

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**



Datashheet



Resources



Samples

**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).

**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 2<sup>nd</sup> edition
- GR 1089 Inter-building
- GR 1089 Intra-building
- YD/T 1082
- YD/T 993
- YD/T 950
- Class 4/5 compliance of IEC 61000-4-5

## 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	

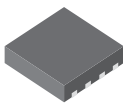
## Surge Ratings

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

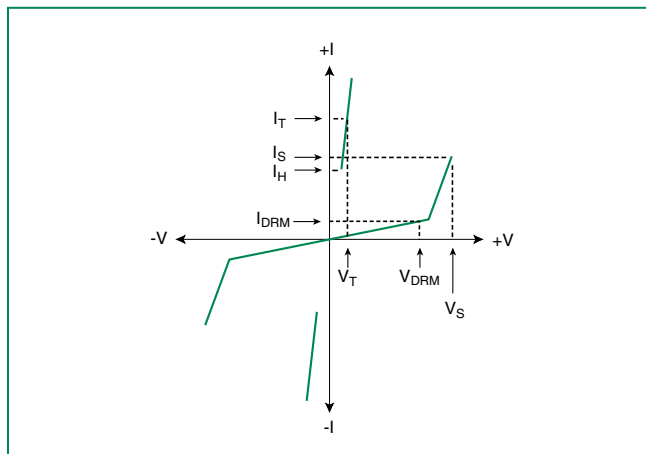
Notes:

- 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

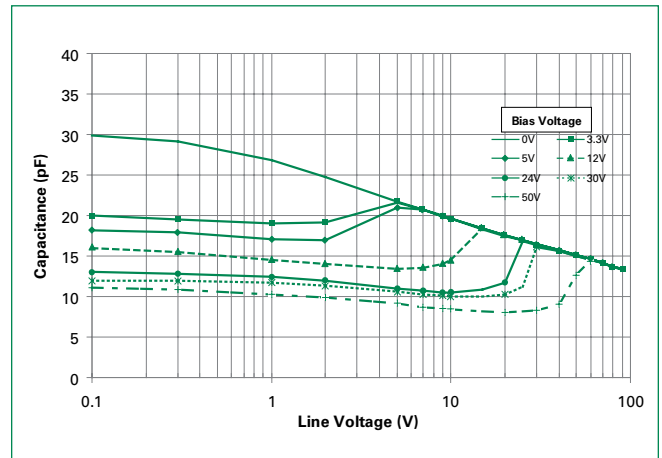
## Thermal Considerations

Package	Symbol	Parameter	Value	Unit
 <p>5x6 QFN</p>	$T_J$	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

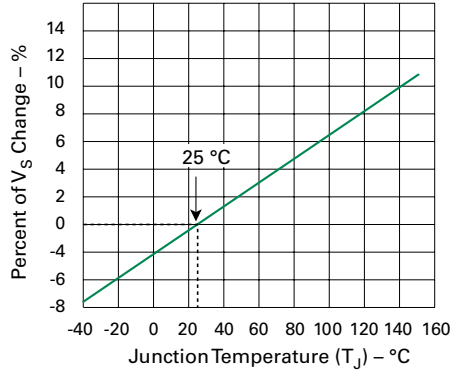


## Capacitance vs. Bias Voltage\*

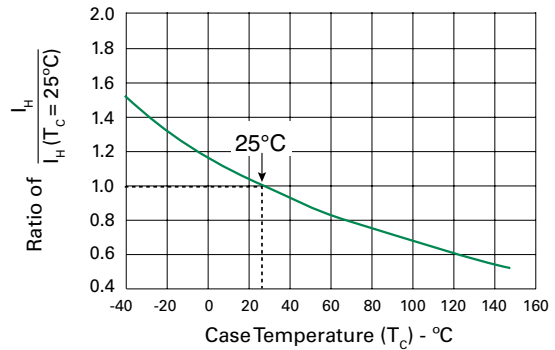


\* Bias voltage must be lower than  $V_{DRM}$

**Normalized  $V_s$  Change vs. Junction Temperature**

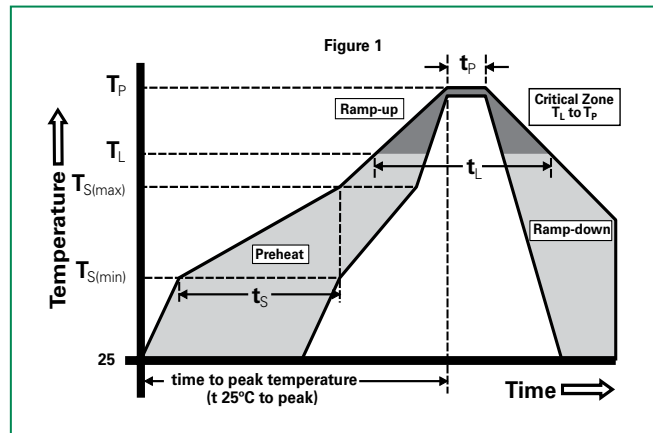


**Normalized DC Holding Current vs. Case Temperature**



**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**

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

**Environmental Specifications**

<b>High Temp Voltage Blocking</b>	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
<b>Temp Cycling</b>	-65°C to +150°C, 15 min. dwell, 10 up to 100 cycles. MIL-STD-750 (Method 1051) EIA/JEDEC, JESD22-A104
<b>Biased Temp &amp; Humidity</b>	52 $V_{DC}$ (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101
<b>High Temp Storage</b>	+150°C 1008 hrs. MIL-STD-750 (Method 1031) JEDEC, JESD22-A-101
<b>Low Temp Storage</b>	-65°C, 1008 hrs.
<b>Thermal Shock</b>	0°C to +100°C, 5 min. dwell, 10 sec. transfer, 10 cycles. MIL-STD-750 (Method 1056) JEDEC, JESD22-A-106
<b>Resistance to Solder Heat</b>	+260°C, 30 secs. MIL-STD-750 (Method 2031)
<b>Moisture Sensitivity Level</b>	85%RH, +85°C, 168 hrs., 3 reflow cycles (+260°C Peak). JEDEC-J-STD-020, Level 1

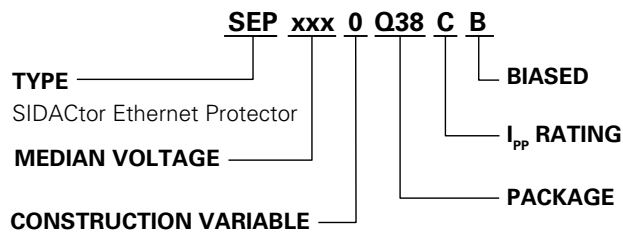
**Dimensions — 5x6 QFN**



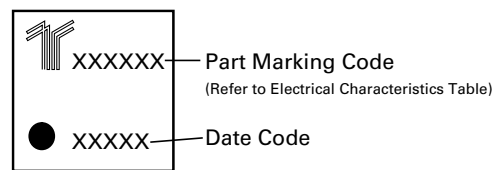
PIN 1 & 8: LINE IN / LINE OUT  
 PIN 2: BIAS (-)  
 PIN 3 & 6: GROUND CONNECTIONS  
 PIN 4 & 5: LINE IN / LINE OUT  
 PIN 7: BIAS (+)

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

**Part Numbering**



**Part Marking**

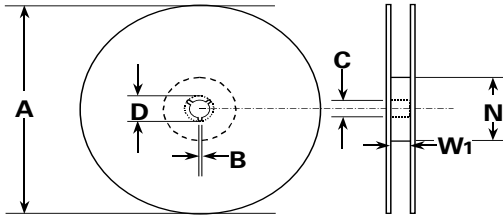


**Packing Options**

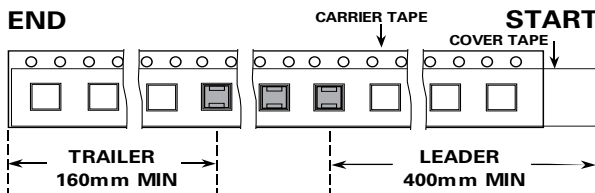
Package Type	Description	Quantity	Added Suffix	Industry Standard
Q38	5x6x1.5 QFN Tape and Reel	4,000	N / A	EIA-481-D

**Tape and Reel Specifications — 5x6 QFN**

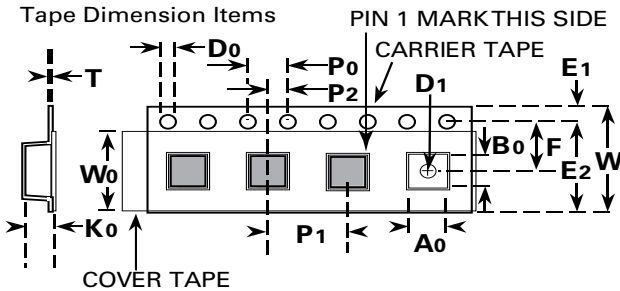
Reel Dimension



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
W <sub>1</sub>	Reel Inner Width at Hub	0.488	0.567	12.40	14.40
A <sub>0</sub>	Pocket Width at Bottom	0.204	0.212	5.20	5.40
B <sub>0</sub>	Pocket Length at Bottom	0.244	0.252	6.20	6.40
D <sub>0</sub>	Feed Hole Diameter	0.059	0.063	1.50	1.60
D <sub>1</sub>	Pocket Hole Diameter	0.059	N/A	1.50	N/A
E <sub>1</sub>	Feed Hole Position 1	0.065	0.073	1.65	1.85
E <sub>2</sub>	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
K <sub>0</sub>	Pocket Depth	0.067	0.075	1.70	1.90
P <sub>0</sub>	Feed Hole Pitch	0.153	0.161	3.90	4.10
P <sub>1</sub>	Component Spacing	0.311	0.319	7.90	8.10
P <sub>2</sub>	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
W <sub>0</sub>	Cover Tape Width	0.358	0.366	9.10	9.30

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