

Specification

(Reference)

Title: CHIP FUSE; RECTANGULAR TYPE

Style: FCC10,16,20,32, FHC10,16,20,32

RoHS COMPLIANCE ITEM

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Issue Dept.: Research & Development Department Hokkaido Research Center

1. Scope

1.1 This specification covers the detail requirements for chip fuses; rectangular type, style of FCC10,16,20,32, FHC10,16,20,32.

1.2 Applicable documents

- UL248-1-2000 Low-Voltage Fuses-Part1: General Requirements
- UL248-14-2000 Low-Voltage Fuses-Part14: Supplemental Fuses
- CSA C22.2 No.248.1-2000 Low-Voltage Fuses-Part1: General Requirements
- CSA C22.2 No.248.14-2000 Low-Voltage Fuses-Part14: Supplemental Fuses
- IEC60127-1 Miniature fuses-part 1: Definitions for miniature fuses and general requirements for miniature fuse-links
- IEC60127-4 Miniature fuses-Part4: Universal modular fuse-links (UMF)

2. Classification

Type designation shall be the following form.

(Example)

| | | | | |
|-----|----|-----|----|----|
| FCC | 20 | 162 | AD | TP |
| 1 | 2 | 3 | 4 | 5 |

 Style

1 Chip fuses; rectangular type Style

2 Size

3 Rated current Example: 162 → 1.6 (A)

4 Optional code

| Symbol | Content |
|--------|----------|
| AB | Standard |
| AD | |

5 Packaging form

3. Safety standard approval

- UL248-1 and UL248-14
- CSA C22.2, No. 248.1-00 and CSA C22.2, No. 248.14-00

The file number to be designated by UL and C-UL shall be as follows: E176847

4. Rating

The ratings shall be in accordance with Table-1.

4.1 Optional code: AB

Table-1(1)

| Style | Rated current | | | Internal resistance value (mΩ max.) | Rated voltage (V) | Breaking capacity (A) | Time / current characteristic | |
|-------|---------------|-------|----------------|-------------------------------------|-------------------|-----------------------|-------------------------------|-----------------|
| | Symbol | (A) | Marking symbol | | | | Current | Pre-arcing time |
| FCC10 | 201 | 0.2 | Z | 2400 | DC30 | 35 | 200% | 5 s max. |
| | 251 | 0.25 | C | 1000 | | | | |
| | 321 | 0.315 | D | 750 | | | | |
| | 401 | 0.4 | E | 620 | | | | |
| | 501 | 0.5 | F | 340 | | | | |
| | 631 | 0.63 | I | 290 | | | | |
| | 751 | 0.75 | A | 220 | | | | |
| | 801 | 0.8 | K | 210 | | | | |
| | 102 | 1.0 | L | 150 | | | | |
| | 132 | 1.25 | M | 120 | | | | |
| | 152 | 1.5 | H | 100 | | | | |
| 162 | 1.6 | N | 90 | | | | | |
| FHC10 | 202 | 2.0 | S | 55 | DC24 | | | |
| | 252 | 2.5 | T | 40 | | | | |

Table-1(2)

| Style | Rated current | | | Internal resistance value (mΩ max.) | Rated voltage (V) | Breaking capacity (A) | Time / current characteristic | |
|-------|---------------|-------|----------------|--|----------------------|--------------------------|-------------------------------|-----------------|
| | Symbol | (A) | Marking symbol | | | | Current | Pre-arcing time |
| FCC16 | 201 | 0.2 | ZB | 3,200 | DC36 | 35 | 200% | 5 s max. |
| | 251 | 0.25 | CB | 1,800 | | | | |
| | 321 | 0.315 | DB | 1,000 | | | | |
| | 401 | 0.4 | EB | 750 | | | | |
| | 501 | 0.5 | FB | 330 | | | | |
| | 631 | 0.63 | IB | 280 | | | | |
| | 751 | 0.75 | AB | 210 | | | | |
| | 801 | 0.8 | KB | 200 | | | | |
| | 102 | 1.0 | LB | 130 | | | | |
| | 132 | 1.25 | MB | 110 | | | | |
| | 152 | 1.5 | HB | 95 | | | | |
| | 162 | 1.6 | NB | 85 | | | | |
| FHC16 | 202 | 2.0 | SB | 70 | | | | |
| FHC16 | 252 | 2.5 | TB | 40 | DC32 | | | |
| FCC20 | 501 | 0.5 | FB | 330 | DC50 | 50 | 200% | 5 s max. |
| | 631 | 0.63 | IB | 270 | | | | |
| | 801 | 0.8 | KB | 190 | | | | |
| | 102 | 1.0 | LB | 130 | | | | |
| | 132 | 1.25 | MB | 100 | | | | |
| | 162 | 1.6 | NB | 80 | | | | |
| FHC20 | 202 | 2.0 | SB | 65 | | | | |
| FHC20 | 252 | 2.5 | TB | 40 | DC32 | | | |

4.2 Optional code: AD

Table-1(3)

| Style | Rated current | | | Internal resistance value (mΩ max.) | Rated voltage (V) | Breaking capacity (A) | Time / current characteristic | |
|-------|---------------|-------|----------------|--|----------------------|--------------------------|-------------------------------|-----------------|
| | Symbol | (A) | Marking symbol | | | | Current | Pre-arcing time |
| FCC10 | 151 | 0.15 | O | 2700 | DC32 | 35 | 250% | 5 s max. |
| | 201 | 0.2 | Z | 1000 | DC30 | | | |
| | 251 | 0.25 | C | 750 | | | | |
| | 321 | 0.315 | D | 620 | | | | |
| | 401 | 0.4 | E | 340 | | | | |
| | 501 | 0.5 | F | 290 | | | | |
| | 631 | 0.63 | I | 210 | | | | |
| | 801 | 0.8 | K | 150 | | | | |
| | 102 | 1.0 | L | 120 | | | | |
| | 132 | 1.25 | M | 90 | | | | |
| FHC10 | 162 | 1.6 | N | 55 | DC24 | | | |
| | 202 | 2.0 | S | 40 | | | | |
| | 252 | 2.5 | T | 36 | | | | |
| | 322 | 3.15 | U | 26 | | | | |

Table-1(4)

| Style | Rated current | | | Internal resistance value (mΩ max.) | Rated voltage (V) | Breaking capacity (A) | Time / current characteristic | |
|-------|---------------|-------|----------------|--|----------------------|--------------------------|-------------------------------|-----------------|
| | Symbol | (A) | Marking symbol | | | | Current | Pre-arcing time |
| FCC16 | 151 | 0.15 | OD | 4000 | DC50 | 35 | 250% | 5 s max. |
| | 201 | 0.2 | ZD | 1800 | DC36 | | | |
| | 251 | 0.25 | CD | 1000 | | | | |
| | 321 | 0.315 | DD | 750 | | | | |
| | 401 | 0.4 | ED | 330 | | | | |
| | 501 | 0.5 | FD | 280 | | | | |
| | 631 | 0.63 | ID | 200 | | | | |
| | 801 | 0.8 | KD | 130 | | | | |
| | 102 | 1.0 | LD | 110 | | | | |
| | 132 | 1.25 | MD | 85 | | | | |
| | 162 | 1.6 | ND | 70 | | | | |
| | 202 | 2.0 | SD | 55 | | | | |
| 252 | 2.5 | TD | 45 | | | | | |
| FHC16 | 322 | 3.15 | UD | 26 | DC24 | | | |
| | 402 | 4.0 | XD | 19 | | | | |
| FCC20 | 401 | 0.4 | 401 | 330 | DC50 | 50 | 250% | 5 s max. |
| | 501 | 0.5 | 501 | 270 | | | | |
| | 631 | 0.63 | 631 | 190 | | | | |
| | 801 | 0.8 | 801 | 130 | | | | |
| | 102 | 1.0 | 102 | 100 | | | | |
| | 132 | 1.25 | 132 | 80 | | | | |
| | 162 | 1.6 | 162 | 65 | | | | |
| | 202 | 2.0 | 202 | 55 | | | | |
| 252 | 2.5 | 252 | 40 | DC32 | | | | |
| 322 | 3.15 | UD | 26 | | | | | |
| 402 | 4.0 | XD | 19 | | | | | |
| FHC20 | 502 | 5.0 | YD | 14 | DC24 | | | |
| FCC32 | 201 | 0.2 | 201 | 1800 | DC64 | 50 | 250% | 5 s max. |
| | 251 | 0.25 | 251 | 1000 | | | | |
| | 321 | 0.315 | 321 | 750 | | | | |
| | 401 | 0.4 | 401 | 350 | | | | |
| | 501 | 0.5 | 501 | 295 | | | | |
| | 631 | 0.63 | 631 | 200 | | | | |
| | 801 | 0.8 | 801 | 140 | | | | |
| | 102 | 1.0 | 102 | 110 | | | | |
| | 132 | 1.25 | 132 | 85 | | | | |
| | 152 | 1.5 | 152 | 78 | | | | |
| | 162 | 1.6 | 162 | 75 | | | | |
| | 202 | 2.0 | 202 | 65 | | | | |
| | 252 | 2.5 | 252 | 45 | | | | |
| 322 | 3.15 | UD | 26 | | | | | |
| 402 | 4.0 | XD | 19 | | | | | |
| FHC32 | 502 | 5.0 | YD | 14 | | | | |

4.3 Working temperature range: -55 to +125(°C)

5. Packaging form

The standard packaging form shall be in accordance with Table-2.

Table-2

| Symbol | Packaging form | | Standard packaging quantity / units | Application |
|--------|------------------------------------|------------------------|-------------------------------------|--------------------------------|
| B | Bulk (loose package) | | 1,000 pcs. | FCC10,16,20,32, FHC10,16,20,32 |
| PA | Press pocket taping (paper taping) | 8mm width, 2mm pitches | 10,000 pcs. | FCC10, FHC10 |
| TP | Paper taping | 8mm width, 4mm pitches | 5,000 pcs. | FCC16,20,32, FHC16,20,32 |

6. Dimensions

6.1 The resistor shall be of the design and physical dimensions in accordance with Figure-1 and Table-3.



Figure-1

Table-3

Unit:mm

| Style | L | W | H | c | d |
|--------------|----------|---------------------------------------|-----------|----------|-----------|
| FCC10, FHC10 | 1.0±0.05 | 0.5±0.05 | 0.4±0.05 | 0.2±0.1 | 0.25±0.10 |
| FCC16, FHC16 | 1.6±0.1 | 0.8 ^{+0.15} _{-0.05} | 0.45±0.10 | 0.3±0.15 | 0.3±0.1 |
| FCC20, FHC20 | 2.0±0.1 | 1.25±0.10 | 0.6±0.1 | 0.4±0.2 | 0.4±0.2 |
| FCC32 | 3.2±0.2 | 1.6±0.15 | 0.6±0.1 | 0.5±0.25 | 0.5±0.25 |
| FHC32 | | | 0.65±0.10 | | |

6.2 Net weight (Reference)

| Style | Net weight(mg) |
|--------------|----------------|
| FCC10, FHC10 | 0.8 |
| FCC16, FHC16 | 2 |
| FCC20, FHC20 | 6 |
| FCC32 | 10 |
| FHC32 | 11 |

7. Marking

The Marking symbol of Sub-clause 4.1 shall be marked on over coat side.

(Example)

| Style | Optional code | Marking symbol | Content |
|-------|---------------|----------------|--------------|
| FCC10 | AB | N | FCC10 162 AB |
| FHC10 | | T | FHC10 322 AD |
| FCC16 | | SB | FCC16 202 AB |
| FHC16 | | TB | FHC16 252 AB |
| FCC20 | | SB | FCC20 202 AB |
| FHC20 | | TB | FHC20 252 AB |
| FCC10 | AD | N | FCC10 162 AD |
| FHC10 | | U | FHC10 322 AD |
| FCC16 | | ND | FCC16 162 AD |
| FHC16 | | UD | FHC16 322 AD |
| FCC20 | | 162 | FCC20 162 AD |
| FHC20 | | UD | FHC20 322 AD |
| FCC32 | | 162 | FCC32 162 AD |
| FHC32 | | UD | FHC32 322 AD |

8. Performance

8.1 Unless otherwise specified, the standard range of atmospheric conditions for tests is as follows;

Ambient temperature: 5 °C to 35 °C, Relative humidity: 45 % to 85 %, Air pressure: 86 kPa to 106 kPa

If there is any doubt the results, measurements shall be made within the following:

Ambient temperature: 20 °C ± 2 °C, Relative humidity: 60 % to 70 %, Air pressure: 86 kPa to 106 kPa

8.2 The performance shall be satisfied in Table-4.

Table-4(1)

| No. | Test items | Condition of test | Performance requirements | | |
|-----|--|---|---|---------|-----------------|
| 1 | Temperature rise | The fuse shall be mounted on the test substrate as shown in Figure-2. Measurement temp.: 10 °C to 30 °C Test current: Rated current The temperature at the hottest point on the surface of the fuse shall be measured after temperature equilibrium has been attained. | 75 °C max. | | |
| 2 | Current carrying capacity | The fuse shall be mounted on the test substrate as shown in Figure-2. Test current: 110 % of Rated current Test temp.: 70 °C ± 2 °C Test period: 1h | Without opening | | |
| 3 | Time / current characteristic | The fuse shall be mounted on the test substrate as shown in Figure-2. Test current shall be applied for continuously. | Optional code | Current | Pre-arcing time |
| | | | AB | 200% | 5 s max. |
| | | | AD | 250% | 5 s max. |
| 4 | Terminal bond strength of the face plating | JIS C 60068-2-21 Ue1 The fuse shall be mounted on the test substrate as shown in Figure-2. Bending value: 3 mm (Among the fulcrums: 90 mm) Duration: 10 s ± 1 s | Change of internal resistance: ±3% No evidence of mechanical damage. | | |

Table-4(2)

| No. | Test items | Condition of test | Performance requirements |
|-----|------------------------------|--|--|
| 5 | Resistance to soldering heat | <p>Test by a piece. Temp. of solder bath: 260 °C ± 5 °C Immersion time: 10 s ± 1 s After immersion into solder, leaving the room temp. for 1h or more, and then measure the internal resistance.</p> <p>• Reflow soldering Pre-heating: 150 °C ~ 180 °C, 120 s max. Peak: 260 °C ± 5 °C, 10 s max. Reflow cycle: 2 times After immersion into solder, leaving the room temp. for 1h or more, and then measure the internal resistance.</p> | <p>Change of internal resistance: ±10% No evidence of appearance damage</p> |
| 6 | Solderability | <p>JIS C 60068-2-58 Test by a piece Flux: Rosin-Methanol Temp. of solder bath: 235 °C ± 5 °C Immersion time: 2 s ± 0.5 s</p> | <p>The surface of terminal immersed shall be min. of 95 % covered with a new coating of solder.</p> |
| 7 | Rapid change temperature | <p>JIS C 60068-2-14 Na The fuse shall be mounted on the test substrate as shown in Figure-2. Upper temperature: +125 °C Lower temperature: -55 °C Duration of exposure at each temperature: 30 min. Number of cycles: 5 cycles</p> | <p>Change of internal resistance: ±10% No evidence of appearance damage</p> |
| 8 | Endurance test | <p>The fuse shall be mounted on the test substrate as shown in Figure-2. Test condition: Nominal ambient temp. and Relative humidity. Test potential: 1. Cycle of 1 h "ON" and 15 min. "OFF" at 1.05 times rated current for 100 cycles. 2. After above the test , 1.25 times rated current for 1h.</p> | <p>The voltage drop across the fuse after the test shall not have increased by more than 10 % of the value measured before test.</p> |

9. Test substrate



Figure-2 FCC, FHC TEST SUBSTRATE

Remark 1). Material: Epoxide woven glass
Thickness: 1.6mm Thickness of copper clad: 0.035mm

10. Taping

10.1 Applicable documents JIS C 0806-3: 1999, EIAJ ET-7103: 2004, EIAJ ET-7200B: 2003

10.2 Taping dimensions

10.2.1 Press pocket taping(8mm width, 2mm pitches)

Taping dimensions shall be in accordance with Figure-3 and Table-5.

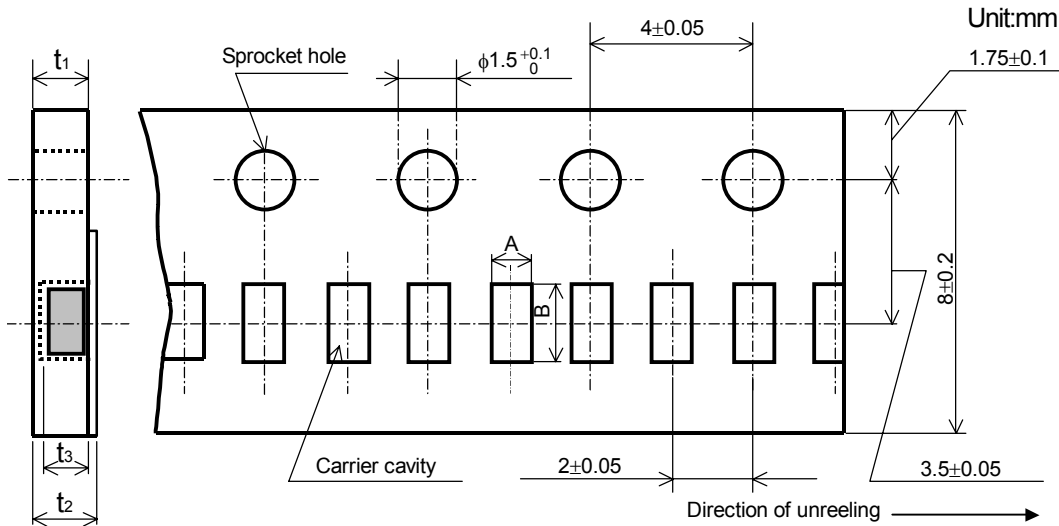


Figure-3

Table-5

Unit:mm

| Style | A | B | t ₁ | t ₂ | t ₃ |
|--------------|----------|----------|----------------|----------------|----------------|
| FCC10, FHC10 | 0.65±0.1 | 1.15±0.1 | 0.6±0.05 | 0.7max. | 0.5±0.05 |

10.2.2 Paper taping (8mm width, 4mm pitches)

Taping dimensions shall be in accordance with Figure-4 and Table-6.



Figure-4

Table-6

Unit:mm

| Style | A | B | t ₁ | t ₂ |
|--------------|-----------|---------|----------------|----------------|
| FCC16, FHC16 | 1.15±0.15 | 1.9±0.2 | 0.6±0.1 | 0.8 max. |
| FCC20, FHC20 | 1.65±0.15 | 2.5±0.2 | 0.8±0.1 | 1.0 max. |
| FCC32, FHC32 | 2.0±0.15 | 3.6±0.2 | | |

- 1). The cover tapes shall not cover the sprocket holes.
- 2). Tapes in adjacent layers shall not stick together in the packing.
- 3). Components shall not stick to the carrier tape or to the cover tape.
- 4). Pitch tolerance over any 10 pitches ±0.2mm.
- 5). The peel strength of the top cover tape shall be within 0.1N to 0.5N on the test method as shown in the following
FCC10:Figure-5,FCC16,20,32: Figure-6.
- 6). When the tape is bent with the minimum radius for 25 mm, the tape shall not be damaged and the components shall maintain their position and orientation in the tape.
- 7). In no case shall there be two or more consecutive components missing.
The maximum number of missing components shall be one or 0.1%, whichever is greater.
- 8). The fuses shall be faced to upward at the over coating side in the carrier cavity.



Figure-5

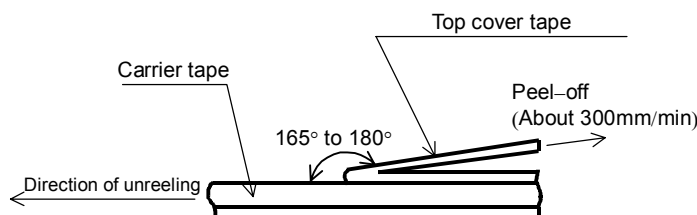


Figure-6

10.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure-7 and Table-7.
Plastic reel (Based on EIAJ ET-7200B)



Figure-7

Table-7

| Style | Unit:mm | | Note |
|--------------------------------|----------------------------------|----------|-------------------|
| | A | B | |
| FCC10,16,20,32, FHC10,16,20,32 | 9 ^{+1.0} / ₀ | 11.4±1.0 | Injection molding |
| | | 13±1.0 | Vacuum forming |

Note: Marking label shall be marked on a place of Marking A or two place of marking A and B.

10.4 Leader and trailer tape.

(Example)



Figure-8

11. Marking on package

The label of a minimum package shall be legibly marked with follows.

11.1 Marking A

- (1) Classification (Style, Rated current, Optional code, Packaging form)
- (2) Quantity
- (3) Lot number
- (5) Manufacturer's name or trade mark
- (6) UL and /or C-UL recognized component mark
- (7) Others

11.2 Marking B (KAMAYA Control label)

12. Recommended Derating for Rated Current

- Nominal Derating
 - Option Code AB: Nominal Derating \leq 70% of Rated Current
 - Option Code AD: Nominal Derating \leq 80% of Rated Current
- Temperature Derating
 - Please refer to the following graph regarding the current derating value for ambient temperature.



- Ex.) • If Optional code: AB (Rated Current:1.0A) is used under ambient temperature 70°C
Kamaya recommends, less than the current value derated as below,
Rated Current: $1.0A \times (\text{Nominal Derating} : 70\% \times \text{Temperature Derating} : 100\%) = 0.7A$
- If Optional code: AD (Rated Current:1.0A) is used under ambient temperature 70°C
Kamaya recommends, less than the current value derated as below,
Rated Current: $1.0A \times (\text{Nominal Derating} : 80\% \times \text{Temperature Derating} : 100\%) = 0.8A$

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