

Metal Oxide Varistors (MOV) Data Sheet

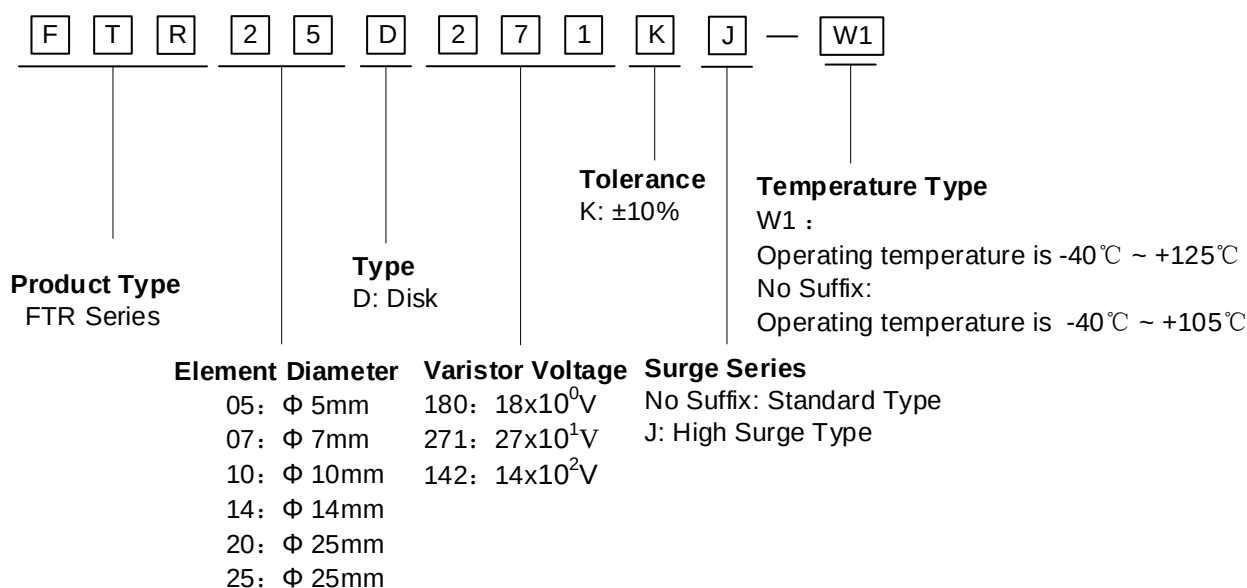
Features

- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature: -40°C ~ +105°C & -40°C ~ +125°C
- Storage Temperature: -40°C ~ +125°C
- Agency recognition: UL 1449 4th /cUL/CQC

Applications

- Power supply, Telecommunication, Smart meter, or PLC protection
- Surge protection in consumer electronics
- Surge protection in industrial electronics
- Surge protection in electronic home appliances, gas and petroleum appliances
- Relay and electromagnetic valve surge absorption

Part Number Code



Electrical Characteristics

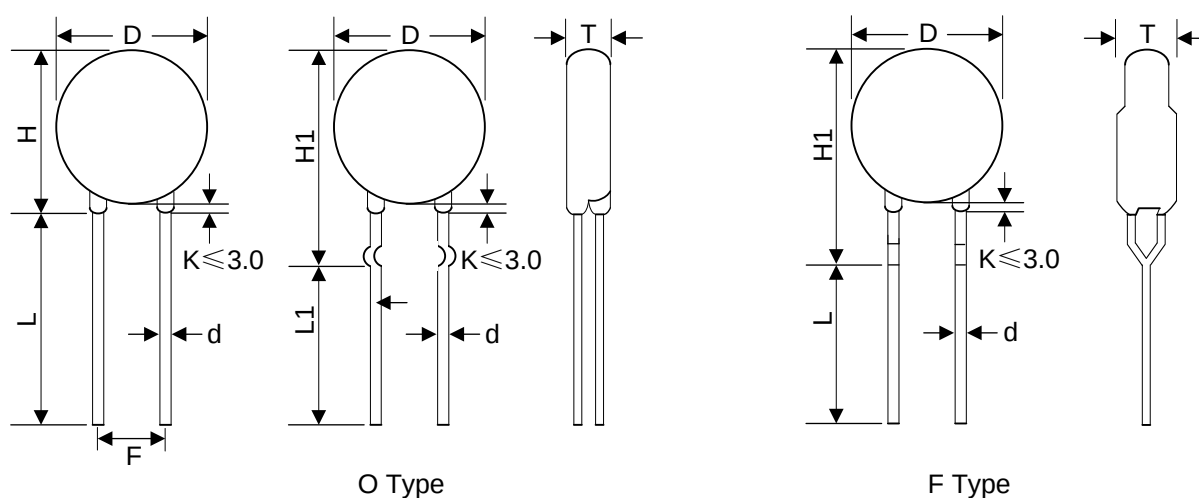
Part Number		Maximum Allowable Voltage		Varistor Voltage	Maximum Clamping Voltage		Withstanding Surge current		Maximum Energy (10/1000μs)	Rated Power	Dimension T _{max}
Standard	High Surge	V _{AC} (V)	V _{DC} (V)	V _{1mA} (V)	I _P (A)	V _C (V)	(A) Standard	(A) High Surge	(J)	(W)	(mm)
FTR25D180K	FTR25D180KJ	11	14	18(15~21.6)	30	36	4500	6000	20	0.25	4.8
FTR25D220K	FTR25D220KJ	14	18	22(19.5~26)	30	43	4500	6000	25	0.25	4.9
FTR25D270K	FTR25D270KJ	17	22	27(24~31)	30	53	4500	6000	30	0.25	5.0
FTR25D330K	FTR25D330KJ	20	26	33(29.5~36.5)	30	65	4500	6000	35	0.25	5.2
FTR25D390K	FTR25D390KJ	25	31	39(35~43)	30	77	4500	6000	40	0.25	5.5
FTR25D470K	FTR25D470KJ	30	38	47(42~52)	30	93	4500	6000	50	0.25	5.1
FTR25D560K	FTR25D560KJ	35	45	56(50~62)	30	110	4500	6000	60	0.25	5.4
FTR25D680K	FTR25D680KJ	40	56	68(61~75)	30	135	4500	6000	70	0.25	5.7
FTR25D820K	FTR25D820KJ	50	65	82(74~90)	150	135	15000	18000	80	1.2	4.5
FTR25D101K	FTR25D101KJ	60	85	100(90~110)	150	165	15000	18000	100	1.2	4.6
FTR25D121K	FTR25D121KJ	75	100	120(108~132)	150	200	15000	18000	120	1.2	4.8
FTR25D151K	FTR25D151KJ	95	125	150(135~165)	150	250	15000	18000	160	1.2	4.9
FTR25D181K	FTR25D181KJ	115	150	180(162~198)	150	300	15000	18000	175	1.2	5.0
FTR25D201K	FTR25D201KJ	130	170	200(180~220)	150	340	15000	18000	190	1.2	4.9
FTR25D221K	FTR25D221KJ	140	180	220(198~242)	150	360	15000	18000	200	1.2	5.2
FTR25D241K	FTR25D241KJ	150	200	240(216~264)	150	395	15000	18000	220	1.2	5.5
FTR25D271K	FTR25D271KJ	175	225	270(243~297)	150	455	15000	18000	255	1.2	5.2
FTR25D301K	FTR25D301KJ	190	250	300(270~330)	150	500	15000	18000	275	1.2	5.3
FTR25D331K	FTR25D331KJ	210	275	330(297~363)	150	550	15000	18000	300	1.2	5.4
FTR25D361K	FTR25D361KJ	230	300	360(324~396)	150	595	15000	18000	330	1.2	5.6
FTR25D391K	FTR25D391KJ	250	320	390(351~429)	150	650	15000	18000	360	1.2	5.8
FTR25D431K	FTR25D431KJ	275	350	430(387~473)	150	710	15000	18000	380	1.2	6.1
FTR25D471K	FTR25D471KJ	300	385	470(423~517)	150	775	15000	18000	400	1.2	6.4
FTR25D511K	FTR25D511KJ	320	415	510(459~561)	150	845	15000	18000	420	1.2	6.7
FTR25D561K	FTR25D561KJ	350	460	560(504~616)	150	925	15000	18000	440	1.2	7.0
FTR25D621K	FTR25D621KJ	385	505	620(558~682)	150	1025	15000	18000	450	1.2	7.3
FTR25D681K	FTR25D681KJ	420	560	680(612~718)	150	1120	15000	18000	460	1.2	7.5
FTR25D751K	FTR25D751KJ	460	615	750(675~825)	150	1240	15000	18000	510	1.2	7.7
FTR25D781K	FTR25D781KJ	485	640	780(702~858)	150	1290	15000	18000	530	1.2	7.8
FTR25D821K	FTR25D821KJ	510	670	820(738~902)	150	1355	15000	18000	570	1.2	8.1
FTR25D911K	FTR25D911KJ	550	745	910(819~1001)	150	1500	15000	18000	620	1.2	8.6
FTR25D102K	FTR25D102KJ	625	825	1000(900~1100)	150	1650	15000	18000	685	1.2	9.2
FTR25D112K	FTR25D112KJ	680	895	1100(990~1210)	150	1815	15000	18000	720	1.2	9.8
FTR25D122K	FTR25D122KJ	750	990	1200(1080~1320)	150	1980	15000	18000	792	1.2	10.4
FTR25D142K	FTR25D142KJ	880	1140	1400(1260~1540)	150	2310	15000	18000	850	1.2	11.2

Part Number		Maximum Allowable Voltage		Varistor Voltage	Maximum Clamping Voltage		Withstanding Surge current		Maximum Energy (10/1000μs)	Rated Power	Dimension T _{max}
Standard	High Surge	V _{AC} (V)	V _{DC} (V)	V _{1mA} (V)	I _P (A)	V _C (V)	(A) Standard	(A) High Surge	(J)	(W)	(mm)
FTR25D162K	FTR25D162KJ	1000	1280	1600(1440~1760)	150	2640	15000	18000	970	1.2	12.8
FTR25D182K	FTR25D182KJ	1100	1465	1800(1620~1980)	150	2970	15000	18000	1092	1.2	13.5

Notes: 1. The tolerance of varistor voltage between 18V and 27V is more than 10%.

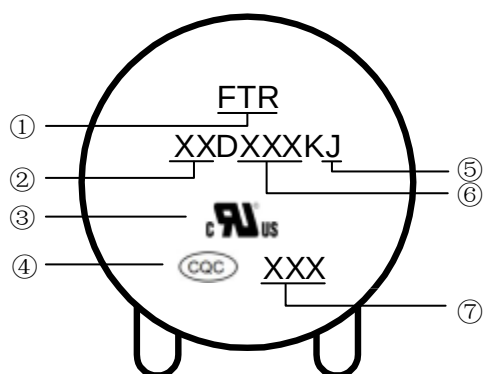
2. Leakage Current (@83% of V_{1mA}): IR ≤ 50μ A (180K~680K) ; IR ≤ 25μ A (820K~182K)

Dimensions



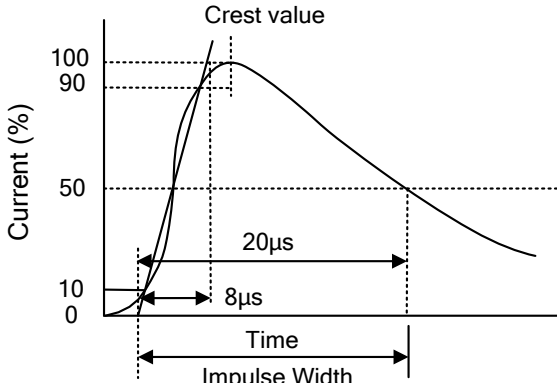
Symbol	H(max.)	H1(Max.)	L(min.)	L1(min.)	D (max.)	F(±0.8)	d(±0.05)	Tmax
Dimension(mm)	31	33	20	15	28	10	1	Please refer to the Electrical Characteristics Table

Marking Code



- ① QG Logo
- ② Disk Size
- ③ UL Accreditation Logo
- ④ CQC Accreditation Logo
- ⑤ “J” is High Surge Code, No “J” is Standard Surge
- ⑥ Varistor Voltage
- ⑦ Date Code

Electrical Ratings

Items	Test Condition/Description	Requirement					
Varistor Voltage	The voltage between two terminals with the specified measuring current 1mA.DC applied is called Vb.	To meet the Specified value					
Maximum Allowable Voltage	The recommended maximum sine wave voltage (RMS) or the Maximum DC voltage can be applied continuously.						
Maximum Clamping Voltage	The maximum voltage between two terminals with the specification standard impulse current. Applied waveform: 8/20μs 						
Rated Wattage	The maximum average power that can be applied within the specified ambient temperature.						
Energy	The maximum energy within the varistor voltage change of ±10% when one impulse of 10/1000μs or 2ms is applied.						
Withstanding Surge Current	The maximum current within the varistor voltage change of ±10% with the standard impulse current (8/20μs) applied one time.						
Varistor Voltage Temp. Coefficient	$\left \frac{V_{1mA@85^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{60} \times 100\%(\%/^{\circ}C) \right $ $\left \frac{V_{1mA@-40^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{65} \times 100\%(\%/^{\circ}C) \right $	≤0.05%/°C					
Surge Life	The change of Vb shall be measured after the impulse listed below which is applied 10,000 times continuously with the interval of ten seconds at room temperature. <table border="1" data-bbox="440 1892 1203 2016"> <tr> <td rowspan="2">25Φ series</td><td>180K to 680K</td><td>250A (8/20μs)</td></tr> <tr> <td>820K to 182K</td><td>450A (8/20μs)</td></tr> </table>	25Φ series	180K to 680K	250A (8/20μs)	820K to 182K	450A (8/20μs)	$\frac{\Delta V_b}{V_b} \leq \pm 10\%$
25Φ series	180K to 680K		250A (8/20μs)				
	820K to 182K	450A (8/20μs)					

Mechanical Characteristics

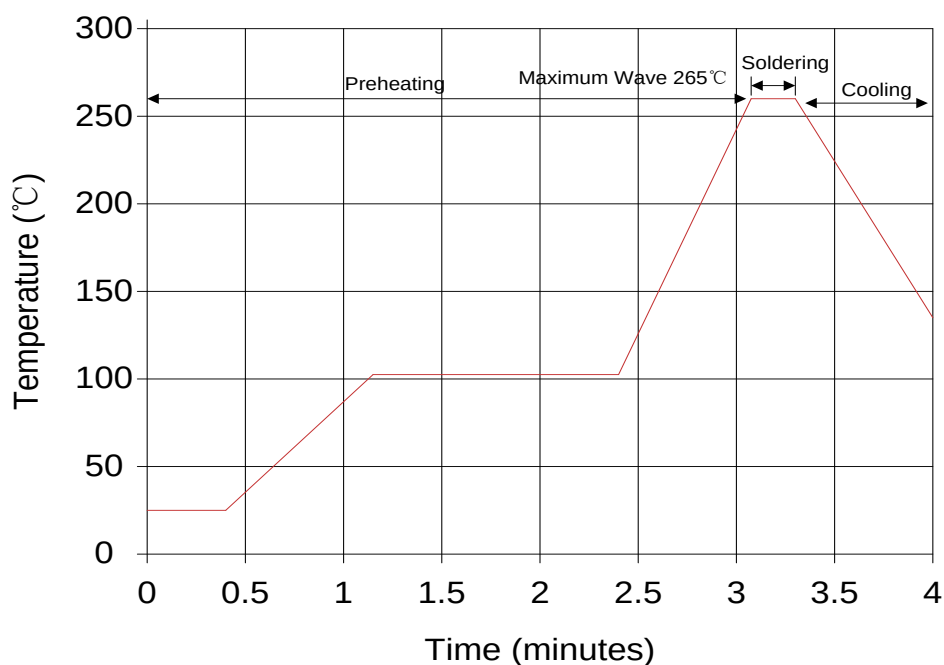
Items	Test conditions / Methods	Specifications								
Tensile Strength of Terminals	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <table><tr><td>Terminal diameter (mm)</td><td>Froce(kg)</td></tr><tr><td>0.5<d≤0.8</td><td>1.0</td></tr><tr><td>0.8<d≤1.25</td><td>2.0</td></tr><tr><td>1.25<d</td><td>4.0</td></tr></table>	Terminal diameter (mm)	Froce(kg)	0.5<d≤0.8	1.0	0.8<d≤1.25	2.0	1.25<d	4.0	NO Visible damage Δ V1mA/V1mA ≤5%
Terminal diameter (mm)	Froce(kg)									
0.5<d≤0.8	1.0									
0.8<d≤1.25	2.0									
1.25<d	4.0									
Bending Strength of Terminals	Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction. <table><tr><td>Terminal diameter (mm)</td><td>Froce(kg)</td></tr><tr><td>0.5<d≤0.8</td><td>0.5</td></tr><tr><td>0.8<d≤1.25</td><td>1.0</td></tr><tr><td>1.25<d</td><td>2.0</td></tr></table>	Terminal diameter (mm)	Froce(kg)	0.5<d≤0.8	0.5	0.8<d≤1.25	1.0	1.25<d	2.0	NO Visible damage Δ V1mA/V1mA ≤5%
Terminal diameter (mm)	Froce(kg)									
0.5<d≤0.8	0.5									
0.8<d≤1.25	1.0									
1.25<d	2.0									
Vibration	Frequency range: 10~55 Hz Amplitude: 0.75mm or 98m/s2 Direction: 3 mutually perpendicular directions, 2hrs each.	NO Visible damage Δ V1mA/V1mA ≤5%								
Solder ability	Solder Temp: 245±5℃ Dipping Time: 2±0.5 sec	At least 95% of terminal electrode is covered by new solder								
Resistanceto Soldering Heat	Solder Temp: 260±5℃ Dipping Time: 10±1 sec	NO Visible damage Δ V1mA/V1mA ≤5%								

Reliability

Items	Test conditions / Methods	Specifications															
High Temperature Storage	Ambient Temp: 125±2℃ Duration: 1000hrs	Δ V1mA/V1mA ≤5%															
Low Temperature Storage	Ambient Temp: -40±2℃ Duration: 1000hrs	Δ V1mA/V1mA ≤5%															
Humidity	Ambient Temp: 40±2℃, 90~95% R.H. Duration: 1000hrs	Δ V1mA/V1mA ≤5%															
Temperature Cycle	The conditions shown below shall be repeated 5 cycles <table> <tr> <th>Step</th><th>Temperature (℃)</th><th>Period (minutes)</th></tr> <tr> <td>1</td><td>-40±3</td><td>30±3</td></tr> <tr> <td>2</td><td>Room temperature</td><td>15±3</td></tr> <tr> <td>3</td><td>125±3</td><td>30±3</td></tr> <tr> <td>4</td><td>Room temperature</td><td>15±3</td></tr> </table>	Step	Temperature (℃)	Period (minutes)	1	-40±3	30±3	2	Room temperature	15±3	3	125±3	30±3	4	Room temperature	15±3	No visible damage ΔV1mA/V1mA ≤5%
Step	Temperature (℃)	Period (minutes)															
1	-40±3	30±3															
2	Room temperature	15±3															
3	125±3	30±3															
4	Room temperature	15±3															
High Temperature Load	Ambient Temp: 105±2℃ Duration: 1000hrs Load: Max. Allowable Voltage In AC eara.	ΔV1mA/V1mA ≤5%															
Damp Heat Load	Ambient Temp: 40±2℃, 90~95% R.H. Duration: 1000hrs Load: Max. Allowable Voltage	No visible damage ΔV1mA/V1mA ≤5%															
Voltage Proof	Metal balls method, 2500Vac 1 min.	No visible damage															

Soldering Recommendation

Wave Lead Free Soldering Recommendation

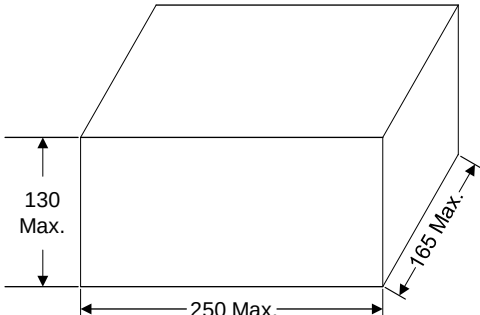


Item	Conditions
Peak Temperature	265°C
Dipping Time	10 seconds(max.)
Soldering	1 time

Recommendation Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C(max.)
Soldering Time	3 seconds(max.)
Distance from Varistor	2mm (min.)

Quantity

Packaging Dimensions (Unit: mm)	Quantity	
In bulk for Terminals Untrimmed Products 	100pcs/bag (180K~621K)	4bags/box
	50pcs/bag (681K~182K)	
In bulk for Terminals Trimmed Products 	100pcs/bag (180K~621K)	4bags/box
	50pcs/bag (681K~182K)	