

2016L Series



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

Agency Approvals

| Agency | Agency File Number |
|-----------------------------------------------------------------------------------|--------------------|
|  | E183209 |
|  | R50119118 |

Applications

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

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} (Ω) | R_{1max} (Ω) |  |  |
| 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.

Temperature Derating

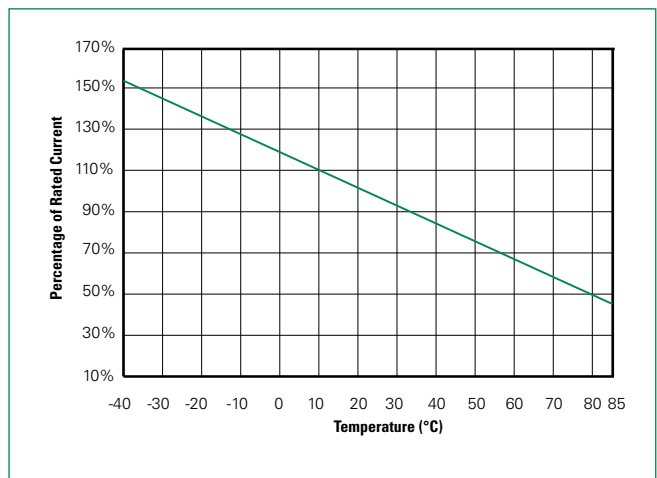
| Part Number | Ambient Operation Temperature | | | | | | | | |
|-------------|-------------------------------|-------|------|------|------|------|------|------|------|
| | -40°C | -20°C | 0°C | 20°C | 40°C | 50°C | 60°C | 70°C | 85°C |
| 2016L030 | 0.45 | 0.40 | 0.35 | 0.30 | 0.25 | 0.23 | 0.20 | 0.18 | 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

Additional Information



Datasheet



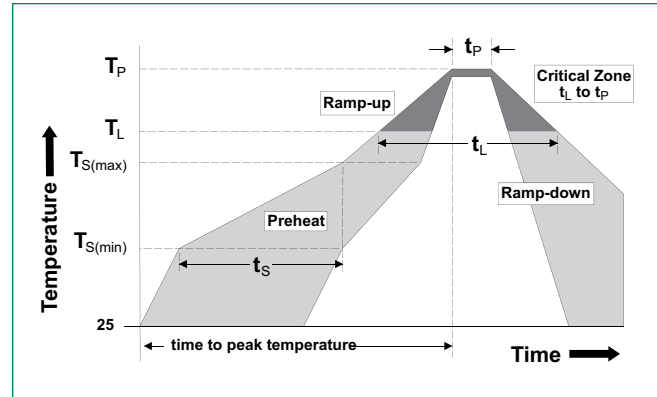
Resources



Samples

Soldering Parameters

| | | |
|---------------------------------------------------------------------------|--------------------------------------------------|------------------|
| Profile Feature | Pb-Free Assembly | |
| Average Ramp-Up Rate ($T_{S(max)}$ to T_p) | 3°C/second max | |
| 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 |
| Time Maintained Above: | Temperature (T_L) | 217°C |
| | Temperature (t_L) | 60 – 150 seconds |
| Peak / Classification Temperature (T_p) | 260 ^{+0/-5} °C | |
| Time within 5°C of actual peak Temperature (t_p) | 20 – 40 seconds | |
| Ramp-down Rate | 6°C/second max | |
| Time 25°C to peak Temperature (T_p) | 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_2 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

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

Environmental Specifications

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

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 | | |
| 2016L030 | | | | | | | | | 0.03 | 0.05 | 0.75 | 1.25 | | | | | | | | |
| 2016L050 | | | | | | | | | 0.05 | 0.08 | 1.20 | 2.00 | | | | | | | | |
| 2016L075/60 | | | | | | | | | 0.05 | 0.08 | 1.20 | 2.00 | | | | | | | | |
| 2016L100 | | | | | | | | 4.43 | 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 _{hold} (A) | I _{hold} 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 |

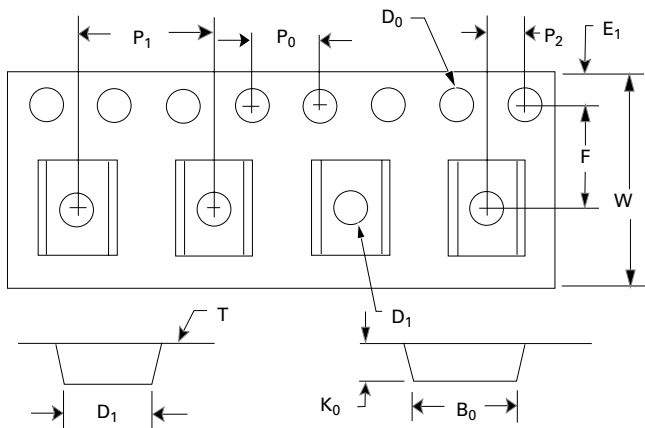
Tape and Reel Specifications

| 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 ₁ | 1.75+/-0.10 | 1.75+/-0.10 | 1.75+/-0.10 |
| D ₀ | 1.55+/-0.05 | 1.55+/-0.05 | 1.55+/-0.05 |
| D ₁ | 1.50 (MIN) | 1.50+/-0.10 | 1.50+/-0.10 |
| P ₀ | 4.0+/-0.10 | 4.0+/-0.10 | 4.0+/-0.10 |
| P ₁ | 8.0+/-0.10 | 8.0+/-0.10 | 8.0+/-0.10 |
| P ₂ | 2.0+/-0.05 | 2.0+/-0.05 | 2.0+/-0.05 |
| A ₀ | 4.40+/-0.10 | 4.48+/-0.10 | 4.45+/-0.10 |
| B ₀ | 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 ₀ | 0.75+/-0.10 | 1.36+/-0.10 | 1.86+/-0.10 |
| Leader Min. | 390 | 390 | 390 |
| Trailer Min. | 160 | 160 | 160 |

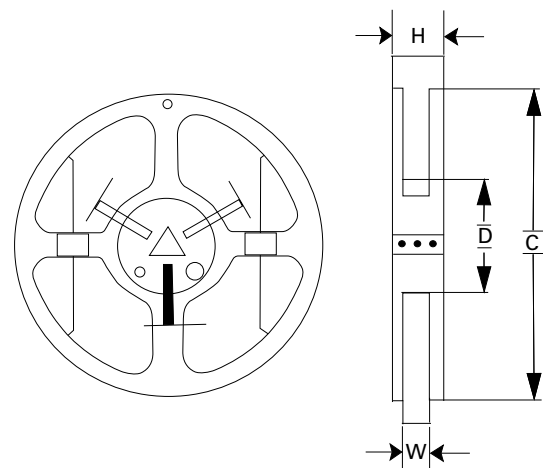
| REEL DIMENSIONS: EIA-481-1 (mm) | |
|------------------------------------|--------------|
| C | Ø178.0+/-1.0 |
| D | Ø60.2+/-0.5 |
| H | 16.0+/-0.5 |
| W | 13.2+/-1.5 |

Tape and Reel Diagram

Tape Specifications



Reel Specifications



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