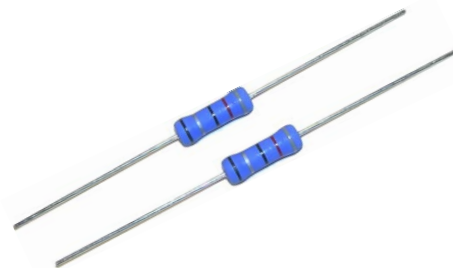


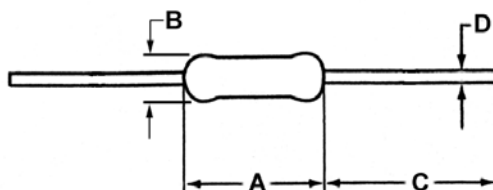
- Features:
- Excellent anti-surge characteristics
 - Stable characteristics through the resistance range
 - Good alternative to carbon composition resistors
 - Applications include power supplies, CRT's, and anti-surge circuits
 - Cut and formed product is available on select sizes; contact factory for details
 - Flameproof coating per UL94 V-0
 - RoHS compliant / lead-free



| Electrical Specifications | | | | | | |
|---------------------------|--------------------------------|-----------------------------------|--------------------------------|---------------------------------|------------------------------|----------------------------------|
| Type / Code | Power Rating (Watts) @ 70°C | Maximum Working Voltage (1) | Maximum Overload Voltage | Dielectric Withstand Voltage | Surge Withstanding (2) | Ohmic Range (Ω) and Tolerance |
| | | | | | | 5% |
| ASRM14 | 0.25W | 500V | 1000V | 200VAC | 2000V | 100K - 22M |
| ASR14 | 0.25W | DC 1600V AC 1150V | DC 2000V AC 1500V | 400VAC | 1000V 3000V | 10 - 510K 560K - 12M |
| ASRM12 | 0.5W | 2000V | 2500V | 500VAC | 5000V 10000V | 10 - 510K 560K - 12M |
| ASRM1 | 1W | 4000V | 5000V | 500VAC | 5000V 10000V | 10 - 510K 560K - 12M |
| ASR1 | 1W | 4000V | 5000V | 500VAC | 5000V 10000V | 10 - 510K 560K - 12M |
| ASRM2 | 2W | 4000V | 5000V | 500VAC | 5000V 10000V | 10 - 510K 560K - 12M |

(1) Lesser of \sqrt{PR} or maximum working voltage.

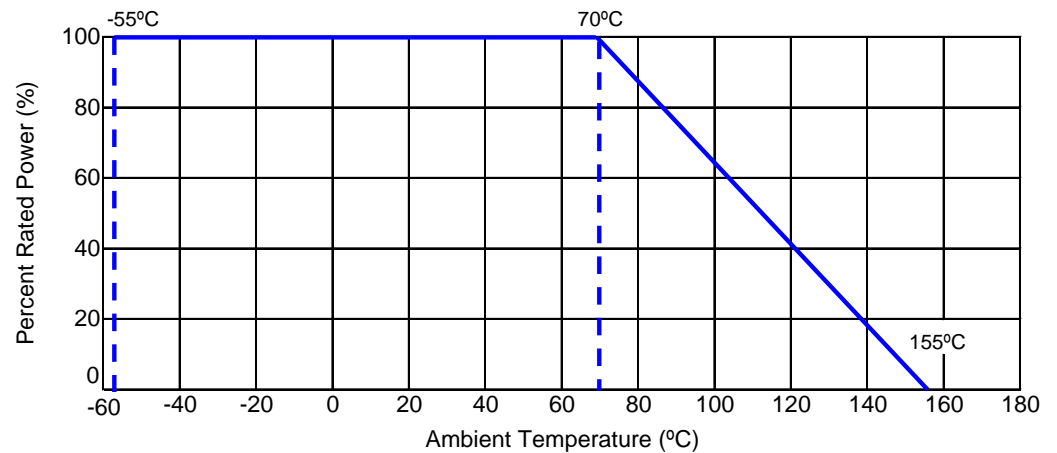
(2) 10 discharges from a 0.01μF capacitor every 5 seconds.



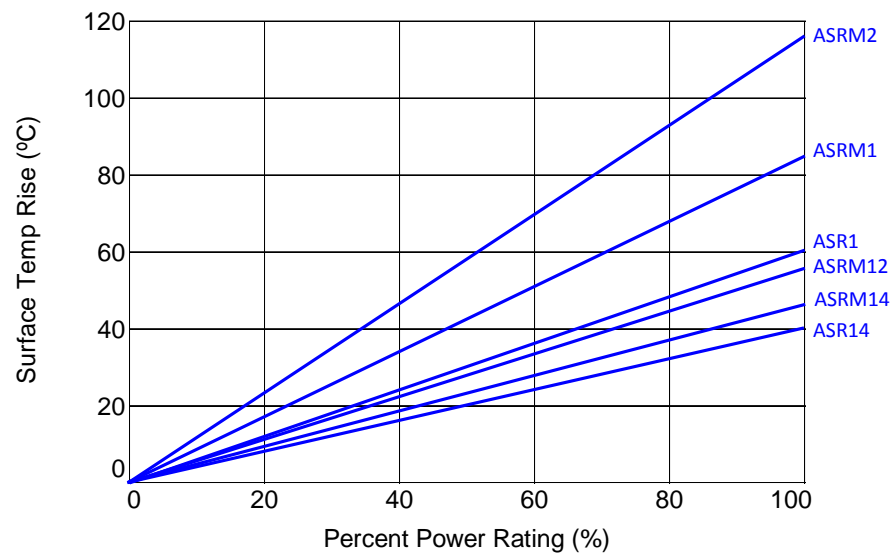
| Mechanical Specifications | | | | | | |
|---------------------------|-------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|--------------|
| Type / Code | Weight (mg/pc) | A Body Length | B Body Diameter | C Lead Length(Bulk) | D Lead Diameter | Unit |
| ASRM14 | 110 | 0.126 ± 0.008 3.20 ± 0.20 | 0.073 ± 0.008 1.85 ± 0.20 | 1.102 ± 0.118 28.00 ± 3.00 | 0.018 ± 0.002 0.45 ± 0.05 | inches mm |
| ASR14 | 210 | 0.236 ± 0.012 6.00 ± 0.30 | 0.091 ± 0.008 2.30 ± 0.20 | 1.102 ± 0.118 28.00 ± 3.00 | 0.022 ± 0.002 0.55 ± 0.05 | inches mm |
| ASRM12 | 330 | 0.354 ± 0.039 9.00 ± 1.00 | 0.118 ± 0.020 3.00 ± 0.50 | 1.102 ± 0.118 28.00 ± 3.00 | 0.028 ± 0.002 0.70 ± 0.05 | inches mm |
| ASRM1 | 570 | 0.433 ± 0.039 11.00 ± 1.00 | 0.157 ± 0.020 4.00 ± 0.50 | 1.102 ± 0.118 28.00 ± 3.00 | 0.031 ± 0.002 0.80 ± 0.05 | inches mm |
| ASR1 | 1340 | 0.591 ± 0.039 15.00 ± 1.00 | 0.197 ± 0.020 5.00 ± 0.50 | 1.378 ± 0.118 35.00 ± 3.00 | 0.031 ± 0.002 0.80 ± 0.05 | inches mm |
| ASRM2 | 1340 | 0.591 ± 0.039 15.00 ± 1.00 | 0.197 ± 0.020 5.00 ± 0.50 | 1.378 ± 0.118 35.00 ± 3.00 | 0.031 ± 0.002 0.80 ± 0.05 | inches mm |

| Performance Characteristics | | | | | | | | | | | | |
|---------------------------------------|--|---|-------------|----------|-------------------------------|------|--------------------------------|--------|---------------------------|------|--------------------------------|--------|
| Test | Test Result | Test Method | | | | | | | | | | |
| Temperature Coefficient of Resistance | ASRM14: ±200 ppm/°C All Other Sizes: -1800~0 ppm/°C | Measure resistance (R ₀) at room temperature (t), after that, measure again the resistance ® at 100 °C higher than room temperature $TCR = \frac{R - R_0}{R_0} \times \frac{10^6}{(t + 100) - t} \text{ (ppm/°C)}$ | | | | | | | | | | |
| Voltage Proof | Change of resistance ≤ ± (0.5%+0.05Ω) No mechanical damage | Lay the resistor on the 90° angle metal V block and apply rated AC voltage for one minute | | | | | | | | | | |
| Insulation Resistance | ≥1000 Mohm | Lay the resistor on the 90° angle metal V block and apply 100Vdc between V block and lead wire for a minute. The insulation resistance will be measured while applying the voltage. | | | | | | | | | | |
| Solvent Resistance | There will be no damage on the insulating surface | Soak in a Isopropyl alcohol for 5 minutes. After drying up for 5 minutes, the stress of 5N is added with the absorbent cotton. Five round trips at the rate of one round trip a second. | | | | | | | | | | |
| Overload (Short Time) | ≤ ± (1%+0.05Ω) | Apply 2.5 times rated voltage or max overload voltage whichever is lower for 5 seconds and leave in room temperature for one hour after test. | | | | | | | | | | |
| Robustness of Terminations | Change of resistance ≤ ± (0.5%+0.05Ω) | Tensile: The body of the resistor is fixed, a static load is added in the direction of drawing out of the terminal, and it maintains it for 10 ± 1 seconds. Tensile strength: 10N Bend: Component body will be fixed so that terminals are perpendicular to the floor. A static load specified below shall be applied to the terminal acting in a direction away from the body. The body of piezoelectric oscillator will be inclined through an angle of 90°C and then retuned to its initial position in 2 or 3 seconds Bending strength: 5N | | | | | | | | | | |
| Resistance to Soldering Heat | Change of resistance ≤ ± (1%+0.05Ω) | Dip the lead into a solder bath having a temperature of 260°C ± 5°C up to 1.5 ± 0.5 mm from the body of the resistors and hold it for 10 ± 0.5 seconds and leave in room temperature for one hour after test. | | | | | | | | | | |
| Solderability | More than 95% of the surface of the lead will be covered by new solder | Dip the lead into a solder bath having a temperature of 245°C ± 5°C up to 1.5 ± 0.5 mm from the body of the resistors and hold it for 5 ± 0.5 seconds. | | | | | | | | | | |
| Rapid Change of Temperature | Change of resistance ≤ ± (1%+0.05Ω) | The resistor shall be subjected to 5 continuous cycle, each as shown in the table below: <table><tr><th>Temperature</th><th>Duration</th></tr><tr><td>Minimum Operating Temperature</td><td>30 m</td></tr><tr><td>Standard Atmospheric Condition</td><td>≤ 30 s</td></tr><tr><td>Max Operating Temperature</td><td>30 m</td></tr><tr><td>Standard Atmospheric Condition</td><td>≤ 30 s</td></tr></table> | Temperature | Duration | Minimum Operating Temperature | 30 m | Standard Atmospheric Condition | ≤ 30 s | Max Operating Temperature | 30 m | Standard Atmospheric Condition | ≤ 30 s |
| Temperature | Duration | | | | | | | | | | | |
| Minimum Operating Temperature | 30 m | | | | | | | | | | | |
| Standard Atmospheric Condition | ≤ 30 s | | | | | | | | | | | |
| Max Operating Temperature | 30 m | | | | | | | | | | | |
| Standard Atmospheric Condition | ≤ 30 s | | | | | | | | | | | |
| Vibration | Change of resistance ≤ ± (1%+0.05Ω) | Apply 1.5mm amplitude vibration to three directions perpendicular to each other 2 hours each, total 6 hours. Vibrating frequency is 10Hz-55Hz-10Hz cycle in 1 minute sweeping and repeat cycle | | | | | | | | | | |
| Damp Heat, Steady State | Change of resistance ≤ ± (5%+0.05Ω) | In the chamber having temperature of 40 ± 2 °C and relative humidity of 93 ± 3%, apply one percent of the rated power, 1.5 hour ON, 0.5 hour OFF for 1000 hours and leave in room temperature for one hour after test. | | | | | | | | | | |
| Endurance at 70 °C | Change of resistance ≤ ± (5%+0.05Ω) | At 70 ± 2 °C, apply rated DC voltage 1.5 ON, 0.5 hour OFF for 1000 hours and leave in room temperature for one hour after test. | | | | | | | | | | |

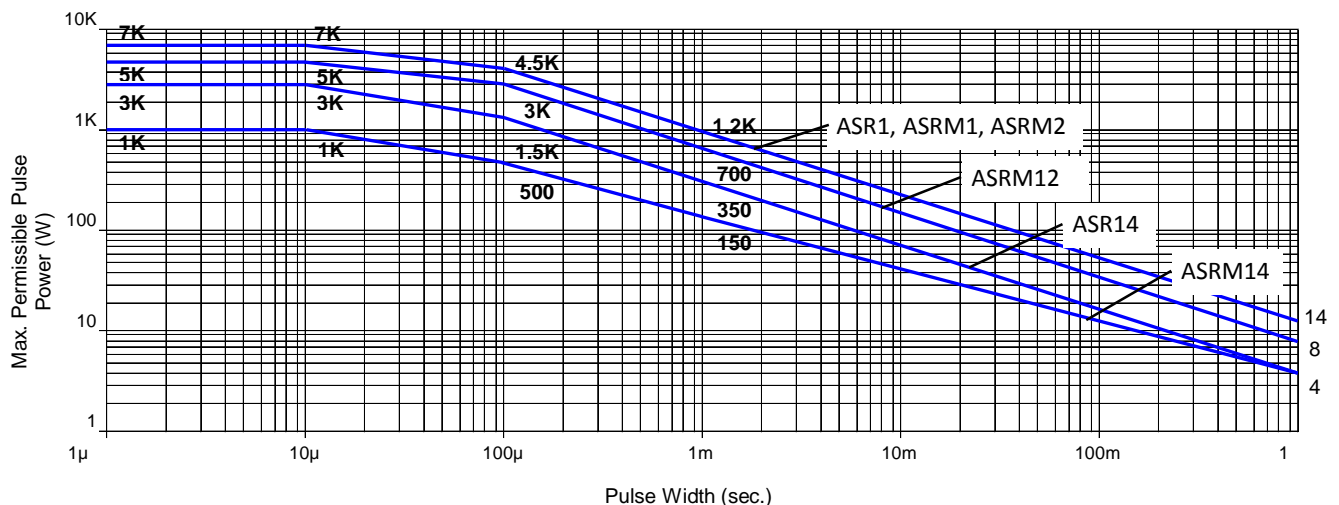
Power Derating Curve:



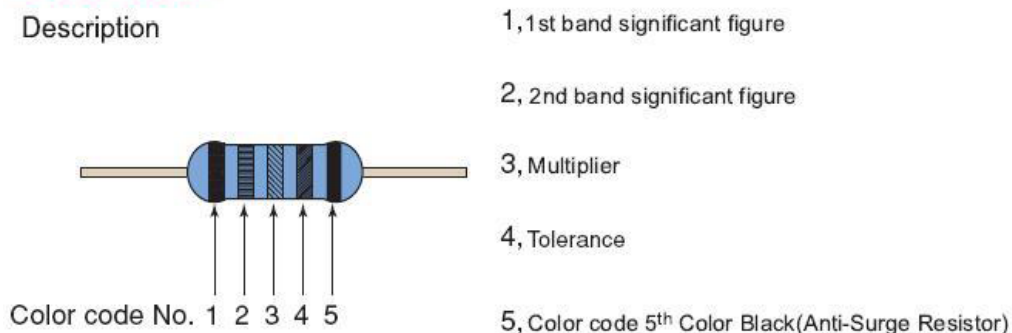
Heat Rise:



Pulse Limiting Power (single square shaped pulse):



Color Code



Repetitive Pulse Information

If repetitive pulses are applied to resistors, pulse wave form must be less than “Pulse limiting voltage”, “Pulse limiting current” or “Pulse limiting wattage” calculated by the formula below.

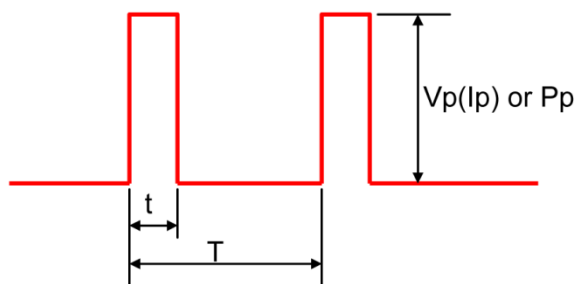
$$V_p = K \sqrt{P \times R \times T/t}$$

$$I_p = K \sqrt{P/R \times T/t}$$

$$P_p = K^2 \times P \times T/t$$

Where:

- V_p: Pulse limiting voltage (V)
- I_p: Pulse limiting current (A)
- P_p: Pulse limiting wattage (W)
- P: Power rating (W)
- R: Nominal resistance (ohm)
- T: Repetitive period (sec)
- t: Pulse duration (sec)
- K: Coefficient by resistors type (refer to below matrix)
- [V_r: Rated Voltage (V), I_r: Rated Current (A)]



Note 1: If $T > 10 \rightarrow T = 10$ (sec), $T/t > 1000 \rightarrow T/t = 1000$

Note 2: If $T > 10$ and $T/t > 1000$, “Pulse Limiting power (Single pulse) is applied

Note 3: If $V_p < V_r$ ($I_p < I_r$ or $P_p < P$), V_r (I_r , P) is V_p (I_p , P_p)

Note 4: Pulse limiting voltage (Current, Wattage) is applied at less than rated ambient temperature. If ambient temperature is more than the rated temperature (70°), please decrease power rating according to “Power Derating Curve”

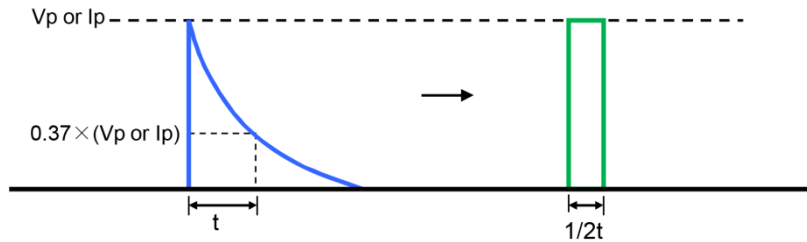
Note 5: Please assure sufficient margin for use period and conditions for “Pulse limiting voltage”

Note 6: If the pulse waveform is not square wave, please judge after transform the waveform into square wave according to “Waveform Transformation to Square Wave” information.

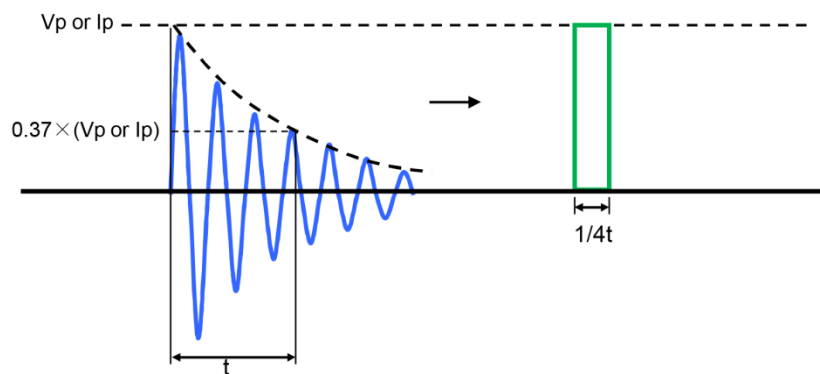
| Coefficient (K) Matrix | |
|------------------------|-----|
| Resistor Type | K |
| ASR, ASRM | 1.0 |

Waveform Transformation to Square Wave

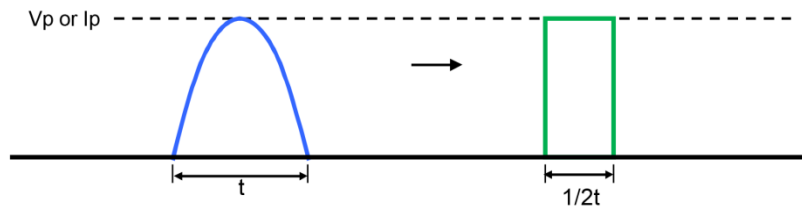
1. Discharge curve wave with time constant " t " → Square wave



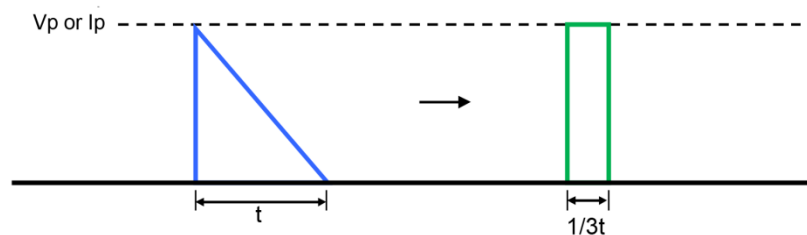
2. Damping oscillation wave with time constant of envelope " t " → Square wave



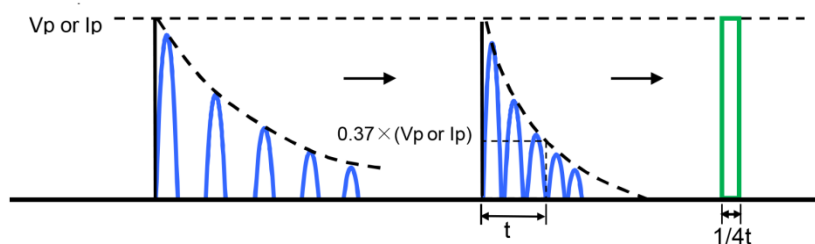
3. Half-wave rectification wave → Square wave



4. Triangular wave → Square wave



5. Special wave → Square wave



How to Order

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|----|----|
| A | S | R | 1 | 4 | J | A | 1 | 0 | 0 | K |

| Product Series | | Size | Power | Tolerance | | Packaging | | | | Resistance Value |
|----------------|-------------|------|-------|-----------|-----|-----------|-------------|-----------------------------------|----------|--|
| Code | Description | | | Code | Tol | Code | Description | Size | Quantity | |
| ASR | Standard | 14 | 0.25W | J | 5% | B | Bulk | ASRM14 | 2,000 | Four characters with the multiplier used as the decimal holder. 10 ohm = 10R0 560 Kohm = 560K 1 Mohm = 1M00 |
| ASRM | Mini | 12 | 0.5W | | | | | ASR14, ASRM12, ASRM1, ASR1, ASRM2 | 1,000 | |
| | | 1 | 1W | | | A | Ammo | ASRM14 | 5,000 | |
| | | 2 | 2W | | | | | ASR14, ASRM12 | 2,000 | |
| | | | | | | | | ASRM1 | 1,000 | |
| | | | | | | | | ASR1, ASRM2 | 500 | |

Legacy Part Number (before January 3, 2011):

| SEI Type | | Code | Nominal Resistance | Tolerance | Packaging | | | |
|----------|-------------|------|--------------------|-----------|-----------------------------------|---------|-------------|------|
| ASR | | 1/4 | 100K | 5% | T | | | |
| Code | Description | Code | Wattage | Tolerance | SEI Types | Pkg Qty | Description | Code |
| ASR | Standard | 1/4 | 0.25W | 5% | ASRM14 | 2,000 | Bulk | A |
| ASRM | Mini | 1/2 | 0.5W | | ASR14, ASRM12, ASRM1, ASR1, ASRM2 | 1,000 | Ammo | T |
| | | 1 | 1W | | ASRM14 | 5,000 | | |
| | | 2 | 2W | | ASR14, ASRM12 | 2,000 | | |
| | | | | | ASRM1 | 1,000 | | |
| | | | | | ASR1, ASRM2 | 500 | | |