

◆ **General**

- Scope

This specification is available for Alloy Shunt Resistors manufactured by ELLON Electro-Mechanics Co., Ltd.

- Quality

The resistor is manufactured by highly quality-controlled process and guaranteed high reliability, it meets RoHS & Halogen-Free requirement.

- Standard measuring conditions

Temperature $20 \pm 2^\circ\text{C}$, Humidity $65 \pm 5\%$. Being no doubt about the judgment, measurements can be made within the following Temperature $5 \sim 35^\circ\text{C}$, Humidity $45 \sim 85\%$.

◆ **Applications**

- Current sensor for power hybrid applications
- Frequency converters
- Power modules
- Communication system
- Automatic control power supply
- High current applications for the automotive

◆ **Specification**

- Resistance Value: $0.1\text{m}\Omega \sim 5\text{m}\Omega$
- Value accuracy: $\pm 0.5\%(D)$, $\pm 1\%(F)$, $\pm 5\%(J)$
- Resistance temperature coefficient : MIN 20PPM/ $^\circ\text{C}$
- Working temperature range: $-55^\circ\text{C} \sim +175^\circ\text{C}$
- Inductors: $< 2\text{Nh}$
- EMV($0 \sim 100^\circ\text{C}$): $< 1\mu\text{V}/^\circ\text{C}$
- Power(P70 $^\circ\text{C}$): MAX15W
- AEC-Q200 Reliability Testing Passed

◆ **Part Number System**

| <u>ESRH</u> | <u>31</u> | <u>F</u> | <u>2W</u> | <u>R001</u> | <u>M</u> | <u>02</u> | <u>G</u> |
|--------------|---|---|--|---|--|-------------------------------|----------------------------|
| Product Type | Size (Inch) | Resistor Tolerance | Rated Power | Resistor Value | Material | Quantity (Pcs) | Remarks |
| ESRH | 16=1206 25=2512 27=2726 31=3921 51=5931 | D= $\pm 0.5\%$ F = $\pm 1\%$ G= $\pm 2\%$ J= $\pm 5\%$ | 1W5=1.5Watt 2W=2Watt 3W=3Watt 5W=5Watt --- 15W=15Watt | 0M30=0.3m Ω R001=1m Ω --- R005=5m Ω | F:FeCrAl M:MnCu K:Karma A:Alloy | 02=2000 04=4000 05=5000 | S=standard G=High power |

(1): ESRH Series

(2): Size Code: 16=1206, 25=2512, 27=2726, 31=3921, 51=5931

(3): Tolerance Code: D= $\pm 0.5\%$, F = $\pm 1\%$, G= $\pm 2\%$, J= $\pm 5\%$

(4): Power Rating: Ex. 1W=1Watt; 1W5=1.5Watt; 2W=2Watt ; 3W=3Watt; 5W=5Watt ;

(5): Resistance Code: 0M30= 0.3mR R001=1mR

(6): Materials: F:FeCrAl; M:MnCu; K:Karma

(7): Optional piece reel quantity: 02=2000PCS; 01=1000PCS; 04=4000PCS; 05=5000

(8): Remarks: Interior code

Matel Type-current Shunt Resistors – ESRH Series



Standard Electrical Specifications

| Type | EIA Code | Rated Power at 100°C | Rated Power at 70°C | Materials | T.C.R. (PPM/°C) | Resistance Range | T/mm |
|--------|----------|----------------------|---------------------|-----------|-----------------|--------------------------------|----------|
| | | | | | | D(±0.5%)F(±1%) G(+2%)J(±5%) | |
| ESRH16 | 1206 | 1.5W | 3W | K | ±75 | 2mΩ | 0.58±0.1 |
| ESRH25 | 2512 | 5W | 7W | M | ±200 | 0.2mΩ | 1.7±0.1 |
| | | 5W | 7W | M | ±200 | 0.3mΩ | 1.7±0.1 |
| | | 5W | 7W | K | ±25 | 1mΩ | 1.3±0.1 |
| | | 5W | 7W | K | ±25 | 1.5mΩ | 1.3±0.1 |
| | | 5W | 7W | K | ±25 | 2mΩ | 1.3±0.1 |
| | | 4W | 6W | K | ±25 | 2.5mΩ | 1.3±0.1 |
| | | 4W | 5W | K | ±25 | 3mΩ | 1.3±0.1 |
| | | 4W | 5W | K | ±25 | 5mΩ | 1.3±0.1 |
| ESRH27 | 2726 | 9W | 12W | M | ±150 | 0.1mΩ | 1.70±0.1 |
| | | 9W | 12W | M | ±150 | 0.2mΩ | 1.70±0.1 |
| | | 7W | 11W | M | ±150 | 0.3mΩ | 1.50±0.1 |
| ESRH31 | 3921 | 5W | 12W | M | ±100 | 0.2mΩ | 1.70±0.1 |
| | | 5W | 10W | M | ±100 | 0.3mΩ | 1.28±0.1 |
| | | 5W | 9W | M | ±100 | 0.4mΩ | 1.00±0.1 |
| | | 5W | 9W | M | ±100 | 0.5mΩ | 0.80±0.1 |
| | | 5W | 8W | M | ±100 | 0.7mΩ | 0.55±0.1 |
| | | 5W | 7W | M | ±100 | 0.8mR | 0.48±0.1 |
| | | 4W | 7W | M | ±100 | 1mΩ | 0.40±0.1 |
| | | 5W | 8W | F | ±50 | 1mΩ | 1.25±0.1 |
| | | 4W | 7W | F | ±50 | 1.5mΩ | 0.94±0.1 |
| | | 4W | 6W | F | ±50 | 2mΩ | 0.62±0.1 |
| | | 3W | 5W | F | ±50 | 2.5mΩ | 0.48±0.1 |
| | | 3W | 5W | F | ±50 | 3mΩ | 0.42±0.1 |
| | | 2.5W | 4W | F | ±50 | 4mΩ | 0.35±0.1 |
| | | 4W | 5W | F | ±50 | 5mΩ | 0.28±0.1 |
| | | 5W | 8W | K | ±75 | 1mΩ | 1.16±0.1 |
| | | 4W | 7W | K | ±75 | 1.5mΩ | 1.05±0.1 |
| | | 5W | 8W | K | ±75 | 2mΩ | 0.65±0.1 |
| | | 4W | 6W | K | ±75 | 2mΩ | 0.56±0.1 |
| | | 3W | 5W | K | ±75 | 2.5mΩ | 0.54±0.1 |
| | | 3W | 5W | K | ±75 | 3mΩ | 0.43±0.1 |
| 2.5W | 4W | K | ±75 | 4mΩ | 0.32±0.1 | | |
| 2W | 3W | K | ±75 | 5mΩ | 0.28±0.1 | | |
| ESRH51 | 5931 | 10W | 15W | M | ±200 | 0.1mΩ | 1.70±0.1 |
| | | 10W | 15W | M | ±150 | 0.2mΩ | 1.60±0.1 |
| | | 9W | 12W | M | ±150 | 0.25mΩ | 1.58±0.1 |

Specifications reflect recent product changes, for more information refer to PCN announcement (LINK) Specifications are Subject to change.

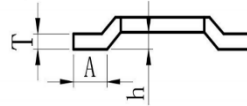
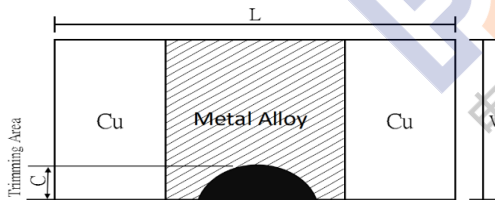
Matel Type-current Shunt Resistors – ESRH Series



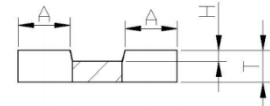
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|--|--|----|-----|---|------|--------|----------|
| | | 7W | 10W | M | ±150 | 0.3mΩ | 0.96±0.1 |
| | | 6W | 9W | M | ±150 | 0.4mΩ | 0.72±0.1 |
| | | 6W | 8W | M | ±100 | 0.5mΩ | 0.58±0.1 |
| | | 6W | 7W | M | ±100 | 0.7mΩ | 0.42±0.1 |
| | | 5W | 7W | M | ±100 | 0.75mΩ | 0.39±0.1 |
| | | 5W | 7W | M | ±100 | 0.8mΩ | 0.36±0.1 |
| | | 6W | 9W | F | ±50 | 1mΩ | 0.94±0.1 |
| | | 6W | 8W | F | ±50 | 1.5mΩ | 0.62±0.1 |
| | | 5W | 7W | F | ±50 | 2mΩ | 0.48±0.1 |
| | | 5W | 7W | F | ±50 | 3mΩ | 0.31±0.1 |
| | | 6W | 9W | K | ±75 | 1mΩ | 0.88±0.1 |
| | | 6W | 8W | K | ±75 | 1.5mΩ | 0.55±0.1 |
| | | 5W | 7W | K | ±75 | 2mΩ | 0.43±0.1 |
| | | 4W | 7W | K | ±75 | 3mΩ | 0.30±0.1 |

- For non-standard parts, please contact our sales dept.
- Power rating is guaranteed for use an aluminum substrate.
- Operating Temperature Range :-55°C~+170°C

◆ Type Dimension



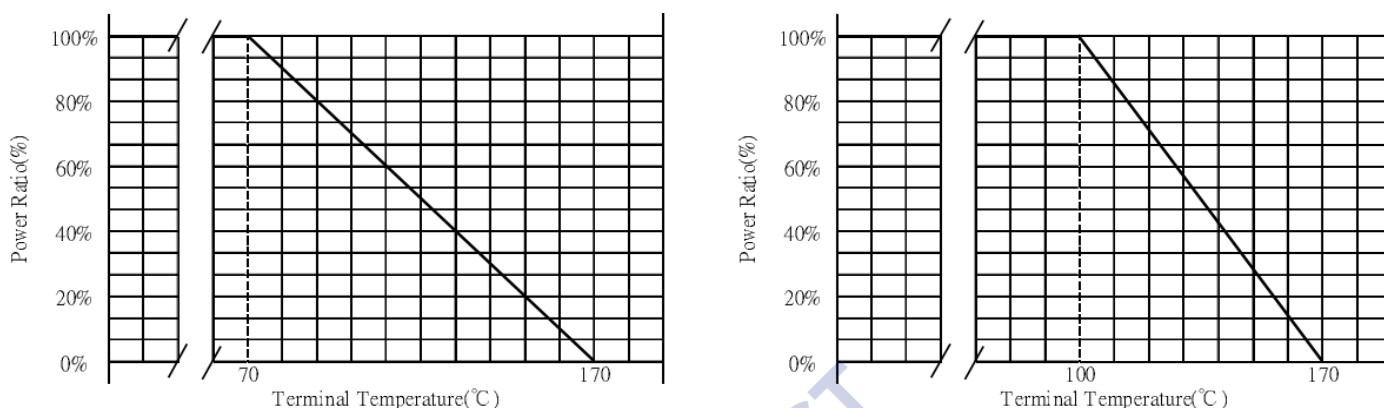
ESRH27/31/51



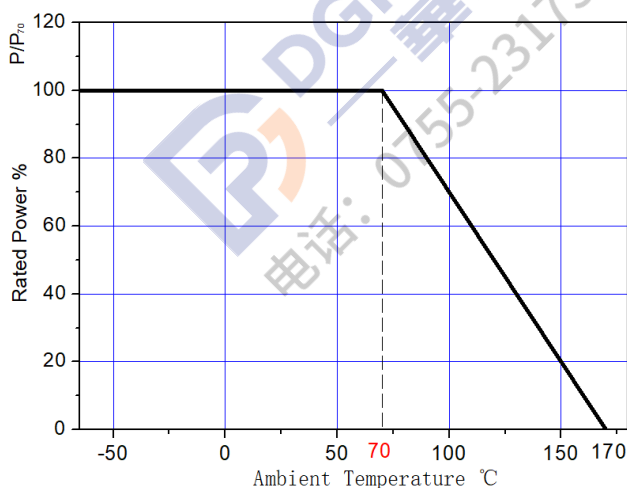
ESRH16 /25

| Type | EIA Code | Resistance | L(mm) | w(mm) | A(mm) | H(mm) |
|--------|----------|-------------|----------|----------|---------|----------|
| ESRH16 | 1206 | 2mΩ | 3.2±0.3 | 1.6±0.3 | 0.8±0.5 | 0.58±0.1 |
| ESRH25 | 2512 | 0.2mΩ~0.3mΩ | 6.4±0.2 | 3.2±0.25 | 2.2±0.3 | 0.65±0.3 |
| | | 1mΩ | | | 2.1±0.3 | 0.45±0.3 |
| | | 1.5mΩ~2.5mΩ | | | 1.6±0.3 | 0.6±0.3 |
| | | 3mΩ~5mΩ | | | 1.4±0.3 | 0.8±0.3 |
| ESRH27 | 2726 | 0.1mΩ~0.2mΩ | 6.95±0.2 | 6.6±0.15 | 2.3±0.3 | 1.7±0.1 |
| | | 0.3mΩ | 6.95±0.2 | 6.6±0.15 | 2.1±0.3 | 1.5±0.1 |
| ESRH31 | 3921 | 0.2mΩ~5mΩ | 10±0.2 | 5.1±0.25 | 2.0±0.2 | 1.0±0.25 |
| ESRH51 | 5931 | 0.1mΩ | 15±0.2 | 7.7±0.3 | 5.5±0.2 | 1.0±0.3 |
| | | 0.2mΩ~3mΩ | 15±0.2 | 7.7±0.3 | 4.2±0.2 | 0.5±0.15 |

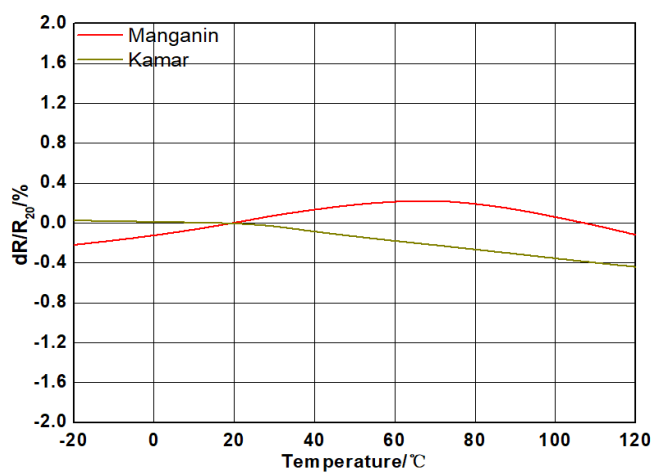
◆ Power Derating Curve



◆ Power Derating



◆ TCR Derating



◆ **Rated Voltage:**

The rated voltage is calculated by the following formula:

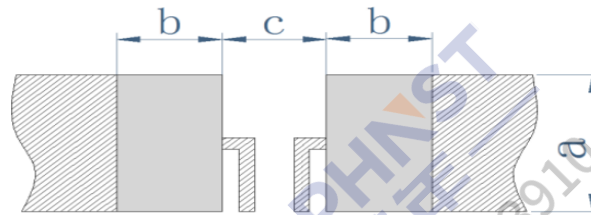
$$E(RCWV) = \sqrt{P * R}$$

E=Rated Voltage(V)

P=Rated Power(W)

R=Resistance Value(R)

◆ **Recommended Solder Pad Layout**



Unit: mm

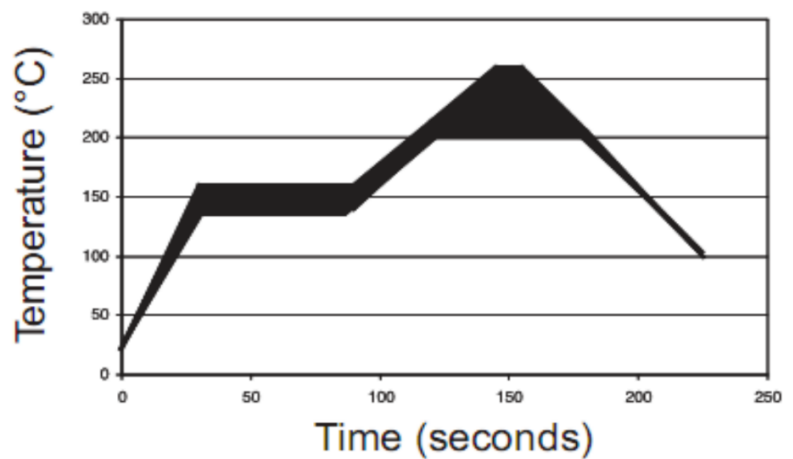
| TYPE | EIA Code | Resistance | a | b | c |
|--------|----------|-------------|------|-----|-----|
| ESRH16 | 1206 | 2mΩ | 3.5 | 1.5 | 1.0 |
| ESRH25 | 2512 | 0.2mΩ~1.5mΩ | 3.7 | 2.8 | 1.8 |
| | | 2mΩ~5mΩ | 3.7 | 2.2 | 3.0 |
| ESRH27 | 2726 | 0.1mΩ~0.2mΩ | 7.95 | 3 | 1.6 |
| | | 0.3mΩ | 7.95 | 3 | 1.6 |
| ESRH31 | 3921 | 0.2mΩ~5mΩ | 6.2 | 2.7 | 5.6 |
| ESRH51 | 5931 | 0.1mΩ | 8.75 | 6.2 | 3.6 |
| | | 0.2mΩ~3mΩ | 8.75 | 5.2 | 5.6 |

◆ **Recommend Soldering Conditions:**

Peaks reflow temperatures and durations

- Reflow Peak = 260 max for 10 sec
- Not suitable for wave soldering

Recommended IR Reflow Profile



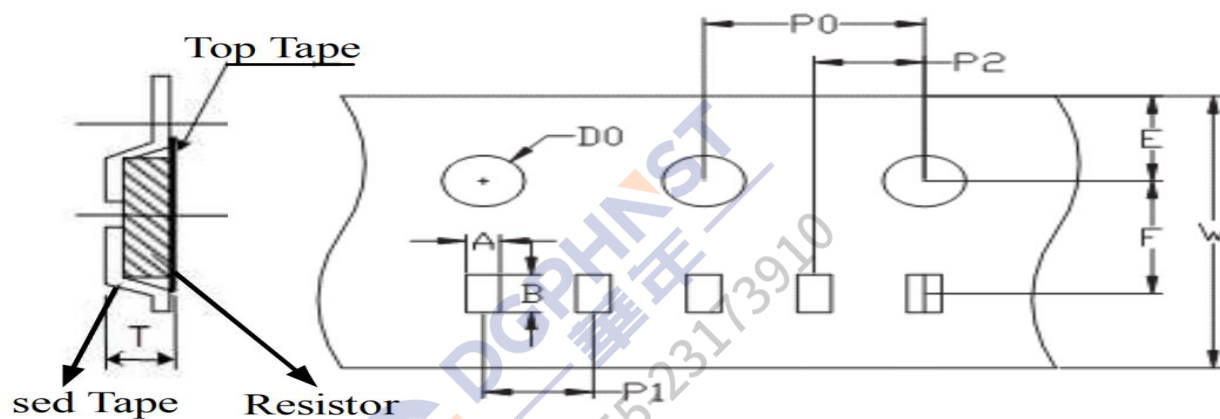
◆ **Storage Temperature**

Temperature 20~30°C, Humidity 40~80%

◆ Packaging

| Size EIA | ESRH16 | ESRH25 | ESRH27 | ESRH31 | ESRH51 |
|---------------------------------------|--------|--------|--------|--------|--------|
| Standard Packing Quantity (pcs /reel) | 5000 | 4000 | 2000 | 2000 | 2000 |

Embossed plastic Tape Specifications



◆ Dimension

| ITEM | A | B | E | F | W | P0 | P1 | P2 | D0 | T |
|--------|----------|----------|----------|----------|----------|----------|----------|----------|---------|----------|
| ESRH16 | 1.95±0.1 | 3.6±0.1 | 1.75±0.1 | 3.5±0.1 | 8.0±0.3 | 4.0±0.1 | 4.0±0.1 | 2.0±0.05 | 1.5±0.1 | 0.95±0.2 |
| ESRH25 | 3.55±0.1 | 6.75±0.1 | 1.75±0.1 | 5.5±0.05 | 12.0±0.2 | 4.0±0.05 | 4.0±0.1 | 2.0±0.05 | 1.5±0.1 | 1.2±0.2 |
| ESRH27 | 7.8±0.1 | 7.5±0.1 | 1.75±0.1 | 7.5±0.05 | 16.0±0.2 | 4.0±0.05 | 12.0±0.1 | 2.0±0.05 | 1.5±0.1 | 1.9±0.2 |
| ESRH31 | 5.5±0.1 | 10.8±0.1 | 1.75±0.1 | 6.5±0.05 | 16.0±0.2 | 4.0±0.05 | 12.0±0.1 | 6.0±0.05 | 1.5±0.1 | 1.2±0.2 |
| ESRH51 | 8.40±0.1 | 15.3±0.1 | 1.75±0.1 | 11.5±0.1 | 24.0±0.3 | 4.0±0.1 | 12.0±0.1 | 2.0±0.1 | 1.5±0.1 | 2.30±0.1 |