

Surface Mount Multilayer Varistors

ES Series (ESD Protection, 0402 & 0603 Size)

Features:

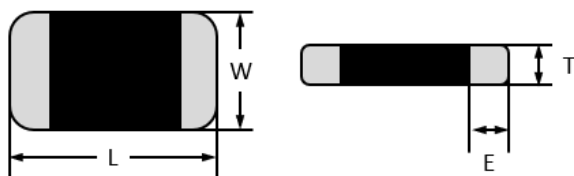
- Fast Response < 0.5 ns
- Low Working Voltage 5 V
- Low Capacitance
- Low Leakage Current < 1 μ A
- Low Clamping Voltage

Applications:

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

Shape and Dimensions:

Unit (mm)	0402	0603
L	1.00 $\pm$ 0.10	1.60 $\pm$ 0.15
W	0.50 $\pm$ 0.10	0.80 $\pm$ 0.15
T	0.50 $\pm$ 0.10	0.90 max.
E	0.25 $\pm$ 0.10	0.30 $\pm$ 0.10



Operating Temperatures:

- -55°C to +85°C

Product Identification:

MLV 0402 ES 024V 0003 P

(1) (2) (3) (4) (5) (6)

(1) **Series Code:** Surface Mount Multilayer Varistors

(2) **Size Code:** L x W (inch), the first two digits - L (length), the last two digits - W (width)

(3) **Characteristic Code:** ES - ESD Protection Series

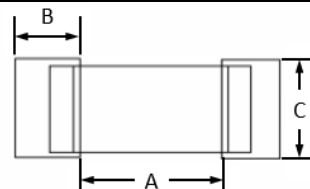
(4) **Max. Working Voltage:** 024V - 24V

(5) **Capacitance Code:** 0003P - 3.0pF

(6) **Capacitance Tolerance:** N - $\pm$ 30%; P - Special; B - Bulk

Recommended Land Patterns:

Unit (mm)	0402	0603
A	0.4~0.6	0.9~1.2
C	0.5~0.6	0.6~1.0
B	0.5~0.7	0.8~1.2



Packaging:

Chip Size	Parts on 7 inch (178 mm) Reel
0402	10,000
0603	4,000

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Ordering Information:

Part Number	Working Voltage (Max)	Breakdown Voltage (1mA)	Clamping Voltage (max)	Typical Capacitance Value (1 MHz)	ESD Contact	ESD Air
	V DC	V	V	pF	kV	kV
MLV0402ES024V0003P	24	48~72	110	3.0 (+80~-20%)	8	15
MLV0402ES005V0005P	5	28 ~ 38V	72	5.0 (+80~-20%)	8	15
MLV0402ES005V0010N	5	28 ~ 38	72	10 (±30%)	8	15
MLV0402ES005V0022N	5	18 ~ 28	52	22 (±30%)	8	15
MLV0402ES005V0056N	5	18 ~ 28	52	56 (±30%)	8	15
MLV0402ES012V0005P	12	28 ~ 38	72	5.0 (+80~-20%)	8	15
MLV0402ES012V0010N	12	28 ~ 38	72	10 (±30%)	8	15
MLV0402ES024V02R5P	24	100 ~ 150	200	2.5 (+80~-20%)	8	15
MLV0402ES024V00R8P	24	100 ~ 150	200	0.8(+80~-20%)	8	15
MLV0603ES005V0005P	5	20 ~ 30	55	5.0 (+80~-20%)	8	15
MLV0603ES005V0010N	5	24 ~ 36	65	10 (±30%)	8	15
MLV0603ES005V0022N	5	15 ~ 25	34	22 (±30%)	8	15
MLV0603ES005V0033N	5	15 ~ 25	34	33 (±30%)	8	15
MLV0603ES012V0005P	12	33 ~ 50	85	5.0 (+80~-20%)	8	15
MLV0603ES012V0010N	12	27 ~ 42	60	10 (±30%)	8	15
MLV0603ES012V0022N	12	20 ~ 30	55	22 (±30%)	8	15
MLV0603ES012V0056N	12	20 ~ 30	55	56 (±30%)	8	15
MLV0603ES012V0100N	12	20 ~ 30	55	100 (±30%)	8	15
MLV0603ES024V02R5P	24	100 ~ 150	200	2.5(+80~-20%)	8	15
MLV0603ES024V0003P	24	48 ~ 72	110	3.0(+80~-20%)	8	15
MLV0603ES024V00R8P	24	100 ~ 150	200	0.8 (+80~-20%)	8	15

* For ES series only.

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Reliability Tests:

No.	Item	Requirement	Condition	Criteria
1	Soldering heat resistance	BDV change $\leq \pm 10\%$ No mechanical damage	One dip at 260°C for 5 sec.	MIL-STD-202 Method 210 IEC 60068-2-20
2	Solderability	New solder coverage $\geq 80\%$	One dip at 255°C for 5 sec. Non-active flux	MIL-STD-202 Method 208 IEC 60068-2-20
3	Maximum surge current	BDV change $\leq \pm 10\%$ No mechanical damage	100 pulses of 8/20 μ s with maximum surge current and 30 sec. interval at 25°C and 30 ~ 65% RH	CECC 42000 IEC 1051-1 Test 4.5
4	Maximum surge energy	BDV change $\leq \pm 10\%$ No mechanical damage	100 pulses of 10/1000 μ s with maximum surge current and 90 sec. interval at 25°C and 30 ~ 65% RH	CECC 42000
5	Thermal cycling	BDV change $\leq \pm 10\%$ No mechanical damage Leakage current $\leq 200 \mu$ A	5 cycles between -40°C and 125°C with 30 min. dwell time at the temperature extremes and 60 min. dwell time at 25°C	CECC 42000 IEC 60068-2-14
6	Low temperature resistance	BDV change $\leq \pm 10\%$ No mechanical damage Leakage current $\leq 200 \mu$ A	1000 hr at -50°C	IEC 60068-2-1
7	Low temperature load resistance	BDV change $\leq \pm 10\%$ No mechanical damage Leakage current $\leq 200 \mu$ A	1000 hr at -50°C with working voltage applied	IEC 60068-2-1
8	High temperature resistance	BDV change $\leq \pm 10\%$ No mechanical damage Leakage current $\leq 200 \mu$ A	1000 hr at 150°C	MIL-STD-202 Method 108 CECC 42000
9	High temperature load resistance	BDV change $\leq \pm 10\%$ No mechanical damage Leakage current $\leq 200 \mu$ A	1000 hr at 85°C with working voltage applied	CECC 42000
10	Humidity resistance	BDV change $\leq \pm 10\%$ No mechanical damage Leakage current $\leq 200 \mu$ A	500 hr at 40°C and 90 ~ 95% RH	MIL-STD-202 Method 103 IEC 60068-2-3 CECC 42000;
11	Humidity load resistance	BDV change $\leq \pm 10\%$ No mechanical damage Leakage current $\leq 200 \mu$ A	500 hr at 40°C and 90 ~ 95% RH with working voltage applied	MIL-STD-202 Method 103 IEC 60068-2-3 CECC 42000
12	ESD contact test*	Varistor voltage change $> 115\%$ working voltage	Contact electrostatic discharge 100 times with 1 second intervals at 8 KV (Level 4) and polarity: +,-	IEC 61000-4-2
13	ESD air test*	Varistor voltage change $> 115\%$ working voltage	Air contact electrostatic discharge 100 times with 1 second intervals at 15 KV (Level 4) and polarity:+,-	IEC 61000-4-2

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