MOV Varistor Device: FMOV14-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)
FMOV14180-H	11	14	18	16	20	36	10	11	3000	0.15	18500
FMOV14220-H	14	18	22	20	24	43	10	14	3000	0.15	16400
FMOV14270-H	17	22	27	24	30	53	10	18	3000	0.15	13000
FMOV14330-H	20	26	33	30	36	65	10	23	3000	0.15	9500
FMOV14390-H	25	31	39	35	43	77	10	26	3000	0.15	8800
FMOV14470-H	30	38	47	42	52	93	10	33	3000	0.15	7700
FMOV14560-H	35	45	56	50	62	110	10	41	3000	0.15	6400
FMOV14680-H	40	56	68	61	75	135	10	46	3000	0.15	5600
FMOV14201-H	130	170	200	180	220	340	100	140	10000	1.0	860
FMOV14221-H	140	180	220	198	242	360	100	155	10000	1.0	810
FMOV14241-H	150	200	240	216	264	395	100	168	10000	1.0	860
FMOV14271-H	175	225	270	243	297	455	100	190	10000	1.0	700
FMOV14301-H	195	250	300	270	330	500	100	209	10000	1.0	640
FMOV14331-H	215	275	330	297	363	550	100	228	10000	1.0	580
FMOV14361-H	230	300	360	324	396	595	100	255	10000	1.0	530
FMOV14391-H	250	320	390	351	429	650	100	275	10000	1.0	480
FMOV14431-H	275	350	430	387	473	710	100	303	10000	1.0	430
FMOV14471-H	300	385	470	423	517	775	100	350	10000	1.0	380
FMOV14511-H	320	420	510	459	561	845	100	382	10000	1.0	350
FMOV14561-H	350	460	560	504	616	915	100	382	10000	1.0	320
FMOV14621-H	395	510	620	558	682	1020	100	382	7500	1.0	300
FMOV14681-H	420	560	680	612	748	1120	100	382	7500	1.0	270
FMOV14751-H	465	615	750	675	825	1235	100	420	7500	1.0	250

NOTE : Specification subject to change without notice.

2. Agency Approvals

Agency	Agency Approvals	Certificate No.
c UL us	UL1449 4th & cUL	In Process
VDE	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

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)	$\triangle V_{1mA}/V_{1mA} \leqq \pm 10\%$ 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	$\triangle V_{1mA}/V_{1mA} \leqq \pm 5\%$ 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	$\triangle V_{1mA}/V_{1mA} \leqq \pm 5\%$ 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	$\triangle V/_{1mA}\ V_{1mA} \leqq \pm 5\%$ 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, Ipeak=0.25*Imax	$\triangle V/V \leqq \pm 10\%$ No visible damage
Pulse current - 10/1000 μs	IEC 61051-2	10/1000 μs, 10 times, Ipeak = 0.0075* Imax	$\triangle V_{1mA}/V_{1mA} \leqq \pm 10\%$ No visible damage
Combination pulse	IEC 62368-1	Additional test: 10 pulses (combination pulse 6KV/3KA), in one direction, 1 per min	$\triangle V_{1mA}/V_{1mA} \leqq \pm 10\%$ 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	$\triangle V_{1mA}/V_{1mA} \leqq \pm 10\%$ 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	$\triangle V_{1mA}/V_{1mA} \leqq \pm 10\%$ No visible damage $R_{ISO} \geqq 100M\Omega$ 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	$\triangle V/V \leqq \pm 10\%$ No visible damage $R_{ISO} \geqq 1000M\Omega$ U ≤ 1,1 $U_{initial}$

NOTE : Specification subject to change without notice.

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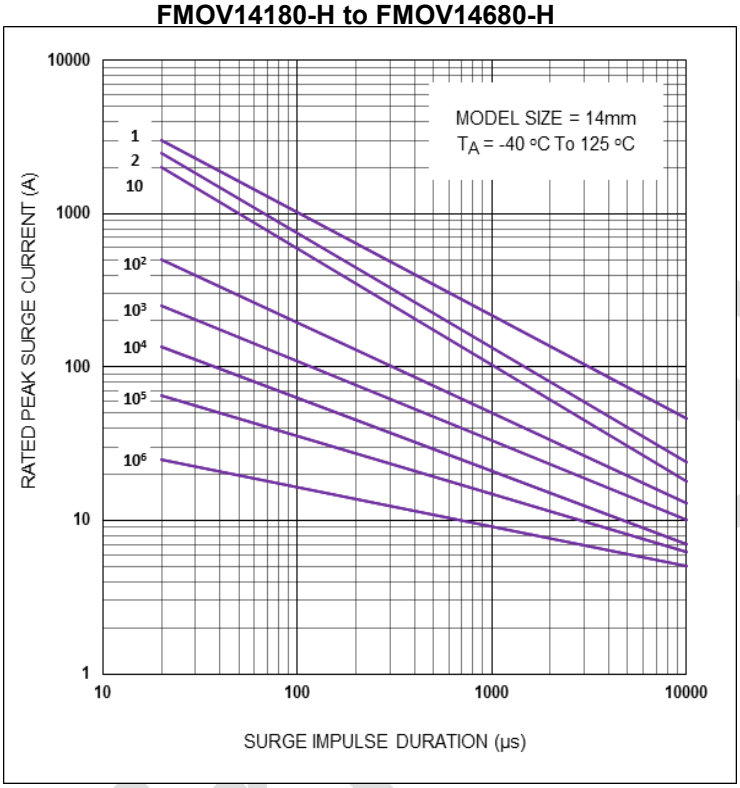
Characteristics	Standard	Test Conditions	Specifications
Damp heat (Steady state)	IEC 60068-2-78 Test Ca	T = 40±2°C, RH = 93(+2/-3)%, 56d , 4 specimens: No voltage applied ,Other 4 specimens: Applied voltage: 10% of the max. d. c. voltage	$\triangle V_{1mA}/V1_{mA} \leqq \pm 10\%$ $R_{ISO} \geqq 100M\Omega$
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	$\frac{V_{1mA}\text{at } 85℃ - V_{1mA}\text{at } 25℃}{V_{1mA}\text{at } 25℃} \times \frac{1}{60} \times 100(\%/C)$	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)

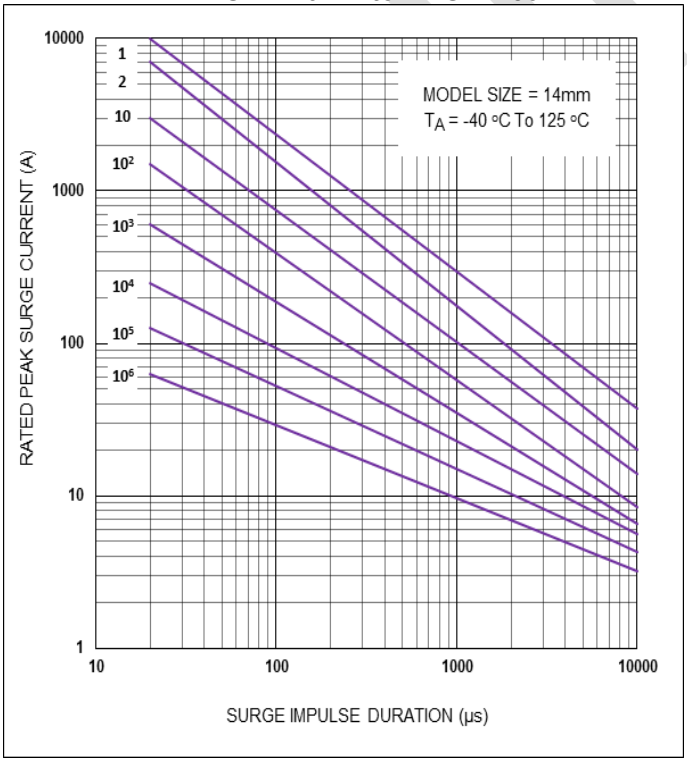
4. Impulse Life Time Rating Curves

FMOV14-H Series

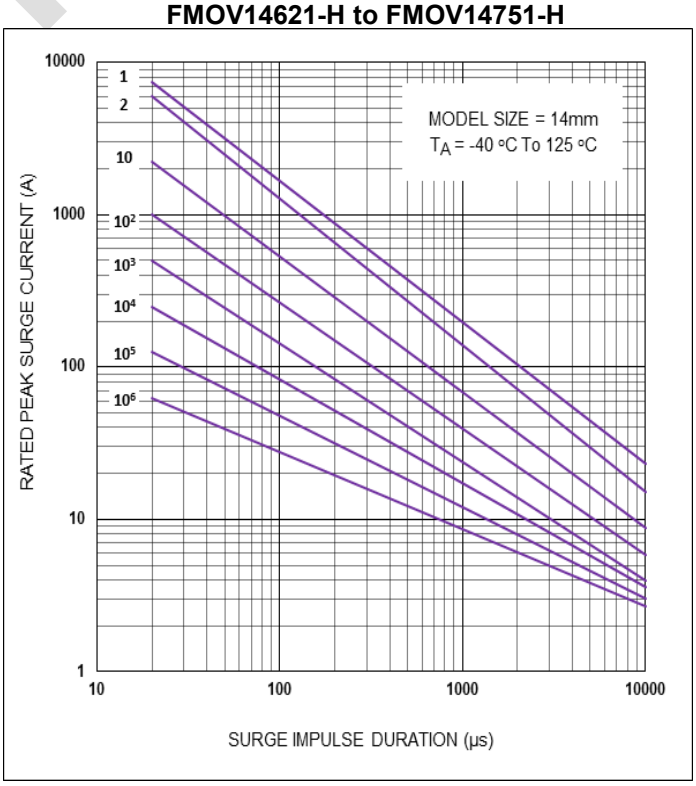
FMOV14180-H to FMOV14680-H



FMOV14201-H to FMOV14561-H



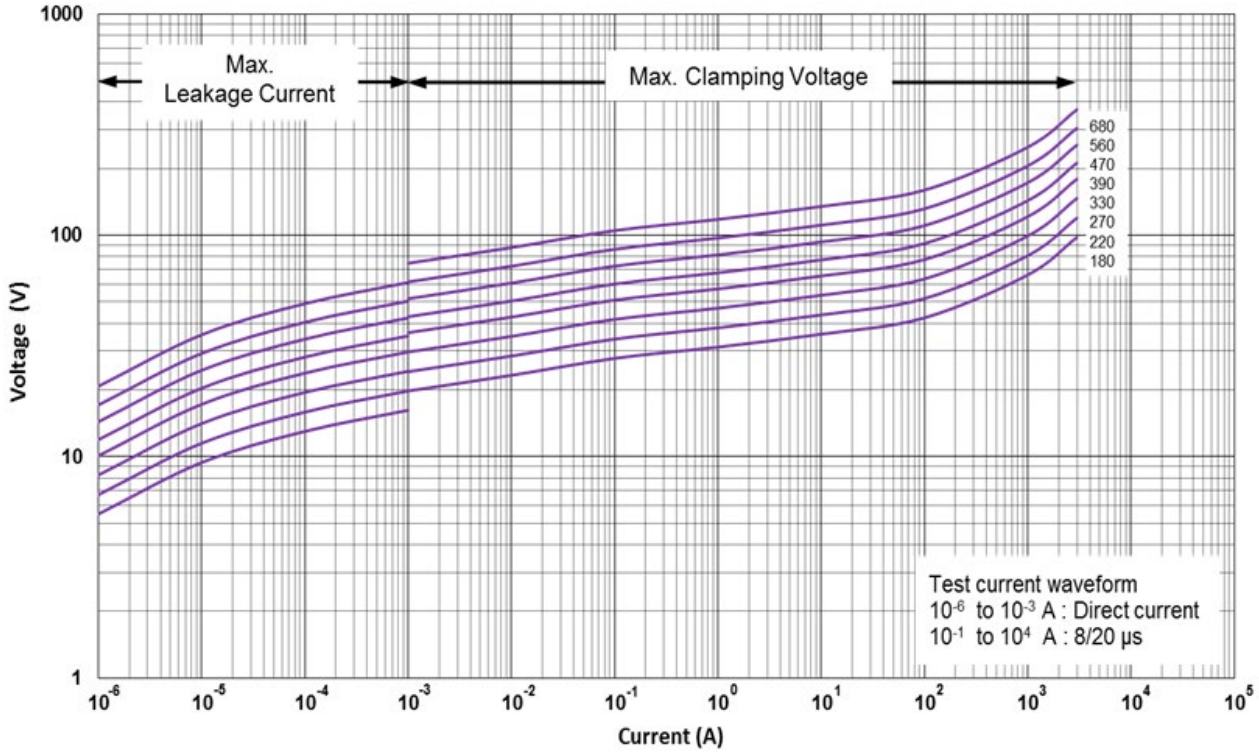
FMOV14621-H to FMOV14751-H



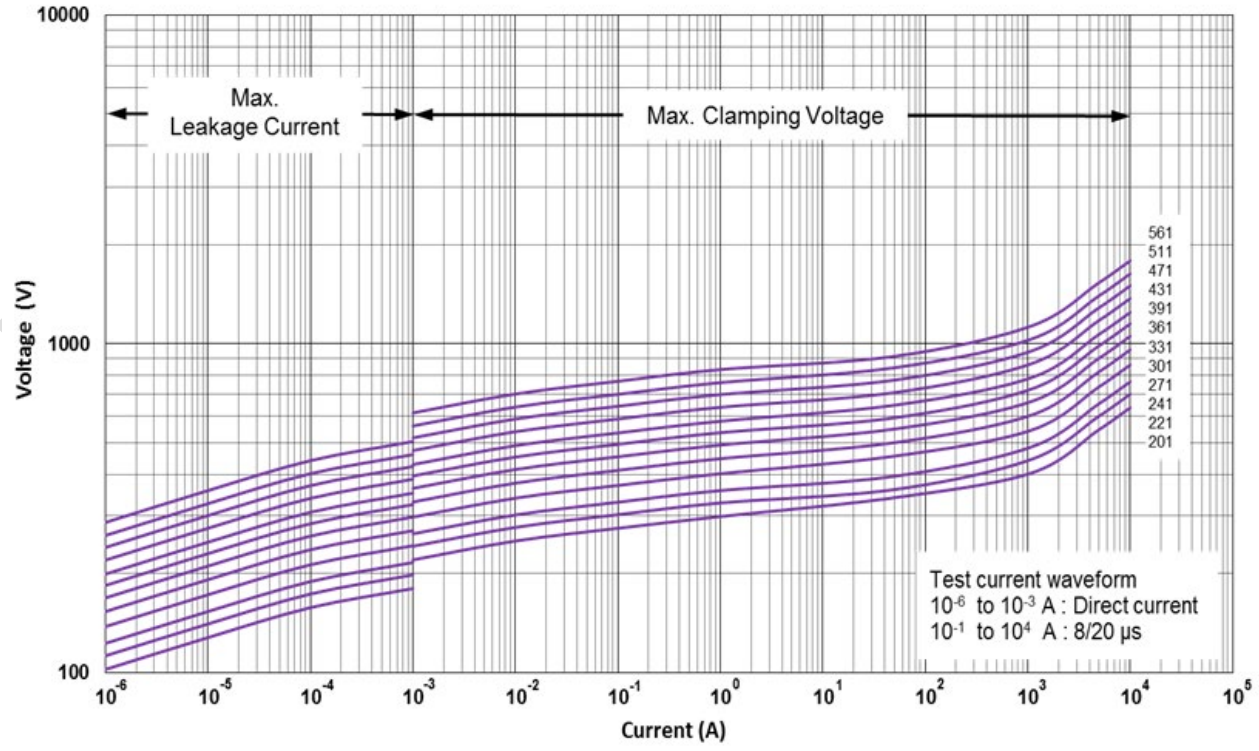
NOTE : Specification subject to change without notice.

5. V-I Curves

(FMOV14180-H to FMOV14680-H)

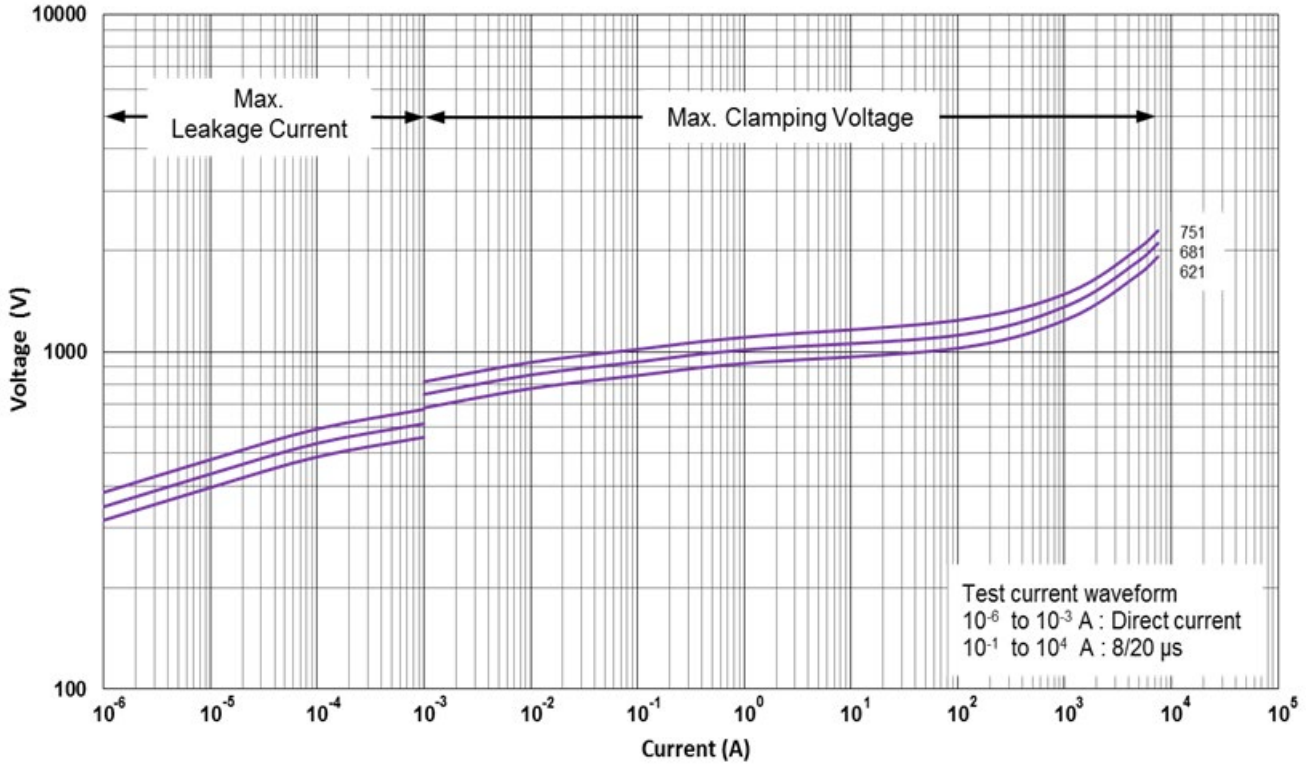


(FMOV14201-H to FMOV14561-H)



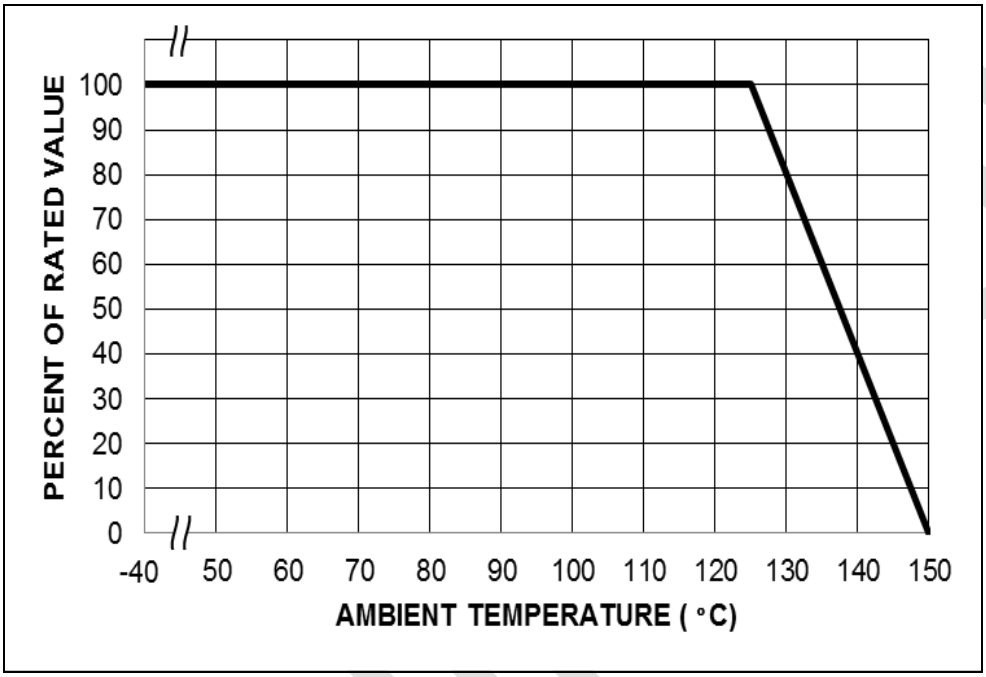
NOTE : Specification subject to change without notice.

(FMOV14621-H to FMOV14751-H)

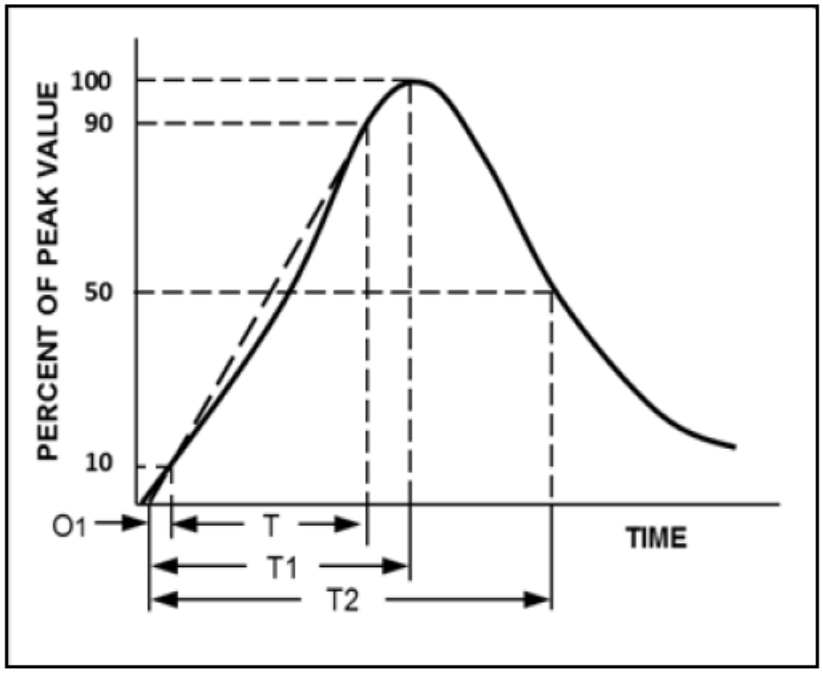


6. Power Derating Curve

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 x T

T2 = Decay Time

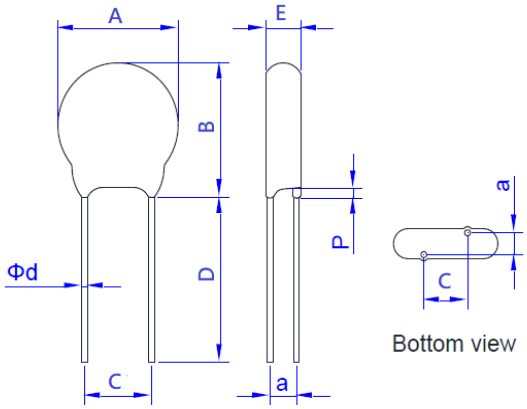
Example - For an 8/20 μs Current Waveform:

8μs = T1 = Rise Time

20μs = T2 = Decay Time

NOTE : Specification subject to change without notice.

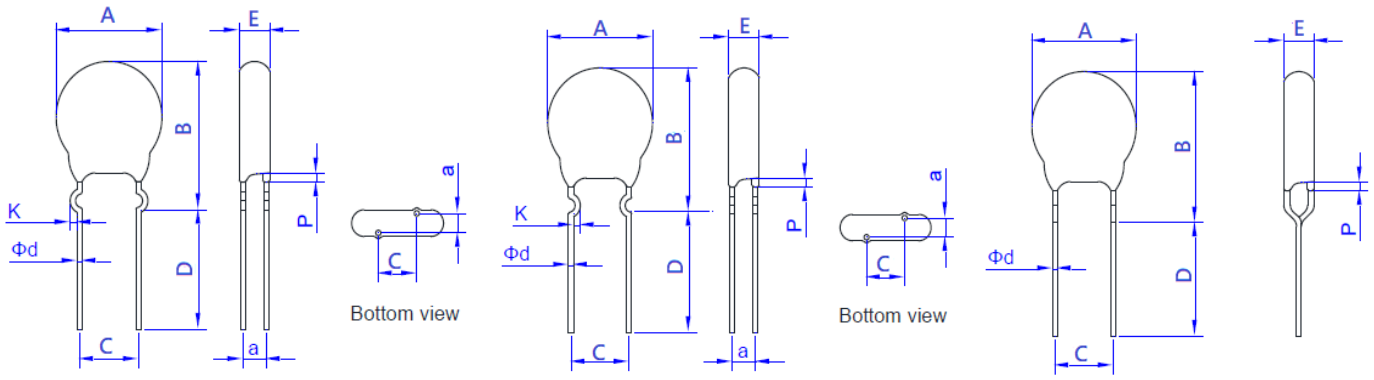
8. Dimension of Component for Standard Product



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
FMOV14180-H	13.5	17.5	20.5	7.5	25.0	5.3	3.0	1.5	0.80
FMOV14220-H	13.5	17.5	20.5	7.5	25.0	5.6	3.0	1.7	0.80
FMOV14270-H	13.5	17.5	20.5	7.5	25.0	5.9	3.0	1.8	0.80
FMOV14330-H	13.5	17.5	20.5	7.5	25.0	5.3	3.0	1.9	0.80
FMOV14390-H	13.5	17.5	20.5	7.5	25.0	5.5	3.0	1.9	0.80
FMOV14470-H	13.5	17.5	20.5	7.5	25.0	5.8	3.0	2.1	0.80
FMOV14560-H	13.5	17.5	20.5	7.5	25.0	6.1	3.0	2.3	0.80
FMOV14680-H	13.5	17.5	20.5	7.5	25.0	6.5	3.0	2.6	0.80
FMOV14201-H	13.5	17.5	20.5	7.5	25.0	6.2	3.0	2.0	0.80
FMOV14221-H	13.5	17.5	20.5	7.5	25.0	6.3	3.0	2.1	0.80
FMOV14241-H	13.5	17.5	20.5	7.5	25.0	6.5	3.0	2.2	0.80
FMOV14271-H	13.5	17.5	20.5	7.5	25.0	6.6	3.0	2.3	0.80
FMOV14301-H	13.5	17.5	20.5	7.5	25.0	6.8	3.0	2.5	0.80
FMOV14331-H	13.5	17.5	20.5	7.5	25.0	7.0	3.0	2.7	0.80
FMOV14361-H	13.5	17.5	20.5	7.5	25.0	7.3	3.0	2.8	0.80
FMOV14391-H	13.5	17.5	20.5	7.5	25.0	7.5	3.0	3.0	0.80
FMOV14431-H	13.5	17.5	20.5	7.5	25.0	7.8	3.0	3.2	0.80
FMOV14471-H	13.5	17.5	20.5	7.5	25.0	8.1	3.0	3.4	0.80
FMOV14511-H	13.5	17.5	20.5	7.5	25.0	8.2	3.0	3.7	0.80
FMOV14561-H	13.5	17.5	20.5	7.5	25.0	8.5	3.0	3.9	0.80
FMOV14621-H	13.5	17.5	20.5	7.5	25.0	8.8	3.0	4.3	0.80
FMOV14681-H	13.5	17.5	20.5	7.5	25.0	8.9	3.0	4.7	0.80
FMOV14751-H	13.5	17.5	20.5	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
FMOV14180-H	13.5	17.5	22.5	7.5	25.0	5.3	3.0	1.0	1.8	1.5	0.80
FMOV14220-H	13.5	17.5	22.5	7.5	25.0	5.6	3.0	1.0	1.8	1.7	0.80
FMOV14270-H	13.5	17.5	22.5	7.5	25.0	5.9	3.0	1.0	1.8	1.8	0.80
FMOV14330-H	13.5	17.5	22.5	7.5	25.0	5.3	3.0	1.0	1.8	1.9	0.80
FMOV14390-H	13.5	17.5	22.5	7.5	25.0	5.5	3.0	1.0	1.8	1.9	0.80
FMOV14470-H	13.5	17.5	22.5	7.5	25.0	5.8	3.0	1.0	1.8	2.1	0.80
FMOV14560-H	13.5	17.5	22.5	7.5	25.0	6.1	3.0	1.0	1.8	2.3	0.80
FMOV14680-H	13.5	17.5	22.5	7.5	25.0	6.5	3.0	1.0	1.8	2.6	0.80
FMOV14201-H	13.5	17.5	22.5	7.5	25.0	6.2	3.0	1.0	1.8	2.0	0.80
FMOV14221-H	13.5	17.5	22.5	7.5	25.0	6.3	3.0	1.0	1.8	2.1	0.80
FMOV14241-H	13.5	17.5	22.5	7.5	25.0	6.5	3.0	1.0	1.8	2.2	0.80
FMOV14271-H	13.5	17.5	22.5	7.5	25.0	6.6	3.0	1.0	1.8	2.3	0.80
FMOV14301-H	13.5	17.5	23.5	7.5	25.0	6.8	3.0	1.0	1.8	2.5	0.80
FMOV14331-H	13.5	17.5	23.5	7.5	25.0	7.0	3.0	1.0	1.8	2.7	0.80
FMOV14361-H	13.5	17.5	23.5	7.5	25.0	7.3	3.0	1.0	1.8	2.8	0.80
FMOV14391-H	13.5	17.5	23.5	7.5	25.0	7.5	3.0	1.0	1.8	3.0	0.80
FMOV14431-H	13.5	17.5	23.5	7.5	25.0	7.8	3.0	1.0	1.8	3.2	0.80
FMOV14471-H	13.5	17.5	23.5	7.5	25.0	8.1	3.0	1.0	1.8	3.4	0.80
FMOV14511-H	13.5	17.5	23.5	7.5	25.0	8.2	3.0	1.0	1.8	3.7	0.80
FMOV14561-H	13.5	17.5	23.5	7.5	25.0	8.5	3.0	1.0	1.8	3.9	0.80
FMOV14621-H	13.5	17.5	23.5	7.5	25.0	8.8	3.0	1.0	1.8	4.3	0.80
FMOV14681-H	13.5	17.5	23.5	7.5	25.0	8.9	3.0	1.0	1.8	4.7	0.80
FMOV14751-H	13.5	17.5	23.5	7.5	25.0	9.2	3.0	1.0	1.8	5.1	0.80

Unit: mm

NOTE : Specification subject to change without notice.

9. Tape and Reel Specifications

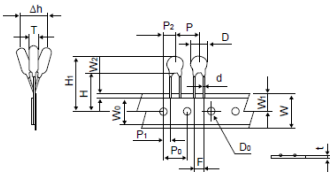


Figure: A

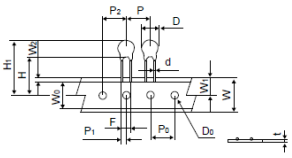


Figure: B

Straight Leads

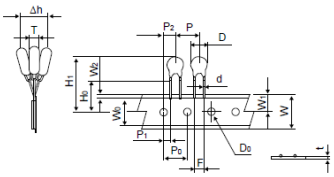


Figure: C

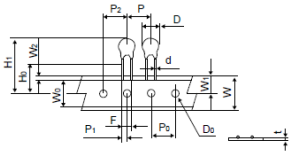


Figure: D

Inline Kink Leads

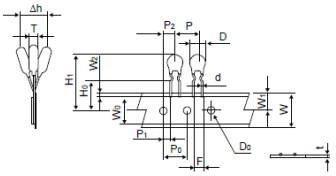


Figure: E

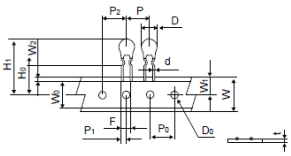


Figure: F

Inside Kink Leads

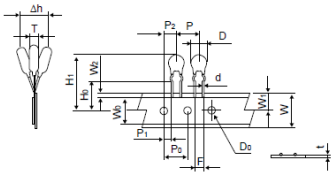


Figure: G

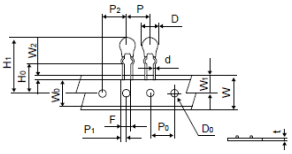


Figure: H

Outside Kink Leads

Symbol	Parameter	FMOV10-H Series
P	Pitch of Component	25.4±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
△h	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	40.0 Max
D0	Feed Hole Diameter	4.0±0.2
t	Total Tape Thickness	0.7±0.2
L	Length of Clopped Lead	11.0 Max
Figure		ACEG

Unit: mm

NOTE : Specification subject to change without notice.

2022/7/8

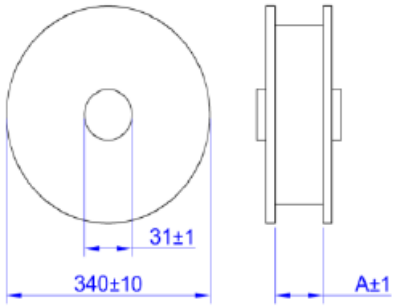
10. Packaging Specifications

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)
FMOV14-H Series	500	500	500	500

Tape & Reel Product Packing

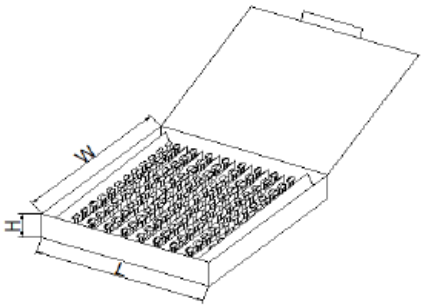
Series	A (mm)	Quantity (pcs/reel)
FMOV14(201~391)-H-T-	56	800
FMOV14(431~621)-H-T-		700
FMOV14(681~751)-H-T-		600



Box Product Packing

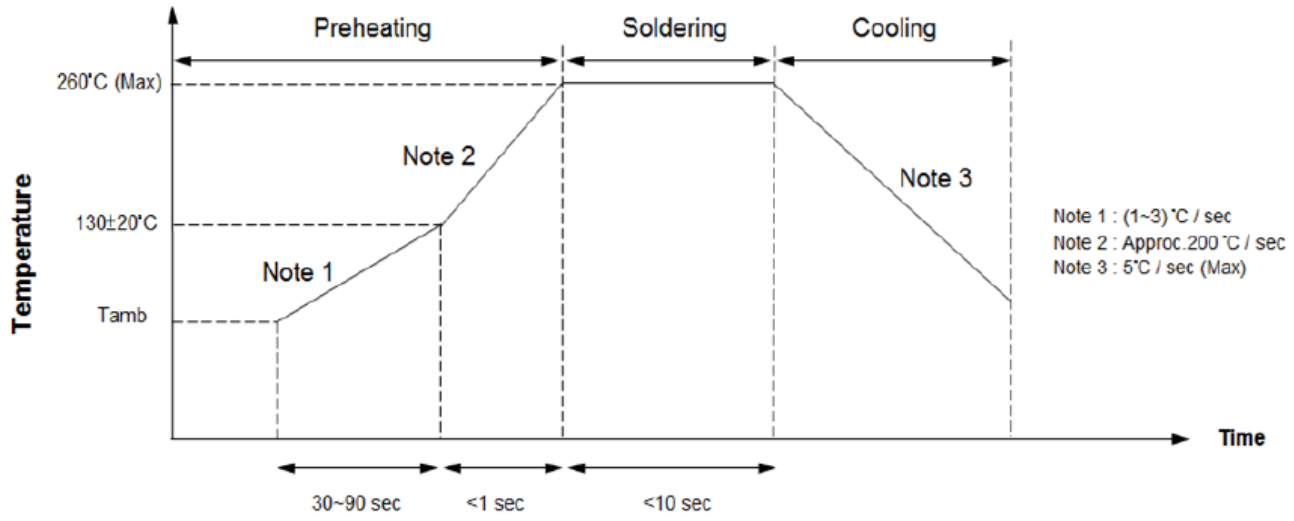
Series	Quantity (pcs/reel)
FMOV14(201~621)-H-T-	500
FMOV14(681~751)-H-T-	400

Series	L±5	W±5	H±5
FMOV14-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℃ (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

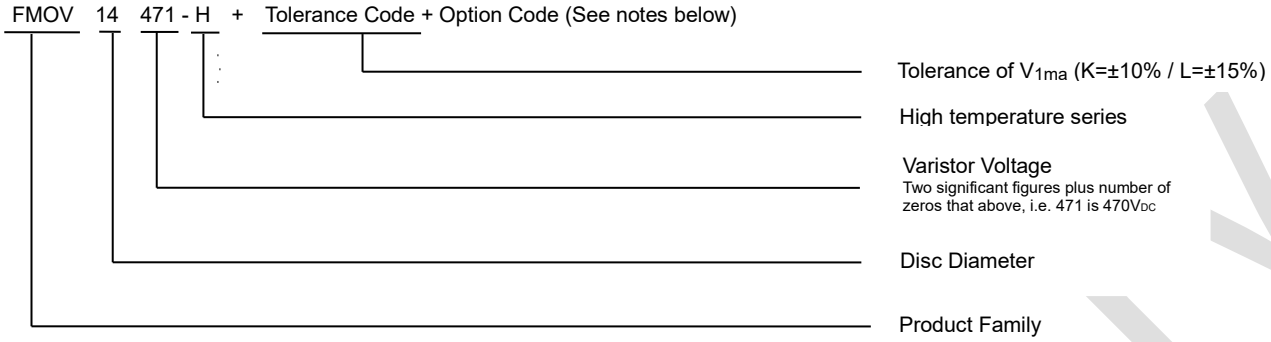
d. Solvent Resistance: MIL–STD–202, Method 215F

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

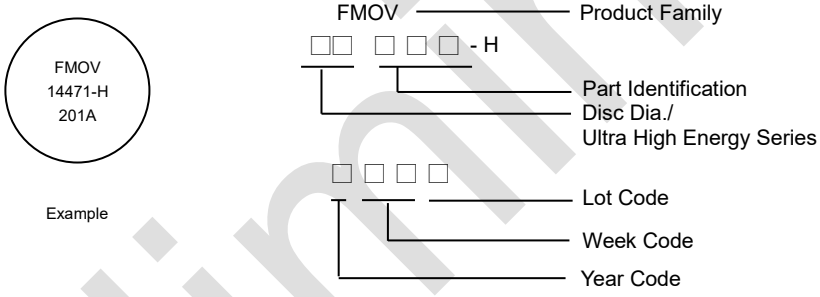
(II) Period of Storage: 1 year

12. Part Numbering and Marking System

Part Numbering System



Marking System



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
FMOV14471-H**KBS**	FMOV14471-H**KBSXXX**	FMOV14471-H**KTS**	FMOV14471-H**KAS**

Outside Kink Lead Bulk Pack	Outside Kink Lead (Short Cut) Bulk Pack	Outside Kink Lead Tape & Reel Pack	Outside Kink Lead Flat Box Pack
FMOV14471-H**KBO**	FMOV14471-H**KBOXXX**	FMOV14471-H**KTO**	FMOV14471-H**KAO**

Inside Kink Lead Bulk Pack	Inside Kink Lead (Short Cut) Bulk Pack	Inside Kink Lead Tape & Reel Pack	Inside Kink Lead Flat Box Pack
FMOV14471-H**KBK**	FMOV14471-H**KBKXXX**	FMOV14471-H**KTK**	FMOV14471-H**KAK**

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
FMOV14471-H**KBI**	FMOV14471-H**KBIXXX**	FMOV14471-H**KTI**	FMOV14471-H**KAI**