

## VGN Series

### Features

- 12.5  $\phi$  ~ 18  $\phi$ , 105°C, 2,000 hours assured
- Bi-polarized series for operations wide temperature range
- Designed for surface mounting on high density PC board
- RoHS Compliance



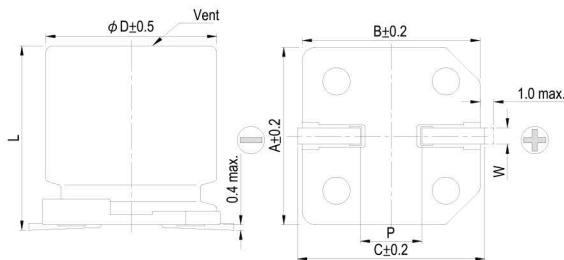
AEC-Q200 Qualified Parts Available: Use "LS" or "KS" Suffix

Marking color: Black

### Specifications

Items	Performance																													
Category Temperature Range	-55°C ~ +105°C																													
Capacitance Tolerance	±20% (at 120 Hz, 20°C)																													
Leakage Current (at 20°C)	I = 0.03CV or 4 (μA) whichever is greater (after 1 minutes) Where, C = rated capacitance in μF, V = rated DC working voltage in V																													
Tanδ (at 120 Hz, 20°C)	<table border="1"> <tr> <td>Rated Voltage</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td>Tanδ (max)</td> <td>0.26</td> <td>0.22</td> <td>0.18</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.09</td> </tr> </table> <p>When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase.</p>	Rated Voltage	6.3	10	16	25	35	50	63	100	Tanδ (max)	0.26	0.22	0.18	0.16	0.14	0.12	0.10	0.09											
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Low Temperature Characteristics (at 120 Hz)	<p>Impedance ratio shall not exceed the values given in the table below.</p> <table border="1"> <tr> <td colspan="2">Rated Voltage</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td rowspan="2">Impedance Ratio</td> <td>Z(-25°C)/Z(+20°C)</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z(-40°C)/Z(+20°C)</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> </tr> </table>	Rated Voltage		6.3	10	16	25	35	50	63	100	Impedance Ratio	Z(-25°C)/Z(+20°C)	5	4	3	2	2	2	2	2	Z(-40°C)/Z(+20°C)	10	8	6	4	3	3	3	3
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Endurance (with the polarity inverted every 250 hours)	<table border="1"> <tr> <td>Test Time</td> <td>2,000 Hrs</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>Tanδ</td> <td>Less than 200% of specified value</td> </tr> <tr> <td>Leakage Current</td> <td>Within specified value</td> </tr> </table> <p>* The above specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage applied for 2,000 hours at 105°C.</p>	Test Time	2,000 Hrs	Capacitance Change	Within ±20% of initial value	Tanδ	Less than 200% of specified value	Leakage Current	Within specified value																					
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Shelf Life Test	<table border="1"> <tr> <td>Test Time</td> <td>1,000 Hrs</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>Tanδ</td> <td>Less than 200% of specified value</td> </tr> <tr> <td>Leakage Current</td> <td>Within specified value</td> </tr> </table> <p>* The above specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1,000 hours at 105°C without voltage applied.</p>	Test Time	1,000 Hrs	Capacitance Change	Within ±20% of initial value	Tanδ	Less than 200% of specified value	Leakage Current	Within specified value																					
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Ripple Current and Frequency Multipliers	<table border="1"> <tr> <td rowspan="4">Cap. (μF)</td> <td>Frequency (Hz)</td> <td>50</td> <td>120</td> <td>1k</td> <td>10k up</td> </tr> <tr> <td>22 ~ 47</td> <td>0.75</td> <td>1.00</td> <td>1.57</td> <td>2.00</td> </tr> <tr> <td>100 ~ 470</td> <td>0.80</td> <td>1.00</td> <td>1.34</td> <td>1.50</td> </tr> <tr> <td>1,000 ~ 3,300</td> <td>0.85</td> <td>1.00</td> <td>1.13</td> <td>1.15</td> </tr> </table>	Cap. (μF)	Frequency (Hz)	50	120	1k	10k up	22 ~ 47	0.75	1.00	1.57	2.00	100 ~ 470	0.80	1.00	1.34	1.50	1,000 ~ 3,300	0.85	1.00	1.13	1.15								
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### Diagram of Dimensions

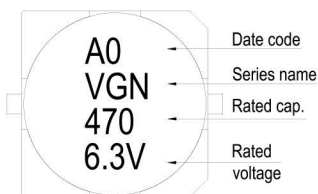


### Lead Spacing and Diameter

Unit: mm

φD	L	A	B	C	W	P ± 0.2
12.5	13.5 ± 0.5	13.0	13.0	13.7	1.1 ~ 1.4	4.4
12.5	16 ± 0.5	13.0	13.0	13.7	1.1 ~ 1.4	4.4
16	16.5 ± 0.5	17.0	17.0	18.0	1.1 ~ 1.4	6.4
16	21.5 ± 0.5	17.0	17.0	18.0	1.1 ~ 1.4	6.4
18	16.5 ± 0.5	19.0	19.0	20.0	1.1 ~ 1.4	6.4
18	21.5 ± 0.5	19.0	19.0	20.0	1.1 ~ 1.4	6.4

### Marking



Dimension:  $\phi D \times L$ (mm)  
Ripple Current: mA<sub>rms</sub> at 120 Hz, 105°C

### Dimension and Permissible Ripple Current

Cap. (μF)	Contents	6.3V (0J)		10V (1A)		16V (1C)		25V (1E)		35V (1V)		50V (1H)		63V (1J)		100V (2A)												
		$\phi D \times L$	mA	$\phi D \times L$	mA	$\phi D \times L$	mA	$\phi D \times L$	mA	$\phi D \times L$	mA	$\phi D \times L$	mA	$\phi D \times L$	mA	$\phi D \times L$	mA											
22	220																12.5×13.5	100										
33	330																12.5×16	150										
47	470																12.5×13.5	130	12.5×13.5	140	16×16.5	180						
100	101																12.5×13.5	180	12.5×16	230	16×16.5	270	18×21.5	310				
220	221																12.5×13.5	270	16×16.5	330	18×16.5	400	16×21.5	400	18×21.5	440		
330	331																12.5×13.5	310	16×16.5	370	18×16.5	450	16×21.5	450	18×21.5	540	18×21.5	590
470	471	12.5×13.5	270	12.5×13.5	340	16×16.5	420	16×16.5	490	18×21.5	590	18×21.5	640															
1,000	102	12.5×16	500	16×16.5	600	18×16.5	670	16×21.5	670	18×21.5	780																	
2,200	222	18×16.5	740	16×21.5	740																							
3,300	332	18×21.5	920																									

### Part Numbering System

VGN Series	470μF	±20%	6.3V	Carrier Tape	12.5 $\phi$ × 13.5L	Pb-free and PET coating case
<b>VGN</b>	<b>471</b>	<b>M</b>	<b>0J</b>	<b>TR</b>	<b>-</b>	<b>S</b>
Series Name	Capacitance	Capacitance Tolerance	Rated Voltage	Package Type	Terminal Type	Case size
						Lead Wire and Coating Type

For automotive application, please replace "S" suffix with an "LS" or "KS" suffix, for non-safety critical and safety critical applications respectively

Note: For more details, please refer to "Part Numbering System (SMD Type)" on page 15.

SMD