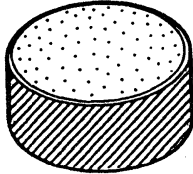


## Industrial High Energy Metal-Oxide Disc Varistors

August 1993



CA SERIES

### Features

- Provided Unpackaged For Unique Packaging By Customer
- Solderable Electrode Finish Also Provides Pressure Contacts for Stacking Applications
- Available Disc Sizes . . . . . 32mm, 40mm, and 60mm Diameter
- Wide Operating Voltage Range  $V_{M(AC)RMS}$  . . . . . 130V to 2800V
- Wide Peak Pulse Current Range  $I_{TM}$  . . . . . 20,000A to 70,000A
- Very High Energy Capability  $W_{TM}$  . . . . . 200J to 10,000J

### Description

CA series transient surge suppressors are industrial high-energy disc varistors intended for special applications requiring unique contact or packaging considerations. The electrode finish of these devices is solderable and can also be used as pressure contacts for stacking applications.

three diameter sizes: 32, 40, and 60mm, with disc thicknesses ranging from 1.8mm minimum to 32mm maximum. They offer a wide voltage range of from 130 to 2800  $V_{M(AC)RMS}$ .

These CA series industrial disc varistors are available in

For information on mounting considerations refer to Applications Brief AB-8820.

### Absolute Maximum Ratings

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

	CA SERIES	UNITS
Continuous:		
Steady State Applied Voltage:		
AC Voltage Range ( $V_{M(AC)RMS}$ ) . . . . .	130 to 2800	V
DC Voltage Range ( $V_{M(DC)}$ ) . . . . .	175 to 3500	V
Transient:		
Peak Pulse Current ( $I_{TM}$ )		
For 8/20 $\mu$ s Current Wave (See Figure 2) . . . . .	20,000 to 70,000	A
Single Pulse Energy Range		
For 10/1000 $\mu$ s Current Wave ( $W_{TM}$ ) . . . . .	200 to 10,000	J
Operating Ambient Temperature Range ( $T_A$ ) . . . . .	-55 to +85	$^{\circ}$ C
Storage Temperature Range ( $T_{STG}$ ) . . . . .	-55 to +125	$^{\circ}$ C
Temperature Coefficient ( $\alpha_V$ ) of Clamping Voltage ( $V_C$ ) at Specified Test Current. . . . .	<0.01	%/ $^{\circ}$ C

## Specifications CA Series

### Device Ratings and Characteristics

MODEL NUMBER	SIZE (mm)	MAXIMUM RATINGS (+85°C)				CHARACTERISTICS (+25°C)				
		CONTINUOUS		TRANSIENT		VARISTOR VOLTAGE AT 1mA DC TEST CURRENT			MAX CLAMPING VOLT $V_C$ AT 200A CURRENT (8/20 $\mu$ s)	TYPICAL CAPACITANCE $f = 1$ MHz
		RMS VOLT-AGE	DC VOLT-AGE	ENERGY (10/1000 $\mu$ s)	PEAK CURRENT (8/20 $\mu$ s)					
		$V_{M(AC)}$ (V)	$V_{M(DC)}$ (V)	$W_{TM}$ (J)	$I_{TM}$ (A)	MIN (V)	$V_{N(DC)}$ (V)	MAX (V)	$V_C$ (V)	(pF)
V131CA32	32	130	175	200	20000	184	200	228	350	4700
V131CA40	40			270	30000				345	10000
V151CA32	32	150	200	220	20000	212	240	268	410	4000
V151CA40	40			300	30000				405	8000
V251CA32	32	250	330	330	20000	354	390	429	680	2500
V251CA40	40			370	30000				650	5000
V251CA60	60			880	50000				620	10000
V271CA32	32	275	369	360	20000	389	430	473	750	2200
V271CA40	40			400	30000				730	4500
V271CA60	60			950	50000				680	9000
V321CA32	32	320	420	390	20000	462	510	539	850	1900
V321CA40	40			460	30000				830	3800
V321CA60	60			1100	50000				760	7500
V421CA32	32	420	560	400	25000	610	680	748	1200	1500
V421CA40	40			600	40000				1130	3000
V421CA60	60			1500	70000				1060	6000
V481CA32	32	480	640	450	25000	670	750	825	1300	1300
V481CA40	40			650	40000				1240	2700
V481CA60	60			1600	70000				1160	5500
V511CA32	32	510	675	500	25000	735	820	910	1440	1200
V511CA40	40			700	40000				1350	2500
V511CA60	60			1800	70000				1300	5000
V571 CA32	32	575	730	550	25000	805	910	1000	1600	1100
V571CA40	40			770	40000				1480	2200
V571CA60	60			2100	70000				1420	4500
V661 CA32	32	660	850	600	25000	940	1050	1160	1820	1000
V661CA40	40			900	40000				1720	2000
V661CA60	60			2300	70000				1640	4000
V751CA32	32	750	970	700	25000	1080	1200	1320	2050	800
V751CA40	40			1050	40000				2000	1800
V751CA60	60			2600	70000				1880	3500
V881CA60	60	880	1150	3200	70000	1290	1500	1650	2340	2700
V112CA60	60	1100	1400	3200	70000	1620	1800	2060	2940	2200
V142CA60	60	1400	1750	5000	70000	2020	2200	2550	3600	1800
V172CA60	60	1700	2150	6000	70000	2500	2700	3030	4300	1500
V202CA60	60	2000	2500	7500	70000	2970	3300	3630	5200	1200
V242CA60	60	2400	3000	8600	70000	3510	3900	4290	6200	1000
V282CA60	60	2800	3500	10000	70000	4230	4700	5170	7400	800

NOTE: Average power dissipation of transients not exceed 1.5W, 2.0W and 2.5W for model 32mm, 40mm and 60mm, 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 design 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 speci-

fications 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 of average power dissipation.

# CA Series

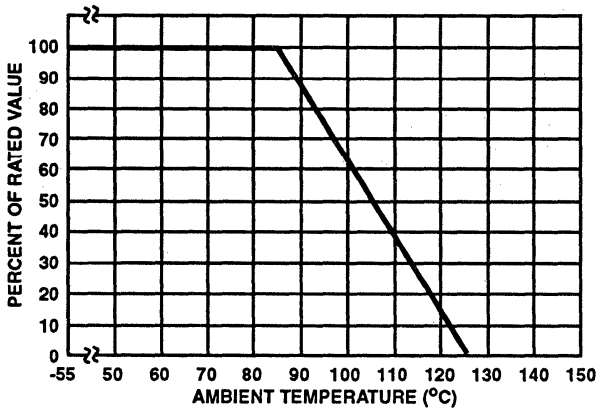
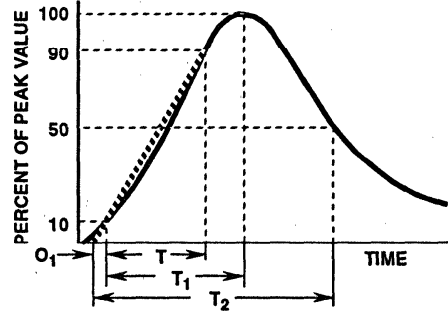


FIGURE 1. CURRENT, ENERGY AND POWER DERATING CURVE



$O_1$  = 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 TEST WAVEFORM

## Transient V-I Characteristics Curves

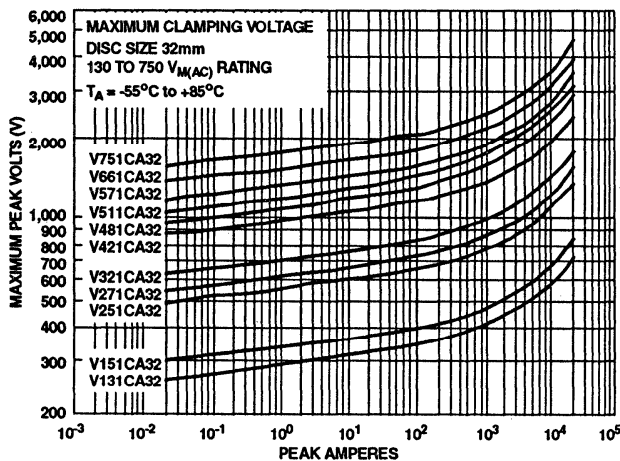


FIGURE 3. CLAMPING VOLTAGE FOR V131CA32 - C751CA32

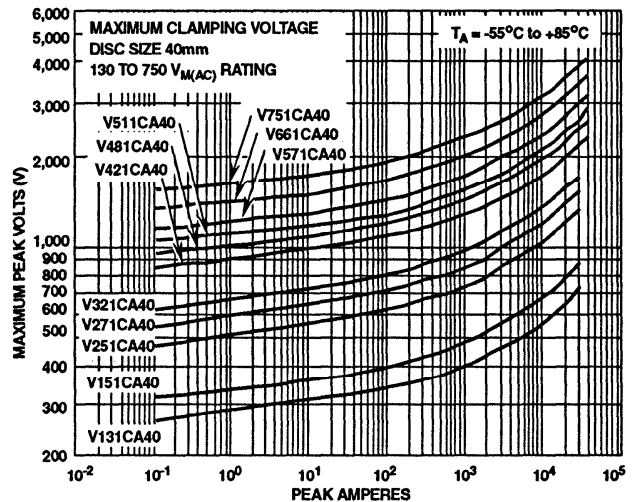


FIGURE 4. CLAMPING VOLTAGE FOR V131CA40 - V751CA40

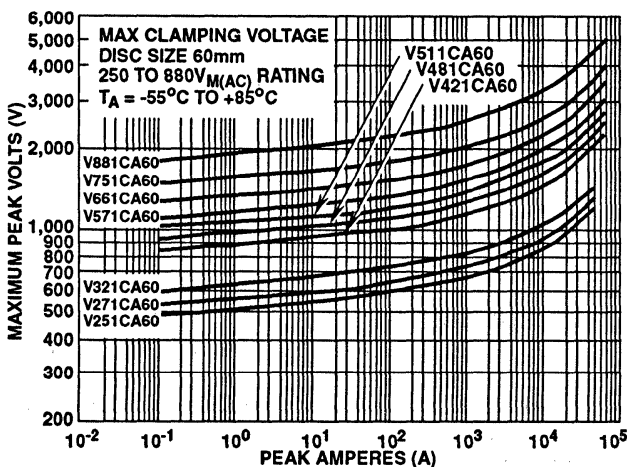


FIGURE 5. CLAMPING VOLTAGE FOR V251CA60 - V881CA60

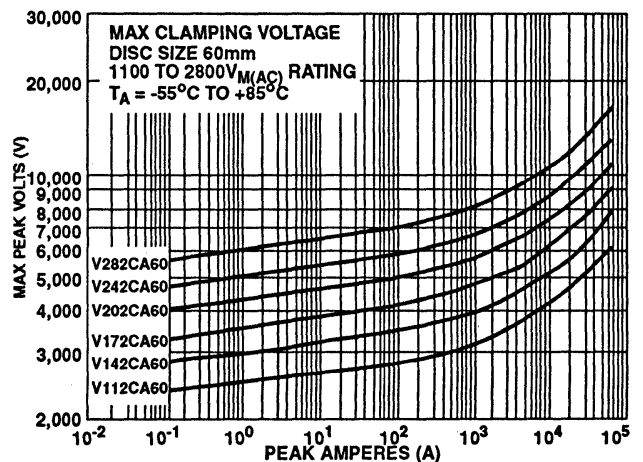


FIGURE 6. CLAMPING VOLTAGE FOR V112CA60 - V282CA60

# CA Series

## Pulse Rating Curves

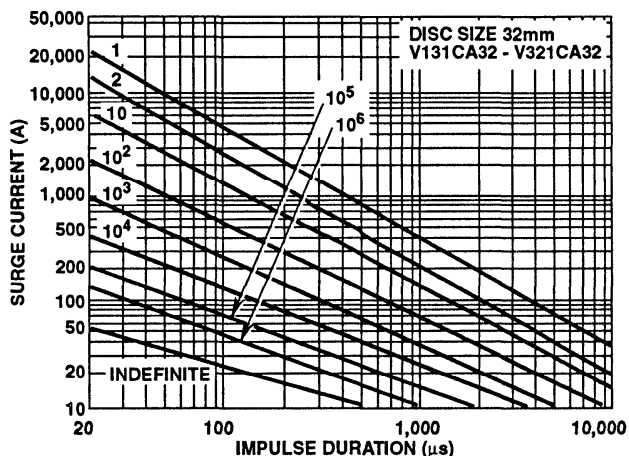


FIGURE 7. SURGE CURRENT RATING CURVES FOR V131CA32 - V321CA32

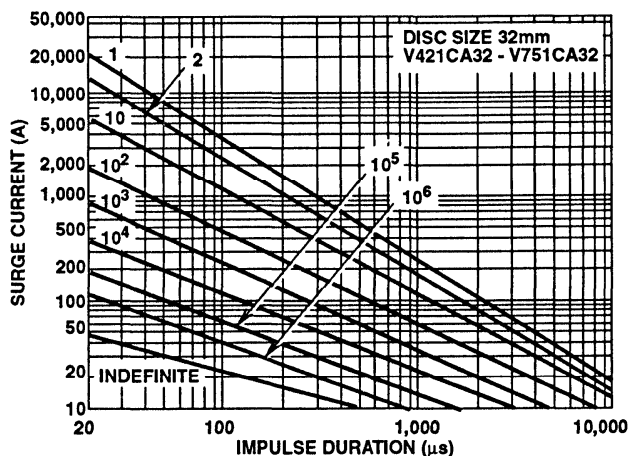


FIGURE 8. SURGE CURRENT RATING CURVES FOR V421CA32 - V751CA32

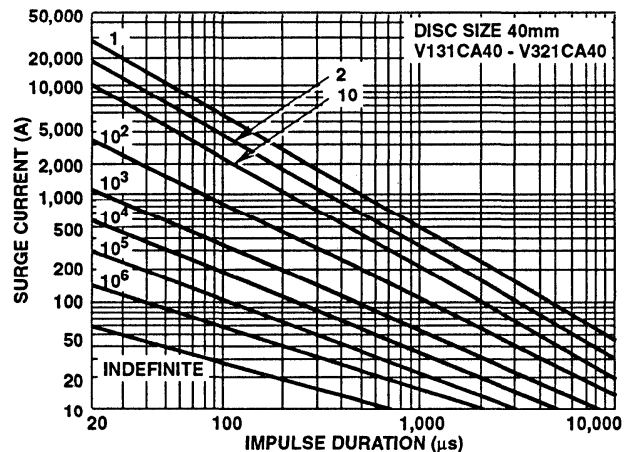


FIGURE 9. SURGE CURRENT RATING CURVES FOR V131CA40 - V321CA40

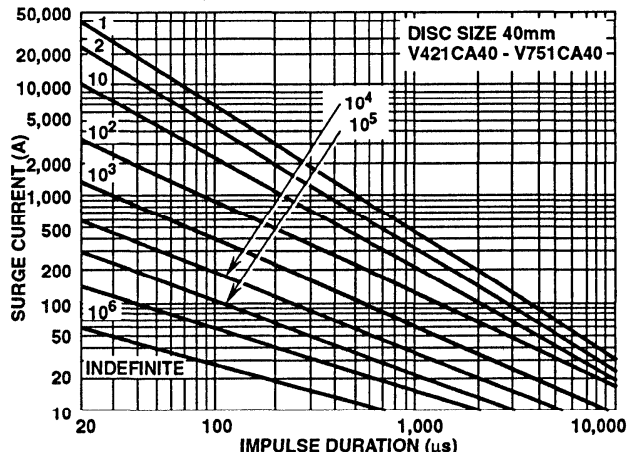


FIGURE 10. SURGE CURRENT RATING CURVES FOR V421CA40 - V751CA40

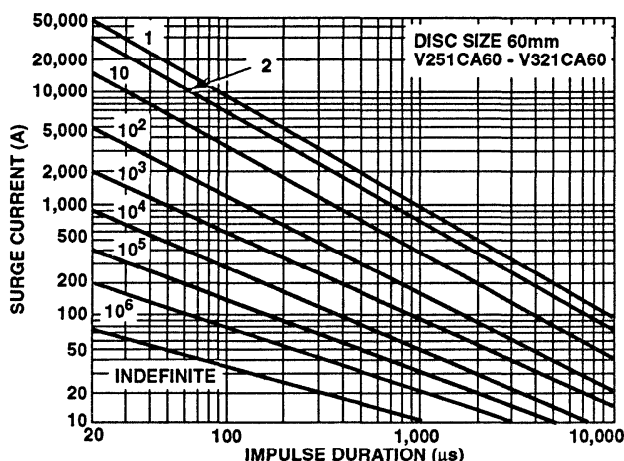


FIGURE 11. SURGE CURRENT RATING CURVES FOR V251CA60 - V321CA60

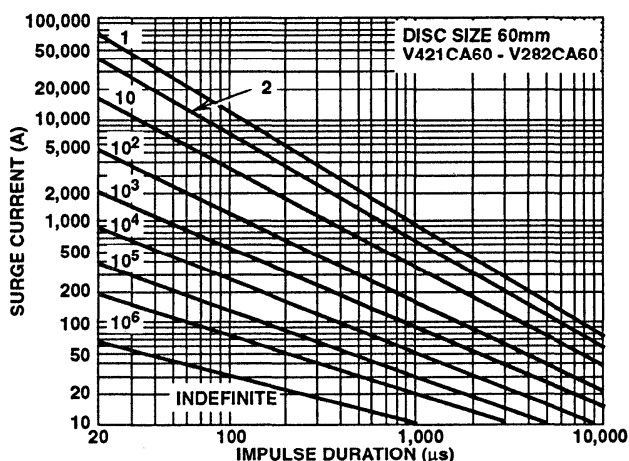


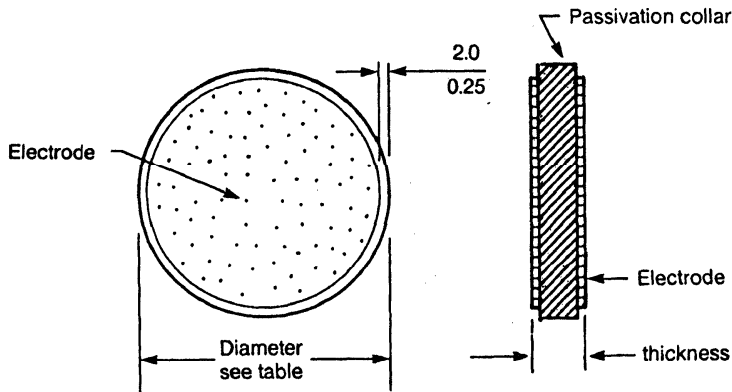
FIGURE 12. SURGE CURRENT RATING CURVES FOR V421CA60 - V282CA60

NOTE: If pulse ratings are exceeded, a shift of  $V_{N(DC)}$  (at specified current) of more than  $\pm 10\%$  could result. This type of shift, which normally results in a decrease of  $V_{N(DC)}$ , may result in the device not meeting the original published specifications, but does not prevent the device from continuing to function, and to provide ample protection.

9  
VARISTOR  
PRODUCTS

## CA Series

### Packaging



NOMINAL SIZE	DISC DIAMETER			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
32	31.0	33.0	1.220	1.299
40	38.0	40.0	1.496	1.575
60	58.0	62.0	2.283	2.441

RMS VOLTS $V_{Med}$	32mm DISC THICKNESS				40 AND 60mm DISC THICKNESS			
	MILLIMETERS		INCHES		MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
130+	1.8	2.4	0.071	0.094	2.5	3.4	0.098	0.134
150+	2.1	2.8	0.083	0.110	2.8	3.8	0.110	0.150
250	1.6	2.2	0.063	0.087	2.0	2.7	0.079	0.106
275	1.8	2.5	0.071	0.098	2.2	3.0	0.087	0.118
320	2.1	2.9	0.083	0.114	2.6	3.5	0.102	0.138
420	2.9	3.9	0.114	0.154	3.5	4.7	0.138	0.185
480	3.1	4.3	0.122	0.169	3.8	5.2	0.150	0.205
510	3.5	4.7	0.138	0.185	4.2	5.7	0.165	0.224
575	3.8	5.1	0.150	0.201	4.6	6.3	0.181	0.248
660	4.4	6.0	0.173	0.236	5.3	7.2	0.209	0.283
750	5.1	6.9	0.240	0.327	6.1	8.3	0.240	0.327
880*	—	—	—	—	7.3	10.3	0.287	0.406
1100*	—	—	—	—	9.2	13.0	0.362	0.512
1400*	—	—	—	—	11.5	16.0	0.453	0.630
1700*	—	—	—	—	14.0	19.0	0.551	0.748
2000*	—	—	—	—	17.0	22.5	0.669	0.886
2400*	—	—	—	—	20.0	27.0	0.787	1.063
2800*	—	—	—	—	24.0	32.0	0.945	1.260

\* Available in 60mm size only.

+ Available in 32 and 40mm only.

Note: Parts available with soldered tabs, to customer specific requirements or standard design.