# Low Ohmic Power Resistors, low inductance, ceramic case

RoHS compliant

## Specifications

| Type | | KN350-8 | KN351-8 | KN352-8 | KN353-8 | KN354-8 |
|---|---|---|---|---|---|---|
| Styles | | 7718 | 7725 | 7738 | 9925 | 9938 |
| Power rating $P_{70}$ | W | 4 | 5 | 7 | 7 | 9 |
| Resistance range | Ω | 0R003 ... 0R051 | 0R004 ... 0R068 | 0R005 ... 0R1 | 0R004 ... 0R068 | 0R005 ... 0R1 |
| E-Series | | E24>0R01 | E24>0R01 | E24>0R01 | E24>0R01 | E24>0R01 |
| Tolerances | % | ± 1, ± 2 ,± 3, ± 5 | | | | |
| Temperature coefficient | $10^{-6} * K^{-1}$ | + 200 ... + 1200 depends on value | | | | |
| max. cont. work. voltage | $V_{RMS}$ | $\sqrt{P_{70} \cdot R}$ for all styles | | | | |
| Insulation voltage (1min.) | $V_{RMS}$ | 2000 | | | | |
| Insulation resistance | Ω | > $10^4$M | | | | |
| Derating | °C | linear 70 ... 250 (0W) | | | | |
| Climatic category | | 55/200/56 | | | | |
| Temperature range | °C | - 55 ... 250 | | | | |
| Thermal resistance | $KW^{-1}$ | 65 | 50 | 38 | 35 | 30 |
| Failure rate (Total, $\vartheta_o$, max., 60% conf. lev.) | $10^{-9} * h^{-1}$ | appr. 10, depends on value | | | | |
| Endurance ($P_{70}$, @70°C, 1000h interm.) | $[\frac{\Delta R}{R}]$ % | ± 3,0 average | | | | |
| Damp heat, steady state (40°C, 93% r.h., 56d) | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | | | |
| Climatic sequence | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | | | |
| Terminal strength | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | | | |
| Terminal tensile strength | N | min. 25 | | | | |
| Resistance to soldering heat (260°C, 10s) | $[\frac{\Delta R}{R}]$ % | ± 0,2 typ. | | | | |
| Solderability | s | 2,5 Flowtime, solderglobule test, IEC 60068-2-20-T | | | | |
| Marking | | printed in clear | | | | |



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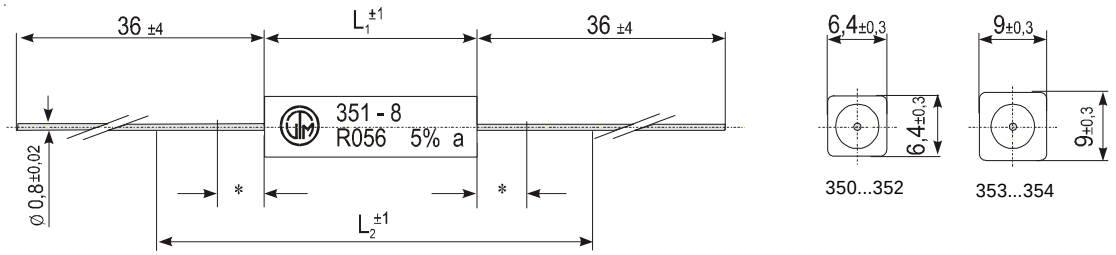
Dimensions in mm:




6mm. reduced solderability in this area

| | KN350-8 | KN351-8 | KN352-8 | KN353-8 | KN354-8 |
|---|---|---|---|---|---|
| $L_1$ | 18 | 25 | 38 | 25 | 38 |
| $L_2$ | 40 | 45 | 60 | 45 | 60 |

Measuring length $L_2$: Resistance value is measured over the centered length $L_2$ on terminals free of oxide and contaminations. Differing conditions require adequate corrections ($R_{terminal}$ = 0,4 mΩ/cm)

Packaging:

| Type | Packaging | Pieces | Pack.Code |
|---|---|---|---|
| KN350-8 | bulk<br>taped | 200<br>1000 | B<br>R |
| KN351-8 | bulk | 200 | B |
| KN352-8 | bulk | 200 | B |
| KN353-8 | bulk | 200 | B |
| KN354-8 | bulk | 100 | B |

Ordering example:

| KN350-8 | 5 | B | 0R015 |
|---|---|---|---|
| Type | Tolerance | Pack.-Code | R-Value |

Revision 200807

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# Low Ohmic Power Resistors, low inductance, axial

RoHS compliant

## Specifications

| Type | | KN350-0 | KN351-0 | KN352-0 |
|---|---|---|---|---|
| Styles | | 3313 | 3321 | 3332 |
| Power rating $P_{70}$ | W | 1 | 2 | 3 |
| Resistance range | Ω | 0R003...0R051 | 0R004...0R068 | 0R005...0R1 |
| E-Series | | E 24 > 0R01 | | |
| Tolerances | % | ± 1, ± 2 ,± 3, ± 5 | | |
| Temperature coefficient | $10^{-6} * K^{-1}$ | + 200 ... + 1200<br>depends on value | | |
| max. cont. work. voltage | $V_{RMS}$ | $\sqrt{P_{70} \cdot R}$ for all styles | | |
| Insulation voltage (1min.) | $V_{RMS}$ | non insulated | | |
| Insulation resistance | Ω | non insulated | | |
| Derating | °C | linear 70 ... 300 (0W) | | |
| Climatic category | | 55/200/56 | | |
| Temperature range | °C | - 55 ... 300 | | |
| Thermal resistance | $KW^{-1}$ | 200 | 100 | 70 |
| Failure rate<br>(Total, $\vartheta_o$, max., 60% conf. lev.) | $10^{-9} * h^{-1}$ | appr. 10, depends on value | | |
| Endurance<br>($P_{70}$, @70°C, 1000h interm.) | $[\frac{\Delta R}{R}]$ % | ± 3,0 | | |
| Damp heat, steady state<br>(40°C, 93% r.h., 56d) | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | |
| Climatic sequence | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | |
| Terminal strength | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | |
| Terminal tensile strength | N | min. 25 | | |
| Resistance to soldering heat<br>(260°C, 10s) | $[\frac{\Delta R}{R}]$ % | ± 0,2 typ. | | |
| Solderability | s | 2,5 Flowtime, solderglobule test, IEC 60068-2-20-T | | |
| Marking | | value imprinted | | |



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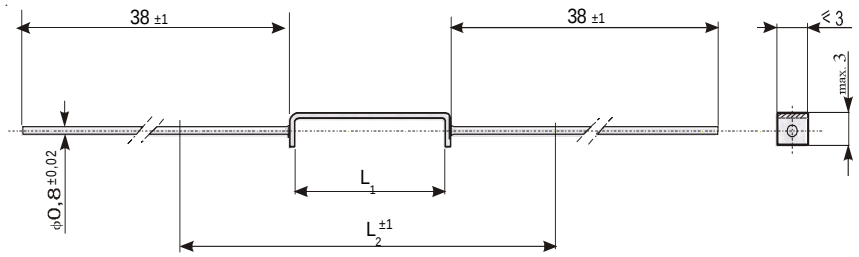
Dimensions in mm:




| Type | $L_1$ | $L_2$ ±1 |
|---|---|---|
| KN350-0 | 12 ...14,5 | 40 |
| KN351-0 | 17,5 ...21,5 | 45 |
| KN352-0 | 29 ... 34 | 60 |

Measuring length $L_2$: Resistance value is measured over the centered length $L_2$ on terminals free of oxide and contaminations. Differing conditions require adequate corrections ($R_{terminal}$ = 0,4 mΩ/cm)

Packaging:

| Type | Packaging | Pieces | Pack.Code |
|---|---|---|---|
| KN350-0 | bulk | 500 | B |
| KK351-0 | bulk | 500 | B |
| KN352-0 | bulk | 500 | B |

Ordering example:

| KN351-0 | 3 | B | 0R033 |
|---|---|---|---|
| Type | Tolerance | Pack.-Code | R-Value |



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# Low Ohmic Power Resistors, low inductance, radial

RoHS compliant

## Specifications

| Type | | KN350-009 | KN351-009<br>KN351-010 | KN352-009<br>KN352-010<br>KN352-011 |
|---|---|---|---|---|
| Power rating $P_{70}$ | W | 0,5 | 1,0 | 1,5 |
| Resistance range | Ω | 0R003...0R051 | 0R003...0R082 | 0R005...0R1 |
| E-Series | | E 24 ≥ 0R01 | | |
| Tolerances | % | ± 1, ± 2 ,± 3, ± 5 | | |
| Temperature coefficient | $10^{-6} * K^{-1}$ | + 200 ... + 1200 | | |
| max. cont. work. voltage | $V_{RMS}$ | $\sqrt{P_{70} \cdot R}$ for all styles | | |
| Insulation voltage (1min.) | $V_{RMS}$ | non insulated | | |
| Insulation resistance | Ω | non insulated | | |
| Derating, linear | °C | 70 ... 300 (0W) | | |
| Climatic category | | 55/200/56 | | |
| Temperature range | °C | - 55 ... 300 | | |
| Thermal resistance | $KW^{-1}$ | 200 | 100 | 70 |
| Failure rate<br>(Total, $\vartheta_o$, max., 60% conf. lev.) | $10^{-9} * h^{-1}$ | ca. 10, depends on value | | |
| Endurance<br>($P_{70}$, 70°C, 1000h interm.) | $[\frac{\Delta R}{R}]$% | ± 3,0 | | |
| Damp heat, steady state<br>(40°C, 93% r.h., 56d) | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | |
| Climatic sequence | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | |
| Terminal strength | $[\frac{\Delta R}{R}]$ % | ± 0,5 | | |
| Terminal tensile strength | N | min. 25 | | |
| Resistance to soldering heat<br>(260°C, 10s) | $[\frac{\Delta R}{R}]$ % | ± 0,2 typ. | | |
| Solderability | s | 2,5 Flowtime, solderglobule test, IEC 60068-2-20-T | | |
| Marking | | value imprinted | | |



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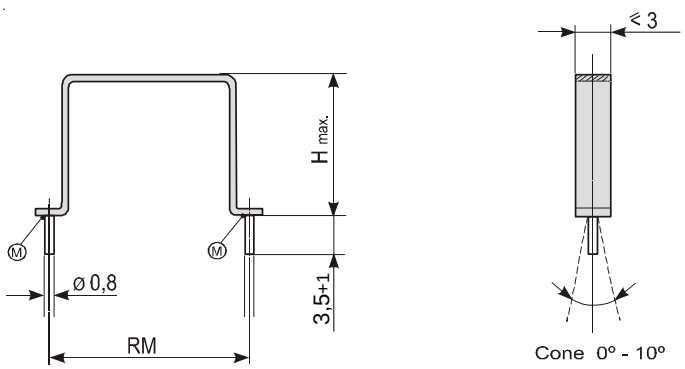
Dimensions in mm:




| Type | RM | Hmax. |
|---|---|---|
| KN350-009<br>KN351-009<br>KN352-009 | 10 | 6,5<br>10,5<br>17,0 |
| KN351-010<br>KN352-010 | 15 | 8<br>14,5 |
| KN352-011 | 20 | 12 |

Construction: The resistive elements consist of a flat metal-band. Spot welded Cu-terminals ensure high stability of contacts. Thus, this construction results in a non inductive resistor of both high stability and overload capacity.

Packaging:

| Type | Packaging | Pieces | Pack.Code |
|---|---|---|---|
| KN350-009 | bulk | 1000 | B |
| KK351-009<br>KN351-010 | bulk | 1000 | B |
| KN352-009<br>KN352-010<br>KN352-011 | bulk | 500 | B |

Ordering example:

| KN350-009 | 5 | B | 0R015 |
|---|---|---|---|
| Type | Tolerance | Pack.-Code | R-Value |



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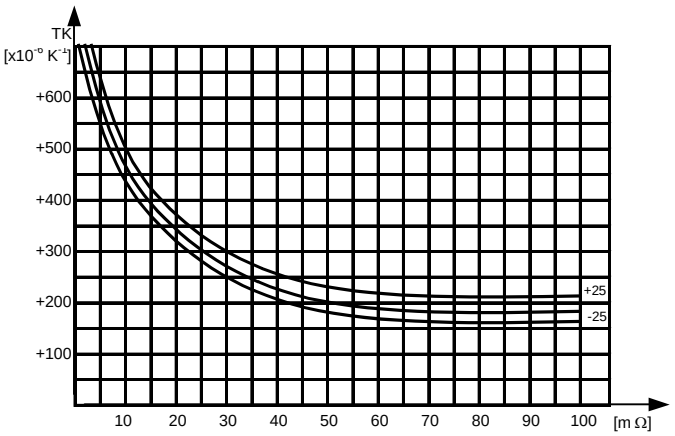



**Diagram:** Temperature coefficient of metal-band resistors series KN (350-354)

## Pulse capability of resistors:

General information on pulse capability very often need additional explanations and do not always comply with a given application.
Please contact factory or sales office for your special requirements. For dealing with your application we need the following information:

Pulse shape and repetition rate
max. peak power
Pulseduration or time constant
max. peak voltage
Resistance value

If already selected:

Type or series or technology
or preferred style

## General:

VITROHM offers a range of low-ohm resistors for current sensing applications, resistance ranges typically from 1 milliohm to 100 milliohms.

These devices are of non-wound construction and made from flat resistive alloy wire.

The resistor's specification depends on the material and the choosen dimensions, namely specific-resistance, thermal conductivity and temperature coefficient are of importance.

### 1. Standard, leaded types, KN-family
Types KN 350 ... KN 354

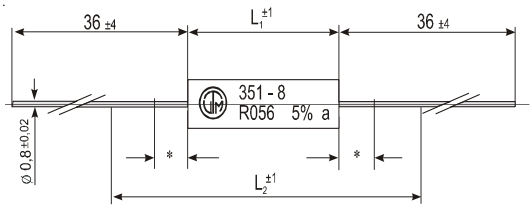
The „KN-resistors" are available in standardized sizes with choices of open-frame and ceramic cased types. Copper leads are welded to the resistive element for board assembly.

Attention should be given to the following:

- resistance value

  The value is specified over a given „measuring length". Between the two measuring points lies the element plus some copper-wire for contact purposes.

  If the actual used total length of the resistor in the application differs from this specified length, the influence of the copper wire of 0.4 mΩ per centimeter must be considered.

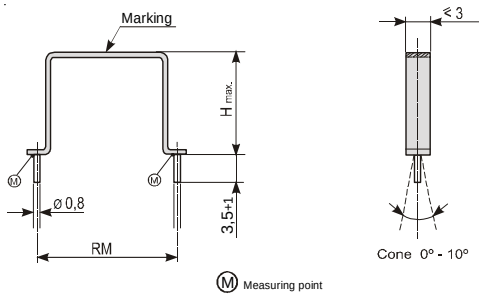



- temperature coefficient

  Typically the temperature coefficient of the resistive element ranges around 150 ppm/°C (ask factory for details). However, the copper wire is part of the effective resistance and influences the TC between the contacts.

  The lower the resistance value, the more influence of the copper leads, the higher the TC!

  If the TC is of concern in a given application, a vertical style of the KN-family should be used (type 35X-009). In this case the influence of the copper wire is almost eliminated.




- power and current rating

  The „KN-resistors" are standard products with a fixed given power rating ($P_{70}$). Nevertheless, current rating can be of concern, especially if overload or pulse conditions can occure.

  The current limit is defined by the current density, and 100 A per $mm^2$ are considered absolute maximum in power electronics. With a 0,8 mm diameter copper wire, the current limit is 50 A.

  With respect to reliability, the welding junction between copper and resistive alloy should not carry more than 20 A continuously.
  The 50 A limit may not be exceeded even under pulse conditions.

### 2. Semi-customized types, LPS-family
Types LPS 355 ... LPS 359

VITROHM provides tools to produce U-shaped low-ohm resistors for direct board mounting.

The solder-tags (1 or 2 per side) are of given dimensions, the size of the final unit is designed in accordance with the applicational requirements.

If the demand for a shunt-resistor justifies a customized solution, the LPS-family offers a variety of possibilities.

# Low Ohmic Power Resistors, low inductance, radial

## Specifications

| Type | | KN353-009<br>KN353-010<br>KN353-011 |
|---|---|---|
| Nominal Power rating $P_{70}$ | W | 3 |
| Resistance range | Ω | 0R005,0R01,0R015,0R02,0R022,0R03,0R033<br>0R039,0R047,0R051,0R06,0R068,0R082,0R1<br>(other values under request) |
| E-series | | E24 >0R01 |
| Tolerance | % | ±1 , ±2 , ±3 , ±5 |
| Temperature coefficient | $10^{-6} * K^{-1}$ | + 200 … + 1200<br>Depends on value |
| Max. cont. working voltage | $V_{RMS}$ | $\sqrt{P_{70} \bullet R}$ for all styles |
| Insulation voltage (1min.) | $V_{RMS}$ | non insulated |
| Insulation resistance | Ω | non insulated |
| Derating linear | °C | 70 … 300 (0W) |
| Climatic category | | 55/200/56 |
| Temperature range | °C | -55…300 |
| Thermal resistance | $KW^{-1}$ | 60 |
| Failure Rate (Total $\vartheta_0$ max, 60% conf. lev.) | $10^{-9} * h^{-1}$ | Appr. 10, depends on value |
| Endurance ($P_{70}$, @70°C, 1000h, interm.) | [ΔR/R] % | ± 3,0 |
| Damp heat, steady state (40°C, 93% r.h., 56d) | [ΔR/R] % | ± 0,5 |
| Climatic sequence | [ΔR/R] % | ± 0,5 |
| Terminal strength | [ΔR/R] % | ± 0,5 |
| Terminal tensile strength | N | min. 25 |
| Resistance to soldering heat (260°C, 10s) | [ΔR/R] % | 0,2% typ. |
| Solderability | S | 2,5 Flowtime, solderglobule test, IEC 60068-2-20-T |
| Marking | | Value imprinted |



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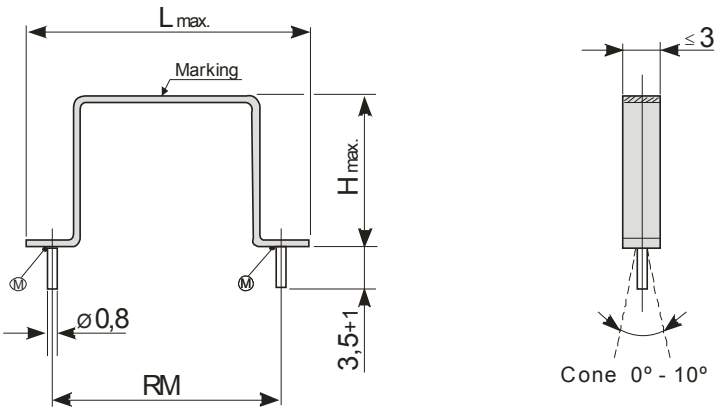
Dimensions in mm:




Ⓜ measuring point

| Type | RM | H max. | L max. |
|---|---|---|---|
| KN353-009 | 10 | 20 | 16 |
| KN353-010 | 15 | 18 | 21 |
| KN353-011 | 20 | 15 | 26 |

Construction: The resistive elements consist of a flat metal-band. Spot welded Cu-terminals ensure high stability of contacts. Thus, this construction results in a non inductive resistor of both high stability and overload capacity.

Packaging:

| Type | Packaging | Pieces | Pack.Code |
|---|---|---|---|
| KN353-009<br>KN353-010<br>KN353-011 | Bullk | 500 | B |

Ordering example:

| KN353-010 | 5 | B | 0R015 |
|---|---|---|---|
| Type | Tolerance | Pack.-Code | R- value |



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