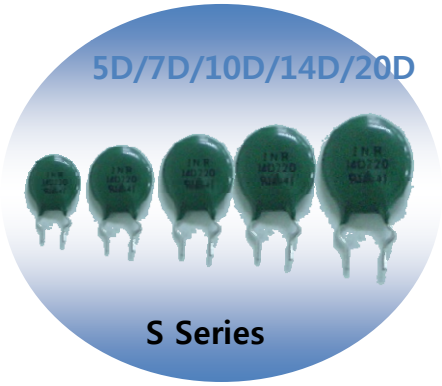
AMOTECH Co., Ltd.

Document	Datasheet
Type	Disk Varistor
Application	Overvoltage Protection
Part No.	S series
Revision	0

DATASHEET

Applications
· SMPS
· UPS
· AC Power Meter
· Overvoltage Protection Module
· AC Power Taps
· Surge Protection of Industrial Area



Features
· Energy rating up to 420 J, single 10 x1000 pulse, (20D751S)
· High surge current ratings up to 10kA
· Wide operating range 130 ~ 680Vrma
· Low leakage current

AMOTECH

Notes
The contents of this datasheet are subject to change without notice. Please confirm the specifications and delivery conditions when placing your order.

Construction

1. Description

INR Varistor is a non-linear resistance material in which the current varies as a power of the applied voltage. Voltage sensitive varistor have been used to great advance in many important application in the electrical power communications and electronic industries.

2. Designation Method of Part Number

I	N	R	14	D	471	S	B	S	A	A	2	5	0		

- I N R: Amotech Nonlinear Variable Resistor
- 14: Diameter of Varistor Element

05	5mm
07	7mm
10	10mm
14	14mm
20	20mm

- D: Disk Type
- 471: ① First two digit Significant figures; ② Third one The number of Zero following
- S: High Energy
- B: ① B: Bulk; ② T: Taping; ③ A: Auto Sing; ④ P: Auto Dual; ⑤ C: Cutting
- S: Lead Type — ① S: Straight; ② Y: Y-Forming; ③ O: O-Forming; ④ L: Bending
- AA: Lead Thick — AA: 0.6Φ; BB: 0.8Φ; CC: 1.0Φ
- 250: Lead Length — ①250: 25mm; ②100: 10mm; ③050: 5mm; ④037: 3.7mm; ⑤034: 3.4mm
- 0: Epoxy Code
- Encapsulation code

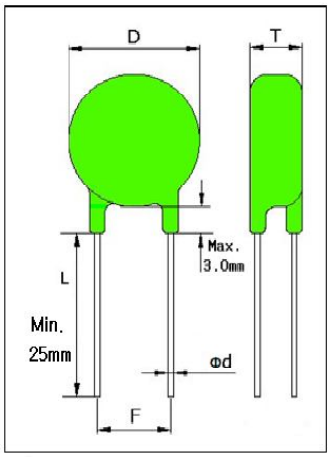
3. Application Notes for UL and CSA Recognized Components

- Related Standards

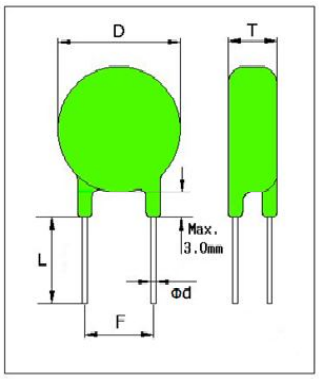
Standards	File No.	Title
UL	E332687	Component - Transient Voltage Surge Suppressors.
	E121315	Component - Across-the-line capacitors, antenna-coupling and line-by-pass components.
CSA	LR83026-2	Accessories and Patrs for Electronic Products - Metal oxide varistors for across-the-line use on 120Vac norminal systems.
VDE	Re.Nr 114190	Surge suppression Varistors Zinc oxide, disk form, insulated with unidirectional leads.

4. Type and Shape

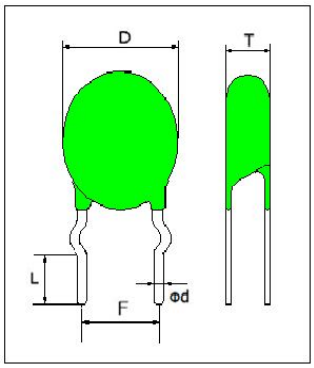
4-1) Bulk-Straight



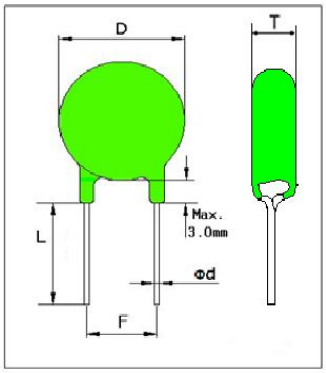
4-2) Cutting Type



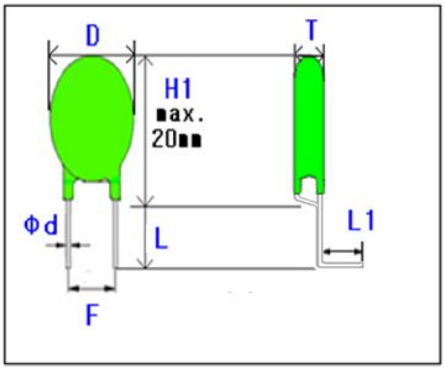
4-3) Cutting Out-Forming



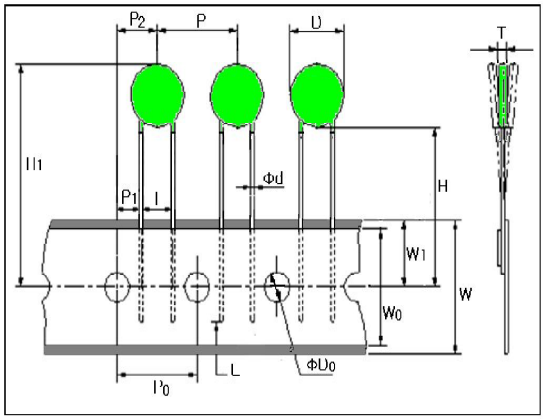
4-4) Cutting Y-Forming



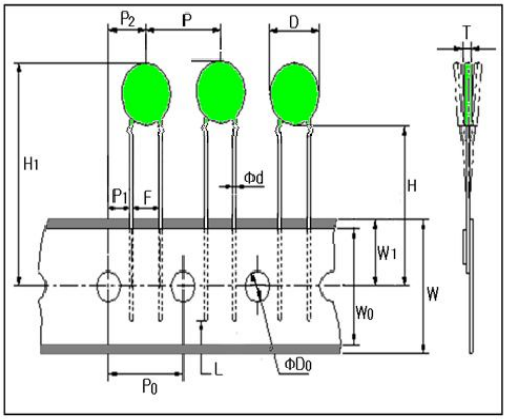
4-5) Bending Type



4-5) Taping Type(Straight & Y-Forming)



4-6) Taping Type(Out-Forming Taping)



5-1. Electrical Specification : Φ07 Series

K grade tolerance = Vn(dc)±10%

Model no.	Varistor Voltage 1mA(V)			Max. Continuous Voltage(V)		Max. Clamping Voltage(V)		Power dissipation	Energy (10/1000㎲)	Peak Current (8/20㎲)
	Min	VN(DC)	Max.	Vm(ac)	Vm(dc)	Vc(V)	Ip(A)	Ptam(W)	Wtm(J)	Itm(A)
INR7D180S	16	18	20	11	14	36	2.5	0.02	2.0	500
INR7D220S	20	22	24	14	18	43	2.5	0.02	2.4	500
INR7D270S	24	27	30	17	22	53	2.5	0.02	3.0	500
INR7D330S	30	33	36	20	26	65	2.5	0.02	3.5	500
INR7D390S	35	39	43	25	31	77	2.5	0.02	4.0	500
INR7D470S	42	47	52	30	38	93	2.5	0.02	5.0	500
INR7D560S	50	56	62	35	45	110	2.5	0.02	6.0	500
INR7D680S	61	68	75	40	56	135	2.5	0.02	7.0	500
INR7D820S	74	82	90	50	65	155	10	0.25	10	1750
INR7D101S	90	100	110	60	85	165	10	0.25	12.0	1750
INR7D121S	108	120	132	75	100	200	10	0.25	13.0	1750
INR7D151S	135	150	165	95	125	250	10	0.25	13.0	1750
INR7D181S	162	180	198	115	150	300	10	0.25	16.0	1750
INR7D201S	180	200	220	130	170	340	10	0.25	17.0	1750
INR7D221S	198	220	242	140	180	360	10	0.25	19.0	1750
INR7D241S	216	240	264	150	200	395	10	0.25	21.0	1750
INR7D271S	243	270	297	175	225	455	10	0.25	24.0	1750
INR7D331S	297	330	363	210	275	550	10	0.25	28.0	1750
INR7D361S	324	360	396	230	300	595	10	0.25	32.0	1750
INR7D391S	351	390	429	250	320	650	10	0.25	35.0	1750
INR7D431S	387	430	473	275	350	710	10	0.25	40.0	1750
INR7D471S	423	470	517	300	385	775	10	0.25	42.0	1750
INR7D511S	459	510	561	320	415	845	10	0.4	45.0	1750
INR7D561S	504	560	616	350	460	925	10	0.4	49.0	1750
INR7D621S	558	620	682	385	505	1,025	10	0.4	55.0	1750
INR7D681S	612	680	748	420	560	1,120	10	0.4	60.0	1750
INR7D751S	675	750	825	460	615	1,240	10	0.4	65.0	1750
INR7D781S	702	780	858	485	640	1,290	10	0.4	65.0	1750
INR7D821S	738	820	902	510	670	1,335	10	0.4	70.0	1750

5-2. Electrical Specification : Φ10 Series

K grade tolerance = Vn(dc)±10%

Model no.	Varistor Voltage 1mA(V)			Max. Continuous Voltage(V)		Max. Clamping Voltage(V)		Power dissipation	Energy (10/1000㎲)	Peak Current (8/20㎲)
	Min	VN(DC)	Max.	Vm(ac)	Vm(dc)	Vc(V)	Ip(A)	Ptam(W)	Wtm(J)	Itm(A)
INR10D180S	16	18	20	11	14	36	5	0.05	3.0	1000
INR10D220S	20	22	24	14	18	43	5	0.05	5.0	1000
INR10D270S	24	27	30	17	22	53	5	0.05	6.0	1000
INR10D330S	30	33	36	20	26	65	5	0.05	7.0	1000
INR10D390S	35	39	43	25	31	77	5	0.05	9.0	1000
INR10D470S	42	47	52	30	38	93	5	0.05	11.0	1000
INR10D560S	50	56	62	35	45	110	5	0.05	13.0	1000
INR10D680S	61	68	75	40	56	135	5	0.05	15.0	1000
INR10D820S	74	82	90	50	65	155	25	0.4	17	3500
INR10D101S	90	100	110	60	85	165	25	0.4	18	3500
INR10D121S	108	120	132	75	100	200	25	0.4	21	3500
INR10D151S	135	150	165	95	125	250	25	0.4	25	3500
INR10D181S	162	180	198	115	150	300	25	0.4	30	3500
INR10D201S	180	200	220	130	170	340	25	0.4	35	3500
INR10D221S	198	220	242	140	180	360	25	0.4	39	3500
INR10D241S	216	240	264	150	200	395	25	0.4	42	3500
INR10D271S	243	270	297	175	225	455	25	0.4	49	3500
INR10D331S	297	330	363	210	275	550	25	0.4	58	3500
INR10D361S	324	360	396	230	300	595	25	0.4	65	3500
INR10D391S	351	390	429	250	320	650	25	0.4	70	3500
INR10D431S	387	430	473	275	350	710	25	0.4	80	3500
INR10D471S	423	470	517	300	385	775	25	0.4	85	3500
INR10D561S	504	560	616	350	455	925	25	0.4	92	3500
INR10D621S	558	620	682	385	505	1,025	25	0.4	95	3500
INR10D681S	612	680	748	420	560	1,120	25	0.4	98	3500
INR10D751S	675	750	825	460	615	1,240	25	0.4	100	3500
INR10D781S	702	780	858	485	640	1,290	25	0.4	105	3500
INR10D821S	738	820	902	510	670	1,355	25	0.4	110	3500
INR10D911S	819	910	1,001	550	745	1,500	25	0.4	130	3500
INR10D102S	900	1,000	1,100	625	825	1,650	25	0.4	140	3500
INR10D112S	990	1,100	1,210	680	895	1,815	25	0.4	155	3500

5-3. Electrical Specification : Φ14 Series

K grade tolerance = Vn(dc)±10%

Model no.	Varistor Voltage 1mA(V)			Max. Continuous Voltage(V)		Max. Clamping Voltage(V)		Power dissipation	Energy (10/1000㎲)	Peak Current (8/20㎲)
	Min	VN(DC)	Max.	Vm(ac)	Vm(dc)	Vc(V)	Ip(A)	Ptam(W)	Wtm(J)	Itm(A)
INR14D180S	16	18	20	11	14	36	10	0.1	7	2,000
INR14D220S	20	22	24	14	18	43	10	0.1	8	2,000
INR14D270S	24	27	30	17	22	53	10	0.1	10	2,000
INR14D330S	30	33	36	20	26	65	10	0.1	12	2,000
INR14D390S	35	39	43	25	31	77	10	0.1	13	2,000
INR14D470S	42	47	52	30	38	93	10	0.1	17	2,000
INR14D560S	50	56	62	35	45	110	10	0.1	20	2,000
INR14D680S	61	68	75	40	56	135	10	0.1	24	2,000
INR14D820S	74	82	90	50	65	155	50	0.6	27	6,000
INR14D101S	90	100	110	60	85	165	50	0.6	33	6,000
INR14D121S	108	120	132	75	100	200	50	0.6	40	6,000
INR14D151S	135	150	165	95	125	250	50	0.6	53	6,000
INR14D181S	162	180	198	115	150	300	50	0.6	60	6,000
INR14D201S	180	200	220	130	170	340	50	0.6	70	6,000
INR14D221S	198	220	242	140	180	360	50	0.6	78	6,000
INR14D241S	216	240	264	150	200	395	50	0.6	84	6,000
INR14D271S	243	270	297	175	225	455	50	0.6	99	6,000
INR14D331S	297	330	363	210	275	550	50	0.6	115	6,000
INR14D361S	324	360	396	230	300	595	50	0.6	130	6,000
INR14D391S	351	390	429	250	320	650	50	0.6	140	6,000
INR14D431S	387	430	473	275	350	710	50	0.6	155	6,000
INR14D471S	423	470	517	300	385	775	50	0.6	175	6,000
INR14D561S	504	560	616	350	455	925	50	0.6	185	6,000
INR14D621S	558	620	682	385	505	1,025	50	0.6	190	6,000
INR14D681S	612	680	748	420	560	1,120	50	0.6	200	6,000
INR14D751S	675	750	825	460	615	1,240	50	0.6	210	6,000
INR14D781S	702	780	858	485	640	1,290	50	0.6	220	6,000
INR14D821S	738	820	902	510	670	1,355	50	0.6	235	6,000
INR14D911S	819	910	1,001	550	745	1,500	50	0.6	255	6,000
INR14D102S	900	1,000	1,100	625	825	1,650	50	0.6	280	6,000
INR14D112S	990	1,100	1,210	680	895	1,815	50	0.6	310	6,000
INR14D182S	1,620	1,800	1,980	1,000	1,465	2,970	50	0.6	310	6,000

5-4. Electrical Specification : Φ20 Series

K grade tolerance = Vn(dc)±10%

Model no.	Varistor Voltage 1mA(V)			Max. Continuous Voltage(V)		Max. Clamping Voltage(V)		Power dissipation	Energy (10/1000㎲)	Peak Current (8/20㎲)
	Min	VN(DC)	Max.	Vm(ac)	Vm(dc)	Vc(V)	Ip(A)	Ptam(W)	Wtm(J)	Itm(A)
INR20D180S	16	18	20	11	14	36	20	0.2	13	3,000
INR20D220S	20	22	24	14	18	43	20	0.2	16	3,000
INR20D270S	24	27	30	17	22	53	20	0.2	19	3,000
INR20D330S	30	33	36	20	26	65	20	0.2	24	3,000
INR20D390S	35	39	43	25	31	77	20	0.2	28	3,000
INR20D470S	42	47	52	30	38	93	20	0.2	34	3,000
INR20D560S	50	56	62	35	45	110	20	0.2	41	3,000
INR20D680S	61	68	75	40	56	135	20	0.2	49	3,000
INR20D820S	74	82	90	50	65	155	100	1	56	10,000
INR20D101S	90	100	110	60	85	165	100	1	70	10,000
INR20D121S	108	120	132	75	100	200	100	1	85	10,000
INR20D151S	135	150	165	95	125	250	100	1	106	10,000
INR20D181S	162	180	198	115	150	300	100	1	130	10,000
INR20D201S	180	200	220	130	170	340	100	1	140	10,000
INR20D221S	198	220	242	140	180	360	100	1	155	10,000
INR20D241S	216	240	264	150	200	395	100	1	168	10,000
INR20D271S	243	270	297	175	225	455	100	1	190	10,000
INR20D331S	297	330	363	210	275	550	100	1	228	10,000
INR20D361S	324	360	396	230	300	595	100	1	255	10,000
INR20D391S	351	390	429	250	320	650	100	1	275	10,000
INR20S431S	387	430	473	275	350	710	100	1	305	10,000
INR20D471S	423	470	517	300	385	775	100	1	350	10,000
INR20D561S	504	560	616	350	455	925	100	1	380	10,000
INR20D621S	558	620	682	385	505	1025	100	1	390	10,000
INR20D681S	612	680	748	420	560	1,120	100	1	400	10,000
INR20D751S	675	750	825	460	615	1,240	100	1	420	10,000
INR20D781S	702	780	858	485	640	1,290	100	1	440	10,000
INR20D821S	738	820	902	510	670	1,355	100	1	460	10,000
INR20D911S	819	910	1,001	550	745	1,500	100	1	510	10,000
INR20D102S	900	1,000	1,100	625	825	1,650	100	1	565	10,000
INR20D112S	990	1,100	1,210	680	895	1,815	100	1	650	10,000

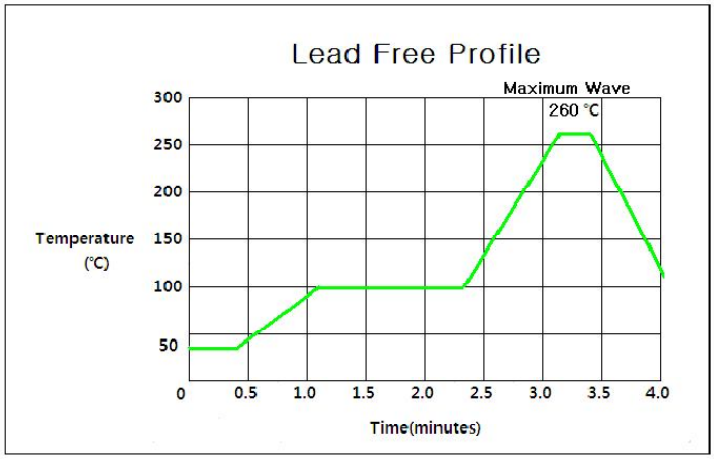
6. Reliability testing Procedures

Term	Test	Test method & Remarks	Specifications
Pulse current capability	Imax 8/20 ㎲	IEC 1051-1, Test 4.5. 1 pulse at maximum peak current	ⓐΔV0.1mA/V0.1mA ≤10% ⓑ No visible damage
Energy capability	Ip 10/1,000㎲	IEC 1051-1, Test 4.5. 1 pulse at maxium energy value E = 1.4×Vc×Ip×T Vc : clamping voltage at peak current Ip : peak current of 10/1,000㎲ pulse T : energy duration time.	
Environmental reliability	① Thermal shock	Condition for 1 cycle Step 1 : Min. -40℃, 30±3 min. Step 2 : Max. +85℃, 30±3 min. Number of cycles: 5 times	ⓐΔV0.1mA/V0.1mA ≤10% ⓑ No visible damage
	② Heat resistance	Apply the rated voltage for 1000±48hrs at 85±3℃ Remove and place for 24±2hrs at room temp. condition, then measure.	
	③ Damp Heat (Steady State)	The specimen shall be subjected to 40±2℃, 90 to 95%RH and the max continuous voltage for1000 hours and then stored at room temp. and normal humidity for one to two hours.	
	④ High Temperature Storage	The specimen shall be subjected to 125±2℃ for 1000 hours in a thermostatic bath without load and then stored at room temperature and norminal humidity for one to two hours.	
	⑤Humidity resistance	Place the disk at 40±2℃ and 90 to 95% humidity for 1000±24hrs. Remove and place for 24±2hrs at room temp. condition, then measure.	ⓐΔV0.1mA/V0.1mA ≤5% ⓑ No visible damage
	⑥ Cold/Low Temperature	The specimen shall be subjected to -40±2℃ without load for 1000hours and then stored at room temperature and norminal humidity for one to two hours.	

6. Reliability testing Procedures

Term	Test	Test method & Remarks	Specifications
Mechanical Reliability	Solderability	IEC 68-2-58 Solder bath method, 260±10℃, 2±1 sec	At least 95% of terminal electrode is covered by new solder.
Mechanical Reliability	① Resistance to soldering heat	IEC 68-2-58 Solder bath method, 260±5℃, 10±0.5s, 270±5℃, 3±0.5s	ⓐ ΔV0.1mA/V0.1mA ≤5% ⓑ No visible damage
	② Terminal Bending strength	IEC 68-2-21 Applied force on the terminal (Duration : 5sec) ⇒ 90'bending for any direction ⇒ ordinary position of terminal ⇒ 90' bending for the opposite position ⇒ordinary position	ⓐ Strength = 0.5Kg ⓑ No visible damage
	③ Terminal Tensile strength	IEC 68-2-21 Applied force on the terminal to the direction of terminal, Duration : 10 sec	ⓐ Strength > 1.0 Kg ⓑ No visible damage

7. Lead Free Profile



* Heat Resistance

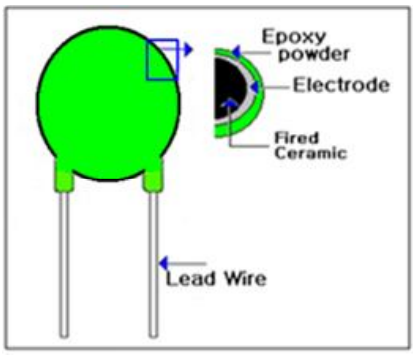
1) Temperature: 260±10℃

2) Time: 2±1 Sec

8. Marking and Illustration

8-1) Marking

INR	Amotech Varistor
14	Disk size = 14 mm
D	Disk - Type
471	V_{1mA} = 470V
	UL Mark
	CSA Mark
	VDE Mark
10A	Production Year & Month
	10=2010year, A=1 month



8-2) Illustration

9. Materials Compnent

9-1) Lead Free Solder

① Name: Lead Free Solder

② Chemistry Component

Chemical Name	Sn	Ag	Cu	Pb	Sb	Cd
Composition (wt%)	REM	2.8-3.2	0.3-0.7	0.05↓	0.10↓	0.002↓

9-2) Lead Wire

① Name: Lead Wire

9-3) Epoxy Powder

① Name: Green Powder(Material: Epoxy)

10. Box Pakage

10-1) Cutting Type

355(W)*260(D)*160(T)

Quantity	
Φ05	8,000
Φ07	8,000
Φ10	4,000
Φ14	2,400 / 3,200 / 4,000
Φ20	1,600

10-2) Bulk Type

355(W)*260(D)*160(T)

Quantity	
Φ05	8,000
Φ07	8,000
Φ10	4,000
Φ14	2,400 / 3,200
Φ20	1,200 / 1,600

10-3) Taping Type

350(W)*300(D)*285(T)

Quantity	
Φ05	10,000
Φ07	5,000 / 7,500
Φ10	4,000 / 4,500 / 5,000
Φ14	4,000
Φ20	-

※ Cutting & Bulk type “INR Varistors” are 200pcs in each Vinyl bag on the box.
(Except: 14D182, 20D Model are 100pcs)

11. Manufacturer and Place

11-1) Manufacture

Amotech Co., Ltd

11-2) Manufacturing Place

No. 101 Wanjie Road, High New Technology Development Area Zibo City,
Sandong Province, P.R. China

12. Comment

We notice your company when we change design,
manufacturing condition and raw material.