

# STS234XXXUXXX

## TVS Diode array ESD suppressor



### Product features

- Protects four I/O lines
- Low clamping voltage
- Low operating voltage
- Low capacitance
- Meets moisture sensitivity level (MSL) 3
- Molding compound flammability rating: UL 94V-0
- Termination finish: Tin

### Applications

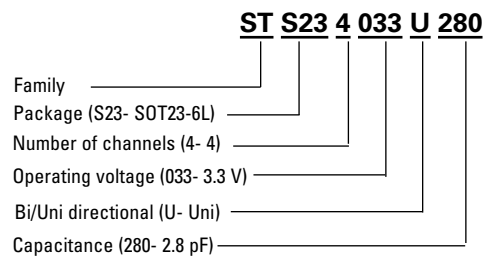
- USB power and data line protection
- Digital video interface (DVI)
- Notebook computers
- Video graphics cards
- Monitors and flat panel displays
- 10/100/1000 ethernet
- SIM ports
- ATM interfaces

### Environmental compliance and general specifications

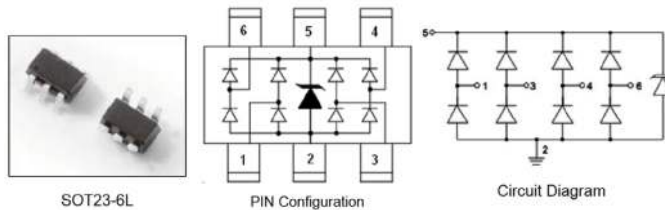
- IEC61000-4-2 (ESD)
  - Up to  $\pm 30$  kV (air)
  - Up to  $\pm 30$  kV (contact)
- IEC61000-4-5 (Lightning) Up to 24 A (8/20  $\mu$ s)



### Ordering part number



### Pin out/functional diagram



### Absolute maximum ratings

(+25 °C, RH=45%-75%, unless otherwise noted)

Parameter	Symbol	Value					Unit
		STS234033U280	STS234050U160	STS234050UL30	STS234050UL65	STS234050U150	
Peak pulse power dissipation on 8/20 μs waveform	$P_{pp}$	500	300	100	100	500	W
Peak pulse current on 8/20 μs waveform	$I_{pp}$	-	-	8	-	-	A
ESD per IEC 61000-4-2 (Air)	$V_{ESD}$	+/-30	+/-30	+/-20	+/-30	+/-30	kV
ESD per IEC 61000-4-2 (Contact)		+/-30	+/-30	+/-20	+/-30	+/-30	
Lead soldering temperature	$T_L$	+260 (10 seconds)	+260 (10 seconds)	+260 (10 seconds)	+260 (10 seconds)	+260 (10 seconds)	°C
Operating junction temperature range	$T_J$	-55 to +125	-55 to +125	-55 to +125	-55 to +125	-55 to +125	°C
Storage temperature range	$T_{STG}$	-55 to +150	-55 to +150	-55 to +150	-55 to +150	-55 to +150	°C

### Electrical characteristics

(+25 °C)

#### STS234033U280

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	pin 5 to pin 2	-	-	3.3	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_r = 1$ mA pin 5 to pin 2	4.0	5.6	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 3.3$ V pin 5 to pin 2	-	-	1	$I_r$ (μA)
Forward voltage	$I_f = 10$ mA	-	0.8	1.2	$V_f$ (V)
Clamping voltage	$I_{pp} = 1$ A, $t_p = 8/20$ μs	-	7	10	$V_c$ (V)
		-	12	16	$V_c$ (V)
		-	14	18	$V_c$ (V)
		-	-	-	$V_c$ (V)
Junction capacitance	$V_{RWM} = 0$ V, $f = 1$ MHz Any I/O pin to Ground	-	2.8	5	$C_j$ (pF)
	$V_{RWM} = 0$ V, $f = 1$ MHz Between I/O pins	-	1.5	2.5	$C_j$ (pF)

#### STS234050U160

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	5.0	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_r = 1$ mA	6.0	-	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 5$ V pin 5 to pin 2	-	-	5	$I_r$ (μA)
Forward voltage	$I_f = 10$ mA	-	1.2	-	$V_f$ (V)
Clamping voltage	$I_{pp} = 15$ A, $t_p = 8/20$ μs	-	22	24.8	$V_c$ (V)
Junction capacitance	$V_{RWM} = 0$ V, $f = 1$ MHz Any I/O pin to Ground	-	3	-	$C_j$ (pF)
	$V_{RWM} = 0$ V, $f = 1$ MHz Between I/O pins	-	1.6	-	$C_j$ (pF)

**STS234050UL30**

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	5.0	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_T = 1$ mA	6.0	-	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 5$ V	-	-	1	$I_R$ ( $\mu$ A)
Forward voltage	$I_T = 10$ mA	-	0.8	1.0	$V_F$ (V)
Clamping voltage	$I_{PP} = 1$ A, $t_D = 8/20$ $\mu$ s	-	9.5	11	$V_C$ (V)
	$I_{PP} = 5$ A, $t_D = 8/20$ $\mu$ s	-	12.5	15	$V_C$ (V)
Junction capacitance	$V_{RWM} = 0$ V, $f = 1$ MHz Any I/O pin to Ground	-	0.65	0.8	$C_J$ (pF)
	$V_{RWM} = 0$ V, $f = 1$ MHz Between I/O pins	-	0.3	0.5	$C_J$ (pF)

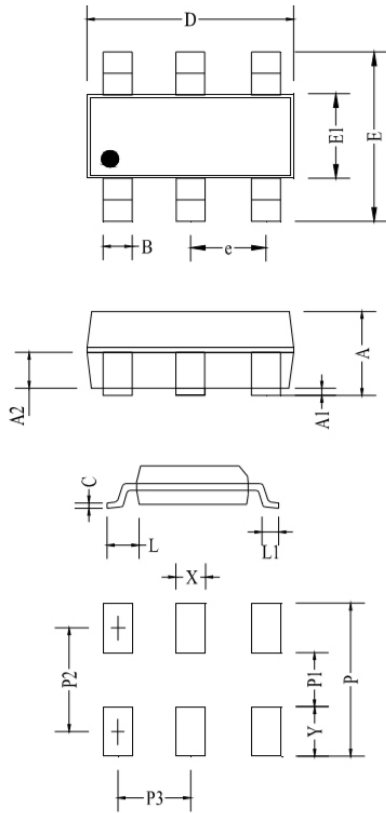
**STS234050UL65**

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	5.0	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_T = 1$ mA	6.0	8.0	10.0	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 5$ V	-	0.01	0.1	$I_R$ ( $\mu$ A)
Forward voltage	$I_T = 10$ mA	-	0.8	1.2	$V_F$ (V)
Clamping voltage	$I_{PP} = 1$ A, $t_D = 8/20$ $\mu$ s	-	9.5	11	$V_C$ (V)
	$I_{PP} = 8$ A, $t_D = 8/20$ $\mu$ s	-	11	13	$V_C$ (V)
Junction capacitance	$V_{RWM} = 0$ V, $f = 1$ MHz Any I/O pin to Ground	-	1.2	1.5	$C_J$ (pF)
	$V_{RWM} = 0$ V, $f = 1$ MHz Between I/O pins	-	0.65	0.75	$C_J$ (pF)

**STS234050U150**

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	pin 5 to pin 2	-	-	5.0	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_T = 1$ mA pin 5 to pin 2	6.0	-	9.0	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 5$ V pin 5 to pin 2	-	-	0.5	$I_R$ ( $\mu$ A)
Forward voltage	$I_T = 10$ mA	-	-	1.2	$V_F$ (V)
Clamping voltage	$I_{PP} = 1$ A, $t_D = 8/20$ $\mu$ s	-	9	10	$V_C$ (V)
	$I_{PP} = 5$ A, $t_D = 8/20$ $\mu$ s	-	10	12	$V_C$ (V)
	$I_{PP} = 24$ A, $t_D = 8/20$ $\mu$ s	-	16	18	$V_C$ (V)
Junction capacitance	$V_{RWM} = 0$ V, $f = 1$ MHz Any I/O pin to Ground	-	3	3.5	$C_J$ (pF)
	$V_{RWM} = 0$ V, $f = 1$ MHz Between I/O pins	-	1.5	2	$C_J$ (pF)

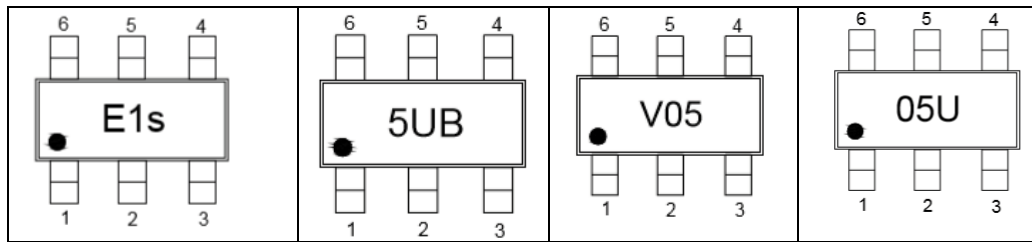
**Mechanical parameters, pad layout- mm/inches**



**Land Pattern**

Dimension	Millimeters		Inches	
	Minimum	Maximum	Minimum	Maximum
A	0.90	1.45	0.035	0.057
A1	0.00	0.15	0.000	0.006
A2	0.45	0.65	0.017	0.026
B	0.35	0.50	0.010	0.020
C	0.08	0.20	0.003	0.007
D	2.80	3.00	0.110	0.122
e	0.69	1.02	0.032	0.043
E1	1.50	1.75	0.060	0.069
E	2.80 BSC		0.110 BSC	
L1	0.35	0.60	0.013	0.024
L	0.60		0.024	
X	0.60		0.024	
Y	1.10		0.043	
P	3.60		0.141	
P1	1.40		0.055	
P2	2.50		0.098	
P3	0.95		0.037	

**Part marking**

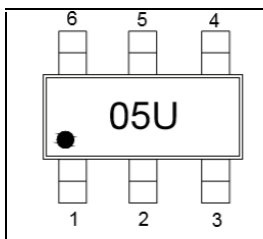


(STS234033U280)

(STS234050U160)

(STS234050UL30)

(STS234050UL65)

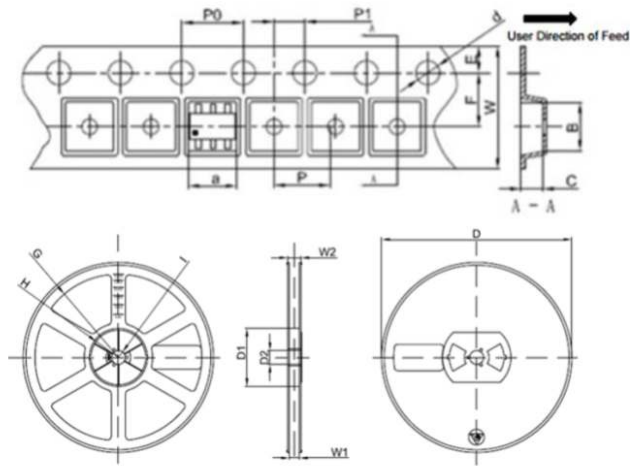


(STS234050U150)

**Packaging information mm/inches**

Drawing not to scale.

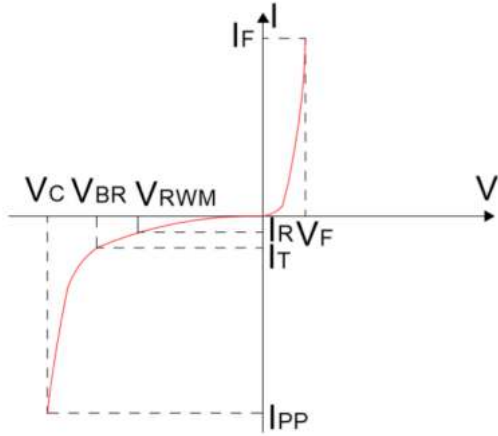
Supplied in tape and reel packaging, 3,000 parts per 7" diameter reel (EIA-481 compliant)



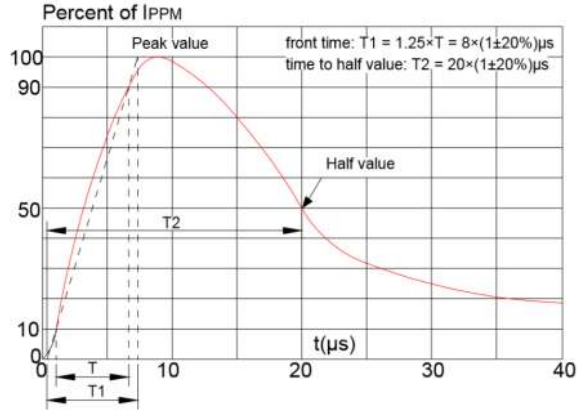
Symbol	Millimeter	Inches
	Typ.	Typ.
a	3.17	0.125
B	3.23	0.127
C	1.37	0.054
d	Φ1.55	Φ0.061
E	1.75	0.069
F	3.50	0.138
P0	4.00	0.157
P	4.00	0.157
P1	2.00	0.079
W	8.00	0.315
D	Φ180	Φ7.087
D1	60.00	2.632
D2	13.00	0.512
G	R78.00	R3.071
H	R25.60	R1.008
I	R6.50	R0.256
W1	9.50	0.374
W2	13.10	0.516

**Ratings and V-I characteristic curves** (+25 °C unless otherwise noted)

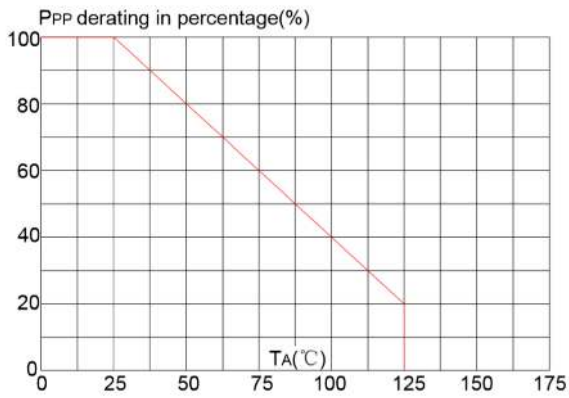
**V- I curve characteristics (Uni-directional)**



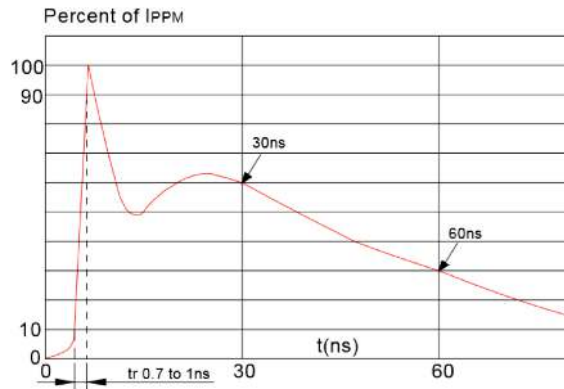
**Pulse waveform (8/20  $\mu$ s)**



**Pulse derating curve**



**ESD waveform**



Solder reflow profile

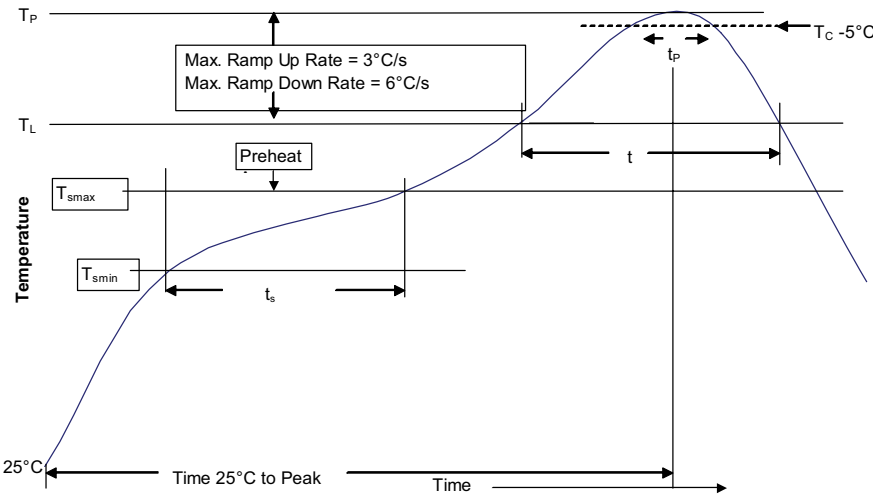


Table 1 - Standard SnPb solder ( $T_C$ )

Package thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2 - Lead (Pb) free solder ( $T_C$ )

Package thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350 - 2000	Volume mm <sup>3</sup> >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 – 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

Reference J-STD-020

Profile feature	Standard SnPb solder	Lead (Pb) free solder
Preheat and soak		
• Temperature min. ( $T_{smin}$ )	100 °C	150 °C
• Temperature max. ( $T_{smax}$ )	150 °C	200 °C
• Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds	60-120 seconds
Ramp up rate $T_L$ to $T_p$	3 °C/ second max.	3 °C/ second max.
Liquidous temperature ( $T_L$ )	183 °C	217 °C
Time ( $t_L$ ) maintained above $T_L$	60-150 seconds	60-150 seconds
Peak package body temperature ( $T_p$ )*	Table 1	Table 2
Time ( $t_p$ )* within 5 °C of the specified classification temperature ( $T_C$ )	20 seconds*	30 seconds*
Ramp-down rate ( $T_p$ to $T_L$ )	6 °C/ second max.	6 °C/ second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

\* Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

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