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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.

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 VG = Varistor Glass Encapsulated Chip		0402 0603 0805 1206 1210 1812 2220 3220	03 = 3.3Vdc 05 = 5.6Vdc 09 = 9Vdc 12 = 12Vdc 14 = 14Vdc 16 = 16Vdc 18 = 18Vdc 22 = 22Vdc 26 = 26Vdc 30 = 30Vdc	31 = 31Vdc 34 = 34Vdc 38 = 38Vdc 42 = 42Vdc 45 = 45Vdc 48 = 48Vdc 56 = 56Vdc 60 = 60Vdc 65 = 65Vdc 85 = 85Vdc	A = 0.1J B = 0.2J C = 0.3J D = 0.4J E = 0.5J F = 0.7J H = 1.2J J = 1.5J K = 0.6J	L = 0.8J S = 1.9-2.0J X = 0.05J M = 1J N = 1.1J U = 4.0-5.0J P = 2.5-3.7J Y = 6.5-12J	140 = 14V 150 = 18V 220 = 22V 250 = 27V 300 = 32V 380 = 38V 390 = 42V 400 = 42V 440 = 44V 490 = 49V 540 = 54V	570 = 57V 580 = 60V 620 = 67V 650 = 67V 770 = 77V 800 = 80V 900 = 90V 101 = 100V 111 = 110V 131 = 135V 151 = 150V	D = 7" (1000)* R = 7" (4000)* T = 13" (10,000)* W = 7" (10,000)** 0402 only	P = Ni/Sn plated

*Not available for 0402
**Only available for 0402

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ELECTRICAL CHARACTERISTICS

AVX PN	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}
	V _{dc}	V _{ac}	V	V	A	μA	J	J	A	pF	V	W	
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_W(DC) DC Working Voltage [V]

V_W(AC) AC Working Voltage [V]

V_B Typical Breakdown Voltage [V @ 1mA_{DC}]

V_C Clamping Voltage [V @ I_V]

I_{VC} Test Current for V_C

I_L Maximum leakage current at the working voltage [μA]

E_T Transient Energy Rating [J, 10x1000μS]

I_P Peak Current Rating [A, 8x20μS]

Cap Typical capacitance [pF] @ frequency specified and 0.5V_{RMS}

V_{Jump} Jump Start (V)

P Power Dissipation (W)

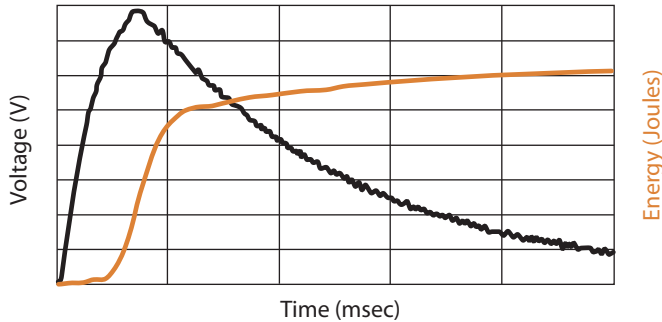
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AUTOMOTIVE SERIES – LOAD DUMP TEST

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

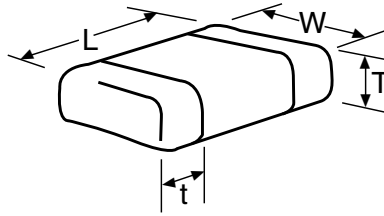
VCAS060316B400	0.5Ω	1Ω	4Ω
100ms	37	38	42
200ms	36	37	41
400ms	35	36	39
VCAS120616K380	0.5Ω	1Ω	4Ω
100ms	42	45	55
200ms	40	43	50
400ms	39	40	45
VCAS121016J390	0.5Ω	1Ω	4Ω
100ms	48	53	74
200ms	46	50	64
400ms	43	46	56
VGAS181216P400	0.5Ω	1Ω	4Ω
100ms	46	52	72
200ms	37	41	59
400ms	32	35	51
VGAS222016Y400	0.5Ω	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

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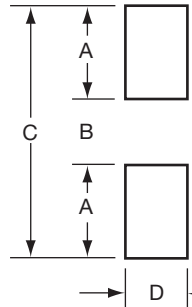


DIMENSIONS: mm (inches)

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

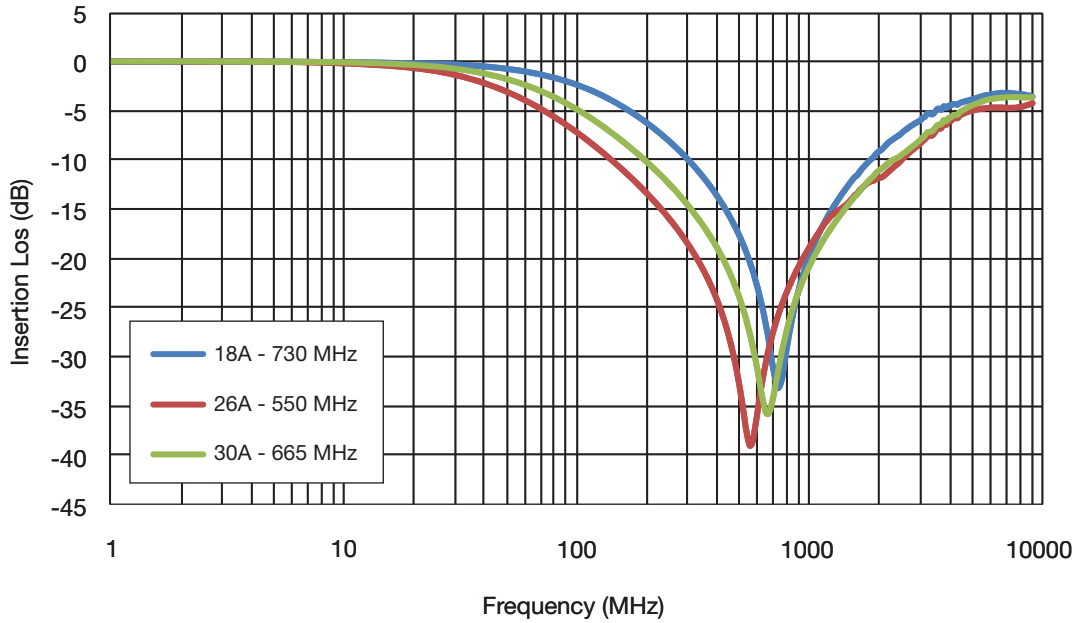
Pad Layout	0402	0603	0805	1206	1210	1812	2220	3220
A	1.61 (0.024)	0.89 (0.035)	1.02 (0.040)	1.02 (0.040)	1.02 (0.040)	1.00 (0.039)	1.00 (0.039)	2.21 (0.087)
B	1.51 (0.020)	0.76 (0.030)	1.02 (0.040)	2.03 (0.080)	2.03 (0.080)	3.60 (0.142)	4.60 (0.18)	5.79 (0.228)
C	1.70 (0.067)	2.54 (0.100)	3.05 (0.120)	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)

TransGuard® Automotive Series

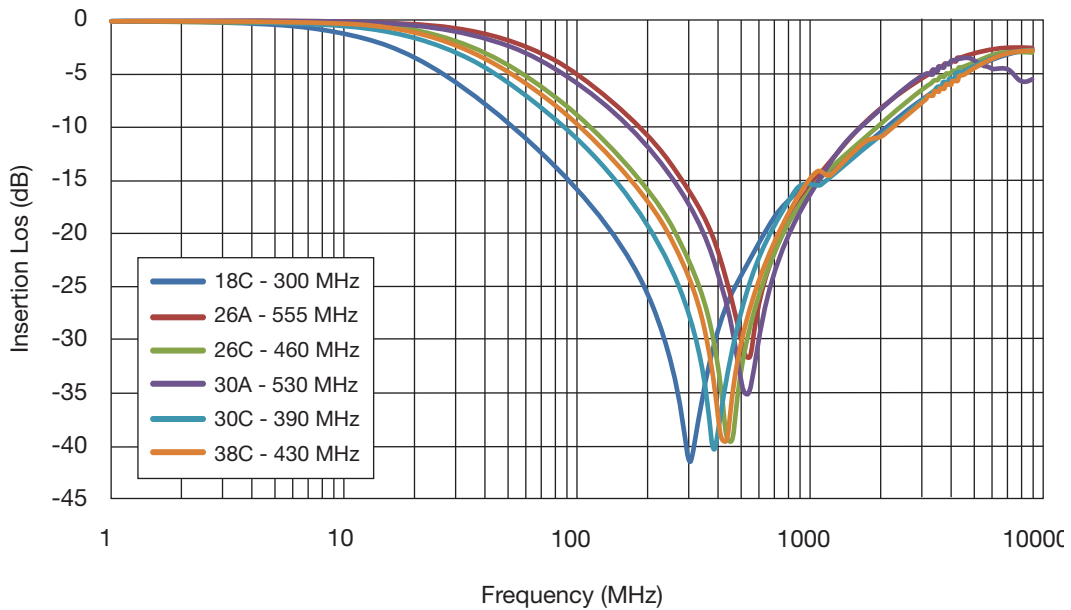
Multilayer Varistors for Automotive Applications

FORWARD TRANSMISSION CHARACTERISTICS (S21)

0603 Case Size



0805 Case Size

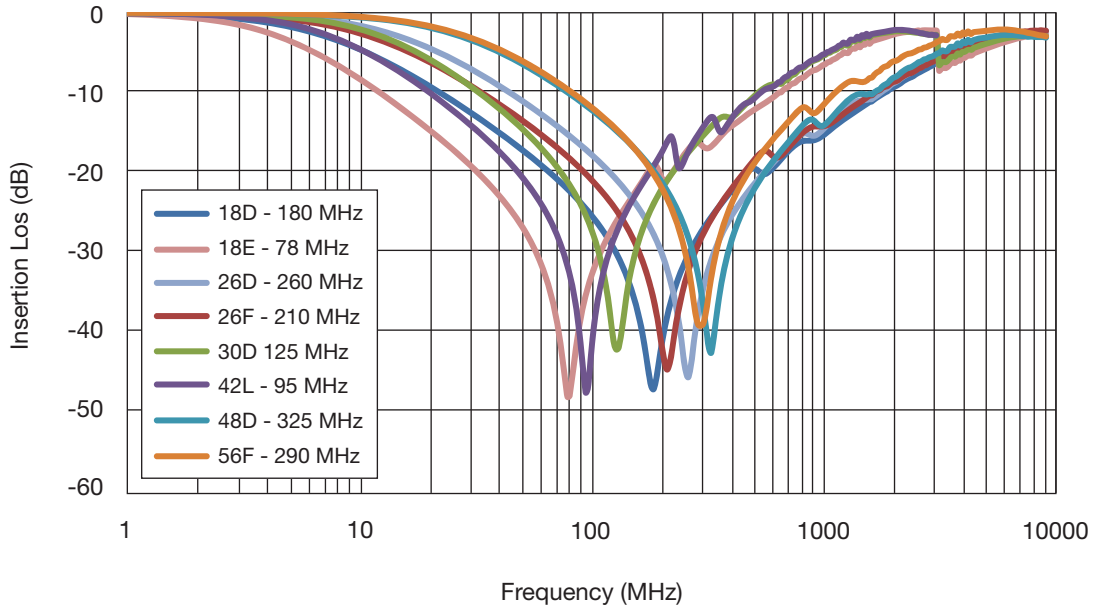


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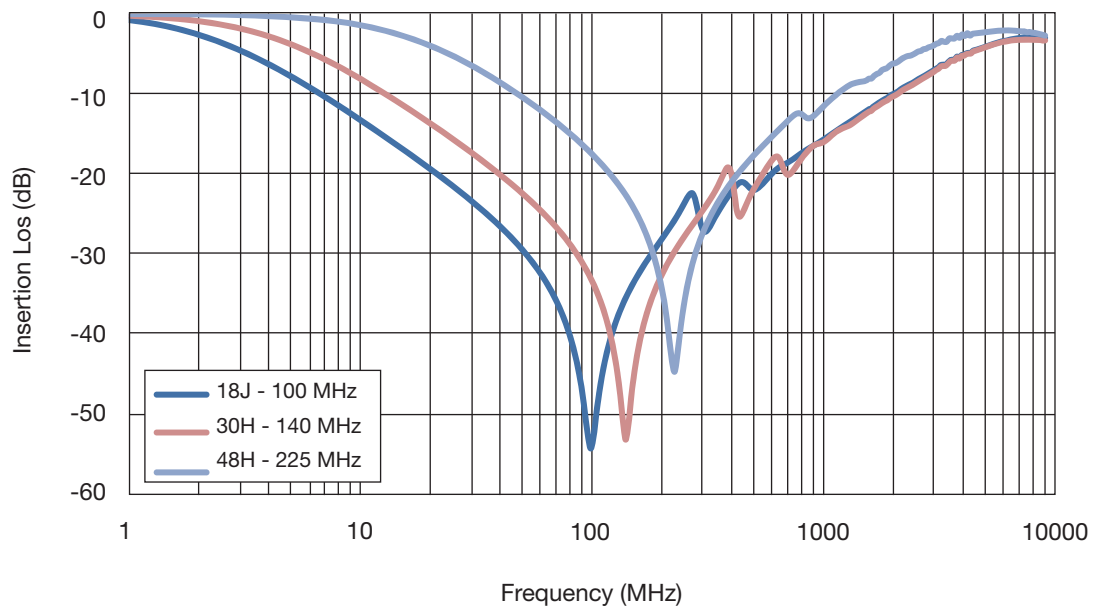
Multilayer Varistors for Automotive Applications

FORWARD TRANSMISSION CHARACTERISTICS (S21)

1206 Case Size



1210 Case Size

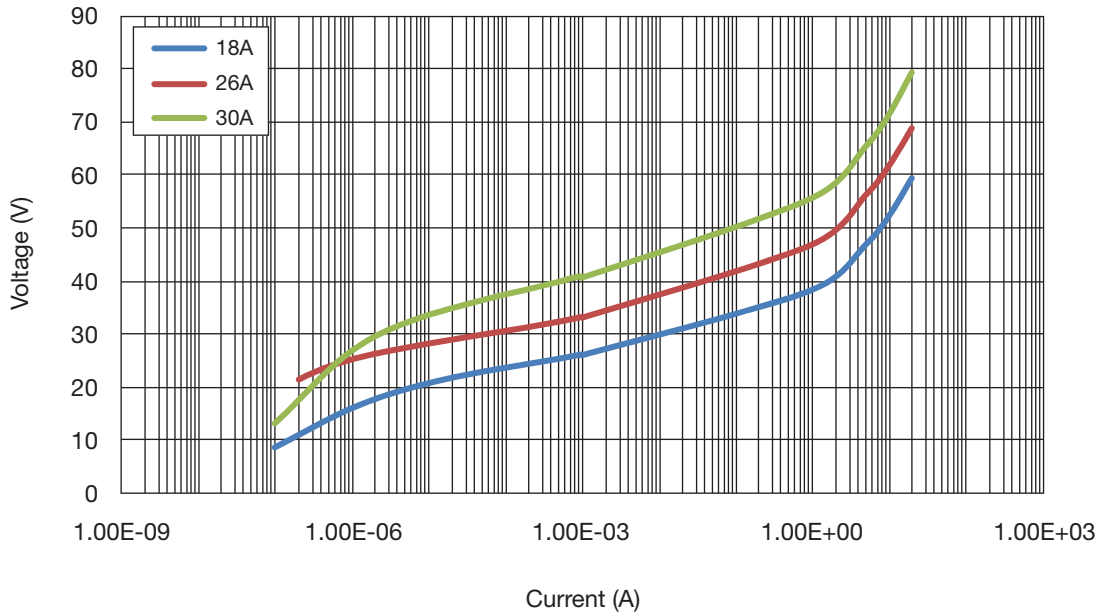


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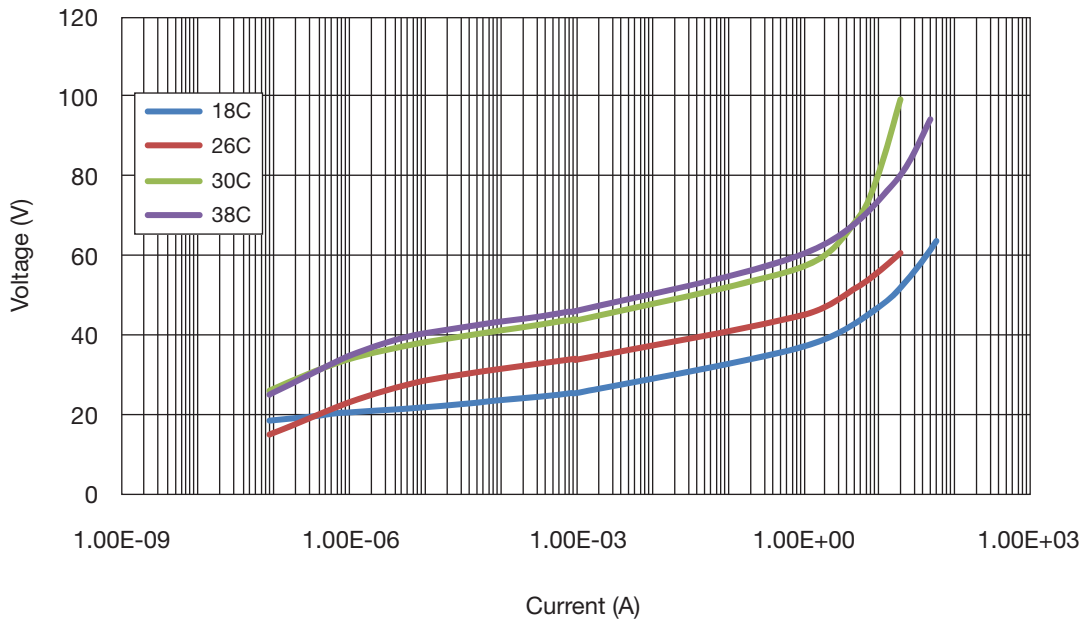
Multilayer Varistors for Automotive Applications

V-I CHARACTERISTICS

0603 Case Size



0805 Case Size

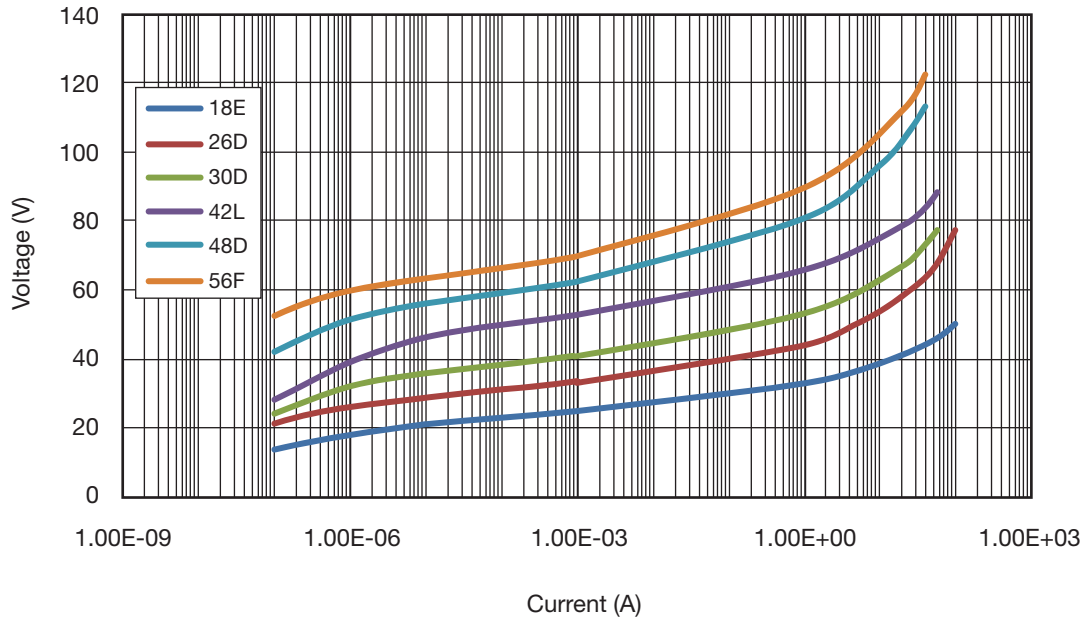


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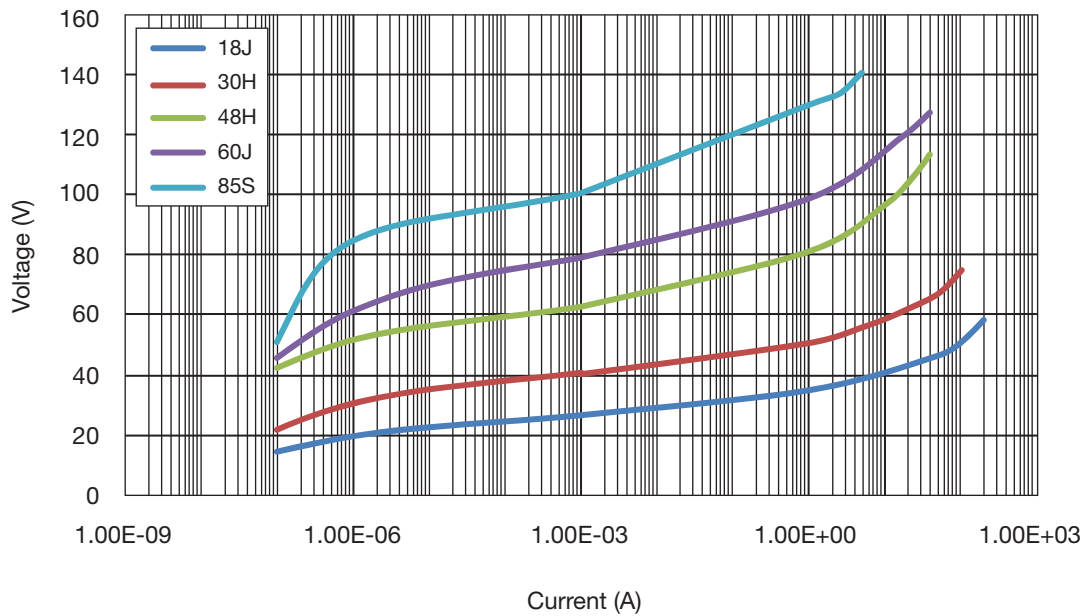
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V-I CHARACTERISTICS

1206 Case Size



1210 Case Size

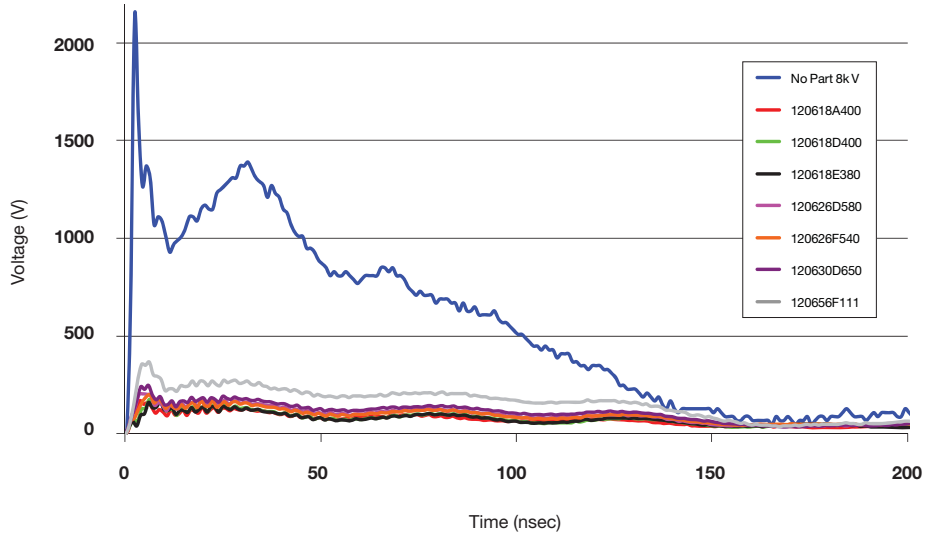


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ESD V-I CHARACTERISTICS

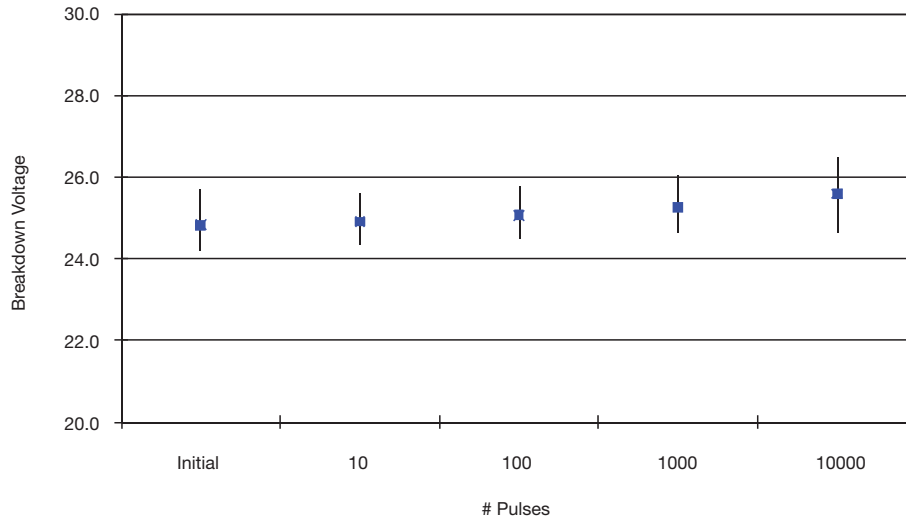
8 kV ESD Vc
(150pF/300ohm IEC Network)



TYPICAL VOLTAGE AT 8 KV PULSE

8kV Pulse	Peak Voltage (V)	30ns Voltage (V)	100ns Voltage (V)
No Part (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

ESD 8 kV IEC 61000-4-2 150pF / 330Ω Resistor
VC060318A400



Mouser Electronics

Authorized Distributor

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AVX:

[VCAS060318A400DP](#) [VCAS080518C400DP](#) [VCAS120618D400DP](#) [VCAS121018J390DP](#) [VCAS040218X400WP](#)
[VCAS060316B400DP](#) [VCAS060316B400RP](#) [VCAS060318A400RP](#) [VCAS060326A580DP](#) [VCAS060326A580RP](#)
[VCAS060330A650DP](#) [VCAS060330A650RP](#) [VCAS080518A400DP](#) [VCAS080518A400RP](#) [VCAS080518C400RP](#)
[VCAS080526A580DP](#) [VCAS080526A580RP](#) [VCAS080526C580DP](#) [VCAS080526C580RP](#) [VCAS080530A650DP](#)
[VCAS080530A650RP](#) [VCAS080530C650DP](#) [VCAS080530C650RP](#) [VCAS080538C770DP](#) [VCAS080538C770RP](#)
[VCAS120616K380DP](#) [VCAS120616K380RP](#) [VCAS120618A400DP](#) [VCAS120618A400RP](#) [VCAS120618D400RP](#)
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[VCAS120630D650RP](#) [VCAS120642L800DP](#) [VCAS120642L800RP](#) [VCAS120648D101DP](#) [VCAS120648D101RP](#)
[VCAS120656F111DP](#) [VCAS120656F111RP](#) [VCAS121016J390DP](#) [VCAS121016J390RP](#) [VCAS121018J390RP](#)
[VCAS121026H560DP](#) [VCAS121026H560RP](#) [VCAS121030H620DP](#) [VCAS121030H620RP](#) [VCAS121048H101DP](#)
[VCAS121048H101RP](#) [VCAS121085S151DP](#) [VCAS121085S151RP](#) [VCAS06LC18X500TP](#) [VCAS121030S620DP](#)
[VCAS040214X300WP](#) [VCAS080514C300DP](#) [VCAS080514A300DP](#) [VCAS120645K900DP](#) [VCAS040205X150WP](#)
[VCAS121060J121DP](#) [VCAS040209X200WP](#) [VCAS120631M650DP](#) [VCAS060305A150DP](#) [VCAS120605D150DP](#)
[VCAS080509A200DP](#) [VCAS080505A150DP](#) [VCAS080512A250DP](#) [VCAS120605A150DP](#) [VCAS120642K900DP](#)
[VCAS120660M131DP](#) [VCAS060309A200DP](#) [VCAS080531C650DP](#) [VCAS120614A300DP](#) [VCAS060314A300DP](#)
[VCAS120614D300DP](#) [VCAS080505C150DP](#) [VCAS120626F540DP](#) [VCAS120634N770DP](#) [VCAS060326A580TP](#)
[VCAS06AG183R0YAT3A](#) [VCAS120618D400TP](#) [VCAS080518A400TP](#) [VCAS060318A400TP](#) [VCAS080518C400TP](#)
[VCAS060305A150RP](#)