Littelfuse Technologies: Power Thyristors • Protection Arrays • Fuses • PTCs • Varistors • TVS Diodes • GDTs • ESD Suppressors • SIDACtor Devices

SPLV2.8 and SPLV2.8-4 Series SPA™ Silicon Protection Array

New Product Introduction

April 2010

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SEMCOR

SPLV2.8 (-4) SPA™ Series
What is it/What does it do?

CIRCUIT
PROTECTION
SOLUTIONS

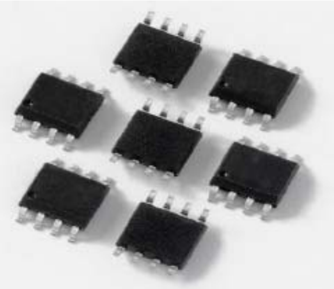
SPA (Silicon Protection Array), commonly called Diode Arrays, are a family of discrete diodes and diode arrays designed to protect sensitive electronic equipment against destructive electrostatic discharges (ESD) and lightning induced surge currents.

Why use this product? The SPLV2.8 and SPLV2.8-4 devices offer robust surge and enhanced ESD protection for sensitive Ethernet chipsets.

Features:	**Benefits:**
-ESD, IEC61000-4-2, ±30kV contact, ±30kV air	-Enhanced ESD protection far exceeding the highest level of the IEC61000-4-2 standard (±8kV)
-Lightning, IEC61000-4-5, 24A (8/20 μs)	-High level lightning protection to help comply with regulatory standards
-Low capacitance of 3.8pF (TYP) per I/O	-Low capacitance minimizes signal degradation
-Extremely low dynamic resistance of approximately 0.3Ω	-Low turn-on voltage and dynamic resistance offers very low clamping voltages

SPLV2.8

SPLV2.8-4



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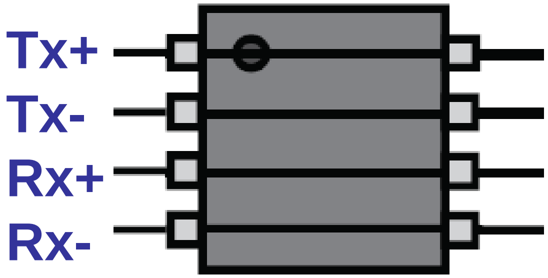
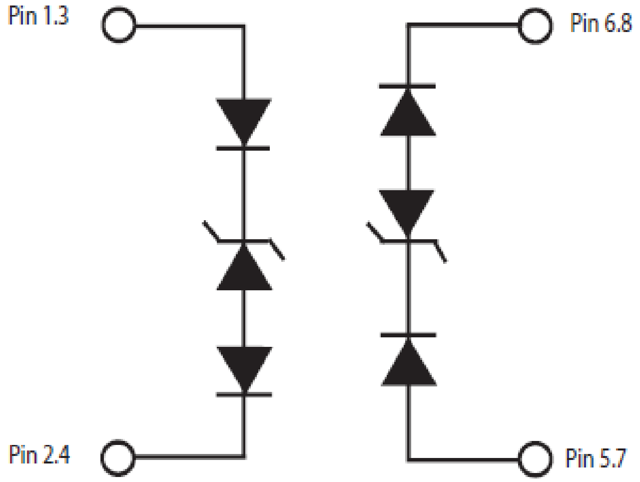
SPLV2.8 (-4) SPA™ Series
How it Works

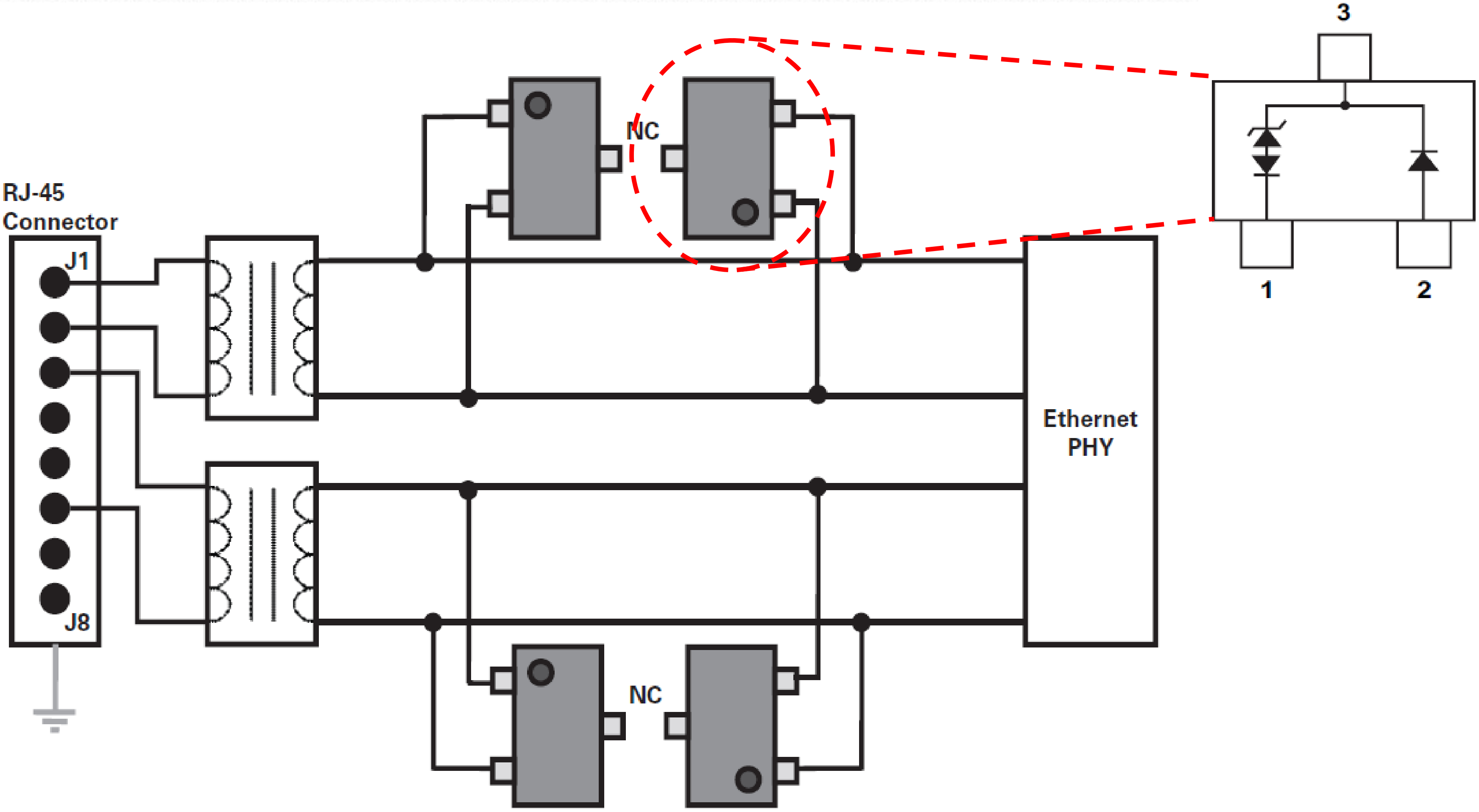
- The SPLV2.8 and SPLV2.8-4 can be placed in area of the circuit that may see lightning induced surges or ESD.
- The device's inputs should be tied between the differential signal lines (Tx±, Rx±).
- During a positive or negative transient event (relative between two lines), the steering diode will conduct or steer the current into the TVS diode and into the other line.



SPLV2.8-4BTG



SPLV2.8 SPA™ Series Application Example



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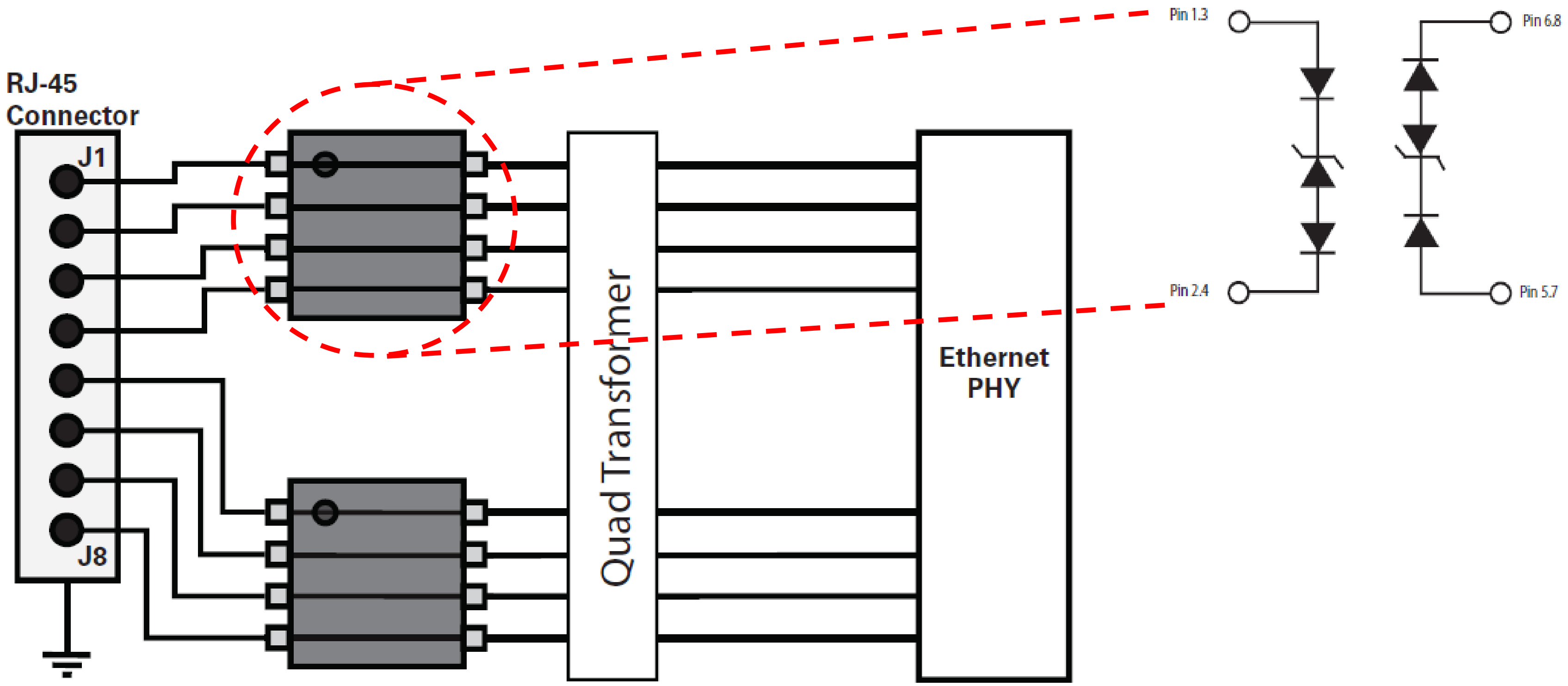
SPLV2.8-4 SPA™ Series
Application Example



Note: Depending upon what protection level is required by the end user, the SPLV2.8-4 may be situated on the driver side of the transformer (i.e. in front of the PHY).

SPLV2.8 SPA™ Series Product Brief

CIRCUIT
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- Family
  - SPA™ Silicon Protection Array Product
  - Series: SPLV2.8
- Part Numbering
  - See part number slide
- Package
  - SOT23-3
  - Surface Mount
- Series Ratings
  - I_{PP}: 24A 8/20µs
  - V_{ESD}: per IEC61000-4-2
    - ±30kV (IEC61000-4-2) Contact Discharge
    - ±30kV (IEC61000-4-2) Air Discharge

- Product is: HF RoHS Pb GREEN
- Minimum order qty: 3000
- Packaging
  - Tape & Reel standard
  - Reel quantity 3000

SPLV2.8-4 SPA™ Series Product Brief

- Family
  - SPA™ Silicon Protection Array Product
  - Series: SPLV2.8-4
- Part Numbering
  - See part number slide
- Package
  - SOIC-8
  - Surface Mount
- Series Ratings
  - I_{PP}: 24A 8/20µs
  - V_{ESD}: per IEC61000-4-2
    - ±30kV (IEC61000-4-2) Contact Discharge
    - ±30kV (IEC61000-4-2) Air Discharge

- Product is: **HF** RoHS Pb GREEN
- Minimum order qty: 2500
- Packaging
  - Tape & Reel standard
  - Reel quantity 2500

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SPLV2.8 SPA™ Series
Ratings and Characteristics

Absolute Maximum Ratings

Parameter	Rating	Units
Peak Pulse Power (t_p=8/20μs)	400	W
Peak Pulse Current (t_p=8/20μs)	24	A
Operating Temperature	-40 to 85	°C
Storage Temperature	-60 to 150	°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics (T_{OP} = 25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1μA			2.8	V
Reverse Breakdown Voltage	V_{BR}	I_T=2μA	3.0			V
Snap Back Voltage	V_{SB}	I_T=50mA	2.8			V
Reverse Leakage Current	I_{LEAK}	V_R=2.8V (Pin 2 or 3 to 1)			1	μA
Clamping Voltage[1]	V_C	I_{PP}=5A, t_p=8/20μs (Pin 3 to 1)		5.7	7.0	V
Clamping Voltage[1]		I_{PP}=24A, t_p=8/20μs (Pin 3 to 1)		8.3	12.5	V
Clamping Voltage[1]		I_{PP}=5A, t_p=8/20μs (Pin 2 to 1)		7.0	8.5	V
Clamping Voltage[1]		I_{PP}=24A, t_p=8/20μs (Pin 2 to 1)		12.5	15.0	V
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact)	±30			kV
		IEC61000-4-2 (Air)	±30			kV
Diode Capacitance[1]	C_D	V_R=0V, f=1MHz (Pin 2 to 1)		3.8	5	pF

NOTES:

[1] Parameter is guaranteed by design and/or device characterization.

SPLV2.8-4 SPA™ Series Ratings and Characteristics

Absolute Maximum Ratings

Parameter	Rating	Units
Peak Pulse Power (t_p=8/20µs)	400	W
Peak Pulse Current (t_p=8/20µs)	24	A
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Storage Temperature	-60 to 150	ºC

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Reverse Breakdown Voltage	V_{BR}	I_T=2µA	3.0			V
Snap Back Voltage	V_{SB}	I_T=50mA	2.8			V
Reverse Leakage Current	I_{LEAK}	V_R=2.8V (Each Line)			1	µA
Clamping Voltage[1]	V_C	I_{PP}=5A, t_p=8/20µs (Each Line)		6.8	8.5	V
Clamping Voltage[1]	V_C	I_{PP}=24A, t_p=8/20µs (Each Line)		12.5	15.0	V
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact)	±30			kV
		IEC61000-4-2 (Air)	±30			kV
Diode Capacitance[1]	C_D	V_R=0V, f=1MHz (Each Line)		3.8	5	pF

NOTES:

[1] Parameter is guaranteed by design and/or device characterization.

SPLV2.8 SPA™ Series
Part Number & Part Marking

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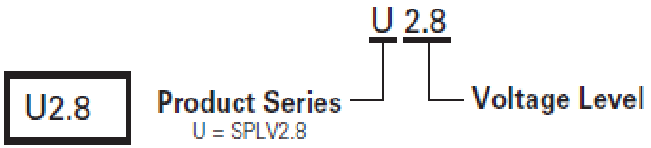
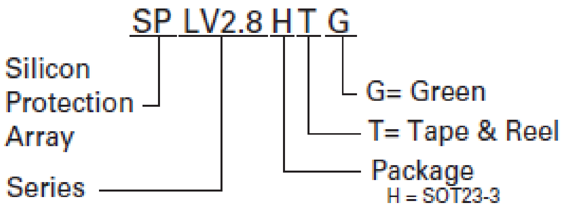
Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SPLV2.8HTG	SOT23-3	U2.8	3000

Part Marking System



Part Numbering System



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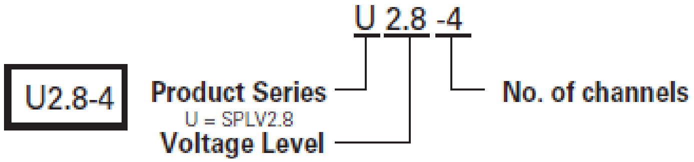
SPLV2.8-4 SPA™ Series
Part Number & Part Marking

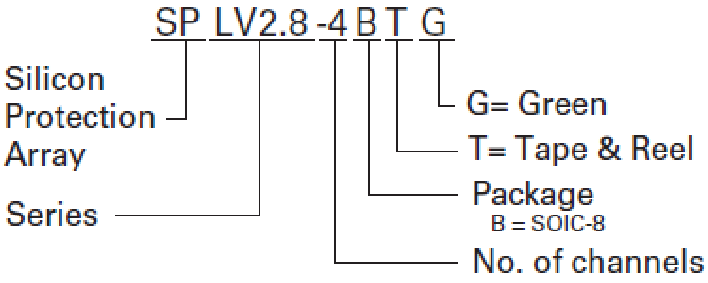
Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SPLV2.8-4BTG	SOIC-8	U2.8-4	2500

Part Marking System



Part Numbering System



SPLV2.8 SPA™ Series Mechanical Footprint

CIRCUIT
PROTECTION
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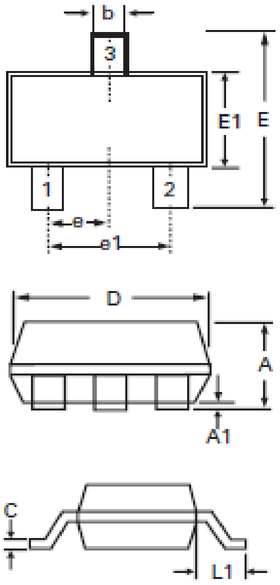
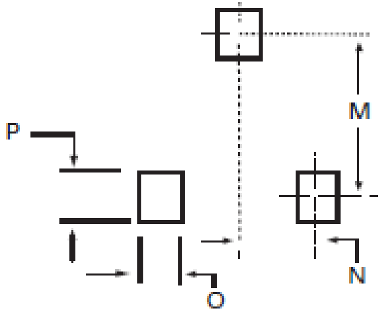
Package Dimensions - SOT-23



Recommended Pad Layout



Package	SOT23-3			
Pins	3			
JEDEC	TO-236			
	Millimetres		Inches	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A1	0.01	0.1	0.0004	0.004
b	0.3	0.5	0.012	0.020
c	0.08	0.2	0.003	0.008
D	2.8	3.04	0.110	0.120
E	2.1	2.64	0.083	0.104
E1	1.2	1.4	0.047	0.055
e	0.95 BSC		0.038 BSC	
e1	1.90 BSC		0.075 BSC	
L1	0.54 REF		0.021 REF	
M		2.29		.90
N		0.95		0.038
O		0.78		0.30 TYP
P		0.78		0.30 TYP

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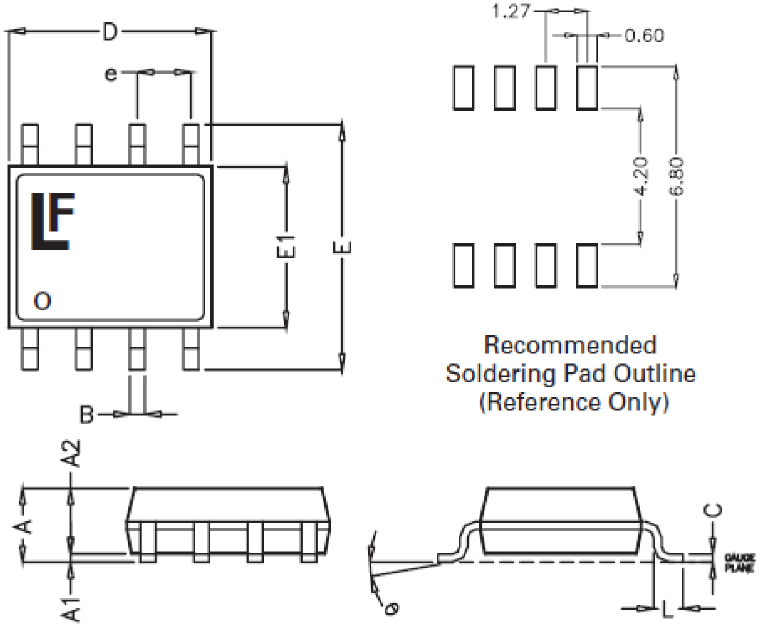
SPLV2.8-4 SPA™ Series Mechanical Footprint

Package Dimensions - Mechanical Drawings and Recommended Solder Pad Outline



Recommended
Soldering Pad Outline
(Reference Only)

Package	MS-012 (SO-8)			
Pins	8			
JEDEC	MO-223 Issue A			
	Millimetres		Inches	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.050	0.065
B	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.40	1.27	0.016	0.050

SPLV2.8 (-4) SPA™ Series
Who are the Competitors?

Competitor	Part #	Package	Channels	ESD Level	V_{CLAMP}	I_{PP} MAX	I/O Cap (1MHz)		Littelfuse Cross Reference	
				-4-2 Contact	*8/20 µs*	*8/20 µs*	*TYP*	*MAX*	*Direct*	*Functional*
Semtech	SLVU2.8	SOT23-3	1	± 8kV	15V @ 24A (MAX)	24A	5pF		SPLV2.8HTG	
Semtech	SLVU2.8-4	SOIC-8	4, (2 diff)	± 15kV	15V @ 24A (MAX)	24A	5pF		SPLV2.8-4BTG	
ST Micro	SLVU2.8-4A1	SOIC-8	4, (2 diff)	± 8kV	15V @ 24A (MAX)	30A	1.5pF		SPLV2.8-4BTG	
Bourns	CDSOT23-SLVU2.8	SOT23-3	1	± 30kV	21V @ 30A (MAX)	30A	2.5pF	3pF	SPLV2.8HTG	
Bourns	CDNBS08-SLVU2.8-4	SOIC-8	4, (2 diff)	± 8kV	21V @ 30A (MAX)	30A	6pF		SPLV2.8-4BTG	
Protek	SLVU2.8-4	SOIC-8	4, (2 diff)	± 30kV	15V @ 24A (MAX)	30A	3pF		SPLV2.8-4BTG	
Protek	SLVU2.8	SOT23-3	1	± 30kV	21V @ 30A (MAX)	30A	2.5pF		SPLV2.8HTG	

- Littelfuse Advantages
  - Enhanced ESD capability (±30kV, MIN)
  - Low clamping (12.5V @ 24A, TYP)
- A complete listing of cross references are available at www.littelfuse.com or www.littelfusebusinesscenter.com

SPLV2.8 (-4) SPA™ Series Applications

Typical Applications

- Any Ethernet Interface Port
- Routers
- Switches
- Optical Switches
- GPON’s
- Repeaters
- Converters
- NIC’s
- Base Station Controllers

Circuits to be Protected

- 10/100 Ethernet
- 1Gb Ethernet