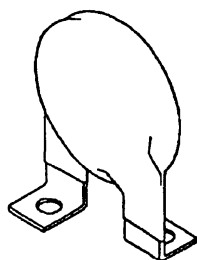


August 1993

Industrial High Energy Metal-Oxide Varistors



HA SERIES

Features

- Recognized as "Transient Voltage Surge Suppressors", UL File #E75961 to Std. 1449
- Recognized as "Transient Voltage Surge Suppressors", CSA File #LR91788 to Standard C22.2 No. 1-M1981
- Wide Operating Voltage Range $V_{M(AC)RMS}$ 130V to 750V
- Two Model Sizes Available 32mm and 40mm
- High Energy Absorption Capability $W_{TM} = 200J$ to 1050J
- High Peak Pulse Current Capability $I_{TM} = 25,000A$ to 40,000A
- Rigid Terminals for Secure Mounting
- Available in Clipped Version for Through Hole Board Mounting - Designation "HC"

Description

HA series transient surge suppressors are industrial high energy metal-oxide varistors. They are designed to provide secondary surge protection in the outdoor and service entrance environment (distribution panels), in computers, and also in industrial applications for motor controls and power supplies used in the oil-drilling, mining, and transportation fields. Possible voltage transients in the ac power network could cause product failure and the subsequent faulty operation of these systems.

The HA series of industrial varistors have similar package construction but differ in size, (32mm and 40mm), ratings and characteristics. The design of the HA series of metal oxide varistors provide rigid terminals to insure secure mounting. Also available in a clipped version for through hole board placement - designation "HC".

Absolute Maximum Ratings For ratings of individual members of a series, see Device Ratings and Characteristics chart

	HA SERIES	UNITS
Continuous:		
Steady State Applied Voltage:		
AC Voltage Range ($V_{M(AC)RMS}$)	130 to 750	V
DC Voltage Range ($V_{M(DC)}$)	175 to 970	V
Transient:		
Peak Pulse Current (I_{TM})		
For 8/20 μ s Current Wave (See Figure 2)	25,000 to 40,000	A
Single Pulse Energy Range		
For 10/1000 μ s Current Wave (W_{TM})	200 to 1050	J
Operating Ambient Temperature Range (T_A)	-55 to +85	$^{\circ}C$
Storage Temperature Range (T_{STG})	-55 to +125	$^{\circ}C$
Temperature Coefficient (αV) of Clamping Voltage (V_C) at Specified Test Current	<0.01	%/ $^{\circ}C$
Hi-Pot Encapsulation (Isolation Voltage Capability)	2500	V
(Dielectric must withstand indicated DC voltage for one minute per MIL-STD 202, Method 301)		
Insulation Resistance	1000	M Ω

9
VARISTOR
PRODUCTS

Specifications HA Series

Device Ratings and Characteristics

HA Series varistors are listed under CSA File #LR91788 as a recognized component.

HA Series varistors are listed under U.L. File #E75961 as a recognized component.

MODEL NUMBER	MAXIMUM RATINGS (+85°C)				CHARACTERISTICS (+25°C)				
	CONTINUOUS		TRANSIENT		VARISTOR VOLTAGE AT 1 mA DC TEST CURRENT			MAXIMUM CLAMPING VOLTAGE (V _C) AT 200 Amps (8/20μs)	TYPICAL CAPACITANCE AT f = 1MHz
	RMS VOLTAGE	DC VOLTAGE	ENERGY (10/1000μs)	PEAK CURRENT (8/20μs)					
	V _{M(AC)}	V _{M(DC)}	W _{TM}	I _{TM}	MIN	V _{N(DC)}	MAX	V _C	C
(V)	(V)	ENERGY	(A)	(V)	(V)	(V)	(V)	(pF)	
V131HA32	130	175	200	25000	184	200	228	350	4700
V131HA40	130	175	270	30000	184	200	228	345	10000
V151HA32	150	200	220	25000	212	240	268	410	4000
V151HA40	150	200	300	30000	212	240	268	405	8000
V251HA32	250	330	330	25000	354	390	429	650	2500
V251HA40	250	330	370	40000	354	390	429	630	5000
V271HA32	275	369	360	25000	389	430	473	710	2200
V271HA40	275	369	400	40000	389	430	473	690	4500
V321HA32	320	420	390	25000	462	510	539	845	1900
V321HA40	320	420	460	40000	462	510	539	825	3800
V421HA32	420	560	400	25000	610	680	748	1120	1500
V421HA40	420	560	600	40000	610	680	748	1100	3000
V481HA32	480	640	450	25000	670	750	825	1290	1300
V481HA40	480	640	650	40000	670	750	825	1230	2700
V511HA32	510	675	500	25000	735	820	910	1355	1200
V511HA40	510	675	700	40000	735	820	910	1295	2500
V571HA32	575	730	550	25000	805	910	1000	1570	1100
V571HA40	575	730	770	40000	805	910	1000	1480	2200
V661HA32	660	850	600	25000	940	1050	1160	1820	1000
V661HA40	660	850	900	40000	940	1050	1160	1720	2000
V751HA32	750	970	700	25000	1080	1200	1320	2050	800
V751HA40	750	970	1050	40000	1080	1200	1320	2000	1800

NOTE: Average power dissipation of transients not to exceed 1.5W and 2.0W for model sizes 32mm and 40mm, respectively.

Power Dissipation Requirements

Transients in a suppressor generate heat too quickly for it to be transferred to the surroundings during the pulse interval. Continuous power dissipation capability, therefore is not a necessary requirement for a suppressor, unless transients occur in rapid succession. Under this condition, the average power dissipation required is simply the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be within the specifications shown on the Device Ratings and Characteristics table for the specific device. Furthermore, the operating values need to be derated at high temperatures as shown in Figure 1. Because varistors can only dissipate a relatively small amount of average power they are, therefore, not suitable for repetitive applications that involve substantial amounts for average power dissipation.

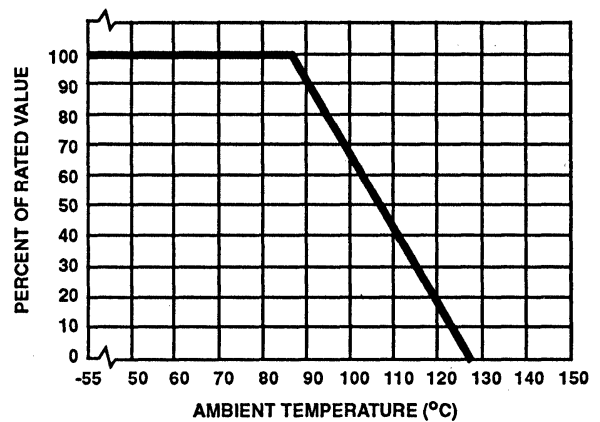
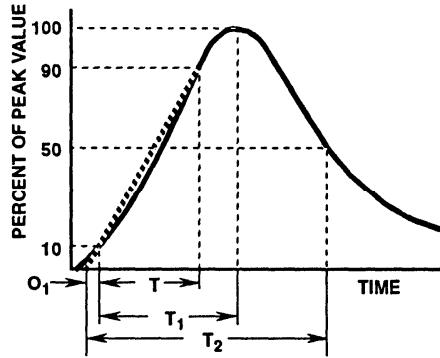


FIGURE 1. CURRENT, ENERGY AND POWER DERATING CURVE

HA Series



O_1 = Virtual Origin of Wave
 T = Time From 10% to 90% of Peak
 T_1 = Virtual Front Time = $1.25 \cdot t$
 T_2 = Virtual Time to Half Value (Impulse Duration)
 Example: For an $8/20\mu s$ Current Waveform:
 $8\mu s = T_1$ = Virtual Front Time
 $20\mu s = T_2$ = Virtual Time to Half Value

FIGURE 2. PEAK PULSE CURRENT WAVEFORM

Transient V-I Characteristics Curves

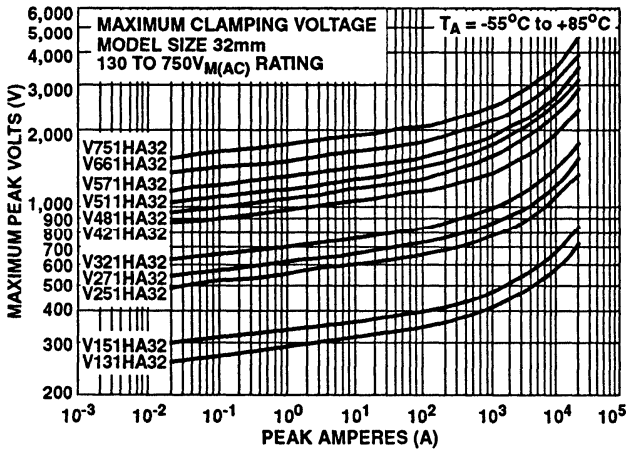


FIGURE 3. CLAMPING VOLTAGE FOR V131HA32 - V751HA32

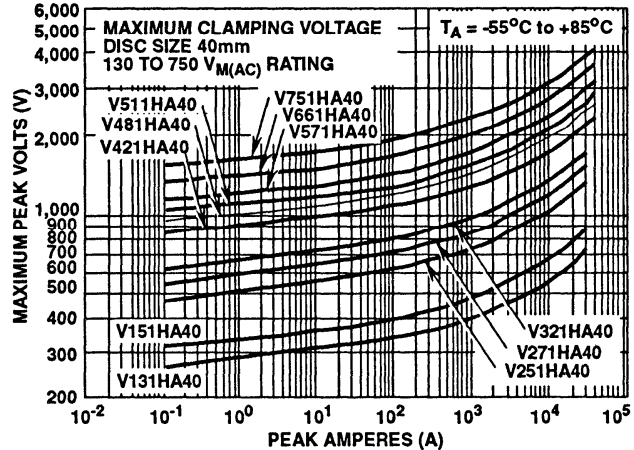


FIGURE 4. CLAMPING VOLTAGE FOR V131HA40 - V751HA40

Pulse Rating Curves

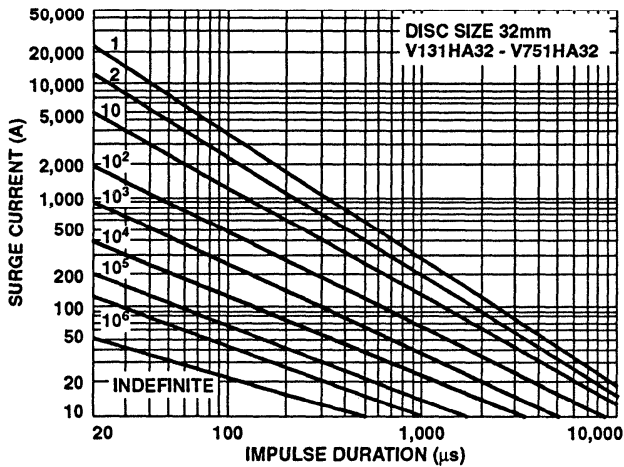


FIGURE 5. SURGE CURRENT RATING CURVES FOR V131HA32 - V751HA32

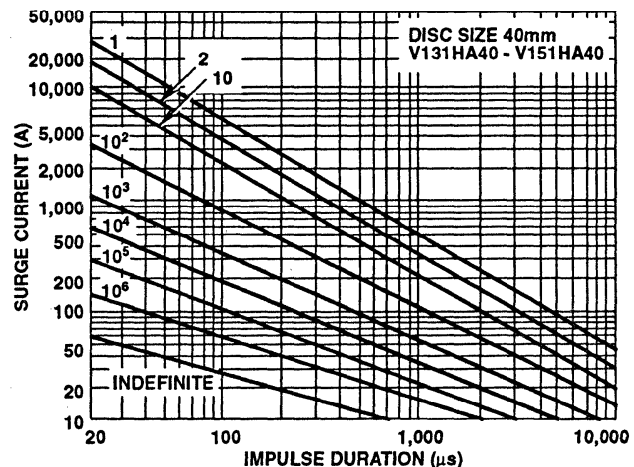


FIGURE 6. SURGE CURRENT RATING CURVES FOR V131HA40 - V151HA40

HA Series

Pulse Rating Curves (Continued)

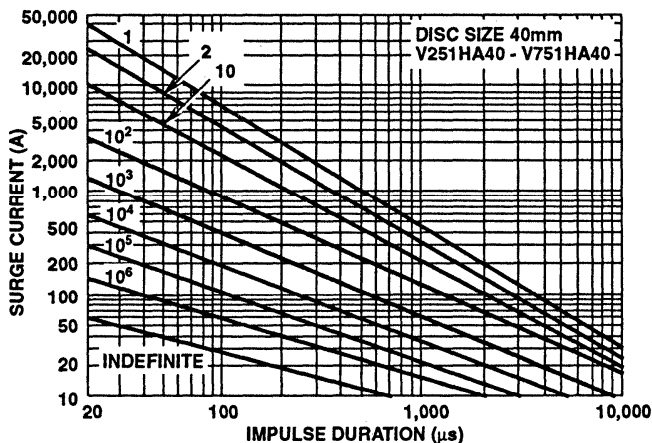


FIGURE 7. SURGE CURRENT RATING CURVES FOR V251HA40 - V751HA40

Packaging

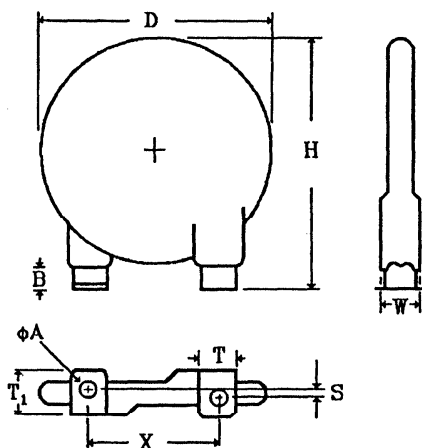


TABLE 1. HA SERIES OUTLINE SPECIFICATIONS
(Dimensions in Millimeters)

	D	H	B	X	ØA	T	T1	S
	MAX	MAX	MIN	NOM	MAX	NOM	NOM	OFFSET
HA32	35.5	52.00	5.0	25	4.20	9.30	10.4	Depends on Device Voltage (See Table 2)
HA40	42.5	57.00	5.0	25	4.20	9.30	10.4	

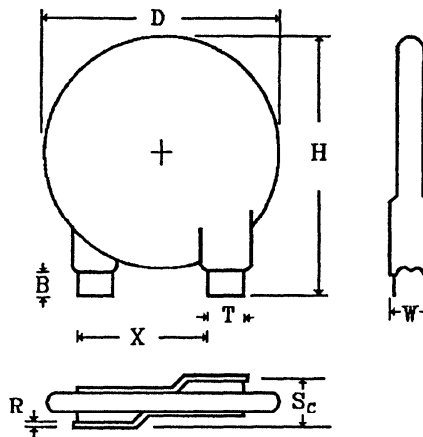


TABLE 3. HC SERIES OUTLINE SPECIFICATIONS
(Dimensions in Millimeters)

	D	H	B	X	T	S _c
	MAX	MAX	MIN	NOM	NOM	OFFSET
HC32	35.5	52.00	5.0	25	9.30	Depends on Device Voltage (See Table 4)
HC40	42.5	57.00	5.0	25	9.30	

TABLE 2. HA SERIES MAXIMUM THICKNESS AND TERMINAL OFFSETS (Dimensions in Millimeters)

VOLTAGE	THICKNESS "W"		DIMENSION "S" (±1mm)	
	HA32	HA40	HA32	HA40
V131 - V321	9.00	9.00	3.90	3.90
V421 - V511	10.30	11.10	2.60	1.80
V571 - V751	12.00	13.00	1.00	0.00

TABLE 4. HC SERIES MAXIMUM THICKNESS AND TERMINAL OFFSETS (Dimensions in Millimeters)

VOLTAGE	THICKNESS "W"		DIMENSION "S _c " (±1mm)	
	HC32	HC40	HC32	HC40
V131 - V321	9.00	9.00	6.00	6.00
V421 - V511	10.30	11.10	7.30	8.10
V571 - V751	12.00	13.00	8.90	10.00