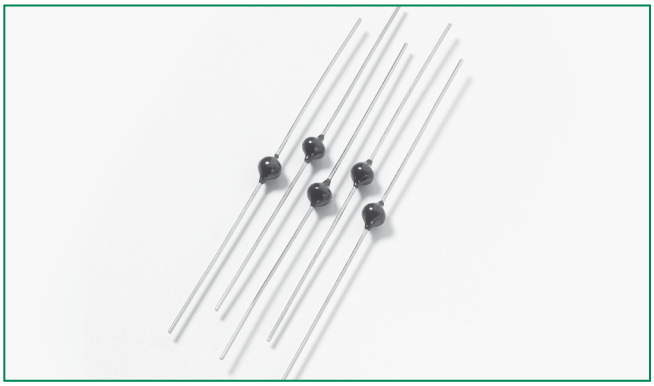
MA Varistor Series

RoHS Pb HF



Agency Approvals

Agency	Agency File Number
	None

Additional Information

Datasheet | **Resources** | **Samples**

Description

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

- Lead–free, Halogen-Free and RoHS compliant.
- 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
- New black epoxy offers improved performance for high temperature Lead-free wave soldering process.

Absolute Maximum Ratings

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

Continuous	MA Series	Units
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 2ms Current Square 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 (COATING Isolation Voltage Capability) Dielectric must withstand indicated DC voltage for one minute per MIL-STD 202, Method 301)	1000	V
COATING Insulation Resistance	1000	MΩ

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.

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MA Series Ratings & Specifications

Part Number	Brand (mm)	Maximum Rating (85°C)				Specifications (25°C)				
		Continuous		Transient		Varistor Voltage at 1mA DC Test Current			Max Clamping Volt 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)	(A)	(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
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.

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Power Dissipation Ratings

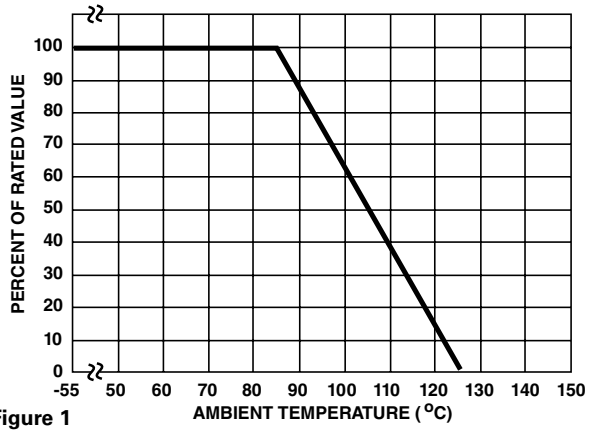

Figure 1

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 above. 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.

Peak Pulse Current Test Waveform

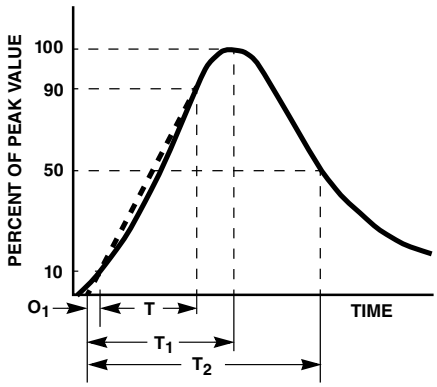

Figure 2

0_1 = Virtual Origin of Wave
T = Time from 10% to 90% of Peak
T_1 = Rise Time = 1.25 x T
T_2 = Decay Time

Example - For an 8/20 μs Current Waveform:
8μs = T_1 = Rise Time
20μs = T_2 = Decay Time

Repetitive Surge Capability

V18MA - V100MA

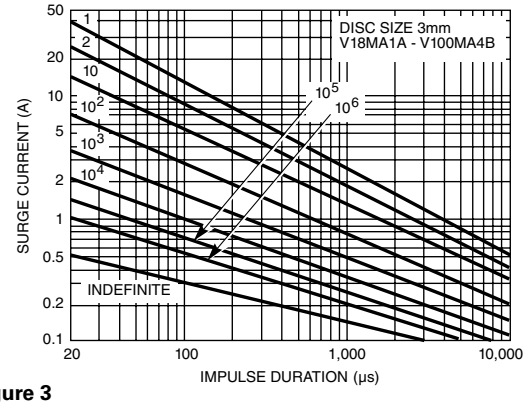

Figure 3

V120MA1A/S - V430MA3A

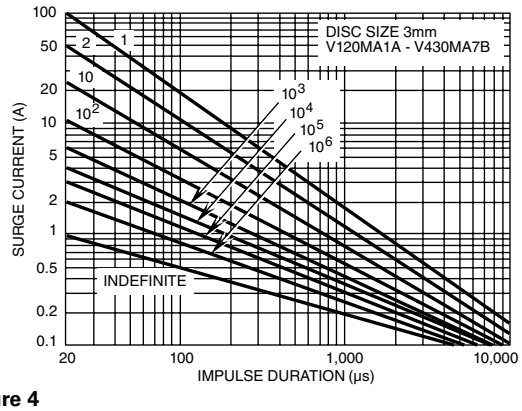

Figure 4

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.

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Maximum Clamping Voltage

V18MA1A/S - V100MA4A/S

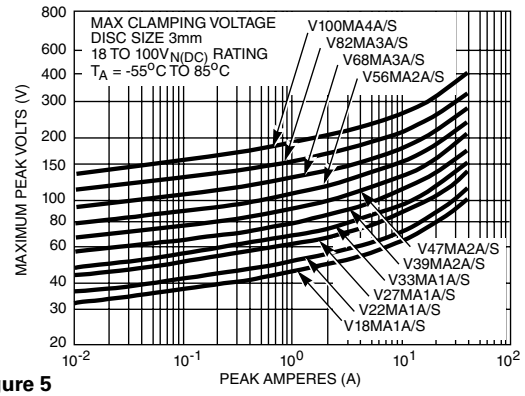


Figure 5

V18MA1B - V100MA4B

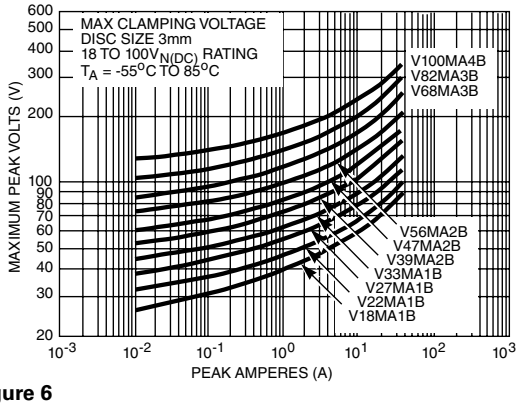


Figure 6

V120MA1A/S - V430MA3A

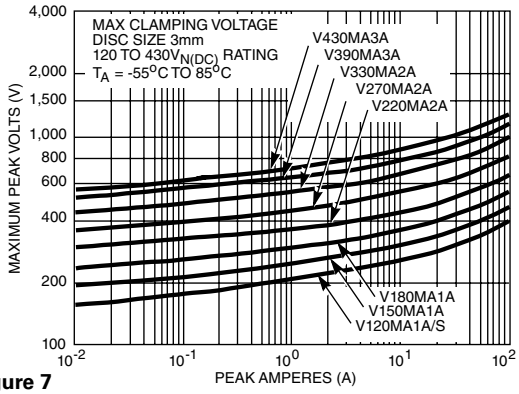


Figure 7

V120MA2B - V430MA7B

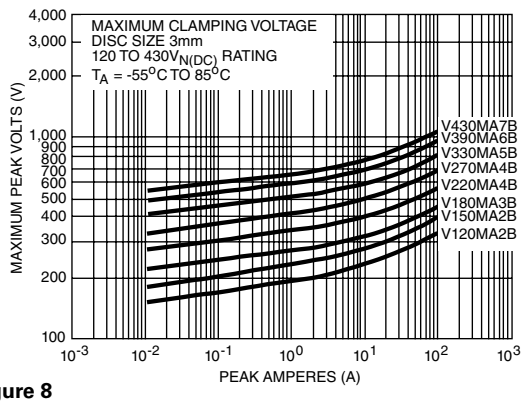


Figure 8

Wave Solder Profile

Non Lead–free Profile

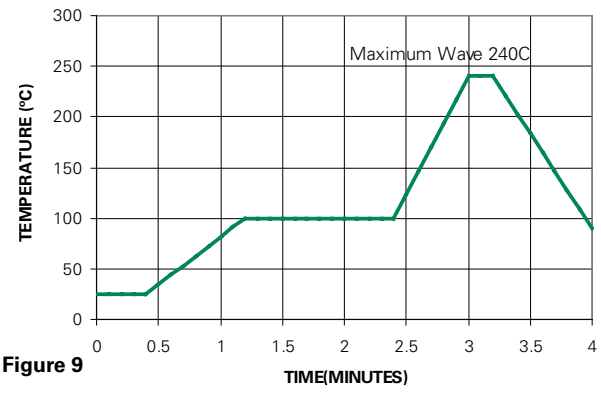


Figure 9

Lead–free Profile

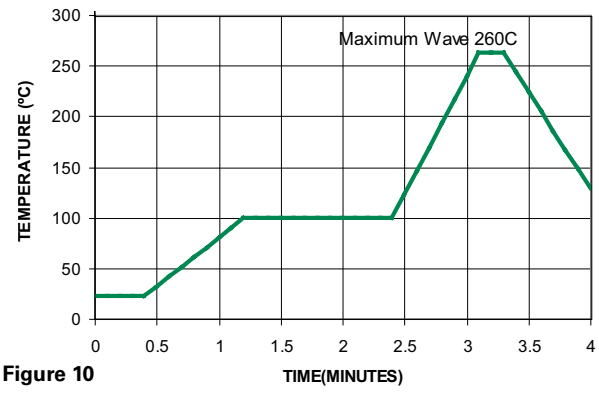
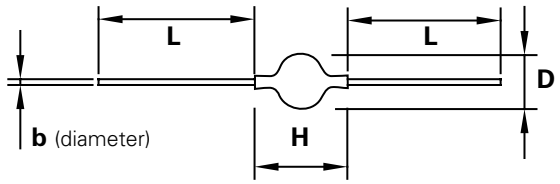


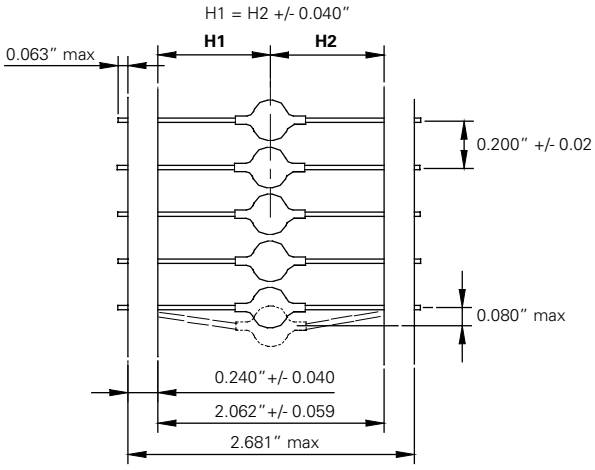
Figure 10

Product Dimensions



Symbol	Inches		Millimeters	
	Min	Max	Min	Max
Øb	0.024	0.026	0.61	0.66
ØD	0.118	0.177	3.0	4.5
H	0.177	0.276	4.5	7.0
L	1.740	1.220	27.3	31.0
Typical Weight = 0.5g				

Tape and Reel Dimensions



Conforms to EIA Standard RS-296-E

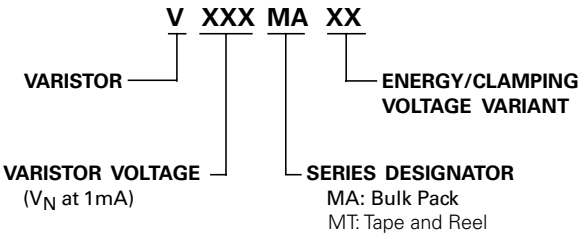
Physical Specifications

Lead Material	Tin–plated Copper clad steel
Soldering Characteristics	Solderability per MIL–STD–202, Method 208
Insulating Material	Cured, flame retardant epoxy polymer meets UL94V–0 requirements
Device Labeling	Marked with LF, voltage and date code

Environmental Specifications

Operating/Storage Temperature	-40°C to +85°C
Passive Aging	+85°C, 1000 hours +/-10% typical voltage change
Humidity Aging	+85°C, 85% RH, 1000 hours +/-10% typical voltage change
Thermal Shock	+85°C to -40°C 5 times +/-10% typical voltage change
Solvent Resistance	MIL–STD–202, Method 215
Moisture Sensitivity	Level 1, J-STD-020

Part Numbering System



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V27MT1B V120MT1A V39MT2B V56MT2A V39MA2S V100MA4B V180MT1A V18MA1B V68MA3A V22MT1B V47MA2B V39MA2A V430MA7B V120MA2B V33MA1B V270MA4B V22MA1B V390MA6B V150MT2B V33MA1A V180MT3B V390MT6B V270MT4B V120MT2B V82MA3B V430MT3A V56MA2S V180MA1A V68MT3A V33MT1B V47MT2B V27MA1B V56MA2B V82MT3B V18MA1A V18MA1S V220MA4B V27MA1S V39MA2B V22MA1S V27MA1A V39MT2A V68MA3B V22MA1A V390MA3A V100MT4B V430MT7B V150MA1A V220MT2A V47MA2S V120MA1A V220MA2A V33MA1S V68MT3B V180MA3B V18MT1B V330MT2A V47MA2A V330MT5B V390MT3A V330MA2A V430MA3A V150MA2B V270MA2A V100MA4A V270MT2A V56MA2A V220MT4B V330MA5B V47MT2A V56MT2B V82MA3A V33MT1A V330MAX1131 V100MA4S V120MA2S V68MA3S V82MA3S