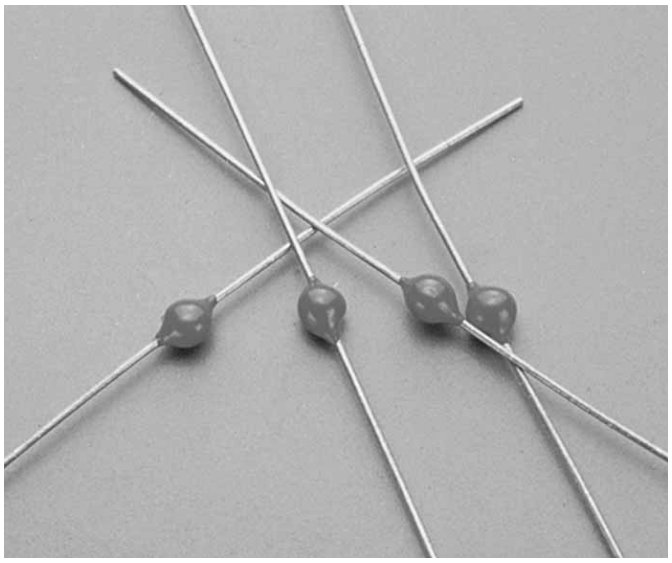
MA Varistor Series

The MA Series of transient surge suppressors are axial-lead metal-oxide varistors (MOVs) for use in a wide variety of board level industrial and commercial electronic equipment. They are intended to protect components and signal/data lines from low energy transients where the small axial lead package is required.

The MA Series is offered with standard (S suffix) or tightened (B suffix) clamping voltage.

See MA Series Device Ratings and Specifications table for part number and brand information.



Features

- 3mm Diameter Disc Size
- Small Axial Lead Package
- Wide Operating Voltage Range
  $V_{M(AC)RMS}$ . . . . . 9V to 264V
  $V_{M(DC)}$ . . . . . 13V to 365V
- Available in Tape and Reel or Bulk Packaging
- No Derating Up to 85°C Ambient

MA Varistor Series

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

	MA SERIES	UNITS
Continuous:		
Steady State Applied Voltage:		
AC Voltage Range ($V_{M(AC)RMS}$)	9 to 264	V
DC Voltage Range ($V_{M(DC)}$)	13 to 365	V
Transient:		
Peak Pulse Current (I_{TM})		
For 8/20µs Current Wave (See Figure 2)	40 to 100	A
Single Pulse Energy Range		
For 10/1000µs Current Wave (W_{TM})	0.06 to 1.7	J
Operating Ambient Temperature Range (T_A)	-55 to 85	°C
Storage Temperature Range (T_{STG})	-55 to 125	°C
Temperature Coefficient (αV) of Clamping Voltage (V_C) at Specified Test Current	<0.01	%/°C
Hi-Pot Encapsulation (Isolation Voltage Capability)	1000	V
(Dielectric must withstand indicated DC voltage for one minute per MIL-STD 202, Method 301)	1000	MΩ
Insulation Resistance		

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Device Ratings and Specifications

PART NUMBER	BRAND	MAXIMUM RATINGS (85°C)				SPECIFICATIONS (25°C)				
		CONTINUOUS		TRANSIENT		VARISTOR VOLTAGE AT 1mA DC TEST CURRENT			MAX CLAMPING VOLTAGE V_C AT 2.0A (8/20µs)	TYPICAL CAPACITANCE
		V_{RMS}	V_{DC}	ENERGY (10/1000µs)	PEAK CURRENT (8/20µs)	MIN	$V_{N(DC)}$	MAX	V_C	f = 1MHz
		$V_{M(AC)}$	$V_{M(DC)}$	W_{TM}	I_{TM}					
		(V)	(V)	(J)	(A)	(V)	(V)	(V)	(V)	(pF)
V18MA1A	18A	9	13	0.06	40	14	18	23	49	550
V18MA1B	18B	10	14	0.07	40	15	18	21	44	550
V18MA1S	18S	10	14	0.06	40	15	18	21	49	550
V22MA1A	22A	10	15	0.09	40	16	22	28	55	410
V22MA1B	22B	14	18	0.10	40	19	22	26	51	410
V22MA1S	22S	14	18	0.09	40	19	22	26	55	410
V27MA1A	27A	13	19	0.10	40	21	27	34	67	370
V27MA1B	27B	17	22	0.11	40	24	27	31	59	370
V27MA1S	27S	17	22	0.10	40	24	27	31	67	370
V33MA1A	33A	18	23	0.13	40	26	33	40	73	300
V33MA1B	33B	20	26	0.15	40	29.5	33	36.5	67	300
V33MA1S	33S	20	26	0.14	40	29.5	33	36.5	73	300
V39MA2A	39A	22	28	0.16	40	31	39	47	86	250
V39MA2B	39B	25	31	0.18	40	35	39	43	79	250
V39MA2S	39S	25	31	0.17	40	35	39	43	86	250
V47MA2A	47A	27	34	0.19	40	37	47	57	99	210
V47MA2B	47B	30	38	0.21	40	42	47	52	90	210
V47MA2S	47S	30	38	0.19	40	42	47	52	99	210
V56MA2A	56A	32	40	0.23	40	44	56	68	117	180
V56MA2B	56B	35	45	0.25	40	50	56	62	108	180
V56MA2S	56S	35	45	0.23	40	50	56	62	117	180
V68MA3A	68A	38	48	0.26	40	54	68	82	138	150
V68MA3B	68B	40	56	0.30	40	61	68	75	127	150
V68MA3S	68S	40	56	0.27	40	61	68	75	138	150
V82MA3A	82A	45	60	0.33	40	65	82	99	163	120
V82MA3B	82B	50	66	0.37	40	73	82	91	150	120
V82MA3S	82S	50	66	0.34	40	73	82	91	163	120

MA Varistor Series

Device Ratings and Specifications (Continued)

PART NUMBER	BRAND	MAXIMUM RATINGS (85°C)				SPECIFICATIONS (25°C)				
		CONTINUOUS		TRANSIENT		VARISTOR VOLTAGE AT 1mA DC TEST CURRENT			MAX CLAMPING VOLTAGE V_C AT 2.0A (8/20μs)	TYPICAL CAPACITANCE
		V_{RMS}	V_{DC}	ENERGY (10/1000μs)	PEAK CURRENT (8/20μs)	MIN	$V_{N(DC)}$	MAX		
		$V_{M(AC)}$	$V_{M(DC)}$	W_{TM}	I_{TM}				V_C	f = 1MHz
		(V)	(V)	(J)	(A)	(V)	(V)	(V)	(V)	(pF)
V100MA4A	100	57	72	0.40	40	80	100	120	200	100
V100MA4B	101	60	81	0.45	40	90	100	110	185	100
V100MA4S	102	60	81	0.42	40	90	100	110	200	100
V120MA1A	120	72	97	0.40	100	102	120	138	220	40
V120MA2B	121	75	101	0.50	100	108	120	132	205	40
V120MA2S	122	75	101	0.46	100	108	120	132	220	40
V150MA1A	150	88	121	0.50	100	127	150	173	255	32
V150MA2B	151	92	127	0.60	100	135	150	165	240	32
V180MA1A	180	105	144	0.60	100	153	180	207	310	27
V180MA3B	181	110	152	0.70	100	162	180	198	290	27
V220MA2A	220	132	181	0.80	100	187	220	253	380	21
V220MA4B	221	138	191	0.90	100	198	220	242	360	21
V270MA2A	270	163	224	0.90	100	229	270	311	460	17
V270MA4B	271	171	235	1.00	100	243	270	297	440	17
V330MA2A	330	188	257	1.00	100	280	330	380	570	14
V330MA5B	331	200	274	1.10	100	297	330	363	540	14
V390MA3A	390	234	322	1.20	100	331	390	449	670	12
V390MA6B	391	242	334	1.30	100	351	390	429	640	12
V430MA3A	430	253	349	1.50	100	365	430	495	740	11
V430MA7B	431	264	365	1.70	100	387	430	473	700	11

NOTE: Average power dissipation of transients not to exceed 200mW.

Power Dissipation Ratings

Should transients occur in rapid succession, 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 Specifications 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.

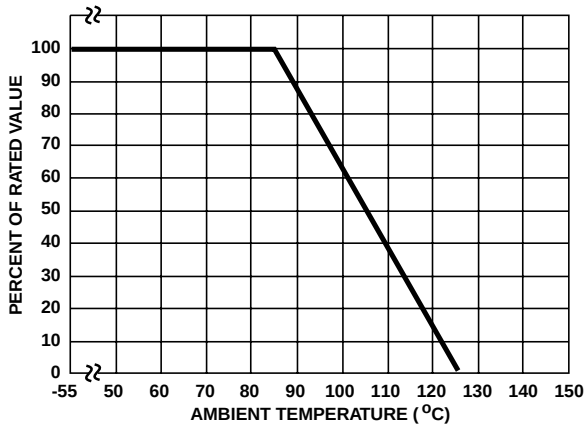
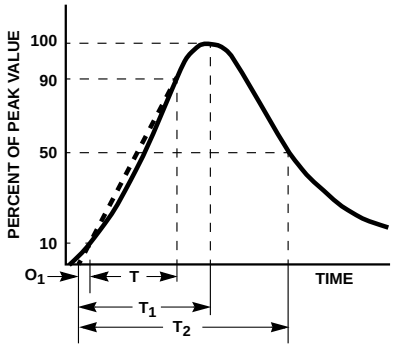


FIGURE 1. CURRENT, ENERGY AND POWER DERATING CURVE

MA Varistor Series



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

FIGURE 2. PEAK PULSE CURRENT TEST WAVEFORM

Transient V-I Characteristics Curves

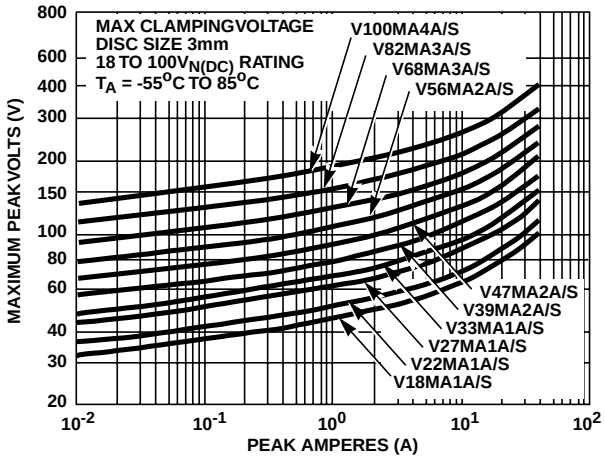
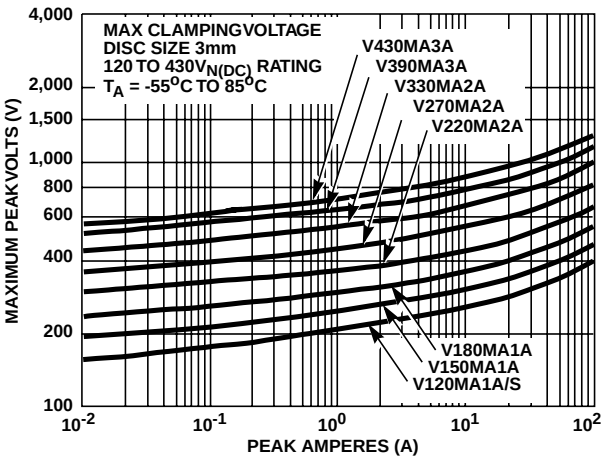


FIGURE 3. CLAMPING VOLTAGE FOR V18MA1A/S - V100MA4A/S



FI GURE 4. CLAMPING VOLTAGE FOR V120MA1A/S - V430MA3A

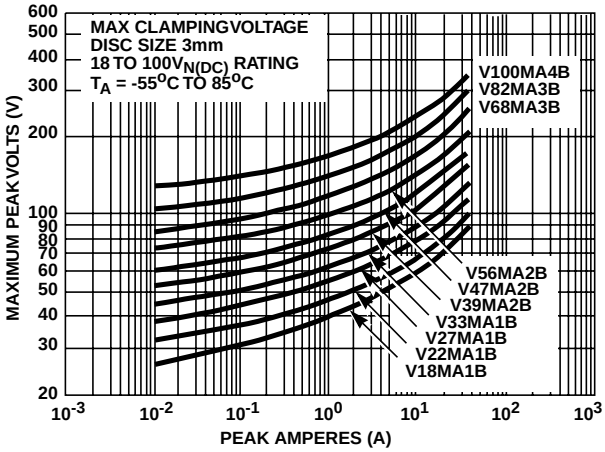


FIGURE 5. CLAMPING VOLTAGE FOR V18MA1B - V100MA4B

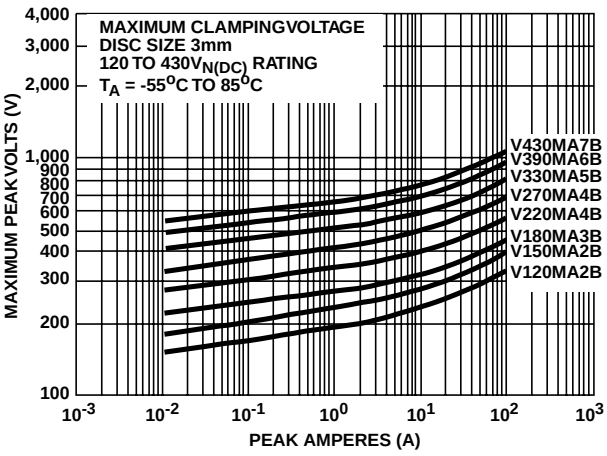


FIGURE 6. CLAMPING VOLTAGE FOR V120MA2B - V430MA7B

MA Varistor Series

Pulse Rating Curves

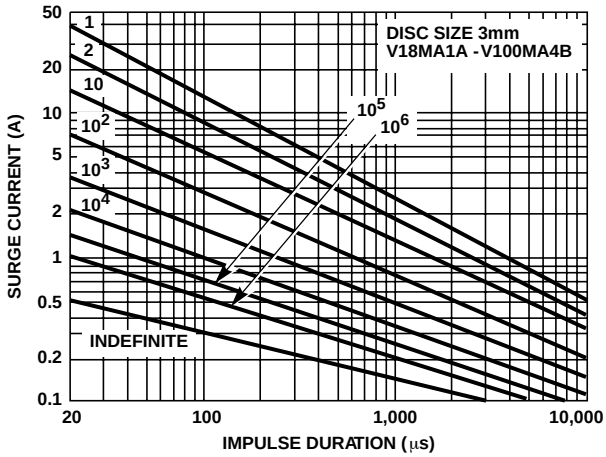


FIGURE 7. SURGE CURRENT RATING CURVES FOR V18MA SERIES - V100MA SERIES

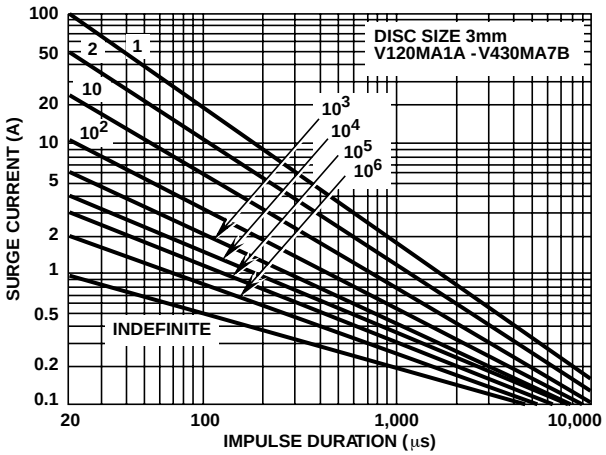
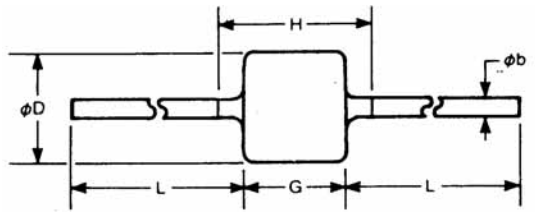


FIGURE 8. SURGE CURRENT RATING CURVES FOR V120MA SERIES - V430MA SERIES

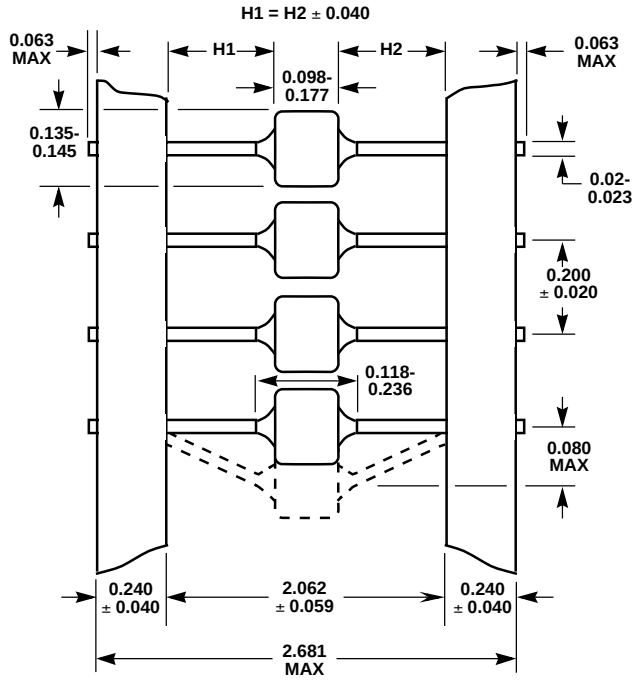
NOTE: If pulse ratings are exceeded, a shift of $V_{N(DC)}$ (at specified current) of more than ±10% could result. This type of shift, which normally results in a decrease of $V_{N(DC)}$, may result in the device not meeting the original published specifications, but it does not prevent the device from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

Mechanical Dimensions



SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
Øb	0.024	0.026	0.61	0.66
ØD	0.135	0.177	3.43	4.5
G	0.098	0.177	3.43	4.5
H	0.118	0.236	3.0	6.0
L	1.130	1.220	28.70	31.0
Typical Weight = 25g				

Tape and Reel Specification



- Conforms to EIA Standard RS-296E

Ordering Information