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MOV Varistor Device: FMOV14-P 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)
FMOV14180-P	11	14	18	16	20	36	10	11	3000	0.15	18500
FMOV14220-P	14	18	22	20	24	43	10	14	3000	0.15	16400
FMOV14270-P	17	22	27	24	30	53	10	18	3000	0.15	13000
FMOV14330-P	20	26	33	30	36	65	10	23	3000	0.15	9500
FMOV14390-P	25	31	39	35	43	77	10	26	3000	0.15	8800
FMOV14470-P	30	38	47	42	52	93	10	33	3000	0.15	7700
FMOV14560-P	35	45	56	50	62	110	10	41	3000	0.15	6400
FMOV14680-P	40	56	68	61	75	135	10	46	3000	0.15	5600
FMOV14201-P	130	170	200	180	220	340	50	96	8000	0.6	770
FMOV14221-P	140	180	220	198	242	360	50	104	8000	0.6	740
FMOV14241-P	150	200	240	216	264	395	50	112	8000	0.6	700
FMOV14271-P	175	225	270	243	297	455	50	120	8000	0.6	640
FMOV14301-P	195	250	300	270	330	500	50	136	8000	0.6	600
FMOV14331-P	215	275	330	297	363	550	50	152	8000	0.6	580
FMOV14361-P	230	300	360	324	396	595	50	164	8000	0.6	540
FMOV14391-P	250	320	390	351	429	650	50	176	8000	0.6	500
FMOV14431-P	275	350	430	387	473	710	50	200	8000	0.6	450
FMOV14471-P	300	385	470	423	517	775	50	220	8000	0.6	400
FMOV14511-P	320	410	510	459	561	845	50	240	8000	0.6	350
FMOV14561-P	350	460	560	504	616	915	50	240	8000	0.6	350
FMOV14621-P	395	510	620	558	682	1020	50	250	8000	0.6	330
FMOV14681-P	420	560	680	612	748	1120	50	260	8000	0.6	320
FMOV14751-P	465	615	750	675	825	1235	50	270	8000	0.6	300
FMOV14781-P	485	640	780	702	858	1290	50	275	8000	0.6	300
FMOV14821-P	510	670	820	738	902	1355	50	280	8000	0.6	270
FMOV14911-P	550	745	910	819	1001	1500	50	295	8000	0.6	260
FMOV14102-P	625	825	1000	900	1100	1650	50	335	8000	0.6	250
FMOV14112-P	680	895	1100	990	1210	1815	50	360	8000	0.6	240

NOTE : Specification subject to change without notice.

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2. Agency Approvals

Agency	Agency Approvals	Certificate No.
	UL1449 4 th & cUL	VZCA2.E515006 VZCA8.E515006
	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	40051896

*FMOV14181-P~ FMOV14112-P meets VDE.

3. Max Rating

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

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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)	$\Delta V_{1mA} / V_{1mA} \leq \pm 10\%$ 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 $U \leq 1.1 U_{initial}$ 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 $U \leq 1,1 U_{initial}$

NOTE : Specification subject to change without notice.



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

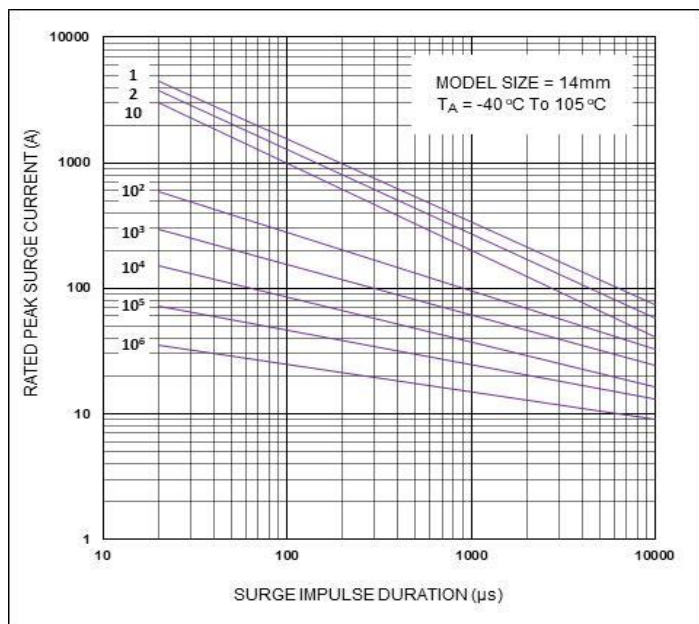
* (According to customer requirements to meet the test items)



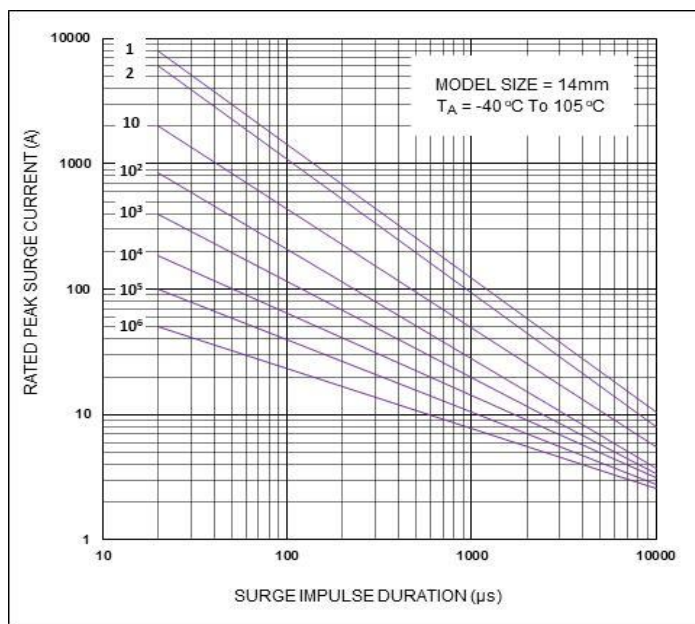
5. Impulse Life Time Rating Curves

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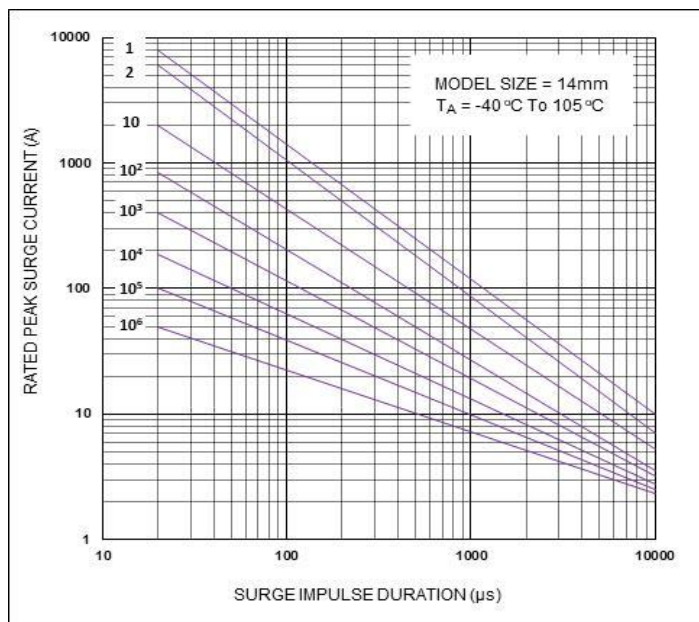
FMOV14180-P to FMOV14680-P



FMOV14201-P to FMOV14751-P



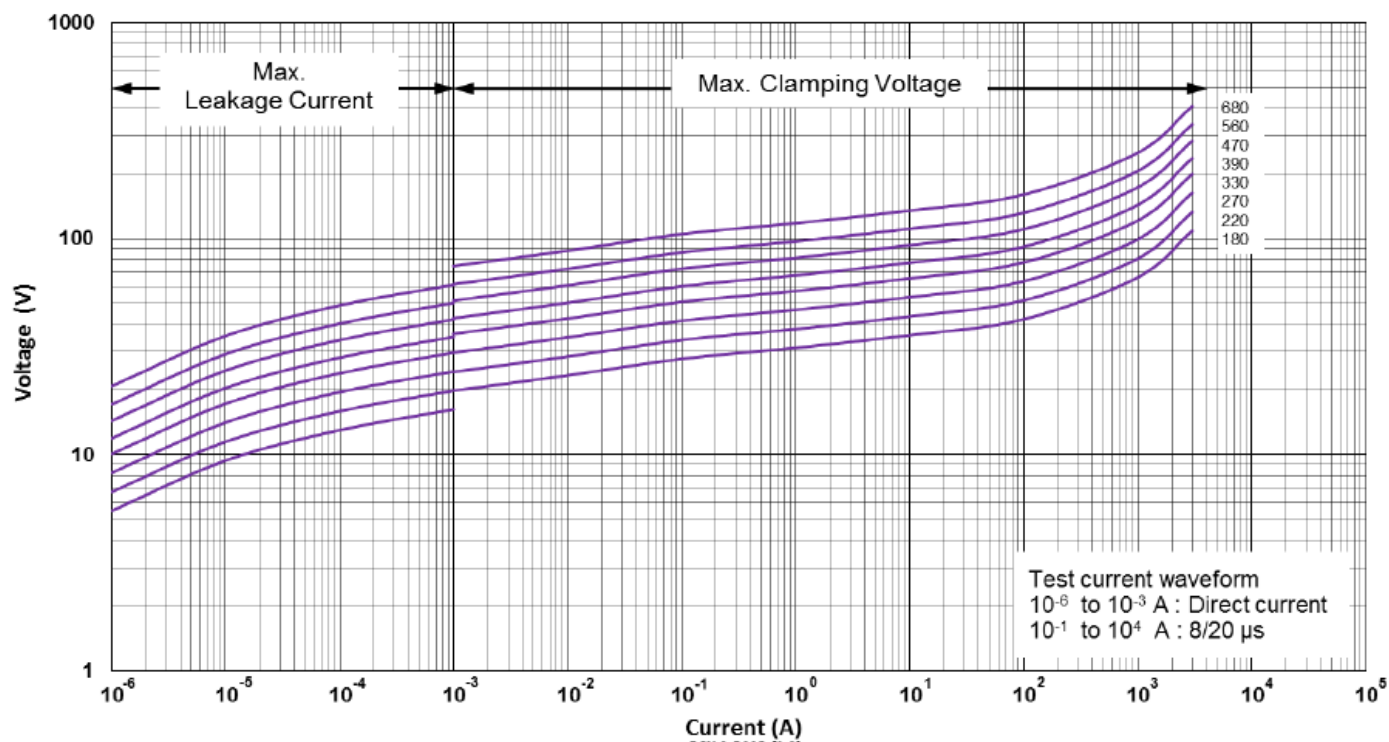
FMOV14781-P to FMOV14112-P



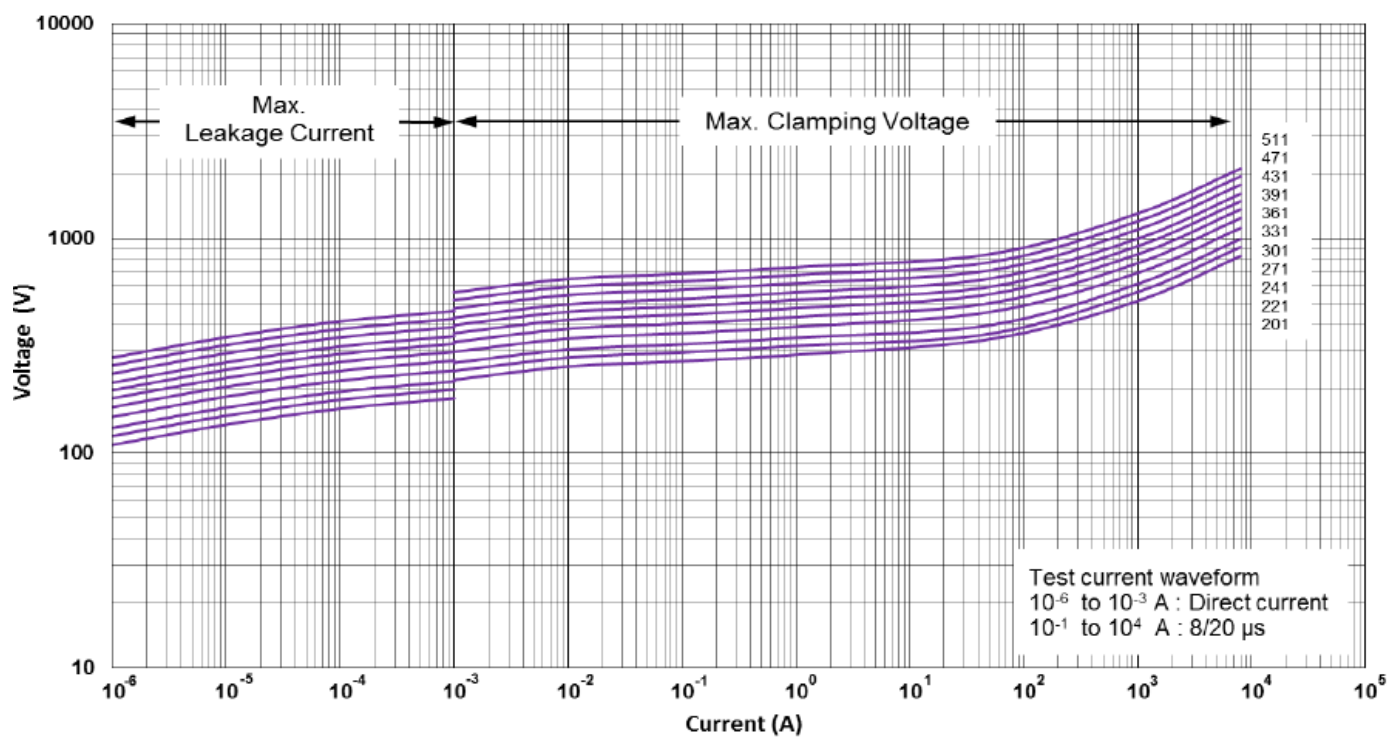


V-I Curves

(FMOV14180-P to FMOV14680-P)

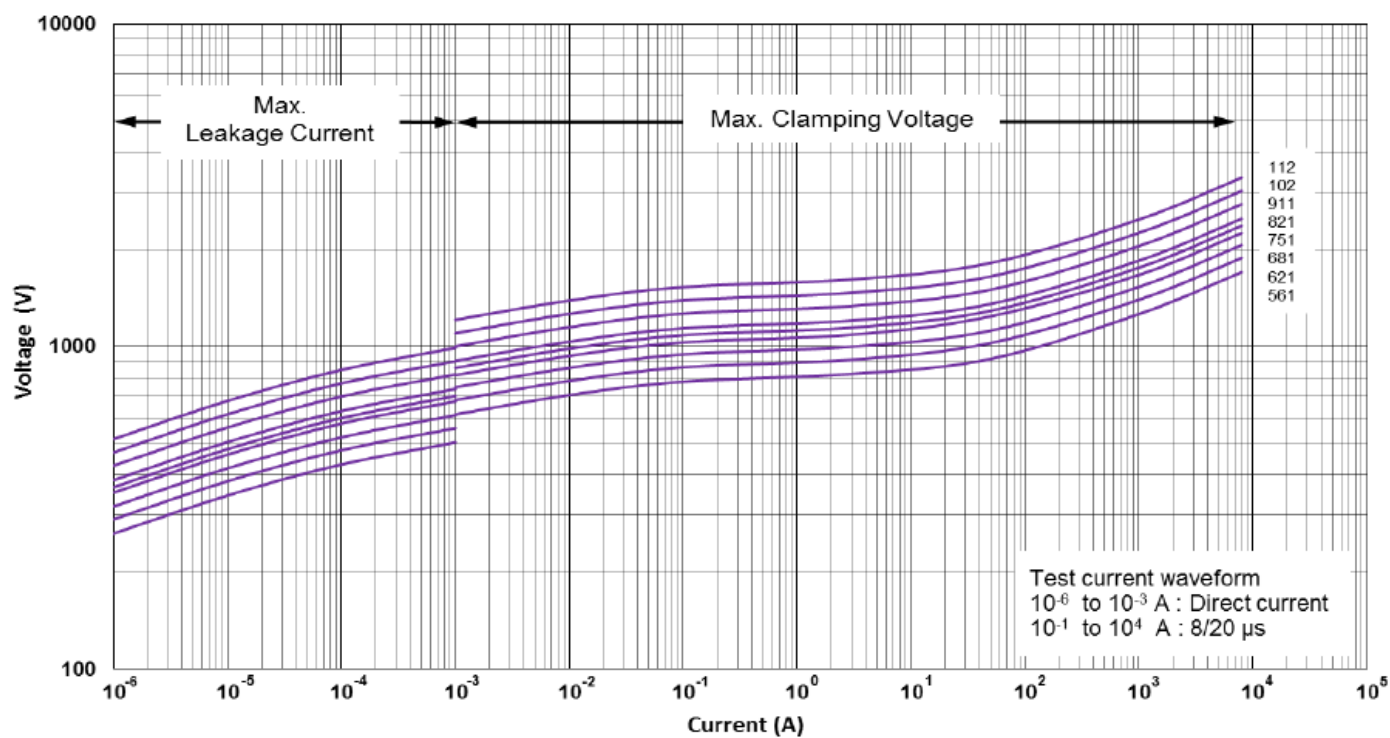


(FMOV14201-P to FMOV14511-P)





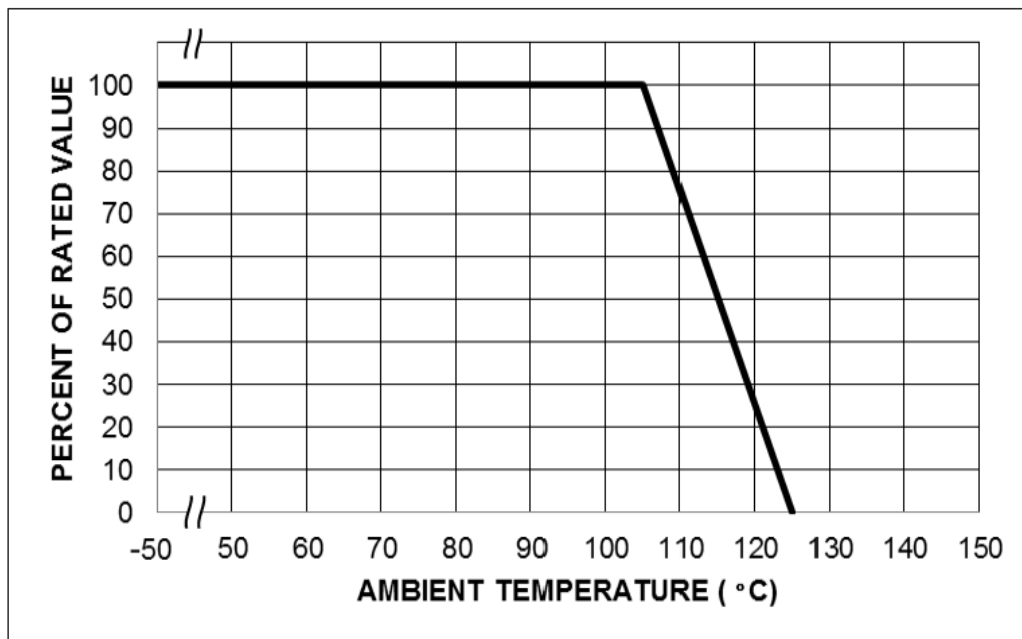
(FMOV14561-P to FMOV14112-P)



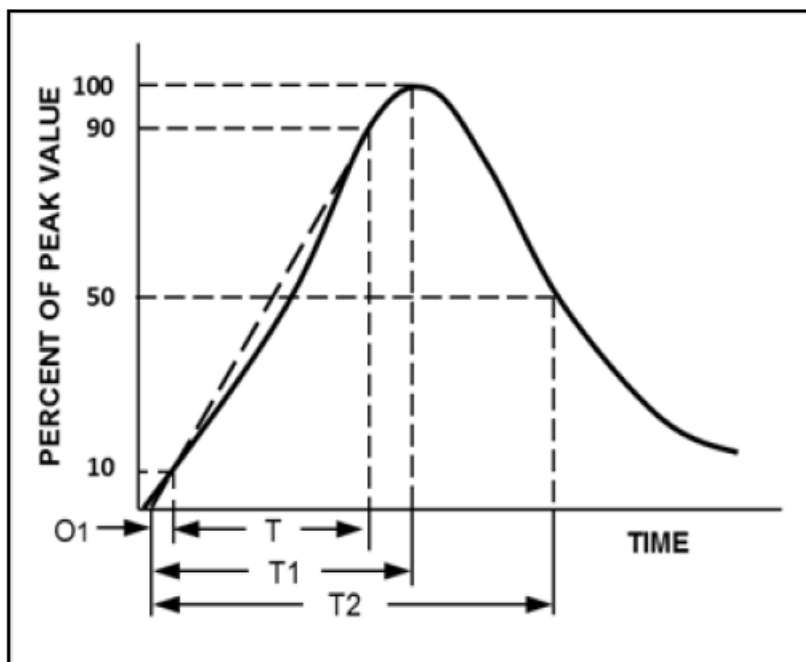


6. Power Derating Curve

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

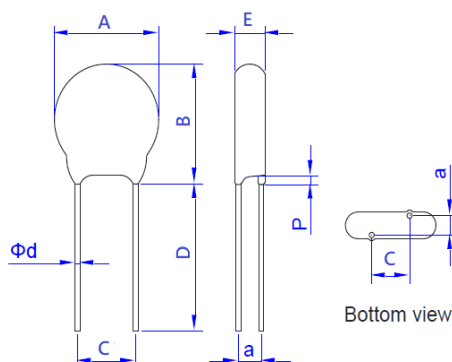
Example - For an 8/20 μ s Current Waveform:

8 μ s = T1 = Rise Time

20 μ s = T2 = Decay Time

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8. Dimension of Component for Standard Product

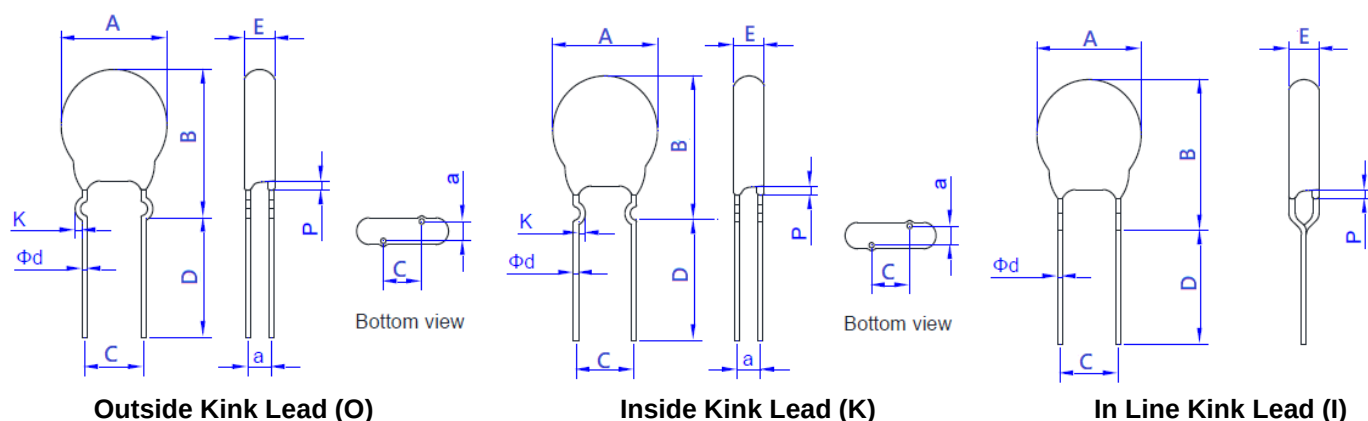


Straight Lead Type (S)

Part Number	A		B	C	D	E	P	a	Φd
	Min.	Max.	Max.	±1.0	Typ.	Max.	Max.	±1.0	±0.05
FMOV14180-P	13.5	17.5	20.5	7.5	25.0	4.0	3.0	1.5	0.80
FMOV14220-P	13.5	17.5	20.5	7.5	25.0	4.3	3.0	1.7	0.80
FMOV14270-P	13.5	17.5	20.5	7.5	25.0	4.5	3.0	1.8	0.80
FMOV14330-P	13.5	17.5	20.5	7.5	25.0	4.0	3.0	1.9	0.80
FMOV14390-P	13.5	17.5	20.5	7.5	25.0	4.2	3.0	1.9	0.80
FMOV14470-P	13.5	17.5	20.5	7.5	25.0	4.4	3.0	2.1	0.80
FMOV14560-P	13.5	17.5	20.5	7.5	25.0	4.7	3.0	2.3	0.80
FMOV14680-P	13.5	17.5	20.5	7.5	25.0	5.0	3.0	2.6	0.80
FMOV14201-P	13.5	17.5	20.5	7.5	25.0	4.6	3.0	1.5	0.80
FMOV14221-P	13.5	17.5	20.5	7.5	25.0	4.7	3.0	1.6	0.80
FMOV14241-P	13.5	17.5	20.5	7.5	25.0	4.8	3.0	1.7	0.80
FMOV14271-P	13.5	17.5	20.5	7.5	25.0	4.9	3.0	1.8	0.80
FMOV14301-P	13.5	17.5	20.5	7.5	25.0	5.0	3.0	1.9	0.80
FMOV14331-P	13.5	17.5	20.5	7.5	25.0	5.2	3.0	2.0	0.80
FMOV14361-P	13.5	17.5	20.5	7.5	25.0	5.5	3.0	2.1	0.80
FMOV14391-P	13.5	17.5	20.5	7.5	25.0	5.6	3.0	2.3	0.80
FMOV14431-P	13.5	17.5	20.5	7.5	25.0	5.8	3.0	2.4	0.80
FMOV14471-P	13.5	17.5	20.5	7.5	25.0	6.0	3.0	2.5	0.80
FMOV14511-P	13.5	17.5	20.5	7.5	25.0	6.2	3.0	2.6	0.80
FMOV14561-P	13.5	17.5	20.5	7.5	25.0	6.4	3.0	2.8	0.80
FMOV14621-P	13.5	17.5	20.5	7.5	25.0	6.6	3.0	3.1	0.80
FMOV14681-P	13.5	17.5	20.5	7.5	25.0	6.7	3.0	3.3	0.80
FMOV14751-P	13.5	17.5	20.5	7.5	25.0	6.9	3.0	3.6	0.80
FMOV14781-P	13.5	17.5	20.5	7.5	25.0	7.3	3.0	3.8	0.80
FMOV14821-P	13.5	17.5	20.5	7.5	25.0	7.5	3.0	4.0	0.80
FMOV14911-P	13.5	17.5	20.5	7.5	25.0	7.6	3.0	4.3	0.80
FMOV14102-P	13.5	17.5	20.5	7.5	25.0	8.1	3.0	4.6	0.80
FMOV14112-P	13.5	17.5	20.5	7.5	25.0	9.0	3.0	5.2	0.80

Unit: mm

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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-P	13.5	17.5	22.5	7.5	25.0	4.0	3.0	1.0	1.8	1.5	0.80
FMOV14220-P	13.5	17.5	22.5	7.5	25.0	4.3	3.0	1.0	1.8	1.7	0.80
FMOV14270-P	13.5	17.5	22.5	7.5	25.0	4.5	3.0	1.0	1.8	1.8	0.80
FMOV14330-P	13.5	17.5	22.5	7.5	25.0	4.0	3.0	1.0	1.8	1.9	0.80
FMOV14390-P	13.5	17.5	22.5	7.5	25.0	4.2	3.0	1.0	1.8	1.9	0.80
FMOV14470-P	13.5	17.5	22.5	7.5	25.0	4.4	3.0	1.0	1.8	2.1	0.80
FMOV14560-P	13.5	17.5	22.5	7.5	25.0	4.7	3.0	1.0	1.8	2.3	0.80
FMOV14680-P	13.5	17.5	22.5	7.5	25.0	5.0	3.0	1.0	1.8	2.6	0.80
FMOV14201-P	13.5	17.5	22.5	7.5	25.0	4.6	3.0	1.0	1.8	1.5	0.80
FMOV14221-P	13.5	17.5	22.5	7.5	25.0	4.7	3.0	1.0	1.8	1.6	0.80
FMOV14241-P	13.5	17.5	22.5	7.5	25.0	4.8	3.0	1.0	1.8	1.7	0.80
FMOV14271-P	13.5	17.5	22.5	7.5	25.0	4.9	3.0	1.0	1.8	1.8	0.80
FMOV14301-P	13.5	17.5	23.5	7.5	25.0	5.0	3.0	1.0	1.8	1.9	0.80
FMOV14331-P	13.5	17.5	23.5	7.5	25.0	5.2	3.0	1.0	1.8	2.0	0.80
FMOV14361-P	13.5	17.5	23.5	7.5	25.0	5.5	3.0	1.0	1.8	2.1	0.80
FMOV14391-P	13.5	17.5	23.5	7.5	25.0	5.6	3.0	1.0	1.8	2.3	0.80
FMOV14431-P	13.5	17.5	23.5	7.5	25.0	5.8	3.0	1.0	1.8	2.4	0.80
FMOV14471-P	13.5	17.5	23.5	7.5	25.0	6.0	3.0	1.0	1.8	2.5	0.80
FMOV14511-P	13.5	17.5	23.5	7.5	25.0	6.2	3.0	1.0	1.8	2.6	0.80
FMOV14561-P	13.5	17.5	23.5	7.5	25.0	6.4	3.0	1.0	1.8	2.8	0.80
FMOV14621-P	13.5	17.5	23.5	7.5	25.0	6.6	3.0	1.0	1.8	3.1	0.80
FMOV14681-P	13.5	17.5	23.5	7.5	25.0	6.7	3.0	1.0	1.8	3.3	0.80
FMOV14751-P	13.5	17.5	23.5	7.5	25.0	6.9	3.0	1.0	1.8	3.6	0.80
FMOV14781-P	13.5	17.5	23.5	7.5	25.0	7.3	3.0	1.0	1.8	3.8	0.80
FMOV14821-P	13.5	17.5	23.5	7.5	25.0	7.5	3.0	1.0	1.8	4.0	0.80
FMOV14911-P	13.5	17.5	23.5	7.5	25.0	7.6	3.0	1.0	1.8	4.3	0.80
FMOV14102-P	13.5	17.5	23.5	7.5	25.0	8.1	3.0	1.0	1.8	4.6	0.80
FMOV14112-P	13.5	17.5	23.5	7.5	25.0	9.0	3.0	1.0	1.8	5.2	0.80

Unit: mm

NOTE : Specification subject to change without notice.

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9. Tape and Reel Specifications

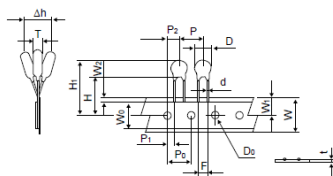


Figure: A

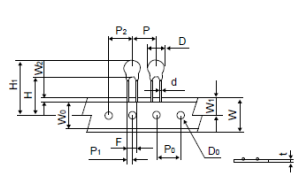


Figure: B

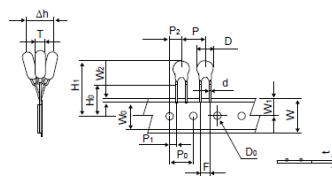


Figure: C

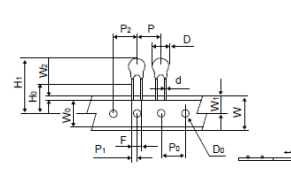


Figure: D

Straight Leads

Inline Kink Leads

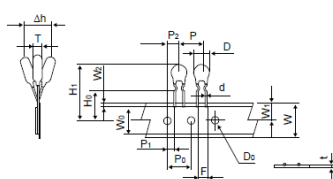


Figure: E

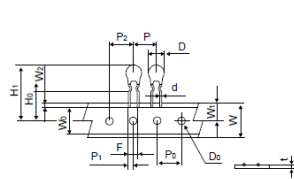


Figure: F

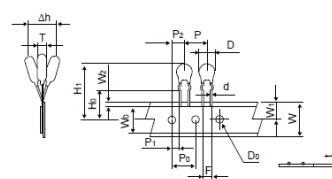


Figure: G

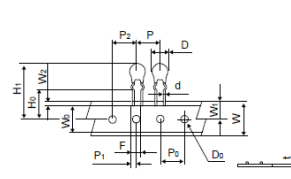


Figure: H

Inside Kink Leads

Outside Kink Leads

Symbol	Parameter	FMOV14-P Series	
P	Pitch of Component	25.4±1.0	30.0±1.0
P0	Feed Hole Pitch	12.7±0.2	15.0±0.2
P1	Feed Hole Center Lead	8.95±0.7	3.75±0.7
P2	Hole center to Component Center	12.7±0.7	7.5±0.7
F	Lead to Lead Distance	7.5±0.8	7.5±0.8
Δh	Component Alignment	2.0 Max	2.0 Max
W	Tape Width	18.0+1.0 -0.5	18.0+1.0 -0.5
W0	Hold Down Tape Width	5.0 Min	5.0 Min
W1	Hole Position	9.0+0.75 -0.50	9.0+0.75 -0.50
W2	Hold Down Tape Position	3.0 Max	3.0 Max
H	Height from Tape Center to Component Base	18.0+2.0 -0	18.0+2.0 -0
H0	Seating Plane Height	16.0±0.5	16.0±0.5
H1	Component Height	40.0 Max	40.0 Max
D0	Feed Hole Diameter	4.0±0.2	4.0±0.2
t	Total Tape Thickness	0.7±0.2	0.7±0.2
L	Length of Clipped Lead	11.0 Max	11.0 Max
Figure		ACEG	BDFH

Unit: mm

NOTE : Specification subject to change without notice.

 FUZETEC TECHNOLOGY CO., LTD.	NO.	FMOV14-P Series		
	Product Specification and Approval Sheet	Version	2	Page 12/15

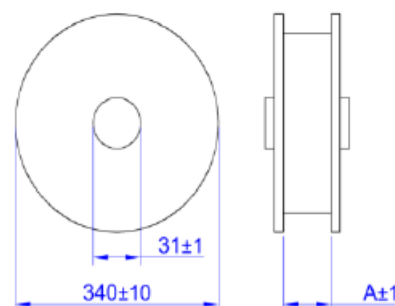
10. Packaging Specifications

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-P Series	500	500	500	500

Tape & Reel Product Packing

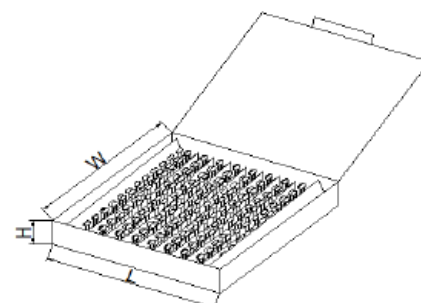
Series	A (mm)	Quantity (pcs/reel)
FMOV14(180~391)-P-T-	56	800
FMOV14(431~621)-P-T-		700
FMOV14(681~112)-P-T-		600



Box Product Packing

Series	Quantity (pcs/reel)
FMOV14(180~391)-P-A-	500
FMOV14(431~621)-P-A-	500
FMOV14(681~112)-P-A-	400

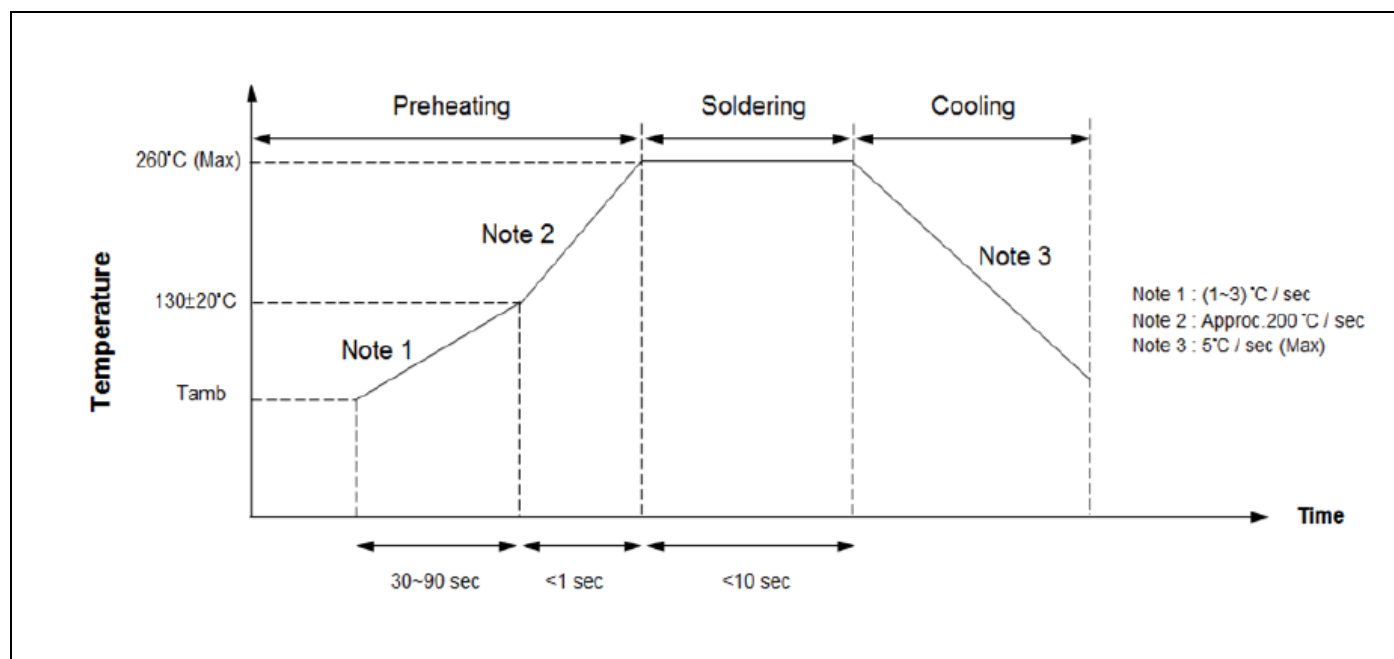
Series	L±5	W±5	H±5
FMOV14-P Series	340	245	50



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: $\leq 75\%RH$
- Keep away from corrosive atmosphere and sunlight
- Solvent Resistance: MIL-STD-202, Method 215F
- Moisture Sensitivity: Level 1, J-STD-020

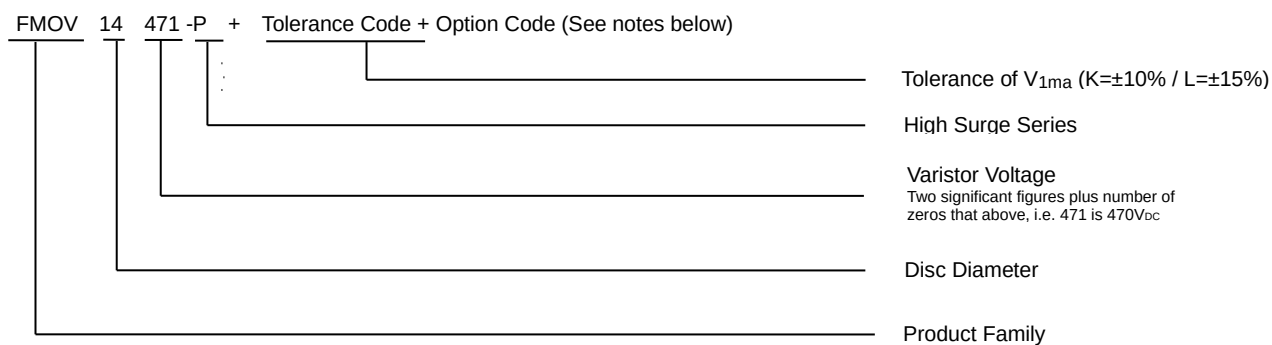
(II) Period of Storage: 1 year

NOTE : Specification subject to change without notice.

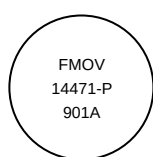


12. Part Numbering and Marking System

Part Numbering System



Marking System



Example

