

# SMQ Series



- Snap Mount
- Downsize
- Large Capacitance
- +85°C Maximum Temperature



The SMQ series is a new high voltage snap-in capacitor series from United Chemi-Con that offers downsized versions of the current miniaturized SMM series. These capacitors have a rated lifetime of 2,000 hours at +85°C with the rated ripple current applied. With high ripple current capability and higher CV per case size than the SMM series, the SMQ capacitors are suitable for many downsized power supply circuits. The SMQ capacitors have a standard 2-pin snap-in terminal style. As an option the SMQ series is available with environmentally friendly PET (polyester) sleeves and Pb-free materials.

The standard SMQ series capacitors are non-solvent proof. Refer to the Mini-Glossary for cleaning guidelines and recommended cleaning agents that are compatible with United Chemi-Con products.

## Summary of Specifications

- PC board 2-pin snap-in terminals.
- Capacitance range: 82 to 3,900µF.
- Voltage range: 160 to 450VDC.
- Category temperature range: -25°C to +85°C.
- Leakage current:  $3\sqrt{CV}$  (µA) maximum after 5 minutes at +20°C.
- Standard capacitance tolerance: ±20%
- Nominal case size (D × L): 22 × 25mm to 35 × 50mm.
- Rated lifetime: 2,000 hours at +85°C with the rated ripple current applied.

## SMQ Specifications

Item	Characteristics																					
Category Temperature Range	-25 to +85°C																					
Rated Voltage Range	160 to 450VDC																					
Capacitance Range	82 to 3,900 $\mu$ F																					
Capacitance Tolerance	$\pm 20\%$ (M) at +20°C, 120Hz																					
Leakage Current	$I \leq 3\sqrt{CV}$ ( $\mu$ A) after 5 minutes at +20°C. Where I = Max. leakage current ( $\mu$ A), C = Nominal capacitance ( $\mu$ F) and V = Rated voltage (V)																					
Dissipation Factor (Tan $\delta$ )	At +20°C, 120Hz <table border="1"> <tr> <td>Rated Voltage (V)</td> <td>160-250</td> <td>315-400</td> <td>450</td> </tr> <tr> <td>Tan <math>\delta</math> (DF)</td> <td>0.15 max.</td> <td>0.15 max.</td> <td>0.20 max.</td> </tr> </table>	Rated Voltage (V)	160-250	315-400	450	Tan $\delta$ (DF)	0.15 max.	0.15 max.	0.20 max.													
Rated Voltage (V)	160-250	315-400	450																			
Tan $\delta$ (DF)	0.15 max.	0.15 max.	0.20 max.																			
Low Temperature Characteristics	At 120Hz, impedance (Z) ratio between the -25°C value and +20°C value shall not exceed the values given below. <table border="1"> <tr> <td>Rated Voltage (V)</td> <td>160-250</td> <td>315-400</td> <td>450</td> </tr> <tr> <td>Z (-25°C) / Z (+20°C)</td> <td>4</td> <td>8</td> <td>8</td> </tr> </table>	Rated Voltage (V)	160-250	315-400	450	Z (-25°C) / Z (+20°C)	4	8	8													
Rated Voltage (V)	160-250	315-400	450																			
Z (-25°C) / Z (+20°C)	4	8	8																			
Rated Ripple Current Multipliers <i>Refer to Section 4 of the Mini-Glossary for explanation of Rated Ripple Current Multipliers.</i>	Frequency (Hz) <table border="1"> <tr> <td>DC Rated Voltage</td> <td>50Hz</td> <td>120Hz</td> <td>300Hz</td> <td>1kHz</td> <td>10kHz</td> <td>50kHz</td> </tr> <tr> <td>160-250V</td> <td>0.81</td> <td>1.00</td> <td>1.17</td> <td>1.32</td> <td>1.45</td> <td>1.50</td> </tr> <tr> <td>315-450V</td> <td>0.77</td> <td>1.00</td> <td>1.16</td> <td>1.30</td> <td>1.41</td> <td>1.43</td> </tr> </table>	DC Rated Voltage	50Hz	120Hz	300Hz	1kHz	10kHz	50kHz	160-250V	0.81	1.00	1.17	1.32	1.45	1.50	315-450V	0.77	1.00	1.16	1.30	1.41	1.43
DC Rated Voltage	50Hz	120Hz	300Hz	1kHz	10kHz	50kHz																
160-250V	0.81	1.00	1.17	1.32	1.45	1.50																
315-450V	0.77	1.00	1.16	1.30	1.41	1.43																
Endurance (Load Life)	The following specifications shall be satisfied when the capacitors are restored to +20°C after subjecting them to DC voltage for 2,000 hours at +85°C with the rated ripple current applied. The sum of the DC voltage and peak AC voltage must not exceed the full rated voltage of the capacitors.  Capacitance change: $\leq \pm 20\%$ of initial measured value Tan $\delta$ (DF) : $\leq 200\%$ of initial specified value Leakage current : $\leq$ initial specified value																					
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to +20°C after exposing them for 1,000 hours at +85°C without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.  Capacitance change: $\leq \pm 15\%$ of initial measured value Tan $\delta$ (DF) : $\leq 150\%$ of initial specified value Leakage current : $\leq$ initial specified value																					

## Part Numbering System for SMQ Series

When ordering, always specify complete catalog number for SMQ Series.

<b>SMQ</b>	<b>450</b>	<b>VS</b>	<b>391</b>	<b>M</b>	<b>30X40</b>	<b>T2</b>	
							Terminal Code: T2 = 2 - Pin Snap-in (Standard).
							Case Code: See Case Sizes in Tables.
							Capacitance Tolerance: M = $\pm 20\%$
							Capacitance Value: Expressed in Microfarads. The first two digits are significant figures, and the third digit indicates the number of zeros for capacitance of 100 $\mu$ F or more. R indicates the decimal point for capacitance less than 100 $\mu$ F (e.g. R39 = .39 $\mu$ F; 3R9 = 3.9 $\mu$ F; 39R = 39 $\mu$ F; 391 = 390 $\mu$ F; 392 = 3,900 $\mu$ F; 393 = 39,000 $\mu$ F).
							Lead Configuration: VS = 2 - Pin Snap-in Terminals.
							DC Rated Voltage: Expressed in Volts (e.g. 450 = 450WVDC).
							Series Name: Indicates Basic Capacitor Design.

## Diagram of Dimensions

### Snap Mount

Type VS-T2  $\varnothing 22 \sim \varnothing 35$

Standard design does not have a plastic disk.

\*Vent may be located either on the bottom or side of the can.

### VS Pin Dimensions

Type	P	W	W <sub>1</sub>	W <sub>2</sub>
VS-T2	4.0 ± 0.5	1.5 ± 0.2	1.0	1.0

Unit: mm

## Standard Voltage Ratings - VS/Snap Mount

Rated Voltage (WVDC)	Capacitance (μF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Rated Ripple Current (A rms) at +85°C, 120Hz
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<b>160 Volts 200 Volts Surge</b>	560	SMQ160VS561M22X25T2	22 × 25	0.444	2.25
	680	SMQ160VS681M22X30T2	22 × 30	0.366	2.5
	820	SMQ160VS821M22X35T2	22 × 35	0.303	2.75
	1,000	SMQ160VS102M22X40T2	22 × 40	0.249	3.0
	1,200	SMQ160VS122M22X45T2	22 × 45	0.207	3.25
	1,500	SMQ160VS152M22X50T2	22 × 50	0.166	3.73
	1,000	SMQ160VS102M25X30T2	25.4 × 30	0.249	3.0
	1,200	SMQ160VS122M25X35T2	25.4 × 35	0.207	3.25
	1,500	SMQ160VS152M25X40T2	25.4 × 40	0.166	3.73
	1,800	SMQ160VS182M25X45T2	25.4 × 45	0.138	4.2
	1,200	SMQ160VS122M30X25T2	30 × 25	0.207	3.25
	1,500	SMQ160VS152M30X30T2	30 × 30	0.166	3.73
	1,800	SMQ160VS182M30X35T2	30 × 35	0.138	4.2
	2,200	SMQ160VS222M30X40T2	30 × 40	0.113	4.78
	1,500	SMQ160VS152M35X25T2	35 × 25	0.166	3.73
	1,800	SMQ160VS182M35X30T2	35 × 30	0.138	4.2
	2,200	SMQ160VS222M35X35T2	35 × 35	0.113	4.78
2,700	SMQ160VS272M35X40T2	35 × 40	0.092	5.45	
3,300	SMQ160VS332M35X45T2	35 × 45	0.075	5.75	
3,900	SMQ160VS392M35X50T2	35 × 50	0.064	6.0	

<b>180 Volts 225 Volts Surge</b>	470	SMQ180VS471M22X25T2	22 × 25	0.529	2.08
	560	SMQ180VS561M22X30T2	22 × 30	0.444	2.25
	680	SMQ180VS681M22X30T2	22 × 30	0.366	2.5
	820	SMQ180VS821M22X35T2	22 × 35	0.303	2.75
	1,000	SMQ180VS102M22X45T2	22 × 45	0.249	3.0
	1,200	SMQ180VS122M22X50T2	22 × 50	0.207	3.31
	680	SMQ180VS681M25X25T2	25.4 × 25	0.366	2.5
	820	SMQ180VS821M25X30T2	25.4 × 30	0.303	2.75
	1,000	SMQ180VS102M25X35T2	25.4 × 35	0.249	3.0
	1,200	SMQ180VS122M25X40T2	25.4 × 40	0.207	3.31
	1,500	SMQ180VS152M25X45T2	25.4 × 45	0.166	3.83
	1,800	SMQ180VS182M25X50T2	25.4 × 50	0.138	4.32
	1,000	SMQ180VS102M30X25T2	30 × 25	0.249	3.0
	1,200	SMQ180VS122M30X30T2	30 × 30	0.207	3.31

\*The case sizes in table are with no sleeve, refer to diagram for case sizes with sleeve.

## Standard Voltage Ratings - VS/Snap Mount

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Rated Ripple Current (A rms) at +85°C, 120Hz
<b>180 Volts</b> 225 Volts Surge	1,500	SMQ180VS152M30X35T2	30 × 35	0.166	3.83
	1,800	SMQ180VS182M30X40T2	30 × 40	0.138	4.32
	2,200	SMQ180VS222M30X45T2	30 × 45	0.113	4.92
	1,200	SMQ180VS122M35X25T2	35 × 25	0.207	3.31
	1,500	SMQ180VS152M35X30T2	35 × 30	0.166	3.83
	1,800	SMQ180VS182M35X30T2	35 × 30	0.138	4.32
	2,200	SMQ180VS222M35X40T2	35 × 40	0.113	4.92
	2,700	SMQ180VS272M35X45T2	35 × 45	0.092	5.52
3,300	SMQ180VS332M35X50T2	35 × 50	0.075	5.75	
<b>200 Volts</b> 250 Volts Surge	390	SMQ200VS391M22X25T2	22 × 25	0.638	1.68
	470	SMQ200VS471M22X30T2	22 × 30	0.529	1.85
	560	SMQ200VS561M22X30T2	22 × 30	0.444	2.43
	680	SMQ200VS681M22X35T2	22 × 35	0.366	2.68
	820	SMQ200VS821M22X40T2	22 × 40	0.303	2.93
	1,000	SMQ200VS102M22X45T2	22 × 45	0.249	3.25
	560	SMQ200VS561M25X25T2	25.4 × 25	0.444	2.43
	680	SMQ200VS681M25X30T2	25.4 × 30	0.366	2.68
	820	SMQ200VS821M25X30T2	25.4 × 30	0.303	2.93
	1,000	SMQ200VS102M25X35T2	25.4 × 35	0.249	3.25
	1,200	SMQ200VS122M25X40T2	25.4 × 40	0.207	3.5
	1,500	SMQ200VS152M25X50T2	25.4 × 50	0.166	3.87
	820	SMQ200VS821M30X25T2	30 × 25	0.303	2.93
	1,000	SMQ200VS102M30X30T2	30 × 30	0.249	3.25
	1,200	SMQ200VS122M30X30T2	30 × 30	0.207	3.5
	1,500	SMQ200VS152M30X35T2	30 × 35	0.166	3.87
	1,800	SMQ200VS182M30X45T2	30 × 45	0.138	4.32
	2,200	SMQ200VS222M30X50T2	30 × 50	0.113	4.92
	1,000	SMQ200VS102M35X25T2	35 × 25	0.249	3.25
	1,200	SMQ200VS122M35X30T2	35 × 30	0.207	3.5
1,500	SMQ200VS152M35X30T2	35 × 30	0.166	3.87	
1,800	SMQ200VS182M35X35T2	35 × 35	0.138	4.32	
2,200	SMQ200VS222M35X40T2	35 × 40	0.113	4.92	
2,700	SMQ200VS272M35X50T2	35 × 50	0.092	5.45	
<b>250 Volts</b> 300 Volts Surge	270	SMQ250VS271M22X25T2	22 × 25	0.921	1.31
	330	SMQ250VS331M22X30T2	22 × 30	0.754	1.75
	390	SMQ250VS391M22X30T2	22 × 30	0.638	1.91
	470	SMQ250VS471M22X35T2	22 × 35	0.529	2.11
	560	SMQ250VS561M22X40T2	22 × 40	0.444	2.25
	680	SMQ250VS681M22X45T2	22 × 45	0.366	2.5
	820	SMQ250VS821M22X50T2	22 × 50	0.303	2.77
	390	SMQ250VS391M25X25T2	25.4 × 25	0.638	1.91
	470	SMQ250VS471M25X30T2	25.4 × 30	0.529	2.11
	560	SMQ250VS561M25X30T2	25.4 × 30	0.444	2.25
	680	SMQ250VS681M25X35T2	25.4 × 35	0.366	2.5
	820	SMQ250VS821M25X40T2	25.4 × 40	0.303	2.77
	1,000	SMQ250VS102M25X45T2	25.4 × 45	0.249	3.32
	560	SMQ250VS561M30X25T2	30 × 25	0.444	2.25
	680	SMQ250VS681M30X30T2	30 × 30	0.366	2.5
	820	SMQ250VS821M30X30T2	30 × 30	0.303	2.77
	1,000	SMQ250VS102M30X35T2	30 × 35	0.249	3.32
	1,200	SMQ250VS122M30X40T2	30 × 40	0.207	3.53
	1,500	SMQ250VS152M30X50T2	30 × 50	0.166	4.04
	820	SMQ250VS821M35X25T2	35 × 25	0.303	2.77
	1,000	SMQ250VS102M35X30T2	35 × 30	0.249	3.32
	1,200	SMQ250VS122M35X35T2	35 × 35	0.207	3.53
	1,500	SMQ250VS152M35X40T2	35 × 40	0.166	4.04
	1,800	SMQ250VS182M35X45T2	35 × 45	0.138	4.55

\*The case sizes in table are with no sleeve, refer to diagram for case sizes with sleeve.

## Standard Voltage Ratings - VS/Snap Mount

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Rated Ripple Current (A rms) at +85°C, 120Hz
<b>315 Volts</b> 365 Volts Surge	180	SMQ315VS181M22X25T2	22 × 25	1.382	1.21
	220	SMQ315VS221M22X30T2	22 × 30	1.13	1.41
	270	SMQ315VS271M22X30T2	22 × 30	0.921	1.6
	330	SMQ315VS331M22X40T2	22 × 40	0.754	1.82
	390	SMQ315VS391M22X45T2	22 × 45	0.638	2.01
	470	SMQ315VS471M22X50T2	22 × 50	0.529	2.27
	330	SMQ315VS331M25X30T2	25.4 × 30	0.754	1.82
	390	SMQ315VS391M25X35T2	25.4 × 35	0.638	2.01
	470	SMQ315VS471M25X40T2	25.4 × 40	0.529	2.27
	560	SMQ315VS561M25X45T2	25.4 × 45	0.444	2.56
	330	SMQ315VS331M30X25T2	30 × 25	0.754	1.82
	390	SMQ315VS391M30X30T2	30 × 30	0.638	2.01
	470	SMQ315VS471M30X30T2	30 × 30	0.529	2.27
	560	SMQ315VS561M30X35T2	30 × 35	0.444	2.56
	680	SMQ315VS681M30X40T2	30 × 40	0.366	2.87
	820	SMQ315VS821M30X45T2	30 × 45	0.303	3.25
	1,000	SMQ315VS102M30X50T2	30 × 50	0.249	3.63
	470	SMQ315VS471M35X25T2	35 × 25	0.529	2.27
	560	SMQ315VS561M35X30T2	35 × 30	0.444	2.56
	680	SMQ315VS681M35X35T2	35 × 35	0.366	2.87
820	SMQ315VS821M35X40T2	35 × 40	0.303	3.25	
1,000	SMQ315VS102M35X45T2	35 × 45	0.249	3.63	
<b>350 Volts</b> 400 Volts Surge	150	SMQ350VS151M22X25T2	22 × 25	1.658	1.12
	180	SMQ350VS181M22X30T2	22 × 30	1.382	1.22
	220	SMQ350VS221M22X35T2	22 × 35	1.13	1.44
	270	SMQ350VS271M22X40T2	22 × 40	0.921	1.66
	330	SMQ350VS331M22X45T2	22 × 45	0.754	1.88
	390	SMQ350VS391M22X50T2	22 × 50	0.638	2.06
	270	SMQ350VS271M25X30T2	25.4 × 30	0.921	1.66
	330	SMQ350VS331M25X35T2	25.4 × 35	0.754	1.88
	390	SMQ350VS391M25X40T2	25.4 × 40	0.638	2.06
	470	SMQ350VS471M25X45T2	25.4 × 45	0.529	2.4
	560	SMQ350VS561M25X50T2	25.4 × 50	0.444	2.6
	390	SMQ350VS391M30X30T2	30 × 30	0.638	2.06
	470	SMQ350VS471M30X35T2	30 × 35	0.529	2.4
	560	SMQ350VS561M30X40T2	30 × 40	0.444	2.6
	680	SMQ350VS681M30X45T2	30 × 45	0.366	2.96
	820	SMQ350VS821M30X50T2	30 × 50	0.303	3.25
	390	SMQ350VS391M35X25T2	35 × 25	0.638	2.06
	470	SMQ350VS471M35X30T2	35 × 30	0.529	2.4
	560	SMQ350VS561M35X30T2	35 × 30	0.444	2.6
	680	SMQ350VS681M35X35T2	35 × 35	0.366	2.96
820	SMQ350VS821M35X45T2	35 × 45	0.303	3.25	
1,000	SMQ350VS102M35X50T2	35 × 50	0.249	3.54	
<b>400 Volts</b> 450 Volts Surge	120	SMQ400VS121M22X25T2	22 × 25	2.072	1.02
	150	SMQ400VS151M22X30T2	22 × 30	1.658	1.16
	180	SMQ400VS181M22X35T2	22 × 35	1.382	1.44
	220	SMQ400VS221M22X40T2	22 × 40	1.13	1.49
	270	SMQ400VS271M22X45T2	22 × 45	0.921	1.67
	330	SMQ400VS331M22X50T2	22 × 50	0.754	1.9
	220	SMQ400VS221M25X30T2	25.4 × 30	1.13	1.49
	270	SMQ400VS271M25X35T2	25.4 × 35	0.921	1.67
	330	SMQ400VS331M25X40T2	25.4 × 40	0.754	1.9
	390	SMQ400VS391M25X45T2	25.4 × 45	0.638	2.13
	470	SMQ400VS471M25X50T2	25.4 × 50	0.529	2.39
	270	SMQ400VS271M30X25T2	30 × 25	0.921	1.67
	330	SMQ400VS331M30X30T2	30 × 30	0.754	1.9
	390	SMQ400VS391M30X35T2	30 × 35	0.638	2.13

\*The case sizes in table are with no sleeve, refer to diagram for case sizes with sleeve.

## Standard Voltage Ratings - VS/Snap Mount

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Rated Ripple Current (A rms) at +85°C, 120Hz
<b>400 Volts 450 Volts Surge</b>	470	SMQ400VS471M30X40T2	30 × 40	0.529	2.39
	560	SMQ400VS561M30X45T2	30 × 45	0.444	2.69
	680	SMQ400VS681M30X50T2	30 × 50	0.366	2.96
	330	SMQ400VS331M35X25T2	35 × 25	0.754	1.9
	390	SMQ400VS391M35X30T2	35 × 30	0.638	2.13
	470	SMQ400VS471M35X30T2	35 × 30	0.529	2.39
	560	SMQ400VS561M35X35T2	35 × 35	0.444	2.69
	680	SMQ400VS681M35X40T2	35 × 40	0.366	2.96
	820	SMQ400VS821M35X45T2	35 × 45	0.303	3.25
<b>450 Volts 500 Volts Surge</b>	82	SMQ450VS82RM22X25T2	22 × 25	4.043	0.83
	100	SMQ450VS101M22X25T2	22 × 25	3.316	0.93
	120	SMQ450VS121M22X30T2	22 × 30	2.763	1.04
	150	SMQ450VS151M22X35T2	22 × 35	2.21	1.19
	180	SMQ450VS181M22X40T2	22 × 40	1.842	1.35
	220	SMQ450VS221M22X45T2	22 × 45	1.507	1.55
	270	SMQ450VS271M22X50T2	22 × 50	1.228	1.78
	150	SMQ450VS151M25X25T2	25.4 × 25	2.21	1.19
	180	SMQ450VS181M25X30T2	25.4 × 30	1.842	1.35
	220	SMQ450VS221M25X40T2	25.4 × 40	1.507	1.55
	270	SMQ450VS271M25X40T2	25.4 × 40	1.228	1.78
	330	SMQ450VS331M25X50T2	25.4 × 50	1.005	2.01
	220	SMQ450VS221M30X30T2	30 × 30	1.507	1.55
	270	SMQ450VS271M30X30T2	30 × 30	1.228	1.78
	330	SMQ450VS331M30X40T2	30 × 40	1.005	2.01
	390	SMQ450VS391M30X40T2	30 × 40	0.85	2.24
	470	SMQ450VS471M30X45T2	30 × 45	0.705	2.53
	560	SMQ450VS561M30X50T2	30 × 50	0.592	2.82
	220	SMQ450VS221M35X25T2	35 × 25	1.507	1.55
	330	SMQ450VS331M35X30T2	35 × 30	1.005	2.01
390	SMQ450VS391M35X35T2	35 × 35	0.85	2.24	
470	SMQ450VS471M35X40T2	35 × 40	0.705	2.53	
560	SMQ450VS561M35X45T2	35 × 45	0.592	2.82	

\*The case sizes in table are with no sleeve, refer to diagram for case sizes with sleeve.