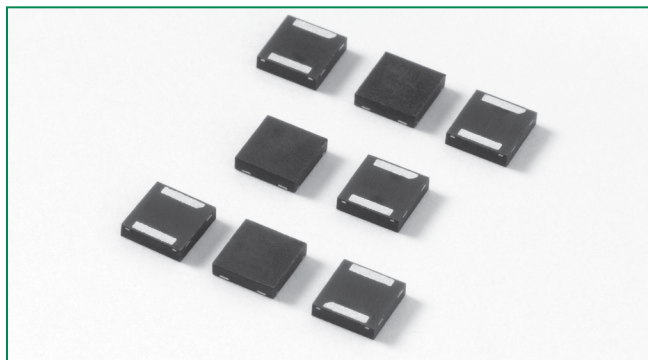


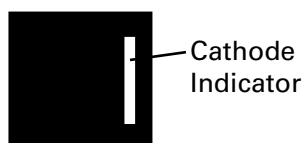
## Fixed Voltage Q2L Series 3.3x3.3 QFN



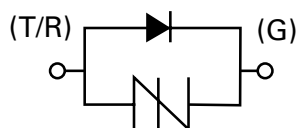
### Agency Approvals

Agency	Agency File Number
	E133083

### Pinout Designation



### Schematic Symbol



### Description

Fixed Voltage Q2L Series are uni-directional SIDACtor® thyristors designed to protect SLICs (Subscriber Line Interface Circuit) from damaging overvoltage transients.

The series provides single line protection using a fixed voltage switching component for negative surges. All positive surges are routed through an internal diode to a ground reference. The small size of the Q2L makes it ideal for high density applications.

### Features and Benefits

- Integrated diode for positive voltage surges
- Low profile
- Small footprint QFN Package
- Low on-state voltage
- Does not degrade surge capability after multiple surge events within limit.
- 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
- GR 1089 Inter-building
- GR-1089 Intra-building
- IEC 61000-4-5 2nd editin
- YD/T 950
- YD/T 993
- YD/T 1082

### Additional Information



Datasheet



Resources



Samples

### Electrical Characteristics

Part Number	Marking	$V_{DRM}$	$V_s$	$I_H$	$I_s$	$I_T$	$V_T$	$V_F$	Capacitance	
		@ $I_{DRM} = 5\mu A$	@ 100V/ $\mu s$	mA min	mA max	A max	@ $I_T = 2.2$ Amps	V max	@ 1MHz @ 2V bias	pF min
P0641Q22CLRP	P61C	58	77	120	800	2.2	4	5	35	75
P0721Q22CLRP	P71C	65	88	120	800	2.2	4	5	25	45
P0901Q22CLRP	P91C	75	98	120	800	2.2	4	5	55	85
P1101Q22CLRP	P10C	95	130	120	800	2.2	4	5	50	75
P1301Q22CLRP	P13C	120	160	120	800	2.2	4	5	45	70
P1701Q22CLRP	P17C	160	200	120	800	2.2	4	5	45	70

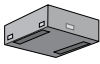
Notes:  
 - Absolute maximum ratings measured at  $T_A = 25^\circ C$  (unless otherwise noted).  
 - Components are not appropriate for positive ringing systems.

**Surge Ratings**

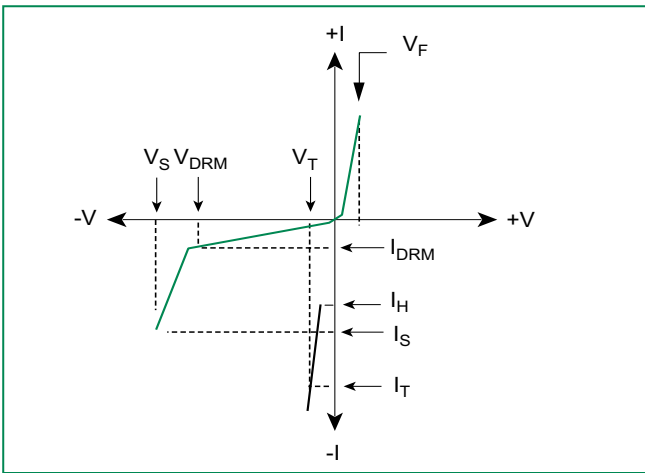
Series	$I_{PP}$					$I_{TSM}$	di/dt
	2/10 $\mu$ s	1.2/50 $\mu$ s/8/20 $\mu$ s	10/160 $\mu$ s	10/560 $\mu$ s	10/1000 $\mu$ s	50 / 60Hz	
	A min	A min	A min	A min	A min	A min	Amps/ $\mu$ s max
C	500	400	200	150	100	30	500

Notes:  
 - Peak pulse current rating ( $I_{PP}$ ) is repetitive and guaranteed for the life of the product that remains in thermal equilibrium.  
 -  $I_{PP}$  ratings applicable over temperature range of -40°C to +85°C  
 - The component must initially be in thermal equilibrium with -40°C  $\leq T_J \leq$  +150°C

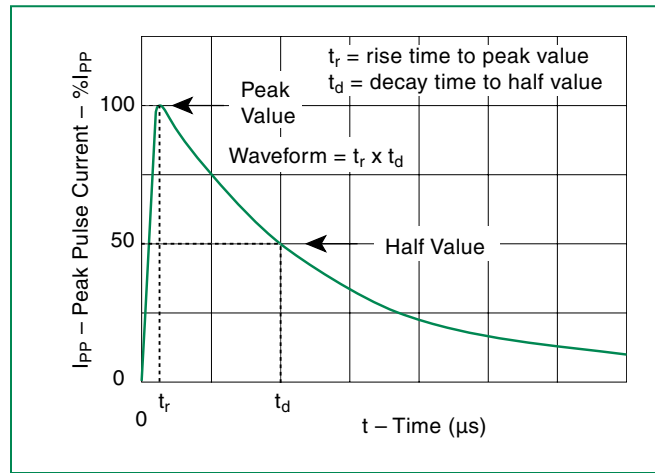
**Thermal Considerations**

Package	Symbol	Parameter	Value	Unit
 3.3x3.3 QFN	$T_J$	Operating Junction Temperature Range	-40 to +150	°C
	$T_S$	Storage Temperature Range	-65 to +150	°C
	$R_{\theta JA}$	Thermal Resistance: Junction to Ambient	120	°C/W

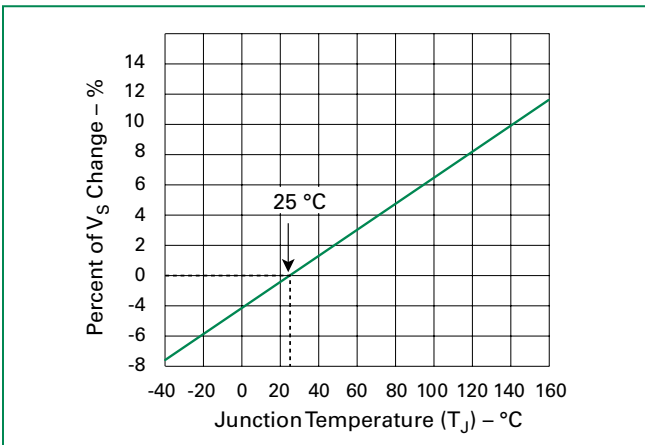
**V-I Characteristics**



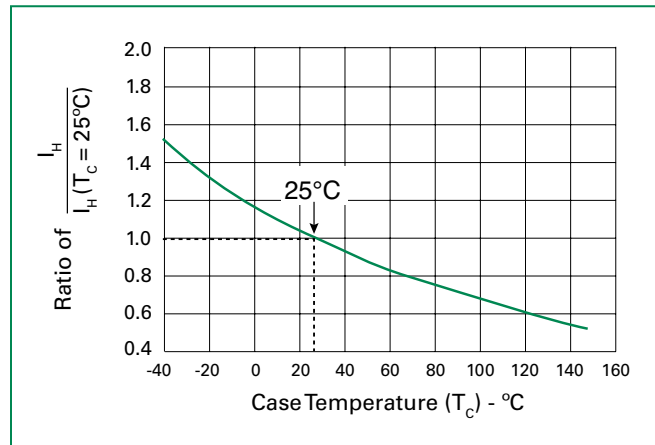
**$t_r$  x  $t_d$  Pulse Waveform**



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

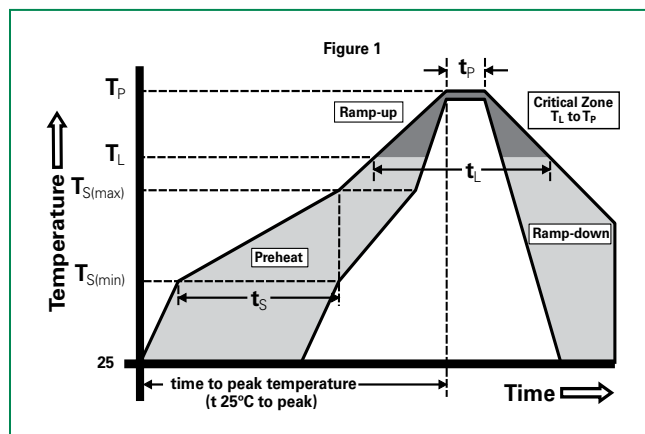


**Normalized DC Holding Current vs. Case Temperature**



### 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



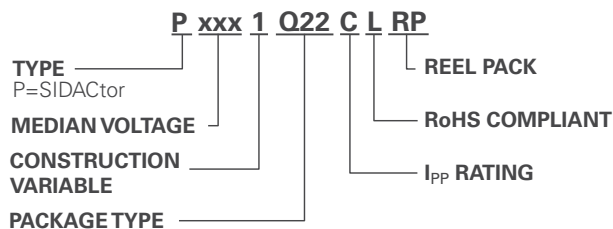
### Physical Specifications

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

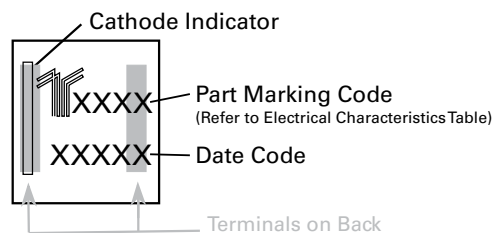
### Environmental Specifications

<b>High Temp Voltage Blocking</b>	80% Rated $V_{DRM}(V_{DC}) + 125^\circ\text{C}$ or $+150^\circ\text{C}$ , 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

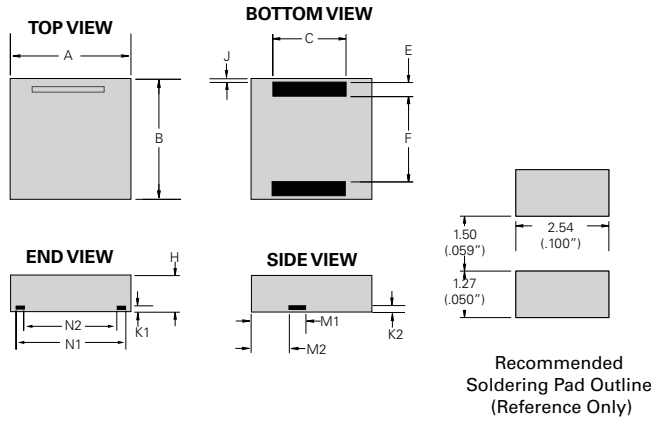
### Part Numbering



### Part Marking



**Dimensions — 3.3x3.3 QFN**



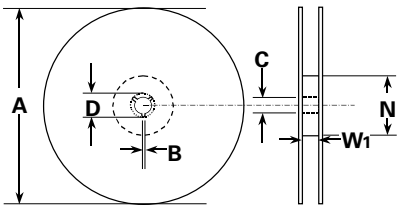
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
<b>A</b>	0.126	0.134	3.200	3.400
<b>B</b>	0.126	0.134	3.200	3.400
<b>C</b>	0.075	0.083	1.900	2.100
<b>E</b>	0.011	0.019	0.285	0.485
<b>F</b>	0.088	0.096	2.230	2.430
<b>H</b>	0.035	0.043	0.900	1.100
<b>J</b>	0.000	0.008	0.000	0.200
<b>K1</b>	0.004	0.012	0.100	0.300
<b>K2</b>	0.004	0.012	0.100	0.300
<b>M1</b>	0.063	0.071	1.610	1.810
<b>M2</b>	0.045	0.053	1.153	1.353
<b>N1</b>	0.095	0.103	2.420	2.620
<b>N2</b>	0.082	0.090	2.080	2.280

**Packing Options**

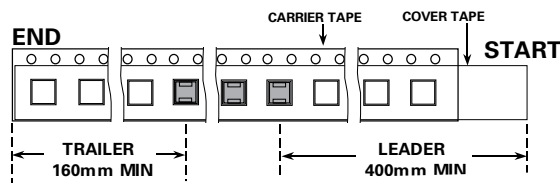
Package Type	Description	Quantity	Added Suffix	Industry Standard
Q22	3.3x3.3 QFN Tape and Reel Pack	5000	RP	EIA-481-D

**Tape and Reel Dimension — 3.3x3.3 QFN**

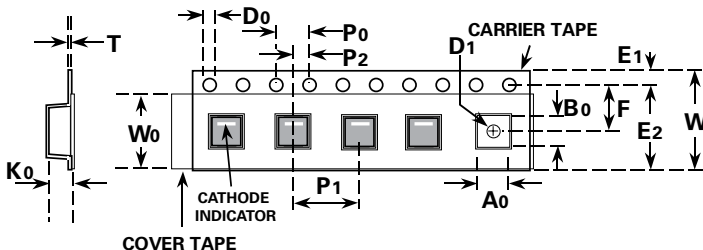
Reel Dimension



Tape Leader and Trailer Dimensions



Tape Dimension Items



	Description	Inches		Millimeters	
		Min	Max	Min	Max
<b>A</b>	Reel Diameter	N/A	12.992	N/A	330.0
<b>B</b>	Drive Spoke Width	0.059	N/A	1.50	N/A
<b>C</b>	Arbor Hole Diameter	0.504	0.531	12.80	13.50
<b>D</b>	Drive Spoke Diameter	0.795	N/A	20.20	N/A
<b>N</b>	Hub Diameter	1.969	N/A	50.00	N/A
<b>W<sub>1</sub></b>	Reel Inner Width at Hub	0.488	0.567	12.40	14.40
<b>A<sub>0</sub></b>	Pocket Width at bottom	0.138	0.146	3.50	3.70
<b>B<sub>0</sub></b>	Pocket Length at bottom	0.138	0.146	3.50	3.70
<b>D<sub>0</sub></b>	Feed Hole Diameter	0.059	0.063	1.50	1.60
<b>D<sub>1</sub></b>	Pocket Hole Diameter	0.059	N/A	1.50	N/A
<b>E<sub>1</sub></b>	Feed hole position 1	0.065	0.073	1.65	1.85
<b>E<sub>2</sub></b>	Feed hole position 2	0.400	0.408	10.15	10.35
<b>F</b>	Feed hole center-Pocket hole	0.215	0.219	5.45	5.55
<b>K<sub>0</sub></b>	Pocket Depth	0.039	0.051	1.00	1.30
<b>P<sub>0</sub></b>	Feed Hole Pitch	0.153	0.161	3.90	4.10
<b>P<sub>1</sub></b>	Component Spacing	0.311	0.319	7.90	8.10
<b>P<sub>2</sub></b>	Feed hole center-Pocket hole	0.077	0.081	1.95	2.05
<b>T</b>	Carrier Tape Thickness	0.010	0.014	0.25	0.35
<b>W</b>	Embossed Carrier Tape Width	0.453	0.484	11.50	12.30
<b>W<sub>0</sub></b>	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](http://www.littelfuse.com/disclaimer-electronics).