

Data Sheet

Customer:

Product: Anti-Sulfurated Thick Film Chip Resistor - AS Series

Size: 0201/0402/0603/0805/1206/1210/2010/2512

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|---------------------|-----------------|---------------------|------------------------|---------------------------|
| 12-Jan-18 | 12-Jan-18 | 12-Jan-18 | 12-Jan-18 | |
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Anti-Sulfurated Thick Film Chip Resistor



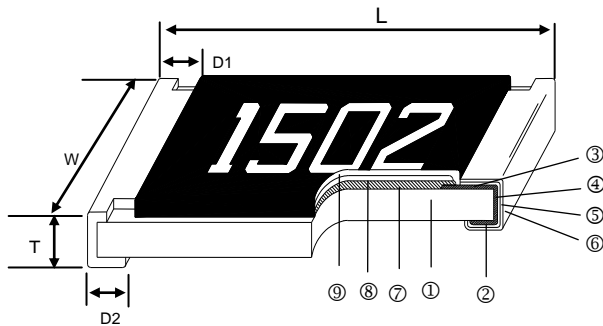
Scope

- This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

Features

- Special construction to prevent sulfuration in a sulfur containing environment

Construction



Applications

- High-end Computer
- Industrial Equipment
- Automatic Equipment Controller
- Medical Equipment
- High-end Multimedia Electronics
- Outdoor Electronic Applications

| | | |
|---------------------|----------------------|----------------------|
| ① Alumina Substrate | ④ Edge Electrode | ⑦ Resistor Layer |
| ② Bottom Electrode | ⑤ Barrier Layer | ⑧ Primary Overcoat |
| ③ Top Electrode | ⑥ External Electrode | ⑨ Secondary Overcoat |

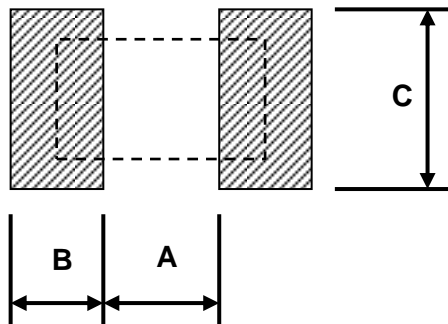
Dimensions

| Type | Size (Inch) | L (mm) | W (mm) | T (mm) | D1 (mm) | D2 (mm) | Weight (g) (1000pcs) |
|------|-------------|-----------|-----------|-----------|-----------|-----------|----------------------|
| AS01 | 0201 | 0.60±0.03 | 0.30±0.03 | 0.23±0.03 | 0.15±0.05 | 0.15±0.05 | 0.150 |
| AS02 | 0402 | 1.00±0.05 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.20±0.10 | 0.620 |
| AS03 | 0603 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 | 2.042 |
| AS05 | 0805 | 2.00±0.10 | 1.25±0.10 | 0.50±0.10 | 0.35±0.20 | 0.40±0.20 | 4.368 |
| AS06 | 1206 | 3.10±0.10 | 1.55±0.10 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 | 8.947 |
| AS10 | 1210 | 3.10±0.10 | 2.60±0.15 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 | 15.959 |
| AS0A | 2010 | 5.00±0.10 | 2.50±0.15 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 | 24.241 |
| AS12 | 2512 | 6.35±0.10 | 3.10±0.15 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 | 39.448 |

Part Numbering

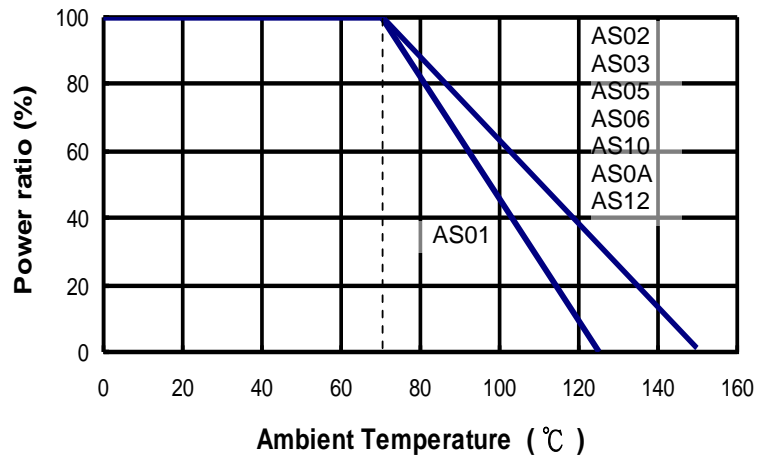
| | | | | | | |
|--------------|--|------------------------------|----------------|---------------------------------------|---|---|
| AS | 03 | F | T | E | | 1003 |
| Product Type | Dimensions | Resistance Tolerance | Packaging Code | TCR (PPM/°C) | Power Rating | Resistance |
| | 01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512 | D: ±0.5% F: ±1% J: ±5% | T: Taping Reel | E: ±100 F: ±200 -: No Specified | : Standard L: 1/12W X: 1/10W W: 1/8W V: 1/4W O: 1/3W U: 1/2W T: 1W | R0R0: 0Ω 0010: 1Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ |

Recommend Land Pattern

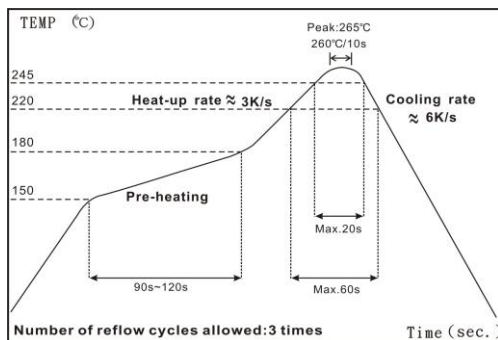


| Type | A (mm) | B (mm) | C (mm) |
|------|--------|--------|--------|
| AS01 | 0.30 | 0.25 | 0.30 |
| AS02 | 0.50 | 0.45 | 0.60 |
| AS03 | 0.90 | 0.60 | 0.90 |
| AS05 | 1.20 | 0.70 | 1.30 |
| AS06 | 2.00 | 0.90 | 1.60 |
| AS10 | 2.00 | 0.90 | 2.80 |
| AS0A | 3.80 | 0.90 | 2.80 |
| AS12 | 4.90 | 1.60 | 3.50 |

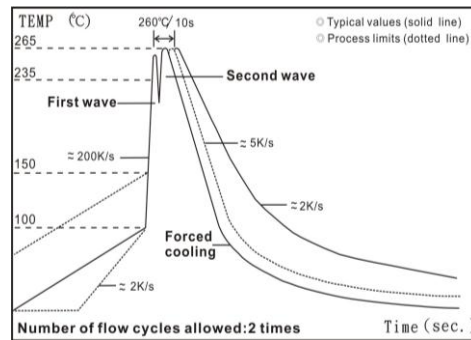
Derating Curve



Soldering Condition



IR Reflow Soldering



Wave Soldering (Flow Soldering)

- (1) Time of IR reflow soldering at maximum temperature point 260°C : 10s
- (2) Time of wave soldering at maximum temperature point 260°C : 10s
- (3) Time of soldering iron at maximum temperature point 410°C : 5s

Standard Electrical Specifications

| Item Type | Power Rating at 70°C Jumper Rated Current | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range | | | TCR (PPM/°C) |
|--------------|--|--------------------------|------------------------------|--|--|------------|----------------------|----------------------|
| | | | | | ±0.5% | ±1% | ±5% | |
| AS01 (0201) | 1/20W | -55 ~ +125°C | 25V | 50V | - | 1Ω - 10MΩ | | ±200 |
| | Jumper: 1A | | | | - | 0Ω (<50mΩ) | | - |
| AS02 (0402) | 1/16W | -55 ~ +155°C | 50V | 100V | 1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ | | | ±200 ±100 ±200 |
| | Jumper: 1A | | | | - | 0Ω (<50mΩ) | | - |
| AS03 (0603) | 1/10W | | 50V | 100V | 1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ | | | ±200 ±100 ±200 |
| | Jumper: 1A | | | | - | 0Ω (<50mΩ) | | - |
| AS05 (0805) | 1/8W | | 150V | 300V | 1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ | | | ±200 ±100 ±200 |
| | Jumper: 2A | | | | - | 0Ω (<50mΩ) | | - |
| AS06 (1206) | 1/4W | | 200V | 400V | 1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ | | | ±200 ±100 ±200 |
| | Jumper: 2A | | | | - | 0Ω (<50mΩ) | | - |
| AS10 (1210) | 1/3W | | 200V | 400V | 1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ | | | ±200 ±100 ±200 |
| | Jumper: 2.5A | | | | - | 0Ω (<50mΩ) | | - |
| AS0A (2010) | 3/4W | | 200V | 400V | 1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ | | | ±200 ±100 ±200 |
| | Jumper: 3.5A | | | | - | 0Ω (<50mΩ) | | - |
| AS12 (2512) | 1W | 250V | 500V | 1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ | | | ±200 ±100 ±200 | |
| | Jumper: 4A | | | - | 0Ω (<50mΩ) | | - | |

High Power Rating Electrical Specifications

| Item Type | Power Rating at 70°C | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range | | TCR (PPM/°C) |
|--------------|-------------------------|--------------------------|------------------------------|--------------------------|-------------------------|--------------|-----------------|
| | | | | | ±1% (E24 · E96) | ±5% (E24) | |
| AS01 (0201) | 1/12W | -55 ~ +125°C | 25V | 50V | 10Ω - 1MΩ | | ±200 |
| AS02 (0402) | 1/10W | -55 ~ +155°C | 50V | 100V | 1Ω - 9.76Ω 10Ω - 1MΩ | | ±200 ±100 |
| AS03 (0603) | 1/4W | | 75V | 150V | | | |
| AS05 (0805) | 1/3W | | 150V | 300V | | | |
| AS06 (1206) | 1/3W | | 200V | 400V | | | |
| AS10 (1210) | 1/2W | | 200V | 400V | | | |
| AS0A (2010) | 1W | | 200V | 400V | | | |
| | | | 200V | 400V | | | |

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

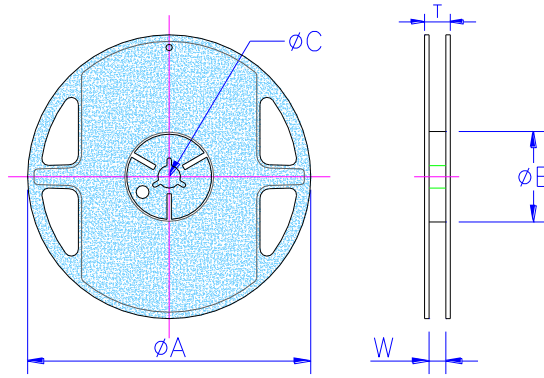
| Item | Requirement | | | Test Method |
|--|---|---------------|--------|--|
| | ±1% and Below | ±5% | Jumper | |
| Temperature Coefficient of Resistance (T.C.R.) | As Spec. | | | JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55°C~+125°C, 25°C is the reference temperature |
| Short Time Overload | ±(1.0%+0.05Ω) | ±(2.0%+0.05Ω) | <50mΩ | JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series |
| Insulation Resistance | ≥10G | | | JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute |
| Endurance | ±(2.0%+0.10Ω) | ±(3.0%+0.10Ω) | <100mΩ | JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" |
| Damp Heat with Load | ±(2.0%+0.10Ω) | ±(3.0%+0.10Ω) | <100mΩ | JIS-C-5201-1 4.24 IEC-60115-1 4.24 40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" |
| Dry Heat | ±(1.0%+0.05Ω) | ±(1.5%+0.10Ω) | <50mΩ | JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +125/+155°C for 1000 hrs |
| Bending Strength | ±(1.0%+0.05Ω) | ±(1.0%+0.05Ω) | <50mΩ | JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm |
| Solderability | 95% min. coverage | | | JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds |
| Resistance to Soldering Heat | ±(0.5%+0.05Ω) | ±(1.0%+0.05Ω) | <50mΩ | JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5°C for 10 seconds |
| Voltage Proof | No breakdown or flashover | | | JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute |
| Leaching | Individual leaching area ≤5% Total leaching area ≤ 10% | | | JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds |
| Rapid Change of Temperature | ±(0.5%+0.05Ω) | ±(1.0%+0.05Ω) | <50mΩ | JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +125/+155°C, 5 cycles |
| Sulfur Test | ±(0.5%+0.05Ω) | ±(0.5%+0.05Ω) | <50mΩ | ASTM-B-809-95 H2S, 50±2°C, 91~93% R.H., no power rating for 1000 hrs |

RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

Storage Temperature: 15~28°C; Humidity < 80%RH

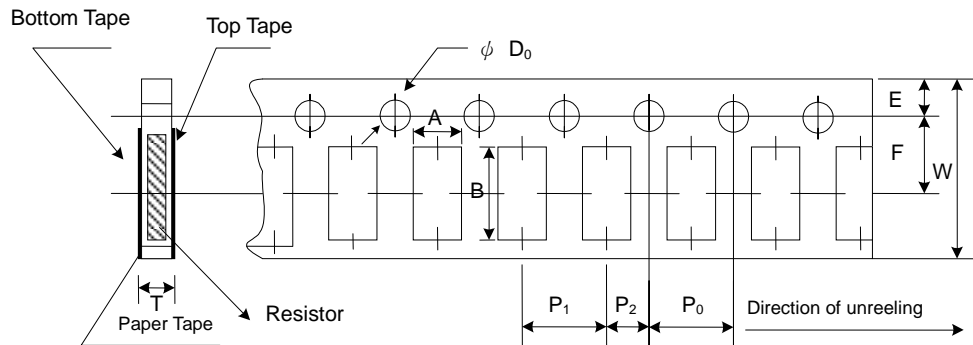
■ Packaging

Reel Specifications & Packaging Quantity



| Type | Packaging Quantity | | Tape Width | Reel Diameter | ΦA (mm) | ΦB (mm) | ΦC (mm) | W (mm) | T (mm) |
|------------------------------|--------------------|-----|------------|---------------|-----------|---------------------|----------|----------|----------|
| AS01 AS02 | Paper | 10K | 8mm | 7 inch | 178.5±1.5 | 60 ^{+1/-0} | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 |
| | | 20K | | 10 inch | 254±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
| | | 40K | | 13 inch | 330±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
| AS03 AS05 AS06 AS10 | Paper | 5K | 8mm | 7 inch | 178.5±1.5 | 60 ^{+1/-0} | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 |
| | | 10K | | 10 inch | 254±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
| | | 20K | | 13 inch | 330±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
| AS0A AS12 | Embossed | 4K | 12mm | 7 inch | 178.5±1.5 | 60 ^{+1/-0} | 13.0±0.5 | 13.0±0.5 | 15.5±0.5 |
| | | 8K | | 10 inch | 250±1.0 | 62±0.5 | 13.0±0.5 | 12.5±0.5 | 16.5±0.5 |

Paper Tape Specifications



| Type | A (mm) | B (mm) | W (mm) | E (mm) | F (mm) | P ₀ (mm) | P ₁ (mm) | P ₂ (mm) | ΦD ₀ (mm) | T (mm) |
|------|-----------|-----------|----------|-----------|-----------|---------------------|---------------------|---------------------|----------------------|-----------|
| AS01 | 0.38±0.05 | 0.68±0.05 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.42±0.20 |
| AS02 | 0.65±0.10 | 1.15±0.10 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.45±0.10 |
| AS03 | 1.10±0.10 | 1.90±0.10 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.70±0.10 |
| AS05 | 1.60±0.10 | 2.40±0.20 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.85±0.10 |
| AS06 | 1.90±0.10 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.85±0.10 |
| AS10 | 2.90±0.10 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.85±0.10 |

Embossed Plastic Tape Specifications



| Type | A (mm) | B (mm) | W (mm) | E (mm) | F (mm) | P ₀ (mm) | P ₁ (mm) | P ₂ (mm) | ΦD ₀ (mm) | T (mm) |
|------|----------|----------|-----------|-----------|----------|---------------------|---------------------|---------------------|----------------------|-------------------|
| AS0A | 2.8±0.10 | 5.5±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.1, -0 | 1.2 ⁺⁰ |
| AS12 | 3.5±0.10 | 6.7±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.1, -0 | 1.2 ⁺⁰ |

■ Marking

No Marking for 0201 and 0402

Jumper for all: Letter "0"

1% for 0805/1206/1210/2010/2512: 4 digits marking

Example:

| Resistance | 100Ω | 2.2KΩ | 10KΩ | 49.9KΩ | 100KΩ |
|------------|------|-------|------|--------|-------|
| Marking | 1000 | 2201 | 1002 | 4992 | 1003 |

5% for 0603/0805/1206/1210/2010/2512: 3 digits marking in E24

Example: 101=100Ω 102=1KΩ (1st and 2nd are E24 code and 3rd code is multiplier)

| E24 code | 10 | 11 | 12 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 27 | 30 | 33 | 36 | 39 | 43 | 47 | 51 | 56 | 62 | 68 | 75 | 82 | 91 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

1% for 0603: 3 digits marking in E96



3 digits marking for Example: 14C=13K7Ω 13C=13K3Ω
68B=4K99Ω 68X=49.9Ω

Marking Table

| Code | E96 | | Code | E96 | | Code | E96 | | Code | E96 | |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|-----|--|
| 01 | 100 | | 25 | 178 | | 49 | 316 | | 73 | 562 | |
| 02 | 102 | | 26 | 182 | | 50 | 324 | | 74 | 576 | |
| 03 | 105 | | 27 | 187 | | 51 | 332 | | 75 | 590 | |
| 04 | 107 | | 28 | 191 | | 52 | 340 | | 76 | 604 | |
| 05 | 110 | | 29 | 196 | | 53 | 348 | | 77 | 619 | |
| 06 | 113 | | 30 | 200 | | 54 | 357 | | 78 | 634 | |
| 07 | 115 | | 31 | 205 | | 55 | 365 | | 79 | 649 | |
| 08 | 118 | | 32 | 210 | | 56 | 374 | | 80 | 665 | |
| 09 | 121 | | 33 | 215 | | 57 | 383 | | 81 | 681 | |
| 10 | 124 | | 34 | 221 | | 58 | 392 | | 82 | 698 | |
| 11 | 127 | | 35 | 226 | | 59 | 402 | | 83 | 715 | |
| 12 | 130 | | 36 | 232 | | 60 | 412 | | 84 | 732 | |
| 13 | 133 | | 37 | 237 | | 61 | 422 | | 85 | 750 | |
| 14 | 137 | | 38 | 243 | | 62 | 432 | | 86 | 768 | |
| 15 | 140 | | 39 | 249 | | 63 | 442 | | 87 | 787 | |
| 16 | 143 | | 40 | 255 | | 64 | 453 | | 88 | 806 | |
| 17 | 147 | | 41 | 261 | | 65 | 464 | | 89 | 825 | |
| 18 | 150 | | 42 | 267 | | 66 | 475 | | 90 | 845 | |
| 19 | 154 | | 43 | 274 | | 67 | 487 | | 91 | 866 | |
| 20 | 158 | | 44 | 280 | | 68 | 499 | | 92 | 887 | |
| 21 | 162 | | 45 | 287 | | 69 | 511 | | 93 | 909 | |
| 22 | 165 | | 46 | 294 | | 70 | 523 | | 94 | 931 | |
| 23 | 169 | | 47 | 301 | | 71 | 536 | | 95 | 953 | |
| 24 | 174 | | 48 | 309 | | 72 | 549 | | 96 | 976 | |
| Code | A | B | C | D | E | F | G | X | Y | | |
| Multiplier | 10 ⁰ | 10 ¹ | 10 ² | 10 ³ | 10 ⁴ | 10 ⁵ | 10 ⁶ | 10 ⁻¹ | 10 ⁻² | | |

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|-----------------|--------------|----------------------------|---|
| Version B3 | Jun 03, 2014 | - | - Environmental Characteristics updated |
| Version B4 | Jul 15, 2016 | - | - Remove Material Description - Modify Storage Temperature |
| Version B5 | Oct 31, 2016 | - | - Increase High Power Rating Electrical Specifications |
| Version B6 | Jan 12, 2018 | - | - Modify Electrical Specifications |

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[0805W8F931KT5E](#) [1206W4F5231T5E](#) [1210W2J0620T5E](#) [201007J0822T4E](#) [0201WMF1005TCE](#) [0201WMF1212TCE](#) [0201WMF1373TCE](#)
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[0201WMF5110TCE](#) [0201WMF6652TEE](#) [0201WMF6812TCE](#) [0201WMF8200TCE](#)