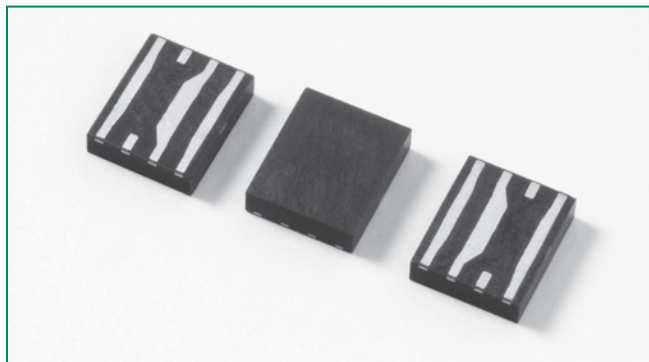


SEP Biased Series - 5x6 QFN



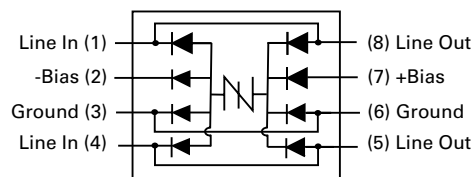
Agency Approvals

Agency	Agency File Number
	E133083

Pinout Designation

Line in	1	8	Line out
- Bias	2	7	+ Bias
Ground	3	6	Ground
Line in	4	5	Line out

Schematic Symbol



Additional Information



Datasheet



Resources



Samples

Description

The new SEP (SIDACtor Thyristor Ethernet/PoE Protector) series has a surge rating compatible with GR1089 inter-building and ITU K.20/21 Enhanced protection requirements. Targeted for high-speed applications such as 10BaseT, 100BaseT, and 1000BaseT, the SEP series maintains signal quality while providing robust protection for Ethernet and PoE applications. This latest silicon design innovation results in a capacitive loading characteristic that is constant with respect to the voltage across the component. This reduces distortion caused by typical solid-state protection solutions. Offered in a surface-mount, QFN package, the SEP provides small package size without sacrificing power and surge handling capabilities.

Features & Benefits

- Compatible with 1000Base-T
- Balanced overvoltage protection
- Low distortion
- Low insertion loss
- Low profile
- SO-8 footprint compatible
- Fails short circuit when surged in excess of ratings
- RoHS Compliant and Halogen-Free
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

Applicable Global Standards

- TIA-968-A
- TIA-968-B
- ITU K.20/21 Enhanced Level
- ITU K.20/21 Basic Level
- IEC 61000-4-5 2nd edition
- GR 1089 Intra-building
- YD/T 1082
- YD/T 993
- YD/T 950
- Class 4/5 compliance of IEC 61000-4-5
- GR 1089 Inter-building

Electrical Characteristics

Part Number	Marking	$V_{DRM} @ I_{DRM}=5\mu A$	$V_S @ 100V/\mu s$	I_H	I_S	$I_T @ V_T$	$V_T @ I_T=2.2Amps$	Capacitance
		V min	V max	mA min	mA max	A max	V max	
SEP0080Q38CB	SEP-8C	6	25	50	800	2.2	8	See Capacitance vs. Bias Voltage Graph
SEP0640Q38CB	SEP06C	58	77	150	800	2.2	8	
SEP0720Q38CB	SEP07C	65	88	150	800	2.2	8	
SEP0900Q38CB	SEP09C	75	98	150	800	2.2	8	
SEP0080Q38BB	SEP-8B	6	25	50	800	2.2	8	
SEP0640Q38BB	SEP06B	58	77	150	800	2.2	8	
SEP0720Q38BB	SEP07B	65	88	150	800	2.2	8	
SEP0900Q38BB	SEP09B	75	98	150	800	2.2	8	

Notes:

- Absolute maximum ratings measured at $T_A = 25^\circ C$ (unless otherwise noted).

- Components are bidirectional (unless otherwise noted).

50/60 Hz Ratings

Parameter Name	Test Conditions	Value	Units
I_{TSM} Maximum non-repetitive on-state current, 50/60 Hz	0.5s	6.5	A
	1s	4.6	
	2s	3.4	
	5s	2.3	
	30s	1.3	
	900s	0.73	

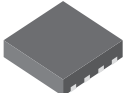
Surge Ratings

Series	I_{PP}				I_{TSM}
	2x10 μ s	1.2/50 μ s-8/20 μ s	10/700-5/310 μ s	10x1000 μ s	600V _{RMS} 1 cycle
	A min	A min	A min	A min	A _{RMS}
B	250	250	100	80	30
C	500	430	200	100	30

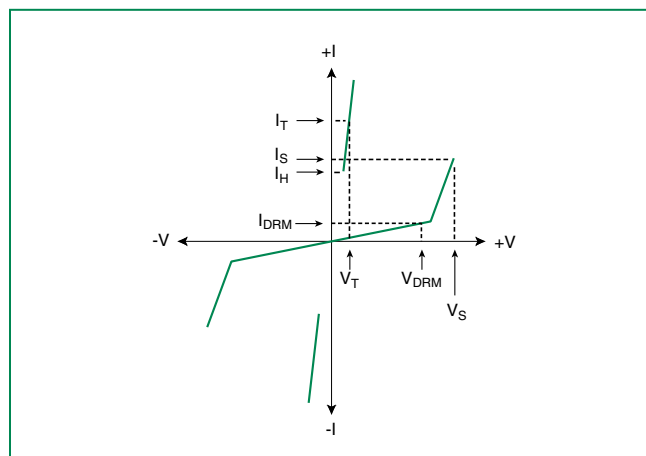
Notes:

- Peak pulse current rating (I_{PP}) is repetitive and guaranteed for the life of the product as long as it returns to 25°C° between surges
- I_{PP} ratings applicable over temperature range of -40°C to +85°C
- The components must initially be in thermal equilibrium with -40°C $\leq T_J \leq$ +150°C

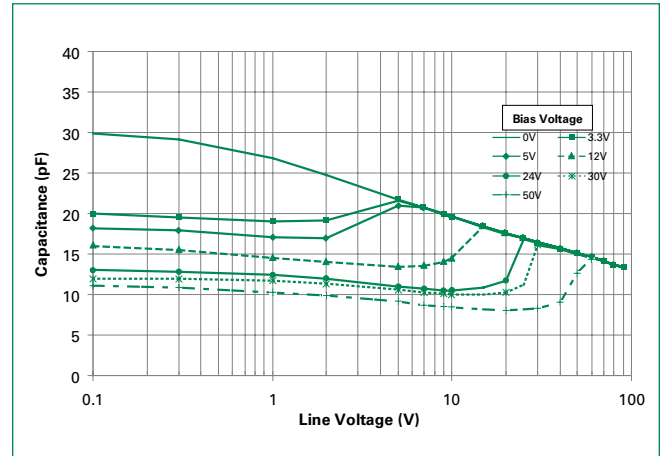
Thermal Considerations

Package	Symbol	Parameter	Value	Unit
 5x6 QFN	T_J	Junction Temperature	-40 to +150	°C
	T_{STG}	Storage Temperature Range	-40 to +150	°C
	$R_{\theta JA}$	Thermal Resistance: Junction to Ambient	100	°C/W

V-I Characteristics

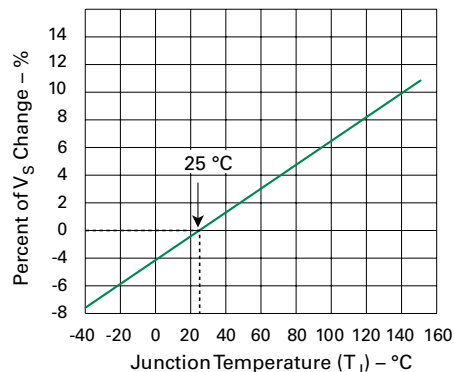


Capacitance vs. Bias Voltage*

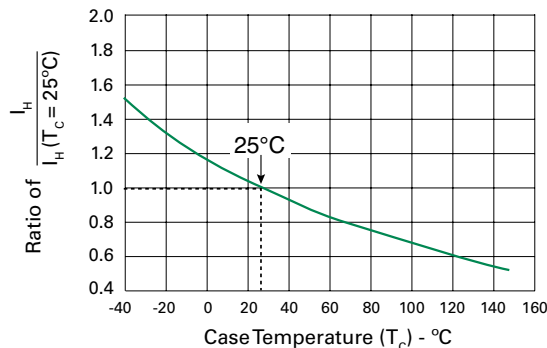


* Bias voltage must be lower than V_{DRM}

Normalized V_s Change vs. Junction Temperature

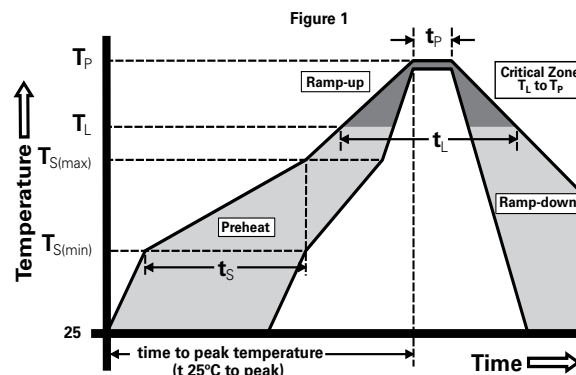


Normalized DC Holding Current vs. Case Temperature



Soldering Parameters

Reflow Condition		Pb-Free assembly (see Fig. 1)
Pre Heat	-Temperature Min ($T_{s(\min)}$)	+150°C
	-Temperature Max ($T_{s(\max)}$)	+200°C
	-Time (Min to Max) (t_s)	60-180 secs.
Average ramp up rate (Liquidus Temp (T_L) to peak)		3°C/sec. Max.
$T_{s(\max)}$ to T_L - Ramp-up Rate		3°C/sec. Max.
Reflow	-Temperature (T_L) (Liquidus)	+217°C
	-Temperature (t_L)	60-150 secs.
Peak Temp (T_p)		+260(+0/-5)°C
Time within 5°C of actual Peak Temp (t_p)		30 secs. Max.
Ramp-down Rate		6°C/sec. Max.
Time 25°C to Peak Temp (T_p)		8 min. Max.
Do not exceed		+260°C



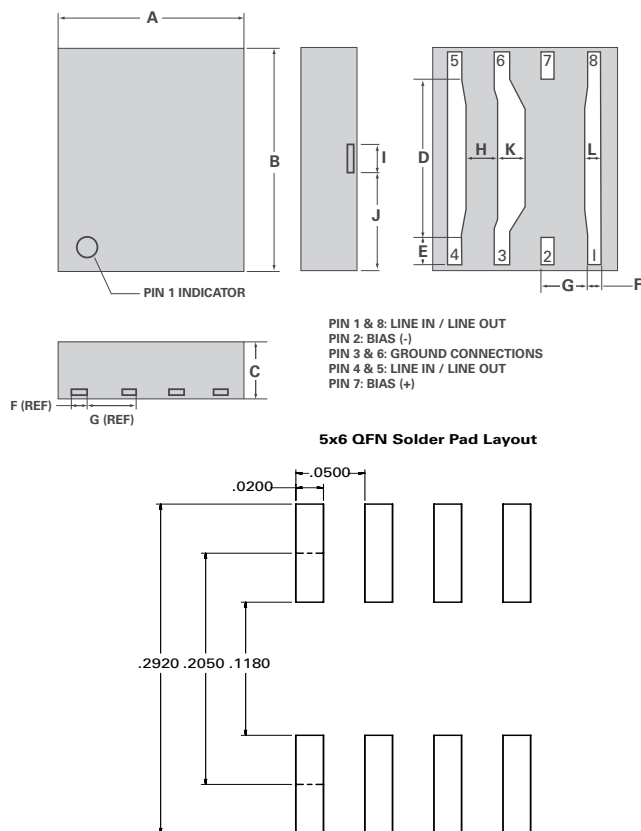
Physical Specifications

Lead Material	Copper Alloy
Terminal Finish	100% Matte-Tin Plated
Body Material	UL Recognized compound meeting flammability rating V-0

Environmental Specifications

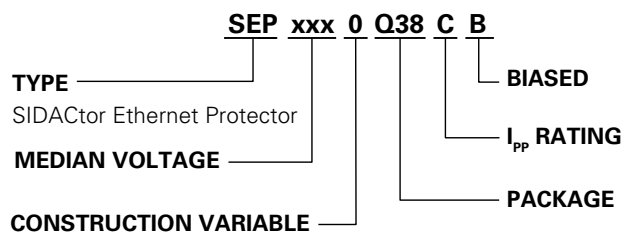
High Temp Voltage Blocking	80% Rated V_{DRM} (V_{AC} Peak) +125°C or +150°C, 504 or 1008 hrs. MIL-STD-750 (Method 1040) JEDEC, JESD22-A-101
Temp Cycling	-65°C to +150°C, 15 min. dwell, 10 up to 100 cycles. MIL-STD-750 (Method 1051) EIA/JEDEC, JESD22-A-104
Biased Temp & Humidity	52 V_{DC} (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101
High Temp Storage	+150°C 1008 hrs. MIL-STD-750 (Method 1031) JEDEC, JESD22-A-101
Low Temp Storage	-65°C, 1008 hrs.
Thermal Shock	0°C to +100°C, 5 min. dwell, 10 sec. transfer, 10 cycles. MIL-STD-750 (Method 1056) JEDEC, JESD22-A-106
Resistance to Solder Heat	+260°C, 30 secs. MIL-STD-750 (Method 2031)
Moisture Sensitivity Level	85%RH, +85°C, 168 hrs., 3 reflow cycles (+260°C Peak). JEDEC-J-STD-020, Level 1

Dimensions — 5x6 QFN

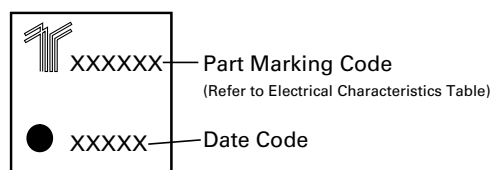


Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.187	0.207	4.745	5.253
B	0.226	0.246	5.745	6.253
C	0.054	0.064	1.374	1.628
D	0.165	0.171	4.199	4.351
E	0.027	0.033	0.686	0.838
F	0.011	0.017	0.279	0.432
G	0.047	0.053	1.194	1.346
H	0.032	0.038	0.800	0.953
I	0.027	0.033	0.686	0.838
J	0.100	0.106	2.540	2.692
K	0.027	0.033	0.686	0.838
L	0.015	0.021	0.381	0.533

Part Numbering



Part Marking

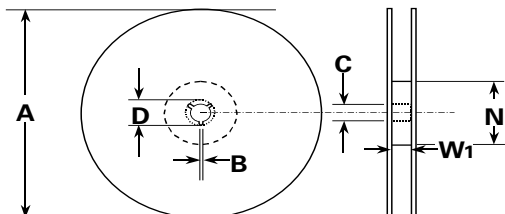


Packing Options

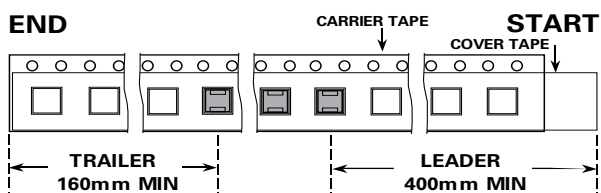
Package Type	Description	Quantity	Added Suffix	Industry Standard
Q38	5x6x1.5 QFN Tape and Reel	4,000	N / A	EIA-481-D

Tape and Reel Specifications — 5x6 QFN

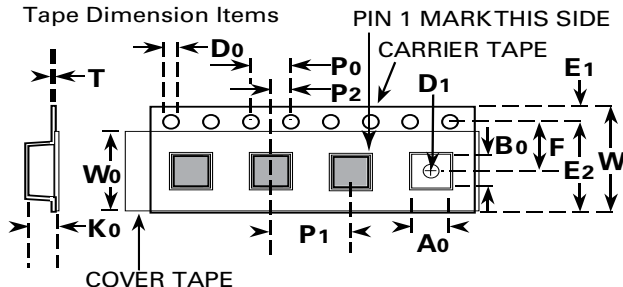
Reel Dimension



Tape Leader and Trailer Dimensions



Tape Dimension Items



Symbols	Description	Inches		Millimeters	
		Min	Max	Min	Max
A	Reel Diameter	N/A	12.992	N/A	330.0
B	Drive Spoke Width	0.059	N/A	1.50	N/A
C	Arbor Hole Diameter	0.504	0.531	12.80	13.50
D	Drive Spoke Diameter	0.795	N/A	20.20	N/A
N	Hub Diameter	1.969	N/A	50.00	N/A
W₁	Reel Inner Width at Hub	0.488	0.567	12.40	14.40
A₀	Pocket Width at Bottom	0.204	0.212	5.20	5.40
B₀	Pocket Length at Bottom	0.244	0.252	6.20	6.40
D₀	Feed Hole Diameter	0.059	0.063	1.50	1.60
D₁	Pocket Hole Diameter	0.059	N/A	1.50	N/A
E₁	Feed Hole Position 1	0.065	0.073	1.65	1.85
E₂	Feed Hole Position 2	0.400	0.408	10.15	10.35
F	Feed Hole Center - Pocket Hole Center 2	0.212	0.220	5.40	5.60
K₀	Pocket Depth	0.067	0.075	1.70	1.90
P₀	Feed Hole Pitch	0.153	0.161	3.90	4.10
P₁	Component Spacing	0.311	0.319	7.90	8.10
P₂	Feed Hole Center - Pocket Hole Center 1	0.077	0.081	1.90	2.10
T	Carrier Tape Thickness	0.010	0.014	0.25	0.35
W	Embossed Carrier Tape Width	0.460	0.484	11.70	12.30
W₀	Cover Tape Width	0.358	0.366	9.10	9.30

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.