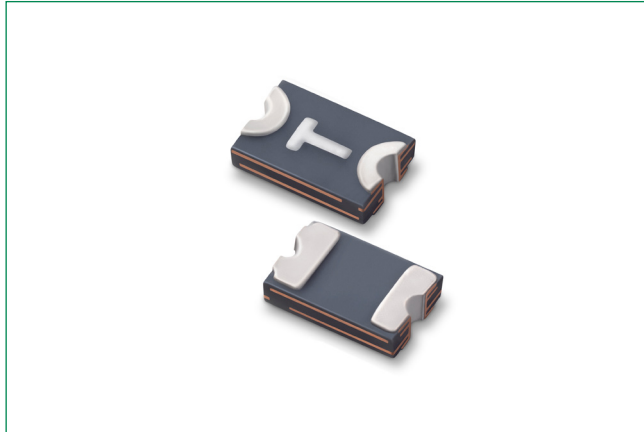



setP™

Temperature Indicators for USB Type-C



Agency Approvals

Agency	Agency File Number
	E74889
	J 50313999

Description

The Littelfuse setP™ temperature indicator helps protect USB Type-C plugs from overheating. It has been designed to the unique specifications of USB Type-C and is capable of helping to protect even the highest levels of USB Power Delivery.

Features & Benefits

- Compact footprint: 0805 mils (2.0 x 1.2mm)
- Sensitive and reliable temperature indication
- SMD compatible with reflow soldering process
- Zero IR loss contribution
- Easy part selection
- USB Power Delivery compliant
- Protects systems with 100W or higher power
- Evaluated to UL 1434 and Annex J of IEC 60730-1

Applications

- USB-C power adapters
- USB Type-C Plugs
- Chargers with captive Type-C Cables
- USB-C to USB-C Cable
- Fast charging standards and protocols compliant with USB-C and USB-PD

Temperature Indication Characteristics

Part Number	Marking Code	Indicating Temperature (°C)			Resistance (Ω)	
		Min	Typical ¹	Max	Max at 25°C ²	R _{ind} ³
SETP0805-100-SE	T	90	100	110	12	35,000
SETP0805-100-CC	V	90	100	110	6	35,000

Notes:

1. T_{ind} = Typical indicating temperature: Typical temperature when device switches to indicating resistance (R_{ind})
2. Maximum post reflow resistance measured at 25°C in still air
3. R_{ind} = Indicating resistance when device reaches the indicating temperature (T_{ind})

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Electrical Characteristics

Part Number	I_{hold}^1 (A)	I_{trip}^2 (A)	V_{max}^3 (Vdc)	I_{max}^4 (A)	P_d^5 typ. (W)	Maximum Time-To-Trip		Resistance	
						Current (A)	Time (Sec.)	R_{min}^6 (Ω)	R_{1max}^7 (Ω)
SETP0805-100-SE	0.06	0.25	6	1	0.6	0.3	1	0.5	12
SETP0805-100-CC	0.075	0.30	6	1	0.6	0.3	5	0.5	6

Notes:

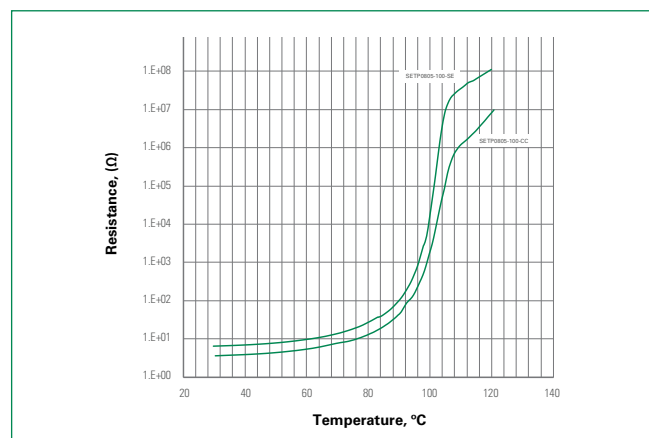
- I_{hold} = I_{hold} should be higher than Vconn requirements when used in a USB-C receptacle port
- I_{trip} = Trip current; minimum current at which the device will trip in 20°C still air
- V_{max} = Maximum voltage device can withstand without damage at rated current (I_{max})
- I_{max} = Maximum 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

6. R_{min} = Minimum resistance of device in initial (un-soldered) state7. R_{1max} = Maximum resistance of device at 20°C measured one hour after tripping or reflow Soldering of 260°C for 20 seconds

(Values specified were determined using PCBs with 0.115in x 1.0in ounce copper traces)

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

Resistance Vs. Temperature Curve



Environmental Specifications

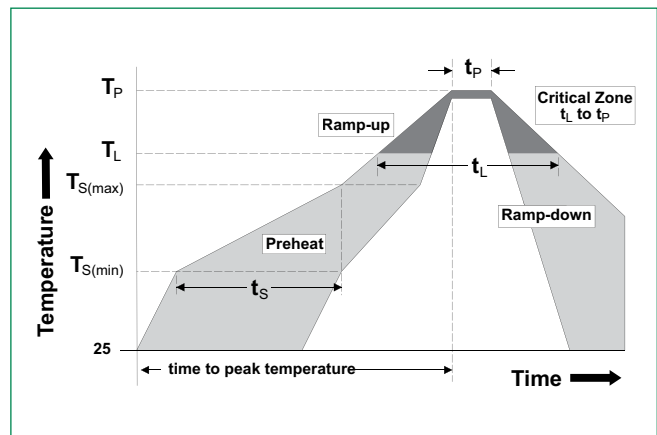
Operating Temperature	-40°C to +85°C
Maximum Device Surface Temperature in Tripped State	110°C
Passive Aging	+70°C 1000 hours ≤ R_{1max} after test
Humidity Aging	+60°C, 90% R.H., 1000 hours ≤ R_{1max} after test
Thermal Shock	MIL-STD-202, Method 215 No change -40°C to +85°C, 10 Cycles
Solvent Resistance	MIL-STD-202, Method 215 No change
Vibration	MIL-STD-883, Method 2007, Condition A No change
Moisture Sensitivity Level	Level 2a, J-STD-020

Physical Specifications

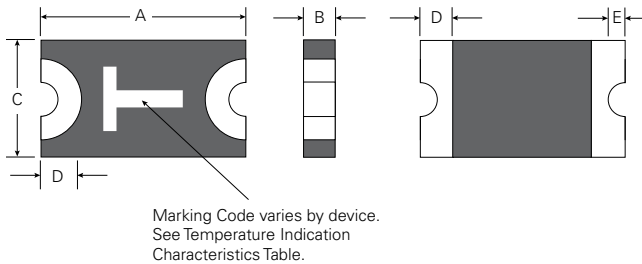
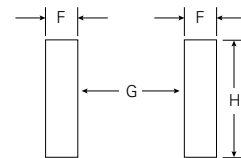
Terminal Material	Solder-Plated Copper (Solder Material: Matte Tin (Sn))
Lead Solderability	Meets EIA Specification RS186-9E, ANSI/J-STD-002, Category 3.

Soldering Parameters

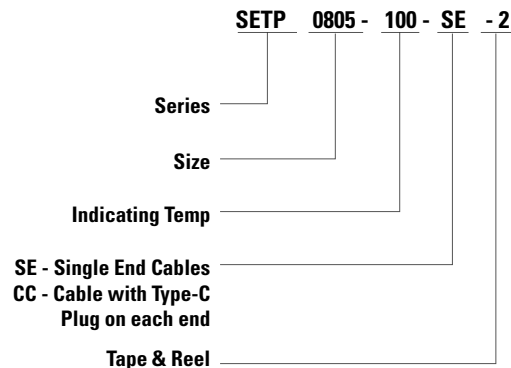
Profile Feature		Pb-Free Assembly
Average Ramp-Up Rate (T _{S(max)} to T _p)		3°C/second max
Pre Heat:	Temperature Min (T _{s(min)})	150°C
	Temperature Max (T _{s(max)})	200°C
	Time (Min to Max) (t _s)	60 – 120 secs
Time Maintained Above:	Temperature (T _L)	217°C
	Temperature (t _L)	60 – 150 seconds
Peak / Classification Temperature (T _p)		260 ^{+0/-5} °C
Time within 5°C of actual peak Temperature (t _p)		30 seconds max
Ramp-down Rate		2°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 (0.010 inch)
- Devices can be cleaned using standard industry methods and solvents
- Devices can be reworked using the standard industry practices

setP™**Temperature Indicators for USB Type-C****Dimensions****Product Dimensions****Solder Pad Layout**

Part Number	Device Dimension																Solder Pad									
	A				B				C				D				E				F		G		H	
	inch		mm		inch		mm		inch		mm		inch		mm		inch	mm	inch	mm	inch	mm	inch	mm		
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max	Max	inch	mm	inch	mm	inch	mm		
SETP0805-100-SE	0.079	0.087	2.00	2.20	0.017	0.024	0.43	0.60	0.051	0.059	1.30	1.50	0.010	0.030	0.25	0.75	0.003	0.076	0.039	1.00	0.047	1.20	0.059	1.50		
SETP0805-100-CC	0.079	0.087	2.00	2.20	0.014	0.024	0.35	0.60	0.051	0.059	1.30	1.50	0.010	0.030	0.25	0.75	0.003	0.076	0.039	1.00	0.047	1.20	0.059	1.50		

Part Ordering Number System**Packaging**

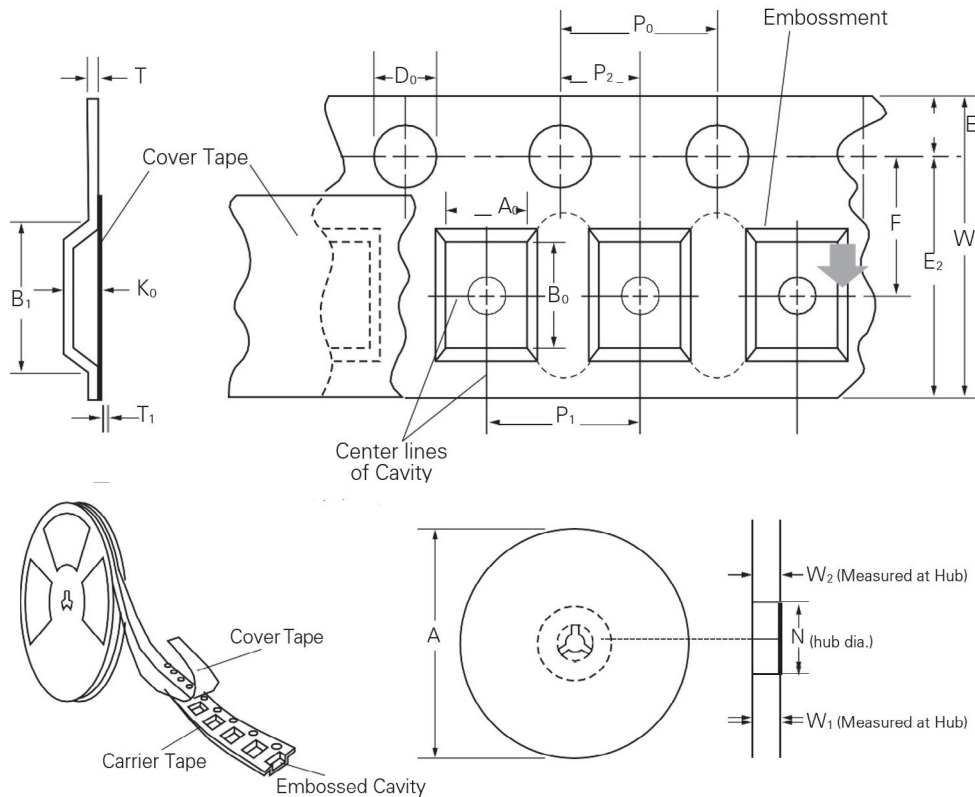
Part Number	Ordering Number	Minimum Order Quantity	Packaging Option	Quantity
SETP0805-100-SE	RF4795-000	20,000	Tape & Reel	4,000
SETP0805-100-CC	RF4819-000	20,000	Tape & Reel	4,000

Installation and Handling Guidelines

- 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.
- Hand-soldering of PTC devices on boards is generally not recommended. Users shall define and verify this process if needed.
- Consult Littelfuse when the device is to be applied with thermal processes other than reflow process on the circuit board, such as molding, encapsulation. User should evaluate molding materials used in the charging cable applications to ensure there are no adverse effect on the PTC devices.

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Tape and Reel Specifications

	SETP0805-100-SE
W	8.0 ± 0.30
P ₀	4.0 ± 0.10
P ₁	4.0 ± 0.10
P ₂	2.0 ± 0.05
A ₀	1.70 ± 0.10
B ₀	2.45 ± 0.10
B ₁ max.	4.35
D ₀	1.55 ± 0.05
F	3.50 ± 0.05
E ₁	1.75 ± 0.10
E ₂ min.	6.25
T max.	0.3
T ₁ max.	0.1
K ₀	0.86 ± 0.10
A max.	179
N min.	53.5
W ₁	9.5 ± 0.5
W ₂ max.	15

Standard Pack Quantity: 4,000 pcs
Minimum Order Quantity: 20,000 pcs

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