

# MVH Series

**UPGRADE**  
Engineering Bulletin Jul 03



MVH  
SURFACE MOUNT-125°C

- Surface Mount
- Vertical Chip
- High Temperature
- Solvent Proof (10-50V)
- +125°C Maximum Temperature



The MVH series capacitors are surface mount, high temperature vertical chip capacitors designed for reflow soldering. This series has been expanded to cover a wider variety of CV and case sizes. The MVH capacitors have a maximum operating temperature of +125°C, which makes them ideal for use in automotive and other high temperature applications.

The MVH series capacitors *except for those rated at 63-450 volts* are 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

- Surface mount lead terminals.
- Capacitance range: 3.3 to 4,700 $\mu$ F.
- Voltage range: 10 to 450VDC.
- Category temperature range: -40°C to +125°C.
- Leakage current: See specifications table for leakage current values at +20°C.
- Standard capacitance tolerance:  $\pm 20\%$
- Nominal case size (D  $\times$  L): 6.3  $\times$  5.7mm to 18  $\times$  21.5mm.
- Rated lifetime: 1,000 to 5,000 hours at +125°C depending on case size and voltage.

## MVH Specifications

Item	Characteristics																																																					
Category Temperature Range	- 40 to +125°C																																																					
Rated Voltage Range	10 to 450VDC																																																					
Capacitance Range	3.3 to 4,700μF																																																					
Capacitance Tolerance	± 20% (M) at +20°C, 120Hz																																																					
Leakage Current	10-100V: $I = 0.03CV$ or $4\mu A$ , whichever is greater, after 2 minutes at +20°C. 160-450V: $I = 0.04CV + 100\mu A$ after 2 minutes at +20°C. Where I = Max. leakage current (μA), C = Nominal capacitance (μF) and V = Rated voltage (V)																																																					
Dissipation Factor (Tan δ)	At +20°C, 120Hz <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Rated Voltage (V)</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> <th>160-250</th> <th>400-450</th> </tr> </thead> <tbody> <tr> <td>Case F60-J10</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.14</td> <td>0.18</td> <td>0.18</td> <td>-</td> <td>-</td> </tr> <tr> <td>Case K14-M22</td> <td>0.22</td> <td>0.18</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.14</td> <td>0.10</td> <td>0.20</td> <td>0.24</td> </tr> </tbody> </table> When nominal capacitance exceeds 1,000μF, add 0.02 to the values above for each 1,000μF increase.	Rated Voltage (V)	10	16	25	35	50	63	100	160-250	400-450	Case F60-J10	0.24	0.20	0.16	0.14	0.14	0.18	0.18	-	-	Case K14-M22	0.22	0.18	0.16	0.14	0.12	0.14	0.10	0.20	0.24																							
Rated Voltage (V)	10	16	25	35	50	63	100	160-250	400-450																																													
Case F60-J10	0.24	0.20	0.16	0.14	0.14	0.18	0.18	-	-																																													
Case K14-M22	0.22	0.18	0.16	0.14	0.12	0.14	0.10	0.20	0.24																																													
Low Temperature Characteristics	At 120Hz, impedance (Z) ratio between the -25°C or -40°C value and +20°C value shall not exceed the values given below. <table border="1" style="margin-top: 10px;"> <thead> <tr> <th colspan="2">Rated Voltage (V)</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> <th>160-250</th> <th>400-450</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Z(-25°C) / Z(+20°C)</td> <td>F60-J10</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>-</td> <td>-</td> </tr> <tr> <td>K14-M22</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>3</td> <td>6</td> </tr> <tr> <td rowspan="2">Z(-40°C) / Z(+20°C)</td> <td>F60-J10</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>-</td> <td>-</td> </tr> <tr> <td>K14-M22</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>6</td> <td>10</td> </tr> </tbody> </table>	Rated Voltage (V)		10	16	25	35	50	63	100	160-250	400-450	Z(-25°C) / Z(+20°C)	F60-J10	4	3	2	2	2	2	2	-	-	K14-M22	4	3	2	2	2	2	2	3	6	Z(-40°C) / Z(+20°C)	F60-J10	10	8	6	4	4	4	4	-	-	K14-M22	8	6	4	3	3	3	3	6	10
Rated Voltage (V)		10	16	25	35	50	63	100	160-250	400-450																																												
Z(-25°C) / Z(+20°C)	F60-J10	4	3	2	2	2	2	2	-	-																																												
	K14-M22	4	3	2	2	2	2	2	3	6																																												
Z(-40°C) / Z(+20°C)	F60-J10	10	8	6	4	4	4	4	-	-																																												
	K14-M22	8	6	4	3	3	3	3	6	10																																												
Endurance (Load Life)	The following specifications shall be satisfied when the capacitors are restored to +20°C after subjecting them to the DC rated voltage for the specified test time at +125°C. <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Case Code</th> <th>F60-H63</th> <th>H10 &amp; J10</th> <th>K14-M22</th> <th>K14-M22</th> </tr> </thead> <tbody> <tr> <td>Rated Voltage</td> <td>10-100V</td> <td>10-100V</td> <td>10-100V</td> <td>160-450V</td> </tr> <tr> <td>Test Time</td> <td>1,000 Hours</td> <td>2,000 Hours</td> <td>5,000 Hours</td> <td>2,000 Hours</td> </tr> </tbody> </table> Capacitance change : ≤ ± 30% of the initial measured value Tan δ (DF) : ≤ 300% of the initial specified value Leakage current : ≤ initial specified value	Case Code	F60-H63	H10 & J10	K14-M22	K14-M22	Rated Voltage	10-100V	10-100V	10-100V	160-450V	Test Time	1,000 Hours	2,000 Hours	5,000 Hours	2,000 Hours																																						
Case Code	F60-H63	H10 & J10	K14-M22	K14-M22																																																		
Rated Voltage	10-100V	10-100V	10-100V	160-450V																																																		
Test Time	1,000 Hours	2,000 Hours	5,000 Hours	2,000 Hours																																																		
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to +20°C after exposing them for the specified test time at +125°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. <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Case Code</th> <th colspan="2">F60-M22</th> </tr> </thead> <tbody> <tr> <td>Rated Voltage</td> <td>10-250V</td> <td>400-450V</td> </tr> <tr> <td>Test Time</td> <td>1,000 Hours</td> <td>500 Hours</td> </tr> </tbody> </table> Capacitance change: ≤ ± 30% of the initial measured value Tan δ (DF) : ≤ 300% of the initial specified value Leakage current : ≤ initial specified value for 10-50V : ≤ 500% of the initial specified value for 63-450V	Case Code	F60-M22		Rated Voltage	10-250V	400-450V	Test Time	1,000 Hours	500 Hours																																												
Case Code	F60-M22																																																					
Rated Voltage	10-250V	400-450V																																																				
Test Time	1,000 Hours	500 Hours																																																				

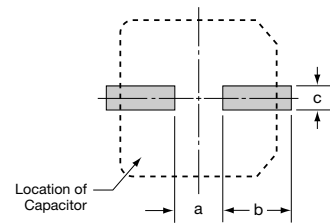
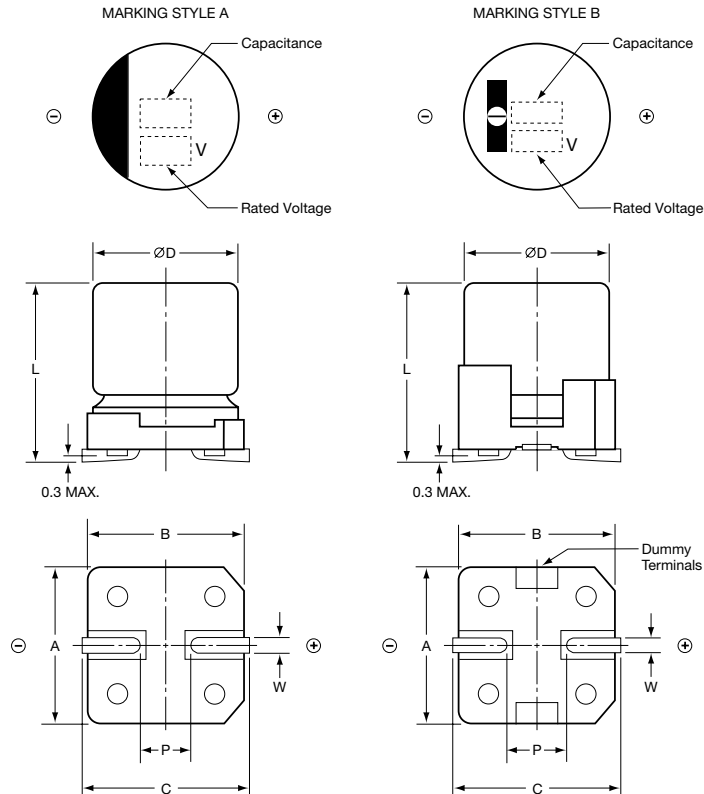
## Diagram of Dimensions

### Vertical Chip SMD Lead Terminals

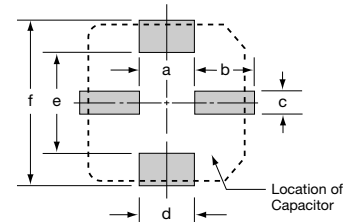
Unit: mm

**VC Type  $\varnothing D = \varnothing 6.3 - \varnothing 12.5^*$** 
**VD Type  $\varnothing D = \varnothing 16 \& \varnothing 18$** 

### Recommended PCB Land Patterns

**VC Type  $\varnothing D = \varnothing 6.3 - \varnothing 12.5$** 


Solder Land

**VD Type  $\varnothing D = \varnothing 16 \& \varnothing 18$** 


Solder Land

\*Marking Style B is used for all  $\varnothing 12.5$  VC Type products.

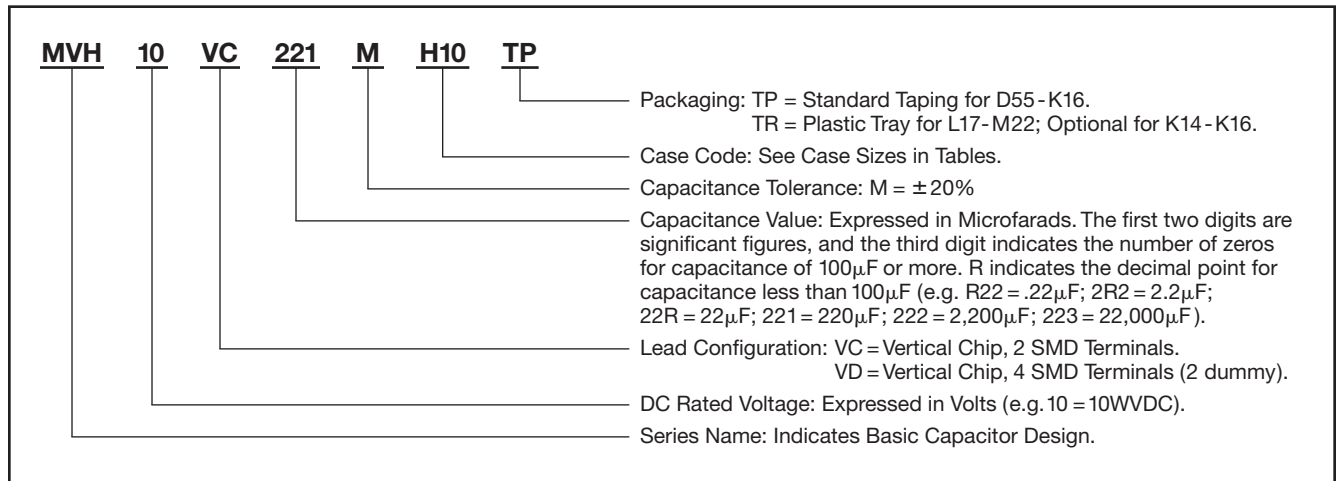
Refer to Packaging section for Surface Mount taping, reel and tray specifications and Surface Mount Soldering section for reflow soldering conditions.

### Case and PCB Land Pattern Dimensions

Case Code	$\varnothing D \pm 0.5$	L	A $\pm 0.2$	B $\pm 0.2$	C $\pm 0.2$	W	P	a	b	c	d	e	f
F60	$\varnothing 6.3$	$5.7 \pm 0.3$	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6	-	-	-
F80	$\varnothing 6.3$	$7.7 \pm 0.3$	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6	-	-	-
H63	$\varnothing 8$	$6.3 \pm 0.5$	8.3	8.3	9.0	0.5-0.8	2.3	2.3	4.5	1.6	-	-	-
H10	$\varnothing 8$	$10.0 \pm 0.5$	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2	-	-	-
J10	$\varnothing 10$	$10.0 \pm 0.5$	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2	-	-	-
K14	$\varnothing 12.5$	$13.5 \pm 0.5$	13.0	13.0	13.7	1.0-1.3	4.2	4.0	5.7	2.5	-	-	-
K16	$\varnothing 12.5$	$16.0 \pm 0.5$	13.0	13.0	13.7	1.0-1.3	4.2	4.0	5.7	2.5	-	-	-
L17	$\varnothing 16$	$16.5 \pm 0.5$	17.0	17.0	18.0	1.0-1.3	6.5	6.0	6.9	2.5	6.5	11.0	19.2
L22	$\varnothing 16$	$21.5 \pm 0.5$	17.0	17.0	18.0	1.0-1.3	6.5	6.0	6.9	2.5	6.5	11.0	19.2
M17	$\varnothing 18$	$16.5 \pm 0.5$	19.0	19.0	20.0	1.0-1.3	6.5	6.0	7.9	2.5	6.5	13.0	21.2
M22	$\varnothing 18$	$21.5 \pm 0.5$	19.0	19.0	20.0	1.0-1.3	6.5	6.0	7.9	2.5	6.5	13.0	21.2

## Part Numbering System for MVH Series

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



## Standard Voltage Ratings - Surface Mount (10-100V)

Rated Voltage (WVDC)	Capacitance ( $\mu$ F)	Catalog Part Number	Nominal Case Size* D x L (mm)	Case Code	Maximum ESR ( $\Omega$ ) at		Rated Ripple Current (mA rms) at +125°C, 100kHz
					+20°C, 100kHz	-40°C, 100kHz	
<b>10 Volts</b> 13 Volts Surge	100	MVH10VC101MF80TP	6.3 x 7.7	F80	2.3	46	72
	100	MVH10VC101MH63TP	8 x 6.3	H63	2.3	46	72
	220	MVH10VC221MH10TP	8 x 10	H10	1.0	20	136
	330	MVH10VC331MJ10TP	10 x 10	J10	0.7	13.4	188
	1,000	MVH10VC102MK14TP	12.5 x 13.5	K14	0.14	2.1	750
	2,200	MVH10VD222ML17TR	16 x 16.5	L17	0.10	1.5	1,000
	2,200	MVH10VD222MM17TR	18 x 16.5	M17	0.10	1.5	1,200
	3,300	MVH10VD332MM17TR	18 x 16.5	M17	0.10	1.5	1,200
<b>16 Volts</b> 20 Volts Surge	47	MVH16VC47RMF60TP	6.3 x 5.7	F60	3.3	66	43
	470	MVH16VC471MK14TP	12.5 x 13.5	K14	0.14	2.1	750
	680	MVH16VC681MK14TP	12.5 x 13.5	K14	0.14	2.1	750
	680	MVH16VD681ML17TR	16 x 16.5	L17	0.10	1.5	1,000
	1,000	MVH16VD102MM17TR	18 x 16.5	M17	0.10	1.5	1,200
	2,200	MVH16VD222MM17TR	18 x 16.5	M17	0.10	1.5	1,200
<b>25 Volts</b> 32 Volts Surge	33	MVH25VC33RMF60TP	6.3 x 5.7	F60	3.3	66	45
	47	MVH25VC47RMF80TP	6.3 x 7.7	F80	2.3	46	68
	47	MVH25VC47RMH63TP	8 x 6.3	H63	2.3	46	68
	100	MVH25VC101MH10TP	8 x 10	H10	1.0	20	126
	220	MVH25VC221MJ10TP	10 x 10	J10	0.7	13.4	211
	330	MVH25VC331MK14TP	12.5 x 13.5	K14	0.14	2.1	750
	470	MVH25VC471MK14TP	12.5 x 13.5	K14	0.14	2.1	750
	470	MVH25VD471ML17TR	16 x 16.5	L17	0.10	1.5	1,000
	680	MVH25VD681ML17TR	16 x 16.5	L17	0.10	1.5	1,000
	680	MVH25VD681MM17TR	18 x 16.5	M17	0.10	1.5	1,200
<b>35 Volts</b> 44 Volts Surge	10	MVH35VC10RMF60TP	6.3 x 5.7	F60	3.3	66	27
	22	MVH35VC22RMF60TP	6.3 x 5.7	F60	3.3	66	39
	33	MVH35VC33RMF80TP	6.3 x 7.7	F80	2.3	46	62
	33	MVH35VC33RMH63TP	8 x 6.3	H63	2.3	46	62
	47	MVH35VC47RMH10TP	8 x 10	H10	1.0	20	92
	100	MVH35VC101MJ10TP	10 x 10	J10	0.7	13.4	151
	330	MVH35VC331MK14TP	12.5 x 13.5	K14	0.14	2.1	750
	330	MVH35VD331ML17TR	16 x 16.5	L17	0.10	1.5	1,000
	470	MVH35VC471MK16TP	12.5 x 16	K16	0.11	1.5	900
	470	MVH35VD471ML17TR	16 x 16.5	L17	0.10	1.5	1,000
680	MVH35VD681MM17TR	18 x 16.5	M17	0.10	1.5	1,200	

\*Refer to diagrams for detailed case size dimensions.

## Standard Voltage Ratings - Surface Mount (10-100V)

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Case Code	Maximum ESR (Ω) at		Rated Ripple Current (mA rms) at +125°C, 100kHz
					+20°C, 100kHz	-40°C, 100kHz	

<b>50 Volts</b> 63 Volts Surge	10	MVH50VC10RMF60TP	6.3 × 5.7	F60	3.3	66	38
	22	MVH50VC22RMF80TP	6.3 × 7.7	F80	2.3	46	50
	22	MVH50VC22RMH63TP	8 × 6.3	H63	2.3	46	50
	33	MVH50VC33RMH10TP	8 × 10	H10	1.0	20	83
	47	MVH50VC47RMJ10TP	10 × 10	J10	0.7	13.4	111
	100	MVH50VC101MK14TP	12.5 × 13.5	K14	0.23	3.5	550
	220	MVH50VC221MK14TP	12.5 × 13.5	K14	0.23	3.5	550
	220	MVH50VD221ML17TR	16 × 16.5	L17	0.15	2.3	850
	330	MVH50VC331MK16TP	12.5 × 16	K16	0.18	2.7	700
	330	MVH50VD331ML17TR	16 × 16.5	L17	0.15	2.3	850
470	MVH50VD471MM17TR	18 × 16.5	M17	0.15	2.3	920	

<b>63 Volts</b> 79 Volts Surge Not Solvent Proof	10	MVH63VC10RMF80TP	6.3 × 7.7	F80	2.3	115	42
	10	MVH63VC10RMH63TP	8 × 6.3	H63	2.3	115	42
	22	MVH63VC22RMH10TP	8 × 10	H10	1.0	50	56
	33	MVH63VC33RMJ10TP	10 × 10	J10	0.7	35	71
	100	MVH63VC101MK14TP	12.5 × 13.5	K14	0.25	12.5	500
	220	MVH63VC221MK16TP	12.5 × 16	K16	0.2	10	600
	330	MVH63VD331ML17TR	16 × 16.5	L17	0.18	9	820
	470	MVH63VD471ML22TR	16 × 21.5	L22	0.11	5.5	1,100

<b>100 Volts</b> 125 Volts Surge Not Solvent Proof	10	MVH100VC10RMH10TP	8 × 10	H10	1.0	50	53
	22	MVH100VC22RMJ10TP	10 × 10	J10	0.7	35	63
	47	MVH100VC47RMK14TP	12.5 × 13.5	K14	0.33	16.5	450
	68	MVH100VC68RMK16TP	12.5 × 16	K16	0.26	13	550
	100	MVH100VD101ML17TR	16 × 16.5	L17	0.24	12	650
	220	MVH100VD221MM22TR	18 × 21.5	M22	0.16	8	950

## Standard Voltage Ratings - Surface Mount (160-450V)

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Case Code	Maximum ESR (Ω) at +20°C, 120Hz	Rated Ripple Current (mA rms) at +125°C, 120Hz
----------------------	------------------	---------------------	-------------------------------	-----------	---------------------------------	--

<b>160 Volts</b> 200 Volts Surge Not Solvent Proof	10	MVH160VC10RMK14TP	12.5 × 13.5	K14	33.16	100
	22	MVH160VD22RML17TR	16 × 16.5	L17	15.07	180
	33	MVH160VD33RMM17TR	18 × 16.5	M17	10.05	245
	68	MVH160VD68RMM22TR	18 × 21.5	M22	4.88	380

<b>200 Volts</b> 250 Volts Surge Not Solvent Proof	10	MVH200VC10RMK14TP	12.5 × 13.5	K14	33.16	100
	22	MVH200VD22RML17TR	16 × 16.5	L17	15.07	180
	33	MVH200VD33RML22TR	16 × 21.5	L22	10.05	250
	33	MVH200VD33RMM17TR	18 × 16.5	M17	10.05	245
	47	MVH200VD47RMM22TR	18 × 21.5	M22	7.05	315

<b>250 Volts</b> 300 Volts Surge Not Solvent Proof	10	MVH250VC10RMK16TP	12.5 × 16	K16	33.16	110
	22	MVH250VD22RML22TR	16 × 21.5	L22	15.07	205
	22	MVH250VD22RMM17TR	18 × 16.5	M17	15.07	200
	33	MVH250VD33RMM22TR	18 × 21.5	M22	10.05	260

<b>400 Volts</b> 450 Volts Surge Not Solvent Proof	4.7	MVH400VC4R7MK14TP	12.5 × 13.5	K14	84.66	70
	6.8	MVH400VD6R8ML17TR	16 × 16.5	L17	58.51	100
	10	MVH400VD10RML22TR	16 × 21.5	L22	39.79	140
	10	MVH400VD10RMM17TR	18 × 16.5	M17	39.79	135

<b>450 Volts</b> 500 Volts Surge Not Solvent Proof	3.3	MVH450VC3R3MK16TP	12.5 × 16	K16	120.57	65
	4.7	MVH450VD4R7ML17TR	16 × 16.5	L17	84.66	85
	10	MVH450VD10RMM22TR	18 × 21.5	M22	39.79	145

\*Refer to diagrams for detailed case size dimensions.