

# 2016L Series

## Surface Mount



### Web Resources



Download ECAD models, order samples, and find technical resources at [www.littelfuse.com](http://www.littelfuse.com)

### Description

The 2016L Series PTC provides surface mount overcurrent protection for low voltage ( $\leq 60V$ ) applications where resettable protection is desired.

### Features

- RoHS compliant, lead-free and halogen-free
- High voltage
- Fast response to fault currents
- Low-profile

### Applications

- IEEE 1394 port protection
- Low voltage telecom equipment protection
- Powered ethernet port protection (IEEE 802.3 af)
- Automotive electronic control module protection

### Agency Approvals

Agency	Agency File Number
	E183209
	R50119118

### Electrical Characteristics

Part Number	Marking	$I_{hold}$ (A)	$I_{trip}$ (A)	$V_{max}$ (Vdc)	$I_{max}$ (A)	$P_d$ typ. (W)	Maximum Time To Trip		Resistance		Agency Approvals	
							Current (A)	Time (Sec.)	$R_{min}$ ( $\Omega$ )	$R_{1max}$ ( $\Omega$ )		
2016L030	LF030	0.30	0.60	60	20	1.40	1.5	3.0	0.500	2.300	X	X
2016L050	LF050	0.55	1.10	60	20	1.40	2.5	5.0	0.200	1.000	X	X
2016L075/60	LF075	0.75	1.50	60	20	1.40	8.0	0.5	0.130	0.900	X	X
2016L100	LF100	1.10	2.20	15	40	1.40	8.0	0.5	0.100	0.400	X	X
2016L100/33	LF100●33	1.10	2.20	33	40	1.40	8.0	0.5	0.100	0.400	X	X
2016L150	LF150	1.50	3.00	15	40	1.40	8.0	1.0	0.070	0.180	X	X
2016L150/33	LF150●33	1.50	3.00	33	40	2.0	8.00	1.00	0.070	0.180	X	X
2016L200	LF200	2.00	4.20	6	40	1.40	8.0	3.0	0.048	0.100	X	X
2016L260/24	LF260●24	2.60	5.00	24	40	1.6	8.00	5.00	0.025	0.075	X	X
2016L300/16	LF300	3.00	5.00	16	40	1.6	8.00	10.00	0.015	0.048	X	X
2016L500	LF500	5.00	10.00	6	100	2.0	25.00	2.00	0.005	0.025	X	X

$I_{hold}$  = Hold current: maximum current device will pass without tripping in 20°C still air.

$I_{trip}$  = Trip current: minimum current at which the device will trip in 20°C still air.

$V_{max}$  = Maximum voltage device can withstand without damage at rated current ( $I_{max}$ )

$I_{max}$  = Maximum fault current device can withstand without damage at rated voltage ( $V_{max}$ )

$P_d$  = Power dissipated from device when in the tripped state at 20°C still air.

$R_{min}$  = Minimum resistance of device in initial (un-soldered) state.

$R_{typ}$  = Typical resistance of device in initial (un-soldered) state.

$R_{1max}$  = Maximum resistance of device at 20°C measured one hour after tripping or reflow soldering of 260°C for 20 sec.

**Caution:** Operation beyond the specified rating may result in damage and possible arcing and flame.

\* Agency Approval is Pending

#### Warning

- Users shall independently assess the suitability of these devices for each of their applications
- Operation of these devices beyond the stated maximum ratings could result in damage to the devices and lead to electrical arcing and/or fire
- These devices are intended to protect against the effects of temporary over-current or over-temperature conditions and are not intended to perform as protective devices where such conditions are expected to be repetitive or prolonged in duration

- Exposure to silicon-based oils, solvents, electrolytes, acids, and similar materials can adversely affect the performance of these PPTC devices
- These devices undergo thermal expansion under fault conditions, and thus shall be provided with adequate space and be protected against mechanical stresses
- Circuits with inductance may generate a voltage ( $L di/dt$ ) above the rated voltage of the PPTC device.

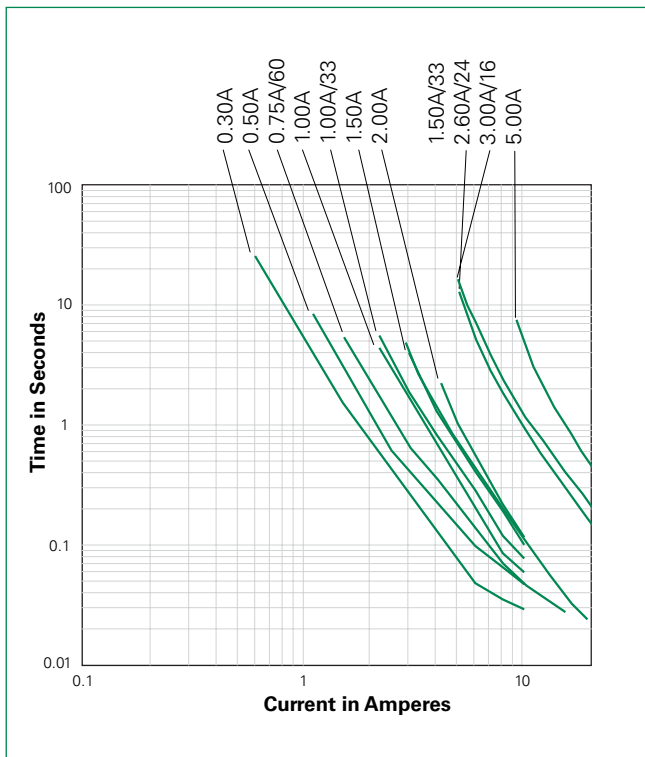
# 2016L Series

## Surface Mount

### Temperature Derating

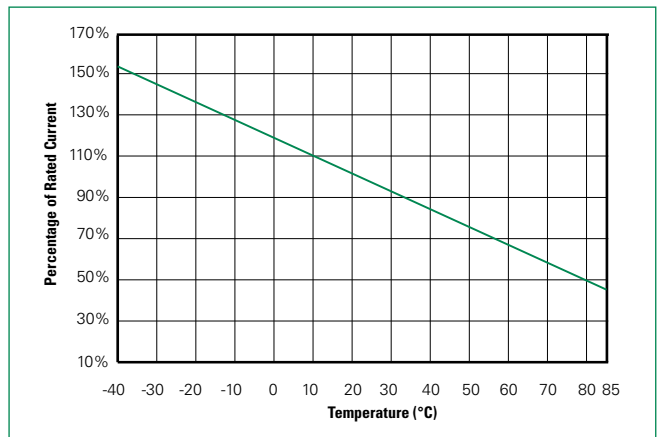
Part Number	Ambient Operation Temperature								
	-40°C	-20°C	0°C	20°C	40°C	50°C	60°C	70°C	85°C
2016L030	0.45	0.40	0.35	0.30	0.25	0.23	0.20	0.18	0.14
2016L050	0.93	0.95	0.65	0.55	0.42	0.38	0.33	0.30	0.23
2016L075/60	1.05	1.06	0.85	0.75	0.60	0.55	0.45	0.40	0.30
2016L100	1.66	1.47	1.29	1.10	0.91	0.83	0.73	0.64	0.50
2016L100/33	1.66	1.47	1.29	1.10	0.91	0.83	0.73	0.64	0.50
2016L150	2.26	2.00	1.76	1.50	1.24	1.13	1.00	0.87	0.68
2016L150/33	2.26	2.00	1.76	1.50	1.24	1.13	1.00	0.87	0.68
2016L200	2.80	2.50	2.19	2.00	1.84	1.74	1.50	1.34	1.14
2016L260/24	3.82	3.46	3.06	2.60	2.24	2.03	1.82	1.60	1.26
2016L300/16	4.40	3.96	3.52	3.00	2.65	2.43	2.20	1.96	1.59
2016L500	7.29	6.57	5.86	5.00	4.38	4.02	3.66	3.26	2.66

### Average Time Current Curves



The average time current curves and Temperature Derating curve performance is affected by a number of variables, and these curves provided as guidance only. Customer must verify the performance in their application.

### Temperature Derating Curve



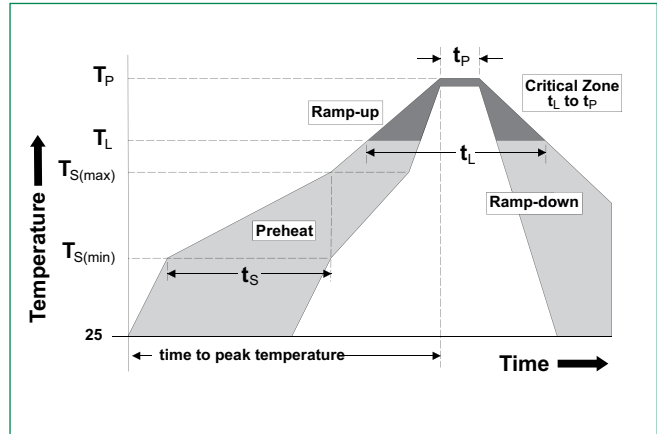
Note: Typical Temperature derating curve, refer to table for derating data

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### Soldering Parameters

<b>Profile Feature</b>	Pb-Free Assembly	
<b>Average Ramp-Up Rate (<math>T_{S(max)}</math> to <math>T_p</math>)</b>	3°C/second max	
<b>Pre Heat:</b>	<b>Temperature Min (<math>T_{s(min)}</math>)</b>	150°C
	<b>Temperature Max (<math>T_{s(max)}</math>)</b>	200°C
	<b>Time (Min to Max) (<math>t_s</math>)</b>	60 – 180 secs
<b>Time Maintained Above:</b>	<b>Temperature (<math>T_L</math>)</b>	217°C
	<b>Temperature (<math>t_L</math>)</b>	60 – 150 seconds
<b>Peak / Classification Temperature (<math>T_p</math>)</b>	260 <sup>+0/-5</sup> °C	
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>	20 – 40 seconds	
<b>Ramp-down Rate</b>	6°C/second max	
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>	8 minutes Max.	



- All temperature refer to topside of the package, measured on the package body surface
- If reflow temperature exceeds the recommended profile, devices may not meet the performance requirements
- Recommended reflow methods: IR, vapor phase oven, hot air oven, N<sub>2</sub> environment for lead
- Recommended maximum paste thickness is 0.25mm (0.010inch)
- Devices can be cleaned using standard industry methods and solvents
- Devices can be reworked using the standard industry practices

### Physical Specifications

<b>Terminal Material</b>	Solder-Plated Copper (Solder Material: Matte Tin(Sn))
<b>Lead Solderability</b>	Meets EIA Specification RS186-9E, ANSI/J-STD-002 Category 3.

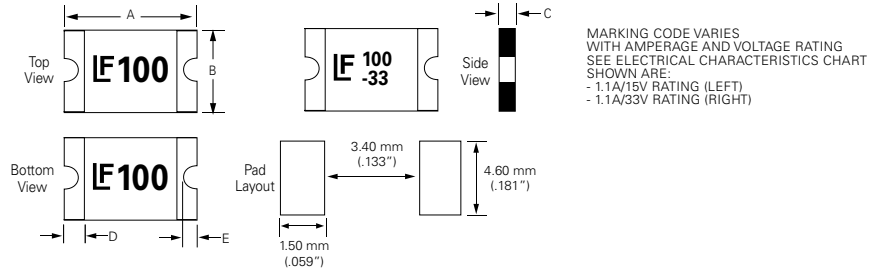
### Environmental Specifications

<b>Operating Temperature</b>	-40°C to +85°C
<b>Maximum Device Surface Temperature in Tripped State</b>	125°C
<b>Passive Aging</b>	+85°C, 1000 hours -/+5% typical resistance change
<b>Humidity Aging</b>	+85°C, 85%, R.H., 1000 hours -/+5% typical resistance change
<b>Thermal Shock</b>	MIL-STD-202, Method 107 +85°C/-40°C 20 times -30% typical resistance change
<b>Solvent Resistance</b>	MIL-STD-202, Method 215 No change
<b>Vibration</b>	MIL-STD-883, Method 2007, Condition A No change
<b>Moisture Sensitivity Level</b>	Level 1, J-STD-020

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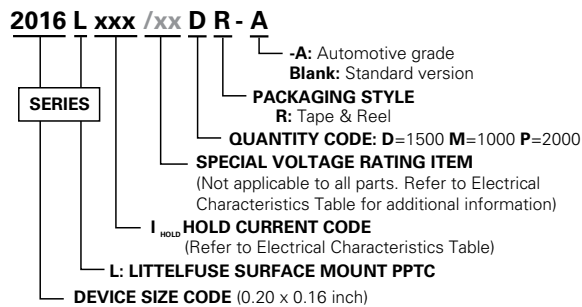
## Surface Mount

### Dimensions (mm)



Part Number	A		B				C				D		E								
	Inches		mm		Inches		mm		Inches		mm		Inches		mm		Inches		mm		
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
2016L030									0.03	0.05	0.75	1.25									
2016L050									0.05	0.08	1.20	2.00									
2016L075/60								4.43	0.05	0.08	1.20	2.00									
2016L100									0.02	0.03	0.50	0.75									
2016L100/33									0.03	0.05	0.75	1.25									
2016L150	0.19	0.21	4.72	5.44	0.15	0.17	3.7		0.03	0.06	0.75	1.55	0.01	0.06	0.3	1.5	0.01	0.03	0.25	0.65	
2016L150/33								4.43	0.03	0.06	0.80	1.60									
2016L200								4.43	0.02	0.03	0.50	0.75									
2016L260/24																					
2016L300/16								4.43	0.03	0.06	0.80	1.60									
2016L500																					

### Part Ordering Number System



### Packaging

Part Number	Ordering Number	Halogen Free	I <sub>hold</sub> (A)	I <sub>hold</sub> Code	Voltage Option	Packaging Option	Quantity	Quantity & Packaging Codes
2016L030	2016L030DR	Yes	0.30	030		Tape and Reel	1500	DR
2016L050	2016L050MR	Yes	0.55	050		Tape and Reel	1000	MR
2016L075/060	2016L075/60MR	Yes	0.75	075	/60	Tape and Reel	1000	MR
2016L100	2016L100PR	Yes	1.10	110		Tape and Reel	2000	PR
2016L100/33	2016L100/33DR	Yes	1.10	110	/33	Tape and Reel	1500	DR
2016L150	2016L150DR	Yes	1.50	150		Tape and Reel	1500	DR
2016L150/33	2016L150/33DR	Yes	1.50	150	/33	Tape and Reel	1,500	DR
2016L200	2016L200PR	Yes	2.00	200		Tape and Reel	2000	PR
2016L260/24	2016L260/24MR	Yes	2.60	260	/24	Tape and Reel	1,000	MR
2016L300/16	2016L300/16MR	Yes	3.00	300	/16	Tape and Reel	1,000	MR
2016L500	2016L500DR	Yes	5.00	500	/6	Tape and Reel	1,500	DR

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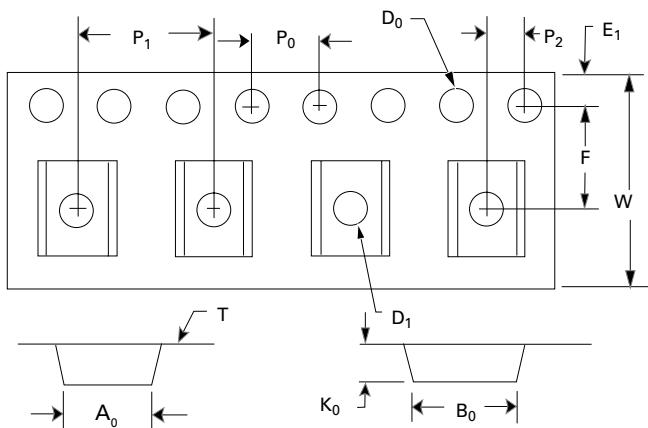
### Tape and Reel Specifications

TAPE SPECIFICATIONS: EIA-481-1 (mm)			
	2016L100 2016L200	2016L030 2016L100/33 2016L150 2016L150/33 2016L500	2016L050 2016L075/60 2016L260/24 2016L300/16
W	12.0+/-0.30	12.0+/-0.30	12.0+/-0.30
F	5.50+/-0.05	5.50+/-0.05	5.50+/-0.05
E <sub>1</sub>	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10
D <sub>0</sub>	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05
D <sub>1</sub>	1.50 (MIN)	1.50+/-0.10	1.50+/-0.10
P <sub>0</sub>	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10
P <sub>1</sub>	8.0+/-0.10	8.0+/-0.10	8.0+/-0.10
P <sub>2</sub>	2.0+/-0.05	2.0+/-0.05	2.0+/-0.05
A <sub>0</sub>	4.40+/-0.10	4.48+/-0.10	4.45+/-0.10
B <sub>0</sub>	5.50+/-0.10	5.40+/-0.10	5.48+/-0.10
T	0.25+/-0.10	0.25+/-0.10	0.25+/-0.10
K <sub>0</sub>	0.75+/-0.10	1.36+/-0.10	1.86+/-0.10
Leader Min.	390	390	390
Trailer Min.	160	160	160

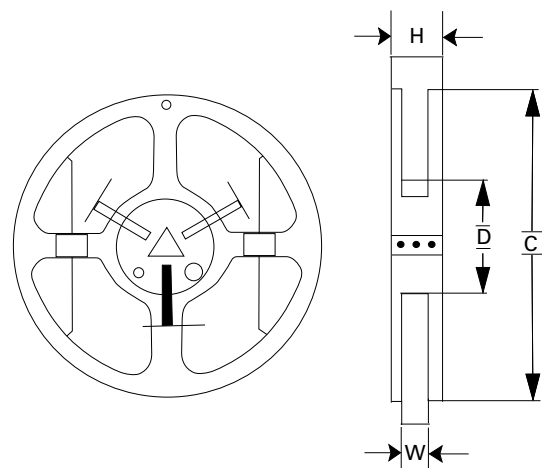
REEL DIMENSIONS: EIA-481-1 (mm)	
C	Ø178.0+/-1.0
D	Ø60.2+/-0.5
H	16.0+/-0.5
W	13.2+/-1.5

### Tape and Reel Diagram

Tape Specifications



Reel Specifications



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