

## TRANSIENT VOLTAGE SUPPRESSOR

# VRD

VRD is a transient voltage suppressor used for protecting electric circuits from surge voltage and thus preventing breakdown.

VRD has superior surge suppression characteristics, such as extremely fast response time, very low clamping voltage, and high surge capacity. Unlike metal oxide varistors, VRD does not have characteristics to change with surge variations within the rated capacity. This feature comprises another superior characteristics of the VRD as a transient voltage suppressors.



### Part number

|                       |  |
|-----------------------|--|
| <b>Z2 033 U - 52Z</b> |  |
| Z2                    | : Rated electricity 1.0W                         |
| 033                   | : Rated electricity 2.0W                         |
| U                     | : Uni-Polar                                      |
| 52Z                   | : Axial tapping winding type                     |
|                       | : Axial tapping relay type                       |
|                       | : Radial form tapping type                       |
|                       | : individually packed in a bag                   |
|                       | : Break down voltage                             |
|                       | : Type   |
|                       | : Rated electricity 1.0W                         |
|                       | : Rated electricity 2.0W                         |
|                       | : Rated electricity 0.5W (reverse blocking type) |

### Electrical characteristics

Figure 1 shows the electrical characteristics. Bipolar type has almost symmetrical breakdown Voltage ( $V_B$ ) The reverse breakdown voltage of the ZD type is 200 Volts or more at  $10\mu A$  DC.



Fig 1

### Taping

One of standard taping is as shown in Figure.



Fig 2

### Taping qty

| Part series | Taping method  | Qty(pcs)     |       |
|-------------|----------------|--------------|-------|
| Z2,Z2U      | Axial tapping  | reel type    | 5,000 |
|             |                | winding type | 2,000 |
|             | Radial tapping | winding type | 2,000 |
|             |                |              |       |
| Z6,Z6U      | Axial tapping  | reel type    | 2,500 |
|             |                | winding type | 1,000 |

### Surge capability

Allowable surge capability ( $P_{PPM}$ ) is determined by the following equation:

$$P_{PPM} = I_{PPM} \times V_C$$

$I_{PPM}$ : Rated peak impulse current

$V_C$ : clamping voltage

The allowable surge capability (Rated peak impulse power dissipation  $P_{PPM}$ ) of VRD is shown in following Figure 3 and the surge capability derating characteristics are shown in Figure 6.



Fig 3

### Surge waveform

There are many types of surge waveform depending on the source of the surge. For the VRD surge suppression characteristics test, the EXP waveform shown below is used. The EXP waveform is shown as  $t_a/t_b$  depending on the time width, however 10/1000 waveform is used as the standard test waveform.



Fig 4

### Surge suppression characteristics

When EXP waveform is applied, the surge suppression waveform shown in the figure 5 can be observed.



### Power derating



### Z2 type VRD has bipolar or unipolar electrical characteristics.

Maximum ratings

Rated peak impulse power dissipation  
:500 W (10/1000 $\mu$ s)  
6.00 kW (8/20 $\mu$ s)

Rated average power dissipation:1W  
Operating and storage temperature  
: -40°C to 125°C

Symbol mark



| Part No.         |                   | Stand-off voltage<br>Vs<br>V | Stand-by current<br>Is<br>$\mu$ A | Breakdown voltage<br>V(BR)<br>V | Pulsed d.c.<br>test current<br>IT<br>mA | Clamping Voltage &<br>Rated peak impulse current |           |              |           | Temperature<br>coefficient<br>(TYP) | Capacitance<br>(TYP)<br>pF |
|------------------|-------------------|------------------------------|-----------------------------------|---------------------------------|---|--|-----------|--------------|-----------|-------------------------------------|----------------------------|
| Bi-polar<br>type | Uni-polar<br>type |                              |                                   |                                 |   | 10/1000 $\mu$ s                                  |           | 8/20 $\mu$ s |           |                                     |                            |
|                  |                   |                              |                                   |                                 |   | Vc<br>V  | Ippm<br>A | Vc<br>V      | Ippm<br>A |                                     |                            |
| -                | Z2008U            | 6.63                         | 500                               | 7.38-9.02                       | 10                                      | 12.5   | 40.0      | 16.3         | 372       | 0.063                               | 2400                       |
| -                | Z2010U            | 8.10                         | 20                                | 9.00-11.0                       |   | 15.0   | 33.4      | 19.5         | 311       | 0.071                               | 1900                       |
| Z2012            | -                 | 9.72                         |                                   | 10.8-13.2                       |   | 17.3   | 28.9      | 22.7         | 267       | 0.066                               | 790                        |
| -                | Z2012U            |                              |                                   | 10.8-13.2                       |   |  |           |              |           | 0.074                               | 1580                       |
| Z2015            | -                 | 12.1                         |                                   | 13.5-16.5                       |   | 22.0   | 22.7      | 28.4         | 213       | 0.075                               | 640                        |
| -                | Z2015U            |                              |                                   | 13.5-16.5                       |   |  |           |              |           | 0.079                               | 1280                       |
| Z2018            | -                 | 14.5                         |                                   | 16.2-19.8                       |   | 26.5   | 18.8      | 34.0         | 178       | 0.079                               | 520                        |
| -                | Z2018U            |                              |                                   | 16.2-19.8                       |   |  |           |              |           | 0.083                               | 1040                       |
| Z2022            | -                 | 17.8                         |                                   | 19.8-24.2                       |   | 31.9   | 15.7      | 41.2         | 147       | 0.082                               | 420                        |
| -                | Z2022U            |                              |                                   | 19.8-24.2                       |   |  |           |              |           | 0.086                               | 840                        |
| Z2027            | -                 | 21.8                         |                                   | 24.3-29.7                       |   | 39.1   | 12.8      | 50.5         | 120       | 0.085                               | 340                        |
| -                | Z2027U            |                              |                                   | 24.3-29.7                       |   |  |           |              |           | 0.089                               | 680                        |
| Z2033            | -                 | 26.8                         |                                   | 29.7-36.3                       |   | 47.7   | 10.5      | 61.7         | 98.2      | 0.087                               | 280                        |
| -                | Z2033U            |                              |                                   | 29.7-36.3                       |   |  |           |              |           | 0.092                               | 560                        |
| Z2039            | -                 | 31.6                         |                                   | 35.1-42.9                       |   | 56.4   | 8.86      | 73.0         | 83.0      | 0.090                               | 240                        |
| -                | Z2039U            |                              |                                   | 35.1-42.9                       |   |  |           |              |           | 0.095                               | 480                        |
| Z2047            | -                 | 38.1                         | 5                                 | 42.3-51.7                       | 1                                       | 67.8   | 7.37      | 88.0         | 68.9      | 0.092                               | 200                        |
| -                | Z2047U            |                              |                                   | 42.3-51.7                       |   |  |           |              |           | 0.097                               | 400                        |
| Z2056            | -                 | 45.4                         |                                   | 50.4-61.6                       |   | 80.5   | 6.21      | 105.0        | 57.7      | 0.094                               | 160                        |
| -                | Z2056U            |                              |                                   | 50.4-61.6                       |   |  |           |              |           | 0.099                               | 320                        |
| Z2068            | -                 | 55.1                         |                                   | 61.2-74.8                       |   | 98.0   | 5.10      | 127.0        | 47.7      | 0.096                               | 130                        |
| -                | Z2068U            |                              |                                   | 61.2-74.8                       |   |  |           |              |           | 0.100                               | 260                        |
| Z2082            | -                 | 66.4                         |                                   | 73.8-90.2                       |   | 118.0  | 4.24      | 153.0        | 39.6      | 0.099                               | 110                        |
| -                | Z2082U            |                              |                                   | 73.8-90.2                       |   |  |           |              |           | 0.102                               | 220                        |
| Z2100            | -                 | 81.0                         |                                   | 90.0-110                        |   | 144.0  | 3.47      | 187.0        | 32.4      | 0.101                               | 90                         |
| -                | Z2100U            |                              |                                   | 90.0-110                        |   |  |           |              |           | 0.104                               | 180                        |
| Z2120            | -                 | 97.2                         |                                   | 108-132                         |   | 173.0  | 2.89      | 222.0        | 27.3      | 0.103                               | 75                         |
| -                | Z2120U            |                              |                                   | 108-132                         |   |  |           |              |           | 0.106                               | 150                        |
| Z2150            | -                 | 121.0                        |                                   | 135-165                         |   | 215.0  | 2.32      | 277.0        | 21.9      | 0.105                               | 60                         |
| -                | Z2150U            |                              |                                   | 135-165                         |   |  |           |              |           | 0.107                               | 120                        |
| Z2180            | -                 | 146.0                        |                                   | 162-198                         |   | 258.0  | 1.94      | 333.0        | 18.2      | 0.106                               | 49                         |
| -                | Z2180U            |                              |                                   | 162-198                         |   |  |           |              |           | 0.108                               | 98                         |

NOTE: Nonsuffix:bi-polar, suffix"U" : uni-polar.

| Part No.      |                | Stand-off voltage<br>V <sub>s</sub><br>V | Stand-by current<br>I <sub>b</sub><br>μA | Breakdown voltage<br>V <sub>(BR)</sub><br>V | Pulsed d.c. test current<br>I <sub>T</sub><br>mA | Clamping Voltage & Rated peak impulse current |                       |                     |                       | Max. temp. coef.<br>%/°C | Capacitance (TYP)<br>pF |
|---------------|----------------|--|--|---|--|---|-----------------------|---------------------|-----------------------|--------------------------|-------------------------|
| Bi-polar type | Uni-polar type |  |  |   |  | 10/1000μs                                     |                       | 8/20μs              |                       |                          |                         |
|               |                |  |  |   |  | V <sub>C</sub><br>V                           | I <sub>PPM</sub><br>A | V <sub>C</sub><br>V | I <sub>PPM</sub><br>A |                          |                         |
| Z6012         | -              | 9.72                                     | 10                                       | 10.8-13.2                                   | 1  | 17.3  | 86.7                  | 22.7                | 802                   | 0.066                    | 4400                    |
| -             | Z6012U         |  |  | 10.8-13.2                                   |  |   |                       |                     |                       | 0.074                    | 8800                    |
| Z6015         | -              | 12.1                                     | 10                                       | 13.5-16.5                                   | 1  | 22.0  | 68.2                  | 28.4                | 641                   | 0.075                    | 3300                    |
| -             | Z6015U         |  |  | 13.5-16.5                                   |  |   |                       |                     |                       | 0.079                    | 6600                    |
| Z6018         | -              | 14.5                                     | 10                                       | 16.2-19.8                                   | 1  | 26.5  | 56.6                  | 34.0                | 535                   | 0.079                    | 2700                    |
| -             | Z6018U         |  |  | 16.2-19.8                                   |  |   |                       |                     |                       | 0.083                    | 5400                    |
| Z6022         | -              | 17.8                                     | 10                                       | 19.8-24.2                                   | 1  | 31.9  | 47.0                  | 41.2                | 442                   | 0.082                    | 2400                    |
| -             | Z6022U         |  |  | 19.8-24.2                                   |  |   |                       |                     |                       | 0.086                    | 4400                    |
| Z6027         | -              | 21.8                                     | 10                                       | 24.3-29.7                                   | 1  | 39.1  | 38.4                  | 50.5                | 360                   | 0.085                    | 1700                    |
| -             | Z6027U         |  |  | 24.3-29.7                                   |  |   |                       |                     |                       | 0.089                    | 3300                    |
| Z6033         | -              | 26.8                                     | 5  | 29.7-36.3                                   | 1  | 47.7  | 31.4                  | 61.7                | 295                   | 0.087                    | 1400                    |
| -             | Z6033U         |  |  | 29.7-36.3                                   |  |   |                       |                     |                       | 0.092                    | 2800                    |
| Z6039         | -              | 31.6                                     | 5  | 35.1-42.9                                   | 1  | 56.4  | 26.6                  | 73.0                | 249                   | 0.090                    | 1200                    |
| -             | Z6039U         |  |  | 35.1-42.9                                   |  |   |                       |                     |                       | 0.095                    | 2400                    |
| Z6047         | -              | 38.1                                     | 5  | 42.3-51.7                                   | 1  | 67.8  | 22.1                  | 88.0                | 207                   | 0.092                    | 1000                    |
| -             | Z6047U         |  |  | 42.3-51.7                                   |  |   |                       |                     |                       | 0.097                    | 2000                    |
| Z6056         | -              | 45.4                                     | 5  | 50.4-61.6                                   | 1  | 80.5  | 18.6                  | 105.0               | 173                   | 0.094                    | 850                     |
| -             | Z6056U         |  |  | 50.4-61.6                                   |  |   |                       |                     |                       | 0.099                    | 1700                    |
| Z6068         | -              | 55.1                                     | 5  | 61.2-74.8                                   | 1  | 98.0  | 15.3                  | 127.0               | 143                   | 0.096                    | 720                     |
| -             | Z6068U         |  |  | 61.2-74.8                                   |  |   |                       |                     |                       | 0.100                    | 1440                    |
| Z6082         | -              | 66.4                                     | 5  | 73.8-90.2                                   | 1  | 118.0   | 12.7                  | 153.0               | 119                   | 0.099                    | 610                     |
| -             | Z6082U         |  |  | 73.8-90.2                                   |  |   |                       |                     |                       | 0.102                    | 1220                    |
| Z6100         | -              | 81.0                                     | 5  | 90.0-110                                    | 1  | 144.0   | 10.4                  | 187.0               | 97.3                  | 0.101                    | 520                     |
| -             | Z6100U         |  |  | 90.0-110                                    |  |   |                       |                     |                       | 0.104                    | 1040                    |
| Z6120         | -              | 97.2                                     | 5  | 108-132                                     | 1  | 173.0   | 8.67                  | 222.0               | 82.0                  | 0.103                    | 440                     |
| -             | Z6120U         |  |  | 108-132                                     |  |   |                       |                     |                       | 0.106                    | 880                     |
| -             | Z6150U         | 121.0                                    | 5  | 135-165                                     | 1  | 215.0   | 6.98                  | 277.0               | 65.7                  | 0.107                    | 720                     |

NOTE : Nonsuffix : Bi-polar, suffix "U" : Uni-polar.

**Z6 type VRD has bipolar or unipolar electrical characteristics.**

Maximum ratings  
 Rated peak impulse power dissipation : 1.5kW(10/1000μs)  
 18.0kW(8/20μs)  
 Rated average power dissipation: 2W  
 Operating and storage temperature : -40°C to 125°C

Symbol mark



| VRD part No. | Stand-off voltage<br>V <sub>s</sub><br>V | Stand-by current<br>I <sub>b</sub><br>μA | Breakdown voltage<br>V <sub>(BR)</sub><br>V | Pulsed d.c. test current<br>I <sub>T</sub><br>mA | Clamping Voltage & Rated peak impulse current |                       |                     |                       | Max. temp. coef.<br>%/°C | Capacitance (TYP)<br>pF |
|--------------|--|--|---|--|---|-----------------------|---------------------|-----------------------|--------------------------|-------------------------|
|              |  |  |   |  | 10/1000μs                                     |                       | 8/20μs              |                       |                          |                         |
|              |  |  |   |  | V <sub>C</sub><br>V                           | I <sub>PPM</sub><br>A | V <sub>C</sub><br>V | I <sub>PPM</sub><br>A |                          |                         |
| ZD015        | 11.4                                     | 10                                       | 12.8-17.2                                   | 1  | 24.0  | 10.4                  | 31.0                | 96.7                  | 0.075                    | 31.5                    |
| ZD018        | 13.7                                     |  | 15.3-20.7                                   |  | 28.0  | 8.93                  | 36.0                | 83.3                  | 0.079                    | 31.0                    |
| ZD022        | 16.8                                     | 5  | 18.7-25.3                                   | 1  | 33.2  | 7.53                  | 43.0                | 69.7                  | 0.082                    | 29.0                    |
| ZD027        | 20.6                                     |  | 23.0-31.0                                   |  | 40.0  | 6.25                  | 52.0                | 57.7                  | 0.085                    | 28.2                    |
| ZD033        | 25.2                                     | 5  | 28.1-37.9                                   | 1  | 48.6  | 5.14                  | 63.0                | 47.6                  | 0.087                    | 27.2                    |
| ZD039        | 29.8                                     |  | 33.2-44.8                                   |  | 57.4  | 4.35                  | 74.0                | 40.5                  | 0.090                    | 26.3                    |
| ZD047        | 35.9                                     | 5  | 40.0-54.0                                   | 1  | 68.5  | 3.65                  | 89.0                | 33.7                  | 0.092                    | 25.0                    |
| ZD056        | 42.8                                     |  | 47.6-64.4                                   |  | 81.0  | 3.08                  | 106.0               | 28.6                  | 0.094                    | 24.1                    |
| ZD068        | 52.0                                     | 5  | 57.8-78.2                                   | 1  | 98.0  | 2.55                  | 127.0               | 23.8                  | 0.096                    | 22.0                    |

**Low capacitance type**

Maximum ratings  
 Reverse voltage: 200 VDC  
 Rated peak impulse power dissipation : 250 W(10/1000μs)  
 3.00 kW(8/20μs)  
 Rated average power dissipation: 500 mW  
 Operating and storage temperature : -40°C to 125°C

Symbol mark



# SMD VRD

## Part number



## Dimensions



## Marking



|                                      | Rating                |
|--------------------------------------|-----------------------|
| Rated average power dissipation      | 1.0W                  |
| Rated peak impulse power dissipation | 300W(10/1000 $\mu$ s) |
|                                      | 1200W(1.2/50 $\mu$ s) |
|                                      | 2000W(8/20 $\mu$ s)   |
| Storage temp. range                  | -40°C~150°C           |

## Taping



| A              | B              | W                  | F                  | E              | P <sub>1</sub> |
|----------------|----------------|--------------------|--------------------|----------------|----------------|
| 3.0<br>±0.1    | 5.2<br>±0.1    | 12.0<br>±0.3       | 5.5<br>±0.05       | 1.75<br>±0.1   | 4.0<br>±0.1    |
| P <sub>2</sub> | P <sub>0</sub> | phi D <sub>0</sub> | phi D <sub>1</sub> | T <sub>1</sub> | T <sub>2</sub> |
| 2.0<br>±0.1    | 4.0<br>±0.1    | 1.5<br>+0.1<br>-0  | 1.5<br>+0.2<br>-0  | 0.3<br>±0.05   | (2.6)          |

Unit (mm)

## Specifications

### ZS type

| Part No. | Breakdown voltage | Stand-off voltage | Stand-by current | Maximum clamping voltage & Maximum peak pulse current |      |              |      | Temperature coefficient (TYP) | Capacitance (TYP) |
|----------|-------------------|-------------------|------------------|---|------|--------------|------|-------------------------------|-------------------|
|          |                   |                   |                  | V <sub>Cmax</sub> /I <sub>PPM</sub>                   |      |              |      |                               |                   |
|          |                   |                   |                  | 10/1000 $\mu$ s                                       |      | 8/20 $\mu$ s |      |                               |                   |
|          |                   |                   |                  | V   | A    | V            | A    |                               |                   |
| ZS1012   | 12(10.8~13.2)     | 9.72              | 10               | 17.3  | 17.3 | 22.4         | 89.3 | 0.066                         | 551               |
| ZS1015   | 15(13.5~16.5)     | 12.1              | 5                | 22.0  | 13.6 | 28.5         | 70.2 | 0.075                         | 465               |
| ZS1018   | 18(16.2~19.8)     | 14.5              |                  | 26.5  | 11.3 | 34.4         | 58.1 | 0.079                         | 376               |
| ZS1022   | 22(19.8~24.2)     | 17.8              |                  | 31.9  | 9.40 | 41.4         | 48.3 | 0.082                         | 299               |
| ZS1027   | 27(24.3~29.7)     | 21.8              |                  | 39.1  | 7.67 | 50.7         | 39.4 | 0.085                         | 248               |
| ZS1033   | 33(29.7~36.3)     | 26.8              |                  | 47.7  | 6.29 | 61.8         | 32.4 | 0.087                         | 198               |
| ZS1039   | 39(35.1~42.9)     | 31.6              |                  | 56.4  | 5.32 | 73.1         | 27.4 | 0.090                         | 164               |
| ZS1047   | 47(42.3~51.7)     | 38.1              |                  | 67.8  | 4.42 | 88.0         | 22.7 | 0.092                         | 137               |

### ZS-U type

| Part No. | Breakdown voltage | Stand-off voltage | Stand-by current | Maximum clamping voltage & Maximum peak pulse current |      |              |      | Temperature coefficient (TYP) | Capacitance (TYP) |
|----------|-------------------|-------------------|------------------|---|------|--------------|------|-------------------------------|-------------------|
|          |                   |                   |                  | V <sub>Cmax</sub> /I <sub>PPM</sub>                   |      |              |      |                               |                   |
|          |                   |                   |                  | 10/1000 $\mu$ s                                       |      | 8/20 $\mu$ s |      |                               |                   |
|          |                   |                   |                  | V   | A    | V            | A    |                               |                   |
| ZS1012U  | 12(10.8~13.2)     | 9.72              | 10               | 17.3  | 17.3 | 22.4         | 89.3 | 0.066                         | 1,102             |
| ZS1015U  | 15(13.5~16.5)     | 12.1              | 5                | 22.0  | 13.6 | 28.5         | 70.2 | 0.075                         | 929               |
| ZS1018U  | 18(16.2~19.8)     | 14.5              |                  | 26.5  | 11.3 | 34.4         | 58.1 | 0.079                         | 751               |
| ZS1022U  | 22(19.8~24.2)     | 17.8              |                  | 31.9  | 9.40 | 41.4         | 48.3 | 0.082                         | 598               |
| ZS1027U  | 27(24.3~29.7)     | 21.8              |                  | 39.1  | 7.67 | 50.7         | 39.4 | 0.085                         | 497               |
| ZS1033U  | 33(29.7~36.3)     | 26.8              |                  | 47.7  | 6.29 | 61.8         | 32.4 | 0.087                         | 395               |
| ZS1039U  | 39(35.1~42.9)     | 31.6              |                  | 56.4  | 5.32 | 73.1         | 27.4 | 0.090                         | 328               |
| ZS1047U  | 47(42.3~51.7)     | 38.1              |                  | 67.8  | 4.42 | 88.0         | 22.7 | 0.092                         | 274               |

### ZS-D type

| Part No. | Breakdown voltage | Stand-off voltage | Stand-by current | Maximum clamping voltage & Maximum peak pulse current |      |              |      | Temperature coefficient (TYP) | Capacitance (TYP) |
|----------|-------------------|-------------------|------------------|---|------|--------------|------|-------------------------------|-------------------|
|          |                   |                   |                  | V <sub>Cmax</sub> /I <sub>PPM</sub>                   |      |              |      |                               |                   |
|          |                   |                   |                  | 10/1000 $\mu$ s                                       |      | 8/20 $\mu$ s |      |                               |                   |
|          |                   |                   |                  | V   | A    | V            | A    |                               |                   |
| ZS1012D  | 12(10.8~13.2)     | 9.72              | 10               | 17.3  | 17.3 | 22.4         | 89.3 | 0.066                         | 30.2              |
| ZS1015D  | 15(13.5~16.5)     | 12.1              | 5                | 22.0  | 13.6 | 28.5         | 70.2 | 0.075                         | 29.1              |
| ZS1018D  | 18(16.2~19.8)     | 14.5              |                  | 26.5  | 11.3 | 34.4         | 58.1 | 0.079                         | 28.2              |
| ZS1022D  | 22(19.8~24.2)     | 17.8              |                  | 31.9  | 9.40 | 41.4         | 48.3 | 0.082                         | 27.3              |
| ZS1027D  | 27(24.3~29.7)     | 21.8              |                  | 39.1  | 7.67 | 50.7         | 39.4 | 0.085                         | 26.4              |
| ZS1033D  | 33(29.7~36.3)     | 26.8              |                  | 47.7  | 6.29 | 61.8         | 32.4 | 0.087                         | 25.5              |
| ZS1039D  | 39(35.1~42.9)     | 31.6              |                  | 56.4  | 5.32 | 73.1         | 27.4 | 0.090                         | 24.8              |
| ZS1047D  | 47(42.3~51.7)     | 38.1              |                  | 67.8  | 4.42 | 88.0         | 22.7 | 0.092                         | 24.0              |

## Данный компонент на территории Российской Федерации

### Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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