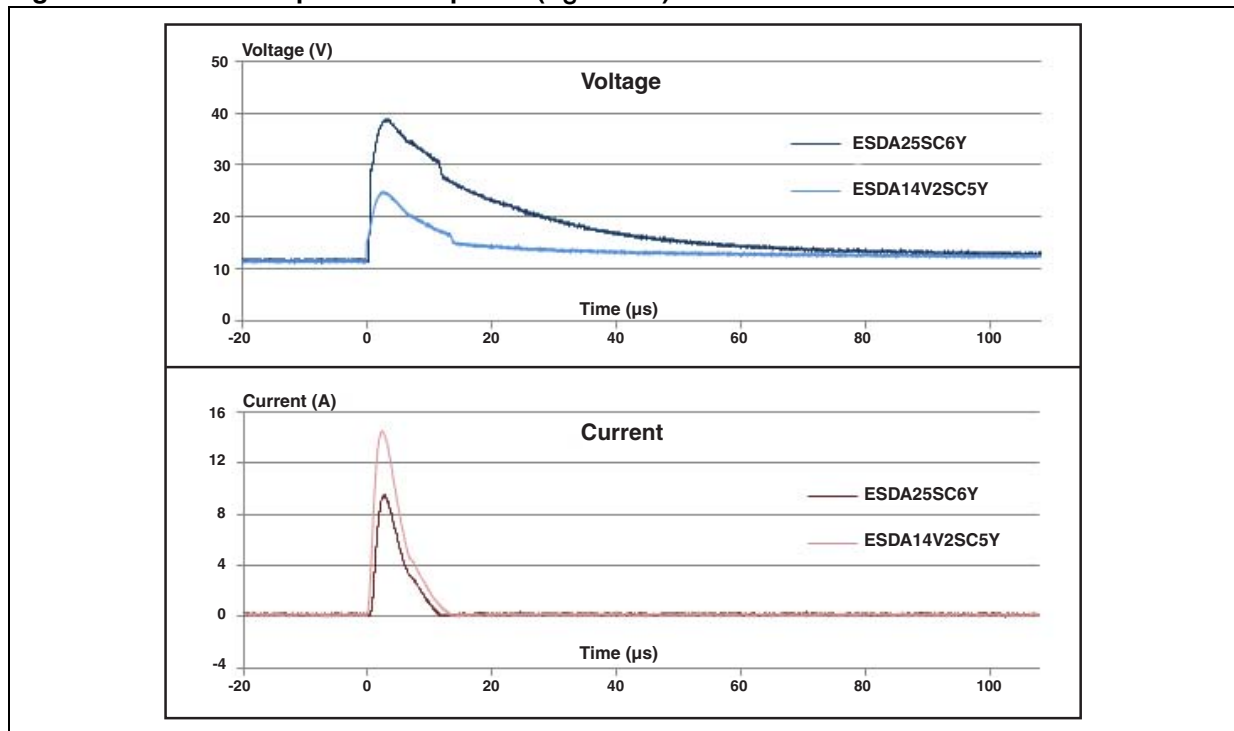


Figure 10. ISO7637-2 pulse 3a response ($V_S = -150\text{ V}$)

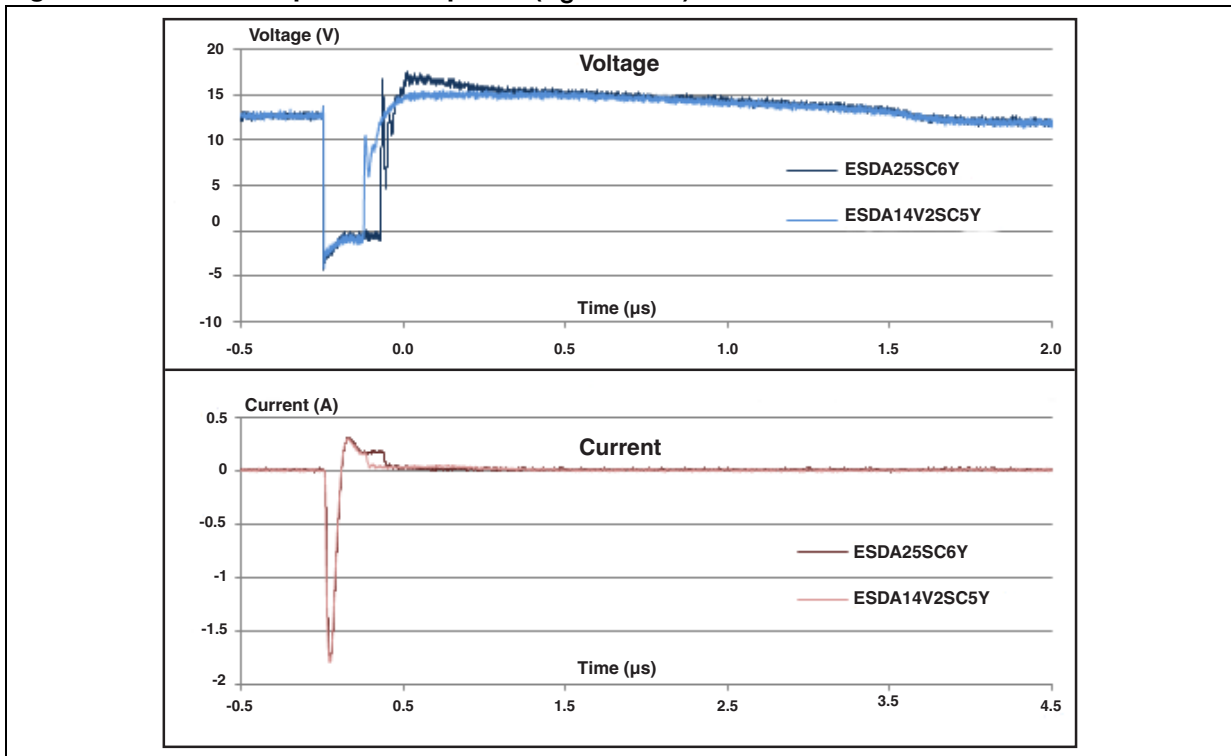
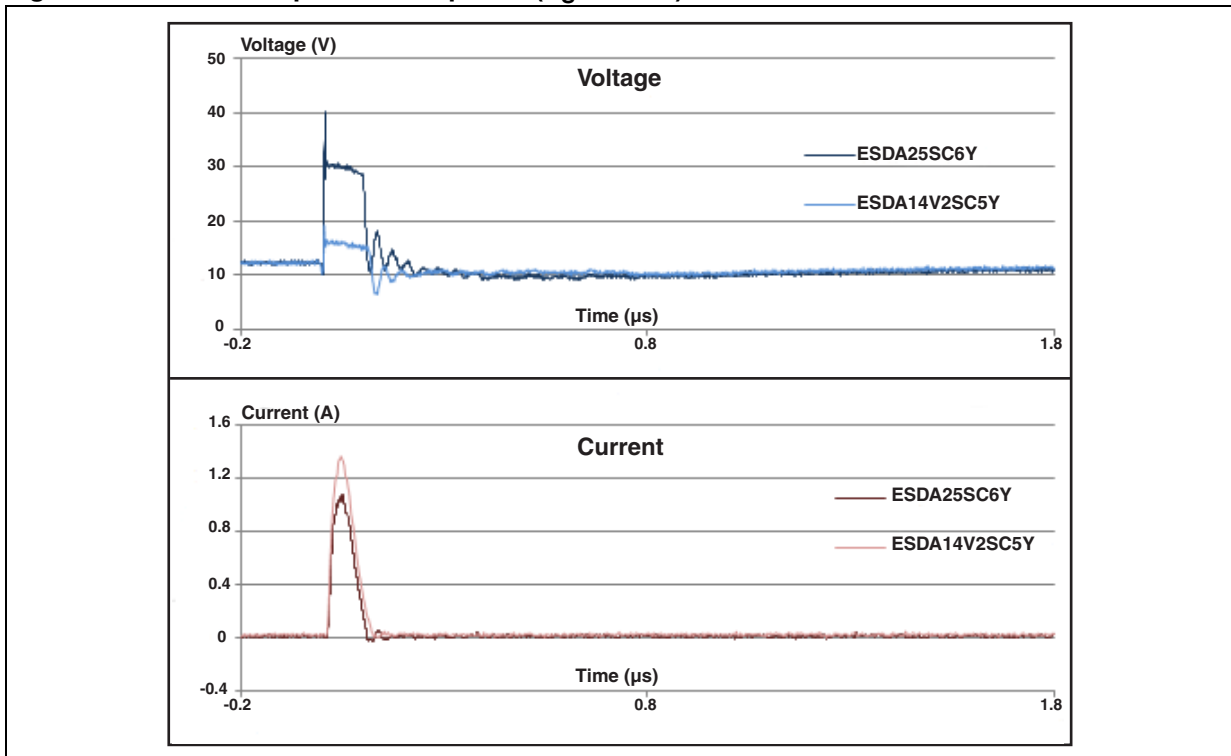


Figure 11. ISO7637-2 pulse 3b response ($V_S = 100\text{ V}$)

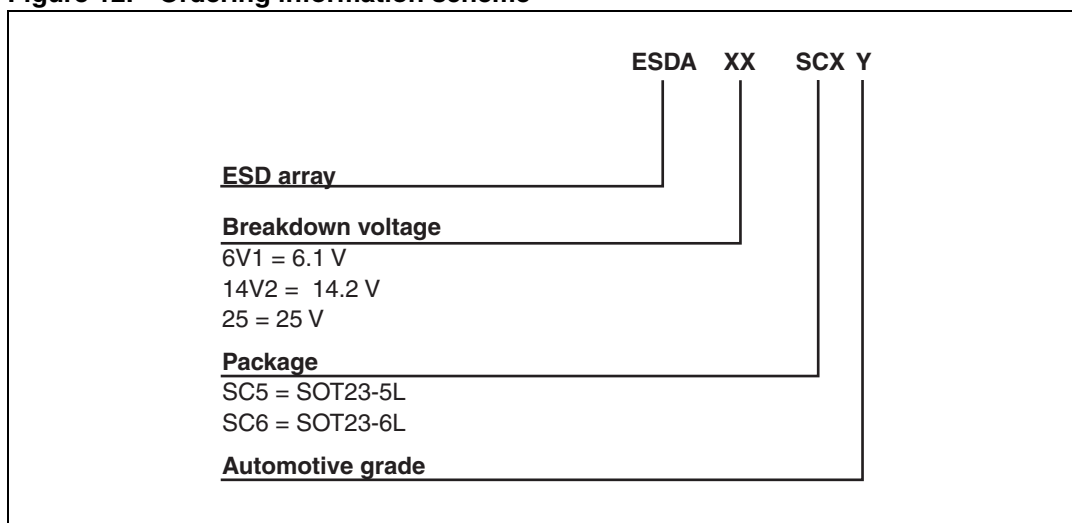


2 Application and design guidelines

More information is available in the STMicroelectronics Application note AN2689: "Protection of automotive electronics from electrical hazards, guidelines for design and component selection".

3 Ordering information

Figure 12. Ordering information scheme



4 Package information

- Epoxy meets UL94, V0 standard
- Lead-free packages

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.

Table 3. SOT23-5L dimensions

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.45	0.035		0.057
A1	0		0.15	0		0.006
A2	0.90		1.30	0.035		0.051
b	0.30		0.50	0.012		0.020
c	0.09		0.20	0.004		0.008
D	2.80		3.05	0.11		0.118
E	1.50		1.75	0.059		0.069
e		0.95			0.037	
H	2.60		3.00	0.102		0.118
L	0.30		0.60	0.012		0.024
M	0°		10°	0°		10°

Figure 13. SOT23-5L footprint (dimensions in mm)

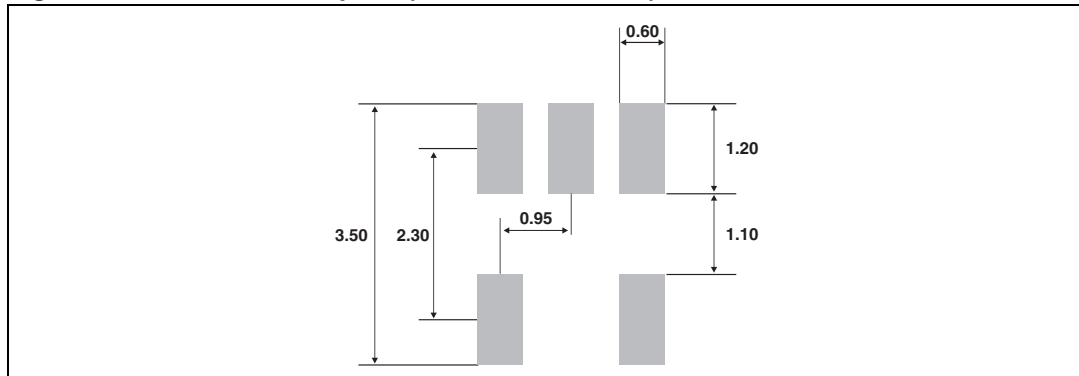


Table 4. SOT23-6L dimensions

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.45	0.035		0.057
A1	0		0.15	0		0.006
A2	0.90		1.30	0.035		0.051
b	0.30		0.50	0.012		0.020
c	0.09		0.20	0.004		0.008
D	2.80		3.05	0.11		0.118
E	1.50		1.75	0.059		0.069
e		0.95			0.037	
H	2.60		3.00	0.102		0.118
L	0.30		0.60	0.012		0.024
θ	0°		10°	0°		10°

Figure 14. SOT23-6L footprint (dimensions in mm)

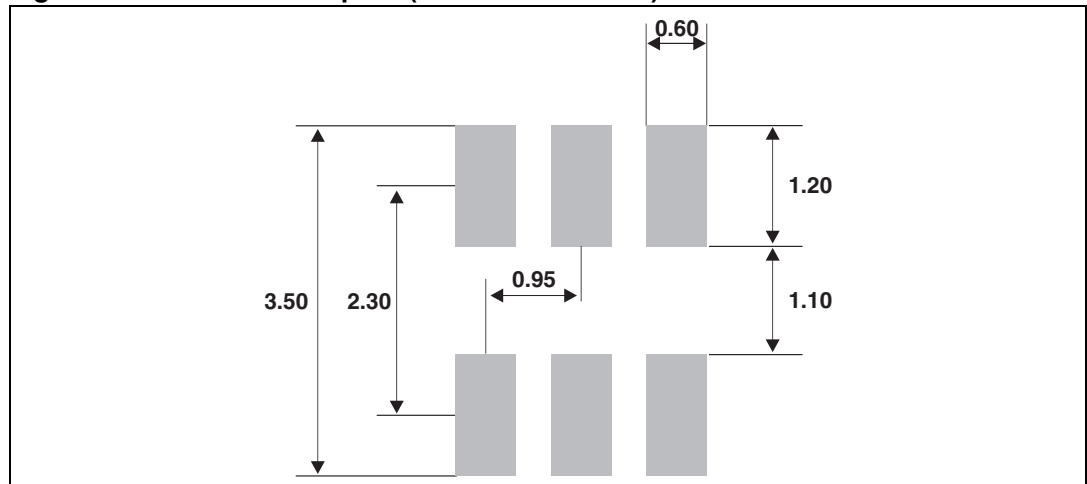
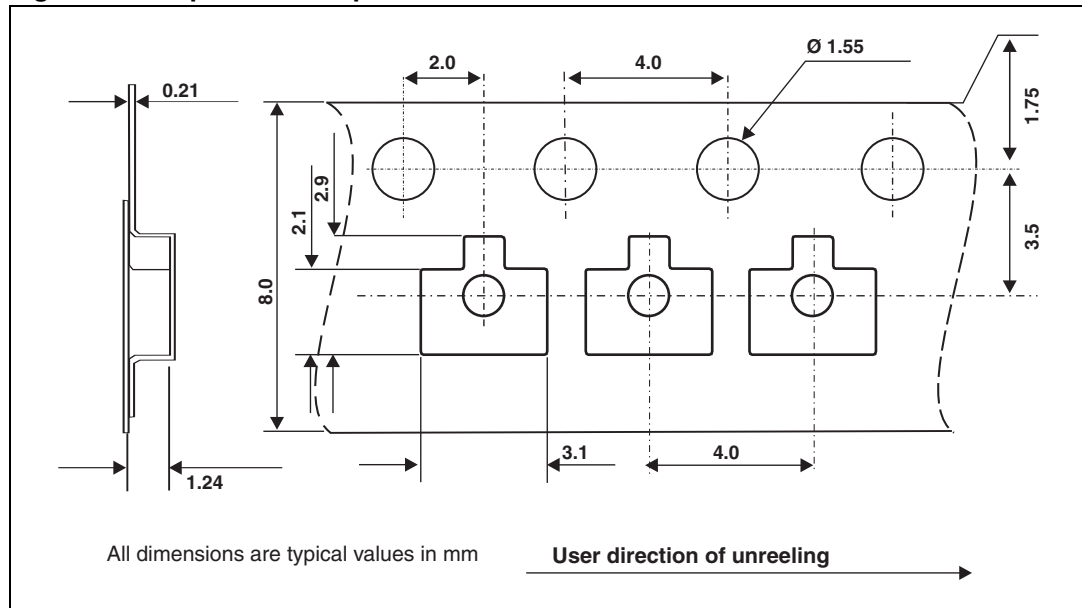


Figure 15. Tape and reel specifications



5 Recommendation on PCB assembly

5.1 Solder paste

1. Use halide-free flux, qualification ROL0 according to ANSI/J-STD-004.
2. "No clean" solder paste recommended.
3. Offers a high tack force to resist component displacement during PCB movement.
4. Use solder paste with fine particles: powder particle size 20-45 μm .

5.2 Placement

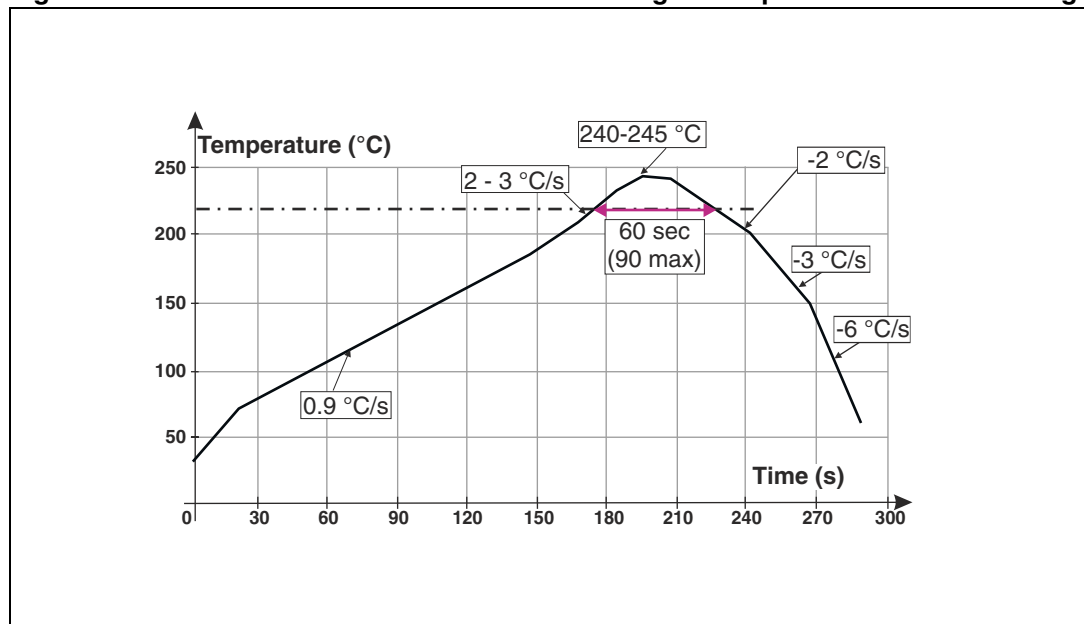
1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering.
3. Standard tolerance of ± 0.05 mm is recommended.
4. 3.5 N placement force is recommended. Too much placement force can lead to squeezed out solder 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.
5. To improve the package placement accuracy, a bottom side optical control should be performed with a high resolution tool.
6. 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.

5.3 PCB design preference

1. To control the solder paste amount, the closed via is recommended instead of open vias.
2. The position of tracks and open vias in the solder area should be well balanced. The symmetrical layout is recommended, in case any tilt phenomena caused by asymmetrical solder paste amount due to the solder flow away.

5.4 Reflow profile

Figure 16. ST ECOPACK® recommended soldering reflow profile for PCB mounting



Note: Minimize air convection currents in the reflow oven to avoid component movement.

6 Ordering information

Table 5. Ordering information

Order codes	Marking ⁽¹⁾	Package	Weight	Base qty	Delivery mode
ESDA5V3SC6Y	ES5Y	SOT23-6L	16.7 mg	3000	Tape and reel
ESDA6V1SC6Y	ES6Y	SOT23-6L			
ESDA14V2SC5Y	EC1Y	SOT23-5L			
ESDA25SC6Y	ES2Y	SOT23-6L			

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

7 Revision history

Table 6. Document revision history

Date	Revision	Changes
04-Sep-2012	1	First issue.

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