MOV Varistor Device: FMOV14-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)
FMOV14180-D	11	14	18	16	20	36	10	4	1000	0.1	25000
FMOV14220-D	14	18	22	20	24	43	10	5	1000	0.1	20000
FMOV14270-D	17	22	27	24	30	53	10	6	1000	0.1	16000
FMOV14330-D	20	26	33	30	36	65	10	7.5	1000	0.1	12200
FMOV14390-D	25	31	39	35	43	77	10	8.6	1000	0.1	7000
FMOV14470-D	30	38	47	42	52	93	10	10	1000	0.1	6750
FMOV14560-D	35	45	56	50	62	110	10	11	1000	0.1	6500
FMOV14680-D	40	56	68	61	75	135	10	14	1000	0.1	5500
FMOV14820-D	50	65	82	74	90	135	50	22	4500	0.6	4300
FMOV14101-D	60	85	100	90	110	165	50	28	4500	0.6	3500
FMOV14121-D	75	100	120	108	132	200	50	32	4500	0.6	2500
FMOV14151-D	95	125	150	135	165	250	50	40	4500	0.6	2100
FMOV14181-D	115	150	180	162	198	300	50	52	4500	0.6	1250
FMOV14201-D	130	170	200	180	220	340	50	57	4500	0.6	1150
FMOV14221-D	140	180	220	198	242	360	50	60	4500	0.6	1100
FMOV14241-D	150	200	240	216	264	395	50	63	4500	0.6	1050
FMOV14271-D	175	225	270	243	297	455	50	70	4500	0.6	1000
FMOV14301-D	195	250	300	270	330	500	50	78	4500	0.6	900
FMOV14331-D	215	275	330	297	363	550	50	93	4500	0.6	850
FMOV14361-D	230	300	360	324	396	595	50	93	4500	0.6	800
FMOV14391-D	250	320	390	351	429	650	50	100	4500	0.6	800
FMOV14431-D	275	350	430	387	473	710	50	115	4500	0.6	650
FMOV14471-D	300	385	470	423	517	775	50	125	4500	0.6	550
FMOV14511-D	320	410	510	459	561	845	50	125	4500	0.6	450
FMOV14561-D	350	460	560	504	616	915	50	125	4500	0.6	400
FMOV14621-D	395	510	620	558	682	1020	50	125	4500	0.6	350
FMOV14681-D	420	560	680	612	748	1120	50	130	4500	0.6	350
FMOV14751-D	465	615	750	675	825	1235	50	143	4500	0.6	330
FMOV14781-D	485	640	780	702	858	1290	50	148	4500	0.6	330
FMOV14821-D	510	670	820	738	902	1355	50	157	4500	0.6	330
FMOV14911-D	550	745	910	819	1001	1500	50	175	4500	0.6	300
FMOV14102-D	625	825	1000	900	1100	1650	50	190	4500	0.6	300
FMOV14112-D	680	895	1100	990	1210	1815	50	213	4500	0.6	200
FMOV14182-D	1000	1465	1800	1620	1980	2950	50	354	4500	0.6	150

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

*FMOV14820-D ~ FMOV14112-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 $U_{initial}$

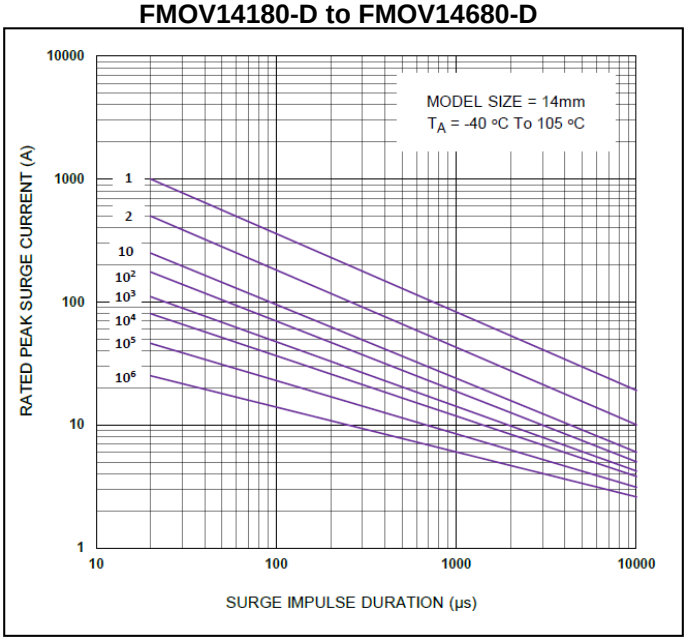
Characteristics	Standard	Test Conditions	Specifications
Damp heat (Steady state)	IEC 60068-2-78 Test Ca	T = 40±2°C, RH = 93(+2/-3)%, 56d , 4 specimens: No voltage applied ,Other 4 specimens: Applied voltage: 10% of the max. d. c. voltage	$\triangle V_{1mA}/V1_{mA} \leqq \pm 10\%$ $R_{ISO} \geqq 100M\Omega$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

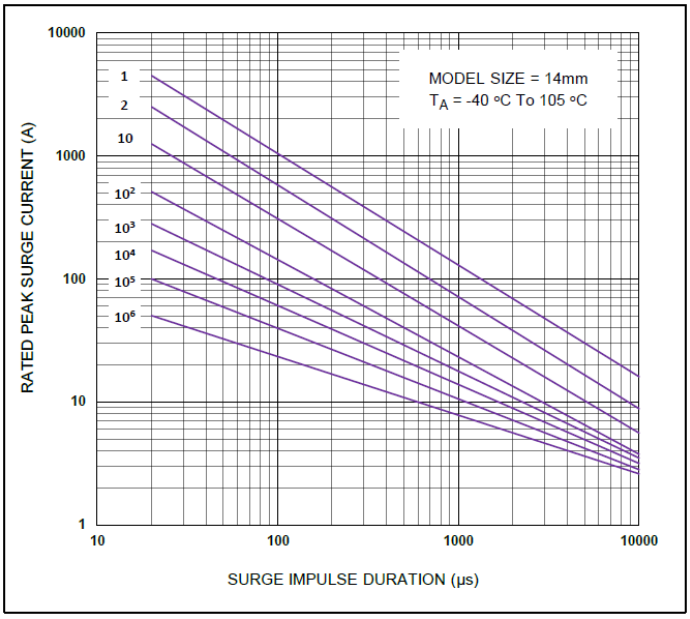
5. Impulse Life Time Rating Curves

FMOV14-D Series

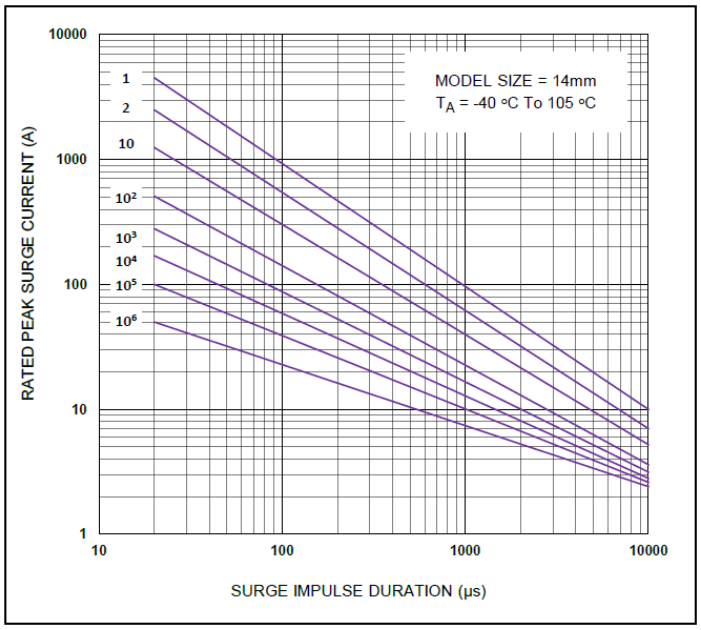
FMOV14180-D to FMOV14680-D



FMOV14820-D to FMOV14751-D

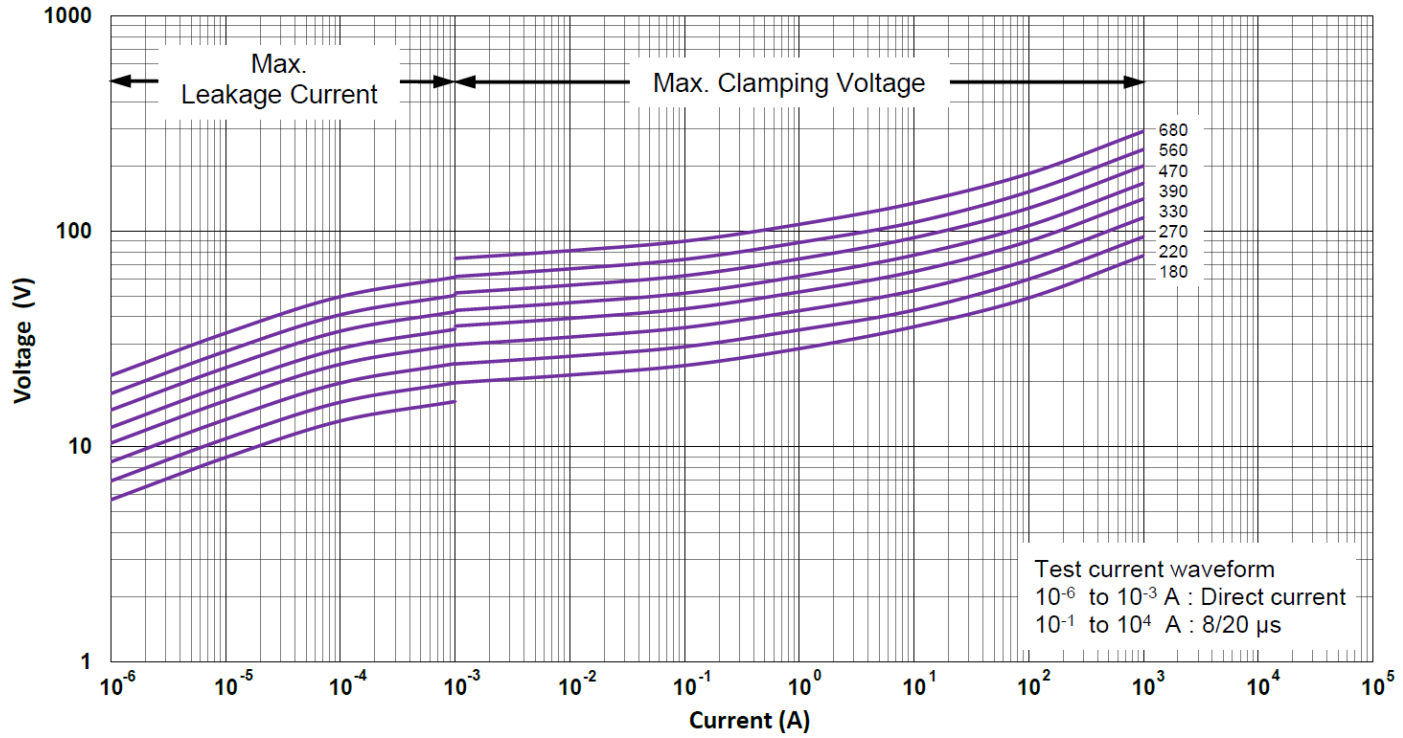


FMOV14781-D to FMOV14182-D

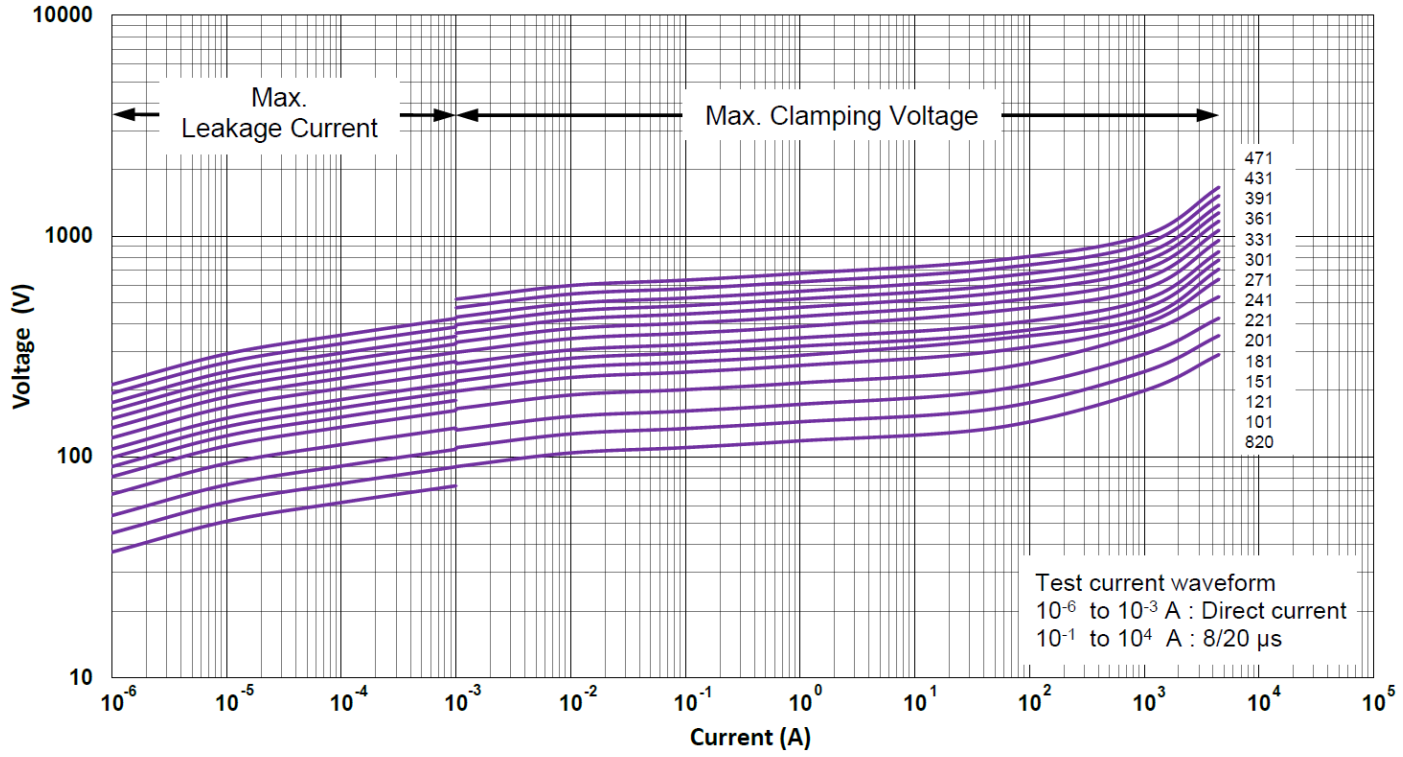


6. V-I Curves

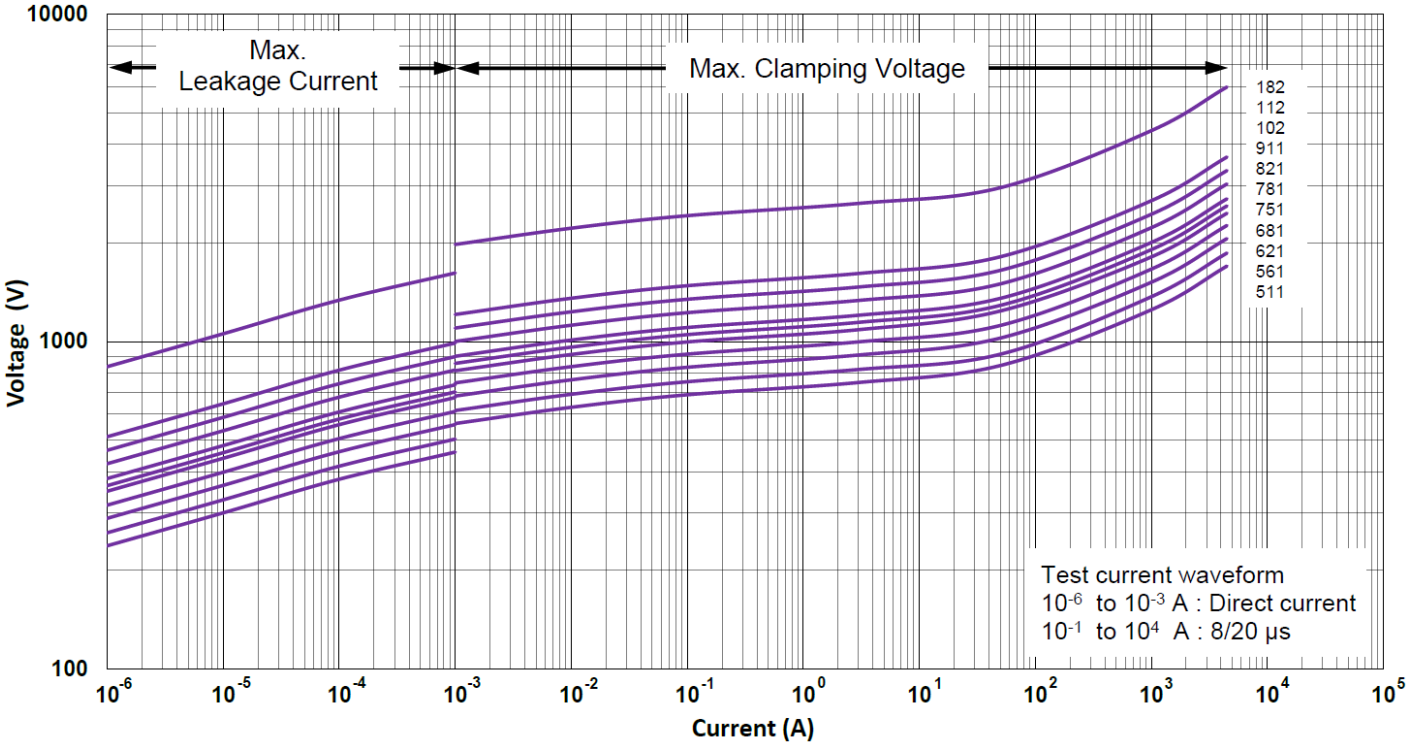
(FMOV14180-D to FMOV14680-D)



(FMOV14820-D to FMOV14471-D)



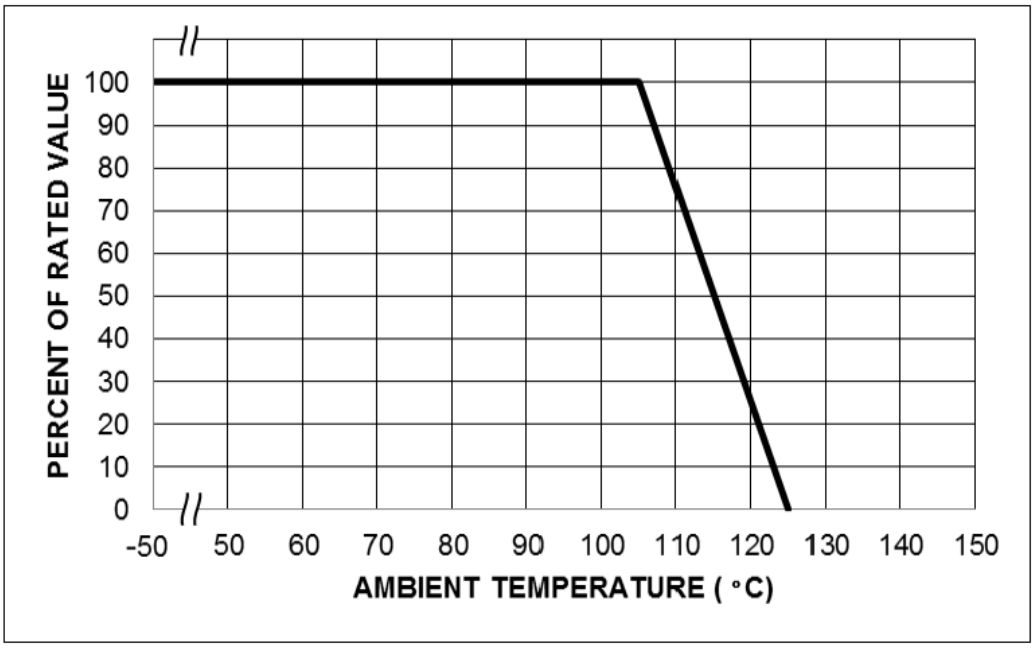
(FMOV14511-D to FMOV14182-D)



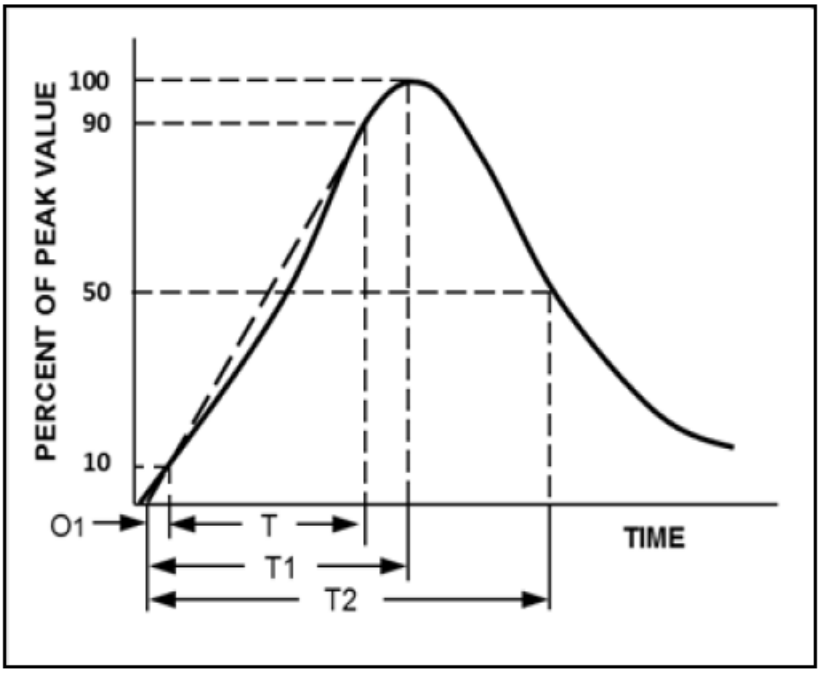
7. Power Derating Curve

Operating Ambient Temperature Range: -40~105℃

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

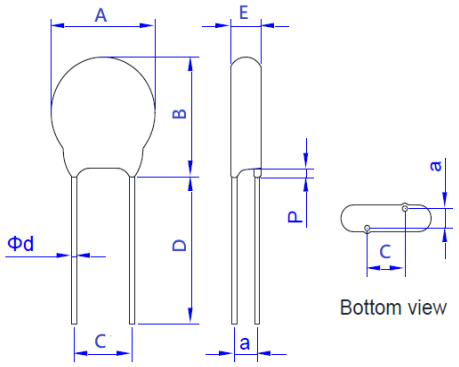
T2 = Decay Time

Example - For an 8/20 μs Current Waveform:

8μs = T1 = Rise Time

20μs = T2 = Decay Time

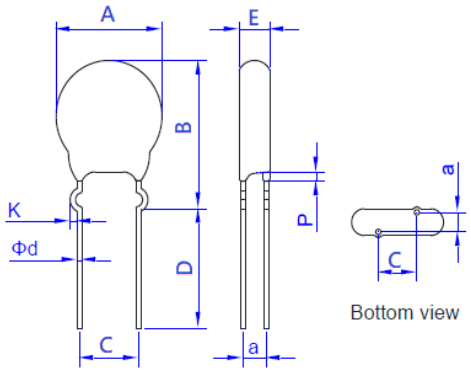
9. Dimension of Component for Standard Product



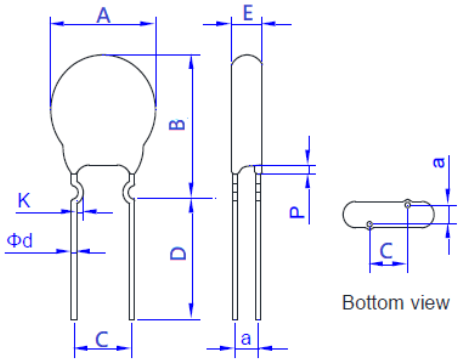
Straight Lead Type (S)

Part Number	A		B	C	D	E	P	a	Φd
	Min.	Max.	Max.	±1.0	Typ.	Max.	Max.	±1.0	±0.05
FMOV14180-D	13.5	17.5	20.5	7.5	25.0	4.0	3.0	1.5	0.80
FMOV14220-D	13.5	17.5	20.5	7.5	25.0	4.3	3.0	1.6	0.80
FMOV14270-D	13.5	17.5	20.5	7.5	25.0	4.5	3.0	1.7	0.80
FMOV14330-D	13.5	17.5	20.5	7.5	25.0	4.0	3.0	1.6	0.80
FMOV14390-D	13.5	17.5	20.5	7.5	25.0	4.2	3.0	1.8	0.80
FMOV14470-D	13.5	17.5	20.5	7.5	25.0	4.4	3.0	1.9	0.80
FMOV14560-D	13.5	17.5	20.5	7.5	25.0	4.7	3.0	2.0	0.80
FMOV14680-D	13.5	17.5	20.5	7.5	25.0	5.0	3.0	2.2	0.80
FMOV14820-D	13.5	17.5	20.5	7.5	25.0	4.0	3.0	1.5	0.80
FMOV14101-D	13.5	17.5	20.5	7.5	25.0	4.3	3.0	1.5	0.80
FMOV14121-D	13.5	17.5	20.5	7.5	25.0	4.5	3.0	1.6	0.80
FMOV14151-D	13.5	17.5	20.5	7.5	25.0	4.8	3.0	1.8	0.80
FMOV14181-D	13.5	17.5	20.5	7.5	25.0	3.9	3.0	1.5	0.80
FMOV14201-D	13.5	17.5	20.5	7.5	25.0	4.0	3.0	1.5	0.80
FMOV14221-D	13.5	17.5	20.5	7.5	25.0	4.1	3.0	1.6	0.80
FMOV14241-D	13.5	17.5	20.5	7.5	25.0	4.2	3.0	1.7	0.80
FMOV14271-D	13.5	17.5	20.5	7.5	25.0	4.3	3.0	1.8	0.80
FMOV14301-D	13.5	17.5	20.5	7.5	25.0	4.4	3.0	1.9	0.80
FMOV14331-D	13.5	17.5	20.5	7.5	25.0	4.6	3.0	2.0	0.80
FMOV14361-D	13.5	17.5	20.5	7.5	25.0	4.8	3.0	1.7	0.80
FMOV14391-D	13.5	17.5	20.5	7.5	25.0	4.9	3.0	1.8	0.80
FMOV14431-D	13.5	17.5	20.5	7.5	25.0	5.1	3.0	1.9	0.80
FMOV14471-D	13.5	17.5	20.5	7.5	25.0	5.3	3.0	2.0	0.80
FMOV14511-D	13.5	17.5	20.5	7.5	25.0	5.4	3.0	2.2	0.80
FMOV14561-D	13.5	17.5	20.5	7.5	25.0	5.6	3.0	2.3	0.80
FMOV14621-D	13.5	17.5	20.5	7.5	25.0	5.8	3.0	2.5	0.80
FMOV14681-D	13.5	17.5	20.5	7.5	25.0	5.9	3.0	2.7	0.80
FMOV14751-D	13.5	17.5	20.5	7.5	25.0	6.1	3.0	2.9	0.80
FMOV14781-D	13.5	17.5	20.5	7.5	25.0	6.4	3.0	3.0	0.80
FMOV14821-D	13.5	17.5	20.5	7.5	25.0	6.6	3.0	3.1	0.80
FMOV14911-D	13.5	17.5	20.5	7.5	25.0	6.7	3.0	3.5	0.80
FMOV14102-D	13.5	17.5	20.5	7.5	25.0	7.1	3.0	3.8	0.80
FMOV14112-D	13.5	17.5	20.5	7.5	25.0	7.5	3.0	4.1	0.80
FMOV14182-D	13.5	17.5	20.5	7.5	25.0	11.5	3.0	6.0	0.80

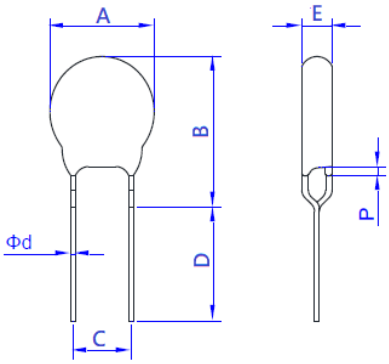
Unit: mm



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-D	13.5	17.5	22.5	7.5	25.0	4.0	3.0	1.0	1.8	1.5	0.80
FMOV14220-D	13.5	17.5	22.5	7.5	25.0	4.3	3.0	1.0	1.8	1.6	0.80
FMOV14270-D	13.5	17.5	22.5	7.5	25.0	4.5	3.0	1.0	1.8	1.7	0.80
FMOV14330-D	13.5	17.5	22.5	7.5	25.0	4.0	3.0	1.0	1.8	1.6	0.80
FMOV14390-D	13.5	17.5	22.5	7.5	25.0	4.2	3.0	1.0	1.8	1.8	0.80
FMOV14470-D	13.5	17.5	22.5	7.5	25.0	4.4	3.0	1.0	1.8	1.9	0.80
FMOV14560-D	13.5	17.5	22.5	7.5	25.0	4.7	3.0	1.0	1.8	2.0	0.80
FMOV14680-D	13.5	17.5	22.5	7.5	25.0	5.0	3.0	1.0	1.8	2.2	0.80
FMOV14820-D	13.5	17.5	22.5	7.5	25.0	4.0	3.0	1.0	1.8	1.5	0.80
FMOV14101-D	13.5	17.5	22.5	7.5	25.0	4.3	3.0	1.0	1.8	1.5	0.80
FMOV14121-D	13.5	17.5	22.5	7.5	25.0	4.5	3.0	1.0	1.8	1.6	0.80
FMOV14151-D	13.5	17.5	22.5	7.5	25.0	4.8	3.0	1.0	1.8	1.8	0.80
FMOV14181-D	13.5	17.5	22.5	7.5	25.0	3.9	3.0	1.0	1.8	1.5	0.80
FMOV14201-D	13.5	17.5	22.5	7.5	25.0	4.0	3.0	1.0	1.8	1.5	0.80
FMOV14221-D	13.5	17.5	22.5	7.5	25.0	4.1	3.0	1.0	1.8	1.6	0.80
FMOV14241-D	13.5	17.5	22.5	7.5	25.0	4.2	3.0	1.0	1.8	1.7	0.80
FMOV14271-D	13.5	17.5	22.5	7.5	25.0	4.3	3.0	1.0	1.8	1.8	0.80
FMOV14301-D	13.5	17.5	23.5	7.5	25.0	4.4	3.0	1.0	1.8	1.9	0.80
FMOV14331-D	13.5	17.5	23.5	7.5	25.0	4.6	3.0	1.0	1.8	2.0	0.80
FMOV14361-D	13.5	17.5	23.5	7.5	25.0	4.8	3.0	1.0	1.8	1.7	0.80
FMOV14391-D	13.5	17.5	23.5	7.5	25.0	4.9	3.0	1.0	1.8	1.8	0.80
FMOV14431-D	13.5	17.5	23.5	7.5	25.0	5.1	3.0	1.0	1.8	1.9	0.80
FMOV14471-D	13.5	17.5	23.5	7.5	25.0	5.3	3.0	1.0	1.8	2.0	0.80
FMOV14511-D	13.5	17.5	23.5	7.5	25.0	5.4	3.0	1.0	1.8	2.2	0.80
FMOV14561-D	13.5	17.5	23.5	7.5	25.0	5.6	3.0	1.0	1.8	2.3	0.80
FMOV14621-D	13.5	17.5	23.5	7.5	25.0	5.8	3.0	1.0	1.8	2.5	0.80
FMOV14681-D	13.5	17.5	23.5	7.5	25.0	5.9	3.0	1.0	1.8	2.7	0.80
FMOV14751-D	13.5	17.5	23.5	7.5	25.0	6.1	3.0	1.0	1.8	2.9	0.80
FMOV14781-D	13.5	17.5	23.5	7.5	25.0	6.4	3.0	1.0	1.8	3.0	0.80
FMOV14821-D	13.5	17.5	23.5	7.5	25.0	6.6	3.0	1.0	1.8	3.1	0.80
FMOV14911-D	13.5	17.5	23.5	7.5	25.0	6.7	3.0	1.0	1.8	3.5	0.80
FMOV14102-D	13.5	17.5	23.5	7.5	25.0	7.1	3.0	1.0	1.8	3.8	0.80
FMOV14112-D	13.5	17.5	23.5	7.5	25.0	7.5	3.0	1.0	1.8	4.1	0.80
FMOV14182-D	13.5	17.5	23.5	7.5	25.0	11.5	3.0	1.0	1.8	6.0	0.80

Unit: mm

10. Tape and Reel Specifications

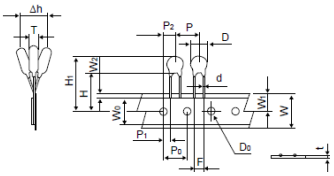


Figure: A

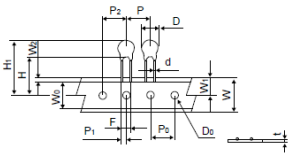


Figure: B

Straight Leads

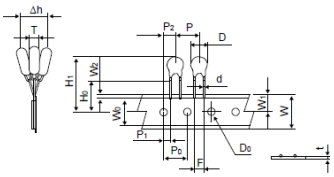


Figure: C

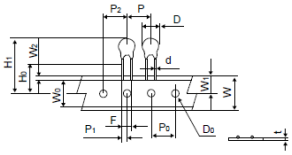


Figure: D

Inline Kink Leads

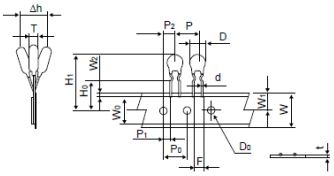


Figure: E

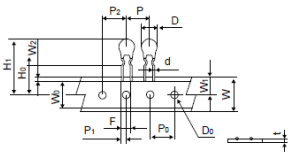


Figure: F

Inside Kink Leads

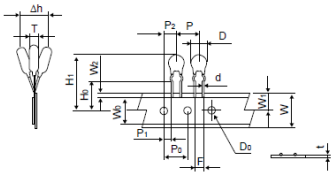


Figure: G

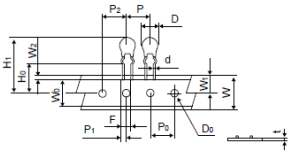


Figure: H

Outside Kink Leads

Symbol	Parameter	FMOV14-D 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
△h	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 Clopped Lead	11.0 Max	11.0 Max
Figure		BDFH	ACEG

Unit: mm

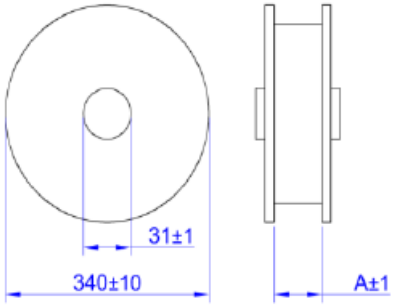
11. Packaging Specifications

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-D Series	500	500	500	500

Tape & Reel Product Packing

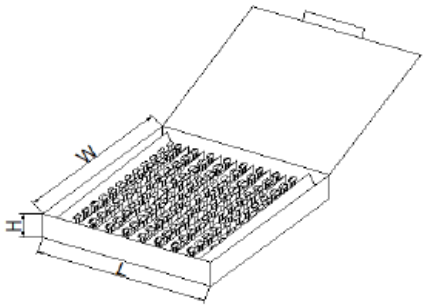
Series	A (mm)	Quantity (pcs/reel)
FMOV14(180~391)-D-T-	56	800
FMOV14(431~621)-D-T-		700
FMOV14(681~112)-D-T-		600



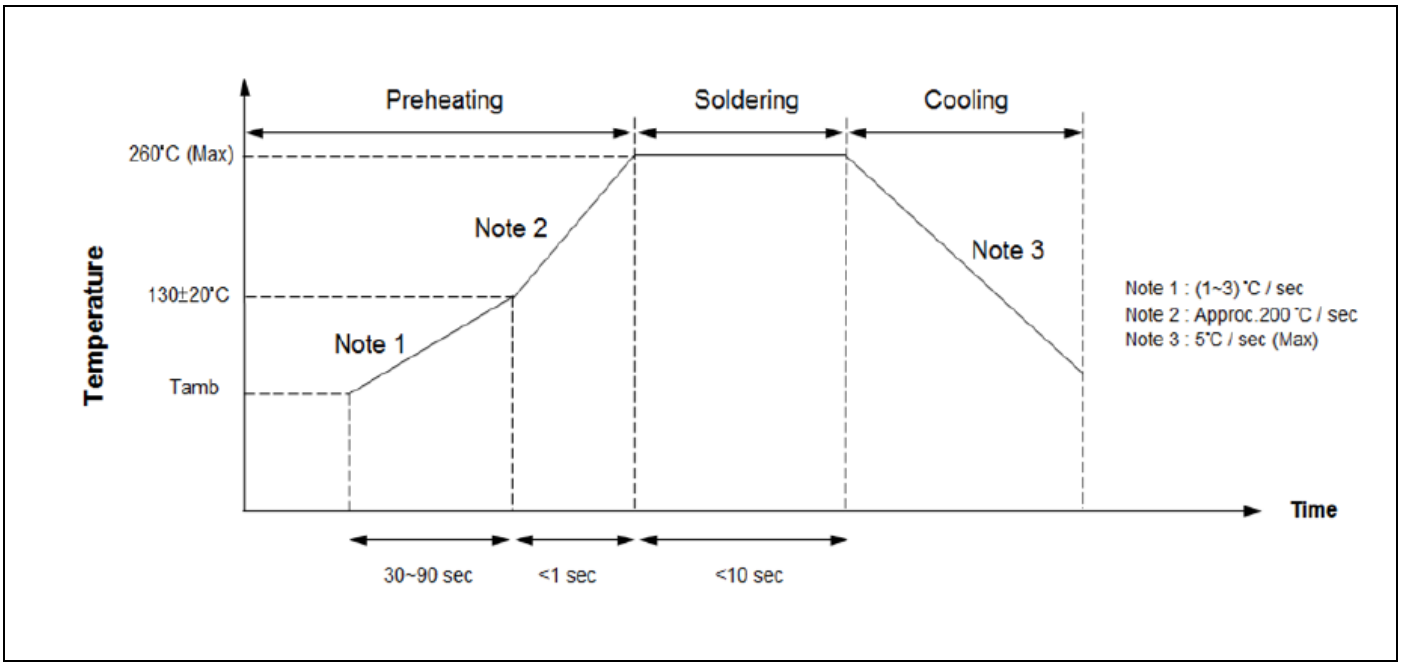
Box Product Packing

Series	Quantity (pcs/box)
FMOV14(180~621)-D-A-	500
FMOV14(681~112)-D-A-	400

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



12. 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

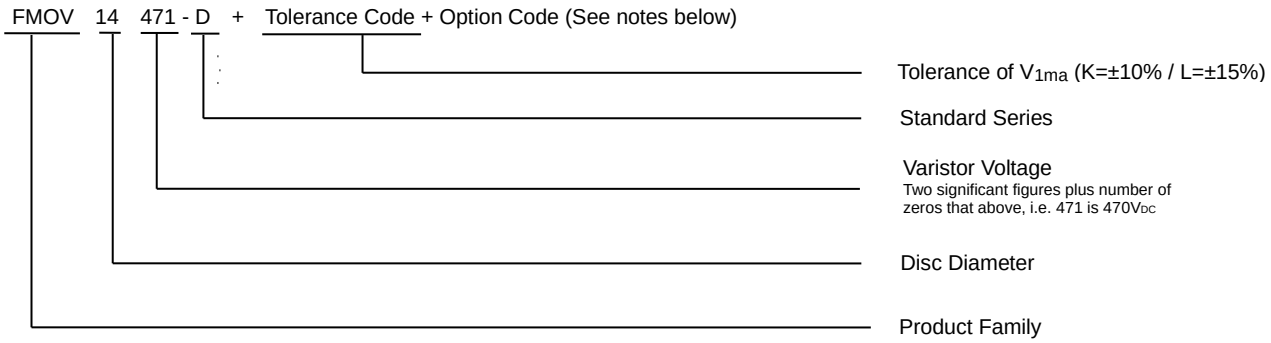
d. Solvent Resistance: MIL–STD–202, Method 215F

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

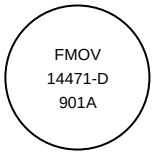
(II) Period of Storage: 1 year

13. Part Numbering and Marking System

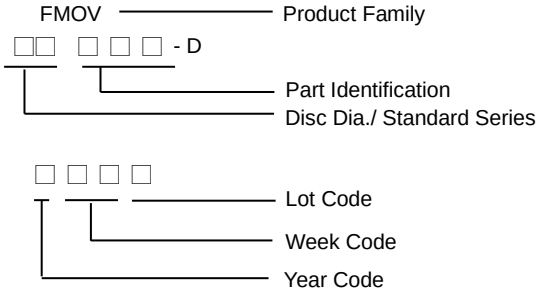
Part Numbering System



Marking System



Example



14. 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-D**KBS**	FMOV14471-D**KBSXXX**	FMOV14471-D**KTS**	FMOV14471-D**KAS**

Tape & Reel Pack Feed Hole Pitch
FMOV14471-D**KTSA**
FMOV14471-D**KTSB**

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-D**KBO**	FMOV14471-D**KBOXXX**	FMOV14471-D**KTO**	FMOV14471-D**KAO**

A: P_0 → 12.7mm±0.2mm

B: P_0 → 15.0mm±0.2mm

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-D**KBK**	FMOV14471-D**KBKXXX**	FMOV14471-D**KTK**	FMOV14471-D**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-D**KBI**	FMOV14471-D**KBIXXX**	FMOV14471-D**KTI**	FMOV14471-D**KAI**