



MOV Varistor Device: FMOV10-H Series (Preliminary)

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)
FMOV10180-H	11	14	18	16	20	36	5	4.0	1500	0.08	8000
FMOV10220-H	14	18	22	20	24	43	5	5.0	1500	0.08	7000
FMOV10270-H	17	22	27	24	30	53	5	6.0	1500	0.08	5500
FMOV10330-H	20	26	33	30	36	65	5	7.5	1500	0.08	4100
FMOV10390-H	25	31	39	35	43	77	5	8.6	1500	0.08	3900
FMOV10470-H	30	38	47	42	52	93	5	10	1500	0.08	3300
FMOV10560-H	35	45	56	50	62	110	5	11	1500	0.08	2800
FMOV10680-H	40	56	68	61	75	135	5	14	1500	0.08	2300
FMOV10201-H	130	170	200	180	220	340	50	52	4500	0.5	420
FMOV10221-H	140	180	220	198	242	360	50	58	4500	0.5	390
FMOV10241-H	150	200	240	216	264	395	50	64	4500	0.5	360
FMOV10271-H	175	225	270	243	297	455	50	67	4500	0.5	330
FMOV10301-H	195	250	300	270	330	500	50	70	4500	0.5	300
FMOV10331-H	215	275	330	297	363	550	50	78	4500	0.5	270
FMOV10361-H	230	300	360	324	396	595	50	84	4500	0.5	250
FMOV10391-H	250	320	390	351	429	650	50	91	4500	0.5	230
FMOV10431-H	275	350	430	387	473	710	50	99	4500	0.5	220
FMOV10471-H	300	385	470	423	517	775	50	107	4500	0.5	200
FMOV10511-H	320	420	510	459	561	845	50	117	4500	0.5	190
FMOV10561-H	350	460	560	504	616	915	50	125	4500	0.5	180
FMOV10621-H	395	510	620	558	682	1020	50	128	4500	0.5	160
FMOV10681-H	420	560	680	612	748	1120	50	134	4500	0.5	140
FMOV10751-H	465	615	750	675	825	1235	50	146	4500	0.5	130

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2. Agency Approvals

Agency	Agency Approvals	Certificate No.
	UL1449 4 th & cUL	In Process
	IEC 61051-1:2007 IEC 61051-2:1991 IEC 61051-2:1991/AMD1:2009 IEC 61051-2-2:1991 IEC 62368-1:2018/G.8.1 IEC 60950-1:2005/AMD1:2009/AMD2:2013, Annex Q	In Process

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3. 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)	$\Delta V_{1mA} / V_{1mA} \leq \pm 10\%$ 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	$\Delta V_{1mA} / V_{1mA} \leq \pm 5\%$ 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	$\Delta V_{1mA} / V_{1mA} \leq \pm 5\%$ 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	$\Delta V_{1mA} / V_{1mA} \leq \pm 5\%$ 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, I _{peak} =0.25*I _{max}	$\Delta V/V \leq \pm 10\%$ No visible damage
Pulse current - 10/1000 μs	IEC 61051-2	10/1000 μs, 10 times, I _{peak} = 0.0075* I _{max}	$\Delta V_{1mA} / V_{1mA} \leq \pm 10\%$ No visible damage
Combination pulse	IEC 62368-1	Additional test: 10 pulses (combination pulse 6KV/3KA), in one direction, 1 per min	$\Delta V_{1mA} / V_{1mA} \leq \pm 10\%$ 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	$\Delta V_{1mA} / V_{1mA} \leq \pm 10\%$ 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	$\Delta V_{1mA} / V_{1mA} \leq \pm 10\%$ 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	$\Delta V/V \leq \pm 10\%$ No visible damage R _{ISO} ≥ 1000MΩ U ≤ 1,1 U _{initial}

NOTE : Specification subject to change without notice.

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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	$\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$ $R_{iso} \geq 100M\Omega$
Maximum Peak Current	Specification Standard	I _{max} , 8/20 μs, 1 time.	$\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$ No visible damage
Nominal Discharge Current Test	UL1449 4th	I _n , 8/20 μs, 15 times, Interval 60s	$\Delta V/V \leq \pm 10\%$ No visible damage
Varistor Voltage Temp. Coefficient	Specification Standard	$\frac{V_{mAat\ 85^{\circ}C} - V_{mAat\ 25^{\circ}C}}{V_{mAat\ 25^{\circ}C}} \times \frac{1}{60} \times 100(\%/^{\circ}C)$	$0.05 \leq TC \leq 0.05(\%/^{\circ}C)$
High Temperature Storage	IEC60068-2-2	1000h, T = 125±2°C	$\Delta V/V \leq \pm 5\%$ No visible damage
Max. Energy	Specification Standard	10/1000 μs, 1 times, Max. Energy	$\Delta V/V \leq \pm 10\%$ 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.	$\Delta V/V \leq \pm 10\%$ 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.	$\Delta V/V \leq \pm 10\%$ No visible damage

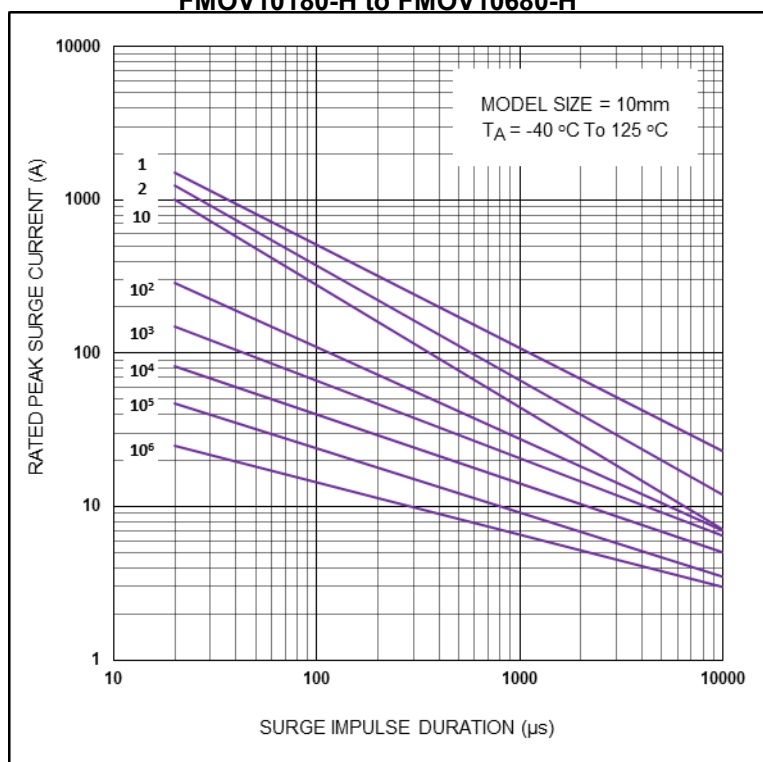
* (According to customer requirements to meet the test items)



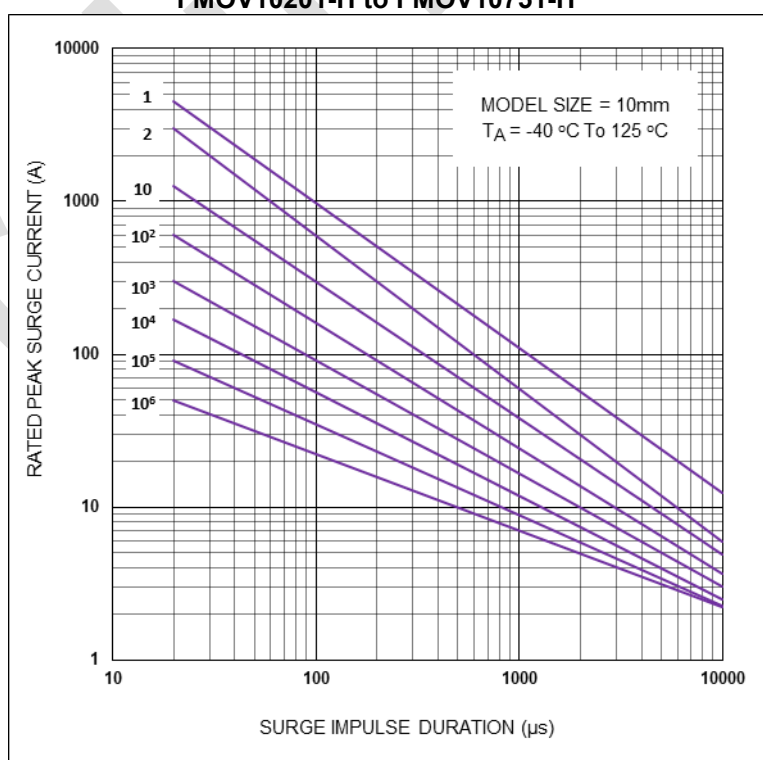
4. Impulse Life Time Rating Curves

FMOV10-H Series

FMOV10180-H to FMOV10680-H



FMOV10201-H to FMOV10751-H

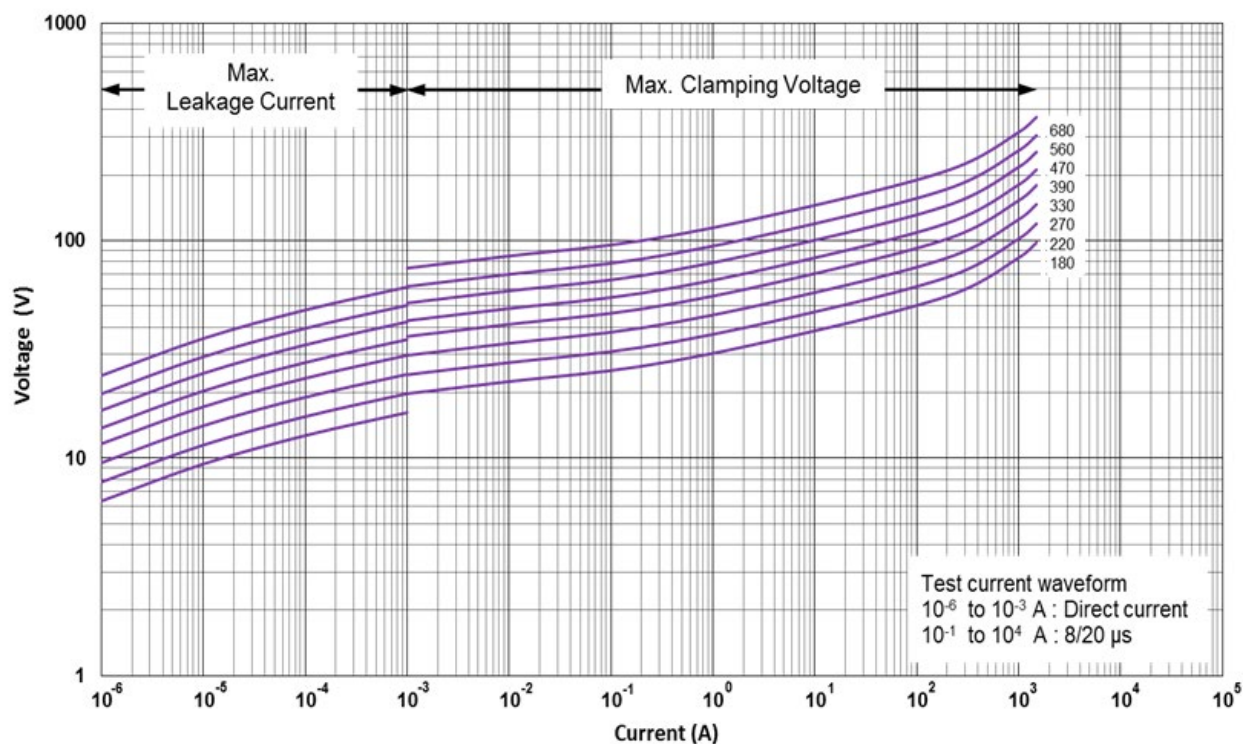


NOTE : Specification subject to change without notice.

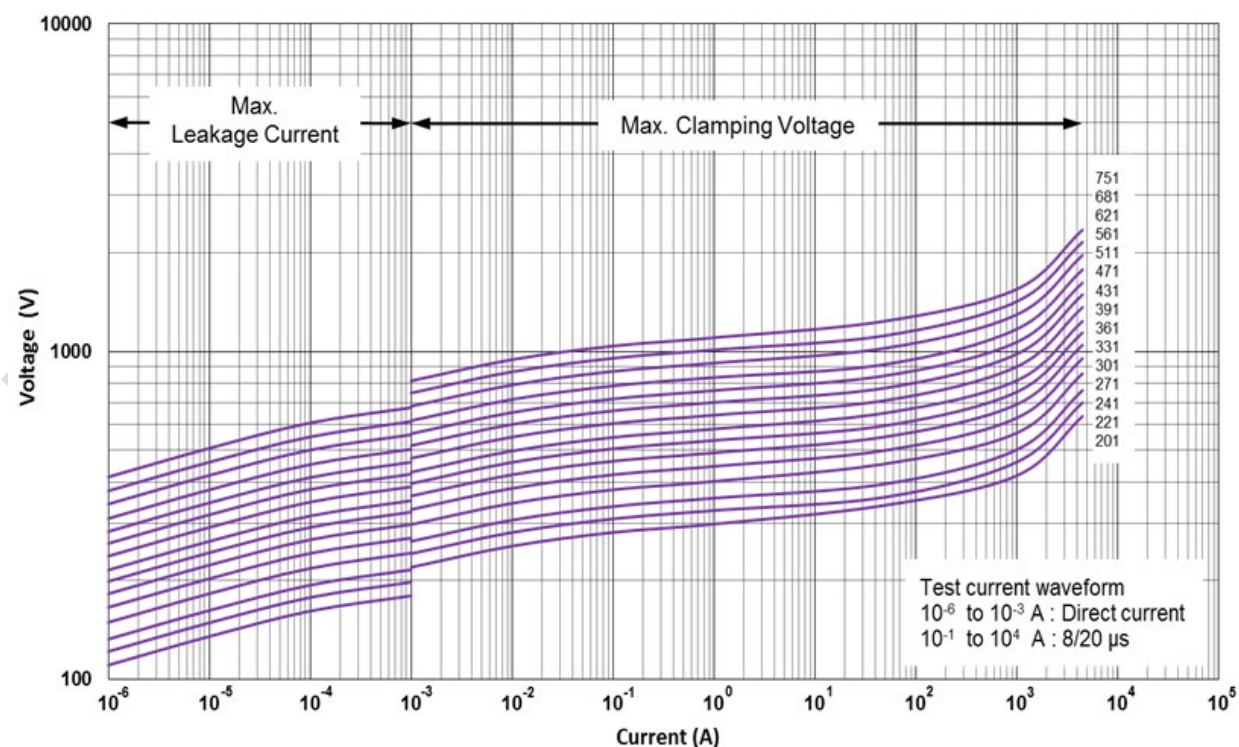


5. V-I Curves

(FMOV10180-H to FMOV10680-H)



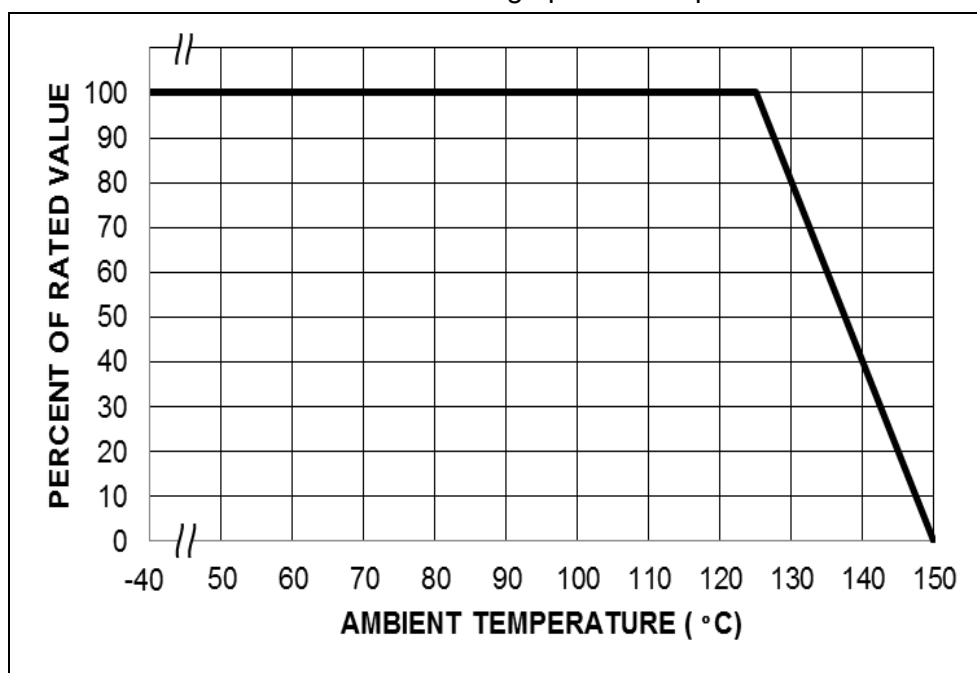
(FMOV10201-H to FMOV10751-H)



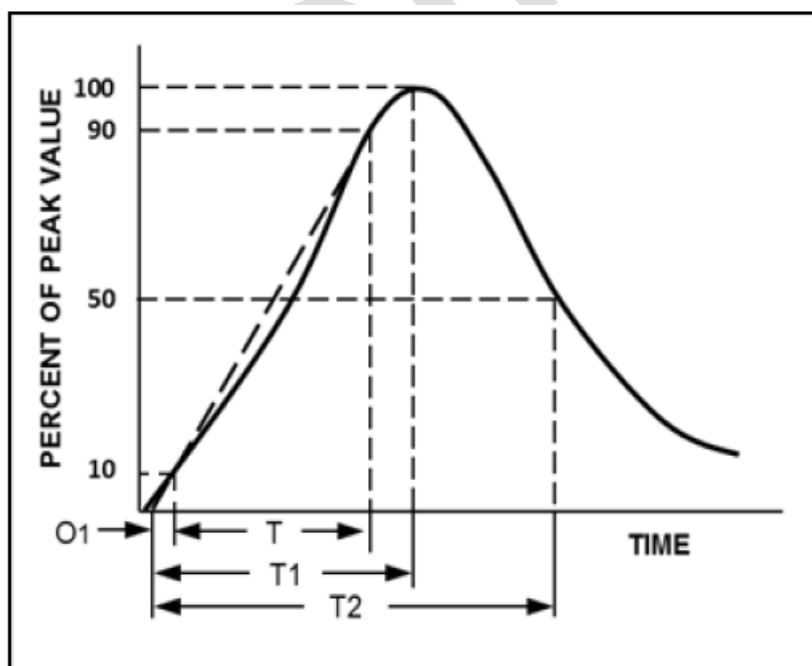


6. Power Derating Curve

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.



7. Surge Current Standard Waveform



O1 = Virtual Origin of Wave

T = Time from 10% to 90% of Peak

T1 = Rise Time = $1.25 \times T$

T2 = Decay Time

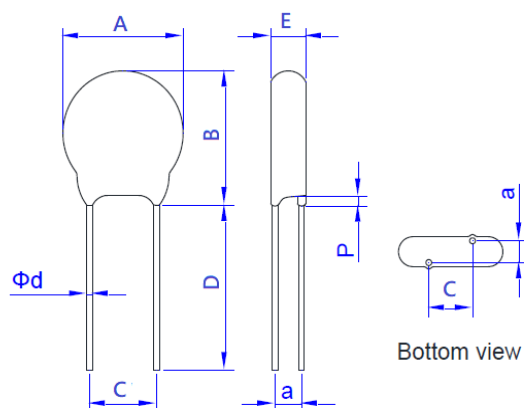
Example - For an 8/20 μ s Current Waveform:

8 μ s = T1 = Rise Time

20 μ s = T2 = Decay Time

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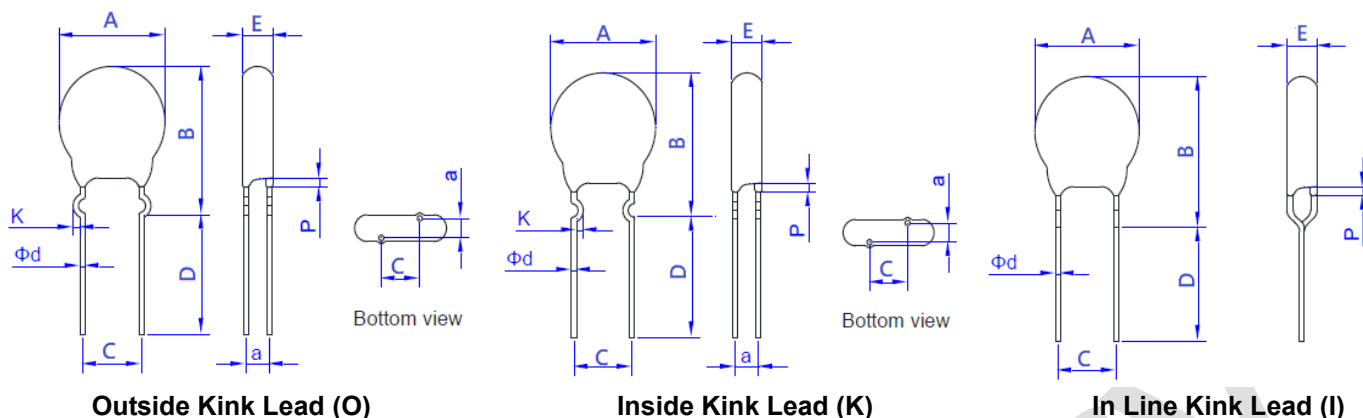
8. Dimension of Component for Standard Product



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
FMOV10180-H	10.5	14.0	17.0	7.5	25.0	5.3	3.0	1.5	0.80
FMOV10220-H	10.5	14.0	17.0	7.5	25.0	5.6	3.0	1.7	0.80
FMOV10270-H	10.5	14.0	17.0	7.5	25.0	5.9	3.0	1.8	0.80
FMOV10330-H	10.5	14.0	17.0	7.5	25.0	5.3	3.0	1.9	0.80
FMOV10390-H	10.5	14.0	17.0	7.5	25.0	5.5	3.0	1.9	0.80
FMOV10470-H	10.5	14.0	17.0	7.5	25.0	5.8	3.0	2.1	0.80
FMOV10560-H	10.5	14.0	17.0	7.5	25.0	6.1	3.0	2.3	0.80
FMOV10680-H	10.5	14.0	17.0	7.5	25.0	6.5	3.0	2.6	0.80
FMOV10201-H	10.5	14.0	17.0	7.5	25.0	6.2	3.0	2.0	0.80
FMOV10221-H	10.5	14.0	17.0	7.5	25.0	6.3	3.0	2.1	0.80
FMOV10241-H	10.5	14.0	17.0	7.5	25.0	6.5	3.0	2.2	0.80
FMOV10271-H	10.5	14.0	17.0	7.5	25.0	6.6	3.0	2.3	0.80
FMOV10301-H	10.5	14.0	17.0	7.5	25.0	6.8	3.0	2.5	0.80
FMOV10331-H	10.5	14.0	17.0	7.5	25.0	7.0	3.0	2.7	0.80
FMOV10361-H	10.5	14.0	17.0	7.5	25.0	7.3	3.0	2.8	0.80
FMOV10391-H	10.5	14.0	17.0	7.5	25.0	7.5	3.0	3.0	0.80
FMOV10431-H	10.5	14.0	17.0	7.5	25.0	7.8	3.0	3.2	0.80
FMOV10471-H	10.5	14.0	17.0	7.5	25.0	8.1	3.0	3.4	0.80
FMOV10511-H	10.5	14.0	17.0	7.5	25.0	8.2	3.0	3.7	0.80
FMOV10561-H	10.5	14.0	17.0	7.5	25.0	8.5	3.0	3.9	0.80
FMOV10621-H	10.5	14.0	17.0	7.5	25.0	8.8	3.0	4.3	0.80
FMOV10681-H	10.5	14.0	17.0	7.5	25.0	8.9	3.0	4.7	0.80
FMOV10751-H	10.5	14.0	17.0	7.5	25.0	9.2	3.0	5.1	0.80

Unit: mm



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
FMOV10180-H	10.5	14.0	19.5	7.5	25.0	5.3	3.0	1.0	1.8	1.5	0.80
FMOV10220-H	10.5	14.0	19.5	7.5	25.0	5.6	3.0	1.0	1.8	1.7	0.80
FMOV10270-H	10.5	14.0	19.5	7.5	25.0	5.9	3.0	1.0	1.8	1.8	0.80
FMOV10330-H	10.5	14.0	19.5	7.5	25.0	5.3	3.0	1.0	1.8	1.9	0.80
FMOV10390-H	10.5	14.0	19.5	7.5	25.0	5.5	3.0	1.0	1.8	1.9	0.80
FMOV10470-H	10.5	14.0	19.5	7.5	25.0	5.8	3.0	1.0	1.8	2.1	0.80
FMOV10560-H	10.5	14.0	19.5	7.5	25.0	6.1	3.0	1.0	1.8	2.3	0.80
FMOV10680-H	10.5	14.0	19.5	7.5	25.0	6.5	3.0	1.0	1.8	2.6	0.80
FMOV10201-H	10.5	14.0	19.5	7.5	25.0	6.2	3.0	1.0	1.8	2.0	0.80
FMOV10221-H	10.5	14.0	19.5	7.5	25.0	6.3	3.0	1.0	1.8	2.1	0.80
FMOV10241-H	10.5	14.0	19.5	7.5	25.0	6.5	3.0	1.0	1.8	2.2	0.80
FMOV10271-H	10.5	14.0	19.5	7.5	25.0	6.6	3.0	1.0	1.8	2.3	0.80
FMOV10301-H	10.5	14.0	20.5	7.5	25.0	6.8	3.0	1.0	1.8	2.5	0.80
FMOV10331-H	10.5	14.0	20.5	7.5	25.0	7.0	3.0	1.0	1.8	2.7	0.80
FMOV10361-H	10.5	14.0	20.5	7.5	25.0	7.3	3.0	1.0	1.8	2.8	0.80
FMOV10391-H	10.5	14.0	20.5	7.5	25.0	7.5	3.0	1.0	1.8	3.0	0.80
FMOV10431-H	10.5	14.0	20.5	7.5	25.0	7.8	3.0	1.0	1.8	3.2	0.80
FMOV10471-H	10.5	14.0	20.5	7.5	25.0	8.1	3.0	1.0	1.8	3.4	0.80
FMOV10511-H	10.5	14.0	20.5	7.5	25.0	8.2	3.0	1.0	1.8	3.7	0.80
FMOV10561-H	10.5	14.0	20.5	7.5	25.0	8.5	3.0	1.0	1.8	3.9	0.80
FMOV10621-H	10.5	14.0	20.5	7.5	25.0	8.8	3.0	1.0	1.8	4.3	0.80
FMOV10681-H	10.5	14.0	20.5	7.5	25.0	8.9	3.0	1.0	1.8	4.7	0.80
FMOV10751-H	10.5	14.0	20.5	7.5	25.0	9.2	3.0	1.0	1.8	5.1	0.80

Unit: mm



9. Tape and Reel Specifications

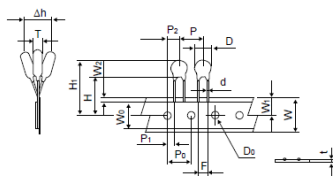


Figure: A

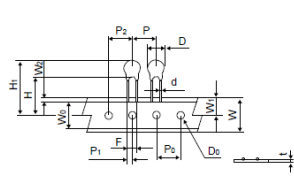


Figure: B

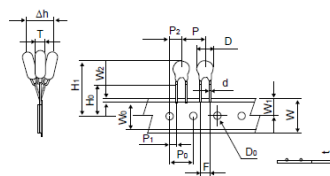


Figure: C

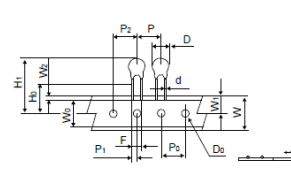


Figure: D

Straight Leads

Inline Kink Leads

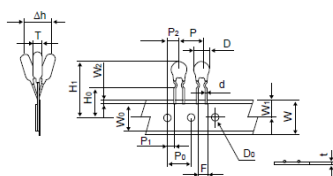


Figure: E

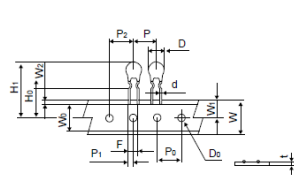


Figure: F

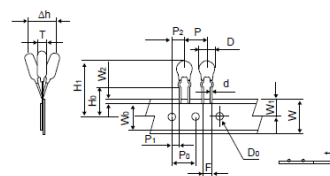


Figure: G

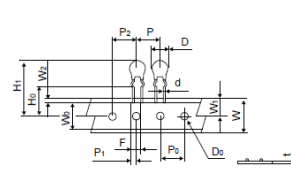


Figure: H

Inside Kink Leads

Outside Kink Leads

Symbol	Parameter	FMOV10-H Series
P	Pitch of Component	12.7±1.0
P0	Feed Hole Pitch	12.7±0.2
P1	Feed Hole Center Lead	8.95±0.7
P2	Hole center to Component Center	12.7±0.7
F	Lead to Lead Distance	7.5±0.8
Δh	Component Alignment	2.0 Max
W	Tape Width	18.0+1.0 -0.5
W0	Hold Down Tape Width	5.0 Min
W1	Hole Position	9.0+0.75 -0.50
W2	Hold Down Tape Position	3.0 Max
H	Height from Tape Center to Component Base	18.0+2.0 -0
H0	Seating Plane Height	16.0±0.5
H1	Component Height	36.0 Max
D0	Feed Hole Diameter	4.0±0.2
t	Total Tape Thickness	0.7±0.2
L	Length of Clipped Lead	11.0 Max
Figure		ACEG

Unit: mm

NOTE : Specification subject to change without notice.

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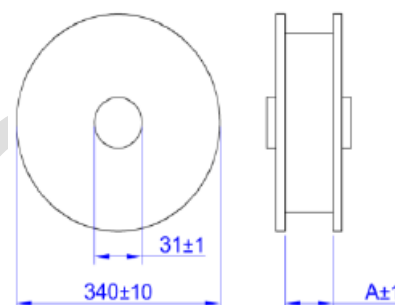
10. Packaging Specifications

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)
FMOV10-H Series	500	500	500	500

Tape & Reel Product Packing

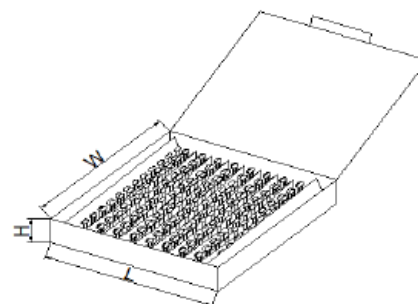
Series	A (mm)	Quantity (pcs/reel)
FMOV10(201~621)-H-T-	56	1000
FMOV10(681~751)-H-T-		800



Box Product Packing

Series	Quantity (pcs/reel)
FMOV10(201~621)-H-T-	1000
FMOV10(681~751)-H-T-	800

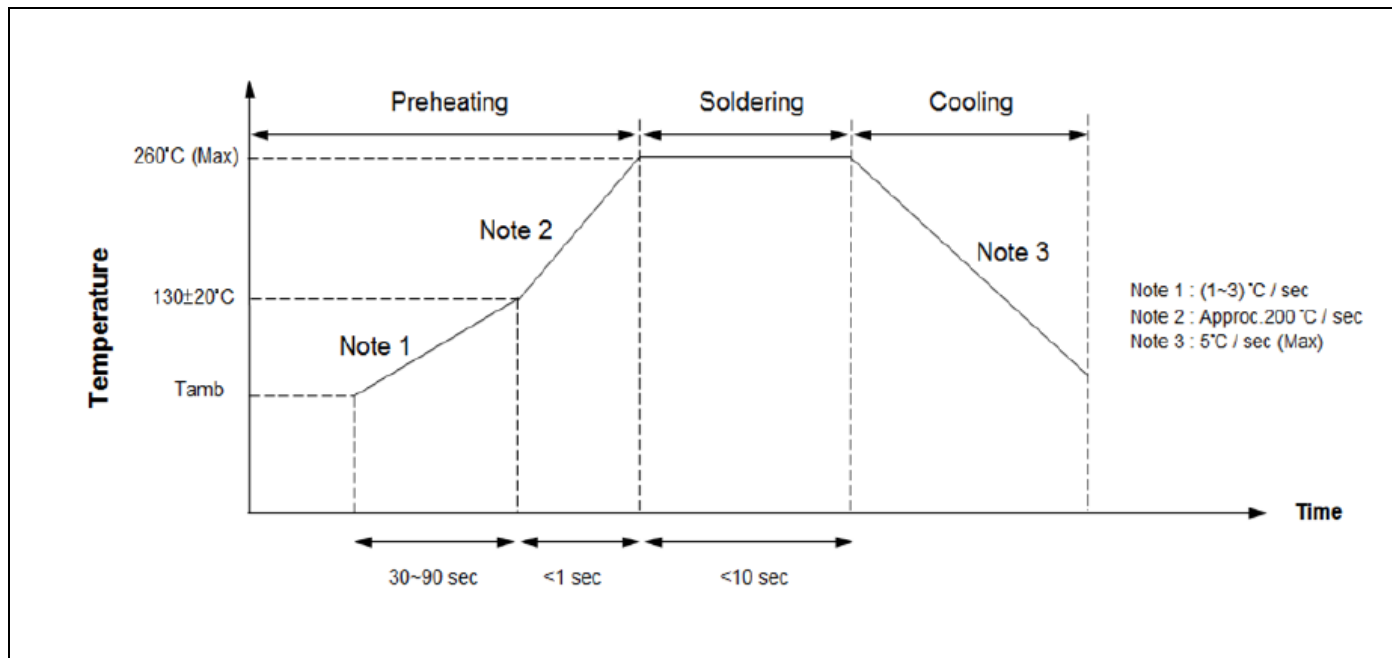
Series	L±5	W±5	H±5
FMOV10-H Series	340	245	50



NOTE : Specification subject to change without notice.



11. Solder Recommendation



Recommendation Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of soldering Iron-tip	360°C (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:

- Storage Temperature: -10°C ~ +40°C
- Relative Humidity: ≤ 75%RH
- Keep away from corrosive atmosphere and sunlight
- Solvent Resistance: MIL-STD-202, Method 215F
- Moisture Sensitivity: Level 1, J-STD-020

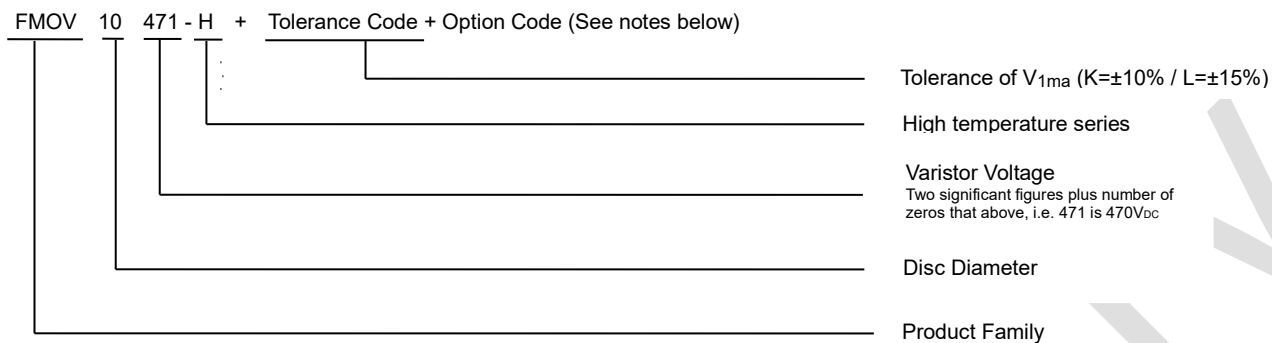
(II) Period of Storage: 1 year

NOTE : Specification subject to change without notice.

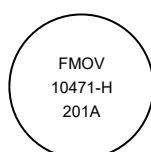


12. Part Numbering and Marking System

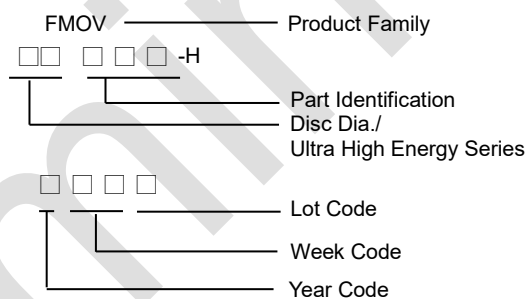
Part Numbering System



Marking System



Example



 FUZETEC TECHNOLOGY CO., LTD.	NO.	FMOV10-H Series		
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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
FMOV10471-HKBS	FMOV10471-HKBSXXX	FMOV10471-HKTS	FMOV10471-HKAS

Outside Kink Lead Bulk Pack	Outside Kink Lead (Short Cut) Bulk Pack	Outside Kink Lead Tape & Reel Pack	Outside Kink Lead Flat Box Pack
FMOV10471-HKBO	FMOV10471-HKBOXXX	FMOV10471-HKTO	FMOV10471-HKAO

Inside Kink Lead Bulk Pack	Inside Kink Lead (Short Cut) Bulk Pack	Inside Kink Lead Tape & Reel Pack	Inside Kink Lead Flat Box Pack
FMOV10471-HKBK	FMOV10471-HKKBXXX	FMOV10471-HKTK	FMOV10471-HKAK

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
FMOV10471-HKBI	FMOV10471-HKBIXXX	FMOV10471-HKTI	FMOV10471-HKAI