

# Lower Voltage Ceramic Singlelayer DC Disc Capacitors

## 2 kV<sub>DC</sub> to 7.5 kV<sub>DC</sub>



### FEATURES

- Low losses
- High capacitance in small sizes
- High stability
- Radial leads
- Material categorization: for definitions of compliance please see [www.vishay.com/doc299912](http://www.vishay.com/doc299912)


**RoHS**  
COMPLIANT

### APPLICATIONS

- Lighting ballasts
- SMPS
- DC and pulse high voltage

### DESIGN

The capacitors consist of a ceramic disc of which both sides are silver-plated. Connection leads are made of tinned copper having diameters of 0.025" (0.64 mm) or 0.032" (0.81 mm).

The capacitors may be supplied with radial kinked or straight leads having lead spacing of 0.250" (6.35 mm) or 0.375" (9.5 mm) or 0.500" (12.7 mm).

The standard tolerances are  $\pm 10\%$  or  $\pm 20\%$ .

Coating is made of resin coating or flame retardant epoxy resin in accordance with "UL 94 V-0".

### CAPACITANCE RANGE

10 pF to 0.10  $\mu$ F

### RATED VOLTAGE

2 kV<sub>DC</sub>  
3 kV<sub>DC</sub>  
6 kV<sub>DC</sub>  
7.5 kV<sub>DC</sub>

### DIELECTRIC STRENGTH BETWEEN LEADS

Component test:

2 kV<sub>DC</sub> 3600 V<sub>DC</sub>, 2 s  
3 kV<sub>DC</sub> 5000 V<sub>DC</sub>, 2 s  
6 kV<sub>DC</sub> 10 500 V<sub>DC</sub>, 2 s  
7.5 kV<sub>DC</sub> 11 250 V<sub>DC</sub>, 2 s

### CERAMIC DIELECTRIC

C0G, U2J, R3L (Class 1)  
X7R, X5F, X5S, Y5S, Y5U, Y5V, Z5U (Class 2)

| QUICK REFERENCE DATA       |          |               |                         |                                   |                    |               |
|----------------------------|----------|---------------|-------------------------|-----------------------------------|--------------------|---------------|
| DESCRIPTION                | VALUE    |               |                         |                                   |                    |               |
| Ceramic Class              | 1        |               | 2                       |                                   |                    |               |
| Ceramic Dielectric         | U2J, R3L | C0G, U2J, R3L | X7R, Y5S, Y5U, Z5U, Y5V | X5F, X5R, X5S, X7R, Y5S, Y5U, Z5U | X5F, X5S, Y5U, Z5U | X5F, Y5U, Z5U |
| Voltage (V <sub>DC</sub> ) | 3000     | 6000          | 2000                    | 3000                              | 6000               | 7500          |
| Min. Capacitance (pF)      | 10       | 10            | 100                     | 47                                | 100                | 100           |
| Max. Capacitance (pF)      | 33       | 47            | 100 000                 | 33 000                            | 10 000             | 2500          |
| Mounting                   | Radial   |               |                         |                                   |                    |               |

### INSULATION RESISTANCE

2 kV<sub>DC</sub> min. 10 000 M $\Omega$   
3 kV<sub>DC</sub> min. 50 000 M $\Omega$  <sup>(1)</sup>  
6 kV<sub>DC</sub> min. 75 000 M $\Omega$   
7.5 kV<sub>DC</sub> min. 200 000 M $\Omega$

#### Note

<sup>(1)</sup> Exemption: 565R30GASS33 min. 25 000 M $\Omega$

### TOLERANCE ON CAPACITANCE

$\pm 10\%$ ,  $\pm 20\%$ ,  $-20\%$  to  $+80\%$

### DISSIPATION FACTOR

Class 1: 0.2 % max. at 1 MHz; 1 V  
Class 2: 2.0 % max. at 1 kHz; 1 V

### CATEGORY TEMPERATURE RANGE

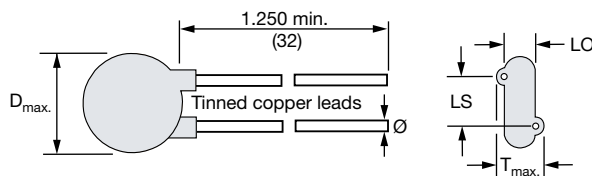
-25 °C to +85 °C

### CLIMATIC CATEGORY ACC. TO EN 60068-1

25/085/21

### OPERATING TEMPERATURE RANGE

-25 °C to +105 °C

**DIMENSIONS** in inches (millimeters)

**ORDERING INFORMATION, CERAMIC 2 kV<sub>DC</sub>**

| C<br>(pF) | TOL.<br>(%) | D <sub>max</sub> .<br>DIAMETER<br>INCH (mm) | T <sub>max</sub> .<br>THICKNESS<br>INCH (mm) | LS<br>LEAD SPACE<br>INCH (mm)<br>± 1 mm | LO<br>LEAD OFFSET<br>INCH (mm)<br>± 0.5 mm | WIRE SIZE |              | ORDERING<br>CODE |
|-----------|-------------|---------------------------------------------|----------------------------------------------|-----------------------------------------|--------------------------------------------|-----------|--------------|------------------|
| X7R       |             |                                             |                                              |                                         |                                            |           |              |                  |
| 100       | ± 10        | 0.330 (8.4)                                 | 0.190 (4.8)                                  | 0.250 (6.4)                             | 0.075 (1.9)                                | 20        | 0.032 (0.81) | 564R20TST10      |
| 220       |             |                                             | 0.180 (4.6)                                  |                                         | 0.071 (1.8)                                |           |              | 564R20TST22      |
| 330       |             |                                             |                                              |                                         | 0.075 (1.9)                                |           |              | 564R20TST33      |
| 470       |             |                                             |                                              |                                         | 0.063 (1.6)                                |           |              | 564R20TST47      |
| 560       |             |                                             |                                              |                                         | 0.087 (2.2)                                |           |              | 564R20TST56      |
| 680       |             |                                             | 0.175 (4.4)                                  |                                         | 0.075 (1.9)                                |           |              | 564R20TST68      |
| 1000      |             | 0.083 (2.1)                                 |                                              |                                         | 564R20TSD10                                |           |              |                  |
| 1500      |             | 0.460 (11.7)                                | 0.160 (4.1)                                  |                                         | 0.063 (1.6)                                |           |              | 564R20TSD15      |
| 1800      |             |                                             |                                              |                                         | 0.055 (1.4)                                |           |              | 564R20TSD18      |
| 2200      |             |                                             | 0.170 (4.3)                                  |                                         | 0.067 (1.7)                                |           |              | 564R20TSD22      |
| 3300      |             |                                             |                                              |                                         | 0.063 (1.6)                                |           |              | 564R20TSD33      |
| 3900      |             | 0.075 (1.9)                                 |                                              |                                         | 564R20TSD39                                |           |              |                  |
| 4700      |             | 0.375 (9.5)                                 |                                              |                                         | 0.071 (1.8)                                |           |              | 564R20TSD47      |
| Y5S       |             |                                             |                                              |                                         |                                            |           |              |                  |
| 1000      | ± 20        | 0.330 (8.4)                                 | 0.175 (4.4)                                  | 0.250 (6.4)                             | 0.067 (1.7)                                | 20        | 0.032 (0.81) | 564R20TSSD10     |
| 2200      |             | 0.460 (11.7)                                | 0.170 (4.3)                                  |                                         | 0.071 (1.8)                                |           |              | 564R20TSSD22     |
| 5600      |             | 0.790 (20.0)                                | 0.190 (4.8)                                  | 0.375 (9.5)                             | 0.091 (2.3)                                |           |              | 564R20TSSD56     |
| Y5U       |             |                                             |                                              |                                         |                                            |           |              |                  |
| 1000      | ± 20        | 0.330 (8.4)                                 | 0.170 (4.3)                                  | 0.250 (6.4)                             | 0.067 (1.7)                                | 20        | 0.032 (0.81) | 564R20GAD10      |
| 1500      |             | 0.330 (8.4)                                 | 0.170 (4.3)                                  |                                         | 0.071 (1.8)                                |           |              | 564R20GAD15      |
| Z5U       |             |                                             |                                              |                                         |                                            |           |              |                  |
| 1800      | ± 20        | 0.360 (9.1)                                 | 0.170 (4.3)                                  | 0.250 (6.4)                             | 0.071 (1.8)                                | 20        | 0.032 (0.81) | 564R20GAD18      |
| 2200      |             | 0.400 (10.2)                                | 0.175 (4.4)                                  |                                         | 0.075 (1.9)                                |           |              | 564R20GAD22      |
| 3300      |             | 0.430 (10.9)                                |                                              |                                         | 0.071 (1.8)                                |           |              | 564R20GAD33      |
| 4700      |             | 0.530 (13.5)                                | 0.170 (4.3)                                  |                                         | 0.075 (1.9)                                |           |              | 564R20GAD47      |
| 6800      |             | 0.560 (14.2)                                |                                              | 0.375 (9.5)                             | 0.067 (1.7)                                |           |              | 564R20GAD68      |
| Y5V       |             |                                             |                                              |                                         |                                            |           |              |                  |
| 0.01 μF   | ± 20        | 0.620 (15.7)                                | 0.170 (4.3)                                  | 0.375 (9.5)                             | 0.067 (1.7)                                | 20        | 0.032 (0.81) | 564R20GASS10     |
| 0.05 μF   |             | 0.950 (24.1)                                | 0.174 (4.4)                                  |                                         | 0.067 (1.7)                                | 20        |              | 564R20GAS50      |
| 0.10 μF   |             | 0.950 (24.1)                                | 0.240 (6.1)                                  |                                         | 0.067 (1.7)                                | 22        | 0.025 (0.64) | 565R20GAP10      |



| ORDERING INFORMATION, CERAMIC 3 kV <sub>DC</sub> |             |                                             |                                              |                                         |                                            |             |              |                  |
|--------------------------------------------------|-------------|---------------------------------------------|----------------------------------------------|-----------------------------------------|--------------------------------------------|-------------|--------------|------------------|
| C<br>(pF)                                        | TOL.<br>(%) | D <sub>max</sub> .<br>DIAMETER<br>INCH (mm) | T <sub>max</sub> .<br>THICKNESS<br>INCH (mm) | LS<br>LEAD SPACE<br>INCH (mm)<br>± 1 mm | LO<br>LEAD OFFSET<br>INCH (mm)<br>± 0.5 mm | WIRE SIZE   |              | ORDERING<br>CODE |
|                                                  |             |                                             |                                              |                                         |                                            | AWG         | INCH (mm)    |                  |
| U2J (N750)                                       |             |                                             |                                              |                                         |                                            |             |              |                  |
| 10                                               | ± 20        | 0.330 (8.4)                                 | 0.210 (5.3)                                  | 0.250 (6.4)                             | 0.110 (2.8)                                | 20          | 0.032 (0.81) | 564R30GAQ10      |
| R3L (N2200)                                      |             |                                             |                                              |                                         |                                            |             |              |                  |
| 22                                               | ± 20        | 0.330 (8.4)                                 | 0.200 (5.1)                                  | 0.250 (6.4)                             | 0.102 (2.6)                                | 20          | 0.032 (0.81) | 564R30GAQ22      |
| 27                                               |             |                                             | 0.190 (4.8)                                  |                                         | 0.091 (2.3)                                |             |              | 564R30GAQ27      |
| 33                                               |             |                                             | 0.170 (4.3)                                  |                                         | 0.071 (1.8)                                |             |              | 564R30GAQ33      |
| X5F                                              |             |                                             |                                              |                                         |                                            |             |              |                  |
| 56                                               | ± 20        | 0.330 (8.4)                                 | 0.190 (4.8)                                  | 0.250 (6.4)                             | 0.091 (2.3)                                | 20          | 0.032 (0.81) | 564R30GAQ56      |
| 68                                               |             |                                             | 0.200 (5.1)                                  |                                         | 0.102 (2.6)                                |             |              | 564R30GAQ68      |
| 270                                              |             |                                             | 0.180 (4.6)                                  |                                         | 0.083 (2.1)                                |             |              | 564R30GAT27      |
| X5R                                              |             |                                             |                                              |                                         |                                            |             |              |                  |
| 330                                              | ± 20        | 0.330 (8.4)                                 | 0.175 (4.4)                                  | 0.250 (6.4)                             | 0.075 (1.9)                                | 20          | 0.032 (0.81) | 564R30GAT33      |
| X5S                                              |             |                                             |                                              |                                         |                                            |             |              |                  |
| 470                                              | ± 20        | 0.330 (8.4)                                 | 0.175 (4.4)                                  | 0.250 (6.4)                             | 0.075 (1.9)                                | 20          | 0.032 (0.81) | 564R30GAT47      |
| X7R                                              |             |                                             |                                              |                                         |                                            |             |              |                  |
| 47                                               | ± 20        | 0.330 (8.4)                                 | 0.230 (5.8)                                  | 0.250 (6.4)                             | 0.130 (3.3)                                | 20          | 0.032 (0.81) | 564R30GAQ47      |
| 100                                              |             |                                             | 0.180 (4.6)                                  |                                         | 0.083 (2.1)                                |             |              | 564R30GAT10      |
| 150                                              |             |                                             | 0.190 (4.8)                                  |                                         | 0.091 (2.3)                                |             |              | 564R30GAT15      |
| 220                                              |             |                                             | 0.175 (4.4)                                  |                                         | 0.075 (1.9)                                |             |              | 564R30GAT22      |
| 390                                              |             |                                             |                                              |                                         | 0.083 (2.1)                                |             |              | 564R30GAT39      |
| 680                                              | ± 10        | 0.180 (4.6)                                 | 0.079 (2.0)                                  |                                         | 564R30TST68                                |             |              |                  |
| 1000                                             |             | 0.190 (4.8)                                 | 0.091 (2.3)                                  |                                         | 564R30TSD10                                |             |              |                  |
| 1500                                             |             | 0.490 (12.5)                                | 0.185 (4.7)                                  |                                         | 564R30TSD15                                |             |              |                  |
| 1800                                             |             | 0.087 (2.2)                                 |                                              |                                         | 564R30TSD18                                |             |              |                  |
| 2200                                             |             | 0.530 (13.5)                                | 0.180 (4.6)                                  |                                         | 0.079 (2.0)                                |             |              | 564R30TSD22      |
| 2700                                             |             | 0.620 (15.7)                                | 0.185 (4.7)                                  |                                         | 0.083 (2.1)                                |             |              | 564R30TSD27      |
| 3300                                             |             |                                             | 0.170 (4.3)                                  | 0.075 (1.9)                             | 564R30TSD33                                |             |              |                  |
| 3900                                             |             | 0.720 (18.3)                                | 0.185 (4.7)                                  | 0.087 (2.2)                             | 564R30TSD39                                |             |              |                  |
| 4700                                             |             |                                             | 0.175 (4.4)                                  | 0.075 (1.9)                             | 564R30TSD47                                |             |              |                  |
| 6800                                             |             |                                             | 0.185 (4.7)                                  | 0.087 (2.2)                             | 564R30TSD68                                |             |              |                  |
| Y5S                                              |             |                                             |                                              |                                         |                                            |             |              |                  |
| 1000                                             | ± 20        | 0.400 (10.2)                                | 0.190 (4.8)                                  | 0.250 (6.4)                             | 0.098 (2.5)                                | 20          | 0.032 (0.81) | 564R30TSSD10     |
| 1500                                             |             | 0.460 (11.7)                                |                                              |                                         | 0.091 (2.3)                                |             |              | 564R30TSSD15     |
| 1800                                             |             | 0.490 (12.4)                                |                                              |                                         | 0.087 (2.2)                                |             |              | 564R30TSSD18     |
| 2200                                             |             | 0.530 (13.5)                                |                                              |                                         |                                            |             |              | 564R30TSSD22     |
| 2700                                             |             | 0.560 (14.2)                                | 0.185 (4.7)                                  | 0.375 (9.5)                             | 564R30TSSD27                               |             |              |                  |
| 3300                                             |             | 0.620 (15.7)                                |                                              |                                         | 0.083 (2.1)                                |             |              | 564R30TSSD33     |
| 3900                                             |             | 0.680 (17.3)                                |                                              |                                         | 0.087 (2.2)                                |             |              | 564R30TSSD39     |
| 4700                                             |             |                                             |                                              |                                         | 0.091 (2.3)                                |             |              | 564R30TSSD47     |
| 5600                                             |             | 0.790 (20.0)                                | 0.190 (4.8)                                  | 0.102 (2.6)                             | 564R30TSSD56                               |             |              |                  |
| 6800                                             |             | 0.900 (22.9)                                | 0.205 (5.2)                                  |                                         | 564R30TSSD68                               |             |              |                  |
| Y5U                                              |             |                                             |                                              |                                         |                                            |             |              |                  |
| 680                                              | ± 20        | 0.330 (8.4)                                 | 0.175 (4.4)                                  | 0.250 (6.4)                             | 0.075 (1.9)                                | 20          | 0.032 (0.81) | 564R30GAT68      |
| 0.010 µF                                         |             | 0.720 (18.3)                                | 0.185 (4.7)                                  | 0.375 (9.5)                             | 0.091 (2.3)                                |             |              | 564R30GAS10      |
| Z5U                                              |             |                                             |                                              |                                         |                                            |             |              |                  |
| 1000                                             | ± 20        | 0.330 (8.4)                                 | 0.195 (5.0)                                  | 0.250 (6.4)                             | 0.098 (2.5)                                | 20          | 0.032 (0.81) | 564R30GAD10      |
| 1500                                             |             | 0.360 (9.1)                                 | 0.190 (4.8)                                  |                                         | 0.091 (2.3)                                |             |              | 564R30GAD15      |
| 1800                                             |             | 0.400 (10.2)                                |                                              |                                         | 0.098 (2.5)                                |             |              | 564R30GAD18      |
| 2200                                             |             | 0.430 (10.9)                                |                                              |                                         | 0.091 (2.3)                                |             |              | 564R30GAD22      |
| 2700                                             |             | 0.460 (11.7)                                |                                              |                                         | 0.098 (2.5)                                |             |              | 564R30GAD27      |
| 3300                                             |             | 0.530 (13.5)                                | 0.185 (4.7)                                  | 0.087 (2.2)                             | 564R30GAD33                                |             |              |                  |
| 3900                                             |             |                                             |                                              | 0.375 (9.5)                             | 0.091 (2.3)                                |             |              | 564R30GAD39      |
| 4700                                             |             | 0.620 (15.7)                                | 0.195 (5.0)                                  |                                         |                                            |             |              | 564R30GAD47      |
| 6800                                             |             | 0.720 (18.3)                                | 0.200 (5.1)                                  |                                         | 0.102 (2.6)                                |             |              | 564R30GAD68      |
| 8200                                             |             |                                             |                                              |                                         |                                            |             |              | 564R30GAD82      |
| 0.033 µF                                         |             |                                             | 0.900 (22.9)                                 | 0.240 (6.1)                             |                                            | 0.087 (2.2) | 22           | 0.025 (0.64)     |

**ORDERING INFORMATION, CERAMIC 6 kV<sub>DC</sub>**

| C<br>(pF)   | TOL.<br>(%) | D <sub>max.</sub><br>DIAMETER<br>INCH (mm) | T <sub>max.</sub><br>THICKNESS<br>INCH (mm) | LS<br>LEAD SPACE<br>INCH (mm)<br>± 1 mm | LO<br>LEAD OFFSET<br>INCH (mm)<br>± 0.5 mm | WIRE SIZE |              | ORDERING<br>CODE |
|-------------|-------------|--------------------------------------------|---------------------------------------------|-----------------------------------------|--------------------------------------------|-----------|--------------|------------------|
|             |             |                                            |                                             |                                         |                                            | AWG       | INCH (mm)    |                  |
| C0G (NP0)   |             |                                            |                                             |                                         |                                            |           |              |                  |
| 10          | ± 20        | 0.400 (10.2)                               | 0.220 (5.6)                                 | 0.375 (9.5)                             | 0.122 (3.1)                                | 20        | 0.032 (0.81) | 564R60GAQ10      |
| U2J (N750)  |             |                                            |                                             |                                         |                                            |           |              |                  |
| 22          | ± 20        | 0.460 (11.7)                               | 0.240 (6.1)                                 | 0.375 (9.5)                             | 0.142 (3.6)                                | 20        | 0.032 (0.81) | 564R60GAQ22      |
| R3L (N2200) |             |                                            |                                             |                                         |                                            |           |              |                  |
| 33          | ± 20        | 0.400 (10.2)                               | 0.230 (5.8)                                 | 0.375 (9.5)                             | 0.130 (3.3)                                | 20        | 0.032 (0.81) | 564R60GAQ33      |
| 47          |             | 0.460 (11.7)                               |                                             |                                         | 0.126 (3.2)                                |           |              | 564R60GAQ47      |
| X5F         |             |                                            |                                             |                                         |                                            |           |              |                  |
| 100         | ± 20        | 0.400 (10.2)                               | 0.240 (6.1)                                 | 0.375 (9.5)                             | 0.142 (3.6)                                | 20        | 0.032 (0.81) | 564R60GAT10      |
| 220         |             |                                            | 0.265 (6.7)                                 |                                         | 0.165 (4.2)                                |           |              | 564R60GAT22      |
| X5S         |             |                                            |                                             |                                         |                                            |           |              |                  |
| 330         | ± 20        | 0.400 (10.2)                               | 0.260 (6.6)                                 | 0.375 (9.5)                             | 0.161 (4.1)                                | 20        | 0.032 (0.81) | 564R60GAT33      |
| Y5U         |             |                                            |                                             |                                         |                                            |           |              |                  |
| 470         | ± 20        | 0.400 (10.2)                               | 0.290 (7.4)                                 | 0.375 (9.5)                             | 0.193 (4.9)                                | 20        | 0.032 (0.81) | 564R60GAT47      |
| 560         |             |                                            | 0.240 (6.1)                                 |                                         | 0.142 (3.6)                                |           |              | 564R60GAT56      |
| Z5U         |             |                                            |                                             |                                         |                                            |           |              |                  |
| 1000        | ± 20        | 0.400 (10.2)                               | 0.270 (6.9)                                 | 0.375 (9.5)                             | 0.173 (4.4)                                | 20        | 0.032 (0.81) | 564R60GAD10      |
| 1500        |             | 0.460 (11.7)                               | 0.280 (7.1)                                 |                                         | 0.157 (4.0)                                |           |              | 564R60GAD15      |
| 2200        |             | 0.530 (13.5)                               | 0.240 (6.1)                                 |                                         | 0.142 (3.6)                                |           |              | 564R60GAD22      |
| 3300        |             | 0.620 (15.7)                               | 0.260 (6.6)                                 |                                         | 0.169 (4.3)                                |           |              | 564R60GAD33      |
| 4700        |             | 0.790 (20.0)                               |                                             |                                         | 0.161 (4.1)                                |           |              | 564R60GAD47      |
| 0.010 μF    |             | 0.950 (24.1)                               | 0.250 (6.4)                                 |                                         | 0.150 (3.8)                                |           |              | 564R60GAS10      |

**ORDERING INFORMATION, CERAMIC 7.5 kV<sub>DC</sub>**

| C<br>(pF) | TOL.<br>(%) | D <sup>max.</sup><br>DIAMETER<br>INCH (mm) | T <sup>max.</sup><br>THICKNESS<br>INCH (mm) | LS<br>LEAD SPACE<br>INCH (mm)<br>± 1 mm | LO<br>LEAD OFFSET<br>INCH (mm)<br>± 0.5 mm | WIRE SIZE |              | ORDERING<br>CODE |
|-----------|-------------|--------------------------------------------|---------------------------------------------|-----------------------------------------|--------------------------------------------|-----------|--------------|------------------|
|           |             |                                            |                                             |                                         |                                            | AWG       | INCH (mm)    |                  |
| X5F       |             |                                            |                                             |                                         |                                            |           |              |                  |
| 100       | ± 20        | 0.530 (13.5)                               | 0.310 (7.9)                                 | 0.500 (12.7)                            | 0.181 (4.6)                                | 20        | 0.032 (0.81) | 564R75GAT10      |
| 470       |             | 0.620 (15.7)                               | 0.270 (6.9)                                 |                                         | 0.161 (4.1)                                |           |              | 564R75GAT47      |
| Y5U       |             |                                            |                                             |                                         |                                            |           |              |                  |
| 1000      | + 80 / - 20 | 0.620 (15.7)                               | 0.320 (8.1)                                 | 0.500 (12.7)                            | 0.181 (4.6)                                | 20        | 0.032 (0.81) | 564R75GAD10      |
| Z5U       |             |                                            |                                             |                                         |                                            |           |              |                  |
| 2500      | + 80 / - 20 | 0.620 (15.7)                               | 0.280 (7.1)                                 | 0.500 (12.7)                            | 0.181 (4.6)                                | 20        | 0.032 (0.81) | 564R75GAD25      |

**TAPE AND REEL OPTIONS**

Part number codes and specifications for tape and reel packaging are found in the general information document - find web-link below.

**RELATED DOCUMENTS**

|                     |                                                                        |
|---------------------|------------------------------------------------------------------------|
| General Information | <a href="http://www.vishay.com/doc?23140">www.vishay.com/doc?23140</a> |
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