Surface Mount Multilayer Varistors

ESD Protection (ES) Series

Features:

- Fast Response < 0.5 ns
- Low Working Voltage 5 V
- Low Capacitance
- Low Leakage Current < 1 μA
- Low Clamping Voltage

Application Fields:

- Cell Phones
- Digital Cameras
- PDAs
- MP3
- Notebooks

Part Number	Working Voltage (Max)	Clamping Voltage (Max)	Leakage Current (Max)	Typical Capacitance Value (1 MHz)	Tolerance of Cap.
	DC(V)	(V)	ILDC(μA)	C (pF)	(%)
MLV0402ES005V0100N	5.5	55	1	100	± 30
MLV0402ES005V0056N	5.5	55	1	56	± 30
MLV0402ES005V0033N	5.5	55	1	33	± 30
MLV0402ES005V0022N	5.5	55	1	22	± 30
MLV0402ES005V0010N	5.5	60	1	10	± 30
MLV0402ES005V0005P	5.5	76	1	5	5~9 pF
MLV0402ES012V0100N	12	55	1	100	± 30
MLV0402ES012V0056N	12	55	1	56	± 30
MLV0402ES012V0033N	12	55	1	33	± 30
MLV0402ES012V0022N	12	55	1	22	± 30
MLV0402ES012V0010N	12	60	1	10	± 30
MLV0402ES012V0005P	12	80	1	5	5~9 pF
MLV0402ES024V0003N	24	120	1	3	± 30
MLV0402ES024V02R5P	24	198	1	2.5	2~4 pF
MLV0402ES024V00R8P	24	200	1	0.8	0.8~1.5 pF
MLV0603ES005V0100N	5.5	55	1	100	± 30
MLV0603ES005V0056N	5.5	55	1	56	± 30
MLV0603ES005V0033N	5.5	55	1	33	± 30
MLV0603ES005V0022N	5.5	55	1	22	± 30
MLV0603ES005V0010N	5.5	60	1	10	± 30
MLV0603ES005V0005P	5.5	76	1	5	5~9 pF
MLV0603ES012V0100N	12	55	1	100	± 30
MLV0603ES012V0056N	12	55	1	56	± 30
MLV0603ES012V0033N	12	55	1	33	± 30
MLV0603ES012V0022N	12	55	1	22	± 30
MLV0603ES012V0010N	12	60	1	10	± 30
MLV0603ES012V0005P	12	80	1	5	5~9 pF
MLV0603ES024V0003N	24	120	1	3	± 30
MLV0603ES024V02R5P	24	198	1	2.5	2~4 pF
MLV0603ES024V00R8P	24	200	1	0.8	0.8~1.5 pF
MLV0805ES005V0100N	5.5	50	1	100	± 30
MLV0805ES005V0056N	5.5	50	1	56	± 30

Surface Mount Multilayer Varistors

Normal Surge Protection (NA) Series

Features:

- Fast Response < 0.5 ns
- Low Capacitance
- Low Clamping Voltage and High Energy Absorption

Application Fields:

- Telecommunications
- Automotive Systems
- Data Systems
- Power Supplies

Ordering Information:

Part Number	Working Voltage (max)		Breakdown Voltage	Peak Current (max)	Clamping Voltage (max)		Energy Absorption (max)	Typical Capacitance Ref.
	AC (V_{RMS})	DC (V)	1 mA (V)	8/20 μs (A)	(A)	(V)	10/1000 μs (J)	1 KHz (pF)
MLV0402NA006V0020	4	5.5	8 (7.5~10.5)	20	1	20	0.05	200
MLV0402NA009V0020	6	9	12 (10.2~13.8)	20	1	23	0.05	135
MLV0402NA011V0020	8	11	15 (12.8~17.3)	20	1	25	0.05	75
MLV0402NA014V0020	11	14	18 (15.3~20.7)	20	1	30	0.05	50
MLV0402NA018V0020	14	18	24 (21.6~26.4)	20	1	39	0.05	45
MLV0603NA006V0030	4	5.5	8 (7.5~10.5)	30	1	20	0.1	360
MLV0603NA009V0030	6	9	12 (10.2~13.8)	30	1	23	0.1	300
MLV0603NA014V0030	11	14	18 (15.3~20.7)	30	1	30	0.1	210
MLV0603NA018V0030	14	18	24 (21.6~26.4)	30	1	39	0.1	160
MLV0603NA022V0030	17	22	27 (24.3~29.7)	30	1	44	0.1	145
MLV0603NA030V0030	25	30	39 (35.1~42.9)	30	1	65	0.1	110
MLV0603NA038V0030	30	38	47 (42.3~51.7)	30	1	77	0.1	90
MLV0805NA006V0080	4	5.5	8 (7.5~10.5)	80	1	20	0.1	1400
MLV0805NA009V0080	6	9	12 (10.2~13.8)	80	1	23	0.1	650
MLV0805NA011V0100	8	11	15 (12.75~17.25)	100	1	25	0.2	410
MLV0805NA014V0100	11	14	18 (15.3~20.7)	100	1	30	0.2	350
MLV0805NA018V0100	14	18	24 (21.6~26.4)	100	1	39	0.2	300
MLV0805NA022V0100	17	22	27 (24.3~29.7)	100	1	44	0.2	250
MLV0805NA026V0100	20	26	33 (29.7~36.3)	100	1	54	0.3	220
MLV0805NA030V0100	25	30	39 (35.1~42.9)	100	1	65	0.3	200
MLV0805NA038V0100	30	38	47 (42.3~51.7)	100	1	77	0.3	150
MLV0805NA045V0080	35	45	56 (50.4~61.6)	80	1	90	0.3	110
MLV1206NA006V0100	4	5.5	8 (7.5~10.5)	100	1	20	0.2	3100
MLV1206NA014V0100	11	14	18 (15.3~20.7)	100	1	30	0.3	800
MLV1206NA018V0100	14	18	24 (21.6~26.4)	100	1	38	0.3	620
MLV1206NA022V0100	17	22	27 (24.3~29.7)	100	1	44	0.4	700
MLV1206NA026V0100	20	26	33 (29.7~36.3)	100	1	54	0.5	480
MLV1206NA030V0100	25	30	39 (35.1~42.9)	100	1	65	0.6	400

Surface Mount Multilayer Varistors

Normal Surge Protection (NA) Series

Ordering Information:

Part Number	Working Voltage (max)		Breakdown Voltage	Peak Current (max)	Clamping Voltage (max)		Energy Absorption (max)	Typical Capacitance
	AC (V_{RMS})	DC (V)	1 mA (V)	8/20 μs (A)	(A)	(V)	10/1000 μs (J)	1 KHz (pF)
MLV1206NA038V0100	30	38	47 (42.3~51.7)	100	1	77	0.7	260
MLV1206NA045V0100	35	45	56 (50.4~61.6)	100	1	90	0.8	230
MLV1206NA056V0100	40	56	68 (61.2~74.8)	100	1	110	1.0	200
MLV1206NA065V0100	50	65	82 (73.8~90.2)	100	1	135	0.5	175
MLV1206NA085V0100	60	85	100 (90~110)	100	1	165	0.6	150
MLV1210NA006V0250	4.5	5.5	8 (7.5~10.5)	250	2.5	20	0.5	5200
MLV1210NA018V0250	14	18	24 (21.6~26.4)	250	2.5	38	0.8	1150
MLV1210NA022V0250	17	22	27 (24.3~29.7)	250	2.5	44	1.0	1720
MLV1210NA026V0250	20	26	33 (29.7~36.3)	250	2.5	54	1.2	610
MLV1210NA030V0250	25	30	39 (35.1~42.9)	250	2.5	65	1.4	920
MLV1210NA038V0250	30	38	47 (42.3~51.7)	250	2.5	77	1.6	780
MLV1210NA045V0250	35	45	56 (50.4~61.6)	250	2.5	90	2.0	400
MLV1210NA056V0250	40	56	68 (61.2~74.8)	250	2.5	110	2.3	300
MLV1210NA085V0200	60	85	100 (90~110)	200	2.5	165	1.4	210
MLV1812NA018V0500	14	18	24 (21.6~26.4)	500	5	38	1.7	2000
MLV1812NA030V0500	25	30	39 (35.1~42.9)	500	5	65	2.9	2500
MLV1812NA038V0500	30	38	47 (42.3~51.7)	500	5	77	3.5	2200
MLV1812NA045V0500	35	45	56 (50.4~61.6)	500	5	90	4.2	1000
MLV2220NA018V1000	14	18	24 (21.6~26.4)	1000	10	38	3.1	8500
MLV2220NA030V1000	25	30	39 (35.1~42.9)	1000	10	65	5.5	3900
MLV2220NA038V1000	30	38	47 (42.3~51.7)	1000	10	77	6.3	4600
MLV2220NA056V1000	40	56	68 (61.2~74.8)	1000	10	110	8.8	4000

Surface Mount Multilayer Varistors

High Surge Protection (HA) Series

Features:

- Fast Response < 0.5 ns
- Low Capacitance
- Low Clamping Voltage and High Energy Absorption

Application Fields:

- Telecommunications
- Automotive Systems
- Data Systems
- Power Supplies

Ordering Information:

Part Number	Working Voltage (max)		Breakdown Voltage	Peak Current (max)	Clamping Voltage (max)		Energy Absorption (max)	Typical Capacitance
	AC (V_{RMS})	DC (V)	1 mA (V)	8/20 μs (A)	(A)	(V)	10/1000 μs (J)	1 KHz (pF)
MLV1206HA014V0200	11	14	18 (15.3~20.7)	200	1	30	0.5	1200
MLV1206HA018V0200	14	18	24 (21.6~27.0)	200	1	39	0.5	780
MLV1206HA022V0200	17	22	27 (24.3~29.8)	200	1	44	0.7	750
MLV1206HA026V0200	20	26	33 (29.7~36.3)	200	1	54	1.0	700
MLV1206HA030V0200	25	30	39 (35.1~42.9)	200	1	65	1.0	510
MLV1206HA038V0200	30	38	47 (42.3~51.7)	200	1	77	1.1	440
MLV1210HA014V0400	11	14	18 (15.3~20.7)	400	2.5	30	1.2	2000
MLV1210HA018V0400	14	18	24 (21.6~27.0)	400	2.5	39	1.4	1600
MLV1210HA022V0400	17	22	27 (24.3~29.8)	400	2.5	44	1.7	1500
MLV1210HA026V0400	20	26	33 (29.7~36.3)	400	2.5	54	1.9	880
MLV1210HA030V0400	25	30	39 (35.1~42.9)	400	2.5	65	1.7	800
MLV1210HA038V0400	30	38	47 (42.3~51.7)	400	2.5	77	2.0	530
MLV1812HA018V0800	14	18	24 (21.6~27.0)	800	5	38	2.3	3500
MLV1812HA030V0800	25	30	39 (35.1~42.9)	800	5	65	3.7	2350
MLV1812HA038V0800	30	38	47 (42.3~51.7)	800	5	77	4.2	1600
MLV1812HA045V0800	35	45	56 (50.4~61.6)	800	5	90	4.2	1200
MLV2220HA014V1200	11	14	18 (15.3~20.7)	1200	10	30	5.4	10500
MLV2220HA018V1200	14	18	24 (21.6~27.0)	1200	10	39	5.8	8500
MLV2220HA022V1200	17	22	27 (24.3~29.8)	1200	10	44	7.2	8300
MLV2220HA030V1200	25	30	39 (35.1~42.9)	1200	10	65	9.6	6000
MLV2220HA038V1200	30	38	47 (42.3~51.7)	1200	10	77	12.0	4000
MLV2220HA045V1200	35	45	56 (50.4~61.6)	1200	10	90	12.0	3500

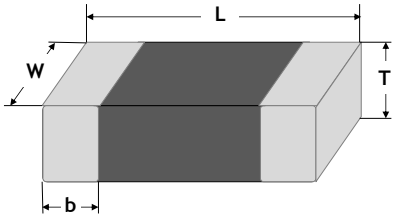
Surface Mount Multilayer Varistors
High Voltage (HV) Series

Features:

- Bidirectional and symmetrical V/I characteristics Low Capacitance
- Meet IEC61000-4-2 Standard
- Large withstanding surge current capability - 400~500A (@8/20μs)
- Multilayer construction provides higher power dissipation

Shape and Dimensions:

Unit (mm)	Length (L)	Width (W)	Thickness (T)	Termination bandwidth (b)
MLV3220HV240V0500	8.1±0.30	5.0±0.30	1.7±0.30	0.8 +0.5/-0.1
MLV3220HV270V0500				
MLV3220HV390V0500			2.2±0.30	
MLV3220HV430V0450				
MLV3220HV470V0400				



Product Identification:

MLV	3220	HV	270V	0500
Category Code	**Size Code**	**Application Code**	**Breakdown Voltage Code**	**Surge Current Code**
MLV = Multilayer Varistor	**Inch** (mm) **3220** (8153)	**HV** = High Voltage	**390V** = 390V **430V** = 430V **470V** = 470V	**0400** = 400A **0450** = 450A **0500** = 500A

Electrical Characteristics:

Operating temperature: -55 to +85°C

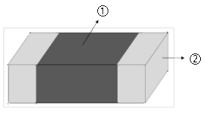
Part Number	Size	Working Voltage		Breakdown Voltage[1] @1mA (V)	Clamping Voltage[2]		Surge Current[3] @8/20μs (A)	Energy (J)	Capacitance[4] @1kHz (pF)
		Vac	Vdc		A	V			
MLV3220HV240V0500	3220	150	200	240 (±10%)	10	390	500	> 14.5	380
MLV3220HV270V0500		175	225	270 (±10%)		450	500	> 16.0	340
MLV3220HV390V0500		250	330	390 (±10%)		647	500	> 20.0	125
MLV3220HV430V0450		275	369	430 (±10%)		705	450	> 21.0	120
MLV3220HV470V0400		300	385	470 (±10%)		775	400	> 21.6	115

[1] The breakdown voltage was measured at 1 mA current.
[2] The clamping voltage was measured at standard current 3220 (10A).
[3] The surge current was tested at 8/20 μs waveform.
[4] The capacitance value only for customer reference, it's not formal specification.

Surface Mount Multilayer Varistors
High Voltage (HV) Series

Construction and Materials:

Body ①	Termination ②
ZnO	Ag/Ni/Sn

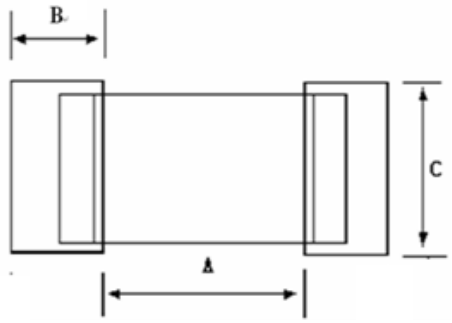


Packaging:

Chip Size	Parts on 7 inch (178mm) Reel
3220	1,000

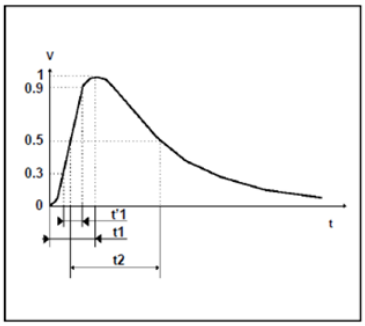
Recommended Foot Print Dimensions:

Size	A (mm)	B (mm)	C (mm)
3220	6.2~7.0	1.6~2.6	4.8~5.8



Surge Waveform:

Severity Level	t1 (=1.67t'1)	t2
1	8 μs	20 μs



Environmental Test:

Test item	Test condition	Requirement
High Temperature Storage	* Temperature : 125±2°C * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Storage	* Temperature : 125±2°C * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Storage	* Temperature : 125±2°C * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Load	* Temperature : 85±2°C * Rated working voltage applied * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Load	* Temperature : 85±2°C * Rated working voltage applied * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage