

Metal Oxide Varistor (TMOV)

Features

- ◆ TMOV integrated thermal protection device
- ◆ Wide operating voltages ranging from 18Vrms to 1200Vrms(AC)
- ◆ High peak surge current rating up to 10KA
- ◆ Rated current: 10~15A
- ◆ Fast responding to transient over-voltage and limited current.
- ◆ Large absorbing transient energy capability
- ◆ Low clamping ratio and no follow-on current
- ◆ Three-lead version available for indication purposes
- ◆ Operating Temperature: -40°C~ +85°C
- ◆ Storage Temperature: -40°C~ +85°C
- ◆ Rated Functioning Temperature:136°C
- ◆ Meets MSL level 1, per J-STD-020

Applications

- ◆ AC panel protection Modules
- ◆ AC power line or AC/DC supplies
- ◆ Surge protection in industrial electronics
- ◆ Surge protection in consumer electronics
- ◆ Relay and electromagnetic valve surge absorption
- ◆ Transistor, diode, IC, thyristor or triac semiconductor protection
- ◆ Surge protection in electronic home appliances, gas and petroleum appliances

Part Numbering

20 - X - XXX - K
 (1) (2) (3) (4)

(1) Size(mm) : 20mm

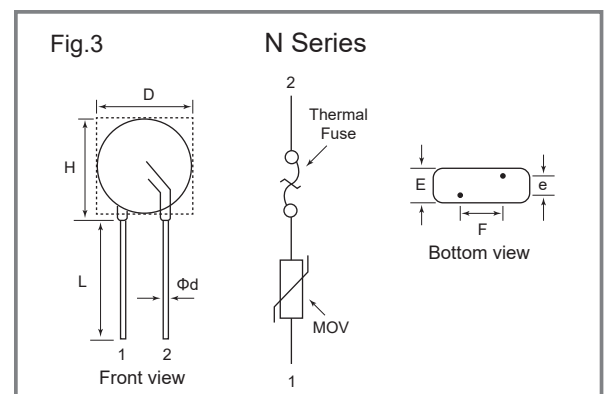
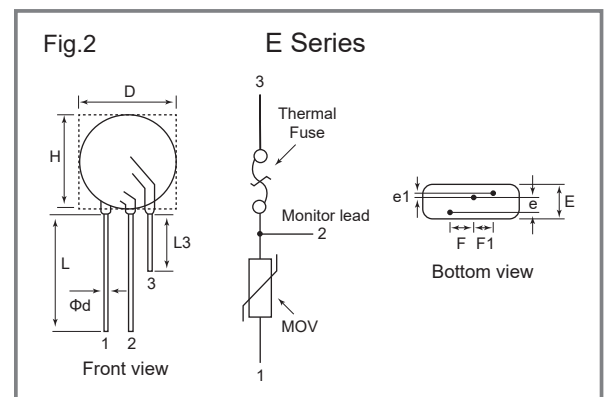
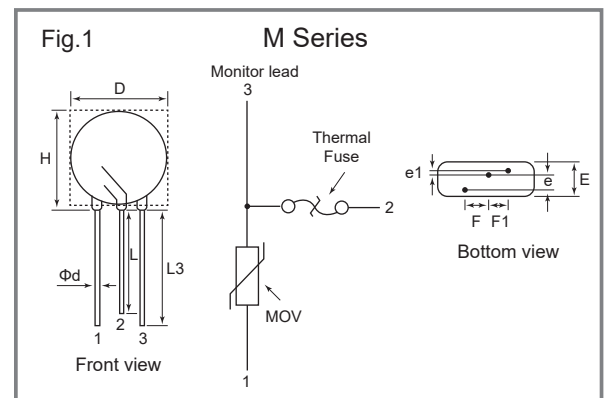
(2) Type : M/E/N: Different Internal Structure

(3) Varistor Voltage : 470($47 \times 10^0 = 47V$) , 471($47 \times 10^1 = 470V$)

(4) Tolerance : K: $\pm 10\%$



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Electrical Characteristics (@ 25°C Unless Otherwise Specified)

Part Number	Lead Configurations	Maximum Allowable Voltage		Varistor Voltage	Maximum Peak Current (8/20μS)		Maximum Clamping Voltage		Maximum Energy		Rated Power	Typical Capacitance (Reference)
		V _{AC} (V)	V _{DC} (V)	V _{1mA} (V)	1 time	2 times	V _C (V)	I _P (A)	(10/1000μs)	2ms	(W)	@1KHz (pF)
					(A)				(J)			
20M180K	Fig.1	11	14	18(15-21.6)	3000	2000	36	20	13	10	0.2	28500
20E180K	Fig.2											
20N180K	Fig.3											
20M220K	Fig.1	14	18	22(19.5-26)	3000	2000	43	20	16	12	0.2	18500
20E220K	Fig.2											
20N220K	Fig.3											
20M270K	Fig.1	17	22	27(24-31)	3000	2000	53	20	19	14	0.2	13000
20E270K	Fig.2											
20N270K	Fig.3											
20M330K	Fig.1	20	26	33(29.5-36.5)	3000	2000	65	20	24	18	0.2	11500
20E330K	Fig.2											
20N330K	Fig.3											
20M390K	Fig.1	25	31	39(35-43)	3000	2000	77	20	28	21	0.2	8500
20E390K	Fig.2											
20N390K	Fig.3											
20M470K	Fig.1	30	38	47(42-52)	5000	3000	93	20	34	25	0.2	7400
20E470K	Fig.2											
20N470K	Fig.3											
20M560K	Fig.1	35	45	56(50-62)	5000	3000	110	20	41	30	0.2	6500
20E560K	Fig.2											
20N560K	Fig.3											
20M680K	Fig.1	40	56	68(61-75)	5000	3000	135	20	49	37	0.2	5800
20E680K	Fig.2											
20N680K	Fig.3											
20M820K	Fig.1	50	65	82(74-90)	6500	4500	135	100	56	42	1.0	4900
20E820K	Fig.2											
20N820K	Fig.3											
20M101K	Fig.1	60	85	100(90-110)	6500	4500	165	100	70	52	1.0	4000
20E101K	Fig.2											
20N101K	Fig.3											
20M121K	Fig.1	75	100	120(108-132)	6500	4500	200	100	85	63	1.0	3300
20E121K	Fig.2											
20N121K	Fig.3											
20M151K	Fig.1	95	125	150(135-165)	10000	8000	250	100	100	70	1.0	2700
20E151K	Fig.2											
20N151K	Fig.3											

Electrical Characteristics (@ 25°C Unless Otherwise Specified)

Part Number	Lead Configurations	Maximum Allowable Voltage		Varistor Voltage	Maximum Peak Current (8/20μS)		Maximum Clamping Voltage		Maximum Energy		Rated Power	Typical Capacitance (Reference)
		VAc (V)	VDC (V)	V1mA (V)	1 time	2 times	Vc (V)	Ip (A)	(10/1000μs)	2ms	(W)	@1KHz (pF)
					(A)				(J)			
20M181K	Fig.1	115	150	180(162-198)	10000	8000	300	100	110	80	1.0	2200
20E181K	Fig.2											
20N181K	Fig.3											
20M201K	Fig.1	130	170	200(185-225)	10000	8000	340	100	140	100	1.0	2000
20E201K	Fig.2											
20N201K	Fig.3											
20M221K	Fig.1	140	180	220(198-242)	10000	8000	365	100	155	110	1.0	1800
20E221K	Fig.2											
20N221K	Fig.3											
20M241K	Fig.1	150	200	240(216-264)	10000	8000	395	100	170	120	1.0	1650
20E241K	Fig.2											
20N241K	Fig.3											
20M271K	Fig.1	175	225	270(243-297)	10000	8000	455	100	190	135	1.0	1500
20E271K	Fig.2											
20N271K	Fig.3											
20M301K	Fig.1	190	250	300(270-330)	10000	8000	500	100	205	145	1.0	1300
20E301K	Fig.2											
20N301K	Fig.3											
20M331K	Fig.1	210	275	330(297-363)	10000	8000	550	100	215	150	1.0	1200
20E331K	Fig.2											
20N331K	Fig.3											
20M361K	Fig.1	230	300	360(324-396)	10000	8000	595	100	225	160	1.0	1100
20E361K	Fig.2											
20N361K	Fig.3											
20M391K	Fig.1	250	320	390(351-429)	10000	8000	650	100	240	170	1.0	1000
20E391K	Fig.2											
20N391K	Fig.3											
20M431K	Fig.1	275	350	430(387-473)	10000	8000	710	100	270	190	1.0	930
20E431K	Fig.2											
20N431K	Fig.3											
20M471K	Fig.1	300	385	470(423-517)	10000	8000	775	100	350	250	1.0	850
20E471K	Fig.2											
20N471K	Fig.3											
20M511K	Fig.1	320	415	510(459-561)	10000	8000	845	100	380	270	1.0	780
20E511K	Fig.2											
20N511K	Fig.3											

Electrical Characteristics (@ 25°C Unless Otherwise Specified)

Part Number	Lead Configurations	Maximum Allowable Voltage		Varistor Voltage	Maximum Peak Current (8/20μS)		Maximum Clamping Voltage		Maximum Energy		Rated Power	Typical Capacitance (Reference)
		V _{AC} (V)	V _{DC} (V)	V _{1mA} (V)	1 time	2 times	V _C (V)	I _P (A)	(10/1000μs)	2ms	(W)	@1KHz (pF)
					(A)				(J)			
20M561K	Fig.1	350	460	560(504-616)	10000	8000	920	100	400	280	1.0	710
20E561K	Fig.2											
20N561K	Fig.3											
20M621K	Fig.1	385	505	620(558-682)	10000	8000	1025	100	425	300	1.0	650
20E621K	Fig.2											
20N621K	Fig.3											
20M681K	Fig.1	420	560	680(612-748)	10000	8000	1120	100	435	310	1.0	600
20E681K	Fig.2											
20N681K	Fig.3											
20M751K	Fig.1	460	615	750(675-825)	10000	8000	1240	100	455	327	1.0	530
20E751K	Fig.2											
20N751K	Fig.3											
20M781K	Fig.1	485	640	780(702-858)	10000	8000	1290	100	461	335	1.0	510
20E781K	Fig.2											
20N781K	Fig.3											
20M821K	Fig.1	510	670	820(738-902)	10000	8000	1355	100	475	344	1.0	500
20E821K	Fig.2											
20N821K	Fig.3											
20M911K	Fig.1	550	745	910(819-1001)	10000	8000	1500	100	500	350	1.0	440
20E911K	Fig.2											
20N911K	Fig.3											
20M102K	Fig.1	625	825	1000(900-1100)	10000	8000	1650	100	560	400	1.0	400
20E102K	Fig.2											
20N102K	Fig.3											
20M112K	Fig.1	680	895	1100(990-1210)	10000	8000	1815	100	610	430	1.0	360
20E112K	Fig.2											
20N112K	Fig.3											
20M122K	Fig.1	750	990	1200(1080-1320)	10000	8000	1980	100	650	460	1.0	320
20E122K	Fig.2											
20N122K	Fig.3											



Part Marking

	Marking	
	Trademark	UN logo
	Part No.	20XXXXK

Packaging Information

Unit:Pcs

Dimension	Part No.	Bag	Carton
20 (M-E-N) XXXK Series	180K to 122K	100	200

Package Dimensions Unit: mm

Symbol		20M Series	20E Series	20N Series
D (Max.)		24.0	24.0	24.0
H (Max.)		26.0	26.0	26.0
F (± 1.0)		7.5	7.5	12.5/7.5
F1 (± 1.0)		5.0	5.0	-
e (Max.)	180K-121K	3.0	3.0	3.0
	151K-391K	3.8	3.8	3.8
	431K-621K	5.5	5.5	5.5
	681K-911K	7.8	7.8	7.8
	102K-122K	10.0	10.0	10.0
e1	180K-121K	1.5 $\pm$ 1.0	1.5 $\pm$ 1.0	-
	151K-391K			
	431K-621K			
	681K-911K			
	102K-122K			
E (Max.)	180K-121K	9.0	9.0	9.0
	151K-391K	9.8	9.8	9.8
	431K-621K	11.5	11.5	11.5
	681K-911K	13.8	13.8	13.8
	102K-122K	16.0	16.0	16.0
L (Min.)		20.0	20.0	20.0
L3 (Min.)		10.0	10.0	-
Φd		1.0		

Mechanical Characteristics

Items	Test conditions / Methods	Specifications								
Tensile Strength of Terminals	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <table><tr><td>Terminal diameter (mm)</td><td>Force (kg)</td></tr><tr><td>0.5 < d ≤ 0.8</td><td>1.0</td></tr><tr><td>0.8 < d ≤ 1.25</td><td>2.0</td></tr><tr><td>1.25 < d</td><td>4.0</td></tr></table>	Terminal diameter (mm)	Force (kg)	0.5 < d ≤ 0.8	1.0	0.8 < d ≤ 1.25	2.0	1.25 < d	4.0	No visible damage $\Delta V_{1mA}/V_{1mA} \leq 5\%$
Terminal diameter (mm)	Force (kg)									
0.5 < d ≤ 0.8	1.0									
0.8 < d ≤ 1.25	2.0									
1.25 < d	4.0									
Bending Strength of Terminals	Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction. <table><tr><td><u>Terminal diameter (mm)</u></td><td><u>Force (kg)</u></td></tr><tr><td>0.5 < d ≤ 0.8</td><td>0.5</td></tr><tr><td>0.8 < d ≤ 1.25</td><td>1.0</td></tr><tr><td>1.25 < d</td><td>2.0</td></tr></table>	<u>Terminal diameter (mm)</u>	<u>Force (kg)</u>	0.5 < d ≤ 0.8	0.5	0.8 < d ≤ 1.25	1.0	1.25 < d	2.0	No visible damage $\Delta V_{1mA}/V_{1mA} \leq 5\%$
<u>Terminal diameter (mm)</u>	<u>Force (kg)</u>									
0.5 < d ≤ 0.8	0.5									
0.8 < d ≤ 1.25	1.0									
1.25 < d	2.0									
Vibration	Frequency range: 10~55 Hz Amplitude: 0.75mm or 98m/s² Direction: 3 mutually perpendicular directions, 2hrs each.	No visible damage $\Delta V_{1mA}/V_{1mA} \leq 5\%$								
Solder ability	Solder Temp: 245±5°C Dipping Time: 2±0.5 sec	At least 95% of terminal electrode is covered by new solder								
Resistance to Soldering Heat	Solder Temp: 260±5°C Dipping Time: ≤ 10 sec	No visible damage $\Delta V_{1mA}/V_{1mA} \leq 10\%$								

Reliability

Items	Test conditions / Methods	Specifications															
High Temperature Storage	Ambient Temp: 85±2°C Duration: 1000hrs	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$															
Low Temperature Storage	Ambient Temp: -40±2°C Duration: 1000hrs	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$															
Humidity	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$															
Temperature Cycle	The conditions shown below shall be repeated 5 cycles <table> <tr> <th>Step</th><th>Temperature (°C)</th><th>Period (minutes)</th></tr> <tr> <td>1</td><td>-40±3</td><td>30±3</td></tr> <tr> <td>2</td><td>Room temperature</td><td>15±3</td></tr> <tr> <td>3</td><td>85±3</td><td>30±3</td></tr> <tr> <td>4</td><td>Room temperature</td><td>15±3</td></tr> </table>	Step	Temperature (°C)	Period (minutes)	1	-40±3	30±3	2	Room temperature	15±3	3	85±3	30±3	4	Room temperature	15±3	No visible damage $\Delta V_{1mA}/V_{1mA} \leq 5\%$
Step	Temperature (°C)	Period (minutes)															
1	-40±3	30±3															
2	Room temperature	15±3															
3	85±3	30±3															
4	Room temperature	15±3															
High Temperature Load	Ambient Temp: 85±2°C Duration: 1000hrs Load: Max. Allowable Voltage In AC eara.	$ \Delta V_{1mA}/V_{1mA} \leq 10\%$															
Damp Heat Load	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs Load: Max. Allowable Voltage	No visible damage $\Delta V_{1mA}/V_{1mA} \leq 10\%$															
Voltage Proof	Metal balls method, 2500Vac 1 min.	No visible damage															

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