

Thin Film Chip Fuses



MFU Thin Film Chip Fuses are the perfect choice for the most fields of modern electronics. The highly controlled manufacturing thin film process guarantees an outstanding stability of fusing characteristics. Typical applications include information technology, telecommunication, medical equipment, industrial, audio/video, and automotive electronics.

FEATURES

- Advanced thin film technology
- Very quick acting fuse characteristics
- Outstanding stability of fusing characteristics
- Green product, supports lead (Pb)-free soldering
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Information technology
- Industrial electronics
- Automotive electronics
- Telecommunication
- Medical equipment
- Audio/video electronics

SIZE

| INCH | 0402 | 0603 | 0805 | 1206 |
|--------|-------|-------|-------|-------|
| METRIC | 1005M | 1608M | 2012M | 3216M |

TECHNICAL SPECIFICATIONS

| DESCRIPTION | MFU 0402 | MFU 0603 | MFU 0805 | MFU 1206 |
|--|---------------------------------|------------------------------------|---------------------------------|------------------------------------|
| Metric size | 1005M | 1608M | 2012M | 3216M |
| Rated current range I_R | 0.5 A to 3.15 A | 0.5 A to 5.0 A | 0.5 A to 5.0 A | 0.5 A to 6.3 A |
| Rated voltage, U_{max} . DC | 32 V | 32 V | 32 V | 63 V |
| Breaking Capacity, I_{max} . at U_{max} . DC | 50 A at 32 V | 50 A at 32 V | 50 A at 32 V | 50 A at 63 V |
| Voltage drop at $1 \times I_R$ | 90 mV to 368 mV | 85 mV to 361 mV | 98 mV to 374 mV | 116 mV to 433 mV |
| Cold resistance at $0.1 \times I_R$ | 22 m Ω to 560 m Ω | 13 m Ω to 550 m Ω | 15 m Ω to 570 m Ω | 14 m Ω to 660 m Ω |
| Permissible film temperature, $\vartheta_{F max}$. | 125 °C | | | |
| Operating temperature range | - 55 °C to 125 °C | | | |
| Permissible continuous current rating at $\vartheta_{amb} = 23$ °C | 0.7 $\times I_R$ | | | |
| Approval UL recognition file | E253806 | | | |
| Approval IEC 60127-4 | n/a | Refer to table: MFU 0603 RATING | | Refer to table: MFU 1206 RATING |
| FIT _{observed} | $\leq 0.2 \times 10^{-9}/h$ | | | |



PART NUMBER AND PRODUCT DESCRIPTION (1)

Part Number: MFU0603FF0100PW00

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M | F | U | 0 | 6 | 0 | 3 | F | F | 0 | 1 | 0 | 0 | 0 | P | W | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | |
|--|------------------------|---|----------------------------------|---------------------------------|
| MODEL/SIZE | FUSING CHARACTERISTIC | RATED CURRENT | PACKAGING (2) | SPECIAL |
| MFU0402 MFU0603 MFU0805 MFU1206 | FF = Very quick acting | Examples: 0.5 A = 00500 1.0 A = 01000 6.3 A = 06300 | E1 E5 E0 P1 P5 PW | Up to 2 digits 00 = Standard |

Product Description: MFU 0603 -FF PW 1A0

| | | | | |
|-------|------------------------------|------------------------|----------------------------------|---|
| MFU | 0603 | -FF | PW | 1A0 |
| MODEL | SIZE | FUSING CHARACTERISTIC | PACKAGING (2) | RATED CURRENT |
| MFU | 0402 0603 0805 1206 | FF = Very quick acting | E1 E5 E0 P1 P5 PW | Examples: 0.5 A = 0A5 1.0 A = 1A0 6.3 A = 6A3 |

Notes

- (1) Products can be ordered using either the PART NUMBER or the PRODUCT DESCRIPTION
- (2) Please refer to table PACKAGING

| PACKAGING | | | | | | | | |
|-----------|------|----------|---|-------|---|---------------|-----|------------|
| TYPE | CODE | QUANTITY | CARRIER TAPE | WIDTH | PITCH | REEL DIAMETER | | |
| MFU 0402 | E1 | 1000 | Card board tape acc. IEC 60286-3 Type I | 8.0 | 2.0 | 180 mm/7" | | |
| | E5 | 5000 | | | | | | |
| | E0 | 10 000 | | | | | | |
| MFU 0603 | P1 | 1000 | | | Card board tape acc. IEC 60286-3 Type I | 8.0 | 4.0 | 180 mm/7" |
| | P5 | 5000 | | | | | | 330 mm/13" |
| | PW | 20 000 | | | | | | 180 mm/7" |
| MFU 0805 | P1 | 1000 | | | | | | 330 mm/13" |
| | P5 | 5000 | | | | | | 180 mm/7" |
| | PW | 20 000 | | | | | | 330 mm/13" |
| MFU 1206 | P1 | 1000 | 180 mm/7" | | | | | |
| | P5 | 5000 | 330 mm/13" | | | | | |
| | PW | 20 000 | 180 mm/7" | | | | | |

DIMENSIONS



| DIMENSIONS - Chip fuse types, mass and relevant physical dimensions | | | | | | | |
|---|-------------------|-----------------|-------------|-------------|---------------------|---------------------|-----------|
| TYPE | H (mm) | L (mm) | W (mm) | WT (mm) | T ₁ (mm) | T ₂ (mm) | MASS (mg) |
| MFU 0402 | 0.32 ± 0.07 | 1.0 ± 0.05 | 0.5 ± 0.05 | > 75 % of W | 0.2 + 0.1/- 0.15 | 0.2 ± 0.1 | 0.65 |
| MFU 0603 | 0.45 + 0.1/- 0.05 | 1.55 ± 0.05 | 0.85 ± 0.1 | > 75 % of W | 0.3 + 0.15/- 0.2 | 0.3 + 0.15/- 0.2 | 1.9 |
| MFU 0805 | 0.45 + 0.1/- 0.05 | 2.0 ± 0.1 | 1.25 ± 0.15 | > 75 % of W | 0.4 + 0.1/- 0.2 | 0.4 + 0.1/- 0.2 | 4.7 |
| MFU 1206 | 0.55 ± 0.1 | 3.2 + 0.1/- 0.2 | 1.6 ± 0.15 | > 75 % of W | 0.5 ± 0.25 | 0.5 ± 0.25 | 9.5 |

SOLDER PAD DIMENSIONS



| RECOMMENDED SOLDER PAD DIMENSIONS | | | | | | | | |
|-----------------------------------|----------------|--------|--------|--------|------------------|--------|--------|--------|
| TYPE | WAVE SOLDERING | | | | REFLOW SOLDERING | | | |
| | G (mm) | Y (mm) | X (mm) | Z (mm) | G (mm) | Y (mm) | X (mm) | Z (mm) |
| MFU 0402 | - | - | - | - | 0.35 | 0.55 | 0.55 | 1.45 |
| MFU 0603 | 0.55 | 1.10 | 1.10 | 2.75 | 0.65 | 0.70 | 0.95 | 2.05 |
| MFU 0805 | 0.80 | 1.25 | 1.50 | 3.30 | 0.90 | 0.90 | 1.40 | 2.70 |
| MFU 1206 | 1.40 | 1.50 | 1.90 | 4.40 | 1.50 | 1.15 | 1.75 | 3.80 |

Note

- The given solder pad dimensions reflect the considerations for board design and assembly as outlined e.g. in standards IEC 61188-5-x, or in publication IPC-7351. They do not guarantee any supposed thermal properties, particularly as these are also strongly influenced by many other parameters.



| MFU 0402 RATING - Very quick acting (FF) | | | | | | | | | | |
|--|------------|------------------------------|---------------|---|---|---|----------------------|--------------------|----------|-------------------------------|
| SIZE | FUSE CHAR. | RATED CURRENT ⁽¹⁾ | RATED VOLTAGE | PRE-ARCING ⁽²⁾ I^2t at $10 \times I_R$ | VOLT. DROP ⁽²⁾ at $1 \times I_R$ | COLD RESIS ⁽²⁾ at $0.1 \times I_R$ | BREAKING CAPACITY DC | MARK. | APPROVAL | PART NUMBER ⁽³⁾⁽⁴⁾ |
| 0402 | FF | 500 mA ⁽⁵⁾ | 32 V | 0.0009 A ² s | 368 mV | 560 mΩ | 50 A at 32 V | - | UL | MFU0402FF00500E500 |
| | | 630 mA ⁽⁵⁾ | 32 V | 0.0014 A ² s | 331 mV | 400 mΩ | 50 A at 32 V | - | UL | MFU0402FF00630E500 |
| | | 750 mA ⁽⁵⁾ | 32 V | 0.0020 A ² s | 275 mV | 280 mΩ | 50 A at 32 V | - | UL | MFU0402FF00750E500 |
| | | 800 mA | 32 V | 0.0023 A ² s | 231 mV | 220 mΩ | 50 A at 32 V | - | UL | MFU0402FF00800E500 |
| | | 1.0 A | 32 V | 0.0028 A ² s | 184 mV | 140 mΩ | 50 A at 32 V | - | UL | MFU0402FF01000E500 |
| | | 1.25 A | 32 V | 0.0039 A ² s | 159 mV | 97 mΩ | 50 A at 32 V | - | UL | MFU0402FF01250E500 |
| | | 1.5 A | 32 V | 0.0059 A ² s | 146 mV | 74 mΩ | 50 A at 32 V | - | UL | MFU0402FF01500E500 |
| | | 1.6 A | 32 V | 0.0065 A ² s | 136 mV | 65 mΩ | 50 A at 32 V | - | UL | MFU0402FF01600E500 |
| | | 1.75 A | 32 V | 0.0077 A ² s | 124 mV | 54 mΩ | 50 A at 32 V | - | UL | MFU0402FF01750E500 |
| | | 2.0 A | 32 V | 0.0101 A ² s | 115 mV | 44 mΩ | 50 A at 32 V | - | UL | MFU0402FF02000E500 |
| | | 2.5 A | 32 V | 0.0157 A ² s | 107 mV | 33 mΩ | 50 A at 32 V | - | UL | MFU0402FF02500E500 |
| | | 3.0 A | 32 V | 0.0227 A ² s | 95 mV | 24 mΩ | 50 A at 32 V | - | UL | MFU0402FF03000E500 |
| 3.15 A | 32 V | 0.0250 A ² s | 90 mV | 22 mΩ | 50 A at 32 V | - | UL | MFU0402FF03150E500 | | |

Notes

- (1) Other values of rated current are available on request
- (2) Typical values
- (3) For packages with 1000 pieces, please use for packaging E1 instead of E5
- (4) For packages with 10 000 pieces, please use for packaging E0 instead of E5
- (5) Available on request

| MFU 0603 RATING - Very quick acting (FF) | | | | | | | | | | |
|--|------------|------------------------------|---------------|---|---|---|----------------------|--------------------|----------|-------------------------------|
| SIZE | FUSE CHAR. | RATED CURRENT ⁽⁶⁾ | RATED VOLTAGE | PRE-ARCING ⁽⁷⁾ I^2t at $10 \times I_R$ | VOLT. DROP ⁽⁷⁾ at $1 \times I_R$ | COLD RESIS ⁽⁷⁾ at $0.1 \times I_R$ | BREAKING CAPACITY DC | MARK. | APPROVAL | PART NUMBER ⁽⁸⁾⁽⁹⁾ |
| 0603 | FF | 500 mA | 32 V | 0.0009 A ² s | 361 mV | 550 mΩ | 50 A at 32 V | F | UL/IEC | MFU0603FF00500P500 |
| | | 630 mA | 32 V | 0.0014 A ² s | 331 mV | 400 mΩ | 50 A at 32 V | CT | UL | MFU0603FF00630P500 |
| | | 750 mA | 32 V | 0.0020 A ² s | 258 mV | 262 mΩ | 50 A at 32 V | G | UL | MFU0603FF00750P500 |
| | | 800 mA | 32 V | 0.0023 A ² s | 249 mV | 237 mΩ | 50 A at 32 V | CV | UL | MFU0603FF00800P500 |
| | | 1.0 A | 32 V | 0.0028 A ² s | 223 mV | 170 mΩ | 50 A at 32 V | H | UL/IEC | MFU0603FF01000P500 |
| | | 1.25 A | 32 V | 0.0039 A ² s | 180 mV | 110 mΩ | 50 A at 32 V | J | UL | MFU0603FF01250P500 |
| | | 1.5 A | 32 V | 0.0059 A ² s | 155 mV | 79 mΩ | 50 A at 32 V | K | UL | MFU0603FF01500P500 |
| | | 1.6 A | 32 V | 0.0065 A ² s | 159 mV | 76 mΩ | 50 A at 32 V | EF | UL/IEC | MFU0603FF01600P500 |
| | | 1.75 A | 32 V | 0.0077 A ² s | 138 mV | 60 mΩ | 50 A at 32 V | L | UL | MFU0603FF01750P500 |
| | | 2.0 A | 32 V | 0.0101 A ² s | 150 mV | 57 mΩ | 50 A at 32 V | N | UL/IEC | MFU0603FF02000P500 |
| | | 2.5 A | 32 V | 0.0157 A ² s | 121 mV | 37 mΩ | 50 A at 32 V | O | UL | MFU0603FF02500P500 |
| | | 3.0 A | 32 V | 0.0227 A ² s | 126 mV | 32 mΩ | 50 A at 32 V | P | UL | MFU0603FF03000P500 |
| | | 3.15 A | 32 V | 0.0250 A ² s | 120 mV | 29 mΩ | 50 A at 32 V | EL | UL/IEC | MFU0603FF03150P500 |
| | | 3.5 A | 32 V | 0.0308 A ² s | 106 mV | 23 mΩ | 50 A at 32 V | R | UL | MFU0603FF03500P500 |
| 4.0 A | 32 V | 0.0403 A ² s | 100 mV | 19 mΩ | 50 A at 32 V | S | UL | MFU0603FF04000P500 | | |
| 5.0 A | 32 V | 0.2275 A ² s | 85 mV | 13 mΩ | 50 A at 32 V | T | UL | MFU0603FF05000P500 | | |

Notes

- (6) Other values of rated current are available on request
- (7) Typical values
- (8) For packages with 1000 pieces, please use for packaging P1 instead of P5
- (9) For packages with 20 000 pieces, please use for packaging PW instead of P5



| MFU 0805 RATING - Very quick acting (FF) | | | | | | | | | | |
|--|------------|------------------------------|---------------|---|---|---|----------------------|--------------------|----------|-------------------------------|
| SIZE | FUSE CHAR. | RATED CURRENT ⁽¹⁾ | RATED VOLTAGE | PRE-ARCING I^2t at $10 \times I_R$ ⁽²⁾ | VOLT. DROP at $1 \times I_R$ ⁽²⁾ | COLD RESIS at $0.1 \times I_R$ ⁽²⁾ | BREAKING CAPACITY DC | MARK. | APPROVAL | PART NUMBER ⁽³⁾⁽⁴⁾ |
| 0805 | FF | 500 mA | 32 V | 0.0009 A ² s | 374 mV | 570 mΩ | 50 A at 32 V | F | UL | MFU0805FF00500P500 |
| | | 630 mA | 32 V | 0.0014 A ² s | 347 mV | 420 mΩ | 50 A at 32 V | CT | UL | MFU0805FF00630P500 |
| | | 750 mA | 32 V | 0.0021 A ² s | 280 mV | 285 mΩ | 50 A at 32 V | G | UL | MFU0805FF00750P500 |
| | | 800 mA | 32 V | 0.0023 A ² s | 262 mV | 250 mΩ | 50 A at 32 V | CV | UL | MFU0805FF00800P500 |
| | | 1.0 A | 32 V | 0.0028 A ² s | 243 mV | 185 mΩ | 50 A at 32 V | H | UL | MFU0805FF01000P500 |
| | | 1.25 A | 32 V | 0.0040 A ² s | 205 mV | 125 mΩ | 50 A at 32 V | J | UL | MFU0805FF01250P500 |
| | | 1.5 A | 32 V | 0.0059 A ² s | 171 mV | 87 mΩ | 50 A at 32 V | K | UL | MFU0805FF01500P500 |
| | | 1.6 A | 32 V | 0.0065 A ² s | 164 mV | 78 mΩ | 50 A at 32 V | EF | UL | MFU0805FF01600P500 |
| | | 1.75 A | 32 V | 0.0077 A ² s | 161 mV | 70 mΩ | 50 A at 32 V | L | UL | MFU0805FF01750P500 |
| | | 2.0 A | 32 V | 0.0101 A ² s | 176 mV | 67 mΩ | 50 A at 32 V | N | UL | MFU0805FF02000P500 |
| | | 2.5 A | 32 V | 0.0157 A ² s | 131 mV | 40 mΩ | 50 A at 32 V | O | UL | MFU0805FF02500P500 |
| | | 3.0 A | 32 V | 0.0227 A ² s | 134 mV | 34 mΩ | 50 A at 32 V | P | UL | MFU0805FF03000P500 |
| | | 3.15 A | 32 V | 0.0250 A ² s | 128 mV | 31 mΩ | 50 A at 32 V | EL | UL | MFU0805FF03150P500 |
| | | 3.5 A | 32 V | 0.0308 A ² s | 119 mV | 26 mΩ | 50 A at 32 V | R | UL | MFU0805FF03500P500 |
| | | 4.0 A | 32 V | 0.0403 A ² s | 105 mV | 20 mΩ | 50 A at 32 V | S | UL | MFU0805FF04000P500 |
| 5.0 A | 32 V | 0.2275 A ² s | 98 mV | 15 mΩ | 50 A at 32 V | T | UL | MFU0805FF05000P500 | | |

Notes

- (1) Other values of rated current are available on request
- (2) Typical values
- (3) For packages with 1000 pieces, please use for packaging P1 instead of P5
- (4) For packages with 20 000 pieces, please use for packaging PW instead of P5

| MFU 1206 RATING - Very quick acting (FF) | | | | | | | | | | |
|--|------------|------------------------------|---------------|---|---|---|----------------------|--------------------|----------|-------------------------------|
| SIZE | FUSE CHAR. | RATED CURRENT ⁽⁵⁾ | RATED VOLTAGE | PRE-ARCING I^2t at $10 \times I_R$ ⁽⁶⁾ | VOLT. DROP at $1 \times I_R$ ⁽⁶⁾ | COLD RESIS at $0.1 \times I_R$ ⁽⁶⁾ | BREAKING CAPACITY DC | MARK. | APPROVAL | PART NUMBER ⁽⁷⁾⁽⁸⁾ |
| 1206 | FF | 500 mA | 63 V | 0.0009 A ² s | 433 mV | 660 mΩ | 50 A at 63 V | F | UL/IEC | MFU1206FF00500P500 |
| | | 630 mA | 63 V | 0.0014 A ² s | 372 mV | 450 mΩ | 50 A at 63 V | CT | UL | MFU1206FF00630P500 |
| | | 750 mA | 63 V | 0.0022 A ² s | 325 mV | 330 mΩ | 50 A at 63 V | G | UL | MFU1206FF00750P500 |
| | | 800 mA | 63 V | 0.0023 A ² s | 273 mV | 260 mΩ | 50 A at 63 V | CV | UL | MFU1206FF00800P500 |
| | | 1.0 A | 63 V | 0.0028 A ² s | 262 mV | 200 mΩ | 50 A at 63 V | H | UL/IEC | MFU1206FF01000P500 |
| | | 1.25 A | 63 V | 0.0041 A ² s | 230 mV | 140 mΩ | 50 A at 63 V | J | UL | MFU1206FF01250P500 |
| | | 1.5 A | 63 V | 0.0059 A ² s | 207 mV | 105 mΩ | 50 A at 63 V | K | UL | MFU1206FF01500P500 |
| | | 1.6 A | 63 V | 0.0066 A ² s | 168 mV | 80 mΩ | 50 A at 63 V | EF | UL/IEC | MFU1206FF01600P500 |
| | | 1.75 A | 63 V | 0.0077 A ² s | 174 mV | 76 mΩ | 50 A at 63 V | L | UL | MFU1206FF01750P500 |
| | | 2.0 A | 63 V | 0.0102 A ² s | 181 mV | 69 mΩ | 50 A at 63 V | N | UL/IEC | MFU1206FF02000P500 |
| | | 2.5 A | 63 V | 0.0159 A ² s | 161 mV | 49 mΩ | 50 A at 63 V | O | UL | MFU1206FF02500P500 |
| | | 3.0 A | 63 V | 0.0229 A ² s | 173 mV | 44 mΩ | 50 A at 63 V | P | UL | MFU1206FF03000P500 |
| | | 3.15 A | 63 V | 0.0251 A ² s | 153 mV | 37 mΩ | 50 A at 63 V | EL | UL/IEC | MFU1206FF03150P500 |
| | | 3.5 A | 63 V | 0.0310 A ² s | 161 mV | 35 mΩ | 50 A at 63 V | R | UL | MFU1206FF03500P500 |
| | | 4.0 A | 63 V | 0.0404 A ² s | 147 mV | 28 mΩ | 50 A at 63 V | S | UL | MFU1206FF04000P500 |
| 5.0 A | 63 V | 0.2275 A ² s | 131 mV | 20 mΩ | 50 A at 63 V | T | UL | MFU1206FF05000P500 | | |
| 6.3 A | 63 V | 0.5160 A ² s | 116 mV | 14 mΩ | 50 A at 63 V | ET | UL | MFU1206FF06300P500 | | |

Notes

- (5) Other values of rated current are available on request
- (6) Typical values
- (7) For packages with 1000 pieces, please use for packaging P1 instead of P5
- (8) For packages with 20 000 pieces, please use for packaging PW instead of P5



DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of metal alloy is deposited on a high grade ceramic body. The fuse elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating.

The result of the determined production is verified by an extensive testing procedure performed on 100 % of the individual fuses. Only accepted products are laid directly into the paper tape in accordance with **IEC 60286-3**.

APPROVALS

The fuses are tested in accordance with the following standards:

- IEC 60127-1
- IEC 60127-4
- UL 248-14
- IEC 60068 series

Approval of conformity is indicated by the UMF Logo on the package label. Recognition by Underwriter Laboratories Inc. is indicated by the UL logo on the package label.

ASSEMBLY

The fuses are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapour phase. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The fuses are RoHS compliant, the pure tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing. Solderability is specified for 2 years after production or re-qualification. The permitted storage time is 20 years.

All products comply with the **JIG 101** list of legal restrictions on hazardous substances.

This includes full compliance with the following directives:

- 2000/53/EC End of Vehicle life Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electronic Equipment Directive (WEEE)

FUNCTIONAL PERFORMANCE



Current Rating Factor ⁽¹⁾ vs. Ambient Temperature θ_{amb}

Note

⁽¹⁾ Current rating factor is in addition to the given permissible continuous current rating of 0.7



FUNCTIONAL PERFORMANCE



Typical $t_{pre-arc}$ vs. I characteristic of MFU 0402 ⁽¹⁾



Typical I^2t vs. $t_{pre-arc}$ characteristic of MFU 0402 ⁽¹⁾

Note

⁽¹⁾ Fuses mounted on a test board according to IEC 60127-4



FUNCTIONAL PERFORMANCE



Typical $t_{pre-arc}$ vs. I characteristic of MFU 0603 ⁽¹⁾



Typical I^2t vs. $t_{pre-arc}$ characteristic of MFU 0603 ⁽¹⁾

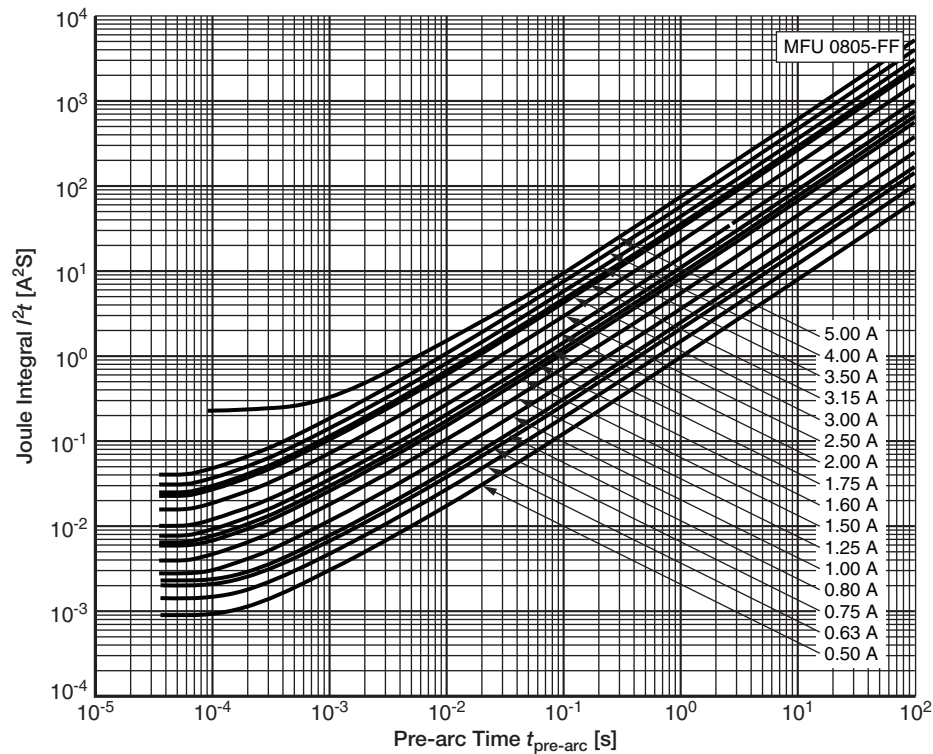
Note

⁽¹⁾ Fuses mounted on a test board according to IEC 60127-4

FUNCTIONAL PERFORMANCE



Typical $t_{pre-arc}$ vs. I characteristic of MFU 0805 ⁽¹⁾



Typical I^2t vs. $t_{pre-arc}$ characteristic of MFU 0805 ⁽¹⁾

Note

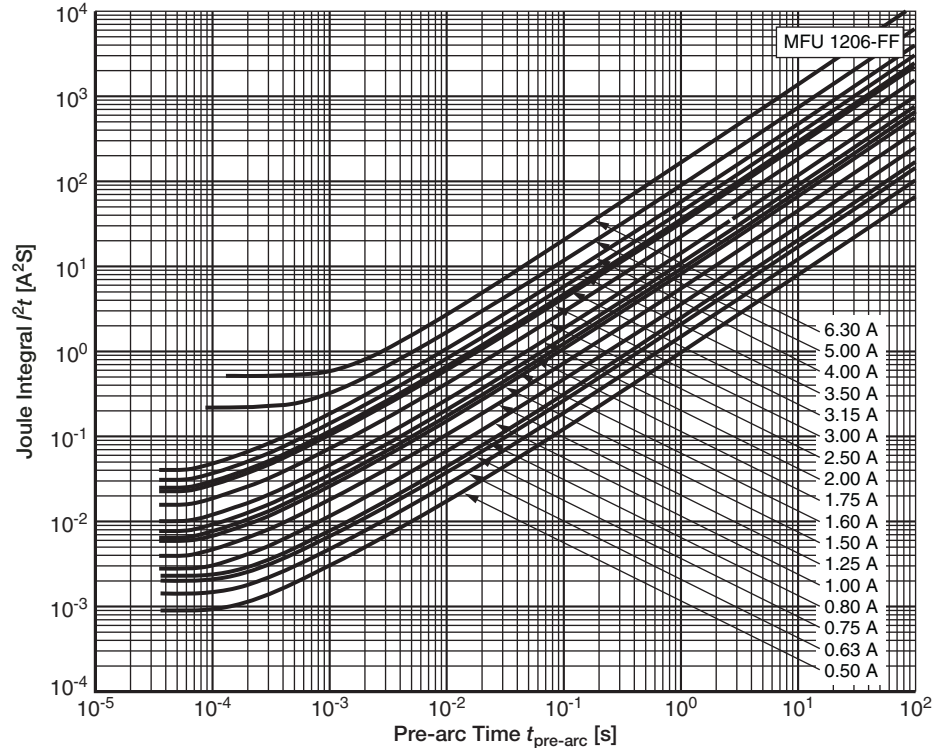
⁽¹⁾ Fuses mounted on a test board according to IEC 60127-4



FUNCTIONAL PERFORMANCE



Typical $t_{pre-arc}$ vs. I characteristic of MFU 1206 ⁽¹⁾



Typical I^2t vs. $t_{pre-arc}$ characteristic of MFU 1206 ⁽¹⁾

Note

⁽¹⁾ Fuses mounted on a test board according to IEC 60127-4



TEST AND REQUIREMENTS

All tests are carried out in accordance with the following specifications:

IEC 60127-1, Miniature fuse - Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links

IEC 60127-4, Universal Modular Fuse Links (UMF)

UL 248-14, Low voltage fuses - Part 14: Supplemental fuses

For the full test schedule refer to the documents listed above. The testing also covers most of the requirements specified by METI and CCC.

The tests are carried out under standard atmospheric conditions in accordance with IEC 60068-1, 5.3. Climatic category LCT/UCT/56 (rated temperature range: Lower category temperature, upper category temperature; damp heat, long term, 56 days) is valid.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C

Relative humidity: 45 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

The components are mounted for testing on printed-circuit boards in accordance with IEC 60127-4, unless otherwise specified.

The requirements stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of IEC 60127-1 and IEC 60127-4 respectively. However, some additional tests and a number of improvements against those minimum requirements have been included.

| TEST PROCEDURES AND REQUIREMENTS | | | | | | |
|----------------------------------|-------------------------|---|---|-----------------|--|---|
| IEC 60127-4 CLAUSE | IEC 60068-2 TEST METHOD | TEST | PROCEDURE | | REQUIREMENTS PERMISSIBLE CHANGE | |
| 8.3.2 | 21 (U _{e1}) | Substrate bending | Depth 1 mm; rate 1 mm/s 1 times | | No visible damage $\Delta R/R \leq \pm 10 \%$ | |
| 8.6.2 | 58 (Td) | Solderability | Solder bath method; SnPb40; non-activated flux; (215 ± 3) °C; (3 ± 0.3) s | | Good tinning (≥ 95 % covered); no visible damage | |
| | | | Solder bath method; SnAg3Cu0.5 or SnAg3.5; non-activated flux; (245 ± 3) °C; (2 ± 0.2) s | | | |
| 8.7.2 | 58 (Td) | Resistance to soldering heat | Solder bath method; (260 ± 5) °C; (10 ± 1) s | | No visible damage $\Delta R/R \leq \pm 10 \%$ | |
| | | | Reflow method 2 (IR/forced gas convection); (260 ± 5) °C; (10 ± 1) s | | | |
| 9.2.1 | - | Time/current characteristics at nominal temperature | Cold resistance at 0.1 x I _R ; destructive testing under overcurrent conditions (DC-Current) | MFU 0402 | $I_R \leq 0.75 \text{ A}$ | At 1.25 x I _R , t _{pre-arc} > 1 h at 2.0 x I _R , t _{pre-arc} < 60 s at 10 x I _R , t _{pre-arc} < 0.001 s |
| | | | | MFU 0402 | $0.8 \text{ A} \leq I_R \leq 3.15 \text{ A}$ | |
| | | | | MFU 0603 | $I_R \leq 5.0 \text{ A}$ | |
| | | | | MFU 0805 | $I_R \leq 5.0 \text{ A}$ | |
| | | | | MFU 1206 | $I_R \leq 6.3 \text{ A}$ | |
| 9.3.2 | - | Breaking capacity | 50 A at rated voltage acc. to UL 248-14 | | Optical inspection with naked eye no visible damage | |
| 9.3.3 | - | Residual resistance | 50 A at rated voltage acc. to UL 248-14 | | Insulation resistance at 2.0 x U _R (DC) higher than 0.1 MΩ | |



| TEST PROCEDURES AND REQUIREMENTS | | | | | | |
|----------------------------------|-------------------------|---|---|----------|---------------------------|---|
| IEC 60127-4 CLAUSE | IEC 60068-2 TEST METHOD | TEST | PROCEDURE | | | REQUIREMENTS PERMISSIBLE CHANGE |
| 9.4 | - | Endurance test acc. to IEC 60127-1 | a) $I = 1.0 \times I_R(\text{DC})$ 1.0 h on; 0.25 h off; 23 °C; 100 times b) $I = 1.25 \times I_R(\text{DC})$ 1.0 h on 23 °C; 1 time | MFU 0402 | $I_R \leq 3.15 \text{ A}$ | No visible damage $\Delta R/R \leq \pm 10 \%$ |
| | | | | MFU 0603 | $I_R \leq 3.15 \text{ A}$ | |
| | | | | MFU 0805 | $I_R \leq 3.15 \text{ A}$ | |
| | | | | MFU 1206 | $I_R \leq 3.15 \text{ A}$ | |
| 9.5 | - | Maximum sustained dissipation acc. to IEC 60127-1 | Calculation in accordance with results of clause 9.4 b) | | | Dissipation \leq acc. to IEC 60127-4 table 2 |
| 9.7 | - | Fuse-link temperature | The test is performed during the final 5 min of clause 9.4 b) | MFU 0402 | $I_R \leq 3.15 \text{ A}$ | Temperature rise of terminals $\leq 85 \text{ K}$ |
| | | | | MFU 0603 | $I_R \leq 3.15 \text{ A}$ | |
| | | | | MFU 0805 | $I_R \leq 3.15 \text{ A}$ | |
| | | | | MFU 1206 | $I_R \leq 3.15 \text{ A}$ | |
| - | - | Verification of temp.-rise and current-carrying capacity acc. to UL 248-14 clause 8.2.3 | $I = 1.0 \times I_R(\text{DC})$ | MFU 0402 | $I_R \leq 3.15 \text{ A}$ | Temperature rise of hot spot $\leq 75 \text{ K}$ acc. to UL 248-14 clause 8.2.4 |
| | | | | MFU 0603 | $I_R \leq 5.0 \text{ A}$ | |
| | | | | MFU 0805 | $I_R \leq 5.0 \text{ A}$ | |
| | | | | MFU 1206 | $I_R \leq 6.3 \text{ A}$ | |
| - | 78 (Cab) | Damp heat, steady state | (40 \pm 2) °C; 56 days; (93 \pm 3) % RH | | | $\Delta R/R \leq \pm 10 \%$ I-t characteristic |
| - | 14 (Na) | Rapid change of temperature | 30 min at LCT; 30 min at UCT; LCT = - 55 °C; UCT = 125 °C; 5 cycles | | | $\Delta R/R \leq \pm 10 \%$ |
| - | 6 (Fc) | Vibration | Endurance by sweeping; 10 Hz to 2000 Hz; no resonance; amplitude $\leq 1.5 \text{ mm}$ or $\leq 200 \text{ m/s}^2$; 6 h | | | $\Delta R/R \leq \pm 10 \%$ |
| - | 45 (XA) | Component solvent resistance | Isopropyl alcohol; 50 °C; method 2 | | | No visible damage |
| - | 45 (XA) | Solvent resistance of marking | Isopropyl alcohol; 50 °C; method 1, toothbrush | | | Marking legible, no visible damage |
| - | 21 (Ue ₃) | Shear (adhesion) | RR 1608M; 9 N | | | No visible damage |
| | | | RR 2012M and RR 3216M; 45 N | | | |
| - | - | Flammability | IEC 60695-2-2, needle flame test; 10 s | | | No burning after 30 s |



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