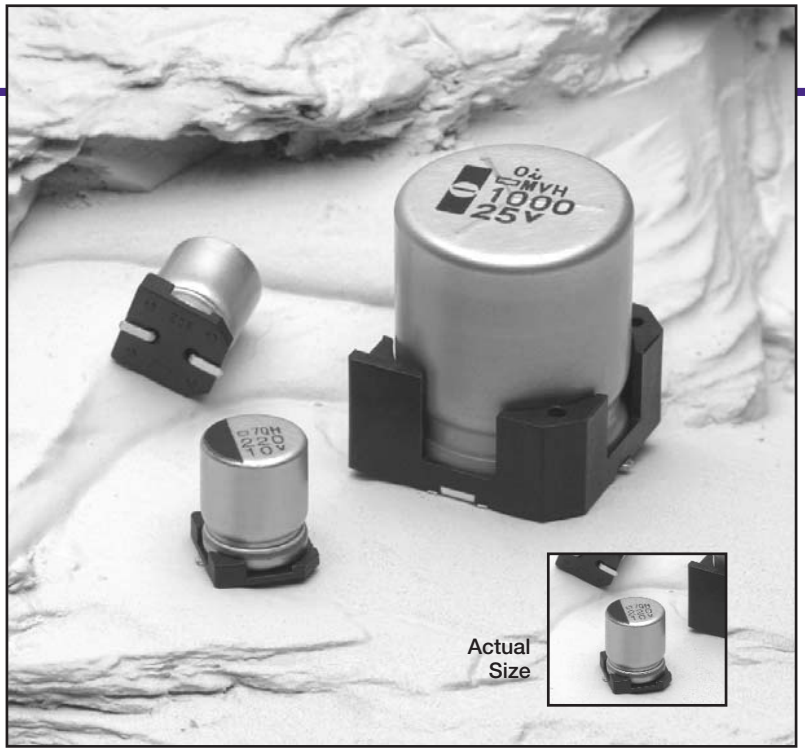
UPGRADE
Engineering Bulletin Jul 03

MVH Series

UNITED CHEMI-CON

- 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 4,700µF.**
- **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: ±20%**
- **Nominal case size (D×L): 6.3×5.7mm to 18×21.5mm.**
- **Rated lifetime: 1,000 to 5,000 hours at +125°C depending on case size and voltage.**

MVH Series

MVH Specifications

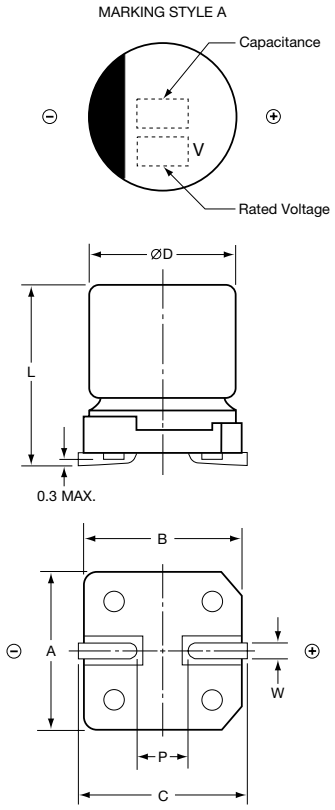
<table>
<tr><th>Item</th><th>Characteristics</th></tr>
<tr><td>Category Temperature Range</td><td>−40 to +125°C</td></tr>
<tr><td>Rated Voltage Range</td><td>10 to 450VDC</td></tr>
<tr><td>Capacitance Range</td><td>3.3 to 4,700μF</td></tr>
<tr><td>Capacitance Tolerance</td><td>±20% (M) at +20°C, 120Hz</td></tr>
<tr><td>Leakage Current</td><td>10-100V: I = 0.03CV or 4μA, whichever is greater, after 2 minutes at +20°C.
160-450V: I = 0.04CV+100μA after 2 minutes at +20°C.
Where I = Max. leakage current (μA), C = Nominal capacitance (μF) and V = Rated voltage (V)</td></tr>
<tr><td>Dissipation Factor (Tan δ)</td><td>At +20°C, 120Hz
<table>
<tr><td>Rated Voltage (V)</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td><td>160-250</td><td>400-450</td></tr>
<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>
</table>
When nominal capacitance exceeds 1,000μF, add 0.02 to the values above for each 1,000μF increase.</td></tr>
<tr><td>Low Temperature Characteristics</td><td>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>
<tr><td colspan="2">Rated Voltage (V)</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td><td>160-250</td><td>400-450</td></tr>
<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>
</table></td></tr>
<tr><td>Endurance (Load Life)</td><td>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>
<tr><td>Case Code</td><td>F60-H63</td><td>H10 & J10</td><td>K14-M22</td><td>K14-M22</td></tr>
<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>
</table>
Capacitance change : ≤ ±30% of the initial measured value
Tan δ (DF) : ≤ 300% of the initial specified value
Leakage current : ≤ initial specified value</td></tr>
<tr><td>Shelf Life</td><td>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>
<tr><td>Case Code</td><td colspan="2">F60-M22</td></tr>
<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>
</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</td></tr>
</table>

Diagram of Dimensions

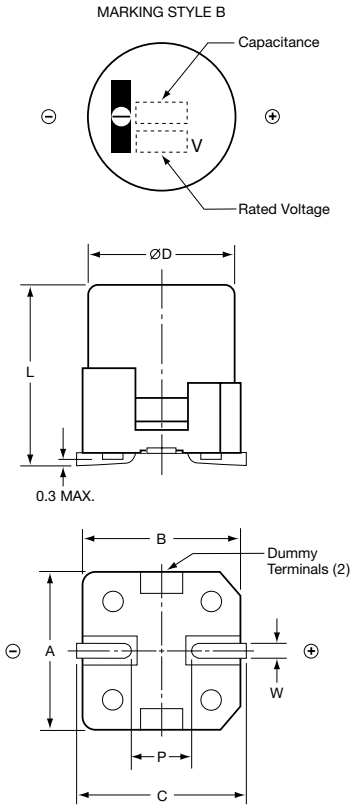
Vertical Chip SMD Lead Terminals

Unit: mm

VC Type ØD = Ø6.3 - Ø12.5*

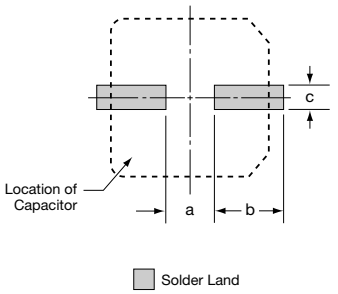


VD Type ØD = Ø16 & Ø18

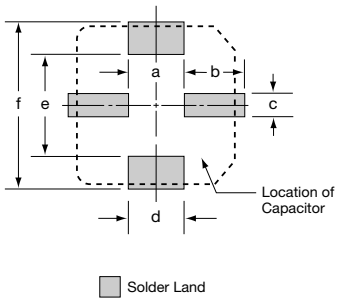


Recommended PCB Land Patterns

VC Type ØD = Ø6.3 - Ø12.5



VD Type ØD = Ø16 & Ø18



*Marking Style B is used for all Ø12.5 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	øD ±0.5	L	A ±0.2	B ±0.2	C ±0.2	W	P	a	b	c	d	e	f
F60	ø6.3	5.7±0.3	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6	–	–	–
F80	ø6.3	7.7±0.3	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6	–	–	–
H63	ø8	6.3±0.5	8.3	8.3	9.0	0.5-0.8	2.3	2.3	4.5	1.6	–	–	–
H10	ø8	10.0±0.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2	–	–	–
J10	ø10	10.0±0.5	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2	–	–	–
K14	ø12.5	13.5±0.5	13.0	13.0	13.7	1.0-1.3	4.2	4.0	5.7	2.5	–	–	–
K16	ø12.5	16.0±0.5	13.0	13.0	13.7	1.0-1.3	4.2	4.0	5.7	2.5	–	–	–
L17	ø16	16.5±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	ø16	21.5±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	ø18	16.5±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	ø18	21.5±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

MVH Series

Part Numbering System for MVH Series

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

MVH 10 VC 221 M H10 TP

- TP: Packaging: TP = Standard Taping for D55-K16. TR = Plastic Tray for L17-M22; Optional for K14-K16.
- H10: Case Code: See Case Sizes in Tables.
- M: Capacitance Tolerance: M = ±20%
- 221: Capacitance Value: Expressed in Microfarads. The first two digits are significant figures, and the third digit indicates the number of zeros for capacitance of 100μF or more. R indicates the decimal point for capacitance less than 100μF (e.g. R22 = .22μF; 2R2 = 2.2μF; 22R = 22μF; 221 = 220μF; 222 = 2,200μF; 223 = 22,000μF).
- VC: Lead Configuration: VC = Vertical Chip, 2 SMD Terminals. VD = Vertical Chip, 4 SMD Terminals (2 dummy).
- 10: DC Rated Voltage: Expressed in Volts (e.g. 10 = 10WVDC).
- MVH: Series Name: Indicates Basic Capacitor Design.

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 +20°C, 100kHz	Maximum ESR (Ω) at −40°C, 100kHz	Rated Ripple Current (mA rms) at +125°C, 100kHz
10 Volts 13 Volts Surge	100	MVH10VC101MF80TP	6.3 × 7.7	F80	2.3	46	72
	100	MVH10VC101MH63TP	8 × 6.3	H63	2.3	46	72
	220	MVH10VC221MH10TP	8 × 10	H10	1.0	20	136
	330	MVH10VC331MJ10TP	10 × 10	J10	0.7	13.4	188
	1,000	MVH10VC102MK14TP	12.5 × 13.5	K14	0.14	2.1	750
	2,200	MVH10VD222ML17TR	16 × 16.5	L17	0.10	1.5	1,000
	2,200	MVH10VD222MM17TR	18 × 16.5	M17	0.10	1.5	1,200
	3,300	MVH10VD332MM17TR	18 × 16.5	M17	0.10	1.5	1,200
	4,700	MVH10VD472MM22TR	18 × 21.5	M22	0.058	0.87	1,550
16 Volts 20 Volts Surge	47	MVH16VC47RMF60TP	6.3 × 5.7	F60	3.3	66	43
	470	MVH16VC471MK14TP	12.5 × 13.5	K14	0.14	2.1	750
	680	MVH16VC681MK14TP	12.5 × 13.5	K14	0.14	2.1	750
	680	MVH16VD681ML17TR	16 × 16.5	L17	0.10	1.5	1,000
	1,000	MVH16VD102MM17TR	18 × 16.5	M17	0.10	1.5	1,200
	2,200	MVH16VD222MM17TR	18 × 16.5	M17	0.10	1.5	1,200
25 Volts 32 Volts Surge	33	MVH25VC33RMF60TP	6.3 × 5.7	F60	3.3	66	45
	47	MVH25VC47RMF80TP	6.3 × 7.7	F80	2.3	46	68
	47	MVH25VC47RMH63TP	8 × 6.3	H63	2.3	46	68
	100	MVH25VC101MH10TP	8 × 10	H10	1.0	20	126
	220	MVH25VC221MJ10TP	10 × 10	J10	0.7	13.4	211
	330	MVH25VC331MK14TP	12.5 × 13.5	K14	0.14	2.1	750
	470	MVH25VC471MK14TP	12.5 × 13.5	K14	0.14	2.1	750
	470	MVH25VD471ML17TR	16 × 16.5	L17	0.10	1.5	1,000
	680	MVH25VD681ML17TR	16 × 16.5	L17	0.10	1.5	1,000
	680	MVH25VD681MM17TR	18 × 16.5	M17	0.10	1.5	1,200
	1,000	MVH25VD102MM22TR	18 × 21.5	M22	0.058	0.87	1,550
35 Volts 44 Volts Surge	10	MVH35VC10RMF60TP	6.3 × 5.7	F60	3.3	66	27
	22	MVH35VC22RMF60TP	6.3 × 5.7	F60	3.3	66	39
	33	MVH35VC33RMF80TP	6.3 × 7.7	F80	2.3	46	62
	33	MVH35VC33RMH63TP	8 × 6.3	H63	2.3	46	62
	47	MVH35VC47RMH10TP	8 × 10	H10	1.0	20	92
	100	MVH35VC101MJ10TP	10 × 10	J10	0.7	13.4	151
	330	MVH35VC331MK14TP	12.5 × 13.5	K14	0.14	2.1	750
	330	MVH35VD331ML17TR	16 × 16.5	L17	0.10	1.5	1,000
	470	MVH35VC471MK16TP	12.5 × 16	K16	0.11	1.5	900
	470	MVH35VD471ML17TR	16 × 16.5	L17	0.10	1.5	1,000
	680	MVH35VD681MM17TR	18 × 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 +20°C, 100kHz	Maximum ESR (Ω) at −40°C, 100kHz	Rated Ripple Current (mA rms) at +125°C, 100kHz
50 Volts 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
63 Volts 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
100 Volts 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
160 Volts 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
200 Volts 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
250 Volts 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
400 Volts 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
450 Volts 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.