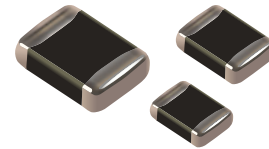


Bourns® Multilayer SMD Varistors

Product Selection Worksheet

Selecting the appropriate Multilayer SMD Varistor (MLV) for your application is easy - just follow these simple steps:



Step 1. What are the qualification requirements?

- Standard industrial grade MLVs - refer to the following data sheets:
 - [ZV HT Series](#) for high temperature applications (up to 150 °C)
 - [ZV Series](#)
 - [ZVE Series](#)
 - [ZVX Series](#)

- Automotive Grade, AEC-Q200 compliant MLVs - refer to the following data sheets:
 - [AV HT Series](#) for high temperature applications (up to 150 °C)
 - [AV Series](#)

Step 2. What is the preferred product footprint?

Note: Select the MLV that matches your soldering pad design, while keeping in mind that varistors must also meet other electrical requirements of the circuit (I_{max} , W_{max}). Available case sizes are 0603, 0805, 1206, 1210, 1812 and 2220.

Model	V_{rms}	V_{dc}	V_n @ 1 mA	V_c	I_c 8/20 μs	W_{max} 10/1000 μs	P max.	I_{max} 8/20 μs	C_{typ} @ 1 kHz	I_{typ} 100 mA/ns
	V	V	V	V	A	J	W	A	pF	nF
ZV 25 K 0603 300	25	31	39	65	1	0.1	0.003	30	165	1.0
ZV 25 K 0805 121	25	31	39	65	1	0.2	0.005	120	260	1.5
ZV 25 K 1206 201	25	31	39	65	1	1.0	0.008	200	510	1.8
ZV 25 K 1210 401	25	31	39	65	3	1.8	0.010	400	1060	1.8
ZV 25 K 1812 801	25	31	39	65	5	3.9	0.015	800	2300	2.5
ZV 25 K 2220 122	25	31	39	65	10	9.5	0.020	1200	5000	3.0

Step 3. What are the requested rated voltages?

Note: In our data sheets, we specify AC/DC rated voltage, varistor voltage (V_n) at 1 mA and clamping voltage as defined at clamping current (I_c). When choosing an appropriate varistor for a specific overvoltage protection application, the circuit designer shall determine the operating parameters of the circuit. The continuous operating voltage should be no more than 20 % above the maximum system voltage under normal conditions. Determine the maximum allowable circuit voltage that does not damage the circuit, taking into account the worst case scenario. Select a varistor with a clamping voltage (V_c) that is less than the maximum allowable voltage for the circuit. The varistor voltage (V_n) represents the applied voltage where the varistor transitions from its "high impedance standby" mode to the "low impedance clamping" mode. V_n is measured at 1 mA and typical V_n tolerance is ± 10 %.

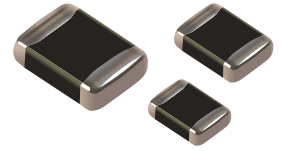
Model	V_{rms}	V_{dc}	V_n @ 1 mA	V_c	I_c 8/20 μs	W_{max} 10/1000 μs	P max.	I_{max} 8/20 μs	C_{typ} @ 1 kHz	I_{typ} 100 mA/ns
	V	V	V	V	A	J	W	A	pF	nF
ZV 25 K 0603 300	25	31	39	65	1	0.1	0.003	30	165	1.0
ZV 25 K 0805 121	25	31	39	65	1	0.2	0.005	120	260	1.5
ZV 25 K 1206 201	25	31	39	65	1	1.0	0.008	200	510	1.8
ZV 25 K 1210 401	25	31	39	65	3	1.8	0.010	400	1060	1.8
ZV 25 K 1812 801	25	31	39	65	5	3.9	0.015	800	2300	2.5
ZV 25 K 2220 122	25	31	39	65	10	9.5	0.020	1200	5000	3.0

Bourns® Multilayer SMD Varistors

Product Selection Worksheet

Step 4. What are peak current and/or energy withstand protection requirements for the downstream circuit?

Hint: Select a varistor with surge current (I_{max}) and/or transient energy (W_{max}) rated values greater than the anticipated transient threat current and/or energy. I_{max} / W_{max} ratings are directly related to the MLV case size: the bigger the size, the better the varistor's surge current and energy capabilities.



Model	V_{rms}	V_{dc}	V_n @ 1 mA	V_c	I_c 8/20 μs	W_{max} 10/1000 μs	P max.	I_{max} 8/20 μs	C_{typ} @ 1 kHz	I_{typ} 100 mA/ns
	V	V	V	V	A	J	W	A	pF	nF
ZV 25 K 0603 300	25	31	39	65	1	0.1	0.003	30	165	1.0
ZV 25 K 0805 121	25	31	39	65	1	0.2	0.005	120	260	1.5
ZV 25 K 1206 201	25	31	39	65	1	1.0	0.008	200	510	1.8
ZV 25 K 1210 401	25	31	39	65	3	1.8	0.010	400	1060	1.8
ZV 25 K 1812 801	25	31	39	65	5	3.9	0.015	800	2300	2.5
ZV 25 K 2220 122	25	31	39	65	10	9.5	0.020	1200	5000	3.0

Step 5. Automotive Applications - What are the requested load dump capabilities?

Hint: Select an automotive grade AEC-Q200 compliant varistor (AV series). As an example, for a 12 V automotive application that must minimally meet 10 times 10 J load dump pulses. First, find the correct voltage rating of the varistor. Allow a 20 % safety margin, so the rated DV voltage of the varistor will be approximately $12 V \times 1.2 = 14.4 VDC$. Check the data sheet. The closest varistor is an AV14 model with a 16 VDC rating. Next, determine the case size of the varistor. Case size is directly related to load dump absorption energy (WLD). Bourns offers model AV14 varistors in case sizes 0805, 1206, 1210, 1812 and 2220 with WLD ranging from 1 J (size 0805) to 12 J (size 2220). In this particular case, select size 2220 as its WLD rating is 12 J (above the requested 10 J). The correct part number for this application would be AV14K2220122NIR1.

Model	V_{rms}	V_{dc}	V_n @ 1 mA	V_{jump} 5 min.	V_c	I_c 8/20 μs	I_{max} 8/20 μs	W_{max} 10/1000 μs	WLD 10 times	P max.	C_{typ} @ 1 kHz
	V	V	V	V	V	A	A	J	J	W	nF
12 V Power Supply											
AV 14 K 0805 121	14	16	24	24.5	40	1	120	0.3	1	0.008	0.44
AV 14 K 1206 201	14	16	24	24.5	40	1	200	0.6	1.5	0.008	1.00
AV 14 K 1210 401	14	16	24	24.5	40	2.5	400	1.6	3	0.010	2.23
AV 14 K 1812 801	14	16	24	24.5	40	5	800	2.4	6	0.015	4.50
AV 14 K 2220 122	14	16	24	24.5	40	10	1200	5.8	12	0.030	10.00
AV 17 K 0805 121	17	20	27	30	44	1	120	0.5	1	0.008	0.37
AV 17 K 1206 201	17	20	27	30	44	1	200	1.1	1.5	0.008	0.81
AV 17 K 1210 401	17	20	27	30	44	2.5	400	1.8	3	0.010	2.00
AV 17 K 1812 801	17	20	27	30	44	5	800	2.9	6	0.015	3.80
AV 17 K 2220 122	17	20	27	30	44	10	1200	7.2	12	0.030	8.00

Step 6. Request samples from your nearest Bourns representative and start testing in your application.

Additional product selection support is available using the Bourns Parametric Search Tool:

www.bourns.com/parametric-search

BOURNS®
www.bourns.com