

# 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	AS	1812	16	P	400	R	P
Varistor	Glass Encapsulate 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	570 = 57V		
				42 = 42Vdc	P = 2.5-3.7J	650 = 65V		
				48 = 48Vdc	U = 4.0-5.0J	770 = 77V		
				60 = 60Vdc	Y = 6.5-12J	900 = 90V		
				65 = 65Vdc		101 = 100V		
						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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### ELECTRIAL CHARACTERISTICS

AVX PN	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>
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

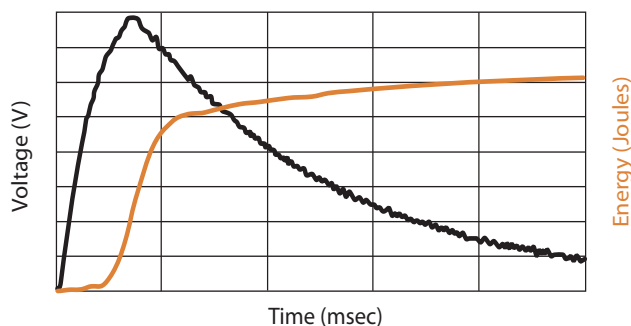
V<sub>W</sub>(DC) DC Working Voltage [V]  
V<sub>W</sub>(AC) AC Working Voltage [V]  
V<sub>B</sub> Typical Breakdown Voltage [V @ 1mA<sub>DC</sub>, 25°C]  
V<sub>C</sub> Clamping Voltage [V @ I<sub>VC</sub>]  
I<sub>VC</sub> Test Current for V<sub>C</sub> [A, 8x20µs]  
I<sub>L</sub> Maximum leakage current at the working voltage, 25°C [µA]

E<sub>T</sub> Transient Energy Rating [J, 10x1000µs]  
E<sub>LD</sub> Load Dump Energy (x10) [J]  
I<sub>P</sub> Peak Current Rating [A, 8x20µs]  
Cap Typical capacitance [pF] @ frequency specified and 0.5V<sub>max</sub>, 25°C, M = 1MHz, K = 1kHz  
V<sub>Jump</sub> Jump Start [V, 5 min]  
P<sub>Diss</sub> 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

	0.5Ω	1Ω	4Ω
<b>VGAS181216P400</b>			
100ms	46	52	72
200ms	37	41	59
400ms	32	35	51
<b>VGAS222016Y400</b>			
100ms	53	60	77
200ms	50	55	73
400ms	47	50	66