

### METALLIZED POLYESTER FILM CAPACITOR MULTIPURPOSE APPLICATIONS

**Typical application:** blocking, coupling, decoupling, by-passing, interference suppression in low voltage applications (i.e.:AUTOMOTIVE)

**PRODUCT CODE: R60**

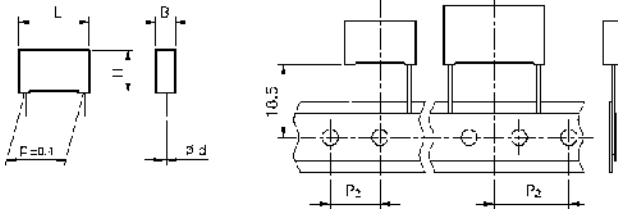
**NOTE:** Special version, in compliance with DIN 44122 is available upon request.

#### Construction:

- **STACKED technology for pitch 10 mm**  
( Rated Voltage from 63 to 630Vdc)
- **WOUND technology from pitch 10 to 27.5mm**  
(Rated Voltage from 63 to 1000Vdc)

Loose

Taped



∅ d ± 0.05	p = 10	p > 10
	0.6	0.8

All dimensions are in mm.

#### PRODUCT CODE SYSTEM

The part number, comprising 14 digits, is formed as follows:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
R	6	0										-	

Digit 1 to 3 Series code.

Digit 4 d.c. rated voltage:

D = 63V E = 100V G = 160V I = 250V  
M = 400V P = 630V Q = 1000V

Digit 5 Pitch:

F = 10mm; I = 15mm; N = 22.5mm; R = 27.5mm  
W = 37.5mm

Digit 6 to 9 Digits 7 - 8 - 9 indicate the first three digits of Capacitance value and the 6th digit indicates the number of zeros that must be added to obtain the Rated Capacitance in pF.

Digit 10 to 11 Mechanical version and/or packaging (table 1)

Digit 12 Identifies the dimensions and electrical characteristics.

Digit 13 Internal use

Digit 14 Capacitance tolerance:  
J=5%; K=10%; M=20%

#### GENERAL TECHNICAL DATA

**Dielectric:** polyester film (polyethylene terephthalate).

**Plates:** aluminium layer deposited by evaporation under vacuum.

**Winding:** non-inductive type.

**Leads:** tinned wire.

**Protection:** plastic case, thermosetting resin filled.  
Box material is solvent resistant and flame retardant according to UL94 V0.

**Marking:** Manufacturer's logo, capacitance, tolerance, D.C. rated voltage.

**Climatic category:** 55/100/56 IEC 60068-1

**Operating temperature range:** -55 to +105°C

For stacked technology an upper operating temperature of +125°C is allowed for a max. operating time of 1000h.

**Related documents:** IEC 60384-2

#### Winding scheme

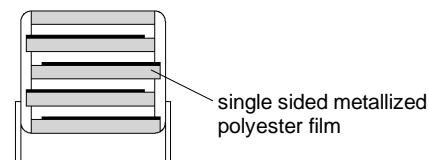


Table 1 (for more detailed information, please refer to page 16)

Standard packaging style	Lead length (mm)	Taping style			Ordering code (Digit 10 to 11)
		P <sub>2</sub> (mm)	Fig. (No.)	Pitch (mm)	
AMMO-PACK		12.70	1	10.0/15.0	DQ
AMMO-PACK		19.05	2	22.5	DQ
REEL ∅ 355mm		12.70	1	10.0/15.0	GY
REEL ∅ 500mm		12.70	1	10.0/15.0	CK
REEL ∅ 500mm		19.05	2	22.5/27.5	CK
Loose, short leads	4 +2				AA
Loose, long leads (p=10mm)	17 +1/-2				Z3
Loose, long leads (p ≥ 15mm)	30 +5 25 +2/-1				40 50

Note: Ammo-pack is the preferred packaging for taped version.

NEW

STACKED VERSION

Rated Cap.	63Vdc/40Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
1.0μF	4.0	9.0	13.0	10.0	50	6.3 E3	R60DF 4100--6--
1.5μF	5.0	11.0	13.0	10.0	50	6.3 E3	R60DF 4150--6--
2.2μF	5.0	11.0	13.0	10.0	50	6.3 E3	R60DF 4220--6--
3.3μF	6.0	12.0	13.0	10.0	50	6.3 E3	R60DF 4330--6--

Rated Cap.	100Vdc/63Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
0.33μF	4.0	9.0	13.0	10.0	75	15 E3	R60EF 3330--6--
0.47μF	4.0	9.0	13.0	10.0	75	15 E3	R60EF 3470--6--
0.68μF	4.0	9.0	13.0	10.0	75	15 E3	R60EF 3680--6--
1μF	5.0	11.0	13.0	10.0	75	15 E3	R60EF 4100--6--
1.5μF	5.0	11.0	13.0	10.0	75	15 E3	R60EF 4150--6--

Rated Cap.	160Vdc/90Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
0.22μF	4.0	9.0	13.0	10.0	100	32 E3	R60GF 3220--6--
0.33μF	4.0	9.0	13.0	10.0	100	32 E3	R60GF 3330--6--
0.47μF	5.0	11.0	13.0	10.0	100	32 E3	R60GF 3470--6--
0.68μF	6.0	12.0	13.0	10.0	100	32 E3	R60GF 3680--6--

Mechanical version and packaging (Table 1)  
Internal use  
Tolerance: J (± 5%); K (± 10%); M (± 20%)

Rated Cap.	250Vdc/160Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
0.10μF	4.0	9.0	13.0	10.0	150	75 E3	R60IF 3100--6--
0.15μF	4.0	9.0	13.0	10.0	150	75 E3	R60IF 3150--6--
0.22μF	5.0	11.0	13.0	10.0	150	75 E3	R60IF 3220--6--
0.33μF	5.0	11.0	13.0	10.0	150	75 E3	R60IF 3330--6--
0.47μF	6.0	12.0	13.0	10.0	150	75 E3	R60IF 3470--6--

Rated Cap.	400Vdc/200Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
0.033μF	4.0	9.0	13.0	10.0	175	140 E3	R60MF 2330--6--
0.047μF	4.0	9.0	13.0	10.0	175	140 E3	R60MF 2470--6--
0.068μF	4.0	9.0	13.0	10.0	175	140 E3	R60MF 2680--6--
0.10μF	5.0	11.0	13.0	10.0	175	140 E3	R60MF 3100--6--
0.15μF	6.0	12.0	13.0	10.0	175	140 E3	R60MF 3150--6--

Rated Cap.	630Vdc/220*Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
1000pF	4.0	9.0	13.0	10.0	200	250 E3	
1500pF	4.0	9.0	13.0	10.0	200	250 E3	
2200pF	4.0	9.0	13.0	10.0	200	250 E3	
3300pF	4.0	9.0	13.0	10.0	200	250 E3	
4700pF	4.0	9.0	13.0	10.0	200	250 E3	
6800pF	4.0	9.0	13.0	10.0	200	250 E3	
0.010μF	4.0	9.0	13.0	10.0	200	250 E3	R60PF 2100--6--
0.015μF	4.0	9.0	13.0	10.0	200	250 E3	R60PF 2150--6--
0.022μF	4.0	9.0	13.0	10.0	200	250 E3	R60PF 2220--6--
0.033μF	5.0	11.0	13.0	10.0	200	250 E3	R60PF 2330--6--
0.047μF	5.0	11.0	13.0	10.0	200	250 E3	R60PF 2470--6--

Mechanical version and packaging (Table 1)  
Internal use  
Tolerance: J (± 5%); K (± 10%); M (± 20%)

Im progress

All dimensions are in mm.

Note: If the working voltage (V) is lower than the rated voltage (V<sub>R</sub>), the capacitor may work at higher dv/dt. In this case the maximum value allowed is obtained multiplying the above value (see table dv/dt) with the ratio V<sub>R</sub>/V.  
The pulse characteristic K<sub>0</sub> depends on the voltage wave-form and in any case it cannot overcome the value given in the above table.

\*Not suitable for across-the-line applications. Please refer to Interference Suppression Capacitors (page 109).

WOUND VERSION

Rated Cap.	63Vdc/40Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
0.47μF	4.0	9.0	13.0	10.0	6.0	0.75 E3	R60DF 3470--3--
0.68μF	4.0	9.0	13.0	10.0	6.0	0.75 E3	R60DF 3680--3--
1.0μF	5.0	11.0	13.0	10.0	6.0	0.75 E3	R60DF 4100--3--
1.5μF	6.0	12.0	13.0	10.0	6.0	0.75 E3	R60DF 4150--3--
0.68μF	5.0	11.0	18.0	15.0	2.5	0.32 E3	R60DI 3680--3--
1.0μF	5.0	11.0	18.0	15.0	2.5	0.32 E3	R60DI 4100--3--
1.5μF	5.0	11.0	18.0	15.0	2.5	0.32 E3	R60DI 4150--3--
2.2μF	6.0	12.0	18.0	15.0	2.5	0.32 E3	R60DI 4220--3--
3.3μF	7.5	13.5	18.0	15.0	2.5	0.32 E3	R60DI 4330--3--
3.3μF	9.0	12.5	18.0	15.0	2.5	0.32 E3	R60DI 4330--L--
4.7μF	8.5	14.5	18.0	15.0	2.5	0.32 E3	R60DI 4470--3--
4.7μF	13.0	12.0	18.0	15.0	2.5	0.32 E3	R60DI 4470--L--
6.8μF	10.0	16.0	18.0	15.0	2.5	0.32 E3	R60DI 4680--3--
3.3μF	6.0	15.0	26.5	22.5	1.5	0.19 E3	R60DN4330--3--
4.7μF	7.0	16.0	26.5	22.5	1.5	0.19 E3	R60DN4470--3--
6.8μF	7.0	16.0	26.5	22.5	1.5	0.19 E3	R60DN4680--3--
10.0μF	8.5	17.0	26.5	22.5	1.5	0.19 E3	R60DN5100--3--
15.0μF	11.0	20.0	26.5	22.5	1.5	0.19 E3	R60DN5150--3--
10.0μF	9.0	17.0	32.0	27.5	1.0	0.13 E3	R60DR5100--3--
15.0μF	11.0	20.0	32.0	27.5	1.0	0.13 E3	R60DR5150--3--
22.0μF	13.0	22.0	32.0	27.5	1.0	0.13 E3	R60DR5220--3--
33.0μF	14.0	28.0	32.0	27.5	1.0	0.13 E3	R60DR5330--3--
47.0μF	18.0	33.0	32.0	27.5	1.0	0.13 E3	R60DR5470--3--
68.0μF	22.0	37.0	32.0	27.5	1.0	0.13 E3	R60DR5680--3--
22.0μF	11.0	22.0	41.5	37.5	0.8	0.10 E3	R60DW5220--3--
33.0μF	13.0	24.0	41.5	37.5	0.8	0.10 E3	R60DW5330--3--
47.0μF	16.0	28.5	41.5	37.5	0.8	0.10 E3	R60DW5470--3--
68.0μF	19.0	32.0	41.5	37.5	0.8	0.10 E3	R60DW5680--3--
100.0μF	24.0	44.0	41.5	37.5	0.8	0.10 E3	R60DW6100--3--

Rated Cap.	160Vdc/90Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
0.22μF	4.0	9.0	13.0	10.0	15.0	4.80 E3	R60GF3220--3--
0.33μF	5.0	11.0	13.0	10.0	15.0	4.80 E3	R60GF3330--3--
0.47μF	6.0	12.0	13.0	10.0	15.0	4.80 E3	R60GF3470--3--
0.33μF	5.0	11.0	18.0	15.0	9.0	2.90 E3	R60GI 3330--3--
0.47μF	5.0	11.0	18.0	15.0	9.0	2.90 E3	R60GI 3470--3--
0.68μF	5.0	11.0	18.0	15.0	9.0	2.90 E3	R60GI 3680--3--
1.0μF	7.5	13.5	18.0	15.0	9.0	2.90 E3	R60GI 4100--3--
1.5μF	8.5	14.5	18.0	15.0	9.0	2.90 E3	R60GI 4150--3--
1.5μF	9.0	12.5	18.0	15.0	9.0	2.90 E3	R60GI 4150--L--
2.2μF	10.0	16.0	18.0	15.0	9.0	2.90 E3	R60GI 4220--3--
2.2μF	13.0	12.0	18.0	15.0	9.0	2.90 E3	R60GI 4220--L--
3.3μF	11.0	19.0	18.0	15.0	9.0	2.90 E3	R60GI 4220--3--
1.5μF	6.0	15.0	26.5	22.5	5.5	1.70 E3	R60GN4150--3--
2.2μF	7.0	16.0	26.5	22.5	5.5	1.70 E3	R60GN4220--3--
3.3μF	8.5	17.0	26.5	22.5	5.5	1.70 E3	R60GN4330--3--
4.7μF	11.0	20.0	26.5	22.5	5.5	1.70 E3	R60GN4470--3--
6.8μF	13.0	22.0	26.5	22.5	5.5	1.70 E3	R60GN4680--3--
3.3μF	9.0	17.0	32.0	27.5	3.0	0.96 E3	R60GR4330--3--
4.7μF	9.0	17.0	32.0	27.5	3.0	0.96 E3	R60GR4470--3--
6.8μF	11.0	20.0	32.0	27.5	3.0	0.96 E3	R60GR4680--3--
10.0μF	15.0	24.5	32.0	27.5	3.0	0.96 E3	R60GR5100--3--
15.0μF	18.0	33.0	32.0	27.5	3.0	0.96 E3	R60GR5150--3--
22.0μF	22.0	37.0	32.0	27.5	3.0	0.96 E3	R60GR5220--3--
10.0μF	11.0	22.0	41.5	37.5	2.0	0.64 E3	R60GW5100--3--
15.0μF	13.0	24.0	41.5	37.5	2.0	0.64 E3	R60GW5150--3--
22.0μF	16.0	28.5	41.5	37.5	2.0	0.64 E3	R60GW5220--3--
33.0μF	19.0	32.0	41.5	37.5	2.0	0.64 E3	R60GW5330--3--
47.0μF	24.0	44.0	41.5	37.5	2.0	0.64 E3	R60GW5470--3--

Rated Cap.	100Vdc/63Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
0.33μF	4.0	9.0	13.0	10.0	9.0	1.8 E3	R60EF 3330--3--
0.47μF	5.0	11.0	13.0	10.0	9.0	1.8 E3	R60EF 3470--3--
0.68μF	6.0	12.0	13.0	10.0	9.0	1.8 E3	R60EF 3680--3--
0.33μF	5.0	11.0	18.0	15.0	3.0	0.6 E3	R60EI 3330--3--
0.47μF	5.0	11.0	18.0	15.0	3.0	0.6 E3	R60EI 3470--3--
0.68μF	5.0	11.0	18.0	15.0	3.0	0.6 E3	R60EI 3680--3--
1.0μF	5.0	11.0	18.0	15.0	3.0	0.6 E3	R60EI 4100--3--
1.5μF	7.5	13.5	18.0	15.0	3.0	0.6 E3	R60EI 4150--3--
2.2μF	8.5	14.5	18.0	15.0	3.0	0.6 E3	R60EI 4220--3--
2.2μF	9.0	12.5	18.0	15.0	3.0	0.6 E3	R60EI 4220--L--
3.3μF	10.0	16.0	18.0	15.0	3.0	0.6 E3	R60EI 4330--3--
3.3μF	13.0	12.0	18.0	15.0	3.0	0.6 E3	R60EI 4330--L--
4.7μF	11.0	19.0	18.0	15.0	3.0	0.6 E3	R60EI 4470--3--
1.5μF	6.0	15.0	26.5	22.5	2.0	0.4 E3	R60EN4150--3--
2.2μF	6.0	15.0	26.5	22.5	2.0	0.4 E3	R60EN4220--3--
3.3μF	7.0	16.0	26.5	22.5	2.0	0.4 E3	R60EN4330--3--
4.7μF	8.5	17.0	26.5	22.5	2.0	0.4 E3	R60EN4470--3--
6.8μF	10.0	18.5	26.5	22.5	2.0	0.4 E3	R60EN4680--3--
10.0μF	13.0	22.0	26.5	22.5	2.0	0.4 E3	R60EN5100--3--
4.7μF	9.0	17.0	32.0	27.5	1.5	0.3 E3	R60ER4470--3--
6.8μF	9.0	17.0	32.0	27.5	1.5	0.3 E3	R60ER4680--3--
10.0μF	11.0	20.0	32.0	27.5	1.5	0.3 E3	R60ER5100--3--
15.0μF	13.0	22.0	32.0	27.5	1.5	0.3 E3	R60ER5150--3--
22.0μF	14.0	28.0	32.0	27.5	1.5	0.3 E3	R60ER5220--3--
33.0μF	18.0	33.0	32.0	27.5	1.5	0.3 E3	R60ER5330--3--
47.0μF	22.0	37.0	32.0	27.5	1.5	0.3 E3	R60ER5470--3--
15.0μF	11.0	22.0	41.5	37.5	1.0	0.2 E3	R60EW5150--3--
22.0μF	13.0	24.0	41.5	37.5	1.0	0.2 E3	R60EW5220--3--
33.0μF	16.0	28.5	41.5	37.5	1.0	0.2 E3	R60EW5330--3--
47.0μF	19.0	32.0	41.5	37.5	1.0	0.2 E3	R60EW5470--3--
68.0μF	24.0	44.0	41.5	37.5	1.0	0.2 E3	R60EW5680--3--

Mechanical version and packaging (Table 1)  
Internal use  
Tolerance: J (± 5%); K (± 10%); M (± 20%)

Rated Cap.	250Vdc/160Vac				Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p			
0.068μF	4.0	9.0	13.0	10.0	20	10.0 E3	R60IF 2680--3--
0.10μF	4.0	9.0	13.0	10.0	20	10.0 E3	R60IF 3100--3--
0.15μF	4.0	9.0	13.0	10.0	20	10.0 E3	R60IF 3150--3--
0.22μF	5.0	11.0	13.0	10.0	20	10.0 E3	R60IF 3220--3--
0.33μF	6.0	12.0	13.0	10.0	20	10.0 E3	R60IF 3330--3--
0.10μF	5.0	11.0	18.0	15.0	12	6.0 E3	R60II 3100--3--
0.15μF	5.0	11.0	18.0	15.0	12	6.0 E3	R60II 3150--3--
0.22μF	5.0	11.0	18.0	15.0	12	6.0 E3	R60II 3220--3--
0.33μF	5.0	11.0	18.0	15.0	12	6.0 E3	R60II 3330--3--
0.47μF	6.0	12.0	18.0	15.0	12	6.0 E3	R60II 3470--3--
0.68μF	7.5	13.5	18.0	15.0	12	6.0 E3	R60II 3680--3--
0.68μF	9.0	12.5	18.0	15.0	12	6.0 E3	R60II 3680--L--
1.0μF	8.5	14.5	18.0	15.0	12	6.0 E3	R60II 4100--3--
1.0μF	13.0	12.0	18.0	15.0	12	6.0 E3	R60II 4100--L--
1.5μF	10.0	16.0	18.0	15.0	12	6.0 E3	R60II 4150--3--
0.47μF	6.0	15.0	26.5	22.5	8	4.0 E3	R60IN 3470--3--
0.68μF	6.0	15.0	26.5	22.5	8	4.0 E3	R60IN 3680--3--
1.0μF	6.0	15.0	26.5	22.5	8	4.0 E3	R60IN 4100--3--
1.5μF	7.0	16.0	26.5	22.5	8	4.0 E3	R60IN 4150--3--
2.2μF	10.0	18.5	26.5	22.5	8	4.0 E3	R60IN 4220--3--
3.3μF	11.0	20.0	26.5	22.5	8	4.0 E3	R60IN 4330--3--
1.5μF	9.0	17.0	32.0	27.5	5	2.5 E3	R60IR 4150--3--
2.2μF	9.0	17.0	32.0	27.5	5	2.5 E3	R60IR 4220--3--
3.3μF	11.0	20.0	32.0	27.5	5	2.5 E3	R60IR 4330--3--
4.7μF	13.0	22.0	32.0	27.5	5	2.5 E3	R60IR 4470--3--
6.8μF	14.0	28.0	32.0	27.5	5	2.5 E3	R60IR 4680--3--
10.0μF	18.0	33.0	32.0	27.5	5	2.5 E3	R60IR 5100--3--
15.0μF	22.0	37.0	32.0	27.5	5	2.5 E3	R60IR 5150--3--
4.7μF	11.0	22.0	41.5	37.5	4	2.0 E3	R60IW 4470--3--
6.8μF	13.0	24.0	41.5	37.5	4	2.0 E3	R60IW 4680--4--
10.0μF	16.0	28.5	41.5	37.5	4	2.0 E3	R60IW 5100--3--
15.0μF	19.0	32.0	41.5	37.5	4	2.0 E3	R60IW 5150--3--
22.0μF	20.0	40.0	41.5	37.5	4	2.0 E3	R60IW 5220--3--
33.0μF	24.0	44.0	41.5	37.5	4	2.0 E3	R60IW 5330--3--

Mechanical version and packaging (Table 1)  
Internal use  
Tolerance: J (± 5%); K (± 10%); M (± 20%)

All dimensions are in mm.

Note: If the working voltage (V) is lower than the rated voltage (V<sub>R</sub>), the capacitor may work at higher dv/dt. In this case the maximum value allowed is obtained multiplying the above value (see table dv/dt) with the ratio V<sub>R</sub>/V.

The pulse characteristic K<sub>0</sub> depends on the voltage wave-form and in any case it cannot overcome the value given in the above table.

WOUND VERSION

Rated Cap.	400Vdc/200Vac					Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p				
0.015μF	4.0	9.0	13.0	10.0	30.0	24.0 E3	R60MF2150--3--	
0.022μF	4.0	9.0	13.0	10.0	30.0	24.0 E3	R60MF2220--3--	
0.033μF	4.0	9.0	13.0	10.0	30.0	24.0 E3	R60MF2330--3--	
0.047μF	4.0	9.0	13.0	10.0	30.0	24.0 E3	R60MF2470--3--	
0.068μF	5.0	11.0	13.0	10.0	30.0	24.0 E3	R60MF2680--3--	
0.10μF	6.0	12.0	13.0	10.0	30.0	24.0 E3	R60MF3100--3--	
0.047μF	5.0	11.0	18.0	15.0	20.0	16.0 E3	R60MI2470--3--	
0.068μF	5.0	11.0	18.0	15.0	20.0	16.0 E3	R60MI2680--3--	
0.10μF	5.0	11.0	18.0	15.0	20.0	16.0 E3	R60MI3100--3--	
0.15μF	5.0	11.0	18.0	15.0	20.0	16.0 E3	R60MI3150--3--	
0.22μF	6.0	12.0	18.0	15.0	20.0	16.0 E3	R60MI3220--3--	
0.33μF	7.5	13.5	18.0	15.0	20.0	16.0 E3	R60MI3330--3--	
0.33μF	9.0	12.5	18.0	15.0	20.0	16.0 E3	R60MI3330--L--	
0.47μF	8.5	14.5	18.0	15.0	20.0	16.0 E3	R60MI3470--3--	
0.47μF	13.0	12.0	18.0	15.0	20.0	16.0 E3	R60MI3470--L--	
0.68μF	11.0	19.0	18.0	15.0	20.0	16.0 E3	R60MI3680--3--	
0.22μF	6.0	15.0	26.5	22.5	10.0	8.0 E3	R60MN3220--3--	
0.33μF	6.0	15.0	26.5	22.5	10.0	8.0 E3	R60MN3330--3--	
0.47μF	6.0	15.0	26.5	22.5	10.0	8.0 E3	R60MN3470--3--	
0.68μF	7.0	16.0	26.5	22.5	10.0	8.0 E3	R60MN3680--3--	
1.0μF	10.0	18.5	26.5	22.5	10.0	8.0 E3	R60MN4100--3--	
1.5μF	11.0	20.0	26.5	22.5	10.0	8.0 E3	R60MN4150--3--	
0.68μF	9.0	17.0	32.0	27.5	8.5	3.4 E3	R60MR3680--3--	
1.0μF	9.0	17.0	32.0	27.5	8.5	3.4 E3	R60MR4100--3--	
1.5μF	10.0	20.0	32.0	27.5	8.5	3.4 E3	R60MR4150--3--	
2.2μF	13.0	22.0	32.0	27.5	8.5	3.4 E3	R60MR4220--3--	
3.3μF	14.0	28.0	32.0	27.5	8.5	3.4 E3	R60MR4330--3--	
4.7μF	18.0	33.0	32.0	27.5	8.5	3.4 E3	R60MR4470--3--	
6.8μF	22.0	37.0	32.0	27.5	8.5	3.4 E3	R60MR4680--3--	
3.3μF	11.0	22.0	41.5	37.5	6.0	2.4 E3	R60MW4330--3--	
4.7μF	13.0	24.0	41.5	37.5	6.0	2.4 E3	R60MW4470--3--	
6.8μF	16.0	28.5	41.5	37.5	6.0	2.4 E3	R60MW4680--3--	
10.0μF	19.0	32.0	41.5	37.5	6.0	2.4 E3	R60MW5100--3--	
15.0μF	24.0	44.0	41.5	37.5	6.0	2.4 E3	R60MW5150--3--	

Rated Cap.	1000Vdc/250Vac*					Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p				
1000pF	4.0	9.0	13.0	10.0	60	120 E3	R60QF1100--0--	
1500pF	4.0	9.0	13.0	10.0	60	120 E3	R60QF1150--0--	
2200pF	4.0	9.0	13.0	10.0	60	120 E3	R60QF1220--0--	
3300pF	4.0	9.0	13.0	10.0	60	120 E3	R60QF1330--0--	
4700pF	5.0	11.0	13.0	10.0	60	120 E3	R60QF1470--0--	
6800pF	6.0	12.0	13.0	10.0	60	120 E3	R60QF1680--0--	
0.010μF	5.0	11.0	18.0	15.0	30	60 E3	R60QI2100--0--	
0.015μF	5.0	11.0	18.0	15.0	30	60 E3	R60QI2150--3--	
0.022μF	6.0	12.0	18.0	15.0	30	60 E3	R60QI2220--3--	
0.033μF	7.5	13.5	18.0	15.0	30	60 E3	R60QI2330--3--	
0.033μF	9.0	12.5	18.0	15.0	30	60 E3	R60QI2330--L--	
0.047μF	10.0	16.0	18.0	15.0	30	60 E3	R60QI2470--0--	
0.047μF	13.0	12.0	18.0	15.0	30	60 E3	R60QI2470--L--	
0.068μF	11.0	19.0	18.0	15.0	30	60 E3	R60QI2680--0--	
0.033μF	6.0	15.0	26.5	22.5	15	30 E3	R60QN2330--0--	
0.047μF	6.0	15.0	26.5	22.5	15	30 E3	R60QN2470--0--	
0.068μF	7.0	16.0	26.5	22.5	15	30 E3	R60QN2680--3--	
0.10μF	8.5	17.0	26.5	22.5	15	30 E3	R60QN3100--3--	
0.15μF	13.0	22.0	26.5	22.5	15	30 E3	R60QN3150--0--	
0.15μF	9.0	17.0	32.0	27.5	12	24 E3	R60QR3150--3--	
0.22μF	11.0	20.0	32.0	27.5	12	24 E3	R60QR3220--3--	
0.33μF	13.0	22.0	32.0	27.5	12	24 E3	R60QR3330--3--	
0.47μF	14.0	28.0	32.0	27.5	12	24 E3	R60QR3470--3--	
0.68μF	18.0	33.0	32.0	27.5	12	24 E3	R60QR3680--3--	
1.0μF	22.0	37.0	32.0	27.5	12	24 E3	R60QR4100--3--	
0.47μF	11.0	22.0	41.5	37.5	10	20 E3	R60QW3470--3--	
0.68μF	13.0	24.0	41.5	37.5	10	20 E3	R60QW3680--3--	
1.0μF	16.0	28.5	41.5	37.5	10	20 E3	R60QW4100--3--	
1.5μF	20.0	40.0	41.5	37.5	10	20 E3	R60QW4150--3--	
2.2μF	24.0	44.0	41.5	37.5	10	20 E3	R60QW4220--3--	

Mechanical version and packaging (Table 1)

Internal use

Tolerance: J (±5%); K (±10%); M (±20%)

Rated Cap.	630Vdc/220*Vac					Max dv/dt (V/μs)	Max K <sub>0</sub> (V <sup>2</sup> /μs)	Part Number
	B	H	L	p				
4700pF	4.0	9.0	13.0	10.0	40	50 E3	R60PF1470--3--	
6800pF	4.0	9.0	13.0	10.0	40	50 E3	R60PF1680--3--	
0.010μF	4.0	9.0	13.0	10.0	40	50 E3	R60PI2100--3--	
0.015μF	4.0	9.0	13.0	10.0	40	50 E3	R60PI2150--3--	
0.022μF	5.0	11.0	13.0	10.0	40	50 E3	R60PI2220--3--	
0.033μF	6.0	12.0	13.0	10.0	40	50 E3	R60PI2330--3--	
0.047μF	6.0	12.0	13.0	10.0	40	50 E3	R60PI2470--3--	
0.033μF	5.0	11.0	18.0	15.0	25	31 E3	R60PI2330--3--	
0.047μF	5.0	11.0	18.0	15.0	25	31 E3	R60PI2470--3--	
0.068μF	6.0	12.0	18.0	15.0	25	31 E3	R60PI2680--3--	
0.10μF	7.5	13.5	18.0	15.0	25	31 E3	R60PI3100--3--	
0.15μF	8.5	14.5	18.0	15.0	25	31 E3	R60PI3150--3--	
0.10μF	6.0	15.0	26.5	22.5	12	15 E3	R60PN3100--3--	
0.15μF	6.0	15.0	26.5	22.5	12	15 E3	R60PN3150--3--	
0.22μF	7.0	16.0	26.5	22.5	12	15 E3	R60PN3220--3--	
0.33μF	10.0	18.5	26.5	22.5	12	15 E3	R60PN3330--3--	
0.33μF	9.0	17.0	32.0	27.5	10	12 E3	R60PR3330--3--	
0.47μF	11.0	20.0	32.0	27.5	10	12 E3	R60PR3470--3--	
0.68μF	13.0	22.0	32.0	27.5	10	12 E3	R60PR3680--3--	
1.0μF	14.0	28.0	32.0	27.5	10	12 E3	R60PR4100--4--	
1.5μF	18.0	33.0	32.0	27.5	10	12 E3	R60PR4150--3--	
2.2μF	22.0	37.0	32.0	27.5	10	12 E3	R60PR4220--3--	
1.0μF	11.0	22.0	41.5	37.5	8	9.6 E3	R60PW4100--3--	
1.5μF	13.0	24.0	41.5	37.5	8	9.6 E3	R60PW4150--3--	
2.2μF	16.0	28.5	41.5	37.5	8	9.6 E3	R60PW4220--3--	
3.3μF	20.0	40.0	41.5	37.5	8	9.6 E3	R60PW4330--3--	
4.7μF	24.0	44.0	41.5	37.5	8	9.6 E3	R60PW4470--3--	

Mechanical version and packaging (Table 1)

Internal use

Tolerance: J (±5%); K (±10%); M (±20%)

All dimensions are in mm

Note 1: If the working voltage (V) is lower than the rated voltage (V<sub>R</sub>), the capacitor may work at higher dv/dt. In this case the maximum value allowed is obtained multiplying the above value (see table dv/dt) with the ratio V<sub>R</sub>/V. The pulse characteristic K<sub>0</sub> depends on the voltage wave-form and in any case it cannot overcome the value given in the above table.

Note 2: Rated voltages higher than 1000Vdc are available upon request

\* Not suitable for across-the-line applications. Please refer to Interference Suppression Capacitors (page 109).

**ELECTRICAL CHARACTERISTICS**

**Rated voltage (V<sub>R</sub>):** 63 Vdc-100 Vdc- 160 Vdc-250 Vdc  
400 Vdc-630 Vdc-1000 Vdc.

**Rated temperature (T<sub>R</sub>):** +85°C

**Temperature derated voltage:**

for temperatures between +85°C and the upper operating temperature (+105°C for wound technology and +125°C for stacked technology) a decreasing factor of 1.25% per degree °C on the rated voltage V<sub>R</sub> has to be applied.

**Capacitance range:** 1000pF to 100µF

**Capacitance values:**

E6 series (IEC 60063 Norm).

**Capacitance tolerances** (measured at 1 kHz):

±5% (J); ±10% (K); ±20% (M).

**Total self-inductance (L):** (lead length ~2mm)

Pitch (mm)	10	15	22.5	27.5	37.5
L(nH) ≈	9	10	18	18	22

**Dissipation factor (DF):**

tgδ × 10<sup>-4</sup> at +25°C ±5°C

kHz	C ≤ 1µF	C > 1µF
1	≤ 100	≤ 100
10	≤ 150	

**Insulation resistance:**

**Test conditions**

Temperature: +25°C ± 5°C

Voltage charge time: 1 min

Voltage charge: 50 Vdc for V<sub>R</sub> < 100 Vdc  
100 Vdc for V<sub>R</sub> ≥ 100 Vdc

**Performance**

For V<sub>R</sub> ≤ 100 Vdc

≥ 3750 MΩ for C ≤ 0.33µF (50000 MΩ)\*

≥ 1250 s for C > 0.33µF ( 5000 s)\*

For V<sub>R</sub> > 100 Vdc

≥ 30000 MΩ for C ≤ 0.33µF (50000 MΩ)\*

≥ 10000 s for C > 0.33µF (17000 s)\*

\*Typical value

**Test voltage between terminations:**

1.6 × V<sub>R</sub> applied for 2 s at +25°C ± 5°C

**TEST METHOD AND PERFORMANCE**

**Damp heat, steady state:**

**Test conditions**

Temperature: +40°C ± 2°C

Relative humidity (RH): 93% ± 2%

Test duration: 56 days

**Performance**

Capacitance change |ΔC/C|: ≤ 5%

DF change (Δtgδ): ≤ 50 × 10<sup>-4</sup> at 1kHz

Insulation resistance: ≥ 50% of initial limit.

**Endurance:**

**Test conditions**

Temperature: +100°C ± 2°C

Test duration: 2000 h

Voltage applied: 1.25 × V<sub>C</sub>

**Performance**

Capacitance change |ΔC/C|: ≤ 5%

DF change (Δtgδ): ≤ 50 × 10<sup>-4</sup> at 10kHz for C ≤ 1µF

≤ 30 × 10<sup>-4</sup> at 1kHz for C > 1µF

Insulation resistance: ≥ 50% of initial limit.

**Resistance to soldering heat:**

**Test conditions**

Solder bath temperature: +260°C ± 5°C

Dipping time (with heat screen): 10 s ± 1 s

**Performance**

Capacitance change |ΔC/C|: ≤ 2%

DF change (Δtgδ): ≤ 50 × 10<sup>-4</sup> at 10kHz for C ≤ 1µF

≤ 30 × 10<sup>-4</sup> at 1kHz for C > 1µF

Insulation resistance: ≥ initial limit.

**Long term stability** (after two years):

**Storage:** standard environmental conditions (see page 11).

**Performance**

Capacitance change |ΔC/C|: ≤ 3% for C ≤ 0.1µF

≤ 2% for C > 0.1µF

**RELIABILITY:**

Reference MIL HDB 217

**Application conditions:**

Temperature: +40°C ± 2°C

Voltage: 0.5 × V<sub>R</sub>

Failure rate: ≤ 5 FIT

(1 FIT = 1 × 10<sup>-9</sup> failures/components × h)

**Failure criteria:**

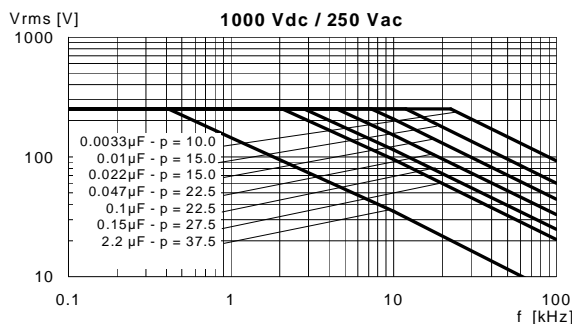
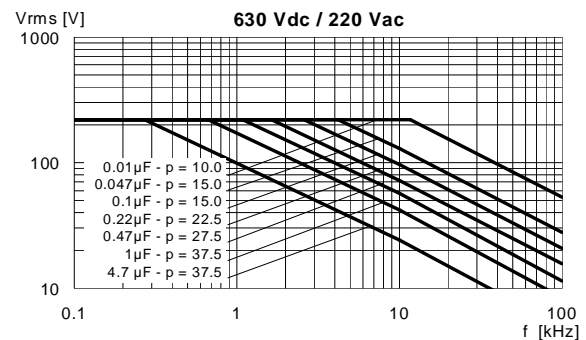
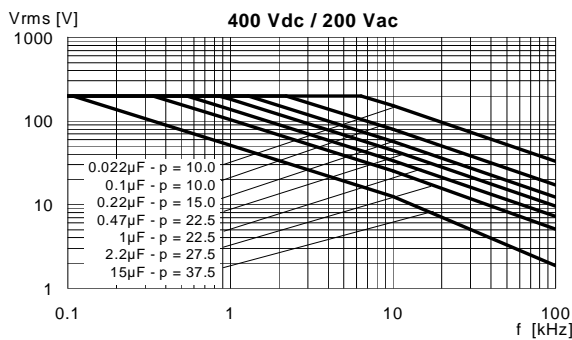
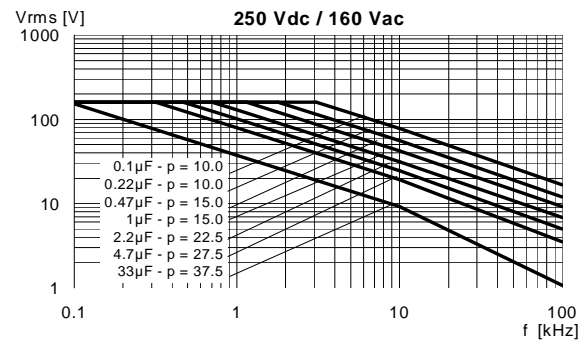
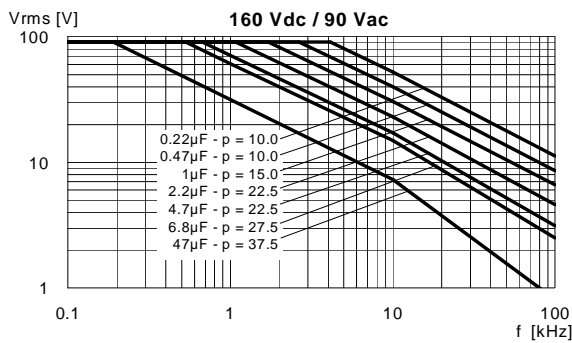
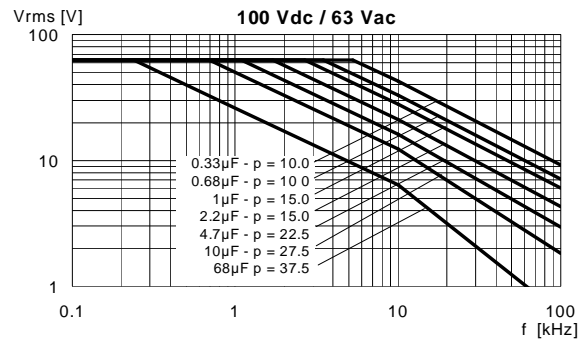
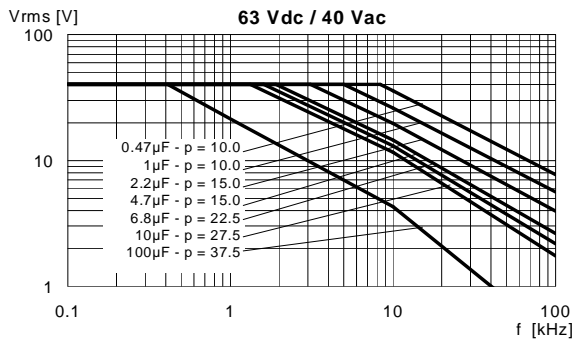
Short or open circuit

Capacitance change |ΔC/C|: > 10%

DF change (Δtgδ): > 2 × initial limit.

Insulation resistance: < 0.005 × initial limit.

MAX. VOLTAGE (Vr.m.s.) VERSUS FREQUENCY (sinusoidal wave-form /  $T_h \leq 40^\circ\text{C}$ )



Note:  $\rho$  (pitch) in mm.