

Glass Encapsulated TransGuard® Automotive Series

Multilayer Varistors for Automotive Applications



GENERAL DESCRIPTION

The Glass Encapsulated 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.

These large case size parts extend TransGuard range into high energy applications. In addition the glass encapsulation provides enhanced resistance against harsh environment or process such as acidic environment, salts or chlorite flux.

GENERAL CHARACTERISTICS

- Operating Temperature: -55°C to 125°C
- Case Size: 1206-2200
- Working Voltage: 16-65Vdc
- Energy: 07-12J
- Peak Current: 200-2000A

FEATURES

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

APPLICATIONS

- Various Automotive Applications
- Internal Combustion Engine (ICE) Vehicles
- Hybrid Electric Vehicles (HEV)
- Plug-in Hybrid Electric Vehicles (PHEV)
- Commercial Vehicles
- Sensors
 - DC Motor
- LIN BUS
 - Relays
- ECU
 - and more
- Applications where Glass Encapsulation is needed for Harsh Environment/Acid-Resistance

HOW TO ORDER

| V | G | AG | 1812 | 16 | P | 400 | R | P |
|----------|-------------------------|-------------------|-----------|-----------------|---------------|------------------|--------------|------------------|
| Varistor | Glass Encapsulated Chip | Automotive Series | Chip Size | Working Voltage | Energy Rating | Clamping Voltage | Package | Termination |
| | | | 1206 | 16 = 16Vdc | D = 0.4J | 390 = 40V | D = 7" reel | P = Ni/Sn plated |
| | | | 1210 | 18 = 18Vdc | F = 0.7J | 400 = 42V | R = 7" reel | |
| | | | 1812 | 22 = 22Vdc | H = 1.2J | 440 = 44V | T = 13" reel | |
| | | | 2220 | 26 = 26Vdc | J = 1.6J | 490 = 49V | | |
| | | | 3220 | 30 = 30Vdc | K = 0.6J | 540 = 54V | | |
| | | | | 31 = 31Vdc | N = 1.1J | 560 = 60V | | |
| | | | | 34 = 34Vdc | S = 2.0J | 650 = 65V | | |
| | | | | 42 = 42Vdc | P = 2.5-3.7J | 770 = 77V | | |
| | | | | 48 = 48Vdc | U = 4.0-5.0J | 900 = 90V | | |
| | | | | 60 = 60Vdc | Y = 6.5-12J | 101 = 100V | | |
| | | | | 65 = 65Vdc | | 121 = 120V | | |
| | | | | | | 131 = 135V | | |

PHYSICAL DIMENSIONS:

mm (inches)

| Size (EIA) | Length (L) | Width (W) | Max Thickness (T) | Land Length (t) |
|------------|----------------------------|----------------------------|---------------------------|---------------------------|
| 1206 | 3.20±0.20 (0.126±0.008) | 1.60±0.20 (0.063±0.008) | 1.70 (0.067) | 0.94 max. (0.037 max.) |
| 1210 | 3.20±0.20 (0.126±0.008) | 2.49±0.20 (0.098±0.008) | 1.70 (0.067) | 0.14 max. (0.045 max.) |
| 1812 | 4.50±0.30 (0.177±0.012) | 3.20±0.30 (0.126±0.012) | 2.00 (0.079) | 1.00 max. (0.040 max.) |
| 2220 | 5.70±0.40 (0.224±0.016) | 5.00±0.40 (0.197±0.016) | 2.50 (0.098) | 1.00 max. (0.040 max.) |
| 3220 | 8.20±0.40 (0.323±0.016) | 5.00±0.40 (0.197±0.016) | 2.50 max. (0.098 max.) | 1.30 max. (0.051 max.) |

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ELECTRICAL CHARACTERISTICS

| Part Number | V _w (DC) | V _w (AC) | V _B | V _C | I _{VC} | I _L | E _T | E _{LD} | I _P | Cap | Freq | V _{Jump} | P _{Diss, MAX} |
|----------------|---------------------|---------------------|----------------|----------------|-----------------|----------------|----------------|-----------------|----------------|-------|------|-------------------|------------------------|
| VGAS120616K390 | 16 | 11 | 24.5±10% | 40 | 1 | 15 | 0.6 | 1.5 | 200 | 900 | K | 27.5 | 0.01 |
| VGAS120616N390 | 16 | 11 | 24.5±10% | 40 | 1 | 15 | 1.1 | 2 | 200 | 1300 | K | 27.5 | 0.01 |
| VGAS121016S390 | 16 | 14 | 24.5±10% | 40 | 2.5 | 15 | 2.0 | 5.00 | 500 | 3000 | K | 27.5 | 0.01 |
| VGAS121016J400 | 16 | 13 | 25.5±10% | 42 | 5 | 10 | 1.6 | 3 | 500 | 3100 | K | 27.5 | 0.03 |
| VGAS181216P390 | 16 | 11 | 24.5±10% | 40 | 5 | 15 | 2.9 | 10 | 1000 | 7000 | K | 27.5 | 0.07 |
| VGAS181216P400 | 16 | 11 | 24.5±10% | 42 | 5 | 10 | 2.9 | 10 | 1000 | 5000 | K | 27.5 | 0.07 |
| VGAS222016Y390 | 16 | 11 | 24.5±10% | 40 | 10 | 15 | 10.2 | 45 | 1500 | 20000 | K | 27.5 | 0.08 |
| VGAS222016Y400 | 16 | 11 | 24.5±10% | 42 | 10 | 10 | 7.2 | 25 | 1500 | 13000 | K | 27.5 | 0.10 |
| VGAS120618D400 | 18 | 13 | 25.5±10% | 42 | 1 | 15 | 0.4 | 1.5 | 150 | 1200 | K | 27.5 | 0.008 |
| VGAS121018J400 | 18 | 13 | 25.5±10% | 42 | 5 | 15 | 1.6 | 3.0 | 500 | 2300 | K | 27.5 | 0.03 |
| VGAS181218P440 | 18 | 14 | 27.5±10% | 44 | 5 | 15 | 2.9 | 6 | 800 | 5000 | K | 27.5 | 0.05 |
| VGAS222022Y490 | 22 | 17 | 30.0±10% | 49 | 10 | 15 | 6.8 | 25 | 1200 | 12000 | K | 27.5 | 0.03 |
| VGAS120626F540 | 26 | 18 | 33.0±10% | 54 | 1 | 15 | 0.7 | 1.5 | 200 | 600 | K | 27.5 | 0.008 |
| VGAS121026H560 | 26 | 18 | 34.5±10% | 60 | 5 | 15 | 1.2 | 3 | 300 | 1200 | 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 | 35.0±10% | 57 | 10 | 15 | 6.8 | 25 | 1100 | 7000 | K | 30 | 0.03 |
| VGAS322026Z570 | 26 | 23 | 35.0±10% | 57 | 10 | 15 | 13.0 | 50 | 1800 | 15000 | K | 30 | 0.04 |
| VGAS121030H620 | 30 | 21 | 41.0±10% | 67 | 5 | 15 | 1.2 | 3 | 280 | 1850 | K | 30 | 0.018 |
| VGAS120631M650 | 31 | 25 | 39.0±10% | 65 | 1 | 15 | 1 | 2.5 | 200 | 700 | K | 30 | 0.03 |
| VGAS121031R650 | 31 | 25 | 39.0±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 | 39.0±10% | 65 | 10 | 15 | 9.6 | 23 | 1200 | 6100 | K | 30 | 0.03 |
| VGAS120634N770 | 34 | 30 | 47.0±10% | 77 | 1.0 | 15 | 1.1 | 1.50 | 200 | 500 | K | 47 | 0.02 |
| VGAS121034S770 | 34 | 30 | 47.0±10% | 77 | 2.5 | 15 | 2 | 3 | 400 | 1000 | K | 48 | 0.04 |
| VGAS181234U770 | 34 | 30 | 47.0±10% | 77 | 5 | 15 | 5 | 6.1 | 800 | 1500 | K | 48 | 0.08 |
| VGAS222034Y770 | 34 | 30 | 47.0±10% | 77 | 10 | 15 | 12 | 25 | 2000 | 6300 | K | 48 | 0.24 |
| VGAS181242U900 | 42 | 35 | 56.0±10% | 90 | 5 | 15 | 4.0 | 6 | 500 | 1200 | K | 48 | 0.015 |
| VGAS222042Y900 | 42 | 37 | 56.0±10% | 90 | 10 | 15 | 12 | 24 | 1000 | 5000 | K | 48 | 0.06 |
| VGAS121048H101 | 48 | 34 | 62.0±10% | 100 | 5 | 15 | 1.2 | - | 250 | 500 | K | 48 | 0.022 |
| VGAS181256U111 | 56 | 40 | 68.0±10% | 110 | 5.0 | 15 | 4.8 | - | 500 | 1100 | K | 48 | 0.04 |
| VGAS121060J121 | 60 | 42 | 76.0±10% | 120 | 5 | 15 | 1.5 | - | 250 | 400 | K | 48 | 0.03 |
| VGAS121065P131 | 65 | 50 | 82.0±10% | 135 | 2.5 | 15 | 2.7 | - | 350 | 600 | K | 48 | 0.05 |
| VGAS181265U131 | 65 | 50 | 82.0±10% | 135 | 5.0 | 15 | 4.5 | - | 400 | 800 | K | 48 | 0.03 |
| VGAS222065Y131 | 65 | 50 | 82.0±10% | 135 | 10 | 15 | 6.5 | - | 1100 | 3000 | K | 48 | 0.06 |
| VGAS181285U161 | 85 | 60 | 100±10% | 165 | 5.0 | 15 | 4.5 | - | 400 | 500 | K | 48 | 0.04 |

V_w(DC) DC Working Voltage [V]

V_w(AC) AC Working Voltage [V]

V_B Typical Breakdown Voltage [V @ 1mA, 25°C]

V_C Clamping Voltage [V @ I_{VC}]

I_{VC} Test Current for VC [A, 8x20μs]

I_L Maximum leakage current at the working voltage, 25°C [μA]

E_T Transient Energy Rating [J, 10x1000μs]

E_{LD} Load Dump Energy (x10) [J]

I_P Peak Current Rating [A, 8x20μs]

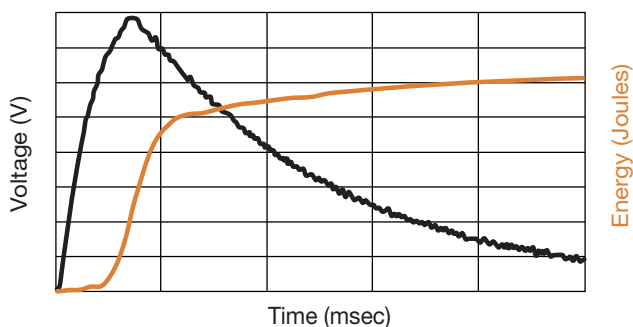
Cap Typical capacitance [pF] @ frequency specified and 0.5V_{RMS}, 25°C, M = 1MHz, K = 1kHz

V_{Jump} Jump Start [V, 5 min]

P_{DISS} Power Dissipation [W]

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.

12V SYSTEMS

| Part Number | 0.5Ω | 1Ω | 4Ω |
|----------------|------|----|----|
| VGAS181216P400 | | | |
| 100ms | 46 | 52 | 72 |
| 200ms | 37 | 41 | 59 |
| 400ms | 32 | 35 | 51 |
| VGAS222016Y400 | | | |
| 100ms | 53 | 60 | 77 |
| 200ms | 50 | 55 | 73 |
| 400ms | 47 | 50 | 66 |