KOA SPEER ELECTRONICS, INC.

EU RoHS COMPLIANT

spec sheet

SS-237 R5
AHA 8/22/12

Surface Mount Metal Oxide Varistors
NV73 Type

ISO 9001:2008 CERTIFIED
TS-16949 CERTIFIED

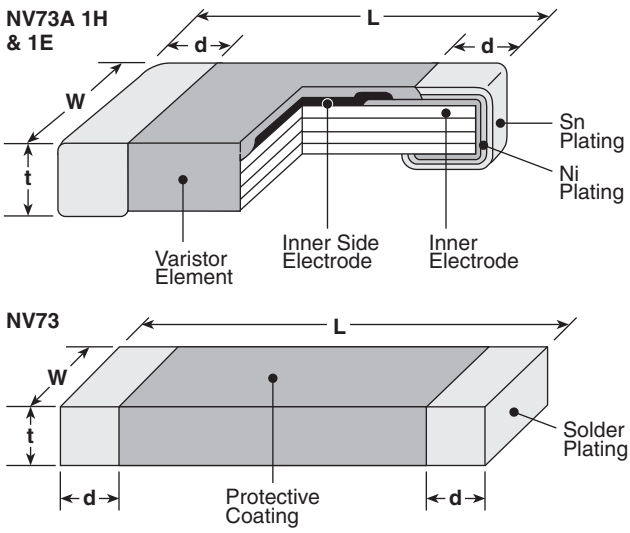
1. General

- Multilayer structure
- High surge current
- Protector against static electricity, switching and incoming surges
- Products with lead-free terminations meet EU-RoHS requirements. Pb located in glass material, electrode and resistor element is exempt per Annex 1, exemption 5 of EU directive 2005/95/EC

2. Features

- Chip type structure suitable for surface mount
- Compact package with large withstanding surge capability
- Symmetrical V-I characteristics make surge absorption possible in either direction

3. Dimensions



Type (Inch Size Code)	Dimensions inches (mm) L	W	t	d
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.012±.001 (0.3±0.03)	.004 min. (0.1 min.)
1E (0402)	.023±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.023 max. (0.6 max.)	.01±.006 (0.25±0.15)
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.016 $^{+.006}_{-.008}$ (0.4 $^{+0.15}_{-0.2}$)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.051 max. (1.3 max.)	.02±.010 (0.5±0.25)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.065 max. (1.65 max.)	.02 $^{+.014}_{-.010}$ (0.5 $^{+0.35}_{-0.25}$)
2E (1210)	.126±.008 (3.2±0.2)	.098±.008 (2.5±0.2)	.059 max. (1.5 max.)	.020±.008 (0.5±0.2)
2J (1812)	.177±.008 (4.5±0.2)	.126±.008 (3.2±0.2)	.079 max. (2.0 max.)	.020 $^{+.001}_{-.004}$ (0.5 $^{+0.3}_{-0.1}$)
2L (2220)	.224±.008 (5.7±0.2)	.197±.008 (5.0±0.2)	.098 max. (2.5 max.)	.020 $^{+.001}_{-.004}$ (0.5 $^{+0.3}_{-0.1}$)

4. Ordering and Specifying Information

NV73	A	L	1J	T	TE	8R2
Type	Energy Code	Capacitance Type	Size	Termination Material	Packaging	Varistor Voltage
	A B C	L: Low Capacitance (1E only)	1H: 0201 1E: 0402 1J: 0603 2A: 0805 2B: 1206 2E: 1210 2J: 1812 2L: 2220	T: Sn	TBM: 2mm press paper (1H: 15,000 pieces/reel) TP: 2mm pitch paper (1E: 10,000 pieces/reel) TE: 7" embossed plastic (1J, 2A, 2B: 2,500 pieces/reel; 2J, 2L: 1,000 pieces/reel 2E: 2,000 pieces/reel)	8.2V 8R2 18V 18 "R" indicates decimal on value <10Ω

Bolivar Drive ■ P.O. Box 547 ■ Bradford, PA 16701 ■ USA ■ 814-362-5536 ■ Fax 814-362-8883 ■ www.koaspeer.com

5. Standard Applications

Part Designation	Reference Varistor Voltage @ 1mA nom. (Range) Vc	Clamping Voltage V_P	I_P	Maximum Peak Current I_P (A) @ 8/20 microsecond (2 pulses)	Maximum Energy E (J)	Maximum Allowable Voltage a.c rms (V)	Maximum Allowable Voltage d.c (V)	Operating Temp. T_{opt} (°C)	Storage Temp. T_{stg} (°C)
NV73A1HTTBM12	12 (10 - 15.6)	35	—	1	0.01	—	6.5	-40°C to +85°C	-40°C to +125°C
NV73A1ETTP8	8 (6.4 - 9.6)	20		20	0.05	4.2	5.5		
NV73A1ETTP18	18 (16.2 - 19.8)	35				6.1	14.0		
NV73AL1ETTP12	12 (10 - 14)	30		5	0.03	7.6	5.5		
NV73AL1ETTP21	21 (18 - 24)	50				9.1	14.0		
NV73AL1ETTP28	28 (24 - 32)	65		2	0.005	10.6	18.0		
NV73AL1ETTP120	120 (90 - 150)	350 (1C=0.5A)		0.5		12.0			
NV73A1JTTE8R2	8.2 (6.8 - 9.8)	21	2A	30	0.1	4.2	6.0		
NV73A1JTTE12	12 (10 - 14.4)	29				6.1	8.6		
NV73A1JTTE15	15 (12.5 - 18)	35				7.6	10.8		
NV73A1JTTE18	18 (16 - 20)	37				9.1	12.8		
NV73A1JTTE20	20 (18 - 22)	40				10.6	15.0		
NV73A1JTTE22	22 (19 - 24)	42				12.0	16.5		
NV73A1JTTE24	24 (21.8 - 26.5)	46				14.0	18.0		
NV73A1JTTE27	27 (25 - 32)	49				17.0	22.0		
NV73A2ATTE8R2	8.2 (6.8 - 9.8)	16	1A	10	0.01	4.2	6.0		
NV73A2ATTE12	12 (10 - 14.4)	22		20	0.03	6.1	8.6		
NV73A2ATTE15	15 (12.5 - 18)	27			0.04	7.6	10.8		
NV73A2ATTE18	18 (16 - 20)	29				9.1	12.8		
NV73A2ATTE20	20 (18 - 22)	33			0.05	10.6	15.0		
NV73A2ATTE22	22 (19 - 24)	39				12.0	16.5		
NV73A2ATTE24	24 (21.8 - 26.5)	42			0.06	14.0	18.0		
NV73A2ATTE27	27 (25 - 32)	50			0.07	17.0	22.0		
NV73A2ATTE33	33 (30 - 39)	60			0.12	20.0	26.0		
NV73A2ATTE39	39 (37 - 47)	72		25	0.14	25.0	31.0		
NV73A2ATTE47	47 (45 - 54)	86			0.16	30.0	38.0		
NV73B2ATTE8R2	8.2 (6.8 - 9.8)	18	2A	20	0.03	4.2	6.0		
NV73B2ATTE12	12 (10 - 14.4)	22		35	0.05	6.1	8.6		
NV73B2ATTE15	15 (12.5 - 18)	30			0.07	7.6	10.8		
NV73B2ATTE18	18 (16 - 20)	32			0.08	9.1	12.8		
NV73B2ATTE20	20 (18 - 22)	36			0.09	10.6	15.0		
NV73B2ATTE22	22 (19 - 24)	40			0.11	12.0	16.5		
NV73B2ATTE24	24 (21.8 - 26.5)	42			0.12	14.0	18.0		
NV73B2ATTE27	27 (25 - 32)	58			0.24	17.0	22.0		
NV73B2ATTE33	33 (30 - 39)	66		50	0.25	20.0	26.0		
NV73C2ATTE8R2	8.2 (6.8 - 9.8)	16	2A	25	0.04	4.2	6.0		
NV73C2ATTE12	12 (10 - 14.4)	22		50	0.09	6.1	8.6		
NV73C2ATTE15	15 (12.5 - 18)	28			0.11	7.6	10.8		
NV73C2ATTE18	18 (16 - 20)	32			0.13	9.1	12.8		
NV73C2ATTE20	20 (18 - 22)	35			0.14	10.6	15.0		
NV73C2ATTE22	22 (19 - 24)	40			0.17	12.0	16.5		
NV73C2ATTE24	24 (21.8 - 26.5)	42			0.18	14.0	18.0		
NV73A2BTTE27	27 (25 - 32)	55	2A	40	0.13	17.0	22.0		
NV73A2BTTE33	33 (30 - 39)	60			0.15	20.0	26.0		
NV73A2BTTE39	39 (37 - 47)	72			0.18	25.0	31.0		
NV73A2BTTE47	47 (45 - 54)	85			0.22	30.0	38.0		
NV73A2BTTE56	56 (52 - 62)	100			0.26	35.0	45.0		

Bolivar Drive ■ P.O. Box 547 ■ Bradford, PA 16701 ■ USA ■ 814-362-5536 ■ Fax 814-362-8883 ■ www.koaspeer.com

5. Standard Applications (continued)

Part Designation	Reference Varistor Voltage @ 1mA nom. (Range) Vc	Clamping Voltage V_P	I_P	Maximum Peak Current I_P (A) @ 8/20 microsecond (2 pulses)	Maximum Energy E (J)	Maximum Allowable Voltage a.c rms (V)	Maximum Allowable Voltage d.c (V)	Operating Temp. T_{opt} (°C)	Storage Temp. T_{stg} (°C)
NV73B2BTTE8R2	8.2 (6.8 - 9.8)	16	2A	30	0.03	4.2	6.0	-40°C to +85°C	-40°C to +125°C
NV73B2BTTE12	12 (10 - 14.4)	22		50	0.07	6.1	8.6		
NV73B2BTTE15	15 (12.5 - 18)	28			0.09	7.6	10.8		
NV73B2BTTE18	18 (16 - 20)	32			0.1	9.1	12.8		
NV73B2BTTE20	20 (18 - 22)	35			0.11	10.6	15.0		
NV73B2BTTE22	22 (19 - 24)	40			0.12	12.0	16.5		
NV73B2BTTE24	24 (21.8 - 26.5)	42			0.14	14.0	18.0		
NV73B2BTTE27	27 (25 - 32)	52			0.16	17.0	22.0		
NV73C2BTTE8R2	8.2 (6.8 - 9.8)	15	2A	40	0.06	4.2	6.0		
NV73C2BTTE12	12 (10 - 14.4)	21		70	0.1	6.1	8.6		
NV73C2BTTE15	15 (12.5 - 18)	27			0.13	7.6	10.8		
NV73C2BTTE18	18 (16 - 20)	29			0.15	9.1	12.8		
NV73C2BTTE20	20 (18 - 22)	31			0.17	10.6	15.0		
NV73C2BTTE22	22 (19 - 24)	35			0.19	12.0	16.5		
NV73C2BTTE24	24 (21.8 - 26.5)	38			0.2	14.0	18.0		
NV73C2BTTE27	27 (25 - 32)	48			0.24	17.0	22.0		
NV73A2ETTE15	15 (12.8 - 17.3)	30	—	400	1.0	8.0	11.0	-50°C to +125°C	-50°C to +150°C
NV73A2ETTE18	18 (15.3 - 20.7)	34			1.2	11.0	14.0		
NV73A2ETTE22	22 (19.8 - 24.2)	39			1.4	12.0	16.5		
NV73A2ETTE24	24 (21.6 - 26.4)	39			1.4	14.0	18.0		
NV73A2ETTE27	27 (24.3 - 29.7)	44			1.7	17.0	22.0		
NV73A2ETTE33	33 (29.7 - 36.3)	54			1.9	20.0	26.0		
NV73A2ETTE39	39 (35.1 - 42.9)	65			1.7	25.0	30.0		
NV73A2ETTE47	47 (42.3 - 51.7)	77			2.0	30.0	38.0		
NV73A2ETTE56	56 (50.4 - 61.6)	90			2.0	35.0	45.0		
NV73A2ETTE82	82 (73.8 - 90.2)	135		250	1.2	50.0	65.0		
NV73A2ETTE100	100 (90.0 - 110.0)	165		200	1.4	60.0	85.0		
NV73A2ETTE110	110 (99.0 - 121.0)	180			1.4	70.0	90.0		
NV73A2JTTE12	12 (10.2 - 13.8)	27		500	0.9	6.0	9.0		
NV73A2JTTE15	15 (12.8 - 17.3)	32			1.2	8.0	11.0		
NV73A2JTTE18	18 (16.2 - 19.8)	35			1.4	11.0	14.0		
NV73A2JTTE22	22 (19.8 - 24.2)	41			1.6	12.0	16.5		
NV73A2JTTE24	24 (21.6 - 26.4)	44			1.7	14.0	18.0		
NV73A2JTTE27	27 (24.3 - 29.7)	49			2.0	17.0	22.0		
NV73A2JTTE33	33 (29.7 - 36.3)	54			2.5	20.0	26.0		
NV73A2JTTE39	39 (35.1 - 42.9	65			2.9	25.0	30.0		
NV73A2JTTE47	47 (42.3 - 51.7)	77			3.5	30.0	38.0		
NV73A2JTTE56	56 (50.4 - 61.6	90			4.2	35.0	45.0		
NV73A2JTTE68	68 (61.2 - 74.8)	110			4.8	40.0	56.0		
NV73A2JTTE82	82 (73.8 - 90.2)	135	—	400	4.5	50.0	65.0		
NV73A2JTTE100	100 (90 - 110)	165			5.8	60.0	85.0		
NV73A2JTTE110	110 (99 - 121)	180			5.8	70.0	90.0		
NV73A2JTTE150	150 (135 - 165)	248		300	5.8	95.0	127.0		
NV73B2JTTE15	15 (12.8 - 17.3)	32		800	1.8	8.0	11.0		
NV73B2JTTE18	18 (15.3 - 20.7)	35			1.9	11.0	14.0		
NV73B2JTTE22	22 (19.8 - 24.2)	41			2.3	12.0	16.5		
NV73B2JTTE24	24 (21.6 - 26.4)	44			2.3	14.0	18.0		
NV73B2JTTE27	27 (24.3 - 29.7)	49			2.7	17.0	22.0		
NV73B2JTTE33	33 (29.7 - 36.3)	54			3.0	20.0	26.0		

Bolivar Drive ■ P.O. Box 547 ■ Bradford, PA 16701 ■ USA ■ 814-362-5536 ■ Fax 814-362-8883 ■ www.koaspeer.com

5. Standard Applications (continued)

Part Designation	Reference Varistor Voltage @ 1mA nom. (Range) Vc	Clamping Voltage V_P	I_P	Maximum Peak Current I_P (A) @ 8/20 microsecond (2 pulses)	Maximum Energy E (J)	Maximum Allowable Voltage a.c rms (V)	Maximum Allowable Voltage d.c (V)	Operating Temp. T_{opt} (°C)	Storage Temp. T_{stg} (°C)
NV73B2JTTE39	39 (35.1 - 42.9)	65			3.7	25.0	30.0		
NV73B2JTTE47	47 (42.3 - 51.7)	77		800	4.2	30.0	38.0		
NV73B2JTTE56	56 (50.4 - 61.6)	90			4.2	35.0	45.0		
NV73A2LTTE12	12 (10.2 - 13.8)	28			1.9	6.0	9.0		
NV73A2LTTE15	15 (12.8 - 17.3)	33			2.3	8.0	11.0		
NV73A2LTTE18	18 (16.2 - 19.8)	36			2.7	11.0	14.0		
NV73A2LTTE22	22 (19.8 - 24.2)	41			2.9	12.0	16.5		
NV73A2LTTE24	24 (21.6 - 26.4)	45			3.1	14.0	18.0		
NV73A2LTTE27	27 (24.3 - 29.7)	48			3.8	17.0	22.0		
NV73A2LTTE33	33 (29.7 - 36.3)	57		1000	4.3	20.0	26.0		
NV73A2LTTE39	39 (35.1 - 42.9)	65			5.5	25.0	30.0		
NV73A2LTTE47	47 (42.3 - 51.7)	77			6.3	30.0	38.0	-50°C to +125°C	-50°C to +150°C
NV73A2LTTE56	56 (50.4 - 61.6)	90	—		7.7	35.0	45.0		
NV73A2LTTE68	68 (61.2 - 74.8)	110			8.8	40.0	56.0		
NV73A2LTTE100	100 (90 - 110)	165			6.8	60.0	85.0		
NV73A2LTTE110	110 (99 - 121)	180			6.8	70.0	90.0		
NV73B2LTTE15	15 (12.8 - 17.3)	33			4.2	8.0	11.0		
NV73B2LTTE18	18 (15.3 - 20.7)	36			5.4	11.0	14.0		
NV73B2LTTE22	22 (19.8 - 24.2)	41			5.8	12.0	16.5		
NV73B2LTTE24	24 (21.6 - 26.4)	45			5.8	14.0	18.0		
NV73B2LTTE27	27 (24.3 - 29.7)	48		1200	7.2	17.0	22.0		
NV73B2LTTE33	33 (29.7 - 36.3)	57			7.8	20.0	26.0		
NV73B2LTTE39	39 (35.1 - 42.9)	65			9.6	25.0	30.0		
NV73B2LTTE47	47 (42.3 - 51.7)	77			12.0	30.0	38.0		
NV73B2LTTE56	56 (50.4 - 61.6)	90			7.7	35.0	45.0		
NV73B2LTTE82	82 (73.8 - 90.2)	135		1000	5.6	50.0	65.0		

Maximum allowable voltage - the maximum sinusoidal RMS voltage or maximum DC voltage which can be applied continuously
E: Maximum energy - the maximum energy within the varistor voltage change of ±10% when a single impulse of 2m sec. is applied
I_P: Maximum peak current - the maximum peak current within the varistor voltage change of ±10% when a single standard impulseof 8/20μ sec. is applied two times with an interval of 5 min.
T_{opt}: Operating temperature - Ambient temperature range when the device is operating
T_{stg}: Storage temperature - Temperature range without causing the device any failure

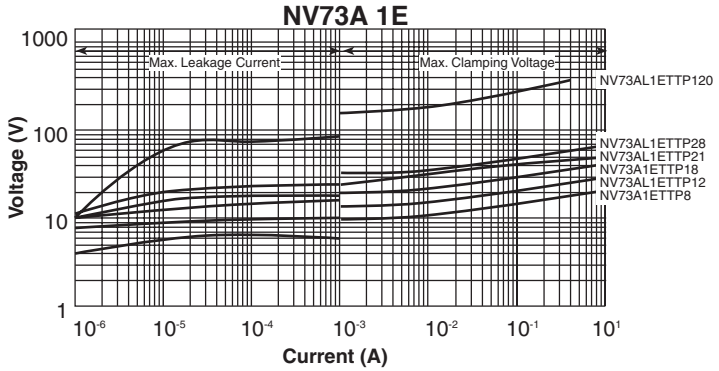
Bolivar Drive ■ P.O. Box 547 ■ Bradford, PA 16701 ■ USA ■ 814-362-5536 ■ Fax 814-362-8883 ■ www.koaspeer.com

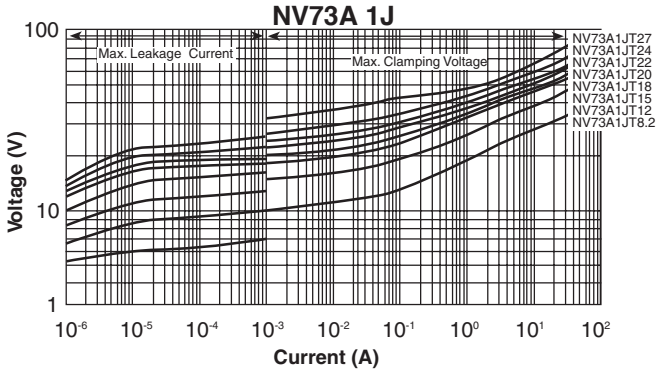
6. Rating Table

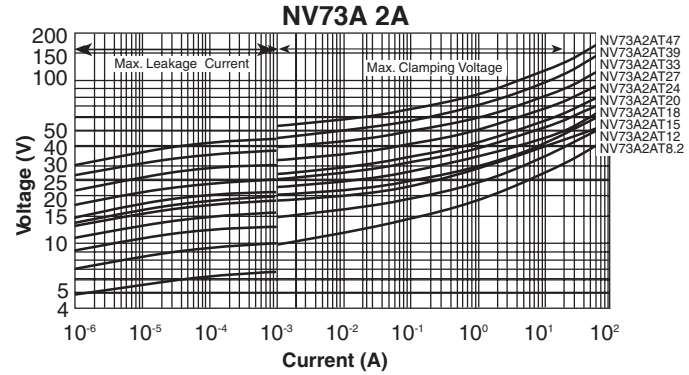
Parameter	Requirement Δ V±%	Test Method
Varistor Voltage	Within specified tolerance	Voltage between terminals when 1mA is flowed
Solderability	95% coverage minimum	230°C ± 5°C, 4 seconds ± 1 second; 235°C ± 5°C, 4 seconds ± 1 second***
Resistance to Solder Heat	±10%	260°C ± 5°C, 10 seconds ± 0.5 second*; 270°C ± 5°C, 3 seconds ± 0.5 second**; 260°C ± 5°C, 4 seconds ± 1 second***
Rapid Change of Temperature	±10%	-40°C (30 minutes), +125°C (30 minutes), 30 cycles; 5 cycles***
Maximum Peak Current	±10%	A single standard impulse of 8/20μ seconds, positive/negative applied once each; A single standard impulse of 8/20μ seconds, 100 pulse, 30 second interval***
Maximum Energy	±10%	A single standard impulse of 10/1000μs, once*; A single standard impulse of 2ms, once**; A single standard impulse of 10/1000μs, 100pluse, 90 second interval***
High Temperature Life with d.c. Bias	±10%	85°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.); 125°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.)***
Low Temperature Life with d.c. Bias***	±10%	-50°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.)
High Temperature Life with a.c. Bias**	±10%	85°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (Va.c.r.m.s.)
High Temperature & High Humidity Life with d.c. Bias	±10%	40°C ± 5°C, 95% RH, 500h, Load: Maximum allowable voltage (d.c.)
Capacitance*	Typical	1kHz: Others, 1MHz: Varistor voltage 120V
High Temperature Storage Life	±10%	125°C ± 5°C, 1000h; 150°C ± 5°C, 1000h***
Low Temperature Storage Life	±10%	-40°C ± 5°C, 1000h; -50°C ± 5°C, 1000h***

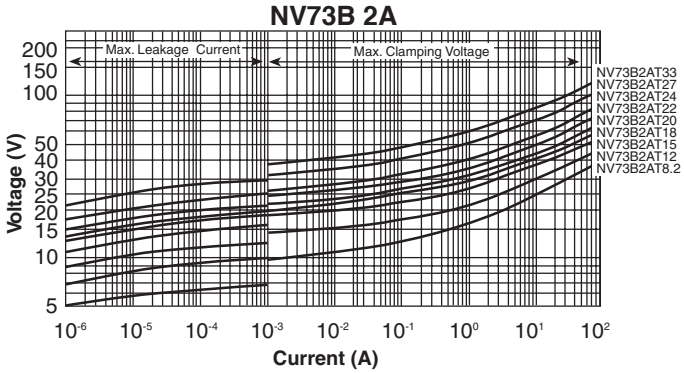
* 1H, 1E ** 1J, 2A, 2B *** 2E, 2J, 2L

7. Voltage-Current Characteristics





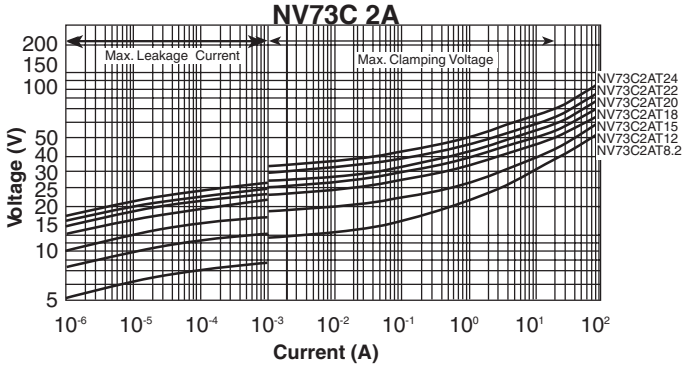




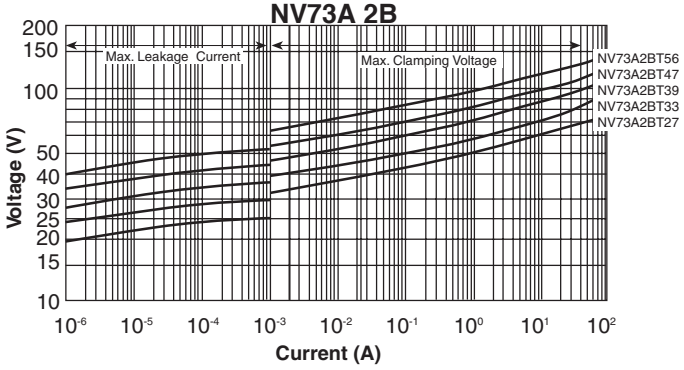
Bolivar Drive ■ P.O. Box 547 ■ Bradford, PA 16701 ■ USA ■ 814-362-5536 ■ Fax 814-362-8883 ■ www.koaspeer.com

7. Voltage-Current Characteristics (continued)

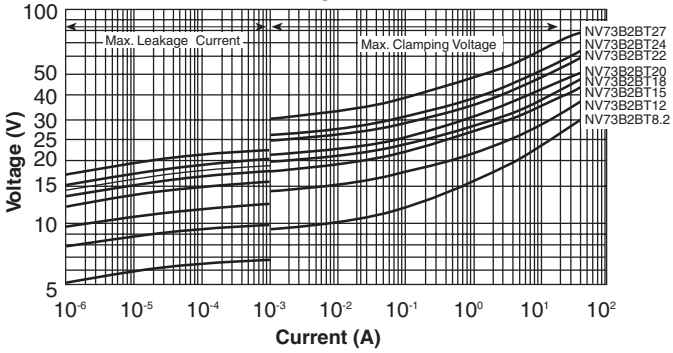
NV73C 2A



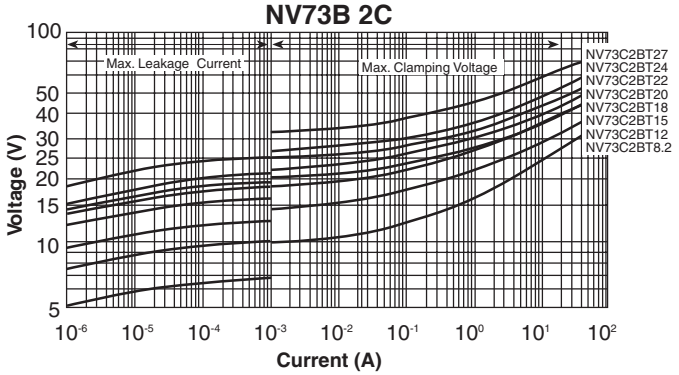
NV73A 2B



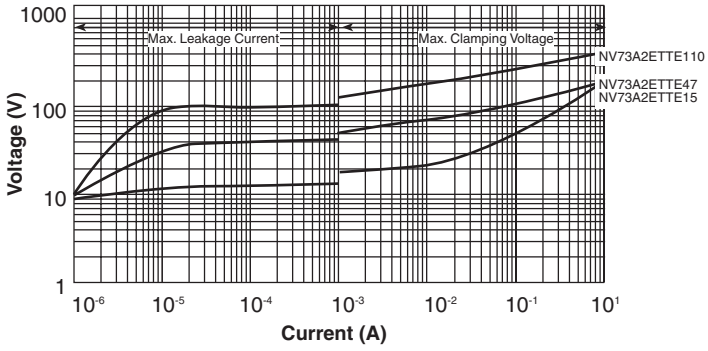
NV73B 2B



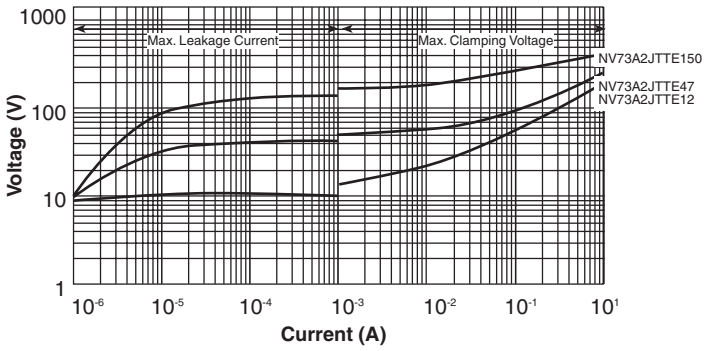
NV73B 2C



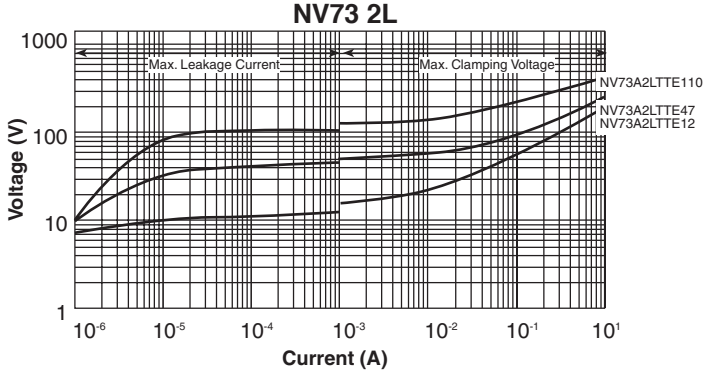
NV73 2E



NV73 2J



NV73 2L

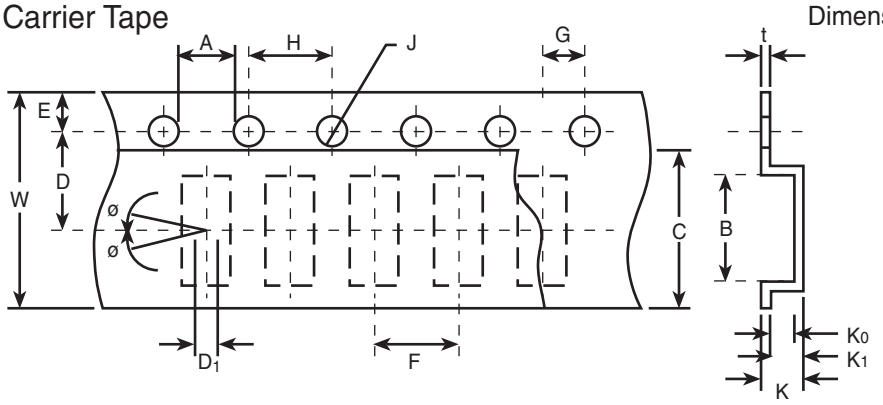


Bolivar Drive ■ P.O. Box 547 ■ Bradford, PA 16701 ■ USA ■ 814-362-5536 ■ Fax 814-362-8883 ■ www.koaspeer.com

8. Packaging

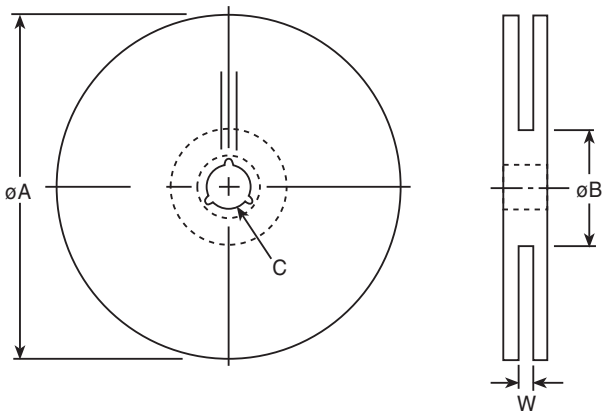
(1) Dimensions of Carrier Tape

Dimensions in inches (mm)



Type		Component Size (mm)			Carrier Tape	Quantity/ Reel (Pieces)	Taping (mm)					Reel Size
		L	W	T			A	B	W	P1	T1	
NV73	1H	0.6	0.3	0.3	TBM	15000	0.68±0.02	0.38±0.02	8.0±0.2	2.0±0.1	0.42+0.02/-0	180
	1E	1.0±0.1	0.5±0.1	0.25±0.15	TP	10000	1.15±0.1	0.65±0.1	8.0±0.2	2.0±0.1	0.6+0.2	180
	1J	1.6±0.15	0.8±0.15	0.8±0.15	TE	2500	1.9±0.1	1.2±0.1	8.0±0.2	4.0±0.1	1.75 max.	180
	2A	2.0±0.2	1.25±0.2	1.3 max.	TE	2500	2.4±0.1	1.6±0.1	8.0±0.2	4.0±0.1	1.75 max.	180
	2B	3.2±0.2	1.6±0.2	1.65 max.	TE	2500	3.6±0.1	2.0±0.1	8.0±0.2	4.0±0.1	1.75 max.	180
	2E	3.2	2.5	1.5 max.	TE	2000	3.5±0.1	2.85±0.1	8.0±0.2	4.0±0.2	1.55 max.	180
	2J	4.5	3.2	2.0 max.	TE	1000	4.9±0.1	3.6±0.1	12.0±0.2	8.0±0.2	2.05 max.	180
	2L	5.7	5.0	2.5 max.	TE	1000	6.0±0.1	5.4±0.1	12.0±0.2	8.0±0.2	2.60 max.	180

(2) Reel dimensions



Dimensions in inches (mm)

	A	B	C	W (min)	W (max)
Series	$7.09 \pm {}^{+0}_{-0.118}$ ($ø180 \pm {}^{+0}_{-3}$)	$2.36 \pm {}^{+0.004}_{0}$ ($ø60 \pm {}^{+0.1}_{0}$)	0.512 ± 0.008 (13.0 ± 0.2)	0.354 ± 0.012 (9.0 ± 0.3)	0.449 ± 0.039 (11.4 ± 1.0)

Bolivar Drive ■ P.O. Box 547 ■ Bradford, PA 16701 ■ USA ■ 814-362-5536 ■ Fax 814-362-8883 ■ www.koaspeer.com