

Multilayer varistors (MLVs)

Surge protection series

SMD

Description

The surge protection series comprises a range of multilayer varistors for protection against severe transient overvoltage and high surge currents, such as 8/20 μ s pulses with peak currents up to 6000 A and 10/700 μ s pulses up to 45 A.

Features

- High energy absorption capability
- High surge load capability acc. to IEC 61000-4-5
- Reliable ESD protection up to 30 kV acc. to IEC 61000-4-2, level 4
- High surge voltage capability up to 2 kV for 10/700 μ s acc. to IEC 61000-4-5 (types with $V_{RMS,max} \leq 60$ V)
- UL approval to UL 1449 (file number E481997)
- Bidirectional protection
- Low leakage current
- Long-term ESD stability
- RoHS-compatible, lead-free
- PSpice simulation model available

Applications

- Industrial applications
- Building safety and security applications
- Power supplies
- Control and measurement equipment
- Hard disk drives

Design

- Multilayer technology
- Flammability rating better than UL 94 V-0
- Termination (see "Soldering directions"):
 - CT types with nickel barrier terminations (AgNiSn), recommended for lead-free soldering, and compatible with tin/lead solder
 - CN types with silver-platin termination (AgPt) for reflow and wave soldering with solder on tin/lead
- basis or lead-free with a silver containing solder

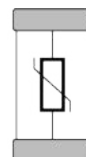
V/I characteristics and derating curves

V/I and derating curves are attached to the data sheet.

The curves are sorted by V_{RMS} and then by case size, which is included in the type designation.

Single Chip

Internal circuit



MLV0006-H

Available case sizes:

EIA	Metric
0805	2012
1206	3216
1210	3225
1812	4532
2220	5750

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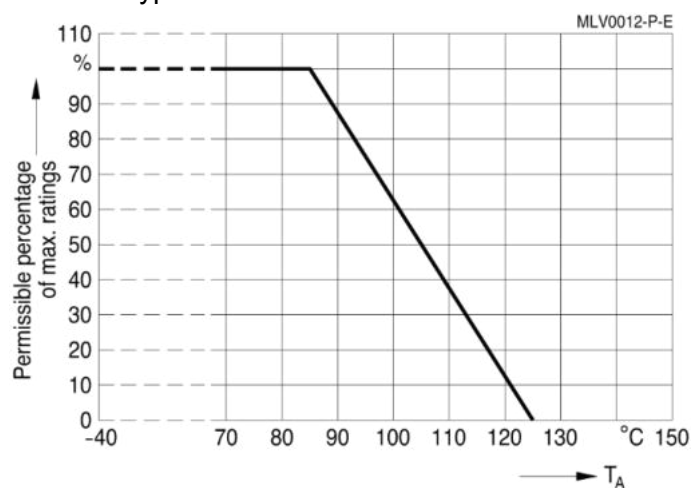
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General technical data

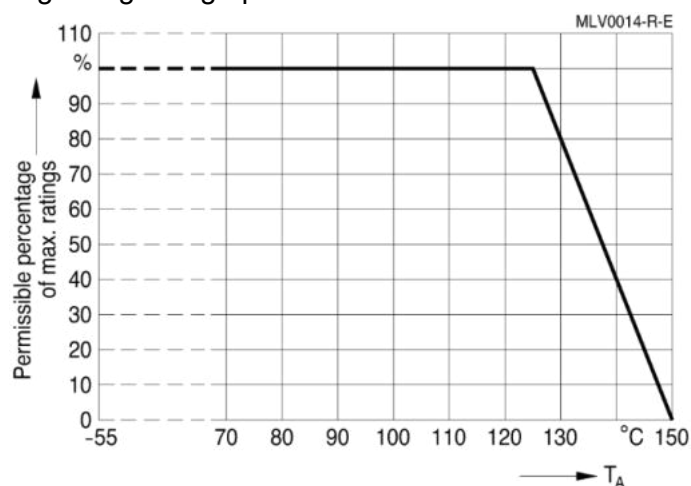
Maximum RMS operating voltage		$V_{RMS,max}$	30 ... 115	V
Maximum DC operating voltage		$V_{DC,max}$	38 ... 150	V
Maximum surge current	(8/20 μ s)	$I_{surge,max}$	40 ... 6000	A
Maximum surge current	(10/700 μ s)	$I_{surge,max}$	45	A
Maximum clamping voltage		$V_{clamp,max}$	77 ... 360	V
Response time		t_{resp}	< 0.5	ns

Temperature derating

Telecom types



High surge/surge protection



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Electrical specifications and ordering codes
Maximum ratings ($T_{op,max}$)

Type	Ordering code	$V_{RMS,max}$ V	$V_{DC,max}$ V	$I_{surge,max}$ (8/20 μ s) A	$I_{surge,max}$ (10/700 μ s) A	W_{max} (2 ms) mJ	$P_{diss,max}$ mW
High surge protection types, 8/20 μs surge rating, $T_{op,max} = -55/+125$ °C, $T_{stg} = -55/+150$ °C							
CT2220K30E2G	B72540T6300K062	30	38	5000	-	15000	20
CN2220K30E2GK2	B72542V6300K062	30	38	6000	-	15000	20
CN2220K50E2GK2	B72542V6500K062	50	65	4500	-	15000	20
CN2220S50E2GK2	B72542V6500S162	50	63	4500	-	15000	20
CT2220K50E2G	B72540T6500K062	50	65	4500	-	15000	20
CT2220S50E3G	B72540T6500S162	50	63	4500	-	15000	20
CN2220K60E2GK2	B72542V6600K062	60	85	4500	-	15000	20
Surge protection types, 8/20 μs surge rating, $T_{op,max} = -55/+125$ °C, $T_{stg} = -55/+150$ °C							
CT0805K30G	B72510T0300K062	30	38	80	-	300	5
CT1206K30G	B72520T0300K062	30	38	200	-	1100	8
CT1210K30G	B72530T0300K062	30	38	300	-	2000	10
CT1812K30G	B72580T0300K062	30	38	800	-	4200	15
CT2220K30G	B72540T0300K062	30	38	1200	-	12000	20
CT1206K35G	B72520T0350K062	35	45	100	-	400	8
CT1210K35G	B72530T0350K062	35	45	250	-	2000	10
CT1812K35G	B72580T0350K062	35	45	500	-	4000	15
CT1206K40G	B72520T0400K062	40	56	100	-	500	8
CT1210K40G	B72530T0400K062	40	56	250	-	2300	10
CT1812K40G	B72580T0400K062	40	56	500	-	4800	15
CT2220K40G	B72540T0400K062	40	56	1000	-	9000	20
CT1206K50G	B72520T0500K062	50	65	100	-	600	8
CT1210K50G	B72530T0500K062	50	65	200	-	1600	10
CT1812K50G	B72580T0500K062	50	65	400	-	4500	15
CT2220K50G	B72540T0500K062	50	65	800	-	5600	20
CT1210K50E2G	B72530T6500K062	50	65	1200	-	3000	10
CT1206K60G	B72520T0600K062	60	85	100	-	700	8
CT1210K60G	B72530T0600K062	60	85	200	-	2000	10
CT1812K60G	B72580T0600K062	60	85	400	-	5800	15
CT2220K60G	B72540T0600K062	60	85	800	-	6800	20
CT1812K130G2	B72580T0131K072	130	170	250	-	3500	15
Telecom types, 10/700 μs surge rating, $T_{op,max} = -40/+85$ °C, $T_{stg} = -40/+125$ °C							
CT1812K75TELEG2	B72580T6750K072	75	100	400	45	2500	15
CT1812S95AG2	B72580T0950S172	95	125	250	45	2800	15
CT1812K115TELEG2	B72580T6111K072	115	150	250	45	3200	15

 1) Measurement frequency: $f = 1$ MHz for $C < 100$ pF, $f = 1$ kHz for $C \geq 100$ pF

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Characteristics (T_A = +25 °C)

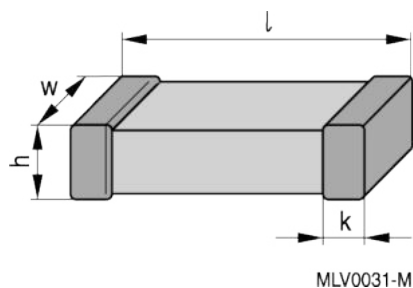
Type	V _V (1 mA) V	ΔV _V %	V _{clamp,max} V	I _{clamp} (8/20 μs) A	C _{typ} ¹⁾ (1 MHz, 1 V) pF
High surge protection types, 8/20 μs surge rating, T_{op,max} = -55/+125 °C, T_{stg} = -55/+150 °C					
CT2220K30E2G	47	±10	77	10	10000
CN2220K30E2GK2	47	±10	77	10	10000
CN2220K50E2GK2	82	±10	135	10	3000
CN2220S50E2GK2	77	±10	130	10	5000
CT2220K50E2G	82	±10	135	10	3000
CT2220S50E3G	77.5	±8.4	115	10	8800
CN2220K60E2GK2	100	±10	165	10	3000
Surge protection types, 8/20 μs surge rating, T_{op,max} = -55/+125 °C, T_{stg} = -55/+150 °C					
CT0805K30G	47	±10	77	1	200
CT1206K30G	47	±10	77	1	500
CT1210K30G	47	±10	77	2.5	1000
CT1812K30G	47	±10	77	5	2000
CT2220K30G	47	±10	77	10	4000
CT1206K35G	56	±10	90	1	200
CT1210K35G	56	±10	90	2.5	600
CT1812K35G	56	±10	90	5	1200
CT1206K40G	68	±10	110	1	250
CT1210K40G	68	±10	110	2.5	500
CT1812K40G	68	±10	110	5	1000
CT2220K40G	68	±10	110	10	2000
CT1206K50G	82	±10	135	1	120
CT1210K50G	82	±10	135	2.5	250
CT1812K50G	82	±10	135	5	500
CT2220K50G	82	±10	135	10	1000
CT1210K50E2G	82	±10	135	2.5	1200
CT1206K60G	100	±10	165	1	100
CT1210K60G	100	±10	165	2.5	200
CT1812K60G	100	±10	165	5	400
CT2220K60G	100	±10	165	10	800
CT1812K130G2	205	±10	340	5	200
Telecom types, 10/700 μs surge rating, T_{op,max} = -40/+85 °C, T_{stg} = -40/+125 °C					
CT1812K75TELEG2	120	±10	250	45	320
CT1812S95AG2	165	±10	270	45	250
CT1812K115TELEG2	180	±10	360	45	200

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Dimensional drawing



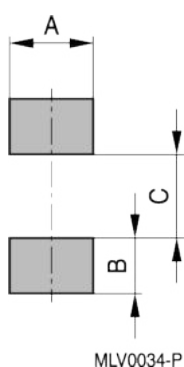
Dimensions in mm

Case size EIA / mm	l	w	h	k
0201 / 0603	0.6 ±0.03	0.30 ±0.03	0.33 max.	0.15 ±0.05
0402 / 1005	1.0 ±0.15	0.50 ±0.10	0.6 max.	0.10 ... 0.30
0603 / 1608	1.6 ±0.15	0.80 ±0.10	0.9 max.	0.10 ... 0.40
0805 / 2012	2.0 ±0.20	1.25 ±0.15	1.4 max.	0.13 ... 0.75
1206 / 3216	3.2 ±0.30	1.60 ±0.20	1.7 max.	0.25 ... 0.75
1210 / 3225	3.2 ±0.30	2.50 ±0.25	1.7 max.	0.25 ... 0.75
1812 / 4532	4.5 ±0.40	3.20 ±0.30	2.5 max.	0.25 ... 1.00
2220 / 5750	5.7 ±0.40	5.00 ±0.40	2.5 max. ^{1) 2)}	0.25 ... 1.00

1) $h_{max} = 3.0$ mm for type CN2220K30E2GK2, CN2220K50E2GK2, CT2220K30E2G, CT2220K50E2G and CN2220S50E2GK2

2) $h_{max} = 3.3$ mm for type CT2220S50E3G and CN2220K60E2GK2

Recommended solder pad layout



Dimensions in mm

Case size EIA / mm	A	B	C
0201 / 0603	0.30	0.25	0.30
0402 / 1005	0.60	0.60	0.50
0603 / 1608	1.00	1.00	1.00
0805 / 2012	1.40	1.20	1.00
1206 / 3216	1.80	1.20	2.10
1210 / 3225	2.80	1.20	2.10
1812 / 4532	3.60	1.50	3.00
2220 / 5750	5.50	1.50	4.20

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Delivery mode

EIA case size	Taping	Reel size mm	Packing unit pcs.	Type	Ordering code
Single chip					
0805	Blister	180	3000	CT0805K30G	B72510T0300K062
1206	Blister	180	2000	CT1206K30G	B72520T0300K062
1206	Blister	180	2000	CT1206K35G	B72520T0350K062
1206	Blister	180	2000	CT1206K40G	B72520T0400K062
1206	Blister	180	2000	CT1206K50G	B72520T0500K062
1206	Blister	180	2000	CT1206K60G	B72520T0600K062
1210	Blister	180	2000	CT1210K30G	B72530T0300K062
1210	Blister	180	2000	CT1210K35G	B72530T0350K062
1210	Blister	180	2000	CT1210K40G	B72530T0400K062
1210	Blister	180	2000	CT1210K50E2G	B72530T6500K062
1210	Blister	180	2000	CT1210K50G	B72530T0500K062
1210	Blister	180	2000	CT1210K60G	B72530T0600K062
1812	Blister	180	1000	CT1812K30G	B72580T0300K062
1812	Blister	180	1000	CT1812K35G	B72580T0350K062
1812	Blister	180	1000	CT1812K40G	B72580T0400K062
1812	Blister	180	1000	CT1812K50G	B72580T0500K062
1812	Blister	180	1000	CT1812K60G	B72580T0600K062
1812	Blister	180	3000	CT1812K130G2	B72580T0131K072
1812	Blister	330	3000	CT1812K115TELEG2	B72580T6111K072
1812	Blister	330	3000	CT1812S95AG2	B72580T0950S172
1812	Blister	330	4000	CT1812K75TELEG2	B72580T6750K072
2220	Blister	180	500	CT2220S50E3G	B72540T6500S162
2220	Blister	180	600	CN2220K30E2GK2	B72542V6300K062
2220	Blister	180	600	CN2220K50E2GK2	B72542V6500K062
2220	Blister	180	600	CN2220K60E2GK2	B72542V6600K062
2220	Blister	180	600	CN2220S50E2GK2	B72542V6500S162
2220	Blister	180	600	CT2220K30E2G	B72540T6300K062
2220	Blister	180	600	CT2220K50E2G	B72540T6500K062
2220	Blister	180	1000	CT2220K30G	B72540T0300K062
2220	Blister	180	1000	CT2220K40G	B72540T0400K062
2220	Blister	180	1000	CT2220K50G	B72540T0500K062
2220	Blister	180	1000	CT2220K60G	B72540T0600K062