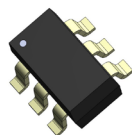


STS234XXXUXXX

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

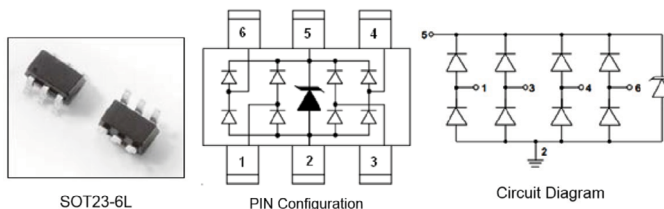
- IEC61000-4-2 (ESD)
 - Up to ± 30 kV (air)
 - Up to ± 30 kV (contact)
- IEC61000-4-5 (Lightning) Up to 24 A (8/20 μ s)



Ordering part number

	ST	S23	4	033	U	280
Family	_____	_____	_____	_____	_____	_____
Package (S23- SOT23-6L)	_____	_____	_____	_____	_____	_____
Number of channels (4- 4)	_____	_____	_____	_____	_____	_____
Operating voltage (033- 3.3 V)	_____	_____	_____	_____	_____	_____
Bi/Uni directional (U- Uni)	_____	_____	_____	_____	_____	_____
Capacitance (280- 2.8 pF)	_____	_____	_____	_____	_____	_____

Pin out/functional diagram



Absolute maximum ratings

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

Parameter	Symbol	Value	STS234033U280	STS234050U160	STS234050UL30	STS234050UL65	STS234050U150	Unit
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)
	$I_{PP} = 15$ A, $t_p = 8/20$ μs	-	12	16	V_c (V)
	$I_{PP} = 24$ A, $t_p = 8/20$ μs	-	14	18	V_c (V)
	$t_p = 8/20$ μs				
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 (μ A)
Forward voltage	$I_T = 10$ mA	-	0.8	1.0	V_F (V)
Clamping voltage	$I_{PP} = 1$ A, $t_p = 8/20$ μ s	-	9.5	11	V_C (V)
	$I_{PP} = 5$ A, $t_p = 8/20$ μ 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)

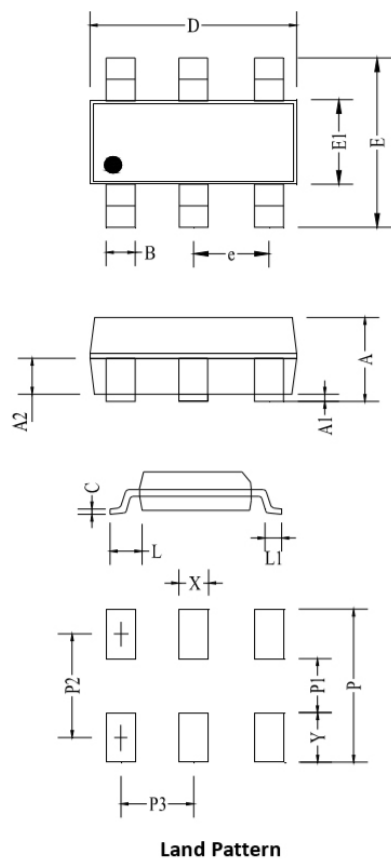
STS234050UL65

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 (μ A)
Forward voltage	$I_T = 10$ mA	-	0.8	1.2	V_F (V)
Clamping voltage	$I_{PP} = 1$ A, $t_p = 8/20$ μ s	-	9.5	11	V_C (V)
	$I_{PP} = 8$ A, $t_p = 8/20$ μ 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

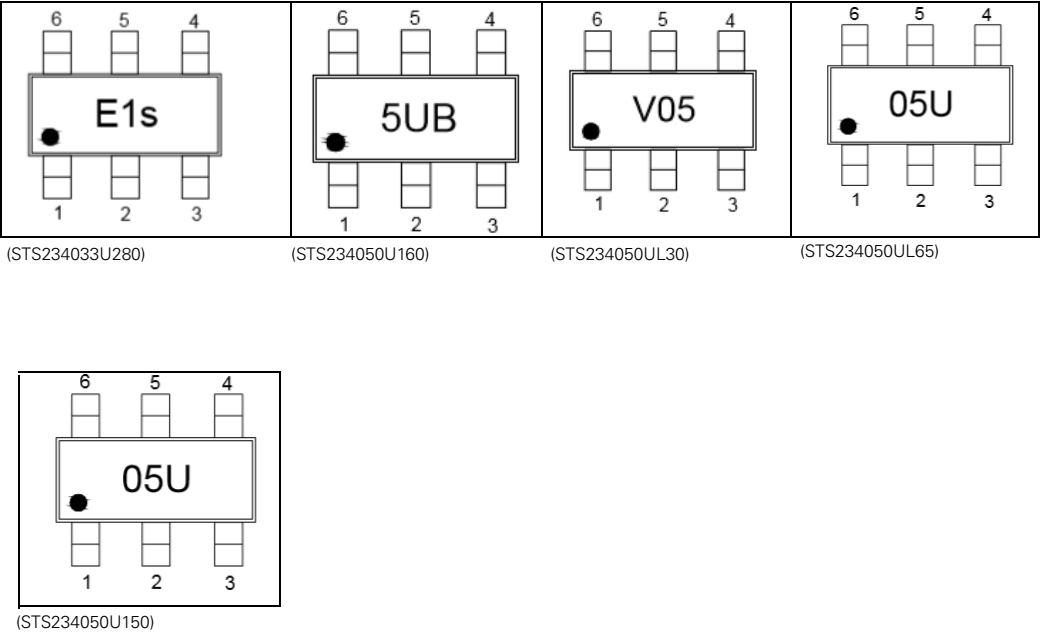
Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	pin 5 to pin 2	-	-	5.0	V_{RWM} (V)
Reverse breakdown voltage	$I_T = 1$ mA pin 5 to pin 2	6.0	-	9.0	V_{BR} (V)
Reverse leakage current	$V_{RWM} = 5$ V pin 5 to pin 2	-	-	0.5	I_R (μ A)
Forward voltage	$I_T = 10$ mA	-	-	1.2	V_F (V)
Clamping voltage	$I_{PP} = 1$ A, $t_p = 8/20$ μ s	-	9	10	V_C (V)
	$I_{PP} = 5$ A, $t_p = 8/20$ μ s	-	10	12	V_C (V)
	$I_{PP} = 24$ A, $t_p = 8/20$ μ 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



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	

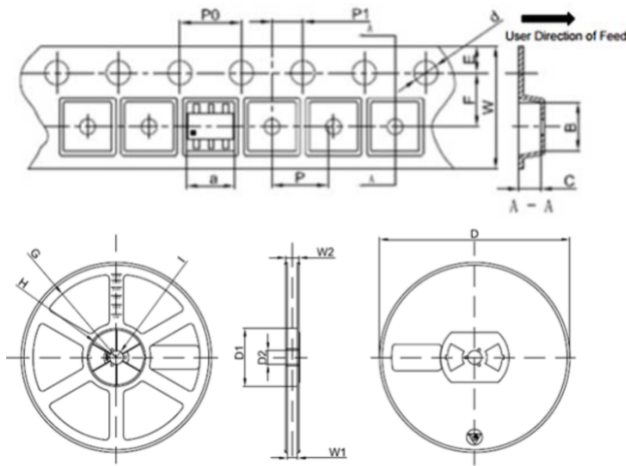
Part marking



Packaging information mm/inches

Drawing not to scale.

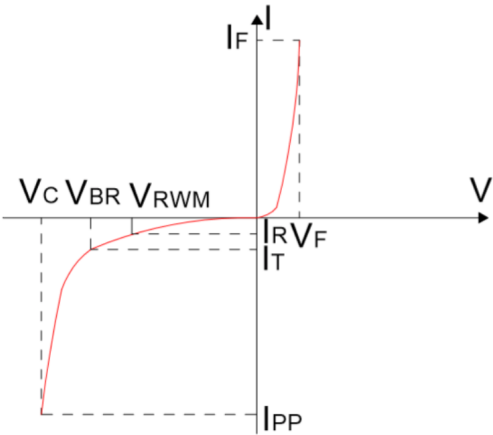
Supplied in tape and reel packaging, 3,000 parts per 7" diameter reel (EIA-481 compliant)



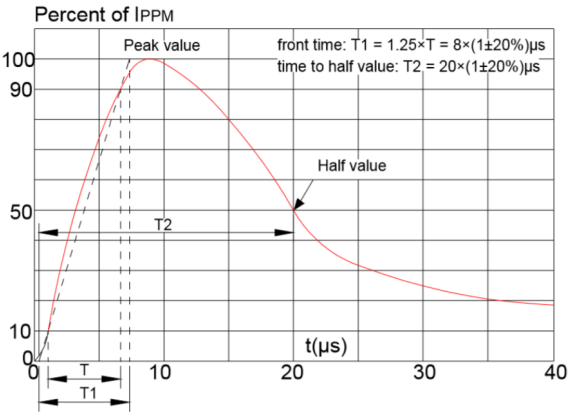
Symbol	Millimeter	Inches
	Typ.	Typ.
a	3.17	0.125
B	3.23	0.127
C	1.37	0.054
d	Φ1.55	Φ0.061
E	1.75	0.069
F	3.50	0.138
P0	4.00	0.157
P	4.00	0.157
P1	2.00	0.079
W	8.00	0.315
D	Φ180	Φ7.087
D1	60.00	2.632
D2	13.00	0.512
G	R78.00	R3.071
H	R25.60	R1.008
I	R6.50	R0.256
W1	9.50	0.374
W2	13.10	0.516

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

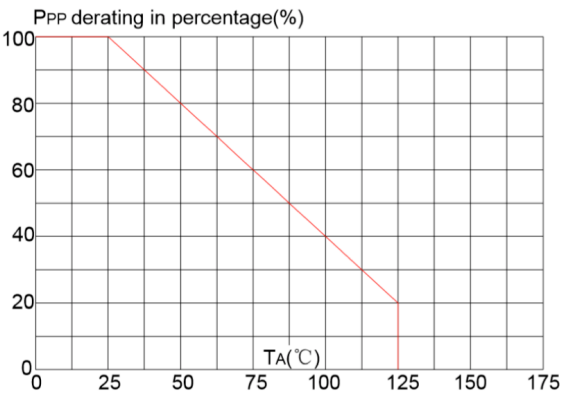
V- I curve characteristics (Uni-directional)



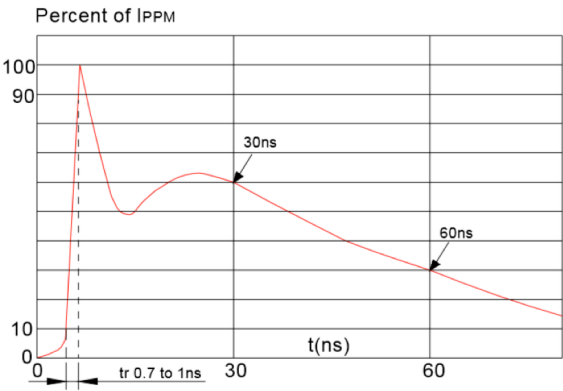
Pulse waveform (8/20 μ s)



Pulse derating curve



ESD waveform



Solder reflow profile

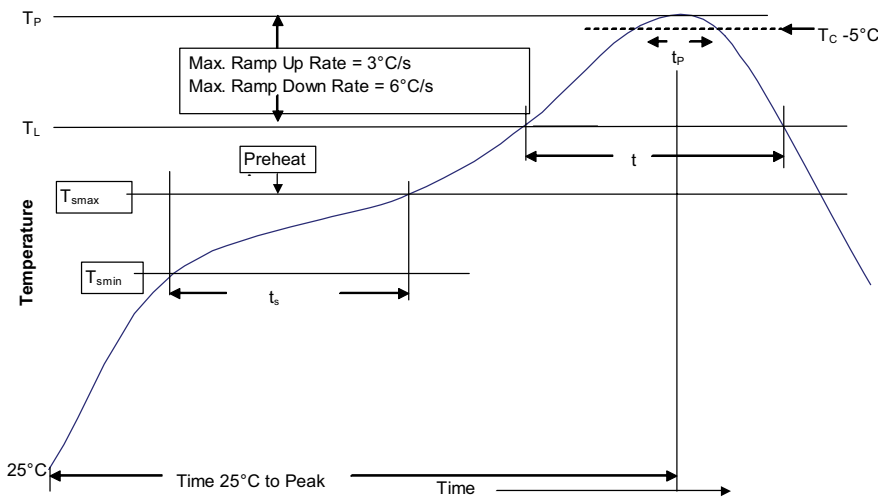


Table 1 - Standard SnPb solder (T_C)

Package thickness	Volume mm ³ <350	Volume mm ³ ≥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 ³ <350	Volume mm ³ 350 - 2000	Volume mm ³ >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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Printed in USA
Publication No. 11149
April 2022

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