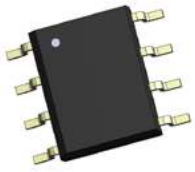
STSP84XXXXXX

TVS Diode array ESD suppressor



Applications

- WAN/LAN equipment
- Desktops, serves, notebooks & handhelds
- Switching systems
- Audio/video inputs
- 10/100/1000 ethernet
- Base stations

Product features

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

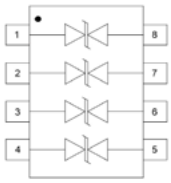
Environmental compliance and general specifications

- IEC61000-4-2 (ESD)
  - Up to ±30 kV (air)
  - Up to ±30 kV (contact)
- IEC61000-4-5 (Lightning) Up to 50 A (8/20 µs)

Pin out/functional diagram

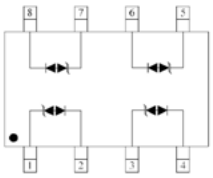
SOP-8

STSP84150B601



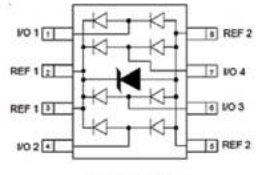
Pin Configuration(Top view)

STSP84028U120
STSP84028UL65

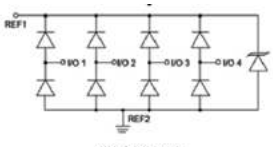


PIN Configuration

STSP84033U800
STSP84050U800



Pin configuration



Circuit diagram

Ordering part number

ST SP8 4 028 U 120

- Family
- Package (SP8 = SOP-8)
- Number of channels (4-4)
- Operating voltage (028 = 2.8 V)
- Bi/Uni directional (U = uni)
- Capacitance (120 = 1.2 pF)

Powering Business Worldwide

Absolute maximum ratings

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

Parameter	Symbol	Value					Unit
		STSP84028 U120	STSP84028 UL65	STSP84033 U800	STSP84050 U800	STSP84150 B601	
Peak pulse power dissipation on 8/20 µs waveform	P_{pp}	1000	600	500	500	300	W
ESD per IEC 61000-4-2 (Air)	V_{ESD}	+/-30	+/-30	+/-15	+/-15	+/-15	kV
ESD per IEC 61000-4-2 (Contact)		+/-30	+/-30	+/-8	+/-8	+/-8	
Lead soldering temperature	T_L	+260 (10 seconds)					°C
Operating junction temperature range	T_J	-55 to +125					°C
Storage temperature range	T_{STG}	-55 to +150					°C

Electrical characteristics

(+25 °C)

STSP84028U120

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	2.8	V_{RWM} (V)
Holding voltage	I_h =10 mA	3.0	-	-	V_h
Reverse leakage current	V_{RWM} = 2.8 V	-	-	1	I_R (µA)
Clamping voltage	I_{pp} = 2 A, t_p = 8/20 µs	-	-	5.5	V_C (V)
	I_{pp} = 10 A, t_p = 8/20 µs	-	-	10	V_C (V)
	I_{pp} = 50 A, t_p = 8/20 µs	-	-	18	V_C (V)
Junction capacitance	V_{RWM} = 0V, f = 1 MHz	-	1.2	2.0	C_J (pF)

STSP84028UL65

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	2.8	V_{RWM} (V)
Reverse breakdown voltage	I_T =1 mA	3.0	-	-	V_{BR} (V)
Reverse leakage current	V_{RWM} = 2.8 V	-	0.01	0.1	I_R (µA)
Clamping voltage	I_{pp} = 2 A, t_p = 8/20 µs	-	-	7.6	V_C (V)
	I_{pp} = 20 A, t_p = 8/20 µs	-	14	20	V_C (V)
Junction capacitance	V_{RWM} = 0V, f = 1 MHz	-	0.65	1	C_J (pF)

STSP84033U800

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	3.3	V_{RWM} (V)
Reverse leakage current	V_{RWM} = 3.3 V	-	-	1	I_R (µA)
Punch-through voltage	I_{PT} = 2 µA	3.5	-	-	V_{PT} (V)
Snapback voltage	I_{SB} = 50 mA	2.8	-	-	V_{SB} (V)
Clamping voltage	I_{pp} = 1 A, t_p = 8/20 µs	-	-	5.3	V_C (V)
	I_{pp} = 10 A, t_p = 8/20 µs	-	-	10	V_C (V)
	I_{pp} = 25 A, t_p = 8/20 µs			15	V_C (V)
Junction capacitance	V_{RWM} = 0V, f = 1 MHz	-	8	15	C_J (pF)
	V_{RWM} = 0V, f = 1 MHz; Between I/O pins and GND	-	4	-	C_J (pF)

STSP84050U800

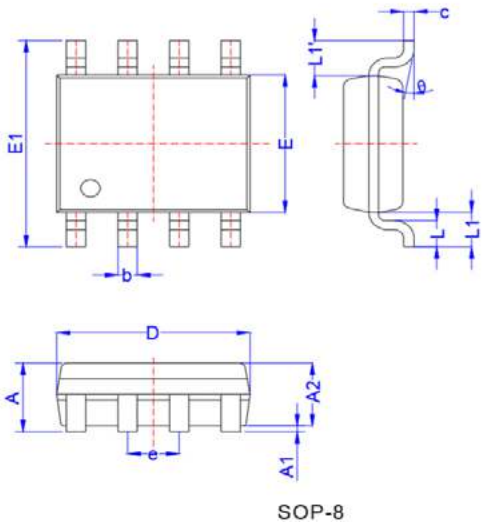
Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	5	V_{RWM} (V)
Reverse breakdown voltage	I_T =1 mA	6	-	-	V_{BR} (V)
Reverse leakage current	V_{RWM} = 5 V	-	-	10	I_R (µA)
Clamping voltage	I_{pp} = 1 A, t_p = 8/20 µs	-	-	9.8	V_C (V)
	I_{pp} = 10 A, t_p = 8/20 µs	-	-	12	V_C (V)
	I_{pp} = 25 A, t_p = 8/20 µs	-	-	20	V_C (V)
Junction capacitance	V_{RWM} = 0V, f = 1 MHz	-	8	15	C_J (pF)
	V_{RWM} = 0V, f = 1 MHz; Between I/O pins and GND	-	4	-	C_J (pF)

STSP84150B601

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	15	V_{RWM} (V)
Reverse breakdown voltage	I_T =1 mA	16.5	-	-	V_{BR} (V)
Reverse leakage current	V_{RWM} = 15 V	-	-	1	I_R (µA)
Peak pulse current	t_p = 8/20 µs	-	-	12	I_{PP} (A)
Clamping voltage	I_{pp} = 1 A, t_p = 8/20 µs	-	-	24	V_C (V)
	I_{pp} = 12 A, t_p = 8/20 µs	-	-	30	V_C (V)
Junction capacitance	V_{RWM} = 0V, f = 1 MHz	-	-	60	C_J (pF)

Mechanical parameters, pad layout- mm/inches

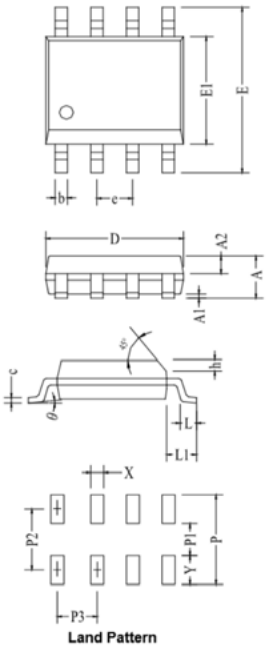
STSP84033U800, STSP84050U800& STSP84150B601



SOP-8

	Millimeters			Inches		
Dimension	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**
A	1.40		1.70	0.055		0.067
A1	0.05		0.15	0.002		0.006
A2	1.35		1.55	0.053		0.061
b	0.31		0.51	0.012		0.020
c	0.17		0.25	0.007		0.010
D	4.70		5.10	0.185		0.201
E	3.80		4.00	0.150		0.157
E1	5.80		6.20	0.228		0.244
e	1.14	1.27	1.40	0.045	0.050	0.055
L	0.62		0.77	0.024		0.030
L1	1.00	1.02	1.04	0.039	0.040	0.041
L1-L1'			0.12			0.005
θ	0 °		8 °	0 °		8 °

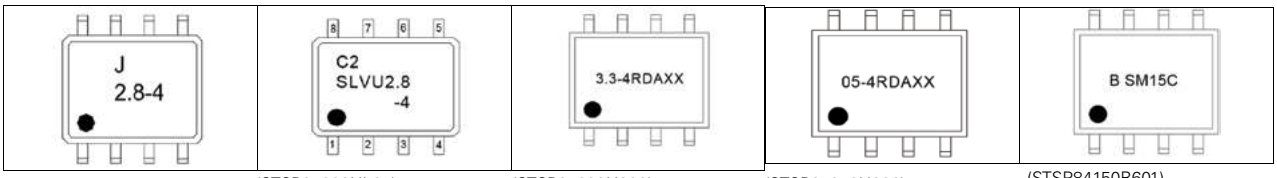
STSP84028U120&STSP84028UL65



Land Pattern

	Millimeters		Inches	
Dimension	**Min.**	**Max.**	**Min.**	**Max.**
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	0.67	0.77	0.026	0.030
b	0.33	0.51	0.013	0.020
c	0.17	0.25	0.007	0.010
D	4.70	5.10	0.185	0.201
e	1.27 BSC		0.05 BSC	
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
h	0.25	0.50	0.010	0.020
θ	0 °	8 °	0 °	8 °
L	0.40	1.27	0.016	0.050
L1	1.04 BSC		0.041 BSC	
X	0.60		0.24	
Y	2.20		0.037	
P	7.40		0.291	
P1	3.00		0.118	
P2	5.20		0.205	
P3	1.27		0.050	

Part marking

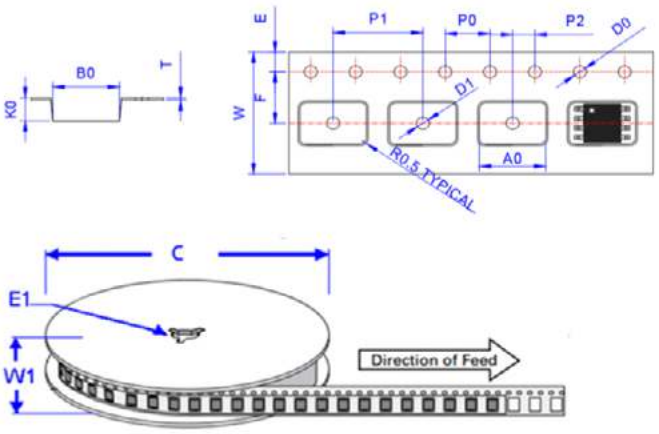


(STSP84028U120) (STSP84028UL65) (STSP84033U800) (STSP84050U800) (STSP84150B601)

Packaging information mm/inches

Drawing not to scale.

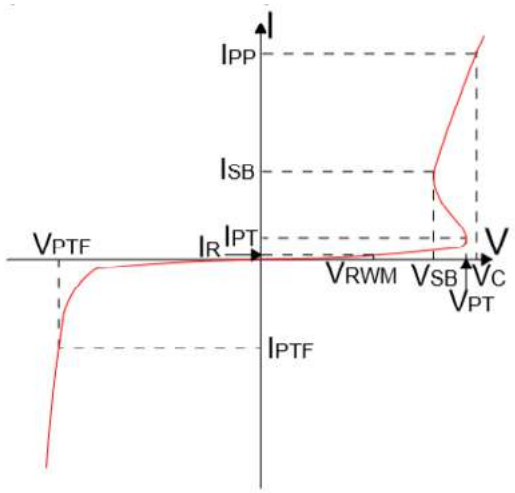
Supplied in tape and reel packaging, 2,500 parts per 7" diameter reel (EIA-481 compliant)



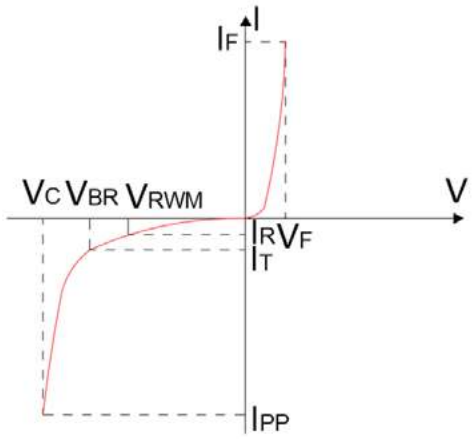
Ref.	Dimensions	
	Millimeters	Inches
A0	6.6±0.10	0.260 ± 0.004
B0	5.3±0.10	0.209 ± 0.004
C	330	13.0
D0	1.50±0.10	0.059 + 0.004
D1	1.50±0.10	0.059 + 0.004
E1	13.3±0.3	0.524± 0.012
E	1.75±0.1	0.069± 0.004
F	5.5±0.05	0.217 ± 0.002
K0	2.1±0.1	0.083 ± 0.004
P0	4.0±0.1	0.157± 0.004
P1	8.0±0.1	0.315± 0.004
P2	2.0±0.05	0.079 ± 0.002
T	0.24±0.1	0.009 ± 0.002
W	12.0±0.3	0.472 ± 0.012
W1	15.7±2.0	0.618 ± 0.079

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

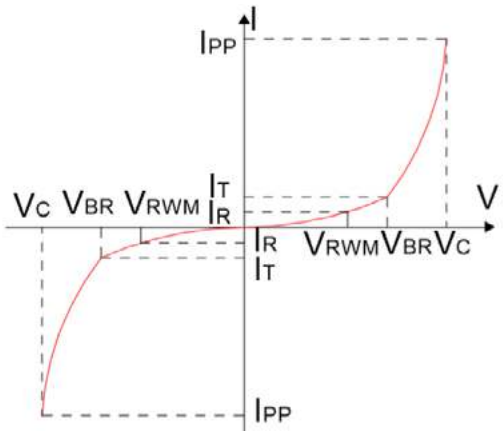
V- I curve characteristics (Uni-directional)
STSP84028U120, STSP84028UL65, STSP84033U800



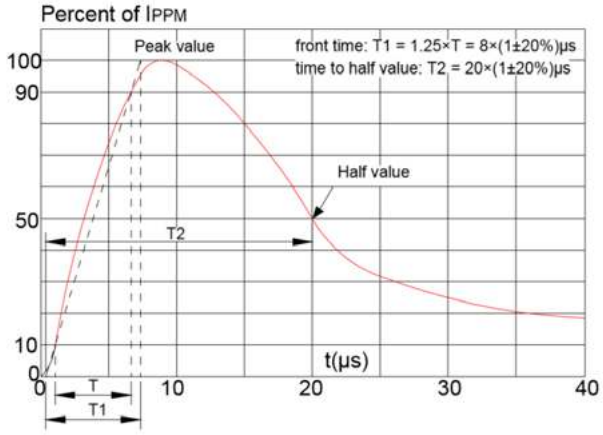
V- I curve characteristics (Uni-directional)
STSP84050U800



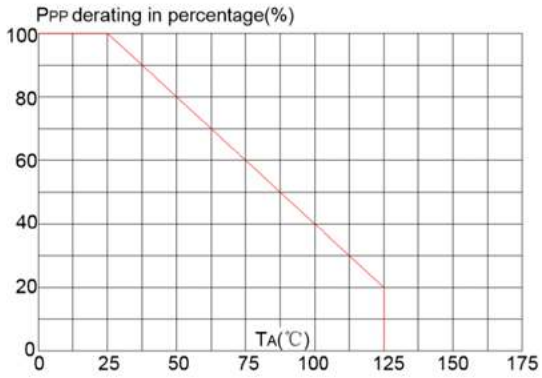
V- I curve characteristics (Bi-directional)
STSP84150B601



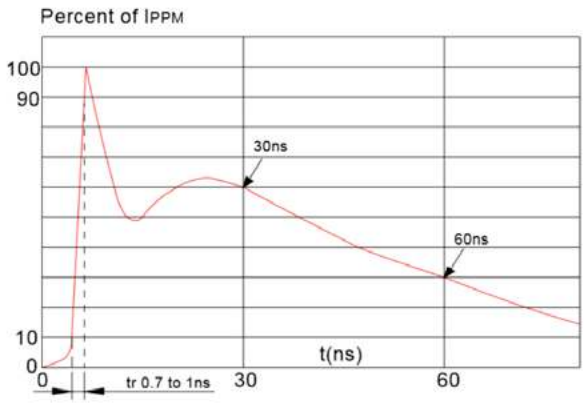
Pulse waveform (8/20 µs)



Pulse derating curve



ESD waveform

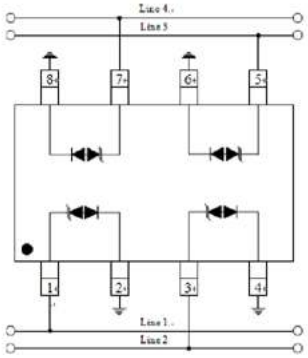


Application information

STSP84028U120 can be configured in different connections to meet the requirement of common-mode and differential-mode as shown in the diagrams below.

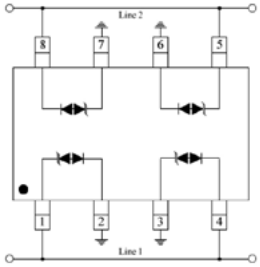
Four line uni-directional common-mode protection

Pin 1 is connected to Line 1
Pin 3 is connected to Line 2
Pin 5 is connected to Line 3
Pin 7 is connected to Line 4
Pin 2, 4, 6 and 8 are connected to ground



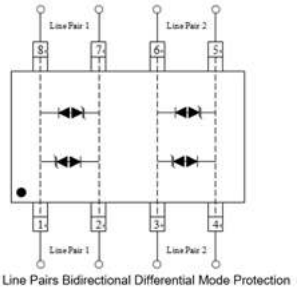
Two Line bi-directional common-mode protection

Pin 1 & 4 is connected to Line 1
Pin 5 & 8 is connected to Line 2
Pin 2, 3, 6 and 7 are connected to ground



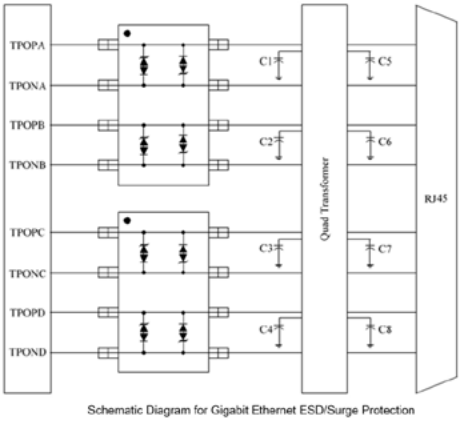
Two line pairs bi-directional differential-mode protection

Pin 1, 2, 7 and 8 are connected to Line
Pin 1 Pair 3, 4, 5 and 6 are connected to Line Pair 2



Two Line Pairs Bidirectional Differential Mode Protection

Gigabit ethernet ESD/surge protection



Schematic Diagram for Gigabit Ethernet ESD/Surge Protection

Solder reflow profile

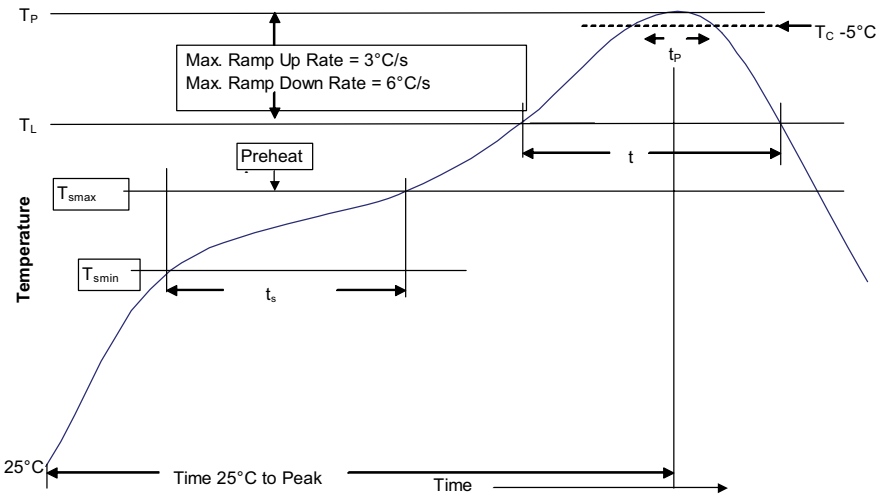


Table 1 - Standard SnPb solder (T_C)

Package thickness	Volume mm3 <350	Volume mm3 ≥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 mm³ <350	Volume mm³ 350 - 2000	Volume mm³ >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) Time (t_L) maintained above T_L		183 °C 60-150 seconds	217 °C 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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