

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 | 05 = 5.6Vdc 09 = 9Vdc 12 = 12Vdc 14 = 14Vdc 16 = 16Vdc 18 = 18Vdc 26 = 26Vdc 30 = 30Vdc 31 = 31Vdc | 34 = 34Vdc 38 = 38Vdc 42 = 42Vdc 45 = 45Vdc 48 = 48Vdc 56 = 56Vdc 60 = 60Vdc 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 = 2.7-3.0J Y = 7.2-12J | 150 = 18V 220 = 22V 250 = 27V 300 = 32V 380 = 38V 390 = 42V 400 = 42V 540 = 54V | 580 = 60V 620 = 67V 650 = 67V 770 = 77V 800 = 80V 101 = 100V 111 = 110V 151 = 150V |
| | | | | | | D = 7" (1000)* R = 7" (4000)* T = 13" (10,000)* W = 13" (10,000)** 0402 only | P = Ni/Sn plated | |

*Not available for 0402
**Only available for 0402

PHYSICAL DIMENSIONS: mm (inches)



| Size (EIA) | Length (L) | Width (W) | Max Thickness (T) | Land Length (t) |
|------------|----------------------------|----------------------------|-------------------|----------------------------|
| 0402 | 1.00±0.10 (0.040±0.004) | 0.50±0.10 (0.020±0.004) | 0.60 (0.024) | 0.25±0.15 (0.010±0.006) |
| 0603 | 1.60±0.15 (0.063±0.006) | 0.80±0.15 (0.031±0.006) | 0.90 (0.035) | 0.35±0.15 (0.014±0.006) |
| 0805 | 2.01±0.20 (0.079±0.008) | 1.25±0.20 (0.049±0.008) | 1.02 (0.040) | 0.71 max. (0.028 max.) |
| 1206 | 3.20±0.20 (0.126±0.008) | 1.60±0.20 (0.063±0.008) | 1.02 (0.040) | 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.) |



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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} |
|-------------------|---------------------|---------------------|----------------|----------------|-----------------|----------------|----------------|-----------------|----------------|-------|------|-------------------|------------------------|
| 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 |
| 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 |
| 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 |
| 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 | 29 | 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 |
| 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 |
| VGAS222034Y770 __ | 34 | 30 | 47.0±10% | 77 | 10 | 15 | 12 | 25 | 2000 | 6300 | K | 48 | 0.240 |
| 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 |
| VCAS120645K900 __ | 45 | 35 | 56±10% | 90 | 1 | 25 | 0.6 | - | 200 | 260 | K | 48 | 0.012 |
| 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 |
| 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 |
| VCAS121085S151 __ | 85 | 60 | 100.0±10% | 150 | 1 | 35 | 2 | - | 250 | 275 | K | 48 | 0.040 |

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_W]
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 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 51 | 56 | 58 |
| 200ms | 50 | 54 | 56 |
| 400ms | 49 | 51 | 53 |
| VCAS080526A580 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 51 | 53 | 59 |
| 200ms | 49 | 51 | 57 |
| 400ms | 48 | 50 | 51 |
| VCAS080526C580 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 51 | 54 | 62 |
| 200ms | 49 | 51 | 56 |
| 400ms | 48 | 49 | 51 |
| VCAS120626D580 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 52 | 60 | 68 |
| 200ms | 50 | 57 | 65 |
| 400ms | 47 | 54 | 61 |
| VCAS121026H560 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 61 | 74 | 91 |
| 200ms | 59 | 69 | 82 |
| 400ms | 55 | 64 | 70 |
| VCAS060330A650 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 57 | 59 | 63 |
| 200ms | 56 | 58 | 61 |
| 400ms | 54 | 57 | 58 |
| VCAS080530A650 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 58 | 62 | 66 |
| 200ms | 56 | 61 | 64 |
| 400ms | 53 | 57 | 61 |
| VCAS080530C650 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 58 | 61 | 63 |
| 200ms | 57 | 58 | 62 |
| 400ms | 55 | 56 | 59 |
| VCAS120630D650 | 0.5Ω | 1Ω | 4Ω |
| 100ms | 61 | 70 | 75 |
| 200ms | 57 | 66 | 69 |
| 400ms | 56 | 62 | 64 |
| VCAS121030H620 | 0.5Ω | 1Ω | 4Ω |
| 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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FORWARD TRANSMISSION CHARACTERISTICS (S21)

0603 Case Size



0805 Case Size



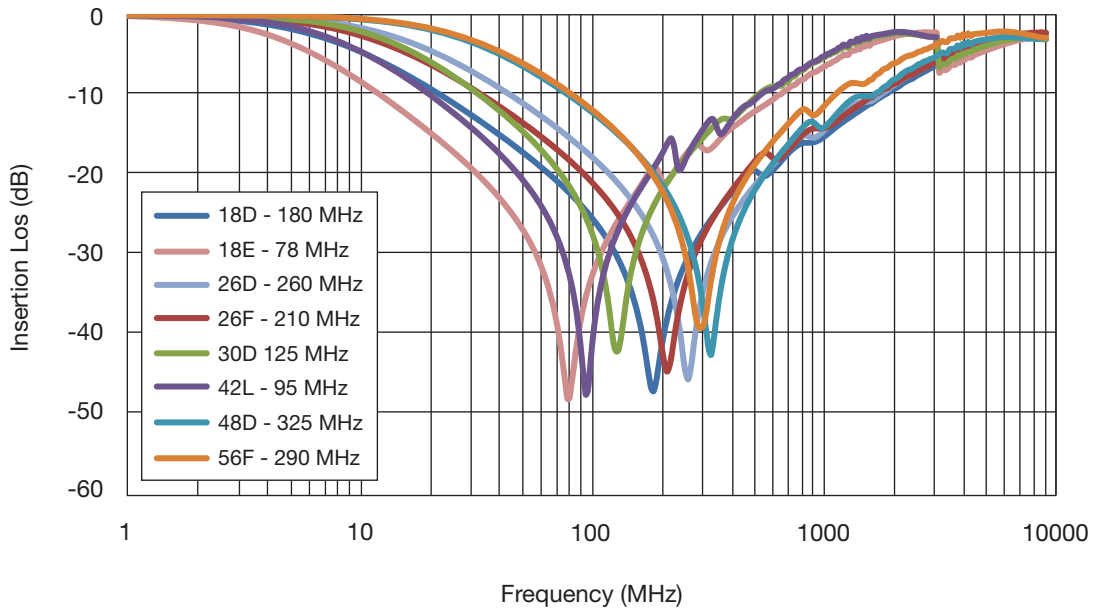
TransGuard® Automotive Series

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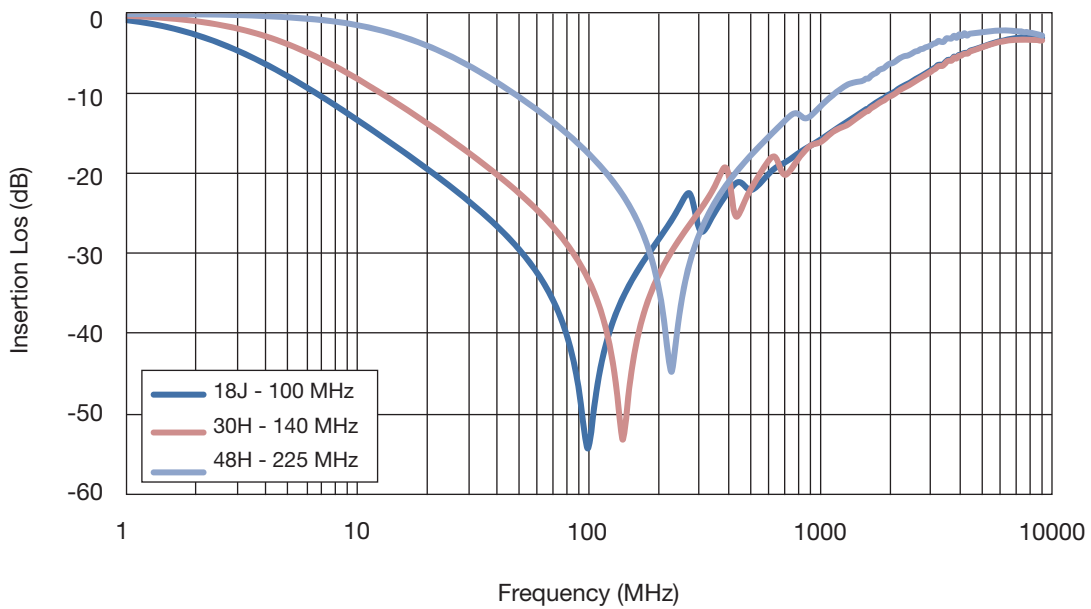


FORWARD TRANSMISSION CHARACTERISTICS (S21)

1206 Case Size



1210 Case Size



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V-I CHARACTERISTICS

0603 Case Size



0805 Case Size



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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 |
| 120626F540 | 201 | 159 | 84 |
| 120630D650 | 249 | 177 | 106 |
| 120656F111 | 366 | 262 | 169 |

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



Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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