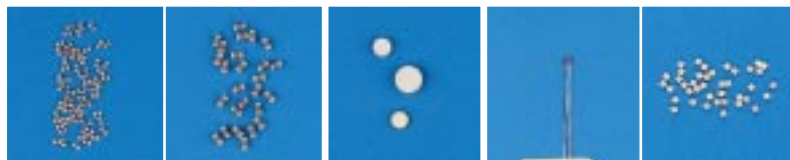


NTC THERMISTORS



DESCRIPTION		CHIPS		LEADLESS DISCS	LEADED CHIPS																																																																						
Type/Size		NC12	NC20	NN..•NR..	NJ28	NK20																																																																					
Climatic category Operating temperature range		40/125/56 -55 +150°C																																																																									
		Dmax/L Hmax/l E/tmin d/e (mm)	2,00 ± 0,3 3,2 ± 0,4 1,25 ± 0,2 1,6 ± 0,2 0,2 0,2 0,90 ± 0,4 1,0 ± 0,5	3,2 ± 0,4 1,6 ± 0,2 0,2 0,2 1,0 ± 0,5	diameter 3,5 to 10 mm thickness 0,5 to 2,5 mm	2,8 3 0,4	1,75 ± 0,25 1,75 ± 0,25 0,7 ± 0,25																																																																				
Tolerance on R25°C		(%)	5 - 10 - 20	5 - 10 - 20		1 - 2 - 3	1 - 2 - 3																																																																				
Dissipation factor		(mW/°C)	2	4		3	2																																																																				
Time constant		(s)	5	7		8	6																																																																				
Nominal resistance at 25°C (R_{25°C}) <div style="display: flex; align-items: flex-start;"> <table border="1" style="margin-right: 10px;"> <thead> <tr> <th>Matériau</th> <th>B(K)</th> <th>Δ B/B (%)</th> </tr> </thead> <tbody> <tr><td>F</td><td>2800</td><td>5</td></tr> <tr><td>G</td><td>3030</td><td>5</td></tr> <tr><td>H</td><td>3160</td><td>5</td></tr> <tr><td>I</td><td>3340</td><td>5</td></tr> <tr><td>J</td><td>3480</td><td>5</td></tr> <tr><td>KC</td><td>3470</td><td>5</td></tr> <tr><td>K</td><td>3630</td><td>5</td></tr> <tr><td>KA</td><td>3625</td><td>1</td></tr> <tr><td>L</td><td>3790</td><td>3</td></tr> <tr><td>MC</td><td>3910</td><td>5</td></tr> <tr><td>M</td><td>3950</td><td>3</td></tr> <tr><td>MA</td><td>3960</td><td>0,5</td></tr> <tr><td>N</td><td>4080</td><td>3</td></tr> <tr><td>NA</td><td>4100</td><td>1</td></tr> <tr><td>P</td><td>4220</td><td>3</td></tr> <tr><td>PA</td><td>4235</td><td>1</td></tr> <tr><td>Q</td><td>4300</td><td>3</td></tr> <tr><td>QA</td><td>4250</td><td>1</td></tr> <tr><td>R</td><td>4400</td><td>3</td></tr> <tr><td>RA</td><td>4380</td><td>1</td></tr> <tr><td>S</td><td>4520</td><td>3</td></tr> <tr><td>T</td><td>4630</td><td>3</td></tr> </tbody> </table> <div style="margin-left: 10px;"> <p>1 Ohm</p> <p>1,5</p> <p>2,2</p> <p>3,3</p> <p>4,7</p> <p>6,8</p> <hr/> <p>10</p> <p>15</p> <p>22</p> <p>33</p> <p>47</p> <p>68</p> <hr/> <p>100</p> <p>150</p> <p>220</p> <p>330</p> <p>470</p> <p>680</p> <hr/> <p>1 KOhm</p> <p>1,5</p> <p>2,2</p> <p>3,3</p> <p>4,7</p> <p>6,8</p> <hr/> <p>10</p> <p>15</p> <p>22</p> <p>33</p> <p>47</p> <p>68</p> <hr/> <p>100</p> <p>150</p> <p>220</p> <p>330</p> <p>470</p> <p>680</p> <hr/> <p>1 MOhm</p> </div> </div>		Matériau	B(K)	Δ B/B (%)	F	2800	5	G	3030	5	H	3160	5	I	3340	5	J	3480	5	KC	3470	5	K	3630	5	KA	3625	1	L	3790	3	MC	3910	5	M	3950	3	MA	3960	0,5	N	4080	3	NA	4100	1	P	4220	3	PA	4235	1	Q	4300	3	QA	4250	1	R	4400	3	RA	4380	1	S	4520	3	T	4630	3					
Matériau	B(K)	Δ B/B (%)																																																																									
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L	3790	3																																																																									
MC	3910	5																																																																									
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<ul style="list-style-type: none"> • NFC 93-271 approved : NV06, NV09 types list GAM-T1 : NV03, NV06, NV09, NV21, NC12, NC20 list LNZ : NV06, NV09, NV21 		The leaded discs exist in different types : ND : coated with phenolic resin • NE : coated with epoxy NV : varnished • NS : uncoated																																																																									

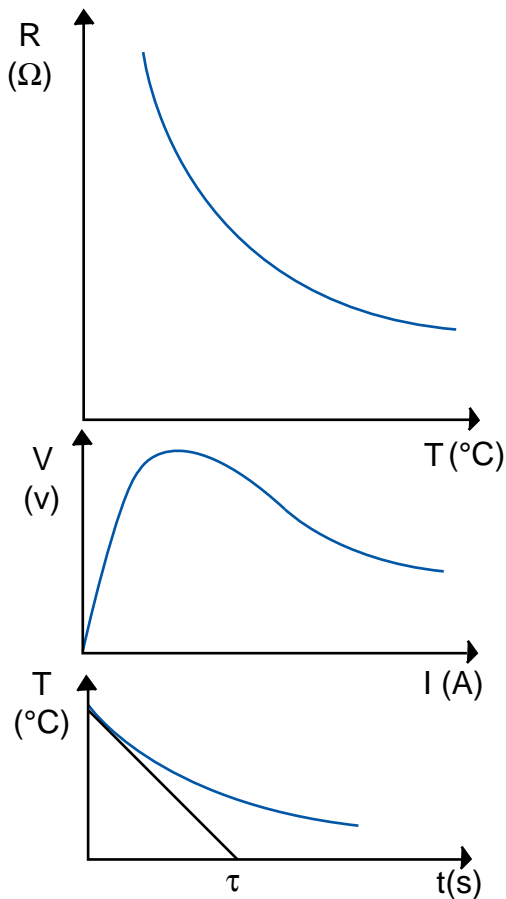
NTC THERMISTORS



INSUL. METAL CASE	LEADED DISCS						RINGS			
	NM06	ND03	ND06	ND09	ND15	ND17	NV21	NA19•NL19	NA57•NL57	
	40/085/56 -55 +150°C						-25 +200°C			
	10 12,6 3,5 0,6	3,5 3 2,54 0,5	6 3 5,08 0,6	9,5 3 5,08 0,6	15 3 7,62 0,8	21 3 7,62 0,8	22 0,8	see detailed specifications		
	10 - 20	5 - 10 - 20	5 - 10 - 20	5 - 10 - 20	25	25	5 - 10 - 20	10 - 20	10 - 20	
	8/20	5 10	7,1 22	9 30	15 75	18 150	20 90	30 (NA) 300 (NA)	100 (NA) 900 (NA)	
1 □										
1,5										
2,2										
3,3										
4,7										
6,8										
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- Temperature measurement, alarm, control and regulation.
- Temperature compensation of resistance of positive temperature coefficient components.
- Liquid level detection, fluid flow measurement.
- Relay time delay. Protection against current overload at power supply switching.

NTC THERMISTORS



TEMPERATURE-RESISTANCE CHARACTERISTIC

R(t)

- Nominal resistance at 25°C R_{25°C}
- Resistance at the temperature T displayed by the ratio $R_T/R_{25°C}$
- Sensibility index defined with the relation $R_2 = R_1 \exp B (1/T_2 - 1/T_1)$ B
- Temperature coefficient $\alpha = -2$ to -8 % /°C and is calculated as : α
 $\alpha = (1/R) \cdot (dR/dT) = -B/T^2$
- Tolerance on the resistance nominal $\Delta R_{25}/R_{25} = 1, 2, 5, 10, 20, 25$ % according to types $\Delta R/R$
at other temperatures : $\Delta R_2/R_2 = \Delta R_1/R_1 + (1/T_2 - 1/T_1) \Delta B$

CURRENT-VOLTAGE CHARACTERISTIC

V(I)

- Dissipation factor (mW/°C) δ
- Maximum temperature and power T_{max}, P_{max}
- Calorific capacity H

TIME-TEMPERATURE CHARACTERISTIC

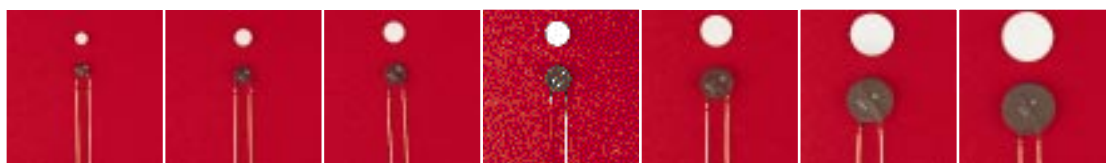
T(t)

- Time constant defined by $\tau = H/\delta$ τ

CODIFICATION • HOW TO ORDER

	PE	08	N	N	0250	X	--	
Codification	Type	Size	Class/Material	Voltage	Value	Tolerance	Suffix	
Varistors	VE VF	07 09 13 17 24	Class M only	VE/VN/VB Types Code : 0	VE/VN/VB Types Vrms in EIA code	K : ± 10 %	-- Bulk	
	VN/VB	32		VF Type Code : 1	VF Type V1 ma in EIA code			
PTC	PE PG PS PV	04 06 08 10 12 16 20	Switching temperature (°C)	B 30 V G 130 V N 265 V	Resistance value R _{25°C} in EIA code	M : ± 20 % X : ± 25 %	BA Chips taping C. 2.54 taping	
	NTC	NC	12 20	Material F according to sensibility index U B	Not Used	Resistance value R _{25°C} in EIA code	F : ± 1 %	D. 5.08 taping
		NJ/NK	28/20				G : ± 2 %	E. 7.62 taping
		NM	06				J : ± 5 %	See detailed specification
		ND	03				K : ± 10 %	
NS		06	M : ± 20 %					
NV		09	X : ± 25 %					
NE	15 17							
NV	21							
NA/NL	19 57							

PTC THERMISTORS



Type/Size	PE04•PG04	PE06•PG06	PE08•PG08	PE10•PG10	PE12•PG12	PE16•PG16	PE20•PG20
Dmax (mm)	5,3	7,2	9	11	13	17,5	22
E (mm)	5	5	5	5	7,6	7,6	7,6
d (mm)	0,6	0,6	0,6	0,6	0,8	0,8	0,8
Amax*	4,8	6,5	8,2	10,2	12,5	16,5	21
Bmax*	3,5	3,5	3,5	3,5	3,5	4	4
Maximum overload current (A)	0,25/1,5	0,50/2,0	0,9/3,0	1,5/4,3	2,2/5,5	3,5/8,0	5,0/11,0
Residual current (mA)	5,0/40	5,0/50	6,0/60	7,0/70	8,0/80	12,0/100	16/30

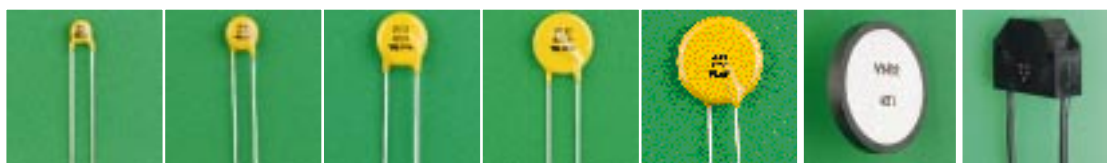
Product range	PE..PB....X.. PG..PB....X..	PE..MG....X.. PG..MG....X..	PE..JN....X.. PG..JN....X..	PE..NN....X.. PG..NN....X..	PE..-....X.. PG..-....X..
Maximum operating voltage		30V	130V	265V	265V
Switching temperature		130°C	110°C	80°C	120°C
Non-tripping current (I _{nt}) and tripping current (I _t)	mA	I _{nt} I _t	I _{nt} I _t	I _{nt} I _t	I _{nt} I _t
Nominal resistance at 25°C (R25°C) <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Size 04 06 08 10 12 16 20 </div>	220 Ohms				35 70
	150			28 56	45 90
	120				52 104
	100		45 90		58 116
	70		50 100	40 80	65 130
	68				65 130
	55		60 120		80 160
	47				85 170
	45				85 170
	35		75 150		90 180
	33				90 180
	25		95 190	75 150	100 200
	22				105 210
	15		125 250	110 220	135 270
	13	125 250			
	10		170 340	150 300	225 450
	7,0		210 420		
	6,8				300 600
	6,0	220 440		200 400	310 620
	4,7				400 800
4,5		280 560			
4,0	300 600				
3,7			300 600	460 920	
3,0		400 800			
2,5	400 800				
1,8	500 1000	650 1300			
1,1	800 1600				

Products defined according to customers specifications with I_{nt}, I_t, ... or with n values of resistance at n temperatures

- Detailed specifications : see catalogue SPC 858
- PE types : with leads and coated
- PG types : discs without leads
- * Amax : max. diameter - PG types
- Bmax : max. thickness - PG types

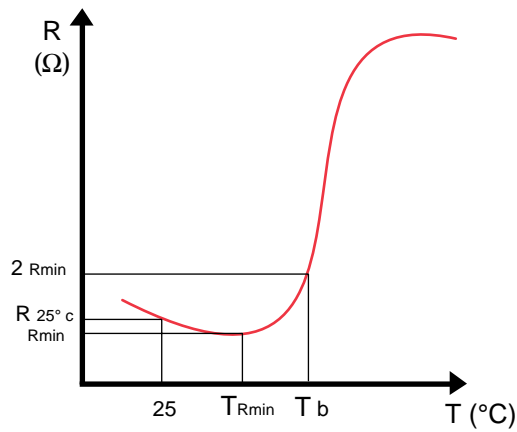
- MAIN APPLICATIONS :**
- Serial protection against current and voltage overload
 - Abnormal temperature rise detection
 - Heating elements
 - Relay time delay, soft-starting of induction motors,...

VARISTORS



Type/Size	VE07	VE09	VE13	VE17	VE24	VN32	VB32
Maximum admissible temperatures	storage : maximum working surface : maximum operating :				-40 +125°C + 85°C + 115°C		
Physical characteristics	response time :				< 25 ns		
	voltage temperature coefficient :				IKI < 0,09%/°C		
	Dmax Hmax E d (mm)	7 10 5,08 0,6	9 12 5,08 0,6	13 16 7,62 0,8	17 20 7,62 0,8	24 27 7,62 0,8	33,5 44 40
Clamping current I_c under 1 pulse 8*20µs	V _{ms} < 40V	1	2,5	5	10		
	V _{ms} > 40V	5	10	25	50	100	2500
Permissible peak current I_p for two surges 8*20µs	V _{ms} < 40V	50	125	250	500		
	V _{ms} > 40V	200	600	1250	2500	4000	14000
Nominal voltages (V)	VE07	VE09	VE13	VE17	VE24	VN32	VB32
V_{rms} V_{dc} V_{1ma} V_c ± 10% max	Admissible energy (J) with 1 surge 10*1000 µs						
17	22	27	53	0,5	1,1	2,5	
20	26	33	65	0,6	1,3	3,1	
25	31	39	77	0,7	1,6	3,7	7
30	38	47	93	0,9	2	4,4	9
35	45	56	110	1,1	2,5	5,4	10
40	56	68	135	1,3	3,0	8,4	13
50	65	82	135	1,8	4,2	8,4	15
60	80	100	165	2,2	4,8	10	17
75	100	120	200	2,5	5,9	12	20
95	125	150	250	3,4	7,6	15	25
115	150	180	300	3,6	8,4	18	30
130	170	205	340	4,2	9,5	19	34
140	180	220	360	4,5	10	22	36
150	200	240	400	4,9	11	24	40
175	225	270	445	5,6	13	28	46
210	275	330	545	7,2	15	31	54
230	300	360	595	7,2	17	36	60
250	320	390	645	8,2	19	38	65
275	350	430	710	8,6	21	43	71
300	385	470	775		25	45	80
320	420	510	840		25	45	82
350	460	560	910		25	45	85
385	505	620	1025		25	45	88
420	560	680	1120		25	45	90
440	585	715	1180			45	95
460	615	750	1240			45	100
510	670	820	1350			55	110
550	715	860	1420			57	113
575	730	910	1500			60	120
625	825	1000	1650			68	130
<ul style="list-style-type: none"> • Most of VE and VF type varistors are "UL" et "CSA" approved • Detailed specifications : see catalogue SPC 861 • Tape and reel available on 	MAIN APPLICATIONS : Parallel protection against voltage overload of equipment submitted to electrical surges (circuit commutation, variation of the power supply network, lightning effects, ...) For VN32/VB32 types, protection of low voltage networks against voltage overload and lightning effects.						

PTC THERMISTORS



TEMPERATURE-RESISTANCE CHARACTERISTIC

- Nominal resistance at 25°C
- Minimal resistance
- Switching temperature
temperature where $R_b = 2R_{min}$

$R(t)$

$R_{25^\circ C}$

R_{min}

T_b

VOLTAGE-CURRENT CHARACTERISTIC

- Maximum operating voltage
- Non-tripping current
if $I < I_{nt}$, PTC cannot switch
- Tripping current
if $I > I_t$, PTC switches
- Maximum overload current
 I to be limited at I_{mo} with a series resistance R_s
- Residual current
 I_{res} in protection state

$I(V)$

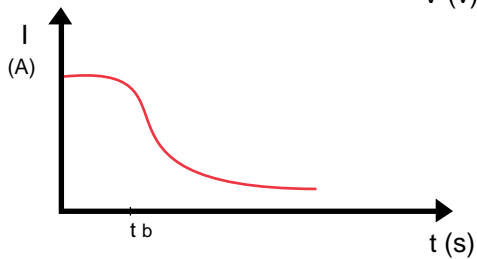
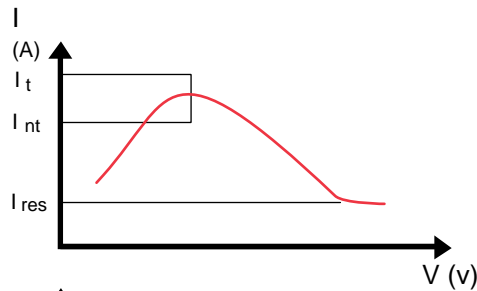
U_{max}

I_{nt}

I_t

I_{mo}

I_{res}



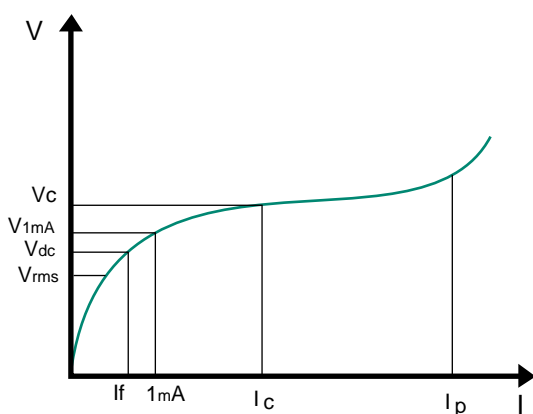
TIME-CURRENT CHARACTERISTIC

- Switching time

$I(t)$

t_b

VARISTORS



CURRENT-VOLTAGE CHARACTERISTIC

- Maximum operating voltage
alternative current
direct current
under this voltage, the leakage current I_f does not affect the circuit to protect
- Nominal voltage under 1 mA,
with a 10% tolerance
- Maximum clamping voltage for a $8 \times 20 \mu s$ pulse
with a maximum peak current I_c
 V_c is an indication of
the protective capability of the varistor

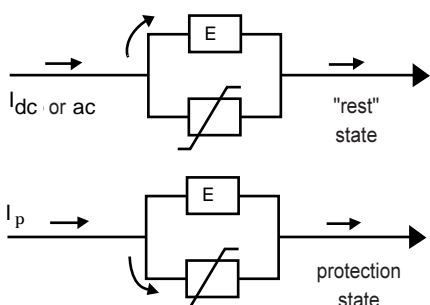
$V(i)$

V_{rms}

V_{dc}

V_{1mA}

V_c



PERMISSIBLE ENERGY

- Permissible peak current for 2 surges $8 \times 20 \mu s$
and generating $\Delta V_{1mA} / V_{1mA} < 10\%$
- Permissible energy for 1 surge $10 \times 1000 \mu s$
transitory energy that the varistor can absorb

I_p

E

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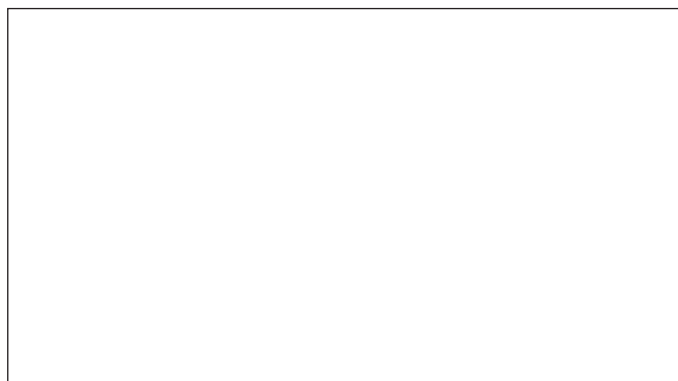
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are subject to change without notice"*