MOV Varistor Device: FMOV20-D Series

1. Device Ratings and Characteristics

Part Number	Maximum Continuous Voltage		Varistor Voltage (@1mA)			Maximum Clamping Voltage @Test Current (@8/20μs)		Maximum Energy (@10/1000μs)	Maximum Peak Current (@8/20μs)	Rated Power	Typical Capacitance (@1KHz)
	ACrms(V)	DC(V)	Vn(Vdc)	Min.	Max.	Vc(V)	Ip(A)	(J)	(A)	(W)	(pF)
FMOV20180-D	11	14	18	16	20	36	20	11	2000	0.2	40000
FMOV20220-D	14	18	22	20	24	43	20	14	2000	0.2	30000
FMOV20270-D	17	22	27	24	30	53	20	18	2000	0.2	24500
FMOV20330-D	20	26	33	30	36	65	20	23	2000	0.2	20000
FMOV20390-D	25	31	39	35	43	77	20	26	2000	0.2	13800
FMOV20470-D	30	38	47	42	52	93	20	33	2000	0.2	13500
FMOV20560-D	35	45	56	50	62	110	20	41	2000	0.2	12200
FMOV20680-D	40	56	68	61	75	135	20	46	2000	0.2	11500
FMOV20820-D	50	65	82	74	90	135	100	48	6500	1	8200
FMOV20101-D	60	85	100	90	110	165	100	51	6500	1	8000
FMOV20121-D	75	100	120	108	132	200	100	55	6500	1	5500
FMOV20151-D	95	125	150	135	165	250	100	70	6500	1	4200
FMOV20181-D	115	150	180	162	198	300	100	85	6500	1	2500
FMOV20201-D	130	170	200	180	220	340	100	95	6500	1	2300
FMOV20221-D	140	180	220	198	242	360	100	100	6500	1	2200
FMOV20241-D	150	200	240	216	264	395	100	108	6500	1	2200
FMOV20271-D	175	225	270	243	297	455	100	127	6500	1	2100
FMOV20301-D	195	250	300	270	330	500	100	150	6500	1	1800
FMOV20331-D	215	275	330	297	363	550	100	163	6500	1	1750
FMOV20361-D	230	300	360	324	396	595	100	163	6500	1	1700
FMOV20391-D	250	320	390	351	429	650	100	180	6500	1	1400
FMOV20431-D	275	350	430	387	473	710	100	190	6500	1	1350
FMOV20471-D	300	385	470	423	517	775	100	220	6500	1	1200
FMOV20511-D	320	410	510	459	561	845	100	220	6500	1	1050
FMOV20561-D	350	460	560	504	616	915	100	220	6500	1	850
FMOV20621-D	395	510	620	558	682	1020	100	220	6500	1	570
FMOV20681-D	420	560	680	612	748	1120	100	230	6500	1	550
FMOV20751-D	465	615	750	675	825	1235	100	255	6500	1	530
FMOV20781-D	485	640	780	702	858	1290	100	265	6500	1	500
FMOV20821-D	510	670	820	738	902	1355	100	282	6500	1	500
FMOV20911-D	550	745	910	819	1001	1500	100	310	6500	1	480
FMOV20102-D	625	825	1000	900	1100	1650	100	342	6500	1	460
FMOV20112-D	680	895	1100	990	1210	1815	100	383	6500	1	400
FMOV20182-D	1000	1465	1800	1620	1980	2950	100	620	6500	1	300

2. Agency Approvals

Agency	Agency Approvals	Certificate No.
c UL us	UL1449 4th & cUL	VZCA2.E515006 VZCA8.E515006
VDE	IEC 61051-1:2007 IEC 61051-2:1991 IEC 61051-2:1991/AMD1:2009 IEC 61051-2-2:1991 IEC 61051-1:2007 IEC 61051-2:1991 IEC 62368-1:2018/G.8.1 IEC 60950-1:2005/AMD1:2009/AMD2:2013, Annex Q	40053039

*FMOV20820-D ~ FMOV20112-D meets VDE.

3. Max Rating

	FMOV-D Series	Units
Operation Ambient Temperature Range	-40 to +105	℃
Storage Temperature Range	-40 to +125	℃
Insulation Resistance	>1000	MΩ
Typical Response Time	<25	ns

4. Reliability

Characteristics	Standard	Test Conditions	Specifications
Robustness of terminations	IEC 60068-2-21 Test Ua1	F = 10 N (d ≤ 0.8 mm) ,F = 20 N (d = 1 mm)	$\triangle V_{1mA}$ /V_{1mA}≦±10% No visible damage
Solderability	IEC 60068-2-20 Test Ta (Method 1)	T = 235±5°C, d = 2±0.5s	Approximately≧95%
Resistance to soldering heat	IEC 60068-2-20 Test Tb (Method 1A)	T = 260±5°C, d = 10±1s	$\triangle V_{1mA}$ /V_{1mA}≦±5% No visible damage
Shock	IEC 60068-2-27 Test Ea	Pulse shape: half-sine. a = 490 m/s^2, d = 11ms. N = 6 x 3 shocks	$\triangle V_{1mA}$ /V_{1mA}≦±5% No visible damage
Vibration	IEC 60068-2-6 Test Fc Method B4	Frequency range: 10 Hz to 55 Hz ,a = 0.75 mm or 98 m/s^2 (whichever is the less), d = 3x2 h	$\triangle V/_{1mA}$ V_{1mA}≦±5% No visible damage
Needle flame test	IEC 60695-11-5	Severity: Vertical 10 s	Duration of burning: 5 s max.
Voltage under pulse condition	IEC 61051-2	At class current, 8/20 μs,	As specified in specification
Voltage proof	IEC 61051-2	Metal balls method (4.8.1.2) 2500 V, 60 s	No breakdown or flashover
Pulse current - 8/20 μs	IEC 61051-2	8/20 μs, 10 times, Ipeak=0.25*Imax	△V/V≦±10% No visible damage
Pulse current - 10/1000 μs	IEC 61051-2	10/1000 μs, 10 times, Ipeak = 0.0075* Imax	$\triangle V_{1mA}$ /V_{1mA}≦±10% No visible damage
Combination pulse	IEC 62368-1	Additional test: 10 pulses (combination pulse 6KV/3KA), in one direction, 1 per min	$\triangle V_{1mA}$ /V_{1mA}≦±10% No visible damage U ≤ 1.1 $U_{initial}$ Voltage proof: No breakdown or flashover
Rapid change of temperature	IEC 60068-2-14 Test Na	N = 5 cycles, d = 30 min , θA = -40±3°C, θB = 85±2°C	$\triangle V_{1mA}$ /V_{1mA}≦±10% No visible damage
Climatic sequence	IEC 60068-2-2 Test Ba IEC 60068-2-30 Test Db IEC 60068-2-1 Test Aa IEC 60068-2-30 Test Db	Dry heat, Test Ba:16±2h, T = 85±2°C Damp heat, Test Db first cycle :24h, T = 55±2°C Cold, Test Aa :2h, T = -40±3°C Damp heat Test Ba remaining cycles:5 cycle	$\triangle V_{1mA}/V_{1mA}$≦±10% No visible damage R_{ISO}≧100MΩ Voltage proof: No breakdown or flashover
Endurance at upper category temperature	IEC 61051-1 (4.21)	T:max temperature as specified , Duration: 1000 h, Voltage: max. a. c. voltage	△V/V≦±10% No visible damage R_{ISO}≧1000MΩ U ≤ 1,1 $U_{initial}$

NOTE : Specification subject to change without notice.

2025/5/8

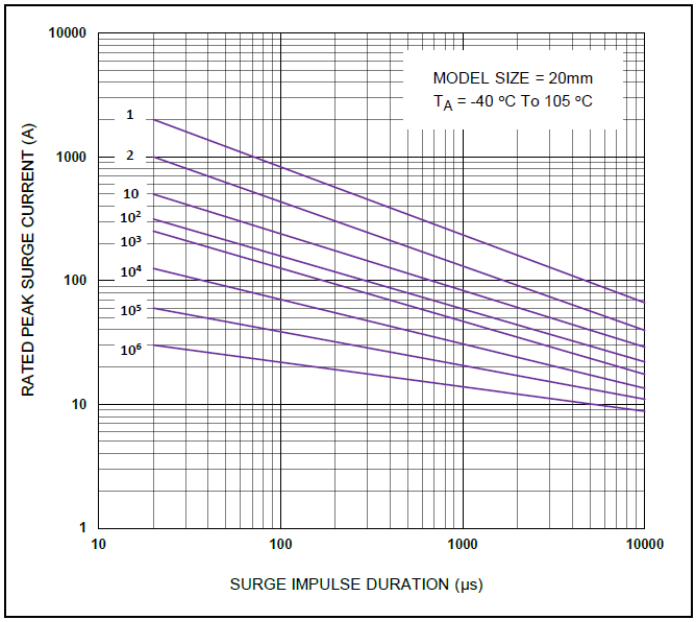
Characteristics	Standard	Test Conditions	Specifications
Damp heat (Steady state)	IEC 60068-2-78 Test Ca	T = 40±2°C, RH = 93(+2/-3)%, 56d , 4 specimens: No voltage applied ,Other 4 specimens: Applied voltage: 10% of the max. d. c. voltage	$\triangle V_{1mA}/V1_{mA} \leqq \pm 10\%$ $R_{ISO} \geqq 100M\Omega$
Maximum Peak Current	Specification Standard	Imax, 8/20 μs, 1 time.	$\triangle V_{1mA}/V1_{mA} \leqq \pm 10\%$ No visible damage
Nominal Discharge Current Test	UL1449 4th	In, 8/20 μs, 15 times, Interval 60s	△V/V≦±10% No visible damage
Varistor Voltage Temp. Coefficient	Specification Standard	$\frac{V_{1mA}\text{ at }85°C - V_{1mA}\text{ at }25°C}{V_{1mA}\text{ at }25°C} \times \frac{1}{60} \times 100(\%/C)$	0.05≦TC≦0.05(%/℃)
High Temperature Storage	IEC60068-2-2	1000h, T = 125±2°C	△V/V≦±5% No visible damage
Max. Energy	Specification Standard	10/1000 μs, 1 times, Max. Energy	△V/V≦±10% No visible damage
Operating duty cycle test ＊	UL1449	6 kV/3 kA combination wave surges, phase angle of 90 (+0, -15) degrees, positive polarity 8times, negative polarity 7 times, interval of 60s.	△V/V≦±10% No visible damage
Surge Immunity Test ＊	IEC 61000-4-5	4kV/2kA combination wave surges, phase angle of 90 (+0, -15) degrees, positive polarity 20times, negative polarity 20times, interval of 60s.	△V/V≦±10% No visible damage

＊ (According to customer requirements to meet the test items)

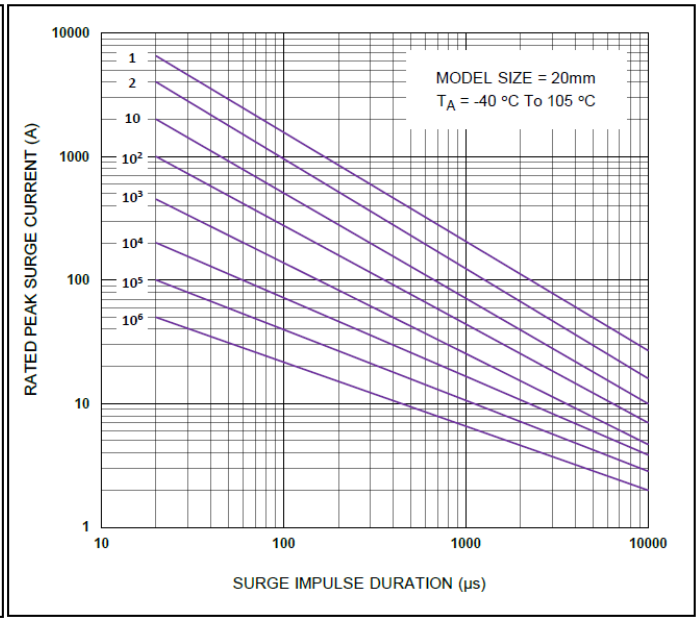
5. Impulse Life Time Rating Curves

FMOV20-D Series

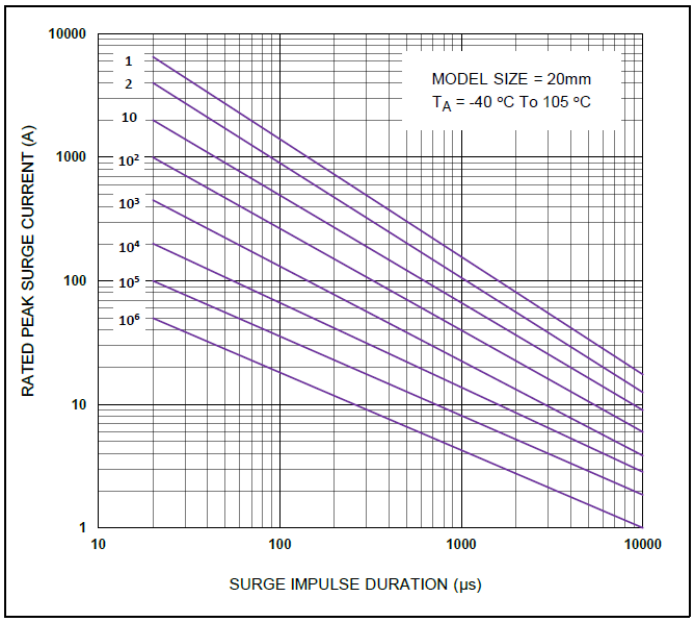
FMOV20180-D to FMOV20680-D



FMOV20820-D to FMOV20751-D



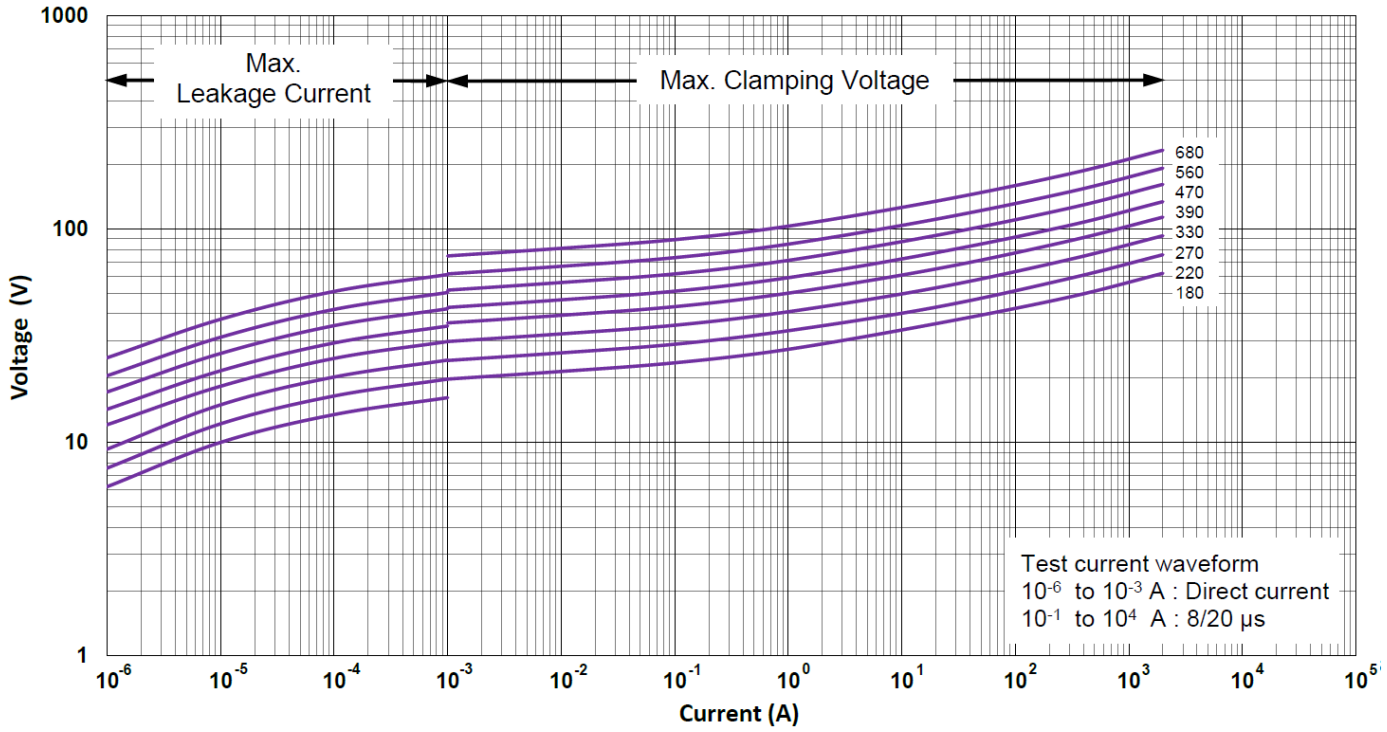
FMOV20781-D to FMOV20182-D



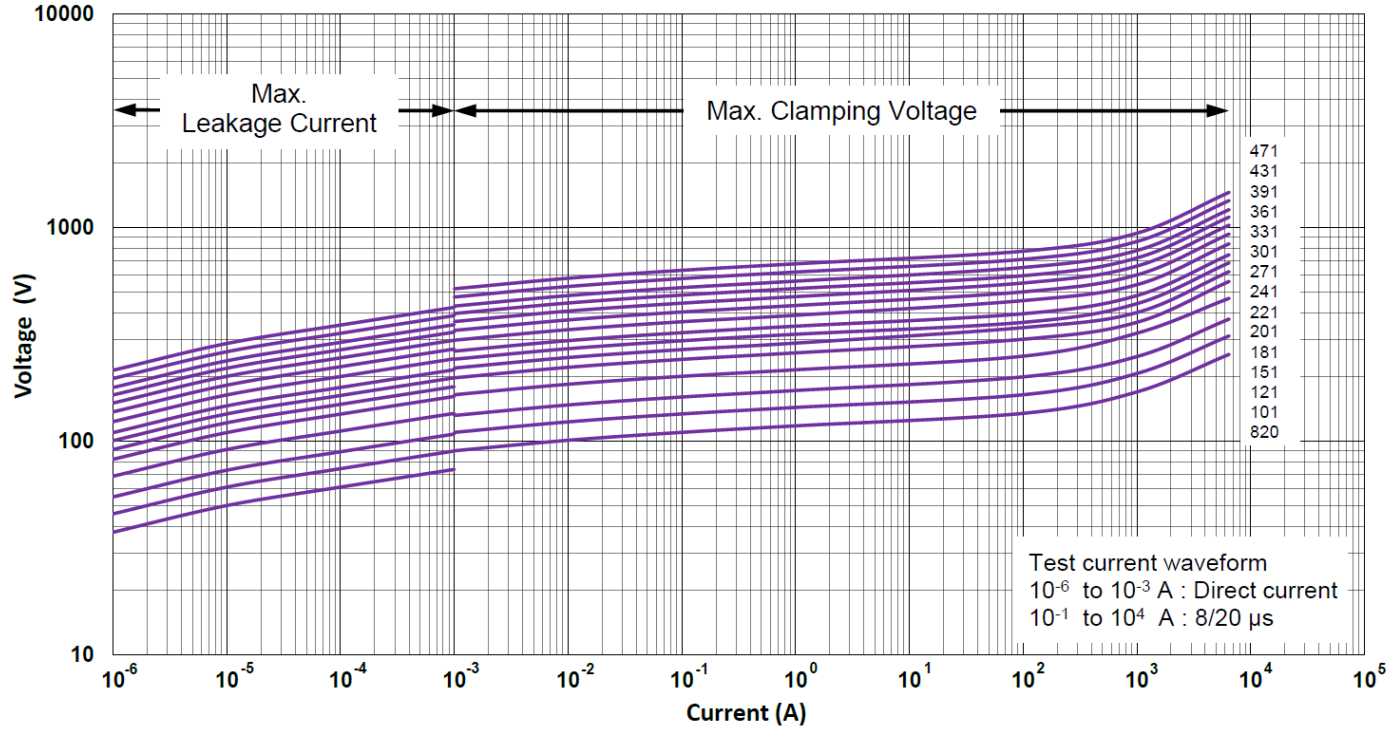
NOTE : Specification subject to change without notice.

6. V-I Curves

(FMOV20180-D to FMOV20680-D)

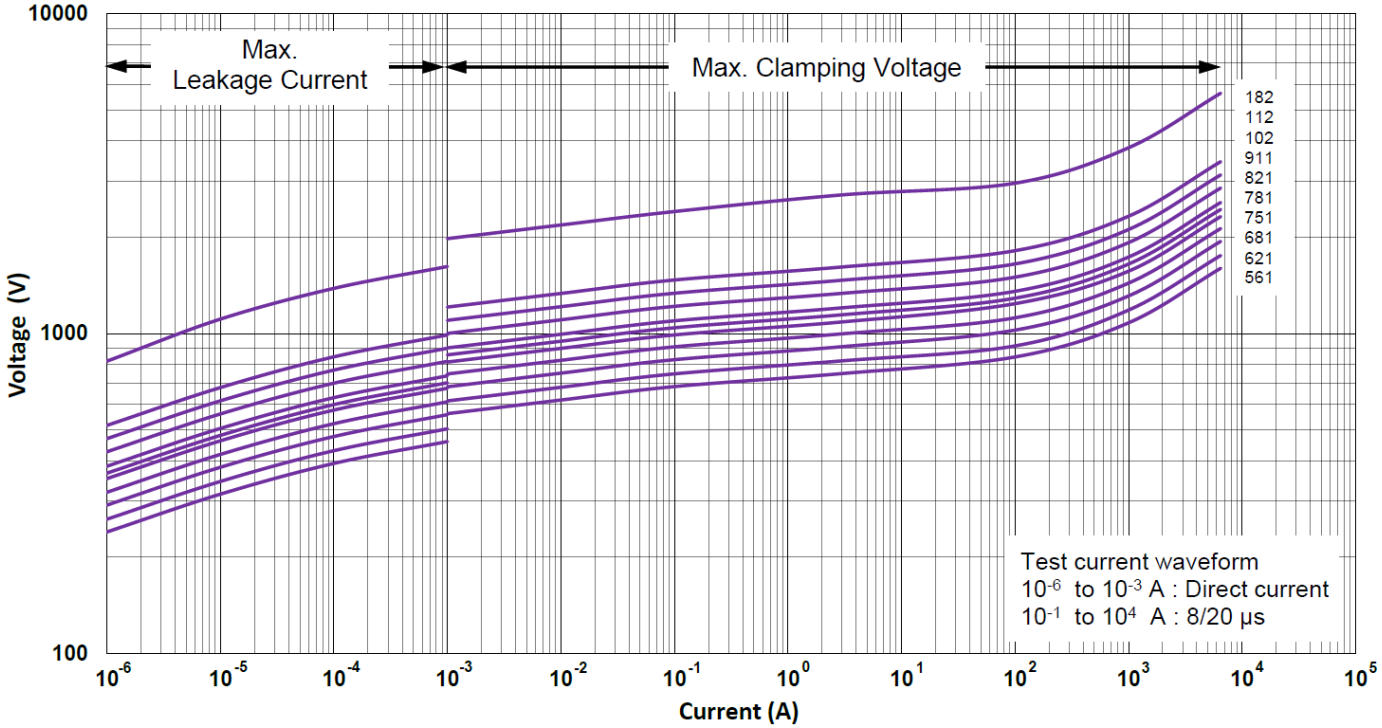


(FMOV20820-D to FMOV20471-D)



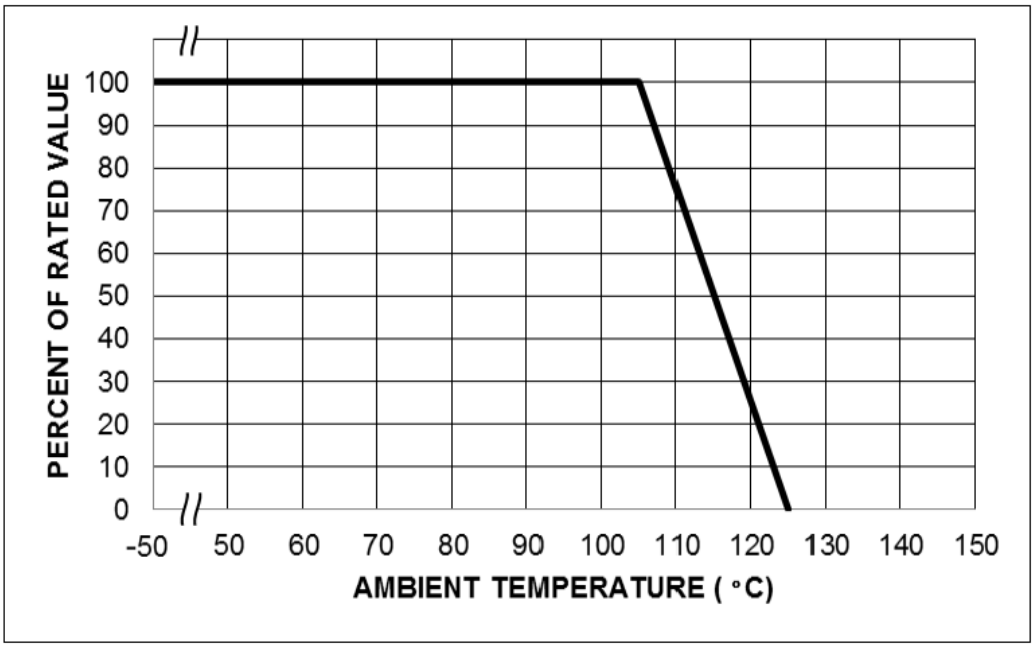
NOTE : Specification subject to change without notice.

(FMOV20511-D to FMOV20182-D)

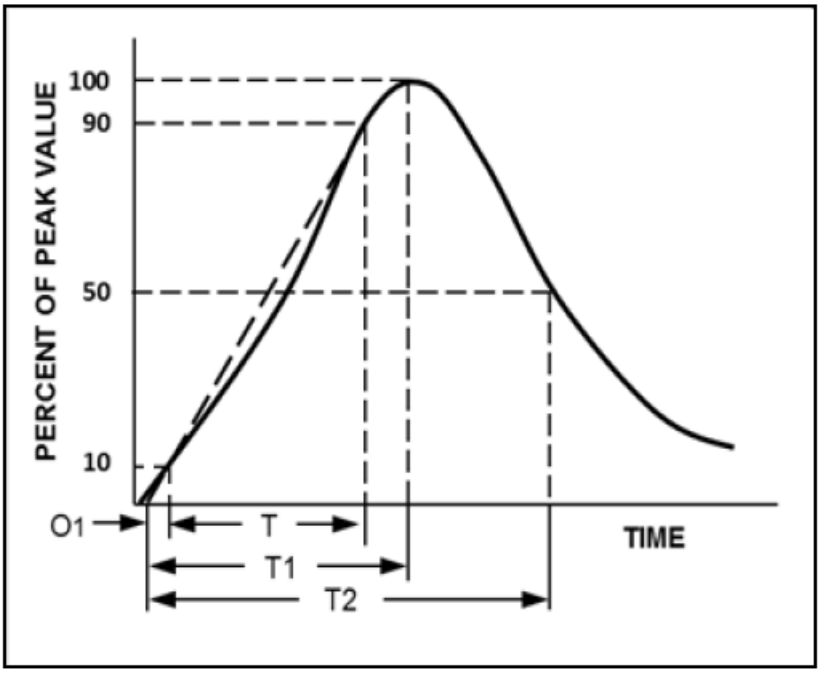


7. Power Derating Curve

Should transients occur in rapid succession, the average power dissipation is the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be with the specifications shown on the Device Ratings and Specifications Table for the specific device. The operating values of a MOV need to be derated at high temperatures as shown above. Because varistors only dissipate a relatively small amount of average power they are not suitable for repetitive applications that involve substantial amounts of average power dissipation.



8. Surge Current Standard Waveform



O1 = Virtual Origin of Wave

T = Time from 10% to 90% of Peak

T1 = Rise Time = 1.25 x T

T2 = Decay Time

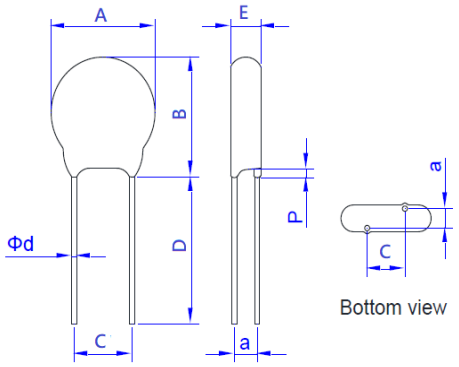
Example - For an 8/20 μs Current Waveform:

8μs = T1 = Rise Time

20μs = T2 = Decay Time

NOTE : Specification subject to change without notice.

9. Dimension of Component for Standard Product

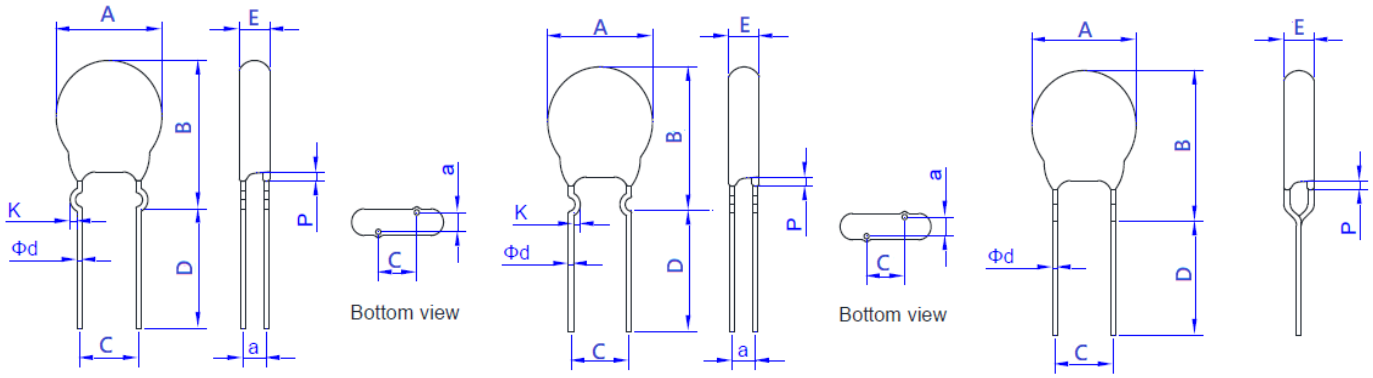


Straight Lead Type (S)

Part Number	A		B	C	D	E	P	a	Φd
	Min.	Max.	Max.	±1.0	Typ.	Max.	Max.	±1.0	±0.05
FMOV20180-D	19.5	25.0	28.0	10.0	25.0	4.3	3.0	1.5	1.00
FMOV20220-D	19.5	25.0	28.0	10.0	25.0	4.6	3.0	1.6	1.00
FMOV20270-D	19.5	25.0	28.0	10.0	25.0	4.8	3.0	1.7	1.00
FMOV20330-D	19.5	25.0	28.0	10.0	25.0	4.3	3.0	1.6	1.00
FMOV20390-D	19.5	25.0	28.0	10.0	25.0	4.5	3.0	1.8	1.00
FMOV20470-D	19.5	25.0	28.0	10.0	25.0	4.7	3.0	1.9	1.00
FMOV20560-D	19.5	25.0	28.0	10.0	25.0	5.0	3.0	2.0	1.00
FMOV20680-D	19.5	25.0	28.0	10.0	25.0	5.4	3.0	2.2	1.00
FMOV20820-D	19.5	25.0	28.0	10.0	25.0	4.3	3.0	1.5	1.00
FMOV20101-D	19.5	25.0	28.0	10.0	25.0	4.6	3.0	1.5	1.00
FMOV20121-D	19.5	25.0	28.0	10.0	25.0	4.8	3.0	1.6	1.00
FMOV20151-D	19.5	25.0	28.0	10.0	25.0	5.1	3.0	1.8	1.00
FMOV20181-D	19.5	25.0	28.0	10.0	25.0	4.2	3.0	1.5	1.00
FMOV20201-D	19.5	25.0	28.0	10.0	25.0	4.3	3.0	1.5	1.00
FMOV20221-D	19.5	25.0	28.0	10.0	25.0	4.4	3.0	1.6	1.00
FMOV20241-D	19.5	25.0	28.0	10.0	25.0	4.5	3.0	1.7	1.00
FMOV20271-D	19.5	25.0	28.0	10.0	25.0	4.6	3.0	1.8	1.00
FMOV20301-D	19.5	25.0	28.0	10.0	25.0	4.7	3.0	1.9	1.00
FMOV20331-D	19.5	25.0	28.0	10.0	25.0	4.9	3.0	2.0	1.00
FMOV20361-D	19.5	25.0	28.0	10.0	25.0	5.1	3.0	1.7	1.00
FMOV20391-D	19.5	25.0	28.0	10.0	25.0	5.2	3.0	1.8	1.00
FMOV20431-D	19.5	25.0	28.0	10.0	25.0	5.4	3.0	1.9	1.00
FMOV20471-D	19.5	25.0	28.0	10.0	25.0	5.6	3.0	2.0	1.00
FMOV20511-D	19.5	25.0	28.0	10.0	25.0	5.7	3.0	2.2	1.00
FMOV20561-D	19.5	25.0	28.0	10.0	25.0	5.9	3.0	2.3	1.00
FMOV20621-D	19.5	25.0	28.0	10.0	25.0	6.1	3.0	2.5	1.00
FMOV20681-D	19.5	25.0	28.0	10.0	25.0	6.2	3.0	2.7	1.00
FMOV20751-D	19.5	25.0	28.0	10.0	25.0	6.4	3.0	2.9	1.00
FMOV20781-D	19.5	25.0	28.0	10.0	25.0	6.7	3.0	3.0	1.00
FMOV20821-D	19.5	25.0	28.0	10.0	25.0	6.9	3.0	3.1	1.00
FMOV20911-D	19.5	25.0	28.0	10.0	25.0	7.0	3.0	3.5	1.00
FMOV20102-D	19.5	25.0	28.0	10.0	25.0	7.4	3.0	3.8	1.00
FMOV20112-D	19.5	25.0	28.0	10.0	25.0	7.9	3.0	4.1	1.00
FMOV20182-D	19.5	25.0	28.0	10.0	25.0	11.9	3.0	6.0	1.00

Unit: mm

NOTE : Specification subject to change without notice.



Outside Kink Lead (O) Inside Kink Lead (K) In Line Kink Lead (I)

Part Number	A		B	C	D	E	P	K		a	Φd
	Min.	Max.	Max.	±1.0	Typ.	Max.	Max.	Min.	Max.	±1.0	±0.05
FMOV20180-D	19.5	25.0	30.0	10.0	25.0	4.3	3.0	1.0	1.8	1.5	1.00
FMOV20220-D	19.5	25.0	30.0	10.0	25.0	4.6	3.0	1.0	1.8	1.6	1.00
FMOV20270-D	19.5	25.0	30.0	10.0	25.0	4.8	3.0	1.0	1.8	1.7	1.00
FMOV20330-D	19.5	25.0	30.0	10.0	25.0	4.3	3.0	1.0	1.8	1.6	1.00
FMOV20390-D	19.5	25.0	30.0	10.0	25.0	4.5	3.0	1.0	1.8	1.8	1.00
FMOV20470-D	19.5	25.0	30.0	10.0	25.0	4.7	3.0	1.0	1.8	1.9	1.00
FMOV20560-D	19.5	25.0	30.0	10.0	25.0	5.0	3.0	1.0	1.8	2.0	1.00
FMOV20680-D	19.5	25.0	30.0	10.0	25.0	5.4	3.0	1.0	1.8	2.2	1.00
FMOV20820-D	19.5	25.0	30.0	10.0	25.0	4.3	3.0	1.0	1.8	1.5	1.00
FMOV20101-D	19.5	25.0	30.0	10.0	25.0	4.6	3.0	1.0	1.8	1.5	1.00
FMOV20121-D	19.5	25.0	30.0	10.0	25.0	4.8	3.0	1.0	1.8	1.6	1.00
FMOV20151-D	19.5	25.0	30.0	10.0	25.0	5.1	3.0	1.0	1.8	1.8	1.00
FMOV20181-D	19.5	25.0	30.0	10.0	25.0	4.2	3.0	1.0	1.8	1.5	1.00
FMOV20201-D	19.5	25.0	30.0	10.0	25.0	4.3	3.0	1.0	1.8	1.5	1.00
FMOV20221-D	19.5	25.0	30.0	10.0	25.0	4.4	3.0	1.0	1.8	1.6	1.00
FMOV20241-D	19.5	25.0	30.0	10.0	25.0	4.5	3.0	1.0	1.8	1.7	1.00
FMOV20271-D	19.5	25.0	30.0	10.0	25.0	4.6	3.0	1.0	1.8	1.8	1.00
FMOV20301-D	19.5	25.0	31.0	10.0	25.0	4.7	3.0	1.0	1.8	1.9	1.00
FMOV20331-D	19.5	25.0	31.0	10.0	25.0	4.9	3.0	1.0	1.8	2.0	1.00
FMOV20361-D	19.5	25.0	31.0	10.0	25.0	5.1	3.0	1.0	1.8	1.7	1.00
FMOV20391-D	19.5	25.0	31.0	10.0	25.0	5.2	3.0	1.0	1.8	1.8	1.00
FMOV20431-D	19.5	25.0	31.0	10.0	25.0	5.4	3.0	1.0	1.8	1.9	1.00
FMOV20471-D	19.5	25.0	31.0	10.0	25.0	5.6	3.0	1.0	1.8	2.0	1.00
FMOV20511-D	19.5	25.0	31.0	10.0	25.0	5.7	3.0	1.0	1.8	2.2	1.00
FMOV20561-D	19.5	25.0	31.0	10.0	25.0	5.9	3.0	1.0	1.8	2.3	1.00
FMOV20621-D	19.5	25.0	31.0	10.0	25.0	6.1	3.0	1.0	1.8	2.5	1.00
FMOV20681-D	19.5	25.0	31.0	10.0	25.0	6.2	3.0	1.0	1.8	2.7	1.00
FMOV20751-D	19.5	25.0	31.0	10.0	25.0	6.4	3.0	1.0	1.8	2.9	1.00
FMOV20781-D	19.5	25.0	31.0	10.0	25.0	6.7	3.0	1.0	1.8	3.0	1.00
FMOV20821-D	19.5	25.0	31.0	10.0	25.0	6.9	3.0	1.0	1.8	3.1	1.00
FMOV20911-D	19.5	25.0	31.0	10.0	25.0	7.0	3.0	1.0	1.8	3.5	1.00
FMOV20102-D	19.5	25.0	31.0	10.0	25.0	7.4	3.0	1.0	1.8	3.8	1.00
FMOV20112-D	19.5	25.0	31.0	10.0	25.0	7.9	3.0	1.0	1.8	4.1	1.00
FMOV20182-D	19.5	25.0	31.0	10.0	25.0	11.9	3.0	1.0	1.8	6.0	1.00

Unit: mm

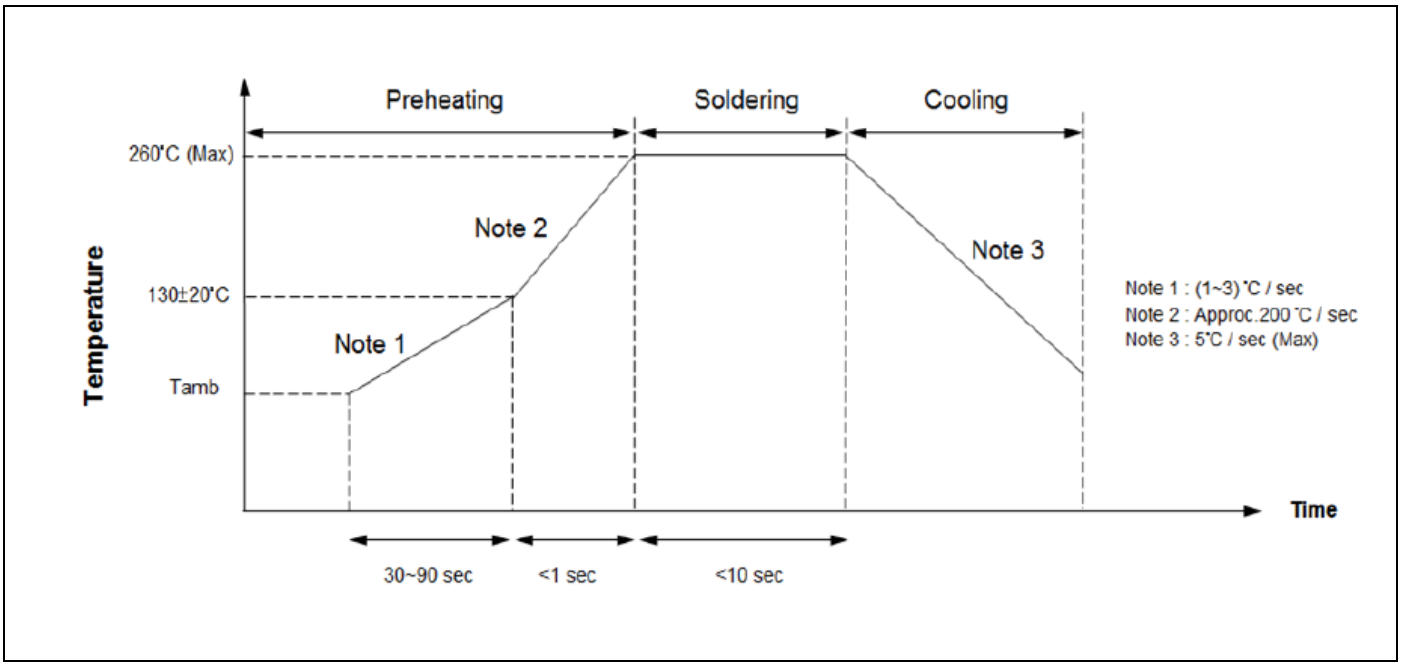
NOTE : Specification subject to change without notice.

10. Packaging Specifications

Bulk Product Packing

Series	Straight Lead Type Quantity (pcs/bag)	Outside Kink Lead Type Quantity (pcs/bag)	Inside Kink Lead Type Quantity (pcs/bag)	In Line Kink Lead Type Quantity (pcs/bag)
FMOV20-D Series	250	250	250	250

11. Solder Recommendation



Recommendation Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of soldering Iron-tip	360℃ (Max)
Soldering Time	3 sec (Max)
Distance from Varistor	2mm (Min)

RoHS Compliant Declaration

We hereby declare that the components delivered to your company are compliant with RoHS Directive 2002/95/EC

Storage Conditions of Products

(I) Storage Conditions:

a. Storage Temperature: -10℃~+40℃

b. Relative Humidity: ≦75%RH

c. Keep away from corrosive atmosphere and sunlight

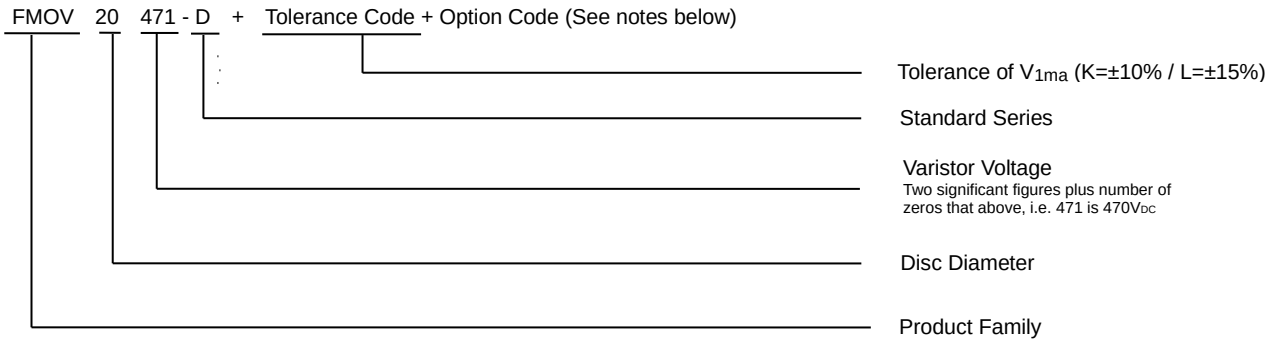
d. Solvent Resistance: MIL–STD–202, Method 215F

e. Moisture Sensitivity: Level 1, J-STD-020

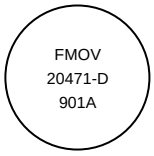
(II) Period of Storage: 1 year

12. Part Numbering and Marking System

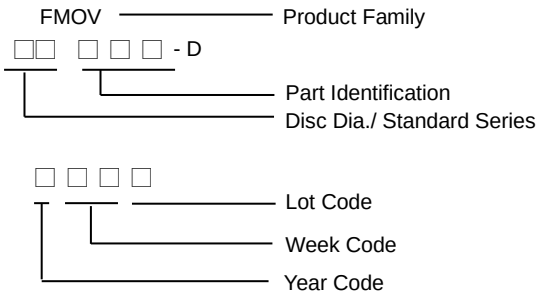
Part Numbering System



Marking System



Example



NOTE : Specification subject to change without notice.

13. Order Notes:

Main Part Code:

Part No + Tolerance Code + Packaging + Lead Type Designators + Option Code

Ordering examples:

Straight Lead Bulk Pack (Standard)	Straight Lead (Short Cut) Bulk Pack	Straight Lead Tape & Reel Pack	Straight Lead Flat Box Pack
FMOV20471-D**KBS**	FMOV20471-D**KBSXXX**	-	-

Tape & Reel Pack Feed Hole Pitch
-
-

Outside Kink Lead Bulk Pack	Outside Kink Lead (Short Cut) Bulk Pack	Outside Kink Lead Tape & Reel Pack	Outside Kink Lead Flat Box Pack
FMOV20471-D**KBO**	FMOV20471-D**KBOXXX**	-	-

Inside Kink Lead Bulk Pack	Inside Kink Lead (Short Cut) Bulk Pack	Inside Kink Lead Tape & Reel Pack	Inside Kink Lead Flat Box Pack
FMOV20471-D**KBK**	FMOV20471-D**KBKXXX**	-	-

In Line Kink Lead Bulk Pack	In Line Kink Lead (Short Cut) Bulk Pack	In Line Kink Lead Tape& Reel Pack	In Line Kink Lead Flat Box Pack
FMOV20471-D**KBI**	FMOV20471-D**KBIXXX**	-	-