

- **Miniature**
- **General Purpose**
- **Solvent Proof**
- **+105°C
Maximum
Temperature**



The KMG series capacitors are designed for general purpose use with an operating temperature range for most of these capacitors from -55°C to $+105^{\circ}\text{C}$. The KMG series is a miniaturized version of the KME series with a load life of 1,000 hours at 105°C with the rated ripple current applied.

The KMG series capacitors below 350 volts were developed to withstand HCFC cleaning agents for five minutes by ultrasonic, vapor or immersion. This solvent proof design allows all circuit board components to be cleaned together, at the same time, without resorting to more expensive epoxy end-sealed capacitors. Refer to the Mini-Glossary for recommended cleaning conditions.

Summary of Specifications

- **Radial lead terminals.**
- **Capacitance range: 0.1 to 22,000 μF .**
- **Voltage range: 6.3 to 450VDC.**
- **Operating temperature range: -55°C to $+105^{\circ}\text{C}$ for 6.3 to 100V; -40°C to $+105^{\circ}\text{C}$ for 160 to 400V; -25°C to $+105^{\circ}\text{C}$ for 450V.**
- **Leakage current: See specifications table for leakage current values at $+20^{\circ}\text{C}$.**
- **Standard capacitance tolerance: $\pm 20\%$**
- **Nominal case size (D \times L): 5 \times 11mm to 18 \times 40mm.**
- **Rated lifetime: 1,000 to 2,000 hours at $+105^{\circ}\text{C}$ with the rated ripple current applied, depending on rated voltage and case size.**

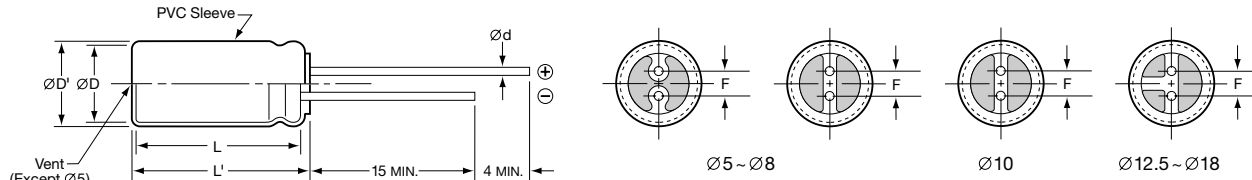
Item	Characteristics											
	6.3 to 100VDC	160 to 400VDC	450VDC									
Rated Voltage Range												
Operating Temperature Range	-55 to +105°C	-40 to +105°C	-25 to +105°C									
Capacitance Range	0.1 to 22,000μF											
Capacitance Tolerance	±20% (M) at +20°C, 120Hz											
Leakage Current	At +20°C											
	DC Rated Voltage	Test Time	Leakage Current (μA)									
	6.3-100V	After 1 minute	I = 0.03CV or 4μA, whichever is greater.									
	160-450V	After 1 minute	CV ≤ 1,000: I = 0.1CV + 40	CV > 1,000: I = 0.04CV + 100								
After 5 minutes		CV ≤ 1,000: I = 0.03CV + 15	CV > 1,000: I = 0.02CV + 25									
Where I = Leakage current (μA), C = Nominal capacitance (μF) and V = Rated voltage (V)												
Dissipation Factor (Tan δ)	At +20°C, 120Hz											
	Rated Voltage (V)	6.3	10	16	25	35	50	63	100	160-250	350-450	
	Tan δ (DF)	0.34	0.24	0.20	0.16	0.14	0.12	0.10	0.08	0.20	0.24	
When nominal capacitance exceeds 1,000μF, add 0.02 to the values above for each 1,000μF increase.												
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.											
	Rated Voltage (V)	6.3	10	16	25	35	50-100	160-250	350-400	450		
	Z(-25°C) / Z(+20°C)	5	4	3	2	2	2	3	6	6		
	Z(-40°C) / Z(+20°C)	12	10	8	5	4	3	4	6	-		
Ripple Current Multipliers <i>Refer to Section 4 of the Mini-Glossary for explanation of Ripple Current Multipliers.</i>	Ambient Temperature (°C)											
	+85°C	+105°C										
	1.75	1.00										
	Frequency (Hz)											
	Capacitance (μF)	50Hz	120Hz	300Hz	1kHz	10kHz	100kHz					
	≤ 3.3μF	0.65	1.00	1.35	1.75	2.30	2.50					
4.7-33μF	0.75	1.00	1.25	1.50	1.75	1.80						
47-1000μF	0.80	1.00	1.15	1.30	1.40	1.50						
≥ 2200μF	0.85	1.00	1.03	1.05	1.08	1.08						
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 +105°C with the rated ripple current applied. The sum of DC voltage and peak AC voltage must not exceed the full rated voltage of the capacitors.											
	Case Diameter	Test Time										
	Ø5-Ø10mm	1,000 hours for 6.3-450V										
	Ø12.5-Ø18mm	1,000 hours for 6.3-100V 2,000 hours for 160-450V										
Capacitance change: ≤ ±20% of initial measured value												
Tan δ (DF) : ≤ 200% of initial specified value												
Leakage current : ≤ 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 +105°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: ≤ ±20% of initial measured value											
	Tan δ (DF) : ≤ 200% of initial specified value											
	Leakage current : ≤ initial specified value for 6.3-100V : ≤ 500% of initial specified value for 160-450V											
Others	Satisfies characteristic W of JIS C5141											

KMG Series

Diagram of Dimensions

VB/Radial Lead

Unit: mm



Gas escape end seal for all case diameters.

For optional lead configurations and tape and ammo packaging, refer to the beginning of the Miniature section.

ØD	ØD' max.	L' max.	Ød	F ± 0.5
5	ØD + 0.5	L + 1.5	0.5	2.0
6.3	ØD + 0.5	L + 1.5	0.5	2.5
8	ØD + 0.5	L + 1.5	0.6	3.5
10, 12.5	ØD + 0.5	L + 1.5	0.6	5.0
16, 18	ØD + 0.5	L + 1.5	0.8	7.5

Part Numbering System for KMG Series

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

KMG 400 VB 22R M 12X25 LL

- Lead Length: LL is Standard.
- Case Code: See Case Sizes in Tables.
- Capacitance Tolerance: M = ± 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 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).
- Lead Configuration: VB = Radial Lead Terminals.
- DC Rated Voltage: Expressed in Volts (e.g. 400 = 400WVDC).
- Series Name: Indicates Basic Capacitor Design.

Standard Voltage Ratings - VB/Radial Lead

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Maximum Ripple Current (mA rms) at +105°C, 120Hz
6.3 Volts 8 Volts Surge	220	KMG6.3VB221M5X11LL	5 × 11	2.562	140
	330	KMG6.3VB331M6X11LL	6.3 × 11	1.708	190
	470	KMG6.3VB471M6X11LL	6.3 × 11	1.199	230
	680	KMG6.3VB681M8X11LL	8 × 11.5	0.829	310
	1,000	KMG6.3VB102M8X11LL	8 × 11.5	0.564	380
	1,500	KMG6.3VB152M10X16LL	10 × 16	0.376	540
	2,200	KMG6.3VB222M10X20LL	10 × 20	0.271	710
	3,300	KMG6.3VB332M10X20LL	10 × 20	0.191	840
	4,700	KMG6.3VB472M12X20LL	12.5 × 20	0.141	1,090
	6,800	KMG6.3VB682M12X25LL	12.5 × 25	0.107	1,350
	10,000	KMG6.3VB103M16X25LL	16 × 25	0.086	1,650
	15,000	KMG6.3VB153M16X35LL	16 × 35.5	0.069	2,010
22,000	KMG6.3VB223M18X40LL	18 × 40	0.057	2,350	

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

KMG Series

Standard Voltage Ratings - VB/Radial Lead

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Maximum Ripple Current (mA rms) at +105°C, 120Hz
10 Volts 13 Volts Surge	220	KMG10VB221M6X11LL	6.3 × 11	1.808	170
	330	KMG10VB331M6X11LL	6.3 × 11	1.205	200
	470	KMG10VB471M6X11LL	6.3 × 11	0.846	250
	680	KMG10VB681M10X12LL	10 × 12.5	0.585	380
	1,000	KMG10VB102M10X12LL	10 × 12.5	0.398	460
	1,500	KMG10VB152M10X20LL	10 × 20	0.265	625
	2,200	KMG10VB222M10X20LL	10 × 20	0.196	760
	3,300	KMG10VB332M12X20LL	12.5 × 20	0.141	1,000
	4,700	KMG10VB472M12X25LL	12.5 × 25	0.106	1,260
	6,800	KMG10VB682M16X25LL	16 × 25	0.083	1,570
	10,000	KMG10VB103M16X35LL	16 × 35.5	0.07	1,890
15,000	KMG10VB153M18X35LL	18 × 35.5	0.057	2,180	
16 Volts 20 Volts Surge	100	KMG16VB101M5X11LL	5 × 11	3.315	110
	150	KMG16VB151M6X11LL	6.3 × 11	2.21	145
	220	KMG16VB221M6X11LL	6.3 × 11	1.507	180
	330	KMG16VB331M8X11LL	8 × 11.5	1.005	260
	470	KMG16VB471M8X11LL	8 × 11.5	0.705	310
	680	KMG16VB681M10X16LL	10 × 16	0.488	460
	1,000	KMG16VB102M10X16LL	10 × 16	0.332	560
	1,500	KMG16VB152M12X20LL	12.5 × 20	0.221	760
	2,200	KMG16VB222M12X20LL	12.5 × 20	0.166	920
	3,300	KMG16VB332M12X25LL	12.5 × 25	0.121	1,170
	4,700	KMG16VB472M16X25LL	16 × 25	0.092	1,480
6,800	KMG16VB682M16X31LL	16 × 31.5	0.073	1,780	
10,000	KMG16VB103M18X35LL	18 × 35.5	0.063	2,060	
25 Volts 32 Volts Surge	47	KMG25VB47RM5X11LL	5 × 11	5.643	80
	68	KMG25VB68RM5X11LL	5 × 11	3.9	96
	100	KMG25VB101M6X11LL	6.3 × 11	2.652	130
	150	KMG25VB151M8X11LL	8 × 11.5	1.768	160
	220	KMG25VB221M8X11LL	8 × 11.5	1.205	230
	330	KMG25VB331M8X11LL	8 × 11.5	0.804	310
	470	KMG25VB471M10X12LL	10 × 12.5	0.564	380
	680	KMG25VB681M10X20LL	10 × 20	0.39	560
	1,000	KMG25VB102M10X20LL	10 × 20	0.265	680
	1,500	KMG25VB152M12X25LL	12.5 × 25	0.177	895
	2,200	KMG25VB222M12X25LL	12.5 × 25	0.136	1,090
	3,300	KMG25VB332M16X25LL	16 × 25	0.1	1,400
	4,700	KMG25VB472M16X31LL	16 × 31.5	0.078	1,710
6,800	KMG25VB682M18X35LL	18 × 35.5	0.063	2,040	
35 Volts 44 Volts Surge	47	KMG35VB47RM5X11LL	5 × 11	4.937	90
	68	KMG35VB68RM6X11LL	6.3 × 11	3.413	120
	100	KMG35VB101M6X11LL	6.3 × 11	2.321	150
	150	KMG35VB151M8X11LL	8 × 11.5	1.547	220
	220	KMG35VB221M8X11LL	8 × 11.5	1.055	270
	330	KMG35VB331M10X12LL	10 × 12.5	0.703	350
	470	KMG35VB471M10X16LL	10 × 16	0.494	460
	680	KMG35VB681M12X20LL	12.5 × 20	0.341	665
	1,000	KMG35VB102M12X20LL	12.5 × 20	0.232	810
	1,500	KMG35VB152M16X25LL	16 × 25	0.155	1,030
	2,200	KMG35VB222M16X25LL	16 × 25	0.121	1,260
	3,300	KMG35VB332M16X35LL	16 × 35.5	0.09	1,610
	4,700	KMG35VB472M18X35LL	18 × 35.5	0.071	1,910

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

KMG Series

Standard Voltage Ratings - VB/Radial Lead

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Maximum Ripple Current (mA rms) at +105°C, 120Hz
50 Volts 63 Volts Surge	0.1	KMG50VBR10M5X11LL	5 × 11	1,989.0	1.3
	0.22	KMG50VBR22M5X11LL	5 × 11	904.091	2.9
	0.33	KMG50VBR33M5X11LL	5 × 11	602.727	4.3
	0.47	KMG50VBR47M5X11LL	5 × 11	423.191	6.2
	1.0	KMG50VB1R0M5X11LL	5 × 11	198.9	13
	2.2	KMG50VB2R2M5X11LL	5 × 11	90.409	20
	3.3	KMG50VB3R3M5X11LL	5 × 11	60.273	25
	4.7	KMG50VB4R7M5X11LL	5 × 11	42.319	30
	10	KMG50VB10RM5X11LL	5 × 11	19.89	40
	22	KMG50VB22RM5X11LL	5 × 11	9.041	65
	33	KMG50VB33RM5X11LL	5 × 11	6.027	90
	47	KMG50VB47RM6X11LL	6.3 × 11	4.232	110
	68	KMG50VB68RM8X11LL	8 × 11.5	2.925	145
	100	KMG50VB101M8X11LL	8 × 11.5	1.989	180
	150	KMG50VB151M10X12LL	10 × 12.5	1.326	245
	220	KMG50VB221M10X12LL	10 × 12.5	0.904	300
	330	KMG50VB331M10X16LL	10 × 16	0.603	410
	470	KMG50VB471M10X20LL	10 × 20	0.423	530
680	KMG50VB681M12X25LL	12.5 × 25	0.293	780	
1,000	KMG50VB102M12X25LL	12.5 × 25	0.199	950	
1,500	KMG50VB152M16X31LL	16 × 31.5	0.133	1,410	
2,200	KMG50VB222M16X35LL	16 × 35.5	0.105	1,470	
3,300	KMG50VB332M18X35LL	18 × 35.5	0.08	1,770	
63 Volts 79 Volts Surge	10	KMG63VB10RM5X11LL	5 × 11	16.575	46
	22	KMG63VB22RM5X11LL	5 × 11	7.534	71
	33	KMG63VB33RM6X11LL	6.3 × 11	5.023	100
	47	KMG63VB47RM6X11LL	6.3 × 11	3.527	120
	100	KMG63VB101M10X12LL	10 × 12.5	1.658	215
	220	KMG63VB221M10X16LL	10 × 16	0.753	335
	330	KMG63VB331M10X20LL	10 × 20	0.502	510
	470	KMG63VB471M12X20LL	12.5 × 20	0.353	640
1,000	KMG63VB102M16X25LL	16 × 25	0.166	930	
100 Volts 125 Volts Surge	0.47	KMG100VBR47M5X11LL	5 × 11	282.128	7.1
	1.0	KMG100VB1R0M5X11LL	5 × 11	132.6	15
	2.2	KMG100VB2R2M5X11LL	5 × 11	60.273	21
	3.3	KMG100VB3R3M5X11LL	5 × 11	40.182	29
	4.7	KMG100VB4R7M5X11LL	5 × 11	28.213	32
	10	KMG100VB10RM6X11LL	6.3 × 11	13.26	54
	22	KMG100VB22RM8X11LL	8 × 11.5	6.027	93
	33	KMG100VB33RM8X11LL	8 × 11.5	4.018	130
	47	KMG100VB47RM10X12LL	10 × 12.5	2.821	165
	100	KMG100VB101M10X20LL	10 × 20	1.326	265
	220	KMG100VB221M12X25LL	12.5 × 25	0.603	440
	330	KMG100VB331M16X25LL	16 × 25	0.402	540
470	KMG100VB471M16X31LL	16 × 31.5	0.282	715	
1,000	KMG100VB102M18X40LL	18 × 40	0.133	985	
160 Volts 200 Volts Surge	3.3	KMG160VB3R3M6X11LL	6.3 × 11	100.455	28
	4.7	KMG160VB4R7M6X11LL	6.3 × 11	70.532	34
	10	KMG160VB10RM10X12LL	10 × 12.5	33.15	67
	22	KMG160VB22RM10X20LL	10 × 20	15.068	120
	33	KMG160VB33RM10X20LL	10 × 20	10.045	145
	47	KMG160VB47RM12X20LL	12.5 × 20	7.053	195
	100	KMG160VB101M16X25LL	16 × 25	3.315	335
	220	KMG160VB221M16X31LL	16 × 31.5	1.507	540
330	KMG160VB331M18X35LL	18 × 35.5	1.005	705	

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

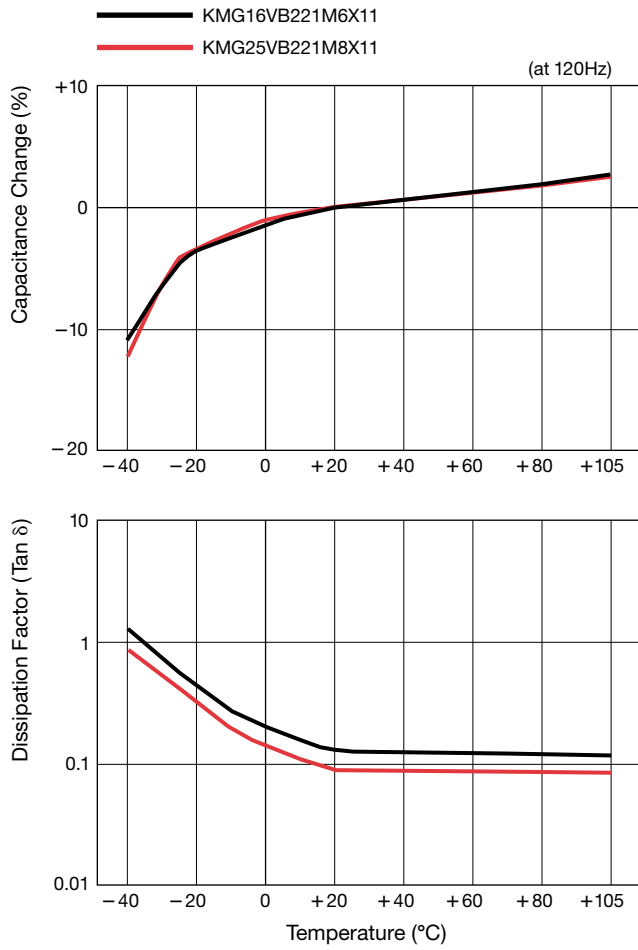
KMG Series

Standard Voltage Ratings - VB/Radial Lead

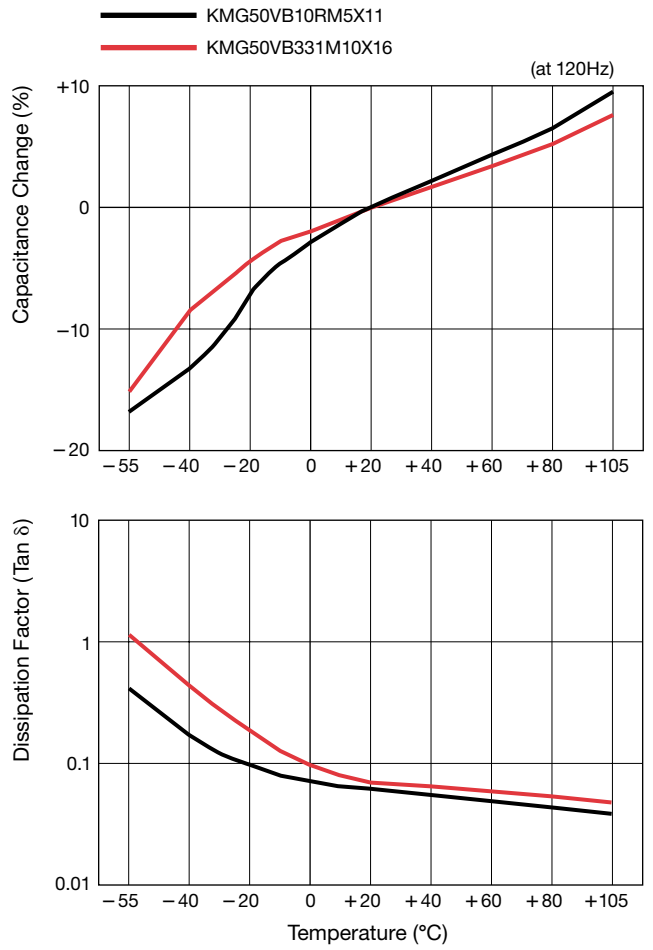
Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Maximum Ripple Current (mA rms) at +105°C, 120Hz
200 Volts 250 Volts Surge	3.3	KMG200VB3R3M6X11LL	6.3 × 11	100.455	28
	4.7	KMG200VB4R7M8X11LL	8 × 11.5	70.532	39
	10	KMG200VB10RM10X16LL	10 × 16	33.15	74
	22	KMG200VB22RM10X20LL	10 × 20	15.068	120
	33	KMG200VB33RM12X20LL	12.5 × 20	10.045	160
	47	KMG200VB47RM12X20LL	12.5 × 20	7.053	195
	100	KMG200VB101M16X25LL	16 × 25	3.315	335
	220	KMG200VB221M18X35LL	18 × 35.5	1.507	575
250 Volts 300 Volts Surge	2.2	KMG250VB2R2M6X11LL	6.3 × 11	150.682	23
	3.3	KMG250VB3R3M8X11LL	8 × 11.5	100.455	32
	4.7	KMG250VB4R7M8X11LL	8 × 11.5	70.532	39
	10	KMG250VB10RM10X16LL	10 × 16	33.15	74
	22	KMG250VB22RM12X20LL	12.5 × 20	15.068	130
	33	KMG250VB33RM12X20LL	12.5 × 20	10.045	160
	47	KMG250VB47RM12X25LL	12.5 × 25	7.053	210
	100	KMG250VB101M16X31LL	16 × 31.5	3.315	365
	220	KMG250VB221M18X40LL	18 × 40	1.507	585
350 Volts 400 Volts Surge Not Solvent Proof	0.47	KMG350VBR47M6X11LL	6.3 × 11	846.383	11
	1.0	KMG350VB1R0M6X11LL	6.3 × 11	397.8	15
	2.2	KMG350VB2R2M8X11LL	8 × 11.5	180.818	26
	3.3	KMG350VB3R3M10X12LL	10 × 12.5	120.545	38
	4.7	KMG350VB4R7M10X16LL	10 × 16	84.638	50
	10	KMG350VB10RM10X20LL	10 × 20	39.78	80
	22	KMG350VB22RM12X20LL	12.5 × 20	18.082	130
	33	KMG350VB33RM16X25LL	16 × 25	12.055	195
	47	KMG350VB47RM16X25LL	16 × 25	8.464	230
	100	KMG350VB101M18X31LL	18 × 31.5	3.978	375
400 Volts 450 Volts Surge Not Solvent Proof	0.47	KMG400VBR47M8X11LL	8 × 11.5	846.383	10
	1.0	KMG400VB1R0M6X11LL	6.3 × 11	397.8	15
	2.2	KMG400VB2R2M8X11LL	8 × 11.5	180.818	26
	3.3	KMG400VB3R3M10X12LL	10 × 12.5	120.545	38
	4.7	KMG400VB4R7M10X16LL	10 × 16	84.638	50
	10	KMG400VB10RM10X20LL	10 × 20	39.78	80
	22	KMG400VB22RM12X25LL	12.5 × 25	18.082	145
	33	KMG400VB33RM16X25LL	16 × 25	12.055	195
	47	KMG400VB47RM16X31LL	16 × 31.5	8.464	250
450 Volts 500 Volts Surge Not Solvent Proof	0.47	KMG450VBR47M10X12LL	10 × 12.5	846.383	9
	1.0	KMG450VB1R0M10X12LL	10 × 12.5	397.8	13
	2.2	KMG450VB2R2M10X12LL	10 × 12.5	180.818	23
	3.3	KMG450VB3R3M10X16LL	10 × 16	120.545	31
	4.7	KMG450VB4R7M10X20LL	10 × 20	84.638	40
	10	KMG450VB10RM12X20LL	12.5 × 20	39.78	65
	22	KMG450VB22RM16X25LL	16 × 25	18.082	115
	33	KMG450VB33RM16X31LL	16 × 31.5	12.055	155
	47	KMG450VB47RM16X35LL	16 × 35.5	8.464	185

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

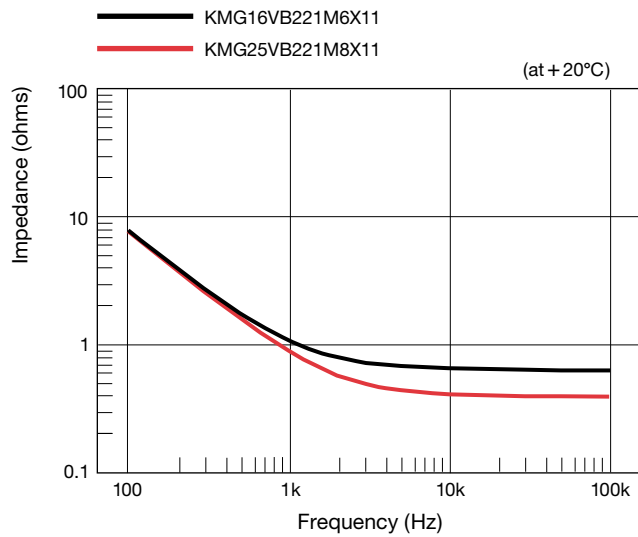
Temperature Characteristics



Temperature Characteristics



Impedance - Frequency Characteristics



Impedance - Frequency Characteristics

