Bourns® Multifuse® Automotive Brochure

Polymeric PTC Thermistors for Automotive Overcurrent Solutions

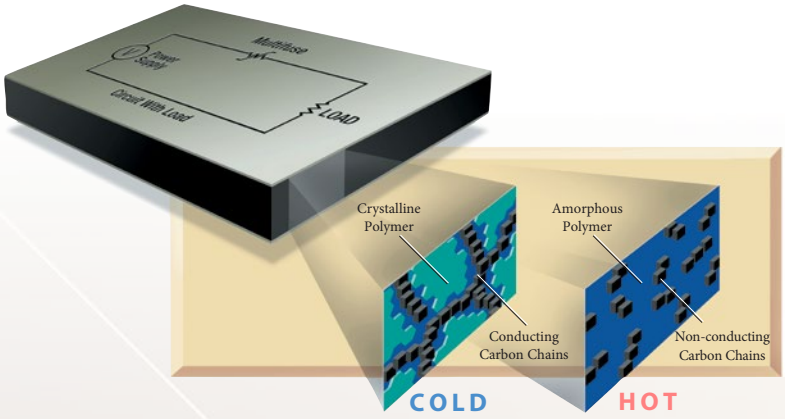
70TH ANNIVERSARY BOURNS® 1947 ★ 2017

Introduction

Multifuse® Products – What They Are

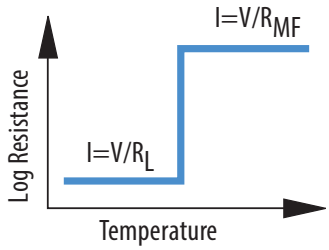
The Bourns® Multifuse® family of Polymeric Positive Temperature Coefficient (PPTC) Resettable Fuses are used in a wide variety of circuit protection applications. Under fault conditions the device resistance will rise exponentially and remain in a "tripped" state, providing continuous circuit protection until the fault is removed. Once the fault is removed, the power cycled through the device will return to its normal low resistance state.

Multifuse® Products – How They Work



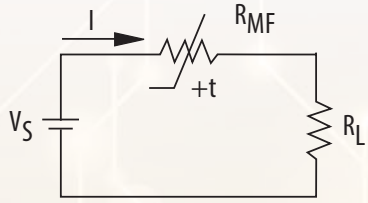
Resettable fuses are manufactured in the form of a conductive plastic, which is comprised of a non-conductive crystalline polymer with highly conductive carbon black particles impregnated throughout the crystal lattice. Because of the close proximity of the carbon black particles within the crystal lattice, under normal conditions current is allowed to flow easily through the conductive plastic. However, under a fault condition when there is an increase in current, the conductive plastic heats at the rate of I^2R. As the material continues to heat, it eventually reaches the phase transformation temperature, which changes the crystal structure into an amorphous structure. Once the material has transformed into this amorphous structure, the conductive particles become isolated and are unable to conduct current hence the drastic change in material resistance. It is only when the current is removed that the material is allowed to cool and return to its original crystal structure.

Multifuse® Products – How They Are Used



PTC Response Characteristic

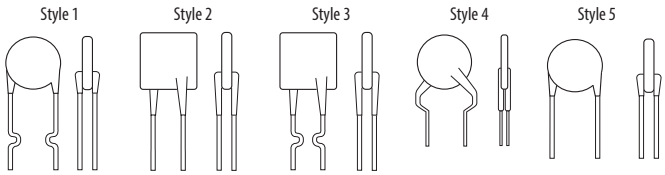
It is the materials used in resettable fuses that allow them to reset after a fault condition has been removed. Resettable fuses exhibit a positive temperature coefficient effect when heated. While many materials exhibit a PTC effect when heated (an increase in resistance in response to a positive change in temperature), what makes the material used in resettable fuses unique is the fact that the increase in resistance changes exponentially rather than in a linear manner.



Typical Circuit Application

It is because of this transformation from a low resistance state to a high resistance state that allows the resettable fuse to protect loads. It is this transition from the low resistance state to high resistance state that is referred to as tripping. The time it takes for a resettable fuse to trip is relatively quick, depending on how high the fault current is and it can be as quick as a fraction of a second. Hence they are an excellent form of protection for most applications where sensitive devices need extra protection.

Radial Leaded Low Voltage Products



MF-R Series
Radial Leaded 16 ~ 60 Volts

Operating Temperature
-40 °C ~ 85 °C

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Nom.	Style
MF-R005	0.05	60	40	7.3	22.0	8.0 (0.315)	8.3 (0.327)	5.1 (0.201)	4
MF-R010	0.10	60	40	2.50	7.50	7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-R017	0.17	60	40	2.00	8.00	7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-R020	0.20	60	40	1.50	4.40	7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-R025	0.25	60	40	1.00	3.00	7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-R030	0.30	60	40	0.76	2.10	7.4 (0.291)	13.4 (0.528)	5.1 (0.201)	1
MF-R040	0.40	60	40	0.52	1.29	7.4 (0.291)	13.7 (0.539)	5.1 (0.201)	1
MF-R050	0.50	60	40	0.41	1.17	7.9 (0.311)	13.7 (0.539)	5.1 (0.201)	1
MF-R065	0.65	60	40	0.27	0.72	9.7 (0.382)	15.2 (0.598)	5.1 (0.201)	1
MF-R075	0.75	60	40	0.18	0.60	10.4 (0.409)	16.0 (0.630)	5.1 (0.201)	1
MF-R090	0.90	60	40	0.14	0.47	11.7 (0.461)	16.7 (0.657)	5.1 (0.201)	1
MF-R090-0-9	0.90	30	40	0.07	0.22	7.4 (0.291)	12.2 (0.480)	5.1 (0.201)	3
MF-R110	1.10	30	40	0.10	0.27	8.9 (0.350)	14.0 (0.551)	5.1 (0.201)	1
MF-R135	1.35	30	40	0.065	0.17	8.9 (0.350)	18.9 (0.744)	5.1 (0.201)	1
MF-R160	1.60	30	40	0.055	0.15	10.2 (0.402)	16.8 (0.661)	5.1 (0.201)	1
MF-R185	1.85	30	40	0.040	0.11	12.0 (0.472)	18.4 (0.724)	5.1 (0.201)	1
MF-R250	2.50	30	40	0.025	0.07	12.0 (0.472)	18.3 (0.720)	5.1 (0.201)	2
MF-R250-0-10	2.50	30	40	0.025	0.07	12.0 (0.472)	18.3 (0.720)	5.1 (0.201)	3
MF-R300	3.00	30	40	0.020	0.08	12.0 (0.472)	18.3 (0.720)	5.1 (0.201)	2
MF-R400	4.00	30	40	0.010	0.05	14.4 (0.567)	24.8 (0.976)	5.1 (0.201)	2
MF-R500	5.00	30	40	0.010	0.05	17.4 (0.685)	24.9 (0.980)	10.2 (0.402)	2
MF-R600	6.00	30	40	0.005	0.04	19.3 (0.760)	31.9 (1.256)	10.2 (0.402)	2
MF-R700	7.00	30	40	0.005	0.03	22.1 (0.870)	29.8 (1.173)	10.2 (0.402)	2
MF- R800	8.0	30	40	0.005	0.03	24.2 (0.953)	32.9 (1.295)	10.2 (0.402)	2
MF-R900	9.00	30	40	0.005	0.02	24.2 (0.953)	32.9 (1.295)	10.2 (0.402)	2
MF-R1100	11.00	16	100	0.003	0.014	24.2 (0.953)	32.9 (1.295)	10.2 (0.402)	2

MF-RHT Series
Radial Leaded High Temperature

Operating Temperature
-40 °C ~ 125 °C

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Nom.	Style
MF-RHT050	0.5	30	40	0.48	1.100	7.4 (0.291)	12.7 (0.500)	5.1 ±0.7 (0.201 ±0.028)	3
MF-RHT070	0.7	16	40	0.3	0.8	6.86 (0.27)	10.8 (0.425)	5.1 ±0.7 (0.201 ±0.028)	3
MF-RHT200	2.0	16	100	0.045	0.110	9.40 (0.37)	14.0 (0.55)	5.1 ±0.7 (0.201 ±0.028)	3
MF-RHT200/32	2.0	32	50	0.045	0.110	9.40 (0.37)	14.0 (0.55)	5.1 ±0.7 (0.201 ±0.028)	3
MF-RHT450	4.5	16	100	0.022	0.054	10.4 (0.41)	15.6 (0.61)	5.1 ±0.7 (0.201 ±0.028)	2
MF-RHT650	6.5	16	100	0.011	0.026	12.7 (0.5)	22.2 (0.88)	5.1 ±0.7 (0.201 ±0.028)	2
MF-RHT750	7.5	16	100	0.0094	0.022	14 (0.55)	23.5 (0.93)	5.1 ±0.7 (0.201 ±0.028)	2
MF-RHT1300	13	16	100	0.0041	0.01	23.5 (0.925)	28.7 (1.17)	10.2 ± 0.7 (0.402 ±0.028)	2

MF-RG Series
Radial Leaded 16 V

Operating Temperature
-40 °C ~ 85 °C

Model	I_{hold} Amperes at 23 °C	V max. Volts	Initial I max. Amps	1 Hour (R_1) Resistance Ohms at 23 °C Min.	Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Nom.	Style
MF- RG300	3.0	16	100	38	64.5	7.1 (0.28)	11.0 (0.443)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG400	4.0	16	100	21	38.5	8.9 (0.35)	12.8 (0.443)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG500	5.0	16	100	15	23	10.4 (0.409)	14.3 (0.563)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG600	6.0	16	100	10	18.5	10.7 (0.421)	17.1 (0.673)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG650	6.5	16	100	8.8	15.8	11.24 (0.441)	19.7 (0.776)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG700	7.0	16	100	7.7	13.0	11.2 (0.441)	19.7 (0.776)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG800	8.0	16	100	5.6	11	12.7 (0.500)	20.9 (0.823)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG900	9.0	16	100	4.7	9.2	14.0 (0.551)	21.7 (0.854)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG1000	10.0	16	100	4.0	7.1	16.5 (0.650)	21.7 (0.854)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG1100	11.0	16	100	3.7	6.2	17.5 (0.689)	26 (1.024)	5.1 ±0.7 (0.201 ±0.028)	2

MF-RX/72 Series
Radial Leaded 72V

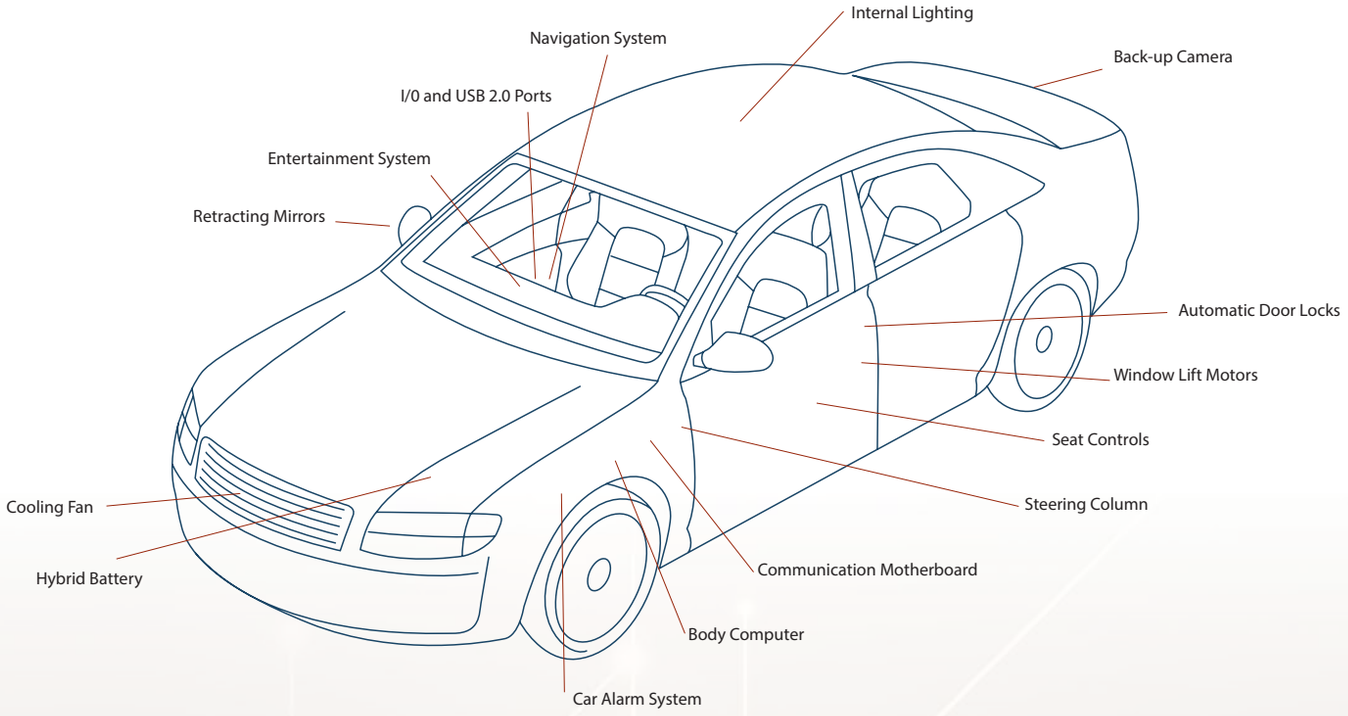
Operating Temperature
-40 °C ~ 85 °C

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Nom.	Style
MF-RX110/72	1.1	72	40	0.15	0.38	10.84 (0.427)	16.8 (0.661)	5.1 ±0.7 (0.201 ±0.028)	2
MF-RX135/72	1.35	72	40	0.12	0.30	12.26 (0.483)	18.3 (0.720)	5.1 ±0.7 (0.201 ±0.028)	2
MF-RX160/72	1.60	72	40	0.09	0.22	13.94 (0.549)	19.9 (0.785)	5.1 ±0.7 (0.201 ±0.028)	2
MF-RX185/72	1.85	72	40	0.08	0.19	15.18 (0.598)	21.2 (0.834)	5.1 ±0.7 (0.201 ±0.028)	2
MF-RX250/72	2.50	72	40	0.05	0.13	17.84 (0.702)	23.8 (0.939)	10.2 ±0.7 (0.402 ±0.028)	2
MF-RX300/72	3.00	72	40	0.04	0.10	20.67 (0.814)	26.7 (1.050)	10.2 ±0.7 (0.402 ±0.028)	2
MF-RX375/72	3.75	72	40	0.03	0.08	23.51 (0.926)	29.6 (1.162)	10.2 ±0.7 (0.402 ±0.028)	2

Bourns® Automotive Multifuse® Products

As the number of electronic safety, comfort control, and power management systems has increased, the need for integrated reliable circuit protection solutions has evolved into a critical design feature on all new automotive platforms.

Bourns has developed its line of Multifuse® Polymeric PTC (PPTC) Resettable Fuses to help automotive manufacturers and designers meet this need. Typical examples of automotive electronic circuits in which Bourns® Multifuse® products are used include:



Resettable Overcurrent Protection

Resettable overcurrent protection offers greater reliability, longer part life and Multifuse® Polymeric PTC Resettable Fuses can be located close to the load being protected instead of traditionally locating fuses in a fuse box.

IATF16949 Certified

The Bourns production facility for Multifuse® PPTC Resettable Fuses is certified to IATF16949. Together with ISO 9001:IATF16949 specifies the quality system requirements for the design, development, production, installation and servicing of automotive related products.

AEC Certification

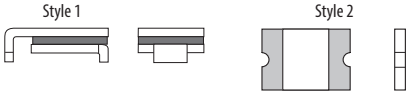
The Bourns® Multifuse® family of Polymeric Positive Temperature Coefficient Resettable Fuses can be certified to AEC-Q200-Rev D. This specification defines the stress test requirements and reference test conditions for qualification of passive electrical devices in automotive applications as defined by a committee of automotive companies.

RoHS Compliant*

All Bourns® Multifuse® Polymeric Positive Temperature Coefficient Resettable Fuses are RoHS compliant* as standard.

**RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.*

Surface Mount Low Voltage Products



MF-SMHT Series (2920 & 3425 package) Surface Mount High Temperature

Operating Temperature -40 °C ~ 125 °C

Model	Ihold Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R1) Post-Trip Resistance	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-SMHT136	1.36	16	100	0.085	0.33		7.98 (0.314)	3 (0.118)	5.44 (0.214)	1
MF-SMHT160	1.60	16	100	0.050	0.15		9.5 (0.374)	3 (0.118)	6.71 (0.264)	1

MF-SM Series (2920 & 3425 package) Surface Mount

Operating Temperature -40 °C ~ 85 °C

Model	Ihold Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R1) Post-Trip Resistance	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-SM030	0.30	60	40	0.9	4.80		7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	1
MF-SM050	0.50	60	40	0.35	1.40		7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	1
MF-SM075	0.75	30	80	0.23	1.00		7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	1
MF-SM075/60	0.75	60	10	0.23	1.00		7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	1
MF-SM100	1.10	30	80	0.12	0.48		7.98 (0.314)	3 (0.118)	5.44 (0.214)	1
MF-SM100/33	1.10	33	40	0.12	0.41		7.98 (0.314)	3 (0.118)	5.44 (0.214)	1
MF-SM125	1.25	15	100	0.07	0.25		7.98 (0.314)	3 (0.118)	5.44 (0.214)	1
MF-SM150	1.50	15	100	0.06	0.25		9.5 (0.374)	3 (0.118)	6.71 (0.264)	1
MF-SM150/33	1.50	33	40	0.06	0.23		9.5 (0.374)	3 (0.118)	6.71 (0.264)	1
MF-SM200	2.00	15	100	0.045	0.125		9.5 (0.374)	3 (0.118)	6.71 (0.264)	1
MF-SM250	2.50	15	100	0.024	0.085		9.5 (0.374)	3 (0.118)	6.71 (0.264)	1

MF-SMDF Series (2018 package) Surface Mount

Operating Temperature -40 °C ~ 85 °C

Model	Ihold Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R1) Post-Trip Resistance	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-SMDF030	0.30	60	20	0.45	2.150		5.44 (0.214)	4.93 (0.194)	1.09 (0.043)	2
MF-SMDF050	0.55	60	10	0.20	1.0		5.44 (0.214)	4.93 (0.194)	1.09 (0.043)	2
MF-SMDF100/33X	1.00	32	50	0.45	0.110		5.44 (0.214)	4.93 (0.194)	1.25 (0.049)	2
MF-SMDF150	1.50	15	40	0.7	0.17		5.44 (0.214)	4.93 (0.194)	0.85 (0.033)	2
MF-SMDF260/24X	2.60	32	50	0.45	0.110		5.44 (0.214)	4.93 (0.194)	2.00 (0.079)	2

MF-MSMF Series (1812 package) Surface Mount

Operating Temperature -40 °C ~ 85 °C

Model	Ihold Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R1) Post-Trip Resistance	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-MSMF010	0.10	60	40	0.70	15.0		4.73 (0.186)	3.41 (0.134)	1.1 (0.043)	2
MF-MSMF014	0.14	60	40	0.40	6.50		4.73 (0.186)	3.41 (0.134)	1.1 (0.043)	2
MF-MSMF020	0.20	30	80	0.40	6.00		4.73 (0.186)	3.41 (0.134)	1.1 (0.043)	2
MF-MSMF030	0.30	30	10	0.30	3.00		4.73 (0.186)	3.41 (0.134)	1.1 (0.043)	2
MF-MSMF050	0.50	15	100	0.15	1.00		4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF075	0.75	13.2	100	0.11	0.45		4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF075/24	0.75	24	40	0.11	0.45		4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF110/16	1.10	16	100	0.04	0.21		4.73 (0.186)	3.41 (0.134)	0.75 (0.03)	2
MF-MSMF250/16	2.50	16	100	0.015	0.1		4.73 (0.186)	3.41 (0.134)	2.0 (0.078)	2

MF-USHT Series (1210 package) Surface Mount/High Temperature

0.35 - 0.50 Amps Hold Current (Working Temp: -40 °C ~ +125 °C)

Model	Ihold Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R1) Post-Trip Resistance	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-USHT035KX	0.35	30	80	0.4	2.2		3.43 (0.135)	2.80 (0.110)	0.85 (0.033)	2
MF-USHT050KX	0.50	30	80	0.3	1.6		3.43 (0.135)	2.80 (0.110)	0.85 (0.033)	2

MF-NSMF Series (1206 package) Surface Mount

Operating Temperature -40 °C ~ 85 °C

Model	Ihold Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R1) Post-Trip Resistance	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-NSMF012	0.12	30	10	1.35	8.5		3.4 (0.134)	1.8 (0.071)	1.1 (0.043)	2
MF-NSMF020	0.2	24	10	0.6	2.6		3.4 (0.134)	1.8 (0.071)	0.85 (0.033)	2
MF-NSMF050	0.5	13.2	100	0.15	0.70		3.4 (0.134)	1.8 (0.071)	0.85 (0.033)	2

MF-NSHT Series (1206 package) Surface Mount/High Temperature

0.16 - 0.35 Amps Hold Current (Working Temp: -40 °C ~ +125 °C)

Model	Ihold Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R1) Post-Trip Resistance	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-NSHT016KX	0.16	30	20	0.7	6.0		3.40 (0.134)	1.80 (0.071)	0.85 (0.033)	2
MF-NSHT035KX	0.35	30	20	0.4	2.6		3.40 (0.134)	1.80 (0.071)	0.85 (0.033)	2

MF-PSHT Series (0805 package) Surface Mount/High Temperature

0.35 - 0.50 Amps Hold Current (Working Temp: -40 °C ~ +125 °C)

Model	Ihold Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R1) Post-Trip Resistance	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-PSHT010X	0.10	16	40	1.00	12.00		2.30 (0.091)	1.50 (0.059)	0.80 (0.031)	2

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