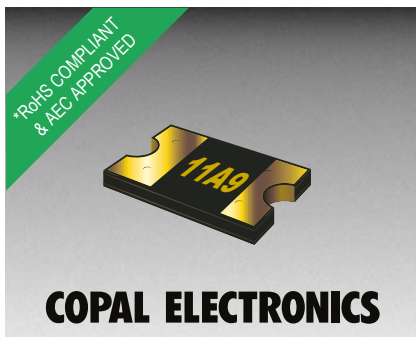




Features

- Compliant with AEC-Q200 Rev-C- Stress Test Qualification for Passive Components in Automotive Applications
- 100 % electrically compatible with all previous generations of 1812 SMT devices
- Compatible with Pb and Pb-free solder reflow profiles
- RoHS compliant* and halogen free**
- Surface mount packaging for automated assembly
- Agency recognition:   
- Standard 4532 mm (1812 mils) footprint
- Patents pending

PRCP-MSMF Series - Polymer Resettable Circuit Protectors

Electrical Characteristics

Model	V max. Volts	I max. Amps	I _{hold}	I _{trip}	Resistance		Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23°C		Ohms at 23°C		Amperes at 23°C	Seconds at 23°C	Watts at 23°C
			Hold	Trip	R _{Min.}	R _{1Max.}			Typ.
PRCP-MSMF010	60.0	40	0.10	0.30	0.70	15.00	0.5	1.50	0.8
PRCP-MSMF014	60.0	40	0.14	0.34	0.40	6.50	1.5	0.15	0.8
PRCP-MSMF020	30.0	80	0.20	0.40	0.40	6.00	6.0	0.06	0.8
PRCP-MSMF020/60***	60.0	40	0.20	0.40	0.40	6.00	1.5	0.15	0.8
PRCP-MSMF030	30.0	10	0.30	0.60	0.30	3.00	8.0	0.10	0.8
PRCP-MSMF050	15.0	100	0.50	1.00	0.15	1.00	8.0	0.15	0.8
PRCP-MSMF075	13.2	100	0.75	1.50	0.11	0.45	8.0	0.20	0.8
PRCP-MSMF075/24	24.0	40	0.75	1.50	0.11	0.45	8.0	0.20	0.8
PRCP-MSMF110	6.0	100	1.10	2.20	0.04	0.21	8.0	0.30	0.8
PRCP-MSMF110/16	16.0	100	1.10	2.20	0.04	0.21	8.0	0.30	0.8
PRCP-MSMF110/24X***	24.0	20	1.10	2.20	0.06	0.18	8.0	0.50	0.8
PRCP-MSMF125	6.0	100	1.25	2.50	0.035	0.14	8.0	0.40	0.8
PRCP-MSMF150	6.0	100	1.50	3.00	0.03	0.120	8.0	0.5	0.8
PRCP-MSMF150/24X	24.0	20	1.50	3.00	0.03	0.120	8.0	1.50	1.0
PRCP-MSMF160	8.0	100	1.60	2.80	0.035	0.099	8.0	2.0	0.8
PRCP-MSMF200	8.0	40	2.00	4.00	0.020	0.080	8.0	3.0	0.8
PRCP-MSMF250/16X***	16.0	100	2.50	5.00	0.015	0.100	8.0	5.0	1.2
PRCP-MSMF260	6.0	100	2.60	5.20	0.015	0.080	8.0	5.0	0.8

*** UL only

Environmental Characteristics

Operating 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.....	+85 °C to -40 °C, 20 times±10 % typical resistance change
Solvent Resistance.....	MIL-STD-202, Method 215No change
Vibration.....	MIL-STD-883C, Method 2007.1, Condition ANo change

Test Procedures And Requirements For Model PRCP-MSMF Series

Test	Test Conditions	Accept/Reject Criteria
Visual/Mech	Verify dimensions and materials.....	Per PRCP physical description
Resistance	In still air @ 23°C.....	R _{min} ≤ R ≤ R _{1max}
Time to Trip.....	At specified current, V _{max} , 23°C	T ≤ max.time to trip (seconds)
Hold Current	30 min at I _{hold}	No trip
Trip Cycle Life	V _{max} , I _{max} , 100 cycles.....	No arcing or burning
Trip Endurance	V _{max} , 48 hours.....	No arcing or burning
Solderability.....	ANSI/J-STD-002.....	95 % min. coverage

UL File Number.....E300792

CSA File Number.....CA1730526

TÜV Certificate Number.....R 50075506

*RoHS Directive 2002/95/EC Jan 27, 2003 including Annex.

**COPAL is using the definition that appears to be prevalent definition used as the industry standard at this time. The COPAL definition of "halogen-free" is:

Bromine(Br) content: ≤ 900 ppm; Chlorine(Cl) content: ≤ 900 ppm; Total Br + Cl content: ≤ 1500 ppm.

Specifications are subject to change without notice.

The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.

Users should verify actual device performance in their specific applications.

Applications

- Overcurrent and overtemperature protection of automotive electronics
- Hard disk drives
- PC motherboards
- PC peripherals
- Point-of-sale (POS) equipment
- PCMCIA cards
- USB port protection - USB 2.0, 3.0 & OTG
- HDMI 1.4 Source protection

PRCP-MSMF Series - Polymer Resettable Circuit Protectors

COPAL ELECTRONICS

Product Dimensions (see next page for outline drawings)

Model	A		B		C		D	Style
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
PRCP-MSMF010	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.70}{(0.028)}$	$\frac{1.10}{(0.043)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF014	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.70}{(0.028)}$	$\frac{1.10}{(0.043)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF020	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.70}{(0.028)}$	$\frac{1.10}{(0.043)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF020/60	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.70}{(0.028)}$	$\frac{1.10}{(0.043)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF030	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.70}{(0.028)}$	$\frac{1.10}{(0.043)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF050	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.55}{(0.022)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF075	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.55}{(0.022)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF075/24	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.55}{(0.022)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF110	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.45}{(0.018)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF110/16	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.45}{(0.018)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF110/24X	$\frac{4.37}{(0.172)}$	$\frac{4.83}{(0.190)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.70}{(0.028)}$	$\frac{1.60}{(0.063)}$	$\frac{0.30}{(0.012)}$	2
PRCP-MSMF125	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.55}{(0.022)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF150	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.55}{(0.022)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF150/24X	$\frac{4.37}{(0.172)}$	$\frac{4.83}{(0.190)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.70}{(0.028)}$	$\frac{1.60}{(0.063)}$	$\frac{0.30}{(0.012)}$	2
PRCP-MSMF160	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.55}{(0.022)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF200	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.55}{(0.022)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1
PRCP-MSMF250/16X	$\frac{4.37}{(0.172)}$	$\frac{4.83}{(0.190)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.70}{(0.028)}$	$\frac{1.60}{(0.063)}$	$\frac{0.30}{(0.012)}$	2
PRCP-MSMF260	$\frac{4.37}{(0.172)}$	$\frac{4.73}{(0.186)}$	$\frac{3.07}{(0.121)}$	$\frac{3.41}{(0.134)}$	$\frac{0.48}{(0.019)}$	$\frac{0.85}{(0.033)}$	$\frac{0.30}{(0.012)}$	1

Packaging:

PRCP-MSMF010 through PRCP-MSMF030 = 1500 pcs. per reel.

PRCP-MSMF050 through PRCP-MSMF200 & PRCP-MSMF260 = 2000 pcs. per reel.

PRCP-MSMF110/24X, PRCP-MSMF150/24X & PRCP-MSMF250/16X = 1500 pcs. per reel.

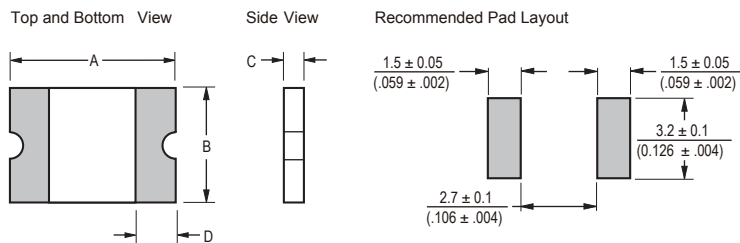
DIMENSIONS: $\frac{\text{MM}}{(\text{INCHES})}$

PRCP-MSMF Series - Polymer Resettable Circuit Protectors

COPAL ELECTRONICS

Product Dimensions (see previous page for dimensions)

Style 1

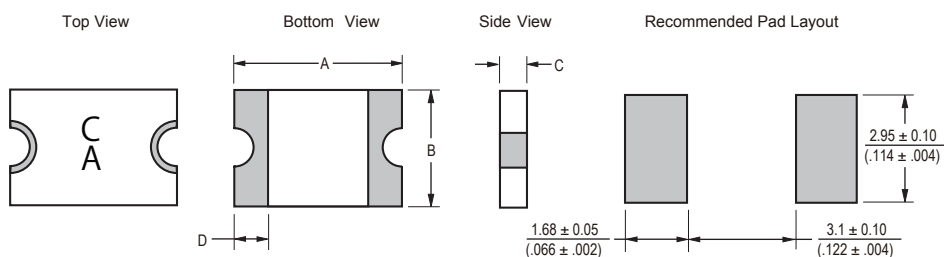


Terminal material:
Electroless Ni under immersion Au

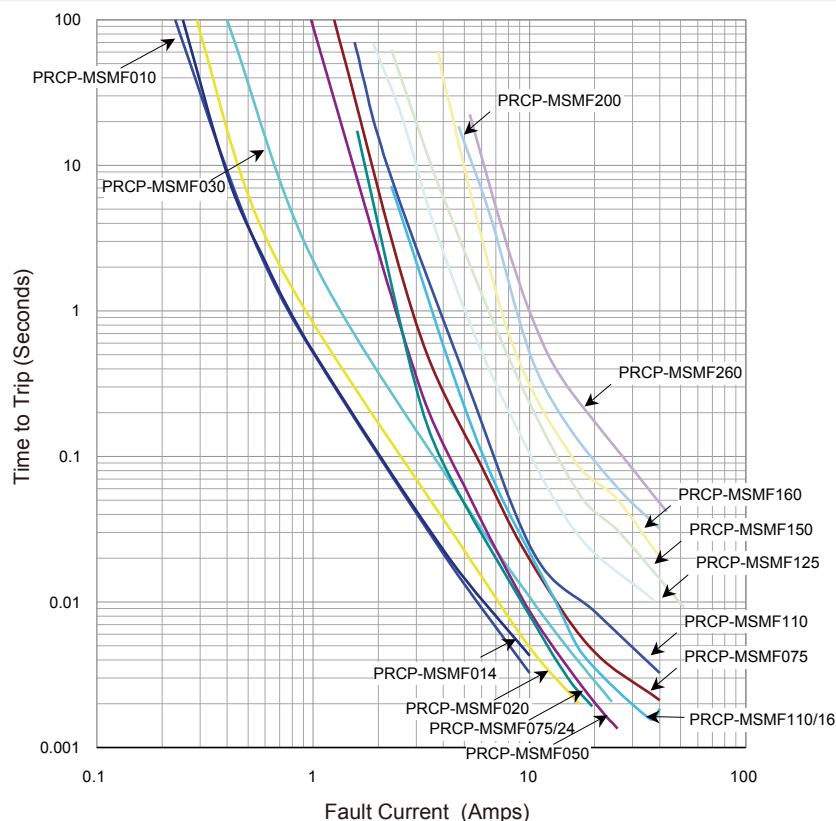
Termination pad solderability:
Standard Au finish:
Meets ANSI/J-STD-002 Category 2.

Recommended Storage:
40 °C max./70 % RH max.

Style 2



Typical Time to Trip at 23 °C



The Time to Trip curves represent typical performance of a device in a simulated application environment. Actual performance in specific customer applications may differ from these values due to the influence of other variables.

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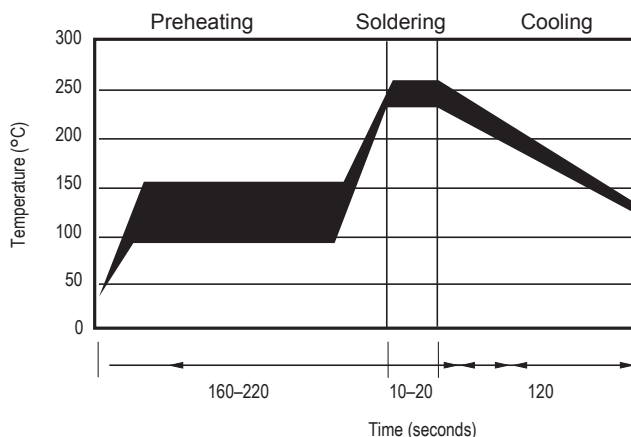
PRCP-MSMF Series - Polymer Resettable Circuit Protectors

COPAL ELECTRONICS

Thermal Derating Chart - I_{hold} / I_{trip} (Amps)

Model	Ambient Operating Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
PRCP-MSMF010	0.16 / 0.32	0.14 / 0.28	0.12 / 0.24	0.10 / 0.20	0.08 / 0.16	0.07 / 0.14	0.06 / 0.12	0.05 / 0.10	0.03 / 0.06
PRCP-MSMF014	0.23 / 0.52	0.19 / 0.45	0.17 / 0.40	0.14 / 0.34	0.12 / 0.29	0.10 / 0.25	0.09 / 0.23	0.08 / 0.21	0.06 / 0.16
PRCP-MSMF020	0.29 / 0.58	0.26 / 0.52	0.23 / 0.46	0.20 / 0.40	0.17 / 0.34	0.15 / 0.30	0.14 / 0.28	0.12 / 0.24	0.10 / 0.20
PRCP-MSMF020/60	0.29 / 0.58	0.26 / 0.52	0.23 / 0.46	0.20 / 0.40	0.17 / 0.34	0.15 / 0.30	0.14 / 0.28	0.12 / 0.24	0.10 / 0.20
PRCP-MSMF030	0.44 / 0.88	0.39 / 0.78	0.35 / 0.70	0.30 / 0.60	0.26 / 0.52	0.23 / 0.46	0.21 / 0.42	0.18 / 0.36	0.15 / 0.30
PRCP-MSMF050	0.77 / 1.54	0.68 / 1.36	0.59 / 1.18	0.50 / 1.00	0.44 / 0.88	0.40 / 0.80	0.37 / 0.74	0.33 / 0.66	0.29 / 0.58
PRCP-MSMF075	1.15 / 2.30	1.01 / 2.02	0.88 / 1.76	0.75 / 1.50	0.65 / 1.30	0.60 / 1.20	0.55 / 1.10	0.49 / 0.98	0.43 / 0.86
PRCP-MSMF075/24	1.15 / 2.30	1.01 / 2.02	0.88 / 1.76	0.75 / 1.50	0.65 / 1.30	0.60 / 1.20	0.55 / 1.10	0.49 / 0.98	0.43 / 0.86
PRCP-MSMF110	1.59 / 3.18	1.43 / 2.86	1.26 / 2.52	1.10 / 2.20	0.95 / 1.90	0.87 / 1.74	0.80 / 1.60	0.71 / 1.42	0.60 / 1.20
PRCP-MSMF110/16	1.59 / 3.18	1.43 / 2.86	1.26 / 2.52	1.10 / 2.20	0.95 / 1.90	0.87 / 1.74	0.80 / 1.60	0.71 / 1.42	0.60 / 1.20
PRCP-MSMF110/24X	2.00 / 4.00	1.70 / 3.40	1.40 / 2.80	1.10 / 2.20	0.95 / 1.90	0.88 / 1.76	0.80 / 1.60	0.73 / 1.46	0.61 / 1.22
PRCP-MSMF125	1.80 / 3.61	1.63 / 3.25	1.43 / 2.86	1.25 / 2.50	1.08 / 2.16	0.99 / 1.98	0.91 / 1.82	0.81 / 1.62	0.68 / 1.36
PRCP-MSMF150	2.17 / 4.34	1.95 / 3.90	1.72 / 3.44	1.50 / 3.00	1.30 / 2.59	1.18 / 2.37	1.09 / 2.18	0.97 / 1.94	0.82 / 1.64
PRCP-MSMF150/24X	2.10 / 4.20	1.90 / 3.80	1.70 / 3.40	1.50 / 3.00	1.25 / 2.50	1.13 / 2.26	1.00 / 2.00	0.88 / 1.76	0.69 / 1.38
PRCP-MSMF160	2.30 / 5.00	2.20 / 4.40	1.90 / 3.80	1.60 / 2.80	1.45 / 2.90	1.30 / 2.60	1.15 / 2.30	1.03 / 2.06	0.91 / 1.82
PRCP-MSMF200	3.08 / 5.40	2.71 / 4.74	2.35 / 4.11	2.00 / 3.50	1.80 / 3.15	1.60 / 2.80	1.50 / 2.63	1.40 / 2.40	1.25 / 2.10
PRCP-MSMF250/16X	3.85 / 7.70	3.45 / 6.90	3.00 / 6.00	2.50 / 5.00	2.05 / 4.10	1.85 / 3.70	1.75 / 3.50	1.30 / 2.60	1.10 / 2.20
PRCP-MSMF260	4.00 / 7.98	3.52 / 7.01	3.06 / 6.09	2.60 / 5.15	2.34 / 4.64	2.08 / 4.13	1.95 / 3.87	1.39 / 2.74	1.04 / 2.05

Solder Reflow Recommendations



Notes:

- PRCP-MSMF models cannot be wave soldered. Please contact COPAL ELECTRONICS for hand soldering recommendations.
- If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.
- Compatible with Pb and Pb-free solder reflow profiles.

How to Order

PRCP - MSMF 075/24 - 2 C

Product Designator

Series

MSMF = 4532 mm (1812 mils) Surface Mount Component

Hold Current, I_{hold}

010-260 (0.10 Amps - 2.60 Amps)

Higher Voltage Option

= Standard Voltage

/16 = 16 Volt Rated

/24 = 24 Volt Rated

/60 = 60 Volt Rated

X = Product Shape

Packaging

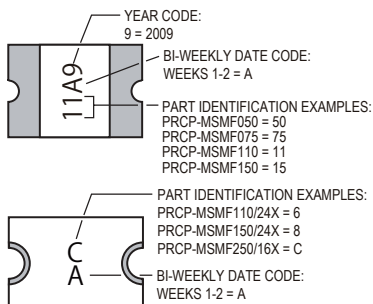
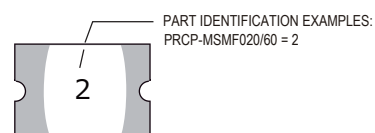
Packaged per EIA 481-1

-2 = Tape and Reel

Halogen Free

Typical Part Marking

Represents total content. Layout may vary.



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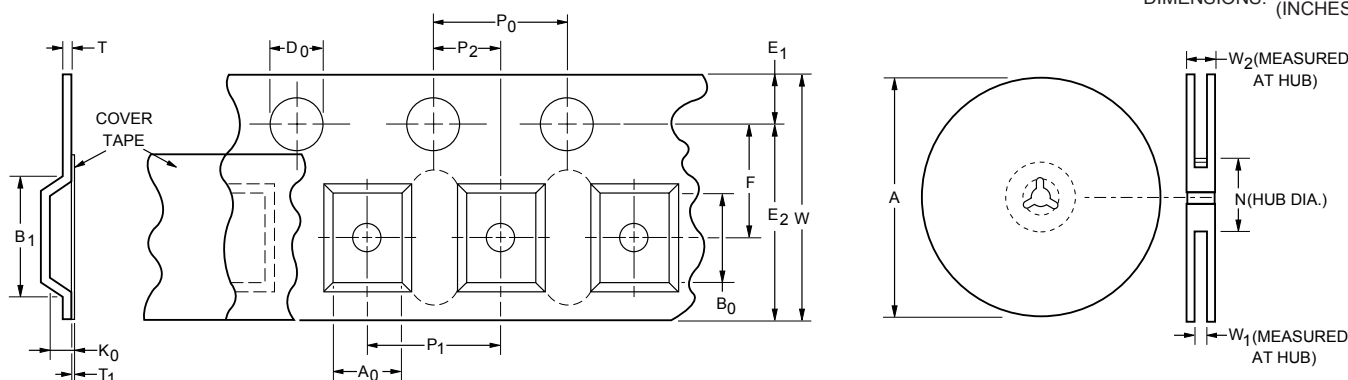
Users should verify actual device performance in their specific applications.

PRCP-MSMF Series Tape and Reel Specifications

COPAL ELECTRONICS

Tape Dimensions	PRCP-MSMF010- PRCP-MSMF030 per EIA-481-1	PRCP-MSMF050- PRCP-MSMF260 per EIA 481-1	PRCP-MSMF110/24X PRCP-MSMF150/24X PRCP-MSMF250/16X per EIA 481-1
W	12.0 ± 0.30 (0.472 ± 0.012)	12.0 ± 0.30 (0.472 ± 0.012)	12.0 ± 0.30 (0.472 ± 0.012)
P ₀	4.0 ± 0.10 (0.157 ± 0.004)	4.0 ± 0.10 (0.157 ± 0.004)	4.0 ± 0.10 (0.157 ± 0.004)
P ₁	8.0 ± 0.10 (0.315 ± 0.004)	8.0 ± 0.10 (0.315 ± 0.004)	8.0 ± 0.10 (0.315 ± 0.004)
P ₂	2.0 ± 0.05 (0.079 ± 0.002)	2.0 ± 0.05 (0.079 ± 0.002)	2.0 ± 0.05 (0.079 ± 0.002)
A ₀	3.66 ± 0.15 (0.144 ± 0.004)	3.66 ± 0.15 (0.144 ± 0.006)	3.70 ± 0.10 (0.146 ± 0.004)
B ₀	4.93 ± 0.10 (0.194 ± 0.004)	4.98 ± 0.10 (0.196 ± 0.004)	5.10 ± 0.10 (0.200 ± 0.004)
B ₁ max.	5.9 (0.232)	5.9 (0.232)	5.9 (0.232)
D ₀	1.5 + 0.10/-0.0 (0.059 + 0.004/-0)	1.5 + 0.10/-0.0 (0.059 + 0.004/-0)	1.5 + 0.10/-0.0 (0.059 + 0.004/-0)
F	5.5 ± 0.05 (0.217 ± 0.002)	5.5 ± 0.05 (0.217 ± 0.002)	5.5 ± 0.05 (0.217 ± 0.002)
E ₁	1.75 ± 0.10 (0.069 ± 0.004)	1.75 ± 0.10 (0.069 ± 0.004)	1.75 ± 0.10 (0.069 ± 0.004)
E ₂ min.	10.25 (0.404)	10.25 (0.404)	10.25 (0.404)
T max.	0.6 (0.024)	0.6 (0.024)	0.6 (0.024)
T ₁ max.	0.1 (0.004)	0.1 (0.004)	0.1 (0.004)
K ₀	1.30 ± 0.10 (0.051 ± 0.004)	0.95 ± 0.10 (0.037 ± 0.004)	1.50 ± 0.10 (0.059 ± 0.004)
Leader min.	390 (15.35)	390 (15.35)	390 (15.35)
Trailer min.	160 (6.30)	160 (6.30)	160 (6.30)
Reel Dimensions			
A max.	185 (7.28)	185 (7.28)	185 (7.28)
N min.	50 (1.97)	50 (1.97)	50 (1.97)
W ₁	12.4 + 2.0/-0.0 (0.488 + 0.079/-0.0)	12.4 + 2.0/-0.0 (0.488 + 0.079/-0.0)	12.4 + 2.0/-0.0 (0.488 + 0.079/-0.0)
W ₂ max.	18.4 (0.724)	18.4 (0.724)	18.4 (0.724)

DIMENSIONS: ^{MM}
(INCHES)



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Revision History

Date	Rev.	Reason
11/02/2005	A	Initial issue
11/04/2005	B	Updated Typical Part Marking
12/12/2005	C	Updated UL, CSA, TÜV File Number
02/08/2008	D	Updated Product Dimensions
01/14/2009	E	Updated How to Order
04/21/2009	F	Updated Typical Part Marking
08/31/2009	G	Updated Electrical Characteristics and Thermal Derating Chart MSMF250/16 was changed to MSMF250/16X
04/06/2010	H	Updated packaging Quantityof reel for MSMF250/16X was changed from 1000 pcs. per reel to 1500 pcs. per reel.
04/26/2010	I	Added MSMF020/60 & MSMF150/24X model
10/31/2011	J	Added MSMF110/24X model
12/19/2013	K	Updated Product Dimensions
02/20/2014	L	Added the acquisition of UL in MSMF020/60
03/28/2014	M	Added the acquisition of CSA, TUV in MSMF150/24X
05/01/2014	N	MSMF020/60 model Updated Typical Part Marking
07/21/2015	O	Updated Features and TTT curve.

Revision : O
Issue date : 07/21/15

PRCP-MSMF SERIES