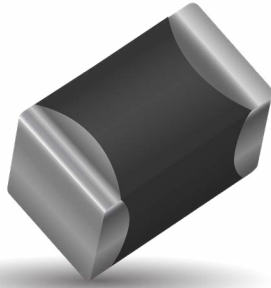


# TransGuard® Automotive Series

## Multilayer Varistors for Automotive Applications



### GENERAL DESCRIPTION

The TransGuard Automotive Series are zinc oxide (ZnO) based ceramic semiconductor devices with non-linear, bi-directional voltage-current characteristics.

They have the advantage of offering bi-directional overvoltage protection as well as EMI/RFI attenuation in a single SMT package. The Automotive Series high current and high energy handling capability make them well suited for protection against automotive related transients.

KYOCERA AVX VG series parts (large case size, high energy) are glass encapsulated. These parts provide the same high reliability as traditional VC series parts. The glass encapsulation provides also enhanced resistance against harsh environment or process such as acids, salts, chlorite flux.

Operating Temperature: -55°C to +125°C

### FEATURES

- High Reliability
- High Energy Absorption (Load Dump)
- High Current Handling
- AEC Q200 Qualified
- Bi-Directional protection
- EMI/RFI attenuation
- Multi-strike capability
- Sub 1nS response to ESD strike

### APPLICATIONS

- Internal Combustion Engine (ICE) Vehicles
- Hybrid Electric Vehicles (HEV)
- Plug-in Hybrid Electric Vehicles (PHEV)
- Commercial Vehicles
  - CAN, LIN, FLEXRAY based modules
  - Sensors
  - Module load dump protection
  - Motor/inductive load transient suppression



### HOW TO ORDER

| VC                                                          | AS                | 1206                                                         | 18                                                                                                                                        | D                                                                                                                                        | 400                                                                                                                  | R                                                                                                         | P                                                                                                                                                        |                                                                                                                                    |                                                                                                                                                     |                  |
|-------------------------------------------------------------|-------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Varistor Chip                                               | Automotive Series | Case Size                                                    | Working Voltage                                                                                                                           | Energy Rating                                                                                                                            | Clamping Voltage                                                                                                     | Package                                                                                                   | Termination                                                                                                                                              |                                                                                                                                    |                                                                                                                                                     |                  |
| VC = Varistor Chip<br>VG = Varistor Glass Encapsulated Chip |                   | 0402<br>0603<br>0805<br>1206<br>1210<br>1812<br>2220<br>3220 | 03 = 3.3Vdc<br>05 = 5.6Vdc<br>09 = 9Vdc<br>12 = 12Vdc<br>14 = 14Vdc<br>16 = 16Vdc<br>18 = 18Vdc<br>22 = 22Vdc<br>26 = 26Vdc<br>30 = 30Vdc | 31 = 31Vdc<br>34 = 34Vdc<br>38 = 38Vdc<br>42 = 42Vdc<br>45 = 45Vdc<br>48 = 48Vdc<br>56 = 56Vdc<br>60 = 60Vdc<br>65 = 65Vdc<br>85 = 85Vdc | A = 0.1J<br>B = 0.2J<br>C = 0.3J<br>D = 0.4J<br>E = 0.5J<br>F = 0.7J<br>H = 1.2J<br>J = 1.5J<br>K = 0.6J<br>L = 0.8J | S = 1.9-2.0J<br>X = 0.05J<br>M = 1J<br>N = 1.1J<br>U = 4.0-5.0J<br>P = 2.5-3.7J<br>Y = 6.5-12J<br>Z = 13J | 140 = 14V<br>150 = 18V<br>220 = 22V<br>250 = 27V<br>300 = 32V<br>380 = 38V<br>390 = 42V<br>400 = 42V<br>440 = 44V<br>490 = 49V<br>540 = 54V<br>570 = 57V | 580 = 60V<br>620 = 67V<br>650 = 67V<br>770 = 77V<br>800 = 80V<br>900 = 90V<br>101 = 100V<br>111 = 110V<br>131 = 135V<br>151 = 150V | D = 7" (1000)*<br>R = 7" (4000)*<br>T = 13" (10,000)*<br>W = 7" (10,000)**<br>0402 only<br><br>*Not available for 0402<br>**Only available for 0402 | P = Ni/Sn plated |

# TransGuard® Automotive Series

## Multilayer Varistors for Automotive Applications



### ELECTRICAL CHARACTERISTICS

| Part Number      | V <sub>W</sub> (DC)<br>Vdc | V <sub>W</sub> (AC)<br>Vac | V <sub>B</sub><br>V | V <sub>C</sub><br>V | I <sub>VC</sub><br>A | I <sub>L</sub><br>μA | E <sub>T</sub><br>J | E <sub>LD</sub><br>J | I <sub>P</sub><br>A | Cap<br>pF | Freq<br>V | V <sub>Jump</sub><br>W | P <sub>Diss. Max</sub> |
|------------------|----------------------------|----------------------------|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|---------------------|-----------|-----------|------------------------|------------------------|
| VCAS060303A140   | 3.3                        | 2.3                        | 6.0±20%             | 14                  | 1                    | 50                   | 0.1                 | -                    | 30                  | 1450      | K         | -                      | 0.002                  |
| VCAS080503A140   | 3.3                        | 2.3                        | 6.0±20%             | 14                  | 1                    | 50                   | 0.1                 | -                    | 40                  | 1000      | K         | -                      | 0.002                  |
| VCAS080503C140   | 3.3                        | 2.3                        | 6.0±20%             | 14                  | 1                    | 50                   | 0.3                 | -                    | 120                 | 4500      | K         | -                      | 0.006                  |
| VCAS120603A140   | 3.3                        | 2.3                        | 6.0±20%             | 14                  | 1                    | 50                   | 0.1                 | -                    | 40                  | 1500      | K         | -                      | 0.002                  |
| VCAS120603D140   | 3.3                        | 2.3                        | 6.0±20%             | 14                  | 1                    | 50                   | 0.4                 | -                    | 150                 | 4000      | K         | -                      | 0.009                  |
| VCAS040205X150__ | 5.6                        | 4.0                        | 8.5±20%             | 18                  | 1                    | 35                   | 0.05                | -                    | 20                  | 175       | M         | -                      | 0.001                  |
| VCAS060305A150__ | 5.6                        | 4.0                        | 8.5±20%             | 18                  | 1                    | 35                   | 0.1                 | -                    | 30                  | 750       | K         | -                      | 0.001                  |
| VCAS080505A150__ | 5.6                        | 4.0                        | 8.5±20%             | 18                  | 1                    | 35                   | 0.1                 | -                    | 40                  | 1100      | K         | -                      | 0.001                  |
| VCAS080505C150__ | 5.6                        | 4.0                        | 8.5±20%             | 18                  | 1                    | 35                   | 0.3                 | -                    | 120                 | 3000      | K         | -                      | 0.005                  |
| VCAS120605A150__ | 5.6                        | 4.0                        | 8.5±20%             | 18                  | 1                    | 35                   | 0.1                 | -                    | 40                  | 1200      | K         | -                      | 0.002                  |
| VCAS120605D150__ | 5.6                        | 4.0                        | 8.5±20%             | 18                  | 1                    | 35                   | 0.4                 | -                    | 150                 | 3000      | K         | -                      | 0.008                  |
| VCAS040209X200__ | 9                          | 6.4                        | 12.7±15%            | 22                  | 1                    | 25                   | 0.05                | -                    | 20                  | 175       | M         | -                      | 0.001                  |
| VCAS060309A200__ | 9                          | 6.4                        | 12.7±15%            | 22                  | 1                    | 25                   | 0.1                 | -                    | 30                  | 550       | K         | -                      | 0.002                  |
| VCAS080509A200__ | 9                          | 6.4                        | 12.7±15%            | 22                  | 1                    | 25                   | 0.1                 | -                    | 40                  | 750       | K         | -                      | 0.002                  |
| VCAS080512A250__ | 12                         | 8.5                        | 16±15%              | 27                  | 1                    | 25                   | 0.1                 | -                    | 40                  | 525       | K         | -                      | 0.002                  |
| VCAS040214X300__ | 14                         | 10                         | 18.5±12%            | 32                  | 1                    | 15                   | 0.05                | -                    | 20                  | 85        | K         | 16                     | 0.001                  |
| VCAS060314A300__ | 14                         | 10                         | 18.5±12%            | 32                  | 1                    | 15                   | 0.1                 | -                    | 30                  | 350       | K         | 16                     | 0.002                  |
| VCAS080514A300__ | 14                         | 10                         | 18.5±12%            | 32                  | 1                    | 15                   | 0.1                 | -                    | 40                  | 325       | K         | 16                     | 0.002                  |
| VCAS080514C300__ | 14                         | 10                         | 18.5±12%            | 32                  | 1                    | 15                   | 0.3                 | -                    | 120                 | 900       | K         | 20                     | 0.006                  |
| VCAS120614A300__ | 14                         | 10                         | 18.5±12%            | 32                  | 1                    | 15                   | 0.1                 | -                    | 40                  | 600       | K         | 20                     | 0.002                  |
| VCAS120614D300__ | 14                         | 10                         | 18.5±12%            | 32                  | 1                    | 15                   | 0.4                 | -                    | 150                 | 1050      | K         | 20                     | 0.008                  |
| VCAS060316B400__ | 16                         | 11                         | 25.5±10%            | 42                  | 1                    | 10                   | 0.2                 | 0.25                 | 30                  | 150       | K         | 27.5                   | 0.003                  |
| VCAS120616K380__ | 16                         | 11                         | 25.5±10%            | 38                  | 1                    | 10                   | 0.6                 | 1.5                  | 200                 | 930       | K         | 27.5                   | 0.010                  |
| VCAS121016J390__ | 16                         | 11                         | 25.5±10%            | 42                  | 5                    | 10                   | 1.6                 | 3                    | 500                 | 3100      | K         | 27.5                   | 0.030                  |
| VGAS121016S390   | 16                         | 14                         | 24.5±10%            | 40                  | 2.5                  | 15                   | 2                   | 5                    | 500                 | 3000      | K         | 27.5                   | 0.01                   |
| VGAS181216P390   | 16                         | 11                         | 24.5±10%            | 40                  | 5                    | 15                   | 2.9                 | 10                   | 1000                | 7000      | K         | 27.5                   | 0.07                   |
| VGAS222016Y390   | 16                         | 11                         | 24.5±10%            | 40                  | 10                   | 15                   | 10.2                | 35                   | 1500                | 20000     | K         | 27.5                   | 0.08                   |
| VGAS181216P400__ | 16                         | 11                         | 24.5±10%            | 42                  | 5                    | 10                   | 2.9                 | 10                   | 1000                | 5000      | K         | 27.5                   | 0.070                  |
| VGAS222016Y400   | 16                         | 11                         | 24.5±10%            | 42                  | 10                   | 10                   | 7.2                 | 25                   | 1500                | 13000     | K         | 25.5                   | 0.100                  |
| VCAS040218X400__ | 18                         | 13                         | 25.5±10%            | 42                  | 1                    | 10                   | 0.05                | 0.05                 | 20                  | 65        | M         | 27.5                   | 0.001                  |
| VCAS060318A400__ | 18                         | 13                         | 25.5±10%            | 42                  | 1                    | 10                   | 0.1                 | 0.25                 | 30                  | 150       | K         | 27.5                   | 0.003                  |
| VCAS080518A400__ | 18                         | 13                         | 25.5±10%            | 42                  | 1                    | 10                   | 0.1                 | 0.1                  | 30                  | 225       | K         | 27.5                   | 0.002                  |
| VCAS080518C400__ | 18                         | 13                         | 25.5±10%            | 42                  | 1                    | 10                   | 0.3                 | 1                    | 120                 | 550       | K         | 27.5                   | 0.007                  |
| VCAS120618A400__ | 18                         | 13                         | 25.5±10%            | 42                  | 1                    | 10                   | 0.1                 | 0.5                  | 30                  | 350       | K         | 27.5                   | 0.002                  |
| VCAS120618D400__ | 18                         | 13                         | 25.5±10%            | 42                  | 1                    | 10                   | 0.4                 | 1.5                  | 150                 | 900       | K         | 27.5                   | 0.008                  |
| VCAS120618E380__ | 18                         | 13                         | 25.5±10%            | 38                  | 1                    | 10                   | 0.5                 | 1.5                  | 200                 | 930       | K         | 27.5                   | 0.010                  |
| VCAS121018J390__ | 18                         | 13                         | 25.5±10%            | 42                  | 5                    | 10                   | 1.6                 | 3                    | 500                 | 3100      | K         | 27.5                   | 0.030                  |
| VGAS181218P440   | 18                         | 14                         | 27.5±10%            | 44                  | 5                    | 15                   | 2.9                 | 6                    | 800                 | 5000      | K         | 27.5                   | 0.05                   |
| VGAS222022Y490   | 22                         | 17                         | 30±10%              | 49                  | 10                   | 15                   | 6.8                 | 25                   | 1200                | 12000     | K         | 27.5                   | 0.03                   |
| VCAS060326A580__ | 26                         | 18                         | 34.5±10%            | 60                  | 1                    | 10                   | 0.1                 | 0.1                  | 30                  | 155       | K         | 27.5                   | 0.002                  |
| VCAS080526A580__ | 26                         | 18                         | 34.5±10%            | 60                  | 1                    | 10                   | 0.1                 | 0.15                 | 30                  | 120       | K         | 27.5                   | 0.002                  |
| VCAS080526C580__ | 26                         | 18                         | 34.5±10%            | 60                  | 1                    | 10                   | 0.3                 | 0.5                  | 100                 | 250       | K         | 27.5                   | 0.006                  |
| VCAS120626D580__ | 26                         | 18                         | 34.5±10%            | 60                  | 1                    | 10                   | 0.4                 | 1                    | 120                 | 500       | K         | 27.5                   | 0.008                  |
| VCAS120626F540__ | 26                         | 18                         | 33.0±10%            | 54                  | 1                    | 15                   | 0.7                 | 1.5                  | 200                 | 600       | K         | 27.5                   | 0.008                  |
| VCAS121026H560__ | 26                         | 18                         | 34.5±10%            | 60                  | 5                    | 10                   | 1.2                 | 3                    | 300                 | 2150      | K         | 27.5                   | 0.018                  |
| VGAS181226P570   | 26                         | 23                         | 35.0±10%            | 57                  | 5                    | 15                   | 2.5                 | 8                    | 600                 | 3000      | K         | 30                     | 0.015                  |
| VGAS222026Y570   | 26                         | 23                         | 35±10%              | 57                  | 10                   | 15                   | 6.8                 | 25                   | 1100                | 7000      | K         | 30                     | 0.030                  |
| VGAS322026Z570   | 26                         | 23                         | 35±10%              | 57                  | 10                   | 15                   | 13                  | 50                   | 1800                | 15000     | K         | 30                     | 0.04                   |
| VCAS060330A650__ | 30                         | 21                         | 41.0±10%            | 67                  | 1                    | 10                   | 0.1                 | 0.15                 | 30                  | 125       | K         | 29                     | 0.002                  |
| VCAS080530A650__ | 30                         | 21                         | 41.0±10%            | 67                  | 1                    | 10                   | 0.1                 | 0.15                 | 30                  | 90        | M         | 29                     | 0.002                  |
| VCAS080530C650__ | 30                         | 21                         | 41.0±10%            | 67                  | 1                    | 10                   | 0.3                 | 0.5                  | 80                  | 250       | K         | 29                     | 0.005                  |
| VCAS120630D650__ | 30                         | 21                         | 41.0±10%            | 67                  | 1                    | 10                   | 0.4                 | 1                    | 120                 | 400       | K         | 29                     | 0.008                  |
| VCAS121030H620__ | 30                         | 21                         | 41.0±10%            | 67                  | 5                    | 10                   | 1.2                 | 3                    | 280                 | 1850      | K         | 30                     | 0.018                  |
| VCAS121030S620__ | 30                         | 21                         | 41.0±10%            | 67                  | 5                    | 10                   | 1.9                 | 3                    | 300                 | 1500      | K         | 29                     | 0.038                  |
| VCAS080531C650__ | 31                         | 25                         | 39.0±10%            | 65                  | 1                    | 10                   | 0.3                 | 0.5                  | 80                  | 250       | K         | 29                     | 0.005                  |
| VCAS120631M650__ | 31                         | 25                         | 39.0±10%            | 65                  | 1                    | 15                   | 1                   | 1.5                  | 200                 | 500       | K         | 29                     | 0.008                  |
| VGAS121031R650   | 31                         | 25                         | 39±10%              | 65                  | 2.5                  | 15                   | 1.7                 | 4.5                  | 300                 | 1200      | K         | 30                     | 0.05                   |
| VGAS181231P650   | 31                         | 25                         | 39.0±10%            | 65                  | 5                    | 15                   | 3.7                 | 8                    | 800                 | 2600      | K         | 30                     | 0.06                   |
| VGAS222031Y650   | 31                         | 25                         | 39±10%              | 65                  | 10                   | 15                   | 9.6                 | 23                   | 1200                | 6100      | K         | 30                     | 0.03                   |
| VCAS120634N770__ | 34                         | 30                         | 47.0±10%            | 77                  | 1                    | 15                   | 1.1                 | 1.5                  | 200                 | 400       | K         | 48                     | 0.008                  |
| VGAS121034S770__ | 34                         | 30                         | 47.0±10%            | 77                  | 2.5                  | 15                   | 2                   | 3.0                  | 400                 | 1000      | K         | 48                     | 0.040                  |
| VGAS181234U770__ | 34                         | 30                         | 47.0±10%            | 77                  | 5                    | 15                   | 5                   | 6.1                  | 800                 | 1500      | K         | 48                     | 0.080                  |

# TransGuard® Automotive Series

## Multilayer Varistors for Automotive Applications



### ELECTRICAL CHARACTERISTICS

| Part Number       | V <sub>w</sub> (DC) | V <sub>w</sub> (AC) | V <sub>B</sub> | V <sub>C</sub> | I <sub>VC</sub> | I <sub>L</sub> | E <sub>T</sub> | E <sub>LD</sub> | I <sub>P</sub> | Cap   | Freq | V <sub>Jump</sub> | P <sub>Diss. Max</sub> |
|-------------------|---------------------|---------------------|----------------|----------------|-----------------|----------------|----------------|-----------------|----------------|-------|------|-------------------|------------------------|
|                   | Vdc                 | Vac                 | V              | V              | A               | μA             | J              | J               | A              | pF    | V    | W                 |                        |
| VGAS222034Y770    | 34                  | 30                  | 47.0±10%       | 77             | 10              | 15             | 12             | 25              | 2000           | 6300  | K    | 48                | 0.240                  |
| VGAS322034Z770    | 34                  | 30                  | 47±10%         | 77             | 10              | 15             | 13             | 50              | 2000           | 18000 | K    | 48                | 0.26                   |
| VCAS080538C770 __ | 38                  | 30                  | 47.0±10%       | 77             | 1               | 10             | 0.3            | -               | 80             | 200   | K    | 48                | 0.006                  |
| VCAS120642L800 __ | 42                  | 32                  | 51.0±10%       | 80             | 1               | 15             | 0.8            | -               | 180            | 600   | K    | 48                | 0.016                  |
| VCAS120642K900    | 42                  | 32                  | 56±10%         | 90             | 1               | 15             | 0.6            | -               | 200            | 260   | K    | 48                | 0.012                  |
| VGAS181242U900    | 42                  | 35                  | 56.0±10%       | 90             | 5               | 15             | 4.0            | 6               | 500            | 1200  | K    | 48                | 0.015                  |
| VGAS222042Y900    | 42                  | 37                  | 56±10%         | 90             | 10              | 15             | 12             | 24              | 1000           | 5000  | K    | 48                | 0.06                   |
| VCAS120645K900    | 45                  | 35                  | 56±10%         | 90             | 1               | 25             | 0.6            | -               | 200            | 260   | K    | 48                | 0.012N                 |
| VCAS120648D101 __ | 48                  | 34                  | 62.0±10%       | 100            | 1               | 10             | 0.4            | -               | 100            | 225   | K    | 48                | 0.008                  |
| VCAS121048H101 __ | 48                  | 34                  | 62.0±10%       | 100            | 1               | 10             | 1.2            | -               | 250            | 500   | K    | 48                | 0.022                  |
| VCAS120656F111 __ | 56                  | 40                  | 68.0±10%       | 110            | 1               | 15             | 0.7            | -               | 100            | 180   | K    | 48                | 0.014                  |
| VGAS181256U111    | 56                  | 40                  | 68±10%         | 110            | 5               | 15             | 4.8            | -               | 500            | 1100  | K    | 48                | 0.04                   |
| VCAS120660M131 __ | 60                  | 50                  | 82.0±10%       | 135            | 1               | 15             | 1              | -               | 150            | 250   | K    | 48                | 0.008                  |
| VCAS121060J121    | 60                  | 42                  | 76±10%         | 120            | 5               | 10             | 1.5            | -               | 250            | 400   | K    | 48                | 0.03                   |
| VGAS121065P131    | 65                  | 50                  | 82±10%         | 135            | 2.5             | 15             | 2.7            | -               | 350            | 600   | K    | 48                | 0.05                   |
| VGAS181265U131    | 65                  | 50                  | 82±10%         | 135            | 5               | 15             | 4.5            | -               | 400            | 800   | K    | 48                | 0.03                   |
| VGAS222065Y131    | 65                  | 50                  | 82±10%         | 135            | 10              | 15             | 6.5            | -               | 1100           | 3000  | K    | 48                | 0.06                   |
| VCAS121085S151 __ | 85                  | 60                  | 100.0±10%      | 150            | 1               | 35             | 2              | -               | 250            | 275   | K    | 48                | 0.040                  |
| VGAS181285U161    | 85                  | 60                  | 100±10%        | 165            | 5               | 15             | 4.5            | -               | 400            | 500   | K    | 48                | 0.04                   |

|                     |                                                           |                   |                                                                                |
|---------------------|-----------------------------------------------------------|-------------------|--------------------------------------------------------------------------------|
| V <sub>w</sub> (DC) | DC Working Voltage (V)                                    | E <sub>t</sub>    | Transient Energy Rating (J, 10x1000μs)                                         |
| V <sub>w</sub> (AC) | AC Working Voltage (V)                                    | I <sub>p</sub>    | Peak Current Rating (A, 8x20μs)                                                |
| V <sub>B</sub>      | Typical Breakdown Voltage (V @ 1mA <sub>DC</sub> )        | Cap               | Typical Capacitance (pF) @ frequency specified and 0.5 V <sub>RMS</sub> , 25°C |
| V <sub>C</sub>      | Clamping Voltage [V @ I <sub>VC</sub> ]                   | V <sub>Jump</sub> | Jump Start (V)                                                                 |
| I <sub>VC</sub>     | Test Current for V <sub>C</sub>                           | P                 | Power Dissipation (W)                                                          |
| I <sub>L</sub>      | Maximum Leakage Current at the working voltage, 25°C (μA) |                   |                                                                                |

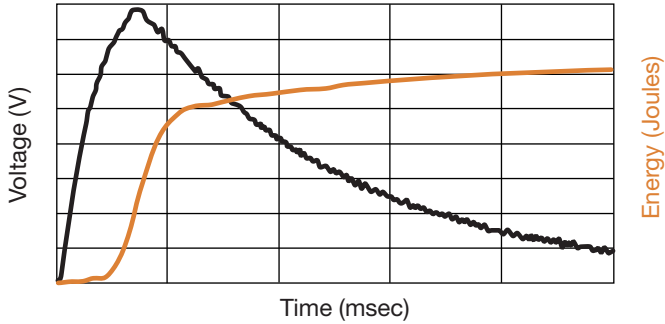
# TransGuard® Automotive Series

## Multilayer Varistors for Automotive Applications



### AUTOMOTIVE SERIES – LOAD DUMP TEST ACCORDING TO ISO DP7637 REV 2 PULSE 5

#### Automotive Load Dump Pulse (According to ISO 7637 Pulse 5)



When using the test method indicated below, the amount of Energy dissipated by the varistor must not exceed the Load Dump Energy value specified in the product table.

### LOAD DUMP LIBRARY

#### TYPICAL MAX VZ VERSUS PULSE DURATION AND RI

##### 12V SYSTEMS

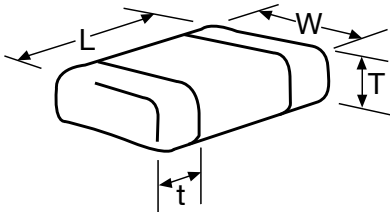
| VCAS060316B400 | 0.5Ω | 1Ω | 4Ω |
|----------------|------|----|----|
| 100ms          | 37   | 38 | 42 |
| 200ms          | 36   | 37 | 41 |
| 400ms          | 35   | 36 | 39 |
| VCAS120616K380 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 42   | 45 | 55 |
| 200ms          | 40   | 43 | 50 |
| 400ms          | 39   | 40 | 45 |
| VCAS121016J390 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 48   | 53 | 74 |
| 200ms          | 46   | 50 | 64 |
| 400ms          | 43   | 46 | 56 |
| VGAS181216P400 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 46   | 52 | 72 |
| 200ms          | 37   | 41 | 59 |
| 400ms          | 32   | 35 | 51 |
| VGAS222016Y400 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 53   | 60 | 77 |
| 200ms          | 50   | 55 | 73 |
| 400ms          | 47   | 50 | 66 |
| VCAS040218X400 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 38   | 39 | 40 |
| 200ms          | 37   | 37 | 38 |
| 400ms          | 34   | 35 | 36 |
| VCAS060318A400 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 37   | 38 | 42 |
| 200ms          | 36   | 37 | 41 |
| 400ms          | 35   | 36 | 39 |
| VCAS080518A400 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 37   | 39 | 40 |
| 200ms          | 35   | 38 | 39 |
| 400ms          | 33   | 37 | 38 |
| VCAS080518C400 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 40   | 41 | 48 |
| 200ms          | 39   | 40 | 45 |
| 400ms          | 38   | 39 | 42 |
| VCAS120618A400 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 43   | 45 | 55 |
| 200ms          | 41   | 43 | 48 |
| 400ms          | 40   | 41 | 45 |
| VCAS120618D400 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 42   | 45 | 55 |
| 200ms          | 40   | 42 | 50 |
| 400ms          | 39   | 40 | 45 |
| VCAS120618E380 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 42   | 45 | 55 |
| 200ms          | 40   | 43 | 50 |
| 400ms          | 39   | 40 | 45 |
| VCAS121018J390 | 0.5Ω | 1Ω | 4Ω |
| 100ms          | 48   | 53 | 74 |
| 200ms          | 46   | 50 | 64 |
| 400ms          | 43   | 46 | 56 |

##### 24V SYSTEMS

| VCAS060326A580 | 1Ω  | 4Ω  | 8Ω  |
|----------------|-----|-----|-----|
| 100ms          | 51  | 56  | 58  |
| 200ms          | 50  | 54  | 56  |
| 400ms          | 49  | 51  | 53  |
| VCAS080526A580 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 51  | 53  | 59  |
| 200ms          | 49  | 51  | 57  |
| 400ms          | 48  | 50  | 51  |
| VCAS080526C580 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 51  | 54  | 62  |
| 200ms          | 49  | 51  | 56  |
| 400ms          | 48  | 49  | 51  |
| VCAS120626D580 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 52  | 60  | 68  |
| 200ms          | 50  | 57  | 65  |
| 400ms          | 47  | 54  | 61  |
| VCAS121026H560 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 61  | 74  | 91  |
| 200ms          | 59  | 69  | 82  |
| 400ms          | 55  | 64  | 70  |
| VCAS060330A650 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 57  | 59  | 63  |
| 200ms          | 56  | 58  | 61  |
| 400ms          | 54  | 57  | 58  |
| VCAS080530A650 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 58  | 62  | 66  |
| 200ms          | 56  | 61  | 64  |
| 400ms          | 53  | 57  | 61  |
| VCAS080530C650 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 58  | 61  | 63  |
| 200ms          | 57  | 58  | 62  |
| 400ms          | 55  | 56  | 59  |
| VCAS120630D650 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 61  | 70  | 75  |
| 200ms          | 57  | 66  | 69  |
| 400ms          | 56  | 62  | 64  |
| VCAS121030H620 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 70  | 77  | 98  |
| 200ms          | 64  | 70  | 89  |
| 400ms          | 56  | 65  | 70  |
| VGAS181234U770 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 87  | 110 | 125 |
| 200ms          | 82  | 97  | 114 |
| 400ms          | 75  | 85  | 95  |
| VGAS222034Y770 | 1Ω  | 4Ω  | 8Ω  |
| 100ms          | 100 | 125 | 165 |
| 200ms          | 91  | 115 | 155 |
| 400ms          | 84  | 104 | 120 |

TransGuard® Automotive Series

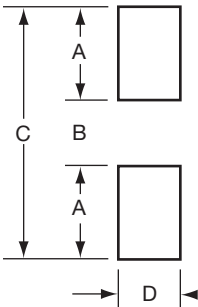
Multilayer Varistors for Automotive Applications



DIMENSIONS: MM (INCHES)

| Style             |             | 0402                       | 0603                       | 0805                       | 1206                                                                     | 1210                       | 1812                       | 2220                       | 3220                       |
|-------------------|-------------|----------------------------|----------------------------|----------------------------|--------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| (L) Length        | mm<br>(in.) | 1.00±0.10<br>(0.040±0.004) | 1.60±0.15<br>(0.063±0.006) | 2.01±0.20<br>(0.079±0.008) | 3.20±0.20<br>(0.126±0.008)                                               | 3.20±0.20<br>(0.126±0.008) | 4.50±0.30<br>(0.177±0.012) | 5.70±0.40<br>(0.224±0.016) | 8.20±0.40<br>(0.323±0.016) |
| (W) Width         | mm<br>(in.) | 0.50±0.10<br>(0.020±0.004) | 0.80±0.15<br>(0.031±0.006) | 1.25±0.20<br>(0.049±0.008) | 1.60±0.20<br>(0.063±0.008)                                               | 2.49±0.20<br>(0.098±0.008) | 3.20±0.30<br>(0.126±0.012) | 5.00±0.40<br>(0.197±0.016) | 5.00±0.40<br>(0.197±0.016) |
| (T) Max Thickness | mm<br>(in.) | 0.6<br>(0.024)             | 0.9<br>(0.035)             | 1.02<br>(0.040)            | 1.02 (0.040)<br>1.27 (0.050) <sup>1)</sup><br>1.70 (0.067) <sup>2)</sup> | 1.70<br>(0.067)            | 2.00<br>(0.080)            | 2.50<br>(0.098)            | 2.50 max. (0.098 max.)     |
| (t) Land Length   | mm<br>(in.) | 0.25±0.15<br>(0.010±0.006) | 0.35±0.15<br>(0.014±0.006) | 0.71 max. (0.028 max.)     | 0.94 max. (0.037 max.)                                                   | 1.14 max. (0.045 max.)     | 1.00 max. (0.039 max.)     | 1.00 max. (0.039 max.)     | 1.30 max. (0.051 max.)     |

1) Applicable for: VCAS120618E380  
2) Applicable for: VCAS120626F540, VCAS120631M650, VCAS120638N770, VCAS120642L800, VCAS120645K900, VCAS120656F111, VCAS120660M131

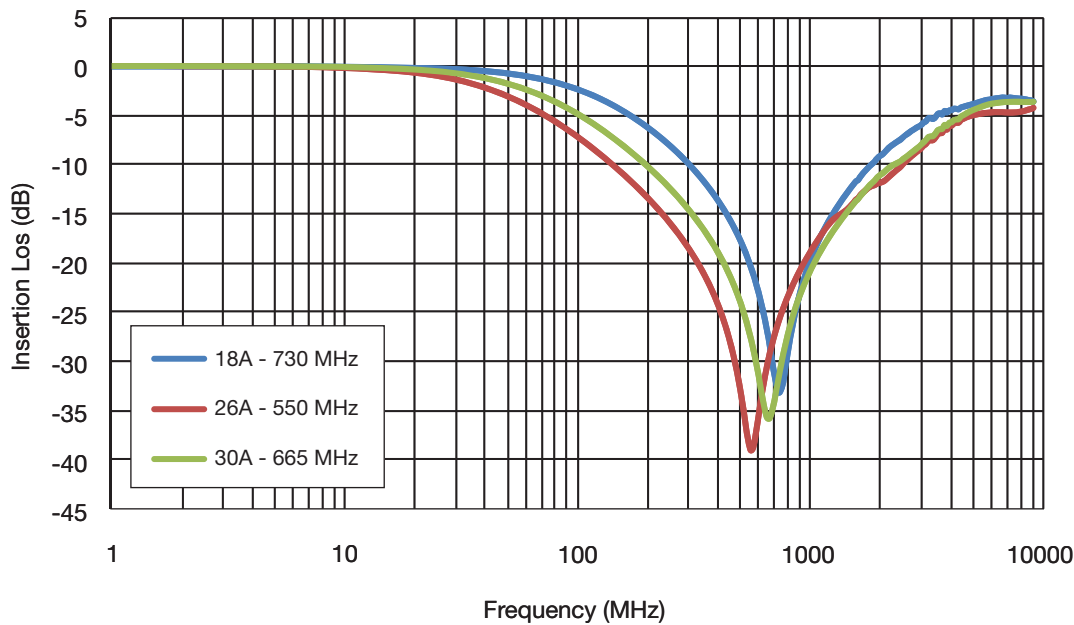


SOLDERING PAD: MM (INCHES)

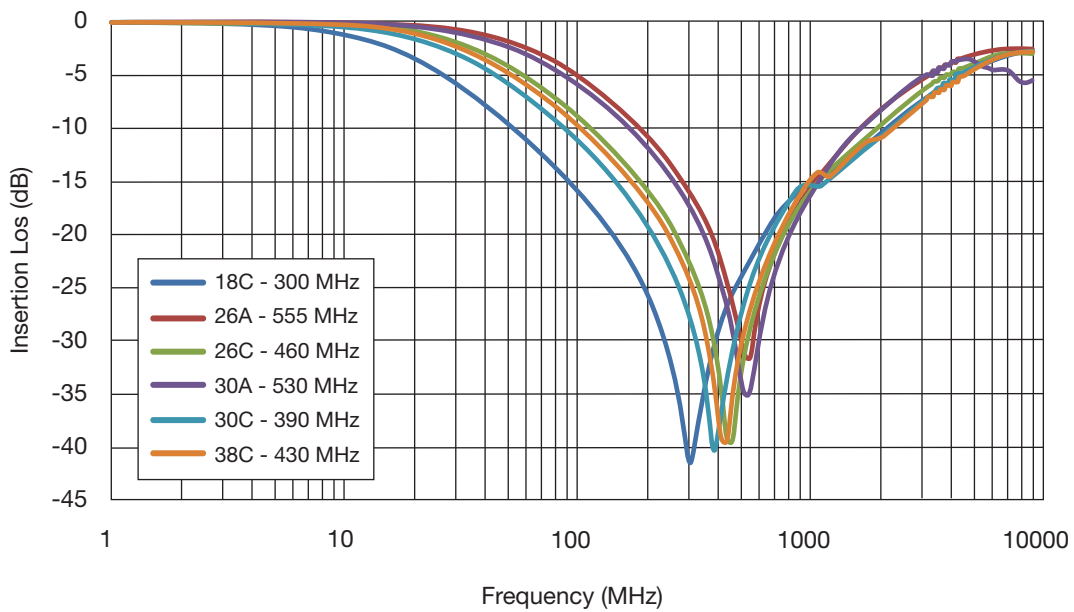
| Pad Layout | 0402         | 0603         | 0805         | 1206         | 1210         | 1812         | 2220         | 3220          |
|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| A          | 1.61 (0.024) | 0.89 (0.035) | 1.02 (0.040) | 1.02 (0.040) | 1.02 (0.040) | 1.00 (0.039) | 1.00 (0.039) | 2.21 (0.087)  |
| B          | 1.51 (0.020) | 0.76 (0.030) | 1.02 (0.040) | 2.03 (0.080) | 2.03 (0.080) | 3.60 (0.142) | 4.60 (0.18)  | 5.79 (0.228)  |
| C          | 1.70 (0.067) | 2.54 (0.100) | 3.05 (0.120) | 4.06 (0.160) | 4.06 (0.160) | 5.60 (0.220) | 6.60 (0.26)  | 10.21 (0.402) |
| D          | 1.51 (0.020) | 0.76 (0.030) | 1.27 (0.050) | 1.65 (0.065) | 2.54 (0.100) | 3.00 (0.118) | 5.00 (0.20)  | 5.50 (0.217)  |

FORWARD TRANSMISSION CHARACTERISTICS (S21)

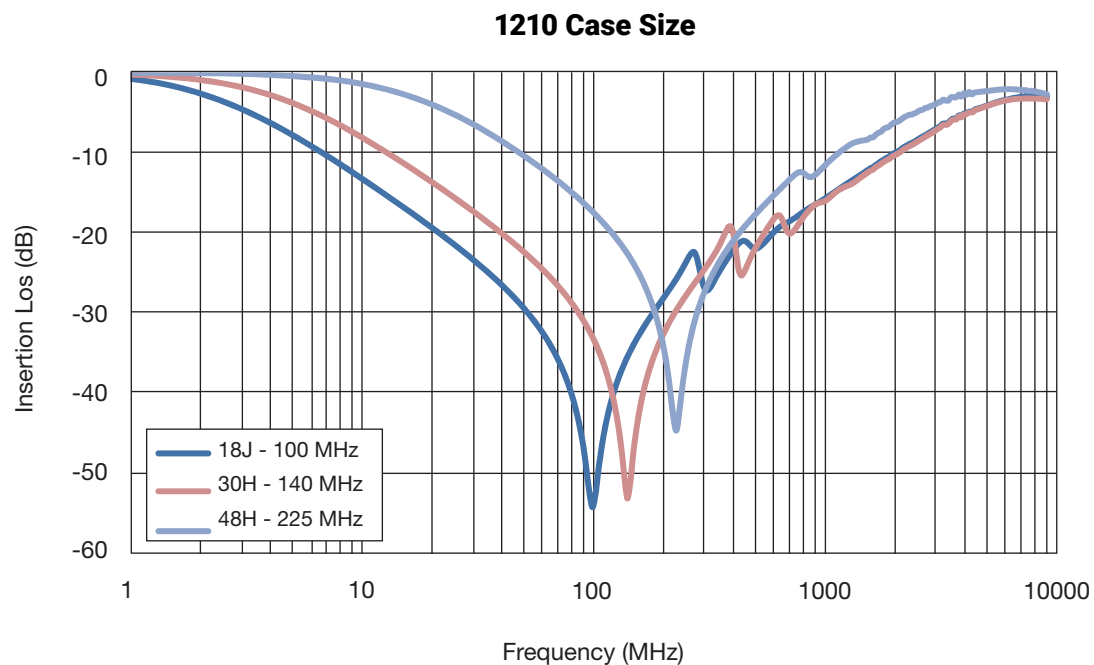
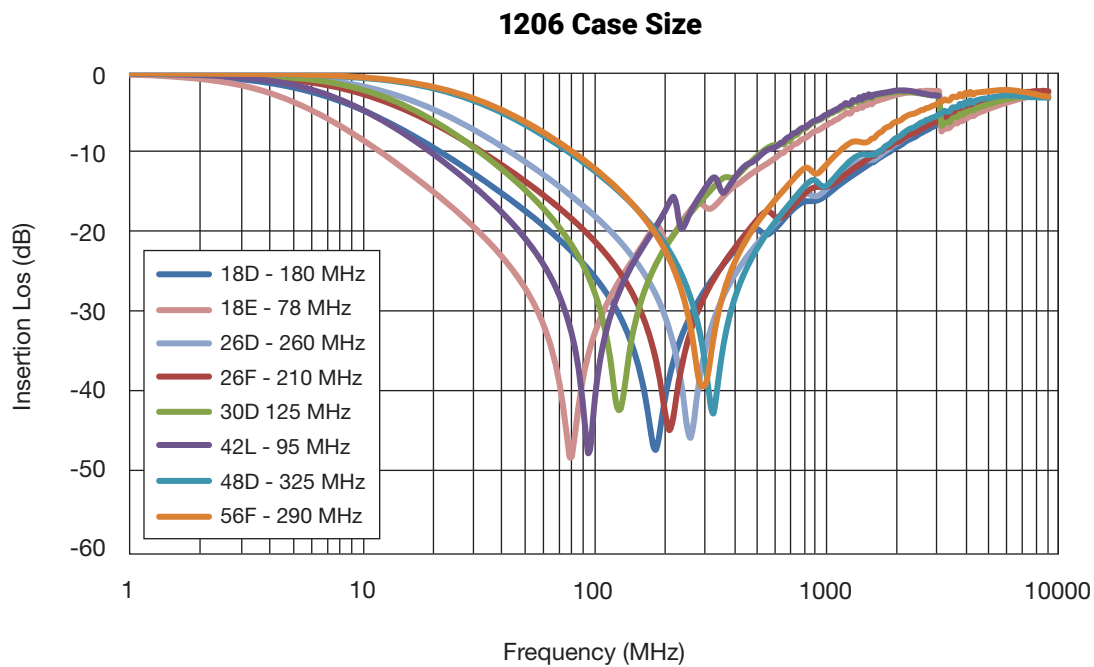
0603 Case Size



0805 Case Size



FORWARD TRANSMISSION CHARACTERISTICS (S21)

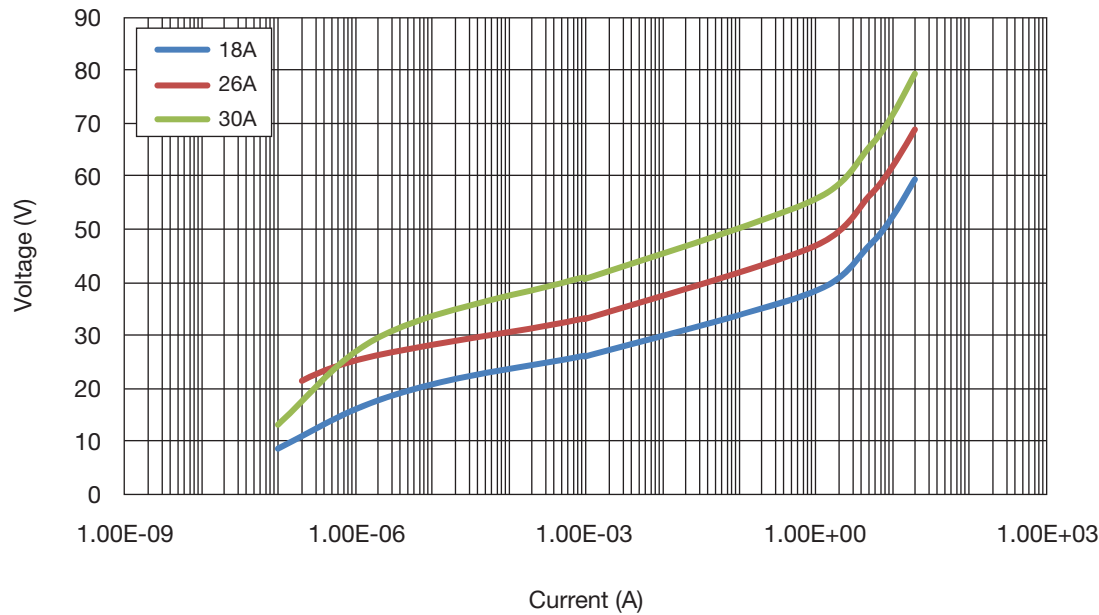


TransGuard® Automotive Series  
Multilayer Varistors for Automotive Applications

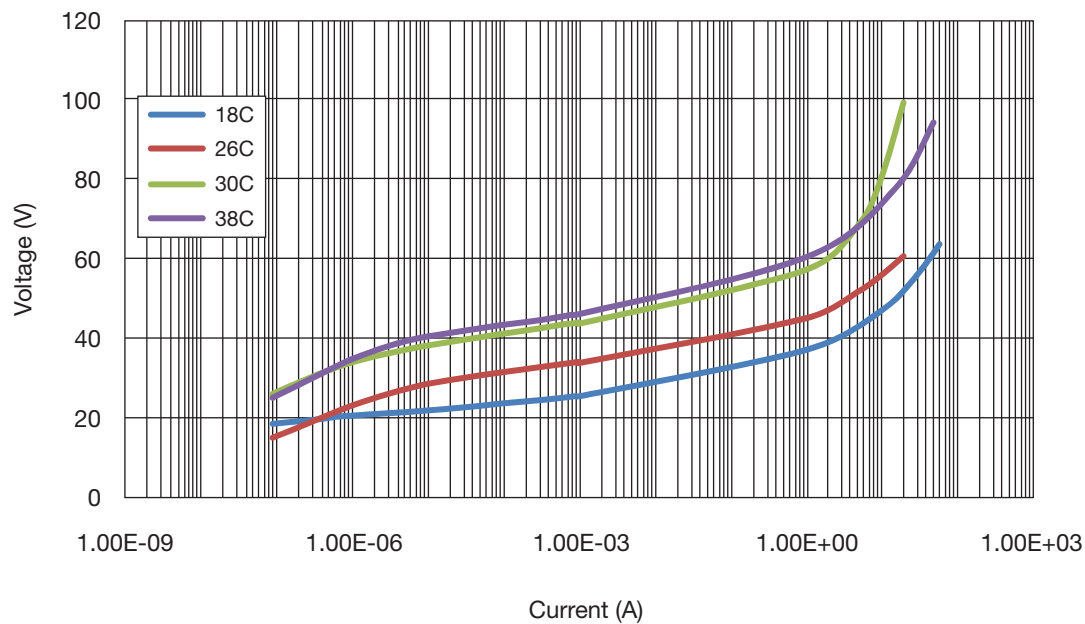


V-I CHARACTERISTICS

0603 Case Size

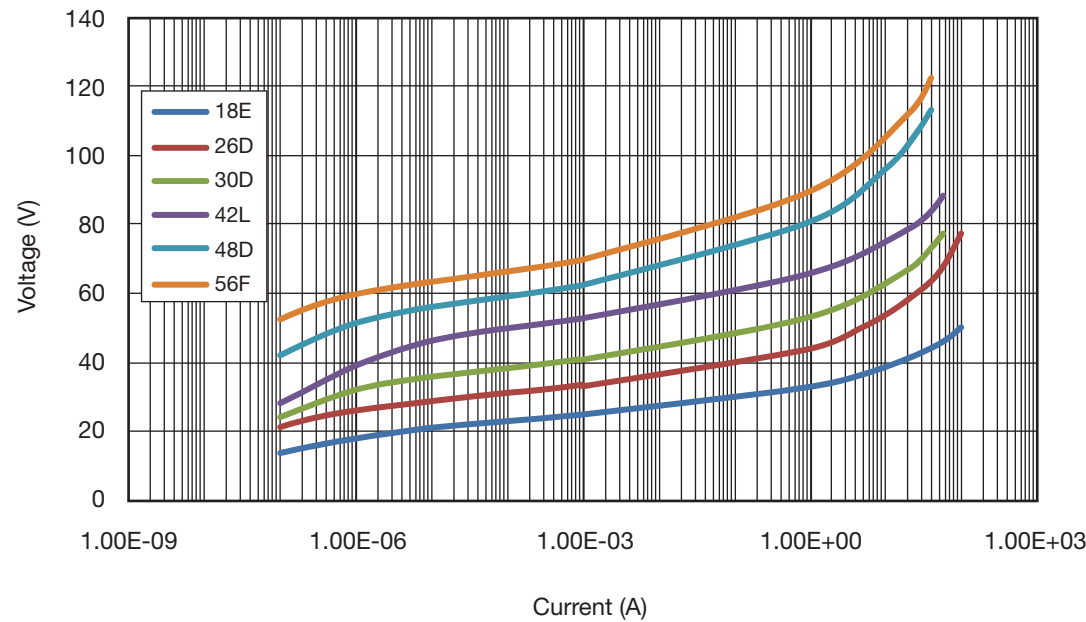


0805 Case Size

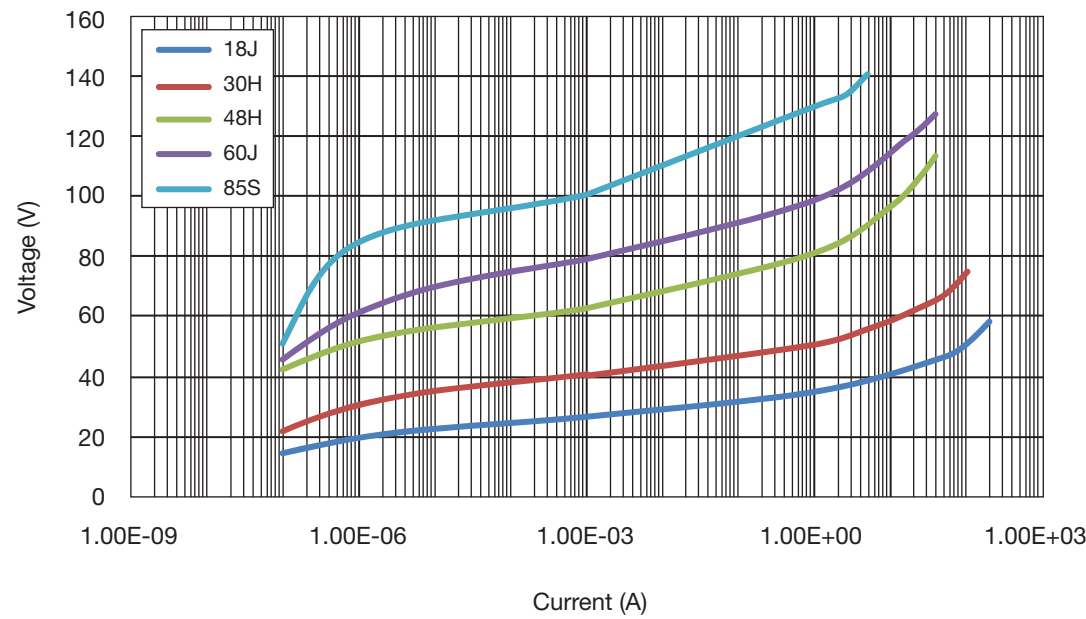


FORWARD TRANSMISSION CHARACTERISTICS (S21)

1206 Case Size



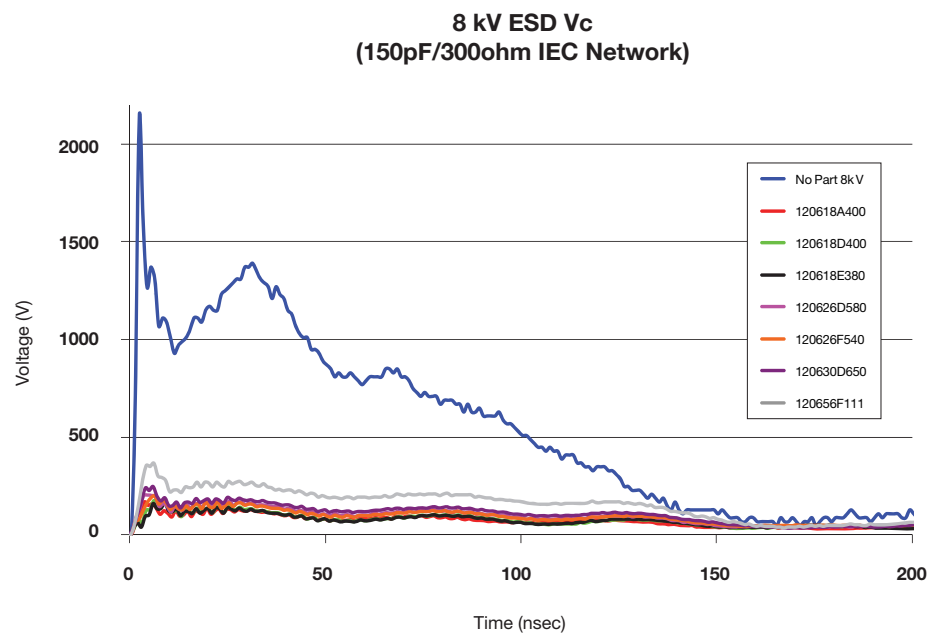
1210 Case Size



TransGuard® Automotive Series
Multilayer Varistors for Automotive Applications

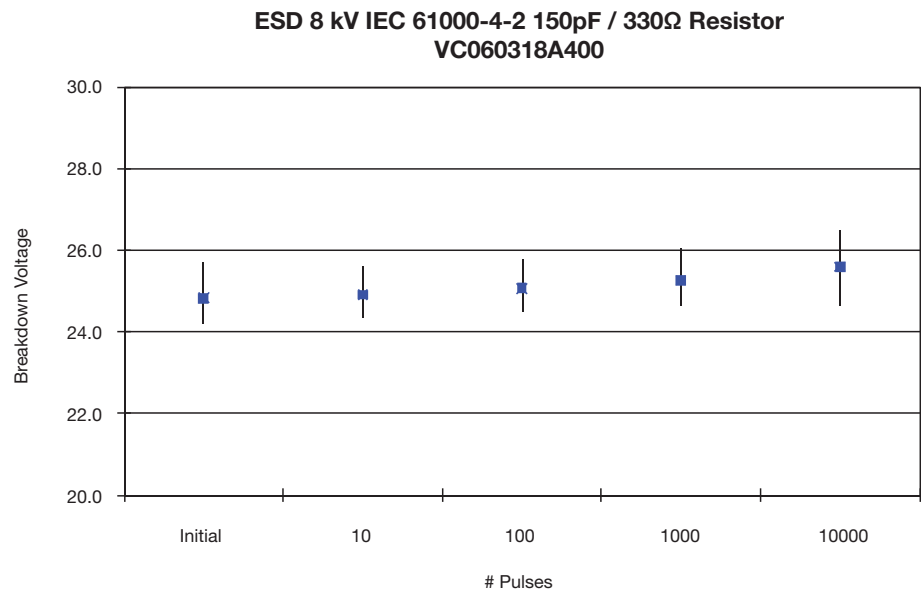


ESD V-I CHARACTERISTICS



TYPICAL VOLTAGE AT 8 KV PULSE

| 8kV Pulse                   | Peak Voltage (V) | 30ns Voltage (V) | 100ns Voltage (V) |
|-----------------------------|------------------|------------------|-------------------|
| No Part<br>(No Suppression) | 2130             | 1370             | 517               |
| 120618A400                  | 171              | 123              | 65                |
| 120618D400                  | 177              | 133              | 66                |
| 120618E380                  | 161              | 121              | 63                |
| 120626D580                  | 203              | 155              | 88                |
| 102626F540                  | 201              | 159              | 84                |
| 120630D650                  | 249              | 177              | 106               |
| 120656F111                  | 366              | 262              | 169               |



# Mouser Electronics

Authorized Distributor

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## Kyocera AVX:

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|-----------------------------------------|-------------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
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| <a href="#"><u>VCAS060316B400DP</u></a> | <a href="#"><u>VCAS060316B400RP</u></a>   | <a href="#"><u>VCAS060318A400RP</u></a> | <a href="#"><u>VCAS060326A580DP</u></a> | <a href="#"><u>VCAS060326A580RP</u></a> |
| <a href="#"><u>VCAS060330A650DP</u></a> | <a href="#"><u>VCAS060330A650RP</u></a>   | <a href="#"><u>VCAS080518A400DP</u></a> | <a href="#"><u>VCAS080518A400RP</u></a> | <a href="#"><u>VCAS080518C400RP</u></a> |
| <a href="#"><u>VCAS080526A580DP</u></a> | <a href="#"><u>VCAS080526A580RP</u></a>   | <a href="#"><u>VCAS080526C580DP</u></a> | <a href="#"><u>VCAS080526C580RP</u></a> | <a href="#"><u>VCAS080530A650DP</u></a> |
| <a href="#"><u>VCAS080530A650RP</u></a> | <a href="#"><u>VCAS080530C650DP</u></a>   | <a href="#"><u>VCAS080530C650RP</u></a> | <a href="#"><u>VCAS080538C770DP</u></a> | <a href="#"><u>VCAS080538C770RP</u></a> |
| <a href="#"><u>VCAS120616K380DP</u></a> | <a href="#"><u>VCAS120616K380RP</u></a>   | <a href="#"><u>VCAS120618A400DP</u></a> | <a href="#"><u>VCAS120618A400RP</u></a> | <a href="#"><u>VCAS120618D400RP</u></a> |
| <a href="#"><u>VCAS120618E380DP</u></a> | <a href="#"><u>VCAS120618E380RP</u></a>   | <a href="#"><u>VCAS120626D580DP</u></a> | <a href="#"><u>VCAS120626D580RP</u></a> | <a href="#"><u>VCAS120630D650DP</u></a> |
| <a href="#"><u>VCAS120630D650RP</u></a> | <a href="#"><u>VCAS120642L800DP</u></a>   | <a href="#"><u>VCAS120642L800RP</u></a> | <a href="#"><u>VCAS120648D101DP</u></a> | <a href="#"><u>VCAS120648D101RP</u></a> |
| <a href="#"><u>VCAS120656F111DP</u></a> | <a href="#"><u>VCAS120656F111RP</u></a>   | <a href="#"><u>VCAS121016J390DP</u></a> | <a href="#"><u>VCAS121016J390RP</u></a> | <a href="#"><u>VCAS121018J390RP</u></a> |
| <a href="#"><u>VCAS121026H560DP</u></a> | <a href="#"><u>VCAS121026H560RP</u></a>   | <a href="#"><u>VCAS121030H620DP</u></a> | <a href="#"><u>VCAS121030H620RP</u></a> | <a href="#"><u>VCAS121048H101DP</u></a> |
| <a href="#"><u>VCAS121048H101RP</u></a> | <a href="#"><u>VCAS121085S151DP</u></a>   | <a href="#"><u>VCAS121085S151RP</u></a> | <a href="#"><u>VCAS06LC18X500TP</u></a> | <a href="#"><u>VCAS121030S620DP</u></a> |
| <a href="#"><u>VCAS040214X300WP</u></a> | <a href="#"><u>VCAS080514C300DP</u></a>   | <a href="#"><u>VCAS080514A300DP</u></a> | <a href="#"><u>VCAS120645K900DP</u></a> | <a href="#"><u>VCAS040205X150WP</u></a> |
| <a href="#"><u>VCAS121060J121DP</u></a> | <a href="#"><u>VCAS040209X200WP</u></a>   | <a href="#"><u>VCAS120631M650DP</u></a> | <a href="#"><u>VCAS060305A150DP</u></a> | <a href="#"><u>VCAS120605D150DP</u></a> |
| <a href="#"><u>VCAS080509A200DP</u></a> | <a href="#"><u>VCAS080505A150DP</u></a>   | <a href="#"><u>VCAS080512A250DP</u></a> | <a href="#"><u>VCAS120605A150DP</u></a> | <a href="#"><u>VCAS120642K900DP</u></a> |
| <a href="#"><u>VCAS120660M131DP</u></a> | <a href="#"><u>VCAS060309A200DP</u></a>   | <a href="#"><u>VCAS080531C650DP</u></a> | <a href="#"><u>VCAS120614A300DP</u></a> | <a href="#"><u>VCAS060314A300DP</u></a> |
| <a href="#"><u>VCAS120614D300DP</u></a> | <a href="#"><u>VCAS080505C150DP</u></a>   | <a href="#"><u>VCAS120626F540DP</u></a> | <a href="#"><u>VCAS120634N770DP</u></a> | <a href="#"><u>VGAS121065P131DP</u></a> |
| <a href="#"><u>VGAS222034Y770DP</u></a> | <a href="#"><u>VGAS121034S770DP</u></a>   | <a href="#"><u>VGAS181216P400DP</u></a> | <a href="#"><u>VGAS222016Y400DP</u></a> | <a href="#"><u>VGAS181234U770DP</u></a> |
| <a href="#"><u>VCAS060326A580TP</u></a> | <a href="#"><u>VCAS06AG183R0YAT3A</u></a> | <a href="#"><u>VCAS120618D400TP</u></a> | <a href="#"><u>VCAS080518A400TP</u></a> | <a href="#"><u>VCAS060318A400TP</u></a> |
| <a href="#"><u>VCAS080518C400TP</u></a> | <a href="#"><u>VCAS060305A150RP</u></a>   | <a href="#"><u>VGAS222031Y650DP</u></a> | <a href="#"><u>VGAS121031R650DP</u></a> | <a href="#"><u>VCAS120645K900RP</u></a> |
| <a href="#"><u>VCAS080514C300RX</u></a> | <a href="#"><u>VCAS120605D150RP</u></a>   | <a href="#"><u>VCAS080514A300RP</u></a> | <a href="#"><u>VCAS080509A200TP</u></a> | <a href="#"><u>VCAS121060J121RP</u></a> |