

Metal Oxide Varistor SMD AEC-Q200 Type

MVS-A Series

MERITEK

FEATURE

- Operating Temperature: -55°C ~ +125°C
- High surge suppress capability for automotive application (load dump)
- Bidirectional and symmetrical V/I characteristics
- Stability in high-temperature and high-humidity environment
- Applications: engine management, airbag, control units, electro hydraulic brake, ABS/ESP, sunroof
- AEC-Q200 compliant



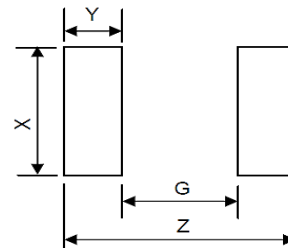
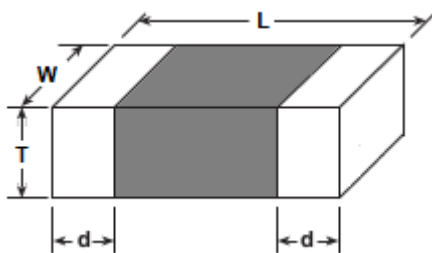
PART NUMBERING SYSTEM



MVS 0402 A 5V5 N 330
(1) (2) (3) (4) (5) (6)

No	Item	Code	Description	Series Reference
(1)	Meritek Series	MVS	Metal Oxide Varistor	Surface Mount type
(2)	Size Code	0402	1.0x0.50x0.60mm	See Dimension Table below
(3)	Product Code	A	A: AEC-Q200	B: General Purpose
(4)	Max DC Voltage	5V5	5V5: 5.5V	220: 22V, 480: 48V, 560:56V
(5)	Capacitance Tolerance	N	N: ±30%	M: ±20%
(6)	Typical Capacitance	330	330: 33pF	First two digits: Significant, Third: Multiplier

DIMENSION AND SOLDERING PAD



Unit: mm

Part Series	EIA	L	W	T max	d	Z	G	X	Y
MVS0402A	0402	1.00±0.15	0.50±0.10	0.60	0.20±0.10	1.7	0.5	0.6	0.6
MVS0603A	0603	1.60±0.15	0.80±0.15	0.95	0.35±0.15	3.0	1.0	1.0	1.0
MVS0805A	0805	2.00±0.20	1.25±0.20	1.00	0.40±0.20	3.4	1.0	1.4	1.2
MVS1206A	1206	3.20±0.30	1.60±0.20	1.50	0.50±0.20	4.5	2.1	1.8	1.2
MVS1210A	1210	3.20±0.30	2.50±0.25	1.50	0.50±0.20	4.5	2.1	2.8	1.2
MVS1812A	1812	4.50±0.40	3.20±0.30	2.00	0.60±0.30	6.0	3.0	3.6	1.5
MVS2220A	2220	5.70±0.40	5.00±0.30	2.50	0.60±0.30	7.2	4.2	5.5	1.5

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ELECTRICAL CHARACTERISTICS

MVS0402A Series

EIA Size 0402	Varistor Voltage 1mA	Max Continuous Voltage		Max Clamping Voltage		Peak Current 8/20 μ s	Max Energy 10/1K μ s	Typical Capacitance	
		DC (V)	AC (V_{rms})	DC (V)	(V)			(A)	(A)
MVS0402A5V5N330	8.8~13.2	4	5.5	31	1	4	0.02	33 \pm 30%	1MHz
MVS0402A5V5N900	8.8~13.2	4	5.5	30	1	10	0.05	90 \pm 30%	1MHz
MVS0402A140N800	16~21	11	14	35	1	10	0.05	80 \pm 30%	1KHz
MVS0402A180N120	22~28	14	18	55	1	2	0.03	12 \pm 30%	1MHz
MVS0402A180N400	22~28	14	18	50	1	20	0.05	40 \pm 30%	1MHz
MVS0402A180N500	22~28	14	18	50	1	20	0.05	50 \pm 30%	1MHz
MVS0402A180N600	22~28	14	18	50	1	20	0.05	60 \pm 30%	1MHz
MVS0402A180N650	22~28	14	18	50	1	20	0.05	65 \pm 30%	1MHz

MVS0603A Series

EIA Size 0603	Varistor Voltage 1mA	Max Continuous Voltage		Max Clamping Voltage		Peak Current 8/20 μ s	Max Energy 10/1K μ s	Typical Capacitance	
		(V)	AC (V_{rms})	DC (V)	(A)			(V)	(A)
MVS0603A5V5N271	8~12	4	5.5	25	1	20	0.10	270 \pm 30%	1MHz
MVS0603A090N491	11~16	7	9	29	1	30	0.10	490 \pm 30%	1MHz
MVS0603A180N120	23~30	14	18	55	1	2	0.03	12 \pm 30%	1MHz
MVS0603A180N150	23~30	14	18	55	1	2	0.03	15 \pm 30%	1KHz
MVS0603A180N150	23~30	14	18	55	1	2	0.03	15 \pm 30%	1MHz
MVS0603A220N530	25~40	17	22	50	1	30	0.105	53 \pm 30%	1KHz
MVS0603A220N101	25~33	17	22	50	1	30	0.10	100 \pm 30%	1KHz
MVS0603A260N111	31~38	20	26	60	1	30	0.10	110 \pm 30%	1MHz
MVS0603A310N900	35.1~42.9	25	31	67	1	30	0.30	90 \pm 30%	1KHz
MVS0603A320N100	51.9~70.1	25	32	120	1	5	0.05	10 \pm 30%	1MHz

MVS0805A Series

EIA Size 0805	Varistor Voltage 1mA	Max Continuous Voltage		Max Clamping Voltage		Peak Current 8/20 μ s	Max Energy 10/1K μ s	Typical Capacitance	
		(V)	AC (V_{rms})	DC (V)	(A)			(V)	(A)
MVS0805A160M651	21.6~26.4	12	16	40	1	120	0.3	650 \pm 20%	1KHz
MVS0805A180M651	23.0~28.0	14	18	44	1	120	0.3	650 \pm 20%	1KHz
MVS0805A180M751	23.0~28.0	14	18	44	1	120	0.3	750 \pm 20%	1KHz
MVS0805A260M501	29.7~36.3	20	26	56	1	80	0.3	500 \pm 20%	1KHz
MVS0805A310M251	35.1~42.9	25	31	67	1	80	0.3	250 \pm 20%	1KHz

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ELECTRICAL CHARACTERISTICS (CONTINUES)

MVS1206A Series

EIA Size 1206	Varistor Voltage 1mA (V)	Max Continuous Voltage		Max Clamping Voltage		Peak Current 8/20 μ s (A)	Max Energy 10/1K μ s (J)	Typical Capacitance	
		AC(V _{rms})	DC (V)	(A)	(V)			(pF)	Freq.
MVS1206A160M102	21.6~26.4	12	16	40	1	200	0.6	1000±20%	1KHz
MVS1206A180M102	22.95~28.05	14	18	42	1	150	0.6	1000±20%	1KHz
MVS1206A340M551	42.3~51.7	26	34	77	1	200	0.4	550±20%	1KHz
MVS1206A450M301	50.4~61.6	35	45	90	1	100	0.4	300±20%	1KHz
MVS1206A480M271	55.8~68.2	37	48	100	1	100	0.4	270±20%	1KHz
MVS1206A560M251	61.2~74.8	40	56	110	1	100	0.5	250±20%	1KHz

MVS1210A Series

EIA Size 1210	Varistor Voltage 1mA (V)	Max Continuous Voltage		Max Clamping Voltage		Peak Current 8/20 μ s (A)	Max Energy 10/1K μ s (J)	Typical Capacitance	
		AC(V _{rms})	DC (V)	(A)	(V)			(pF)	Freq.
MVS1210A160M242	21.6~26.4	12	16	40	2.5	400	1.6	2400±20%	1KHz
MVS1210A180M312	22.95~28.05	14	18	42	2.5	500	1.6	3100±20%	1KHz
MVS1210A260M152	29.7~36.3	20	26	54	2.5	400	1.9	1500±20%	1KHz
MVS1210A310M122	35.1~42.9	25	31	65	2.5	300	1.7	1200±20%	1KHz

MVS1812A Series

EIA Size 1812	Varistor Voltage 1mA (V)	Max Continuous Voltage		Max Clamping Voltage		Peak Current 8/20 μ s (A)	Max Energy 10/1K μ s (J)	Typical Capacitance	
		AC(V _{rms})	DC (V)	(A)	(V)			(pF)	Freq.
MVS1812A160M452	21.6~26.4	12	16	40	5	800	2.4	4500±20%	1KHz
MVS1812A300M172	35~43	23	30	77	5	600	3.8	1700±20%	1KHz

MVS2220A Series

EIA size 2220	Varistor Voltage 1mA (V)	Max Continuous Voltage		Max Clamping Voltage		Peak Current 8/20 μ s (A)	Max Energy 10/1K μ s (J)	Typical Capacitance	
		AC(V _{rms})	DC (V)	(A)	(V)			(pF)	Freq.
MVS2220A160M103	21.6~26.4	12	16	42	10	1200	5.8	10000±20%	1KHz
MVS2220A160M203	21.6~26.4	12	16	42	10	1200	10	20000±20%	1KHz

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RELIABILITY TEST CONDITON AND REQUIREMENT

Item	Standard	Test conditions / Methods	Specifications																																										
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	Test temp. at 150 +3/-0°C Duration: 1000 hr Unpowered, measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$																																										
Temperature Cycling	JESD22 Method JA-104	Lower test temp. at -40 +0/-3°C, Upper test temp. at 125 +3/-0°C, Soak time at lower or upper temp. : 1 min, Cycle time: 2 Cycles/hr, number of cycles: 1000. Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$																																										
Moisture Resistance	MIL-STD-202 Method 106	Duration of 1 cycle: 24 hr, number of cycles: 10, unpowered. Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$																																										
		<table border="1"> <thead> <tr> <th rowspan="2">Step</th> <th colspan="2">Temp. (°C)</th> <th rowspan="2">Humidity (%)</th> <th rowspan="2">Period (hr)</th> </tr> <tr> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> <td>65</td> <td>90~100</td> <td>2.5</td> </tr> <tr> <td>2</td> <td>65</td> <td>65</td> <td>90~100</td> <td>3</td> </tr> <tr> <td>3</td> <td>65</td> <td>25</td> <td>80~100</td> <td>2.5</td> </tr> <tr> <td>4</td> <td>25</td> <td>65</td> <td>90~100</td> <td>2.5</td> </tr> <tr> <td>5</td> <td>65</td> <td>65</td> <td>90~100</td> <td>3</td> </tr> <tr> <td>6</td> <td>65</td> <td>25</td> <td>80~100</td> <td>2.5</td> </tr> <tr> <td>7</td> <td>25</td> <td>25</td> <td>80~100</td> <td>8</td> </tr> </tbody> </table>		Step	Temp. (°C)		Humidity (%)	Period (hr)	Start	Finish	1	25	65	90~100	2.5	2	65	65	90~100	3	3	65	25	80~100	2.5	4	25	65	90~100	2.5	5	65	65	90~100	3	6	65	25	80~100	2.5	7	25	25	80~100	8
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Biased Humidity	MIL-STD-202 Method 103	Test temp at 85°C, rel. humidity of air: 85% Duration: 1000 hr, Bias at Working Voltage Vdc. Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$																																										
Operational Life	MIL-STD-202 Method 108	Test temp. at 125 +3/-0°C, duration: 1000 hr. Bias at Working Voltage Vdc. Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$																																										
External Visual	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship.	No visible damage																																										
Physical Dimension	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification.	Within the specified values																																										
Resistance to Solvents	MIL-STD-202 Method 215	Solvent 1: 1 part (by volume) of isopropyl alcohol 3 part (by volume) of mineral spirits.	No visible damage																																										
Mechanical Shock	MIL-STD-202 -213	Test Condition F. Peak value: 1500g's. Half sine Waveform. Normal duration (D): 0.5ms, In 3 directions perpendicularly intersecting each other (total 18 times).	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$																																										
Vibration	MIL-STD-202 Method 204	Acceleration: 5 g's. Sweep time: 20 min. Frequency range: 10 to 2000 Hz, 3×12 cycles	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$																																										
Resistance to Soldering Heat	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Temperature: 260±5°C, Time: 10±1s. Immersion and emersion rate: 25mm/s ±6mm/s. Number of heat cycles: 1	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 5\%$																																										
Thermal Shock	MIL-STD-202 Method 107	Lower test temp. at -55 +0/-3°C, Upper test temp. at 125 +3/-0°C. Maximum transfer time: 20 seconds. Dwell time: 15 minutes. Air-Air. Number of cycles: 300	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$																																										

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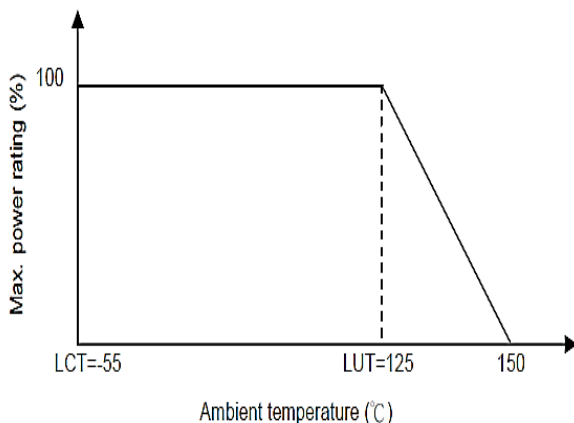
MVS-A Series

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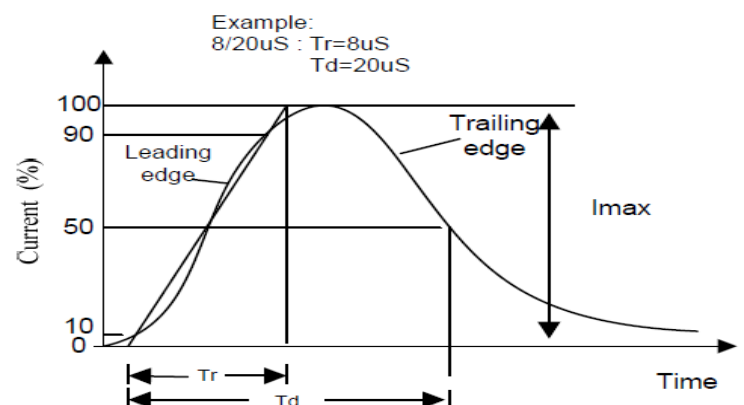
RELIABILITY TEST CONDITON AND REQUIREMENT (CONTINUES)

Item	Standard	Test conditions / Methods	Specifications
ESD	AEC-Q200-002	Discharge capacitance: 150 pF. Charging voltage: 6 KV. Contact discharge, 1 pulse in each polarity	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Solderability	IEC 60068-2-58 J-STD-002	4 hours at 155°C dry heat, Dip at 245±5°C 3±0.3sec Steam aging 8h±15min at 93±3°C, Dip at 260±5°C 7±0.5sec	95% of termination wetted
Electrical Characteristic	Specifications	V1mA(-55°C), V1mA(25°C), V1mA(125°C)	Within the specified values
Board Flex	AEC-Q200-005 (JIS-C-6429)	Bend the board: 2mm (Min.). Duration: 60 (+5) Sec	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Terminal Strength	AEC-Q200-006 (JIS-C-6429)	Apply force: 0402=0.5kg (5 N), 0603=1.0kg (10 N) Chip size>0805=1.8kg (17.7 N) Duration of the applied forces: 60 (+1) Sec	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Electrical Transient Conduction	ISO-7637-2	Test pulses 5a, Number of pulses: 10 Test Energy: W_{LD} (Load dump)	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$

POWER DERATING CURVE

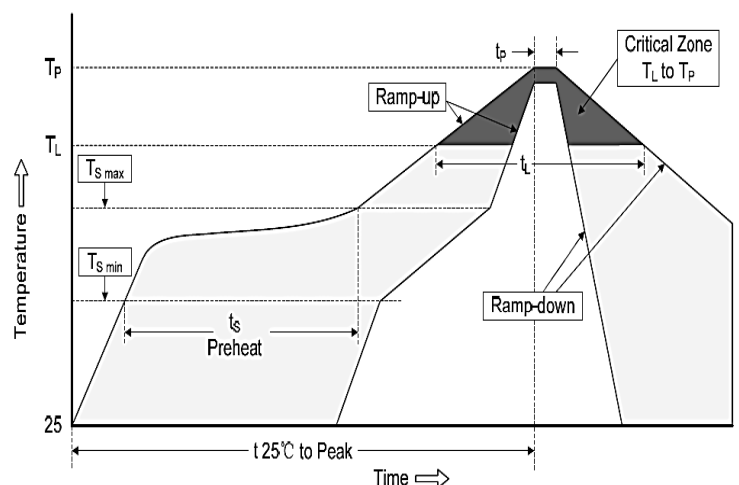


SURGE CURRENT STANDARD WAVEFORM



SOLDERING RECOMMENDATION

Reflow Condition		
Pre Heat	Temp. Min $T_{s(min)}$	150°C
	Temp. Max $T_{s(max)}$	200°C
	Time (min. to max.) (t_s)	60~180 seconds
Average ramp up rate (Liquidus Temperature) (T_L) to peak		3°C/second max.
$T_{s(max)}$ to T_L (Ramp-up rate)		3°C/second max.
Reflow	Temp. (T_L)	217°C
	Time (t_L) (min. to max.)	60~150 seconds
Peak Temperature (T_P)		260°C
Time within 5°C of actual peak Temperature (t_p)		10 seconds
Ramp-down Rate		6°C/second max.



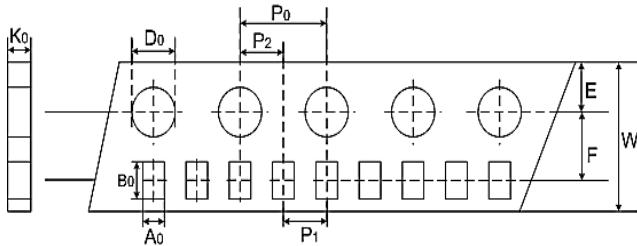
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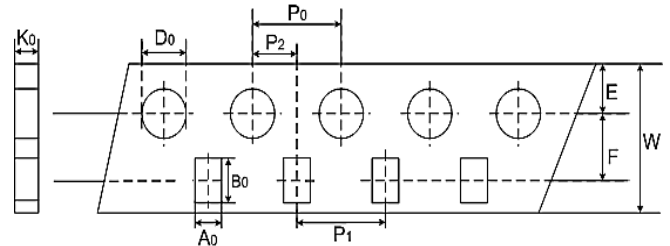
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TAPING SPECIFICATON

Taping Specification (0402)



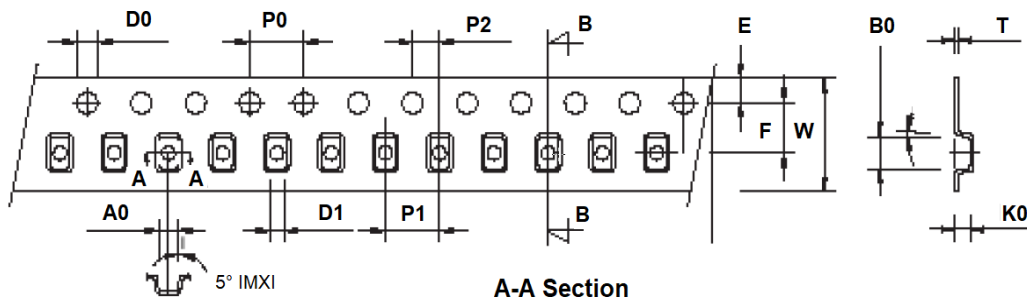
Taping Specification (0603, 0805)



Unit (mm)

Size	A ₀ ±0.05	B ₀ ±0.12	W ±0.2	E ±0.1	F ±0.05	P ₁ ±0.1	P ₂ ±0.05	P ₀ ±0.1	D ₀ ±0.1	K ₀ ±0.1
0402	0.62	1.12	8	1.75	3.5	2	2	4	1.55	0.6
0603	1.1	1.9	8	1.75	3.5	4	2	4	1.55	0.95
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1

Taping Specification (1206, 1210, 1812, 2220)



Unit (mm)

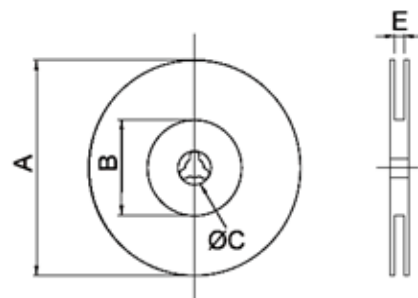
Size	A ₀ ±0.2	B ₀ ±0.2	W ±0.2	E ±0.1	F ±0.05	P ₁ ±0.1	P ₂ ±0.05	P ₀ ±0.1	D ₀ ±0.1	D ₁ ±0.1	T ±0.1
1206	1.85	3.45	8	1.75	3.5	4	2	4	1.55	1	0.25
1210	2.75	3.55	8	1.75	3.5	4	2	4	1.55	1	0.25
1812	3.65	4.96	12	1.75	5.5	8	2	4	1.55	1.5	0.25
2220	5.5	6.25	12	1.75	5.5	8	2	4	1.55	1.5	0.25

TAPE CARRIER SPECIFICATON AND Quantity

(Unit: mm)

Size	A ±1	B ±0.5	C ±0.2	E ±0.5	Pcs/ Reel
0402	178	60	13.0	9.0	10000
0603	178	60	13.0	9.0	4000
0805	178	60	13.0	9.0	3500
1206	178	60	13.0	9.0	2500
1210	178	60	13.0	9.0	2500
1812	178	60	13.0	13.2	1000
2220	178	60	13.0	13.2	850

CARRIER TAPE REELS



*Specifications subject to change without notice.