

## **MF72 NTC Thermal Resistor**

MF72 Leaded, Standard, NTC series

**Series/Type:** NTC10\*\*\*\*\*  
**Ordering code:** VCRR NTC\*D\*\*\*\*\*  
**Date:** January 2020  
**Version:** 1

## MF72 NTC Thermal Resistor

NTC\*D\*\*\*\*\*

## MF72 Leaded , Standard, NTC series

VCRR NTC \*D\*\*\*\*\*

### Construction

- Round NTC Chip element, leaded
- Coating: phenolic or silicone resin encapsulation, flame-retardant to UL 94 V-0
- Terminals: tinned wire

### Features

- Small size, strong power and strong capability of surge current protection
- Fast response to surge current
- Longevity of service, high reliability
- ROHS, REACH

### Approvals

- UL
- ROHS
- REACH

### Delivery mode

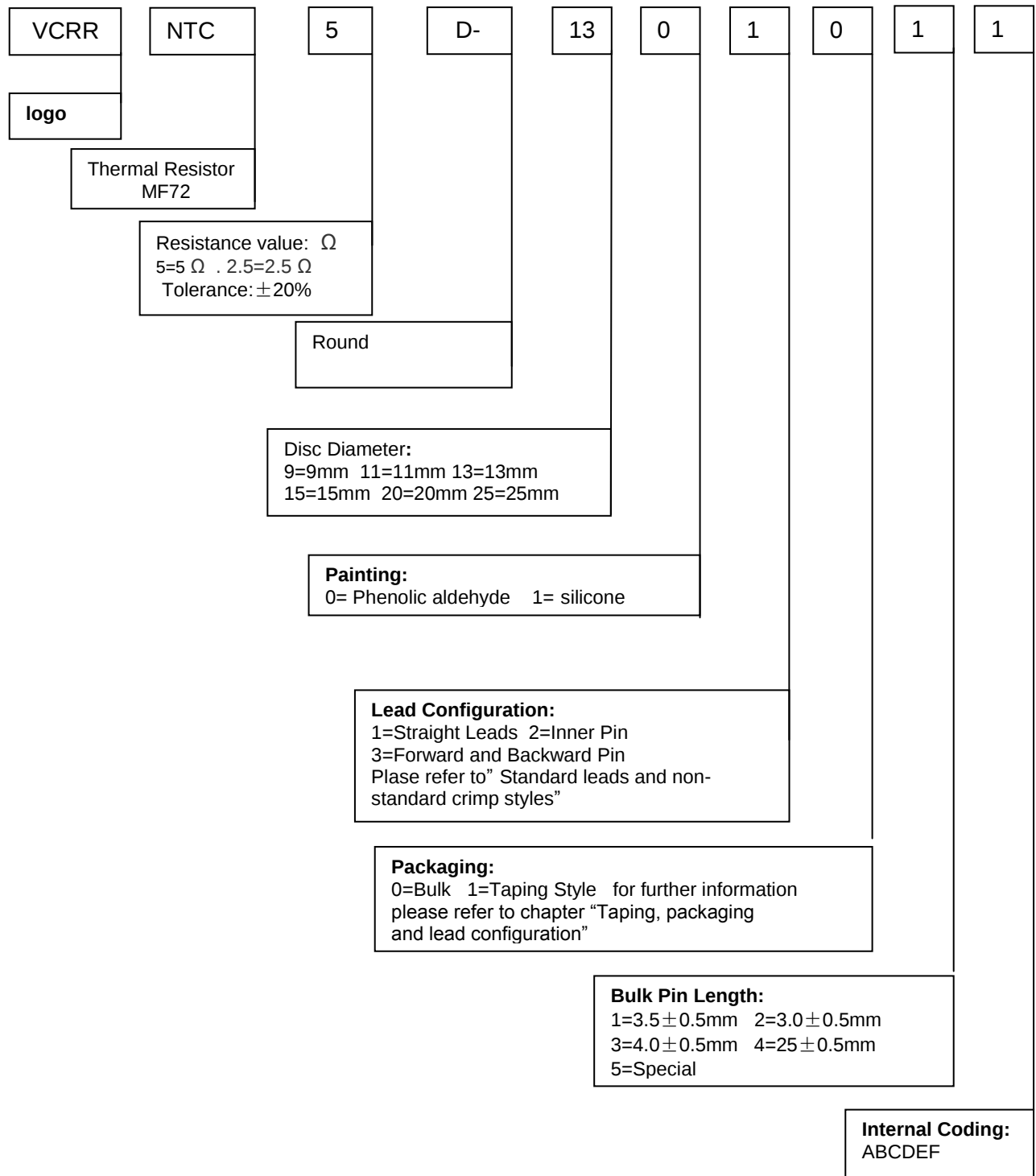
- Bulk (standard), taped versions on reel or in Ammo pack upon request
- For further details refer to chapter "Taping, packaging and lead configuration" for leaded varistors.

### General technical data

|                       |                |              |    |
|-----------------------|----------------|--------------|----|
| Climatic category     | to IEC 60068-1 | 40/200/56    |    |
| Operating temperature | to IEC 61051   | -40 ... +200 | °C |
| Storage temperature   |                | -10~40       | °C |

## Taping, packaging and lead configuration

### 1 JORDUN Electronics ordering code system for leaded varistors



**MF72 NTC Thermal Resistor**
**NTC\*D\*\*\*\*\***
**MF72 Leaded , Standard, NTCseries**
**VCRRNTC\*D\*\*\*\*\***
**2 Performance Specification**

| Part NO<br>MF72 | R25 | Maximum<br>steady-state<br>current (A) | Approximate<br>resistance<br>value at<br>maximum<br>current (Ω) | Dissipation<br>coefficient<br>(Mw/℃) | The thermal<br>time constant<br>is<br>approximately<br>(S) | operation<br>temperature<br>(℃) |          |
|-----------------|-----|----------------------------------------|-----------------------------------------------------------------|--------------------------------------|------------------------------------------------------------|---------------------------------|----------|
| 5D-5            | 5   | 1                                      | 0.353                                                           | 15                                   | 17                                                         | -40~+180                        |          |
| 10D-5           | 10  | 0.7                                    | 0.771                                                           |                                      |                                                            |                                 |          |
| 60D-5           | 60  | 0.3                                    | 1.878                                                           |                                      |                                                            |                                 |          |
| 200D-5          | 200 | 0.1                                    | 18.7                                                            |                                      |                                                            |                                 |          |
| 5D-7            | 5   | 2                                      | 0.283                                                           | 16                                   | 27                                                         |                                 | -40~+180 |
| 8D-7            | 8   | 1                                      | 0.539                                                           |                                      |                                                            |                                 |          |
| 10D-7           | 10  | 1                                      | 0.616                                                           |                                      |                                                            |                                 |          |
| 12D-7           | 12  | 1                                      | 0.816                                                           |                                      |                                                            |                                 |          |
| 16D-7           | 16  | 0.7                                    | 1.003                                                           |                                      |                                                            |                                 |          |
| 22D-7           | 22  | 0.6                                    | 1.108                                                           |                                      |                                                            |                                 |          |
| 33D-7           | 33  | 0.5                                    | 1.485                                                           |                                      |                                                            |                                 |          |
| 200D-7          | 200 | 0.2                                    | 11.65                                                           |                                      |                                                            |                                 |          |
| 3D-9            | 3   | 4                                      | 0.12                                                            | 16                                   | 38                                                         | -40~+200                        |          |
| 4D-9            | 4   | 3                                      | 0.19                                                            |                                      |                                                            |                                 |          |
| 5D-9            | 5   | 3                                      | 0.21                                                            |                                      |                                                            |                                 |          |
| 6D-9            | 6   | 2                                      | 0.315                                                           |                                      |                                                            |                                 |          |
| 8D-9            | 8   | 2                                      | 0.4                                                             |                                      |                                                            |                                 |          |
| 10D-9           | 10  | 2                                      | 0.458                                                           |                                      |                                                            |                                 |          |
| 12D-9           | 12  | 1                                      | 0.652                                                           |                                      |                                                            |                                 |          |
| 16D-9           | 16  | 1                                      | 0.802                                                           |                                      |                                                            |                                 |          |
| 20D-9           | 20  | 1                                      | 0.864                                                           |                                      |                                                            |                                 |          |
| 22D-9           | 22  | 1                                      | 0.95                                                            |                                      |                                                            |                                 |          |
| 30D-9           | 30  | 1                                      | 1.022                                                           |                                      |                                                            |                                 |          |
| 33D-9           | 33  | 1                                      | 1.124                                                           |                                      |                                                            |                                 |          |
| 50D-9           | 50  | 1                                      | 1.252                                                           |                                      |                                                            |                                 |          |
| 60D-9           | 60  | 0.8                                    | 1.502                                                           |                                      |                                                            |                                 |          |
| 80D-9           | 80  | 0.8                                    | 2.01                                                            |                                      |                                                            |                                 |          |
| 120D-9          | 120 | 0.8                                    | 3.015                                                           |                                      |                                                            |                                 |          |
| 200D-9          | 200 | 0.5                                    | 5.007                                                           |                                      |                                                            |                                 |          |
| 400D-9          | 400 | 0.2                                    | 30.3                                                            |                                      |                                                            |                                 |          |
| 2.5D-11         | 2.5 | 5                                      | 0.095                                                           | 17                                   | 43                                                         |                                 | -40~+200 |
| 3D-11           | 3   | 5                                      | 0.1                                                             |                                      |                                                            |                                 |          |
| 4D-11           | 4   | 4                                      | 0.15                                                            |                                      |                                                            |                                 |          |
| 5D-11           | 5   | 4                                      | 0.156                                                           |                                      |                                                            |                                 |          |
| 6D-11           | 6   | 3                                      | 0.24                                                            |                                      |                                                            |                                 |          |
| 8D-11           | 8   | 3                                      | 0.255                                                           |                                      |                                                            |                                 |          |
| 10D-11          | 10  | 3                                      | 0.275                                                           |                                      |                                                            |                                 |          |
| 12D-11          | 12  | 2                                      | 0.462                                                           |                                      |                                                            |                                 |          |
| 16D-11          | 16  | 2                                      | 0.47                                                            |                                      |                                                            |                                 |          |
| 20D-11          | 20  | 2                                      | 0.512                                                           |                                      |                                                            |                                 |          |
| 22D-11          | 22  | 2                                      | 0.563                                                           |                                      |                                                            |                                 |          |
| 30D-11          | 30  | 1.5                                    | 0.667                                                           |                                      |                                                            |                                 |          |
| 33D-11          | 33  | 1.5                                    | 0.734                                                           |                                      |                                                            |                                 |          |
| 50D-11          | 50  | 1.5                                    | 1.021                                                           |                                      |                                                            |                                 |          |
| 60D-11          | 60  | 1.5                                    | 1.215                                                           |                                      |                                                            |                                 |          |
| 80D-11          | 80  | 1.2                                    | 1.656                                                           |                                      |                                                            |                                 |          |
| 1.3D-13         | 1.3 | 7                                      | 0.062                                                           | 18                                   | 66                                                         | -40~+200                        |          |
| 1.5D-13         | 1.5 | 7                                      | 0.073                                                           |                                      |                                                            |                                 |          |

**MF72 NTC Thermal Resistor**
**NTC\*D\*\*\*\*\***
**MF72 Leaded , Standard, NTCseries**
**VCRRNTC\*D\*\*\*\*\***

| Part NO<br>MF72 | R25 | Maximum<br>steady-state<br>current (A) | Approximate<br>resistance<br>value at<br>maximum<br>current (Ω ) | Dissipation<br>coefficient<br>(Mw/℃) | The thermal<br>time constant<br>is<br>approximately<br>(S) | operation<br>temperature<br>(℃) |
|-----------------|-----|----------------------------------------|------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------|---------------------------------|
| 2.5D-13         | 2.5 | 6                                      | 0.088                                                            | 18                                   | 66                                                         | -40~+200                        |
| 3D-13           | 3   | 6                                      | 0.092                                                            |                                      |                                                            |                                 |
| 4D-13           | 4   | 5                                      | 0.12                                                             |                                      |                                                            |                                 |
| 5D-13           | 5   | 5                                      | 0.125                                                            |                                      |                                                            |                                 |
| 6D-13           | 6   | 4                                      | 0.17                                                             |                                      |                                                            |                                 |
| 7D-13           | 7   | 4                                      | 0.188                                                            |                                      |                                                            |                                 |
| 8D-13           | 8   | 4                                      | 0.194                                                            |                                      |                                                            |                                 |
| 10D-13          | 10  | 4                                      | 0.206                                                            |                                      |                                                            |                                 |
| 12D-13          | 12  | 3                                      | 0.316                                                            |                                      |                                                            |                                 |
| 15D-13          | 15  | 3                                      | 0.335                                                            |                                      |                                                            |                                 |
| 16D-13          | 16  | 3                                      | 0.338                                                            |                                      |                                                            |                                 |
| 20D-13          | 20  | 3                                      | 0.372                                                            |                                      |                                                            |                                 |
| 30D-13          | 30  | 2.5                                    | 0.517                                                            |                                      |                                                            |                                 |
| 47D-13          | 47  | 2                                      | 0.81                                                             |                                      |                                                            |                                 |
| 120D-13         | 120 | 1.2                                    | 2.124                                                            |                                      |                                                            |                                 |
| 1.3D-15         | 1.3 | 8                                      | 0.048                                                            | 21                                   | 75                                                         |                                 |
| 1.5D-15         | 1.5 | 8                                      | 0.052                                                            |                                      |                                                            |                                 |
| 2.5D-15         | 2.5 | 7                                      | 0.065                                                            |                                      |                                                            |                                 |
| 3D-15           | 3   | 7                                      | 0.075                                                            |                                      |                                                            |                                 |
| 5D-15           | 5   | 6                                      | 0.112                                                            |                                      |                                                            |                                 |
| 6D-15           | 6   | 5                                      | 0.155                                                            |                                      |                                                            |                                 |
| 7D-15           | 7   | 5                                      | 0.173                                                            |                                      |                                                            |                                 |
| 8D-15           | 8   | 5                                      | 0.178                                                            |                                      |                                                            |                                 |
| 10D-15          | 10  | 5                                      | 0.18                                                             |                                      |                                                            |                                 |
| 12D-15          | 12  | 4                                      | 0.25                                                             |                                      |                                                            |                                 |
| 15D-15          | 15  | 4                                      | 0.268                                                            |                                      |                                                            |                                 |
| 16D-15          | 16  | 4                                      | 0.276                                                            |                                      |                                                            |                                 |
| 20D-15          | 20  | 4                                      | 0.288                                                            |                                      |                                                            |                                 |
| 30D-15          | 30  | 3.5                                    | 0.438                                                            |                                      |                                                            |                                 |
| 47D-15          | 47  | 3                                      | 0.68                                                             |                                      |                                                            |                                 |
| 120D-15         | 120 | 1.8                                    | 1.652                                                            |                                      |                                                            |                                 |
| 0.7D-20         | 0.7 | 11                                     | 0.018                                                            | 28                                   | 113                                                        |                                 |
| 1.3D-20         | 1.3 | 9                                      | 0.037                                                            |                                      |                                                            |                                 |
| 3D-20           | 3   | 8                                      | 0.055                                                            |                                      |                                                            |                                 |
| 5D-20           | 5   | 7                                      | 0.087                                                            |                                      |                                                            |                                 |
| 6D-20           | 6   | 6                                      | 0.113                                                            |                                      |                                                            |                                 |
| 8D-20           | 8   | 6                                      | 0.142                                                            |                                      |                                                            |                                 |
| 10D-20          | 10  | 6                                      | 0.162                                                            |                                      |                                                            |                                 |
| 12D-20          | 12  | 5                                      | 0.195                                                            |                                      |                                                            |                                 |
| 16D-20          | 16  | 5                                      | 0.212                                                            | 30                                   | 130                                                        |                                 |
| 0.7D-25         | 0.7 | 12                                     | 0.014                                                            |                                      |                                                            |                                 |
| 1.5D-25         | 1.5 | 10                                     | 0.027                                                            |                                      |                                                            |                                 |
| 3D-25           | 3   | 9                                      | 0.044                                                            |                                      |                                                            |                                 |
| 5D-25           | 5   | 8                                      | 0.07                                                             |                                      |                                                            |                                 |
| 8D-25           | 8   | 7                                      | 0.114                                                            |                                      |                                                            |                                 |
| 10D-25          | 10  | 7                                      | 0.13                                                             |                                      |                                                            |                                 |
| 12D-25          | 12  | 6                                      | 0.156                                                            |                                      |                                                            |                                 |
| 16D-25          | 16  | 6                                      | 0.16                                                             |                                      |                                                            |                                 |

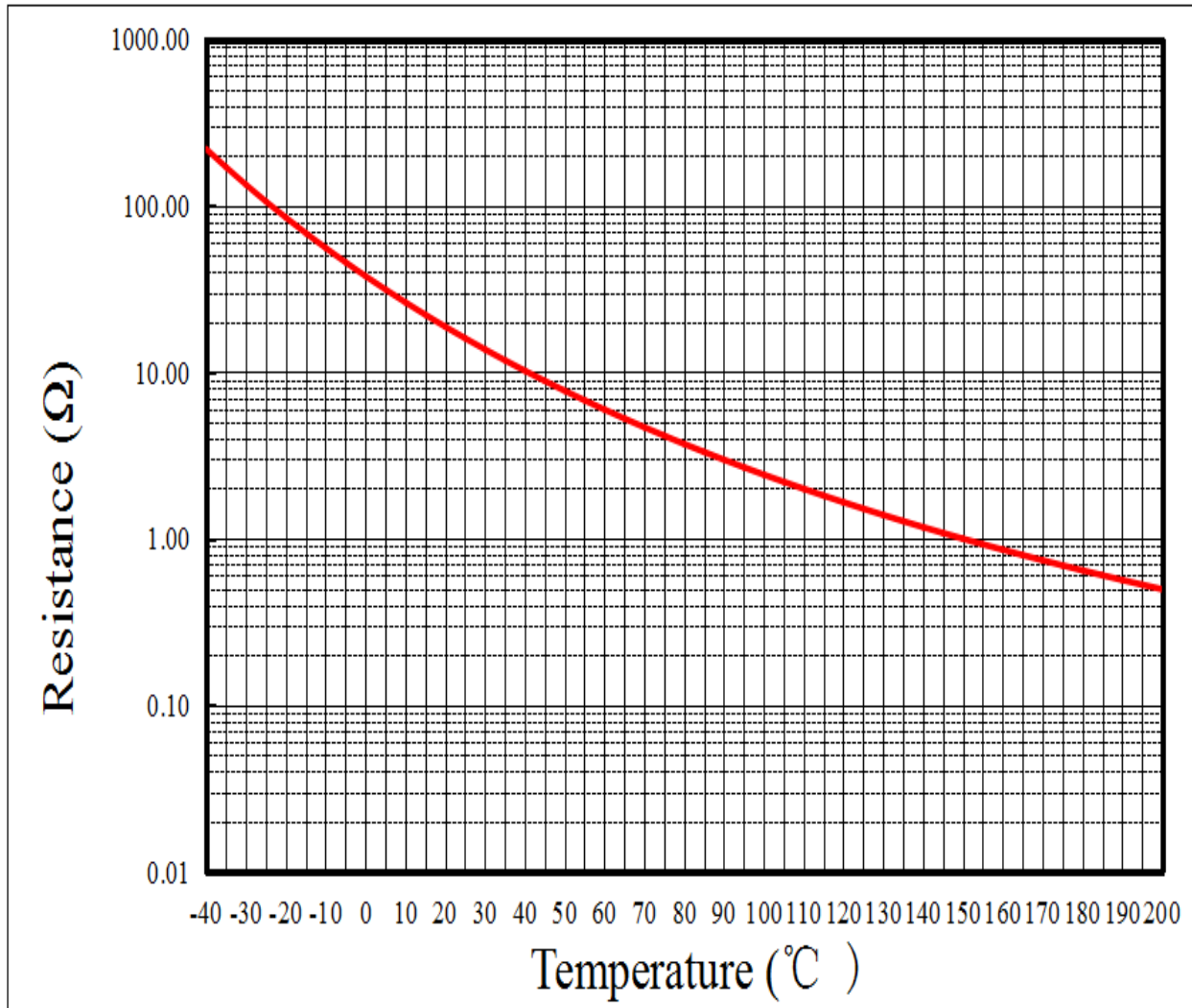
### 3 Electrical Properties and requirements

| Item                            | Test conditions                                                                                                                                                                                              | Specification request                                     |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Zero Power Resistance           | At 25 °C, the change in resistance value caused by internal heating of the resistor can be ignored relative to the total measurement error, and the resistance value measured without timing can be ignored. | See Electrical Parameters                                 |
| B-Value                         | $B = \frac{T_1 \cdot T_2}{T_2 - T_1} \cdot \ln \left( \frac{R_1}{R_2} \right)$ <p>The B Value can be calculated using the zero Power resistance value at 25°C and 50°C. The equation is as above</p>         | See Electrical Parameters                                 |
| Thermal Dissipation Constant    | The ratio of the change of the dissipation power to the corresponding change of the temperature at specified temperature. The unit is: mW/°C                                                                 | See Electrical Parameters                                 |
| Thermal Time Constant           | Under zero power condition, Thermal Time constant is the time required by a thermistor that its body temperature reach 63.2% of the difference between its initial and final temperature                     | See Electrical Parameters                                 |
| leads terminal tensile strength | Rasten body with a load applied to each 1.0kg for 10 sec.                                                                                                                                                    | No break out and damage<br>Resistance change: within ±20% |
| leads terminal bend strength    | Fixed body and hang 0.5kg on one terminal,<br>bend 90° then back, again in opposite                                                                                                                          | No break out and damage<br>Resistance change: within ±20% |
| vibration                       | Frequency: 10~50Hz<br>Amplitude modulation: 1.55mm<br>Direction and time: X、Y and Z direction for 2 hrs each                                                                                                 | No substantial damage                                     |
| Solderability                   | Temperature: 235 ± 5°C<br>Time: 3S<br>Time: 3S                                                                                                                                                               | Covered termination: ≥98%                                 |

**MF72 NTC Thermal Resistor**
**NTC\*D\*\*\*\*\***
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**VCRRNTC\*D\*\*\*\*\***

|                                        |                                                                                                                                                                                                                                                               |                                           |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Solder ability                         | the leadwires shall be dipped in a molten solder of $350 \pm 10^{\circ}\text{C}$ for $3.0 \pm 0.5$ seconds up to the point $4.0 \pm 0.8\text{mm}$ .after the specimen shall be left at room ambient temperature for 24 hours,the resistance shall be measured | Resistance change:within $\pm 10\%$       |
| Dry heat<br>(high temperature storage) | Specimen shall be subjected to an ambient of $125 \pm 2^{\circ}\text{C}$ for 1000+48hours.and after the specimen shall be left at room ambient for 1 to 2 hours,the resistance shall be measured                                                              | Resistance change:<br>within $\pm 10\%$   |
| Cold<br>(low temperature storage)      | Specimen shall be subjected to an ambient of $-40 \pm 3^{\circ}\text{C}$<br><br>For 1000+48 hours.and after the specimen<br><br>0<br><br>shall be left at room ambient for 1 to 2 hours,the resistance shall be measured                                      | Resistance change:<br>within $\pm 10\%$   |
| humidity test                          | $40 \pm 2^{\circ}\text{C}$ 95%RH,1000HR                                                                                                                                                                                                                       | Resistance change: within<br>$\pm 10\%$   |
| Temp Cycle test                        | $-40^{\circ}\text{C}/30' \rightarrow 25^{\circ}\text{C}/5' \rightarrow$<br>$+125^{\circ}\text{C}/30' \rightarrow 25^{\circ}\text{C}/5'$                                                                                                                       | Resistance change: within<br>$\pm 20\%$   |
| Operating Temperature                  | Allowable temperature range while the thermistor work continuously for long time                                                                                                                                                                              | $-40^{\circ}\text{C}+200^{\circ}\text{C}$ |
| Storage Conditions                     | $-10^{\circ}\text{C}-40^{\circ}\text{C}$ RH $\leq 75\%$                                                                                                                                                                                                       |                                           |

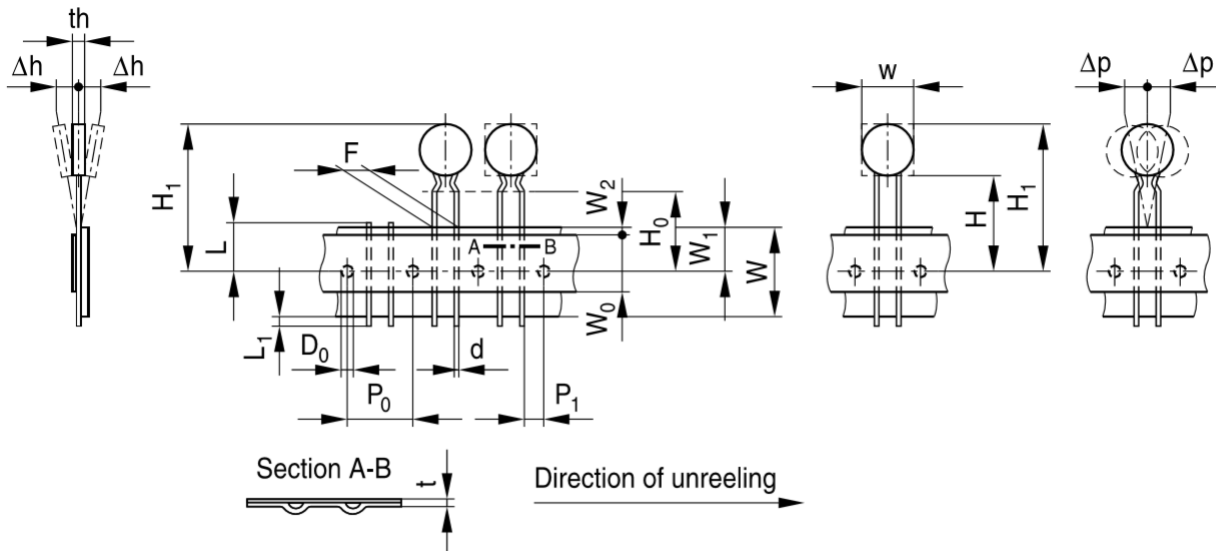
#### 4.0 R-T关系图



## 5. Taping and packaging of leaded NTC

Tape packaging for lead spacing  $\boxed{e}$  = 5 fully conforms to IEC 60286-2, while for lead spacings  $\boxed{e}$  = 7.5 and 10 the taping mode is based on this standard.

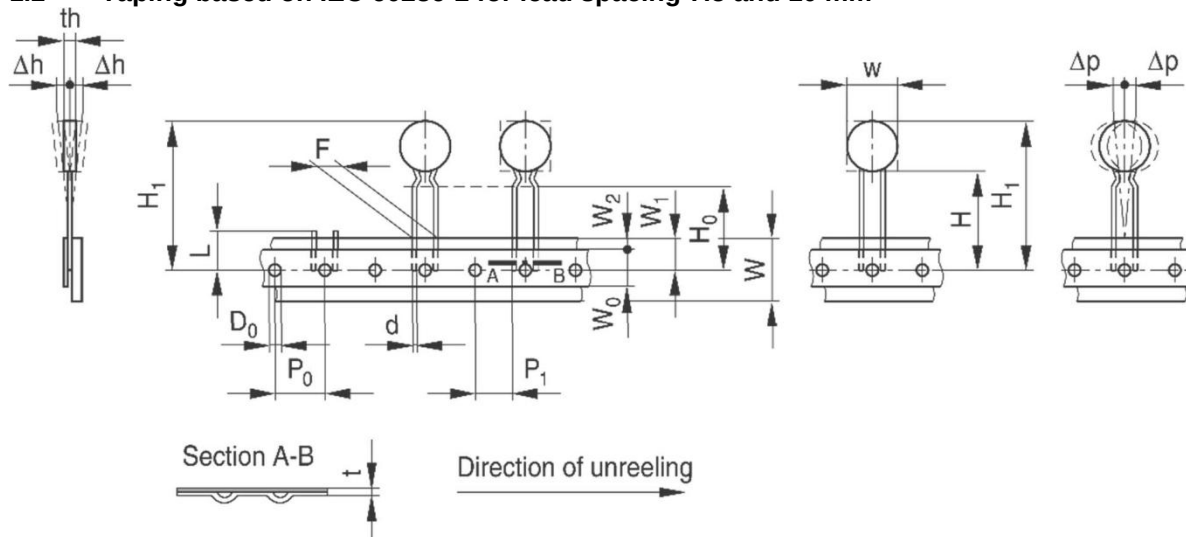
### 1.1 Taping in accordance with IEC 60286-2 for lead spacing 5.0 mm



$$F \triangleq \boxed{e} = 5.0 \text{ mm}$$

VAR0410-X-E

### 1.2 Taping based on IEC 60286-2 for lead spacing 7.5 and 10 mm



$$F \triangleq \boxed{e} = 7.5 \text{ mm}$$

$$F \triangleq \boxed{e} = 10 \text{ mm}$$

VAR0395-J-E

## MF72 NTC Thermal Resistor

NTC\*D\*\*\*\*

## MF72 Leaded , Standard, NTCseries

VCRRNTC\*D\*\*\*\*

### 1.3 Tape dimensions (in mm)

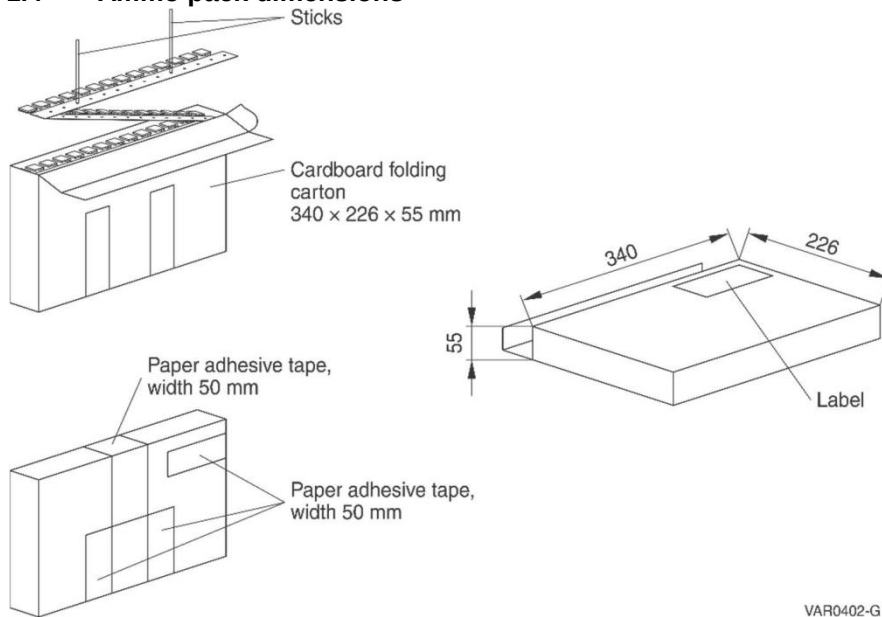
| Symbol         | $e = 5.0$ | Tolerance                  | $e = 7.5$          | Tolerance                  | $e = 10.0$   | Tolerance                  | Remarks                                                   |
|----------------|-----------|----------------------------|--------------------|----------------------------|--------------|----------------------------|-----------------------------------------------------------|
| w<br>th<br>d   | 0.6       | max.<br>max.<br>$\pm 0.05$ | 0.8                | max.<br>max.<br>$\pm 0.05$ | 1.0          | max.<br>max.<br>$\pm 0.05$ | see tables in<br>each series<br>under<br>"Dimensions<br>" |
| P <sub>0</sub> | 12.7      | $\pm 0.3$                  | 12.7 <sup>1)</sup> | $\pm 0.3$                  | 12.7         | $\pm 0.3$                  | $\pm 1$ mm/20<br>sprocket holes                           |
| P <sub>1</sub> | 3.85      | $\pm 0.7$                  | 8.95               | $\pm 0.8$                  | 7.7          | $\pm 0.8$                  |                                                           |
| F              | 5.0       | $\pm 10$                   | 7.5                | $\pm 0.8$                  | 10.0         | $\pm 0.8$                  | measured at<br>top of compo-<br>nent body                 |
| $\Delta h$     | 0         | $\pm 2.0$                  | depends on s       |                            | depends on s |                            |                                                           |
| $\Delta p$     | 0         | $\pm 1.3$                  | 0                  | $\pm 2.0$                  | 0            | $\pm 2.0$                  |                                                           |
| W              | 18.0      | $\pm 0.5$                  | 18.0               | $\pm 0.5$                  | 18.0         | $\pm 0.5$                  | Peel-off<br>force $\geq 5$ N                              |
| W <sub>0</sub> | 5.5       | min.                       | 11.0               | min.                       | 11.0         | min.                       |                                                           |
| W <sub>1</sub> | 9.0       | $\pm 0.5$                  | 9.0                | $+0.75/-0.5$               | 9.0          | $+0.75/-0.5$               |                                                           |
| W <sub>2</sub> | 3.0       | max.                       | 3.0                | max.                       | 3.0          | max.                       |                                                           |
| H              | 18.0      | $+2.0/-0$                  | 18.0               | $+2.0/-0$                  | 18.0         | $+2.0/-0$                  | <sup>2)</sup><br><sup>3)</sup>                            |
| H <sub>0</sub> | 16.0      | $\pm 0.5$                  | 16.0               | $\pm 0.5$                  | 16.0         | $\pm 0.5$                  |                                                           |
|                | (18.0)    |                            | (18.0)             |                            |              |                            |                                                           |
| H <sub>1</sub> | 32.2      | max.                       | 45.0               | max.                       | 45.0         | max.                       |                                                           |
| D <sub>0</sub> | 4.0       | $\pm 0.2$                  | 4.0                | $\pm 0.2$                  | 4.0          | $\pm 0.2$                  | without lead                                              |
| t              | 0.9       | max.                       | 0.9                | max.                       | 0.9          | max.                       |                                                           |
| L              | 11.0      | max.                       | 11.0               | max.                       | 11.0         | max.                       |                                                           |
| L <sub>1</sub> | 0.5       | max.                       |                    |                            |              |                            |                                                           |

1) Taping with P<sub>0</sub> = 15.0 mm upon request

2) Applies only to uncrimped types

3) Applies only to crimped types (H<sub>0</sub> = 18 upon request)

### 1.4 Ammo pack dimensions



### 1.5 Quantities Per Packaging

| Part No | $\Omega$ | Bulk |        | Ammo Packing(Taping) |        |
|---------|----------|------|--------|----------------------|--------|
|         |          | Bag  | Carton | Box                  | Carton |
| -7/9-11 | ---      | 1000 | 12000  | 1000                 | 10000  |
| -13     | ---      | 500  | 6000   | 1000                 | 10000  |
| -15     | ---      | 500  | 6000   | 800                  | 8000   |
| -20     | ---      | 250  | 3000   | ----                 | ----   |
| -25     | ---      | 100  | 600    | ----                 | ----   |

## 6. Lead configuration

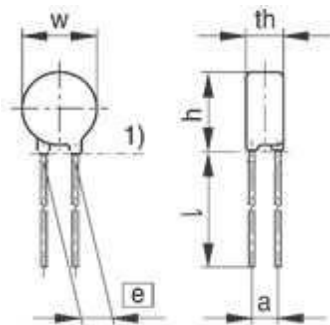
Straight leads are standard for disk NTC. Other lead configurations as crimp style or customerspecific lead wire length according to are optional. Crimped leads (non-standard) are differently crimped for technical reasons; the individual crimp styles are denot-ed by consecutive numbers (S, S2 through S5) as shown in the dimensional drawings below.

The crimp styles of the individual types can be seen from the type designation in the ordering tables.

## 1.6 Standard leads and non-standard crimp styles

The basic dimensions in figure 1 to 5 are valid for types with either round or square (EnergetiQ series) component head

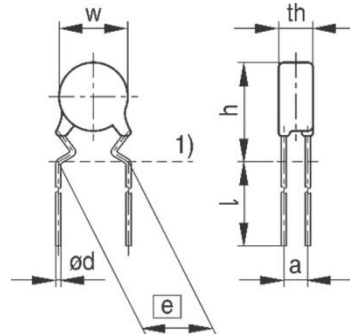
### Standard, straight leads



1) Seating plane to IEC 717  
VAR0586-W-E

**Figure 1**

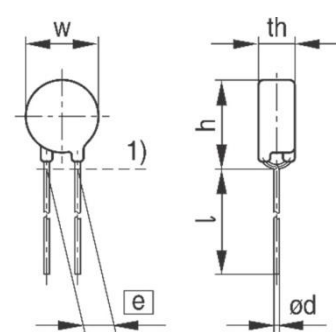
### Non-standard, crimp style S2



1) Seating plane to IEC 60717  
VAR0411-F-E

**Figure 2**

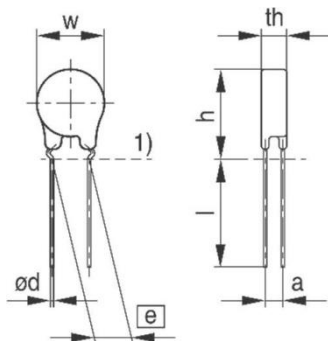
### Non-standard, crimp style S3



1) Seating plane to IEC 60717  
VAR0396-R-E

**Figure 3**

### Non-standard, crimp style S5



1) Seating plane to IEC 60717  
VAR0726-M-E

**Figure**

## 1.7 Trimmed leads (non-standard)

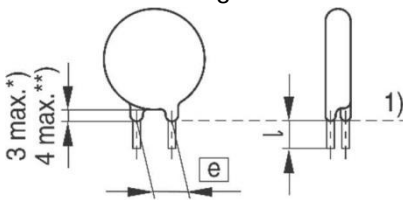
Varistors with cut leads available upon request.

Lead length tolerances:

Straight leads  $\pm 0.8$  mm

Crimped leads  $\pm 0.5$  mm

Minimum lead length 3.0 mm



1) Seating plane to IEC 60717

\*) For round component head

\*\*) For EnergetiQ series, square component head

VAR0642-U-E

## Cautions and warnings

### General

1. JORDUN Electronics thermal Resistor (NTC) are designed for specific applications and should not be used for purposes not identified in our specifications, application notes and data books unless otherwise agreed with JORDUN Electronics during the design-in-phase.
2. Ensure suitability of NTC through reliability testing during the design-in phase. The NTC should be evaluated taking into consideration worst-case conditions.
3. For applications of NTC in line-to ground circuits based on various international and local standards there are restrictions existing or additional safety measures required.

### Storage

1. Store NTC only in original packaging. Do not open the package prior to processing.
2. Recommended storage conditions in original packaging:  

|                      |                                                         |
|----------------------|---------------------------------------------------------|
| Storage temperature: | -10 °C ... +40 °C                                       |
| Relative humidity:   | <75% annual average,<br><95% on maximum 30 days a year. |
| Dew precipitation:   | Is to be avoided.                                       |
3. Avoid contamination of an NTC during storage, handling and processing.
4. Avoid storage of NTC in harmful environments that can affect the function during long-term operation (examples given under operation precautions).
5. The NTCtype series should be soldered after shipment from JORDUN ELECTRONIC within the time specified.  

|     |           |
|-----|-----------|
| NTC | 24 months |
|-----|-----------|

### Handling

1. NTC must not be dropped.
2. Components must not be touched with bare hands. Gloves are recommended.
3. Avoid contamination of the surface of NTC electrodes during handling, be careful of the sharp edge of NTC electrodes.

### Soldering (where applicable)

1. Use rosin-type flux or non-activated flux.
2. Insufficient preheating may cause ceramic cracks.

3. Rapid cooling by dipping in solvent is not recommended.
4. Complete removal of flux is recommended.
5. Temperatures of all preheat stages and the solder bath must be strictly controlled especially for T series

### **Mounting**

1. Potting, sealing or adhesive compounds can produce chemical reactions in the NTC ceramic that will degrade the component's electrical characteristics.
2. Overloading NTC may result in ruptured packages and expulsion of hot materials. For this reason the NTC should be physically shielded from adjacent components.

### **Operation**

1. Use NTC only within the specified temperature operating range
2. Use NTC only within the specified voltage and current ranges.
3. Environmental conditions must not harm the NTC. Use NTC only in normal atmospheric conditions. Avoid use in the presence of deoxidizing gases (chlorine gas, hydrogen sulfide gas, ammonia gas, sulfuric acid gas, etc), corrosive agents, humid or salty conditions, Avoid contact with any liquids and solvent

All dimensions are given in mm.

The commas used in numerical values denote decimal points.

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