

Thick Film Chip Resistor Current Sensing Type

CSR series

MERITEK

FEATURE

- Operating Temperature: -55 ~ +155°C
- 3 Watts power rating in 1 Watt size, 1225 package
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating



PART NUMBERING SYSTEM

CSR 0201 R T R100 F
(1) (2) (3) (4) (5) (6)



| No | Item | Code | Description | Series Reference |
|-----|----------------|------|-----------------|---|
| (1) | Meritek Series | CSR | Current Sensing | Chip Resistor SMD Type |
| (2) | Size Code | 0201 | 0201 | 0402, 0603, 0805, 1206, 1210, 2010, 2512, 1225, 3720, 7520, 0612 |
| (3) | TCR (PPM/°C) | R | R: ±1000 | E: ±100, F: ±200, G: ±300, H: ±400, J: ±600, K: ±150, R: ±1000 |
| (4) | Power Rating | T | T: 1W | Blank: Standard, W: 1/8W, P: 1/5W, V: 1/4W, U: 1/2W, Q: 3/4W, T: 1W, A: 1.5W, S: 2W |
| (5) | Resistance | R100 | R100: 0.1Ω | R001: 0.001Ω ~ 8R00: 8Ω |
| (6) | Tolerance | F | F: ±1% | G: ±2%, J: ±5% |

ELECTRICAL CHARACTERISTICS

Low TCR Electrical Specification

| Size | Power Rating at 70°C | Operating Temperature | Max Operating Current | Resistance (mΩ) | | | TCR (PPM/°C) |
|------|----------------------|-----------------------|-----------------------|-----------------|-----|-----|--------------|
| | | | | ±1% | ±2% | ±5% | |
| 0805 | 1/8W | -55 ~ +155°C | 1.11A | 100 ~ 1000 | | | ±100 |
| 1206 | 1/4W | -55 ~ +155°C | 1.58A | 100 ~ 1000 | | | ±100 |
| 1210 | 1/2W | -55 ~ +155°C | 2.58A | 75 ~ 1000 | | | ±100 |
| 2010 | 3/4W | -55 ~ +155°C | 3.87A | 50 ~ 1000 | | | ±100 |
| 2512 | 1W | -55 ~ +155°C | 7.07A | 20 ~ 1000 | | | ±100 |
| 2512 | *2W | -55 ~ +155°C | 6.32A | 50 ~ 1000 | | | ±100 |
| 3720 | 1W | -55 ~ +155°C | 3.16A | 100 ~ 500 | | | ±100 |
| 7520 | 2W | -55 ~ +155°C | 6.32A | 50 ~ 350 | | | ±100 |

Notes:

- * indicates ultra high power
- Operating current = $\sqrt{P/R}$
- Current sensing resistor series can be designed based on customer's requirement

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ELECTRICAL CHARACTERISTICS (CONTINUED)

Standard Electrical Specification

| Size | Power Rating at 70°C | Operating Temperature | Max Operating Current | Resistance (mΩ) | | | TCR (PPM/°C) |
|------|----------------------|-----------------------|-----------------------|-----------------|-------|-----|--------------|
| | | | | ±1% | ±2% | ±5% | |
| 0201 | 1/20W | -55 ~ +155°C | 0.70A | 100 ~ 147 | | | ±1000 |
| | | | | 150 ~ 500 | | | ±600 |
| | | | | 510 ~ 1000 | | | ±300 |
| 0402 | 1/16W | -55 ~ +155°C | 1.11A | 50 ~ 100 | | | ±400 |
| | | | | 102 ~ 500 | | | ±300 |
| | | | | 510 ~ 1000 | | | ±200 |
| 0603 | 1/10W | -55 ~ +155°C | 2.23A | 20 ~ 50 | | | ±600 |
| | | | | 51 ~ 100 | | | ±400 |
| | | | | 102 ~ 500 | | | ±300 |
| | | | | 510 ~ 1000 | | | ±200 |
| 0805 | 1/8W | -55 ~ +155°C | 2.50A | 20 ~ 50 | | | ±600 |
| | | | | 51 ~ 100 | | | ±400 |
| | | | | 102 ~ 196 | | | ±300 |
| | | | | 200 ~ 1000 | | | ±200 |
| 1206 | 1/4W | -55 ~ +155°C | 5.00A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |
| 1210 | 1/2W | -55 ~ +155°C | 7.07A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |
| 2010 | 3/4W | -55 ~ +155°C | 8.66A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |
| 2512 | 1W | -55 ~ +155°C | 10.0A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |
| 1225 | 3W | -55 ~ +155°C | 31.6A | 3 ~ 5 | | | ±300 |
| | | | | 6 ~ 20 | | | ±200 |
| | | | | 21 ~ 30 | | | ±150 |
| | | | | 33 ~ 8000 | | | ±100 |
| 3720 | 1W | -55 ~ +155°C | 10.0A | 10 ~ 18 | | | ±300 |
| | | | | 20 ~ 500 | | | ±150 |
| 7520 | 2W | -55 ~ +155°C | 44.7A | - | 1 ~ 4 | | ±300 |
| | | | | 5 ~ 10 | | | ±200 |
| | | | | 11 ~ 350 | | | ±150 |
| 0612 | 1W | -55 ~ +155°C | 10.0A | 10 ~ 27 | | | ±600 |
| | | | | 30 ~ 91 | | | ±300 |
| | | | | 100 ~ 499 | | | ±200 |
| | | | | 500 ~ 1000 | | | ±100 |

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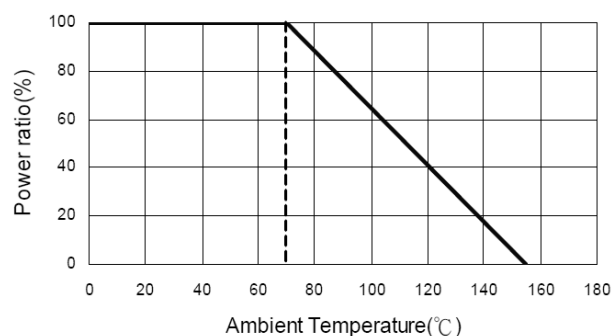
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ELECTRICAL CHARACTERISTICS (CONTINUED)

High Power & Ultra High Power Rating Electrical Specification

| Size | Power Rating at 70°C | Operating Temperature | Max Operating Current | Resistance (mΩ) | | | TCR (PPM/°C) |
|------|----------------------|-----------------------|-----------------------|-----------------|-----|-----|--------------|
| | | | | ±1% | ±2% | ±5% | |
| 0402 | 1/8W | -55 ~ +155°C | 1.56A | 51 ~ 100 | | | ±400 |
| | | | | 102 ~ 500 | | | ±300 |
| | | | | 510 ~ 1000 | | | ±200 |
| 0603 | 1/8W 1/5W | -55 ~ +155°C | 1.98A | 51 ~ 100 | | | ±400 |
| | | | | 102 ~ 500 | | | ±300 |
| | | | | 510 ~ 1000 | | | ±200 |
| 0805 | 1/4W | -55 ~ +155°C | 2.21A | 51 ~ 100 | | | ±400 |
| | | | | 102 ~ 500 | | | ±300 |
| | | | | 510 ~ 1000 | | | ±200 |
| 1206 | 1/2W | -55 ~ +155°C | 7.07A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |
| 1210 | 3/4W | -55 ~ +155°C | 8.66A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |
| 2010 | 1W | -55 ~ +155°C | 10.0A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |
| 2512 | 1.5W | -55 ~ +155°C | 12.2A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |
| 2512 | *2W | -55 ~ +155°C | 14.1A | 10 ~ 20 | | | ±600 |
| | | | | 21 ~ 50 | | | ±400 |
| | | | | 51 ~ 91 | | | ±300 |
| | | | | 100 ~ 1000 | | | ±200 |

POWER DERATING CURVE

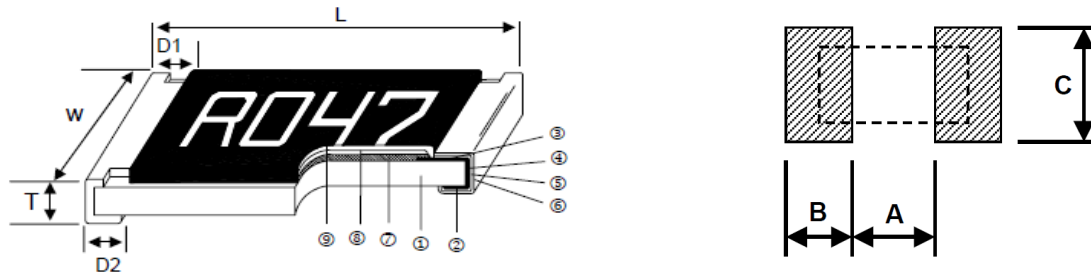


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DIMENSIONS



| Size | L (mm) | W (mm) | T (mm) | D1 (mm) | D2 (mm) | A (mm) | B (mm) | C (mm) | Weight (g/1kpcs) |
|--------------------------|-----------|-----------|-----------|-----------|-----------|--------|--------|-----------|------------------|
| 0201 | 0.60±0.03 | 0.30±0.03 | 0.23±0.05 | 0.12±0.05 | 0.15±0.05 | 0.25 | 0.30 | 0.40±0.20 | 0.18 |
| 0402 | 1.00±0.05 | 0.50±0.05 | 0.32±0.10 | 0.25±0.10 | 0.20±0.10 | 0.50 | 0.50 | 0.60±0.20 | 0.70 |
| 0603 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 | 0.80 | 1.00 | 0.90±0.20 | 1.99 |
| 0805 | 2.00±0.10 | 1.25±0.10 | 0.55±0.10 | 0.30±0.20 | 0.40±0.25 | 1.00 | 1.00 | 1.35±0.20 | 5.30 |
| 1206 | 3.10±0.10 | 1.55±0.10 | 0.55±0.10 | 0.50±0.30 | 0.40±0.25 | 2.00 | 1.15 | 1.70±0.20 | 8.82 |
| 1210 | 3.10±0.10 | 2.60±0.15 | 0.55±0.10 | 0.50±0.30 | 0.50±0.25 | 2.00 | 1.15 | 2.50±0.20 | 15.50 |
| 2010 | 5.00±0.10 | 2.50±0.15 | 0.60±0.15 | 0.60±0.30 | 0.50±0.25 | 3.60 | 1.40 | 2.50±0.20 | 27.03 |
| 2512 | 6.35±0.10 | 3.10±0.15 | 0.60±0.10 | 0.60±0.30 | 0.55±0.25 | 4.90 | 1.60 | 3.20±0.20 | 43.08 |
| 2512(2W) (10~99mΩ) | 6.35±0.20 | 3.15±0.15 | 0.74±0.10 | 0.60±0.30 | 0.55±0.25 | 4.90 | 1.60 | 3.20±0.20 | 53.08 |
| 2512(2W) (100~1000mΩ) | 6.35±0.20 | 3.15±0.15 | 0.74±0.10 | 0.60±0.30 | 2.10±0.10 | 1.00 | 3.55 | 3.20±0.20 | 53.08 |
| 1225 | 3.10±0.15 | 6.30±0.15 | 0.90±0.15 | 0.60±0.30 | 0.80±0.25 | 1.20 | 2.00 | 7.00±0.20 | 64.88 |
| 3720 | 2.00±0.20 | 3.75±0.20 | 0.60±0.10 | 0.40±0.20 | 0.40±0.20 | 1.00 | 1.80 | 3.90±0.20 | 19.96 |
| 7520 | 2.00±0.20 | 7.50±0.30 | 0.60±0.10 | 0.40±0.20 | 0.40±0.20 | 1.00 | 1.80 | 7.60±0.20 | 35.71 |
| 0612 | 1.55±0.10 | 3.10±0.15 | 0.55±0.10 | 0.30±0.15 | 0.45±0.15 | 0.60 | 1.00 | 3.20±0.20 | 10.19 |

CONSTRUCTION

| Item | Construction | Item | Construction | Item | Construction |
|------|-------------------|------|--------------------|------|--------------------|
| 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 |

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RELIABILITY TEST CONDITION AND REQUIREMENT

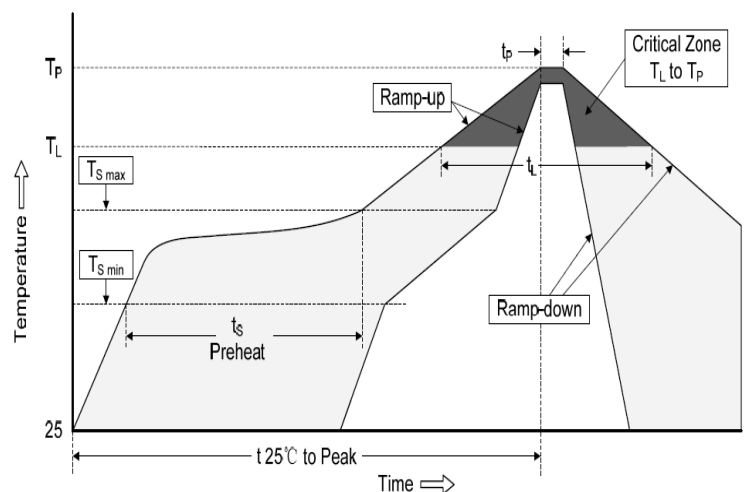
| Test | Standard | Condition | Requirement |
|--|---|--|--|
| Temperature Coefficient of Resistance (T.C.R.) | JIS-C-5201-1 4.8 IEC-60115-1 4.8 | -55°C ~ +125°C, 25°C is the reference temperature | As Specified |
| Short Time Overload | JIS-C-5201-1 4.13 IEC-60115-1 4.13 | Overload Voltage for 5 seconds | $ \Delta R/R \leq 0.5\%+0.05\Omega$, $ \Delta R/R \leq 1.0\%+0.05\Omega$ for high power rating |
| Insulation Resistance | JIS-C-5201-1 4.6 IEC-60115-1 4.6 | Apply Max Overload Voltage for 1 minute | I.R. $\geq 10G\Omega$ |
| Endurance | JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 | 70 \pm 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF". | $ \Delta R/R \leq 1\%+0.05\Omega$ |
| Damp Heat with Load | JIS-C-5201-1 4.24 IEC-60115-1 4.24 | 40 \pm 2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF". | $ \Delta R/R \leq 0.5\%+0.05\Omega$ |
| Dry Heat | JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 | at +155°C for 1000 hrs | $ \Delta R/R \leq 0.5\%+0.05\Omega$ |
| Bending Strength | JIS-C-5201-1 4.33 IEC-60115-1 4.33 | Bending once for 5 seconds 2010,2512 sizes: 2mm, other sizes: 3mm | $ \Delta R/R \leq 1\%+0.05\Omega$ |
| Solderability | JIS-C-5201-1 4.17 IEC-60115-1 4.17 | 245 \pm 5°C for 3 seconds | 95% min. coverage |
| Resistance to Soldering Heat | JIS-C-5201-1 4.18 IEC-60115-1 4.18 | 260 \pm 5°C for 10 seconds | $ \Delta R/R \leq 0.5\%+0.05\Omega$ |
| Voltage Proof | JIS-C-5201-1 4.7 IEC-60115-1 4.7 | 1.42 times Max. operating voltage for 1 minute | No breakdown or flashover |
| Leaching | JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 | 260 \pm 5°C for 30 seconds | Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$ |
| Thermal Shock | JIS-C-5201-1 4.19 IEC-60115-1 4.19 | -55°C ~ +155°C, 5 cycles | $ \Delta R/R \leq 0.5\%+0.05\Omega$ |

Notes:

- RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max operating voltage, whichever is lower
- Overload Voltage = $2.5 \cdot \sqrt{(P \cdot R)}$ or Max overload voltage, whichever is lower

RECOMMENDED SOLDERING PROFILES

| Reflow Condition | | |
|--|-------------------------------|-----------------|
| Pre Heat | Temp. Min $T_{s(min)}$ | 150°C |
| | Temp. Max $T_{s(max)}$ | 180°C |
| | Time (min. to max.) (t_s) | 90-120 seconds |
| Average ramp up rate (T_L) to peak | | 3°C/second max. |
| $T_{s(max)}$ to T_L (Ramp-up rate) | | 3°C/second max. |
| Reflow | Temp. (T_L) | 220°C |
| | Time (min. to max.) (t_L) | 60 seconds max. |
| Peak Temperature (T_P) | | 260°C ~265°C |
| Time within 5°C of actual peak Temperature (t_p) | | 10 seconds max. |
| Ramp-down Rate | | 6°C/second |



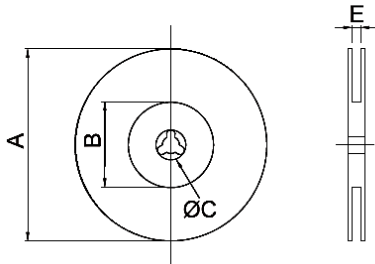
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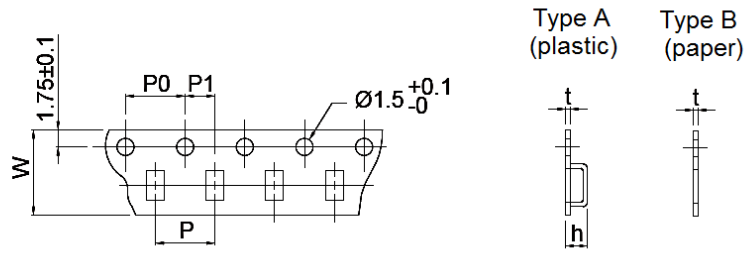
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PACKAGING DIMENSION

CARRIER TAPE REELS



TAPE DIMENSIONS (mm)



| Series | Reel Dimension (mm) | | | | Tape Dimensions (mm) | | | | | | Parts Per Reel | |
|-------------|---------------------|-----------|-----------|-----------|----------------------|------------|-------------|-------------|------------|------------|----------------|--------|
| | A ±2.0 | B ±1.0 | C ±0.7 | E ±1.0 | W ±0.20 | P ±0.10 | P0 ±0.05 | P1 ±0.05 | H ±0.20 | T ±0.20 | Type | 7" |
| CSR0201 | 178.0 | 60.0 | 13.5 | 9.5 | 8.00 | 2.00 | 4.00 | 2.00 | - | 0.42 | B | 10,000 |
| CSR0402 | 178.0 | 60.0 | 13.5 | 9.5 | 8.00 | 2.00 | 4.00 | 2.00 | - | 0.45 | B | 10,000 |
| CSR0603 | 178.0 | 60.0 | 13.5 | 9.5 | 8.00 | 4.00 | 4.00 | 2.00 | - | 0.70 | B | 5,000 |
| CSR0805 | 178.0 | 60.0 | 13.5 | 9.5 | 8.00 | 4.00 | 4.00 | 2.00 | - | 0.85 | B | 5,000 |
| CSR1206 | 178.0 | 60.0 | 13.5 | 9.5 | 8.00 | 4.00 | 4.00 | 2.00 | - | 0.85 | B | 5,000 |
| CSR1210 | 178.0 | 60.0 | 13.5 | 9.5 | 8.00 | 4.00 | 4.00 | 2.00 | - | 0.85 | B | 5,000 |
| CSR0612 | 178.0 | 60.0 | 13.5 | 9.5 | 8.00 | 4.00 | 4.00 | 2.00 | - | 0.85 | B | 5,000 |
| CSR2010 | 178.0 | 60.0 | 13.5 | 13.5 | 12.00 | 4.00 | 4.00 | 2.00 | 1.00 | - | A | 4,000 |
| CSR2512 | 178.0 | 60.0 | 13.5 | 13.5 | 12.00 | 4.00 | 4.00 | 2.00 | 1.00 | - | A | 4,000 |
| CSR2512(2W) | 178.0 | 60.0 | 13.5 | 13.5 | 12.00 | 4.00 | 4.00 | 2.00 | 1.45 | - | A | 2,000 |
| CSR1225 | 178.0 | 60.0 | 13.5 | 13.5 | 12.00 | 4.00 | 4.00 | 2.00 | 1.45 | - | A | 2,000 |
| CSR3720 | 178.0 | 60.0 | 13.5 | 13.5 | 12.00 | 4.00 | 4.00 | 2.00 | 1.20 | - | A | 2,000 |
| CSR7520 | 178.0 | 60.0 | 13.5 | 17.5 | 16.00 | 4.00 | 4.00 | 2.00 | 1.20 | - | A | 2,000 |

*Specifications subject to change without notice.