

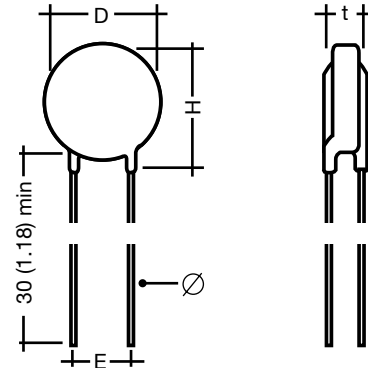
Zinc Oxide Varistors



VE/VF Types for Heavy Duty Applications (“P Series”)

FEATURES

- “P Series” are especially dedicated to heavy duty applications encountered in the AC power network. Higher surge current and energy ratings provide an improved protection and a better reliability
- Radial lead varistors
- Operating voltage range from 130 V to 625 V (V_{rms} for VE types) or 205 V to 1000 V (V_{1mA} for VF types)
- Available in tape and reel for use with automatic insertion equipment (see pages 31 to 33 for details).



PARTICULAR CHARACTERISTICS

| UL (USA and Canadian Standards) | VE Series P/N codification using (D_{max} , V_{rms}) | VF Series P/N codification using ($d_{ceramic}$, V_{1mA}) | Maximum operating voltage | | Nominal voltage at 1 mA dc | | |
|--|--|--|------------------------------|----------|-------------------------------|--------------------|-----------------|
| | | | V_{rms} | V_{DC} | $V_{1mA\ mini}$ | $V_{1mA\ nominal}$ | $V_{1mA\ maxi}$ |
| ★ ★ ★ ★ ★ | VE07P00131K __ VE09P00131K __ VE13P00131K __ VE17P00131K __ VE24P00131K __ | VF05P12050K __ VF07P12050K __ VF10P12050K __ VF14P12050K __ VF20P12050K __ | 130 | 170 | 184 | 205 | 226 |
| ★ ★ ★ ★ ★ | VE07P00141K __ VE09P00141K __ VE13P00141K __ VE17P00141K __ VE24P00141K __ | VF05P10221K __ VF07P10221K __ VF10P10221K __ VF14P10221K __ VF20P10221K __ | 140 | 180 | 198 | 220 | 242 |
| ★ ★ ★ ★ ★ | VE07P00151K __ VE09P00151K __ VE13P00151K __ VE17P00151K __ VE24P00151K __ | VF05P10241K __ VF07P10241K __ VF10P10241K __ VF14P10241K __ VF20P10241K __ | 150 | 200 | 216 | 240 | 264 |
| ★ ★ ★ ★ ★ | VE07P01750K __ VE09P01750K __ VE13P01750K __ VE17P01750K __ VE24P01750K __ | VF05P10271K __ VF07P10271K __ VF10P10271K __ VF14P10271K __ VF20P10271K __ | 175 | 225 | 243 | 270 | 297 |
| ★ ★ ★ ★ ★ | VE07P00211K __ VE09P00211K __ VE13P00211K __ VE17P00211K __ VE24P00211K __ | VF05P10331K __ VF07P10331K __ VF10P10331K __ VF14P10331K __ VF20P10331K __ | 210 | 275 | 297 | 330 | 363 |
| ★ ★ ★ ★ ★ | VE07P00231K __ VE09P00231K __ VE13P00231K __ VE17P00231K __ VE24P00231K __ | VF05P10361K __ VF07P10361K __ VF10P10361K __ VF14P10361K __ VF20P10361K __ | 230 | 300 | 324 | 360 | 396 |

Zinc Oxide Varistors



VE/VF Types for Heavy Duty Applications (“P Series”)

DIMENSIONS millimeters (inches)

| Type | Type | D | | H max. | t max. | ϕ +10% -0.05 (.002) | E ± 0.8 (.031) |
|--------|--------|------------------|-------------------------|-----------|-----------|--------------------------------|-------------------|
| | | Ceramic diameter | Maximum coated diameter | | | | |
| VE07 | VF05 | 5 (.196) | 7 (.275) | 10 (.394) | see table | 0.6 (.024) | 5.08 (0.20) |
| VE09 | VF07 | 7 (.275) | 9 (.354) | 12 (.472) | | 0.6 (.024) | 5.08 (0.20) |
| VE13* | VF10* | 10 (.393) | 13* (.512) | 16 (.630) | | 0.8* (.031) | 7.62*(0.30) |
| VE17 | VF14 | 14 (.551) | 17 (.669) | 20 (.787) | | 0.8 (.031) | 7.62 (0.30) |
| VE24** | VF20** | 20 (.787) | 24 (.945) | 27 (1.06) | | 0.8** (.031) | 7.62 (0.30) |

* VE13 / VF10: For models with $V_{RMS} \leq 320$ V
 other version/suffixes available with:
 E = 5.08 (0.20) Suffix:
 $\phi = 0.6 (.024)$ Bulk: HB
 D = 12.5 (.492) max Tape: DA, DB, DC,
 DD, DQ, ...

**VE24 / VF20: For lead diameter = 1.0 (.039),
 please consult us.

GENERAL CHARACTERISTICS

Storage temperature: -40°C to +125°C
 Max. operating temperature: +85°C
 Response time: < 25 ns
 Voltage coefficient temp.: $|K| < 0.09\%/^{\circ}\text{C}$
 Voltage proof: 2500 V
 Epoxy coating: Flame retardant
 UL94-VO

MARKING

Type
 AC nominal voltage (EIA coding) for VE types
 V_{1mA} varistor voltage (EIA coding) for VF types
 Logo
 UL logo (when approved)
 Lot number (VE13/17/24 and VF10/14/20 only)

| Max. clamping voltage (8 x 20 μs) | | Max. energy absorption (10 x 1000 μs) W (J) Number of surges 1 surge | Max. permissible peak current (8 x 20 μs) Ip (A) | | Typical capacitance f = 1kHz pF | Mean power dissipation W | Maximum thickness t mm (inches) | V/I characteristic Page | Derating curves Page |
|---|--------|---|---|----------|---------------------------------------|-----------------------------|---------------------------------------|----------------------------|-------------------------|
| Vp (V) | Ip (A) | | 1 surge | 2 surges | | | | | |
| 340 | 5 | 8.5 | 800 | 600 | 90 | 0.1 | 4.1 (.161) | 34 | 24 |
| 340 | 10 | 17.5 | 1750 | 1250 | 250 | 0.2 | 4.1 (.161) | 34 | 25 |
| 340 | 25 | 35 | 3500 | 2500 | 450 | 0.4 | 4.7 (.185) | 34 | 26 |
| 340 | 50 | 70 | 6000 | 4500 | 1000 | 0.6 | 4.7 (.185) | 35 | 27 |
| 340 | 100 | 140 | 10000 | 7000 | 2500 | 0.8 | 5.1 (.201) | 35 | 28 |
| 360 | 5 | 9 | 800 | 600 | 85 | 0.1 | 4.2 (.165) | 34 | 24 |
| 360 | 10 | 19 | 1750 | 1250 | 235 | 0.2 | 4.2 (.165) | 34 | 25 |
| 360 | 25 | 39 | 3500 | 2500 | 425 | 0.4 | 4.8 (.189) | 34 | 26 |
| 360 | 50 | 78 | 6000 | 4500 | 930 | 0.6 | 4.8 (.189) | 35 | 27 |
| 360 | 100 | 155 | 10000 | 7000 | 2250 | 0.8 | 5.2 (.205) | 35 | 28 |
| 400 | 5 | 10.5 | 800 | 600 | 80 | 0.1 | 4.3 (.169) | 34 | 24 |
| 400 | 10 | 21 | 1750 | 1250 | 220 | 0.2 | 4.3 (.169) | 34 | 25 |
| 400 | 25 | 42 | 3500 | 2500 | 400 | 0.4 | 4.9 (.193) | 34 | 26 |
| 400 | 50 | 85 | 6000 | 4500 | 850 | 0.6 | 4.9 (.193) | 35 | 27 |
| 400 | 100 | 170 | 10000 | 7000 | 2000 | 0.8 | 5.3 (.209) | 35 | 28 |
| 445 | 5 | 11 | 800 | 600 | 70 | 0.1 | 4.5 (.177) | 34 | 24 |
| 445 | 10 | 24 | 1750 | 1250 | 190 | 0.2 | 4.5 (.177) | 34 | 25 |
| 445 | 25 | 50 | 3500 | 2500 | 340 | 0.4 | 5.1 (.201) | 34 | 26 |
| 445 | 50 | 100 | 6000 | 4500 | 750 | 0.6 | 5.1 (.201) | 35 | 27 |
| 445 | 100 | 190 | 10000 | 7000 | 2000 | 0.8 | 5.5 (.217) | 35 | 28 |
| 545 | 5 | 13 | 800 | 600 | 60 | 0.1 | 4.9 (.193) | 34 | 24 |
| 545 | 10 | 28 | 1750 | 1250 | 155 | 0.2 | 4.9 (.193) | 34 | 25 |
| 545 | 25 | 60 | 3500 | 2500 | 275 | 0.4 | 5.5 (.217) | 34 | 26 |
| 545 | 50 | 115 | 6000 | 4500 | 600 | 0.6 | 5.5 (.217) | 35 | 27 |
| 545 | 100 | 230 | 10000 | 7000 | 1650 | 0.8 | 5.9 (.232) | 35 | 28 |
| 595 | 5 | 16 | 800 | 600 | 55 | 0.1 | 5.1 (.201) | 34 | 24 |
| 595 | 10 | 32 | 1750 | 1250 | 140 | 0.2 | 5.1 (.201) | 34 | 25 |
| 595 | 25 | 65 | 3500 | 2500 | 250 | 0.4 | 5.7 (.224) | 34 | 26 |
| 595 | 50 | 130 | 6000 | 4500 | 550 | 0.6 | 5.7 (.224) | 35 | 27 |
| 595 | 100 | 250 | 10000 | 7000 | 1500 | 0.8 | 6.1 (.240) | 35 | 28 |



Zinc Oxide Varistors



VE/VF Types for Heavy Duty Applications (“P Series”)

| UL (USA and Canadian Standards) | VE Series P/N codification using (D_{max} , V_{rms}) | VF Series P/N codification using ($d_{ceramic}$, V_{1mA}) | Maximum operating voltage | | Nominal voltage at 1 mA dc | | |
|--|--|--|------------------------------|----------|-------------------------------|--------------------|-----------------|
| | | | V_{rms} | V_{dc} | $V_{1mA\ mini}$ | $V_{1mA\ nominal}$ | $V_{1mA\ maxi}$ |
| ★ ★ ★ ★ ★ | VE07P00251K __ VE09P00251K __ VE13P00251K __ VE17P00251K __ VE24P00251K __ | VF05P10391K __ VF07P10391K __ VF10P10391K __ VF14P10391K __ VF20P10391K __ | 250 | 320 | 351 | 390 | 429 |
| ★ ★ ★ ★ ★ | VE07P02750K __ VE09P02750K __ VE13P02750K __ VE17P02750K __ VE24P02750K __ | VF05P10431K __ VF07P10431K __ VF10P10431K __ VF14P10431K __ VF20P10431K __ | 275 | 350 | 387 | 430 | 473 |
| ★ ★ ★ ★ ★ | VE07P00301K __ VE09P00301K __ VE13P00301K __ VE17P00301K __ VE24P00301K __ | VF05P10471K __ VF07P10471K __ VF10P10471K __ VF14P10471K __ VF20P10471K __ | 300 | 385 | 423 | 470 | 517 |
| ★ ★ ★ ★ | VE09P00321K __ VE13P00321K __ VE17P00321K __ VE24P00321K __ | VF07P10511K __ VF10P10511K __ VF14P10511K __ VF20P10511K __ | 320 | 420 | 459 | 510 | 561 |
| ★ ★ ★ ★ | VE09P00351K __ VE13P00351K __ VE17P00351K __ VE24P00351K __ | VF07P10561K __ VF10P10561K __ VF14P10561K __ VF20P10561K __ | 350 | 460 | 504 | 560 | 616 |
| ★ ★ ★ ★ | VE09P03850K __ VE13P03850K __ VE17P03850K __ VE24P03850K __ | VF07P10621K __ VF10P10621K __ VF14P10621K __ VF20P10621K __ | 385 | 505 | 558 | 620 | 682 |
| ★ ★ ★ ★ | VE09P00421K __ VE13P00421K __ VE17P00421K __ VE24P00421K __ | VF07P10681K __ VF10P10681K __ VF14P10681K __ VF20P10681K __ | 420 | 560 | 612 | 680 | 748 |
| ★ ★ ★ | VE13P00441K __ VE17P00441K __ VE24P00441K __ | VF10P17150K __ VF14P17150K __ VF20P17150K __ | 440 | 585 | 643 | 715 | 787 |
| ★ ★ ★ | VE13P00461K __ VE17P00461K __ VE24P00461K __ | VF10P10751K __ VF14P10751K __ VF20P10751K __ | 460 | 615 | 675 | 750 | 825 |
| ★ ★ ★ | VE13P00511K __ VE17P00511K __ VE24P00511K __ | VF10P10821K __ VF14P10821K __ VF20P10821K __ | 510 | 670 | 738 | 820 | 902 |
| ★ ★ ★ | VE13P00551K __ VE17P00551K __ VE24P00551K __ | VF10P10861K __ VF14P10861K __ VF20P10861K __ | 550 | 715 | 774 | 860 | 946 |
| ★ ★ ★ | VE13P05750K __ VE17P05750K __ VE24P05750K __ | VF10P10911K __ VF14P10911K __ VF20P10911K __ | 575 | 730 | 819 | 910 | 1001 |
| ★ ★ ★ | VE13P06250K __ VE17P06250K __ VE24P06250K __ | VF10P10102K __ VF14P10102K __ VF20P10102K __ | 625 | 825 | 900 | 1000 | 1100 |

Zinc Oxide Varistors



VE/VF Types for Heavy Duty Applications (“P Series”)

| Max. clamping voltage (8 x 20 μ s) | | Max. energy absorption (10 x 1000 μ s) W (J) Number of surges 1 surge | Max. permissible peak current (8 x 20 μ s) Ip (A) | | Typical capacitance f = 1kHz pF | Mean power dissipation W | Maximum thickness t mm (inches) | V/I characteristic | Derating curves |
|--|--------|--|--|----------|---------------------------------------|-----------------------------|---------------------------------------|--------------------|-----------------|
| Vp (V) | Ip (A) | | 1 surge | 2 surges | | | | Page | Page |
| 645 | 5 | 17 | 800 | 600 | 50 | 0.1 | 5.4 (.213) | 34 | 24 |
| 645 | 10 | 35 | 1750 | 1250 | 130 | 0.2 | 5.4 (.213) | 34 | 25 |
| 645 | 25 | 70 | 3500 | 2500 | 230 | 0.4 | 5.9 (.232) | 34 | 26 |
| 645 | 50 | 140 | 6000 | 4500 | 500 | 0.6 | 5.9 (.232) | 35 | 27 |
| 645 | 100 | 280 | 10000 | 7000 | 1300 | 0.8 | 6.3 (.248) | 35 | 28 |
| 710 | 5 | 20 | 800 | 600 | 45 | 0.1 | 5.7 (.224) | 34 | 24 |
| 710 | 10 | 40 | 1750 | 1250 | 120 | 0.2 | 5.7 (.224) | 34 | 25 |
| 710 | 25 | 80 | 3500 | 2500 | 210 | 0.4 | 6.3 (.248) | 34 | 26 |
| 710 | 50 | 160 | 6000 | 4500 | 450 | 0.6 | 6.3 (.248) | 35 | 27 |
| 710 | 100 | 310 | 10000 | 7000 | 1200 | 0.8 | 6.7 (.264) | 35 | 28 |
| 775 | 5 | 21 | 800 | 600 | 40 | 0.1 | 6.0 (.236) | 34 | 24 |
| 775 | 10 | 42 | 1750 | 1250 | 100 | 0.2 | 6.0 (.236) | 34 | 25 |
| 775 | 25 | 85 | 3500 | 2500 | 180 | 0.4 | 6.6 (.260) | 34 | 26 |
| 775 | 50 | 170 | 6000 | 4500 | 400 | 0.6 | 6.6 (.260) | 35 | 27 |
| 775 | 100 | 340 | 10000 | 7000 | 1000 | 0.8 | 7.0 (.276) | 35 | 28 |
| 840 | 10 | 45 | 1750 | 1250 | 100 | 0.2 | 6.4 (.252) | 34 | 25 |
| 840 | 25 | 90 | 3500 | 2500 | 170 | 0.4 | 7.0 (.276) | 34 | 26 |
| 840 | 50 | 180 | 5000 | 4000 | 380 | 0.6 | 7.0 (.276) | 35 | 27 |
| 840 | 100 | 360 | 8000 | 6000 | 950 | 0.8 | 7.5 (.295) | 35 | 28 |
| 910 | 10 | 47 | 1750 | 1250 | 95 | 0.2 | 6.6 (.260) | 34 | 25 |
| 910 | 25 | 95 | 3500 | 2500 | 160 | 0.4 | 7.3 (.287) | 34 | 26 |
| 910 | 50 | 190 | 5000 | 4000 | 365 | 0.6 | 7.3 (.287) | 35 | 27 |
| 910 | 100 | 380 | 8000 | 6000 | 900 | 0.8 | 7.8 (.307) | 35 | 28 |
| 1025 | 10 | 50 | 1750 | 1250 | 95 | 0.2 | 7.0 (.276) | 34 | 25 |
| 1025 | 25 | 100 | 3500 | 2500 | 150 | 0.4 | 7.7 (.303) | 34 | 26 |
| 1025 | 50 | 200 | 5000 | 4000 | 350 | 0.6 | 7.7 (.303) | 35 | 27 |
| 1025 | 100 | 400 | 8000 | 6000 | 850 | 0.8 | 8.1 (.319) | 35 | 28 |
| 1120 | 10 | 52 | 1750 | 1250 | 80 | 0.2 | 7.4 (.291) | 34 | 25 |
| 1120 | 25 | 105 | 3500 | 2500 | 120 | 0.4 | 8.2 (.323) | 34 | 26 |
| 1120 | 50 | 210 | 5000 | 4000 | 300 | 0.6 | 8.2 (.323) | 35 | 27 |
| 1120 | 100 | 420 | 8000 | 6000 | 700 | 0.8 | 8.6 (.339) | 35 | 28 |
| 1180 | 25 | 105 | 3500 | 2500 | 115 | 0.4 | 8.4 (.331) | 34 | 26 |
| 1180 | 50 | 210 | 5000 | 4000 | 275 | 0.6 | 8.4 (.331) | 35 | 27 |
| 1180 | 100 | 420 | 8000 | 6000 | 650 | 0.8 | 8.8 (.346) | 35 | 28 |
| 1240 | 25 | 105 | 3500 | 2500 | 110 | 0.4 | 8.5 (.335) | 34 | 26 |
| 1240 | 50 | 210 | 5000 | 4000 | 250 | 0.6 | 8.5 (.335) | 35 | 27 |
| 1240 | 100 | 420 | 8000 | 6000 | 600 | 0.8 | 9.0 (.354) | 35 | 28 |
| 1350 | 25 | 110 | 3500 | 2500 | 100 | 0.4 | 9.0 (.354) | 34 | 26 |
| 1350 | 50 | 225 | 5000 | 4000 | 220 | 0.6 | 9.0 (.354) | 35 | 27 |
| 1350 | 100 | 450 | 7500 | 6000 | 550 | 0.8 | 9.4 (.370) | 35 | 28 |
| 1420 | 25 | 120 | 3500 | 2500 | 90 | 0.4 | 9.3 (.366) | 34 | 26 |
| 1420 | 50 | 240 | 5000 | 4000 | 200 | 0.6 | 9.3 (.366) | 35 | 27 |
| 1420 | 100 | 480 | 7500 | 6000 | 500 | 0.8 | 9.7 (.382) | 35 | 28 |
| 1500 | 25 | 125 | 3500 | 2500 | 80 | 0.4 | 9.7 (.382) | 34 | 26 |
| 1500 | 50 | 250 | 5000 | 4000 | 180 | 0.6 | 9.7 (.382) | 35 | 27 |
| 1500 | 100 | 500 | 7500 | 6000 | 450 | 0.8 | 10.1 (.398) | 35 | 28 |
| 1650 | 25 | 140 | 3500 | 2500 | 74 | 0.4 | 10.5 (.413) | 34 | 26 |
| 1650 | 50 | 230 | 5000 | 4000 | 165 | 0.6 | 10.5 (.413) | 35 | 27 |
| 1650 | 100 | 560 | 7500 | 6000 | 410 | 0.8 | 11.0 (.433) | 35 | 28 |



Zinc Oxide Varistors

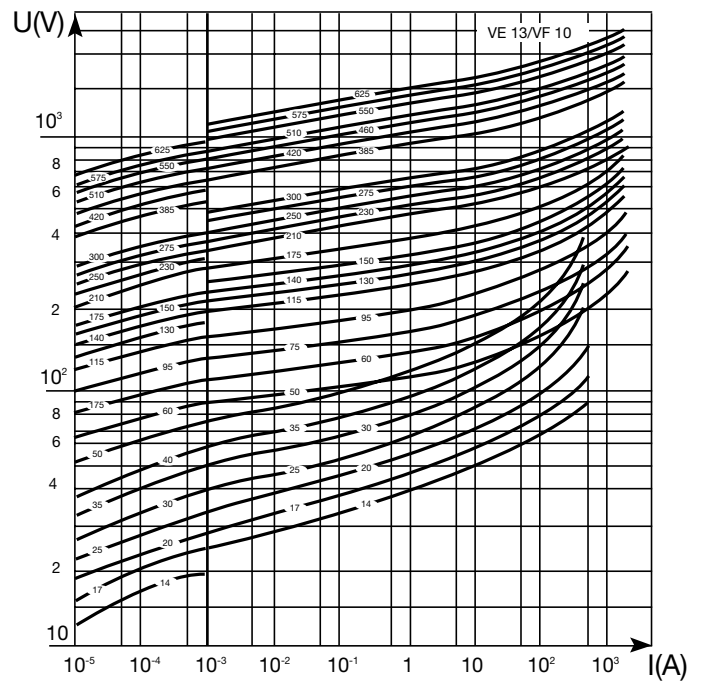
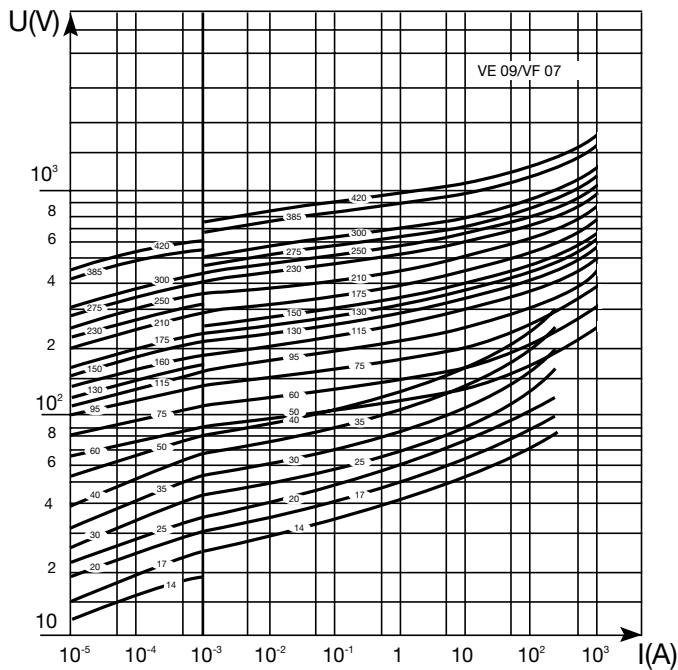
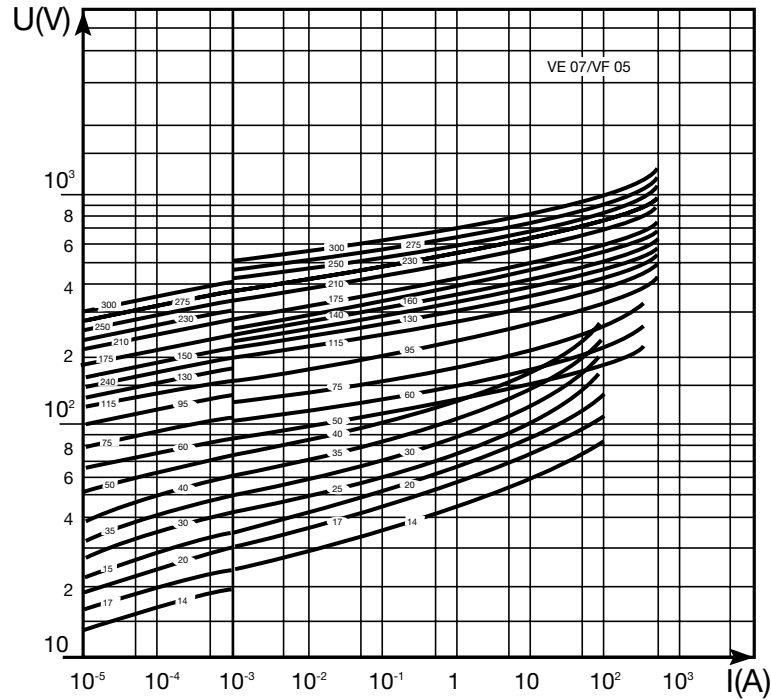


Electrical Characteristics VE / VF Types

VOLTAGE-CURRENT CHARACTERISTICS

V/I characteristics give:

- for I below 1 mA the maximum leakage current under V_{dc}
- for I above 1 mA the maximum clamping voltage

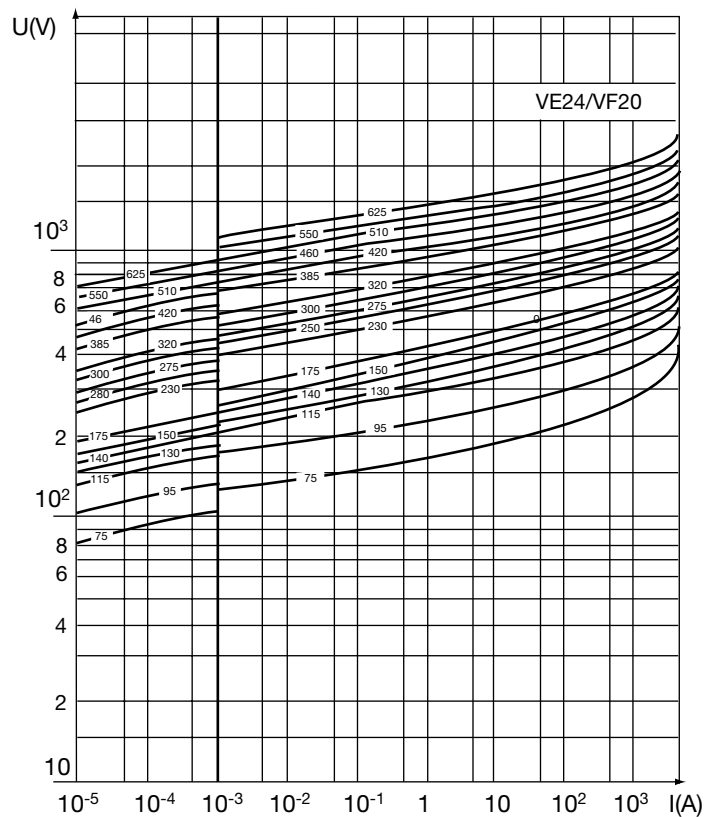
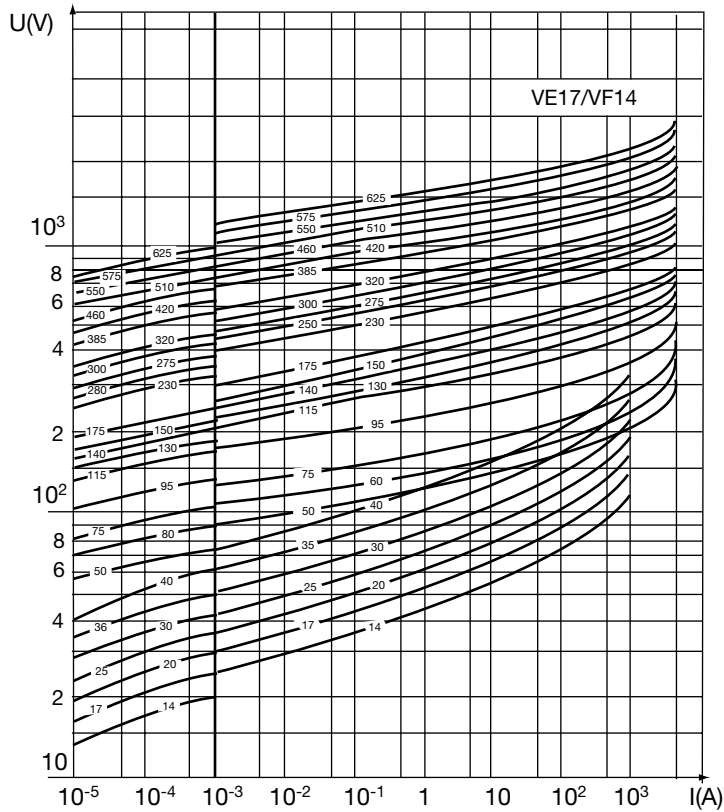


Zinc Oxide Varistors



Electrical Characteristics VE / VF Types

VOLTAGE-CURRENT CHARACTERISTICS

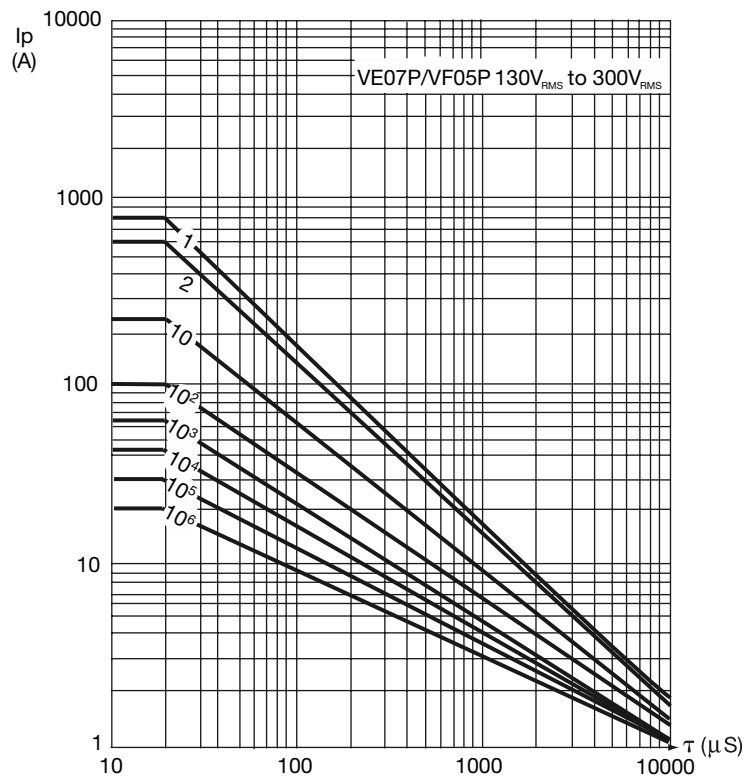
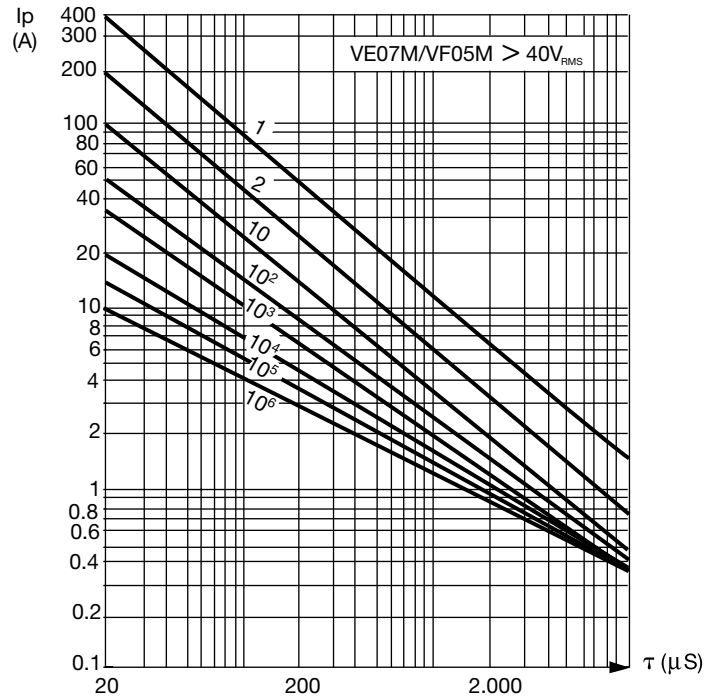
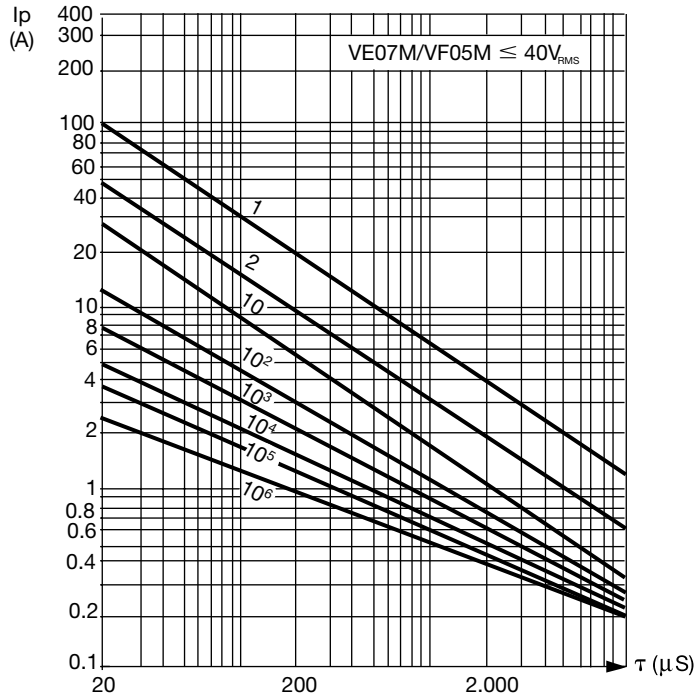


Zinc Oxide Varistors



Electrical Characteristics VE / VF Types

MAXIMUM SURGE CURRENT (I_p) DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY

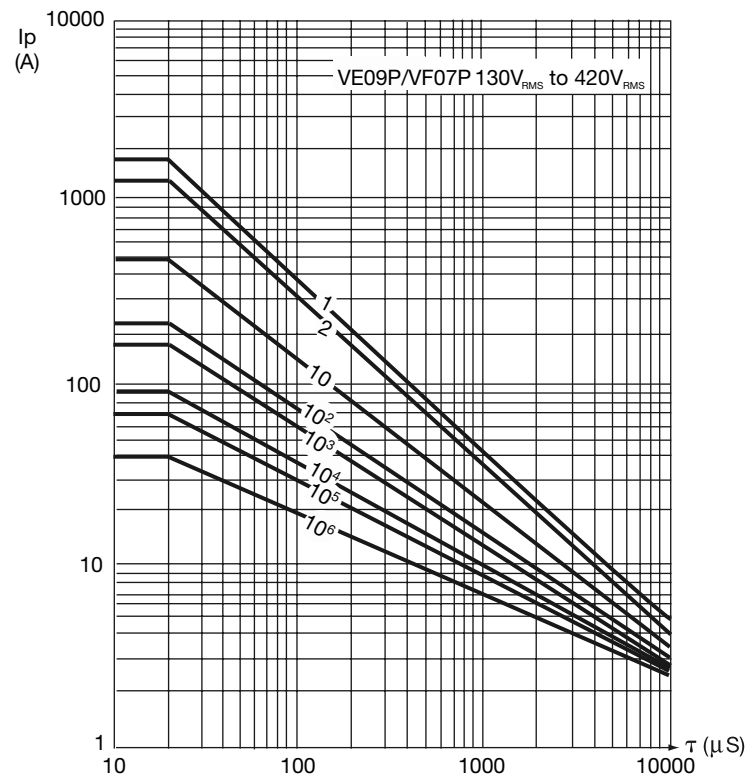
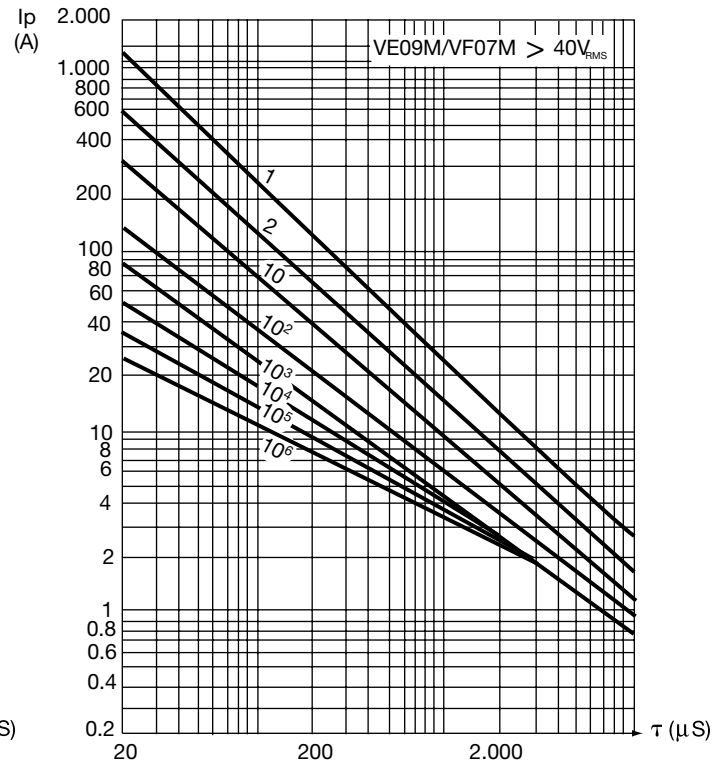
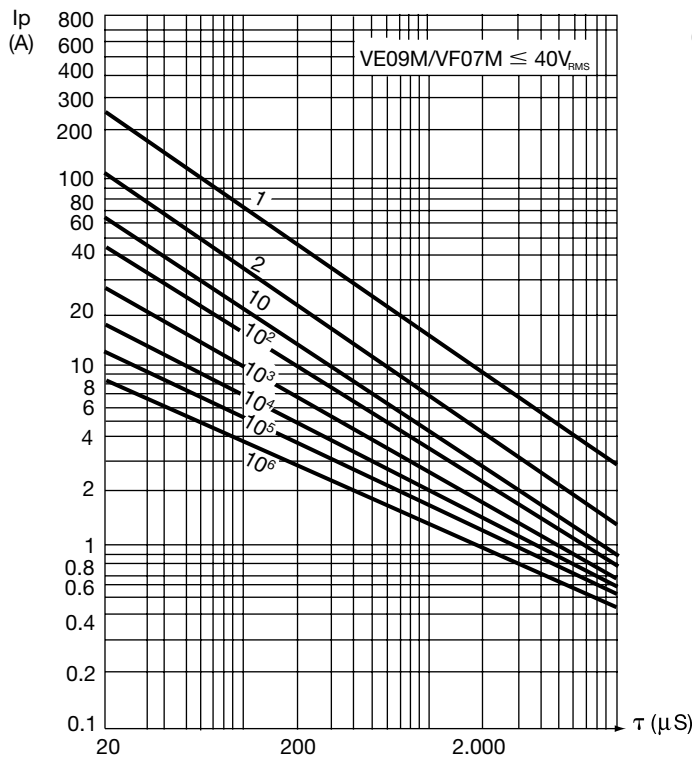


Zinc Oxide Varistors



Electrical Characteristics VE / VF Types

MAXIMUM SURGE CURRENT (I_p) DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY

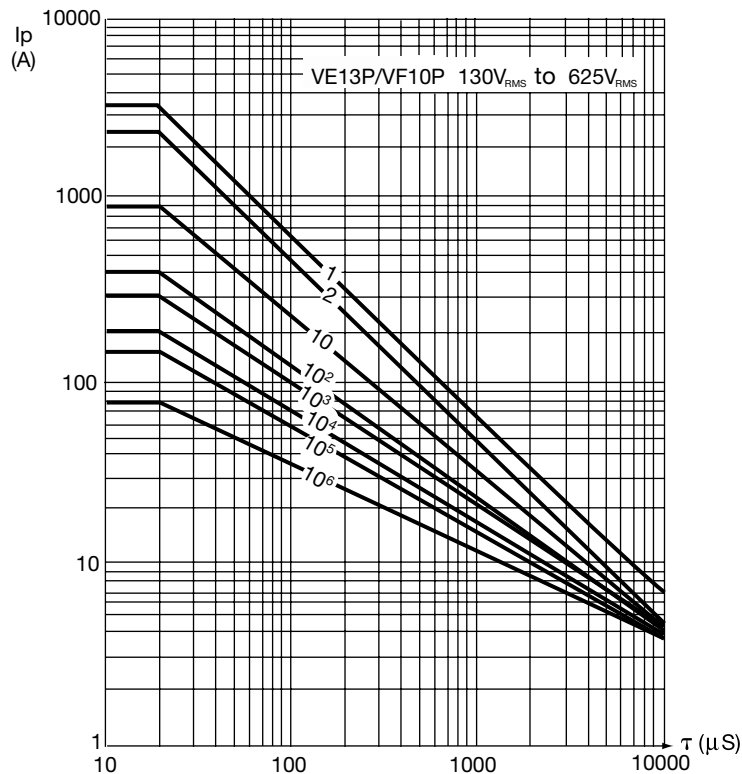
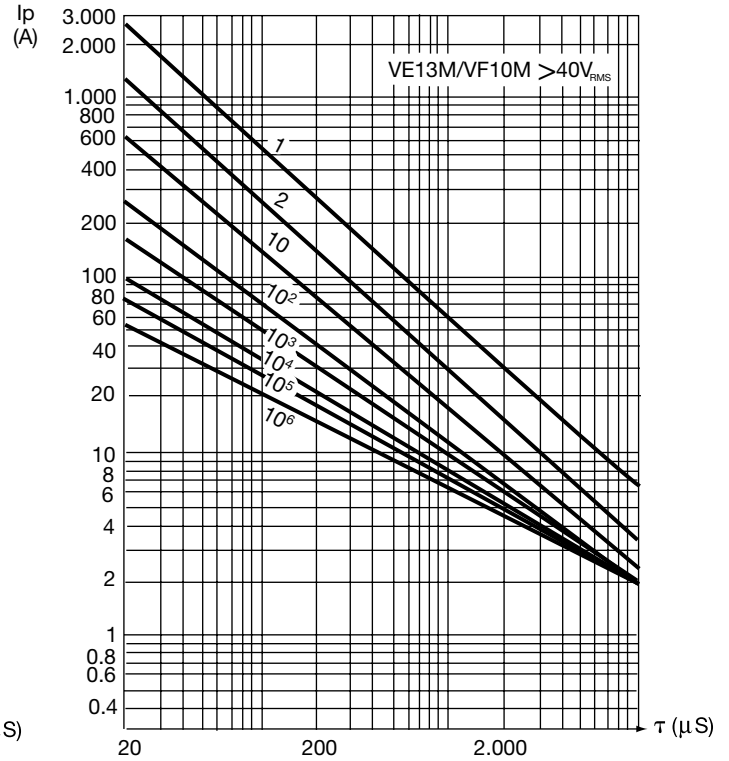
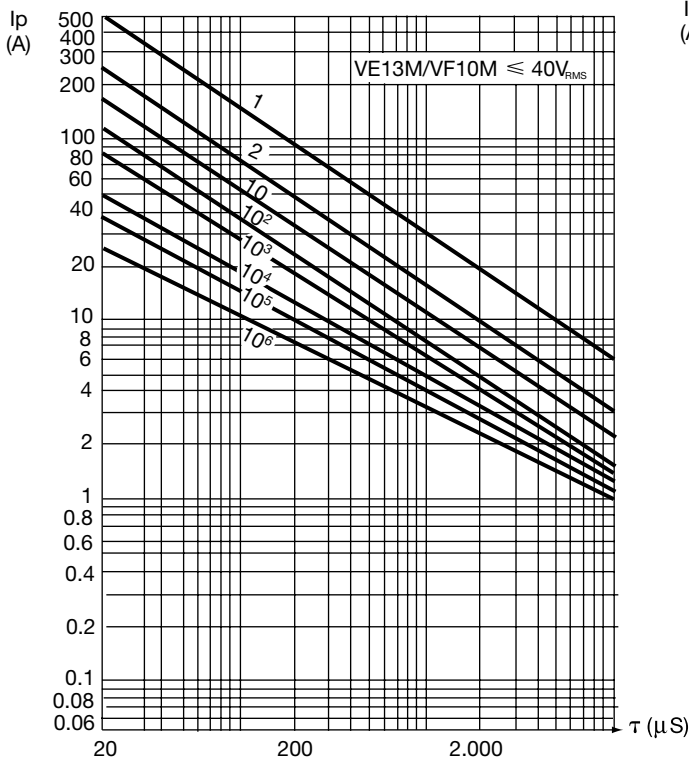


Zinc Oxide Varistors

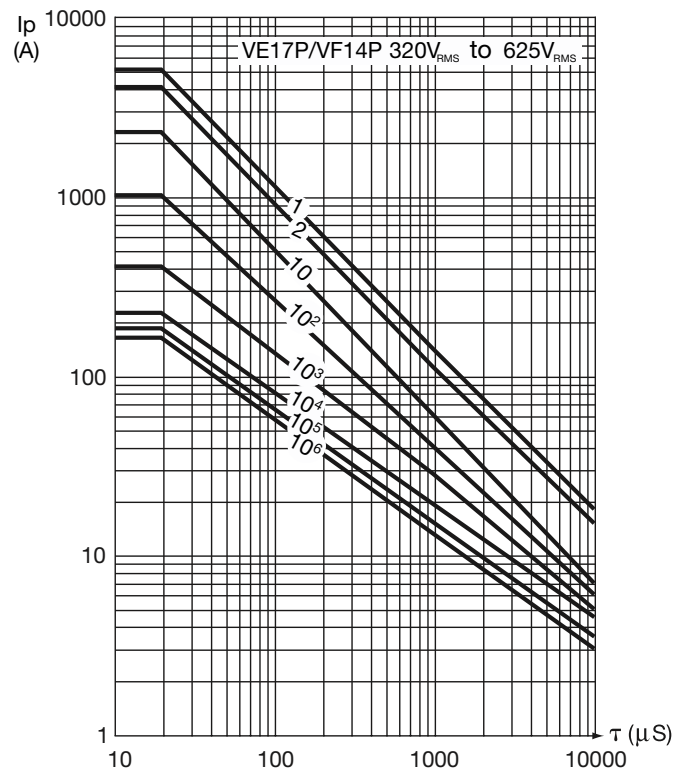
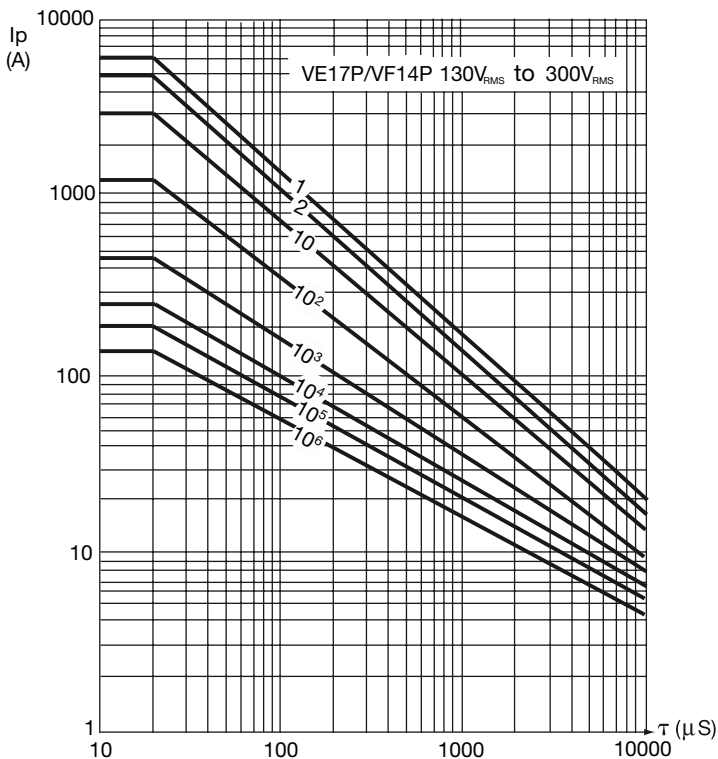
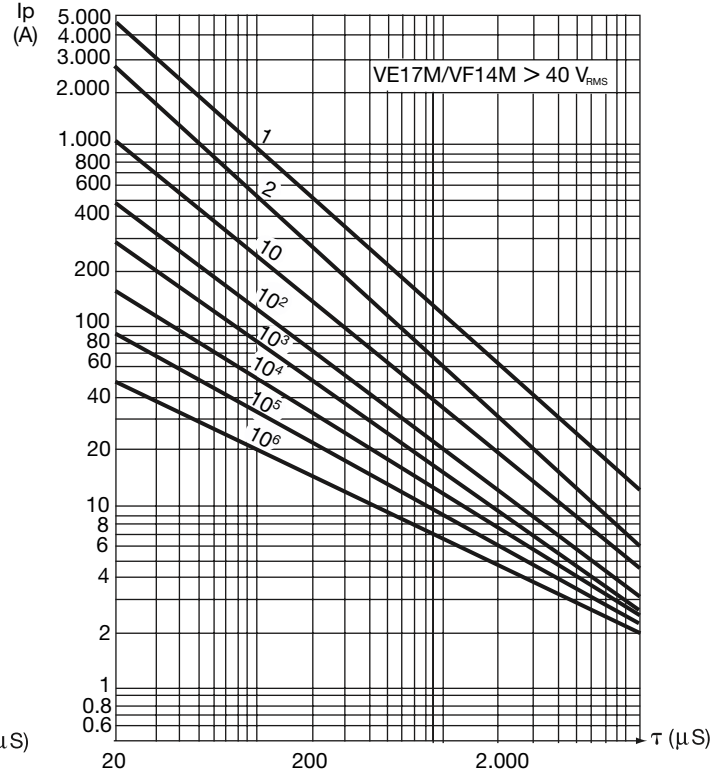
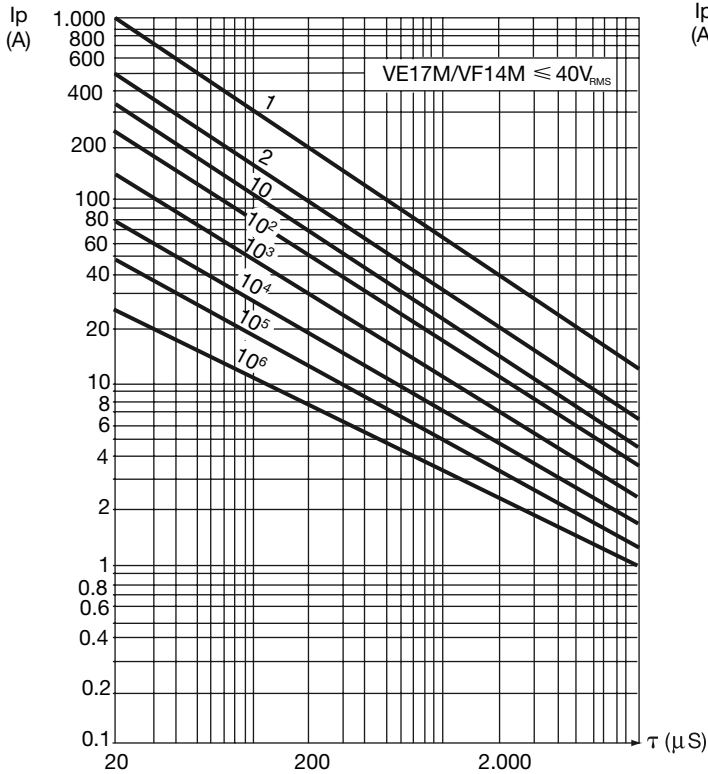


Electrical Characteristics VE / VF Types

MAXIMUM SURGE CURRENT (I_p) DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY



MAXIMUM SURGE CURRENT (I_p) DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY



MAXIMUM SURGE CURRENT (I_p) DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY

