

THB Metallized Polypropylene DC-Link Film Capacitor

85 °C / 85 % RH 1000 h at U_{NDC} - Vishay Automotive Grade



FEATURES

- High robustness under high humidity
- THB 85 °C, 85 % RH, 1000 h at rated U_{NDC}
- AEC-Q200 qualified, revision D at $T_{max.} = 85\text{ °C}$ ($T_{max.} = 105\text{ °C}$ available on request)
- High ripple current capability, low ESR, low ESL
- Mounting: radial
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

HALOGEN
FREE
GREEN
(5-2008)

APPLICATIONS

- Ideal for out-of-doors applications or in other harsh environments
- Renewable energies inverters
- UPS
- Battery chargers
- Motor drives

LINKS TO ADDITIONAL RESOURCES

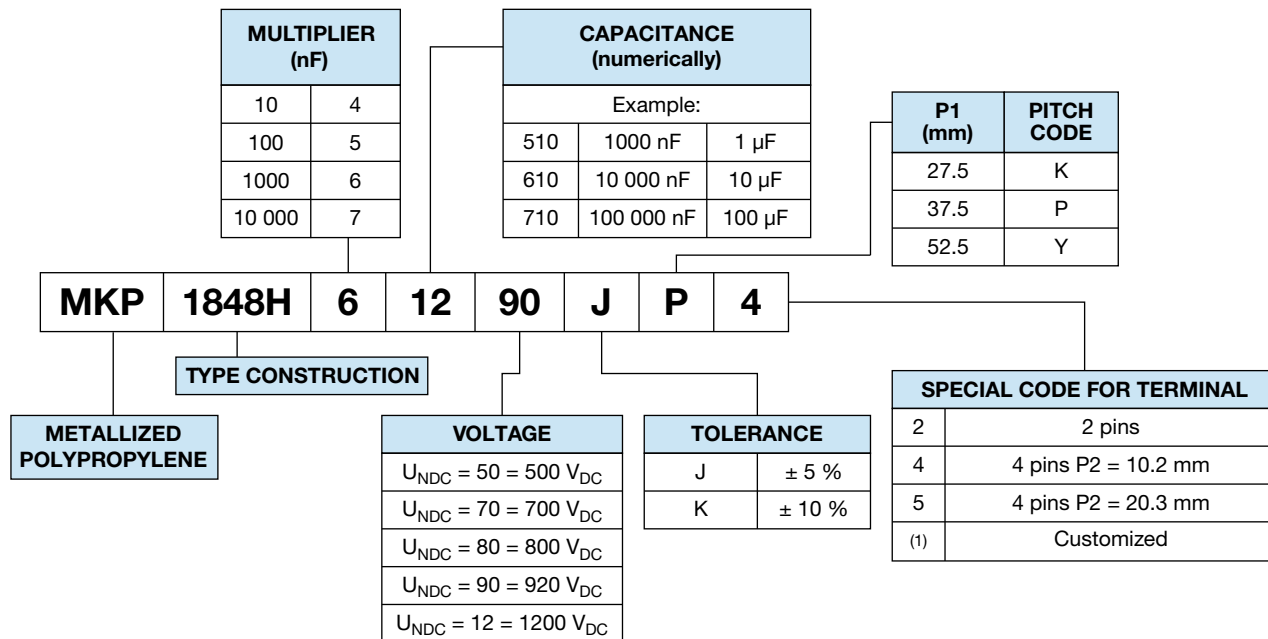


QUICK REFERENCE DATA	
Rated capacitance range	1 μ F to 80 μ F
Capacitance tolerance	$\pm 5\%$, $\pm 10\%$
Climatic testing class	40 / 085 / 56
Rated temperature	85 °C
Maximum permissible case temperature	105 °C, observing voltage derating
Maximum applicable peak to peak ripple voltage	0.2 x U_{NDC}
Reference standards	IEC 61071, IEC 60068
Dielectric	Polypropylene film
Electrodes	Metallized dielectric capacitor
Construction	Mono construction
Encapsulation	Plastic case sealed with resin; flame retardant UL 94 V-0
Terminals	Tinned wire
Self inductance (L_S)	< 1 nH per mm of lead spacing
Withstanding DC voltage between terminals ⁽¹⁾	1.5 U_{NDC} for 10 s, cut off current 10 mA, rise time $\leq 1000\text{ V/s}$
Insulation resistance	RC between leads, after 1 min > 10 000 s, measuring voltage: 500 V
Life time expectancy ⁽²⁾	Useful life time: > 100 000 h at U_{NDC} and 70 °C FIT: < $10 \times 10^{-9}/h$ (10 per 10^9 component h) at 0.5 x U_{NDC} , 40 °C
Marking	Manufacturer's name; C-value; tolerance; rated voltage; manufacturer's type designation; code for dielectric material, manufacturer location, year and week

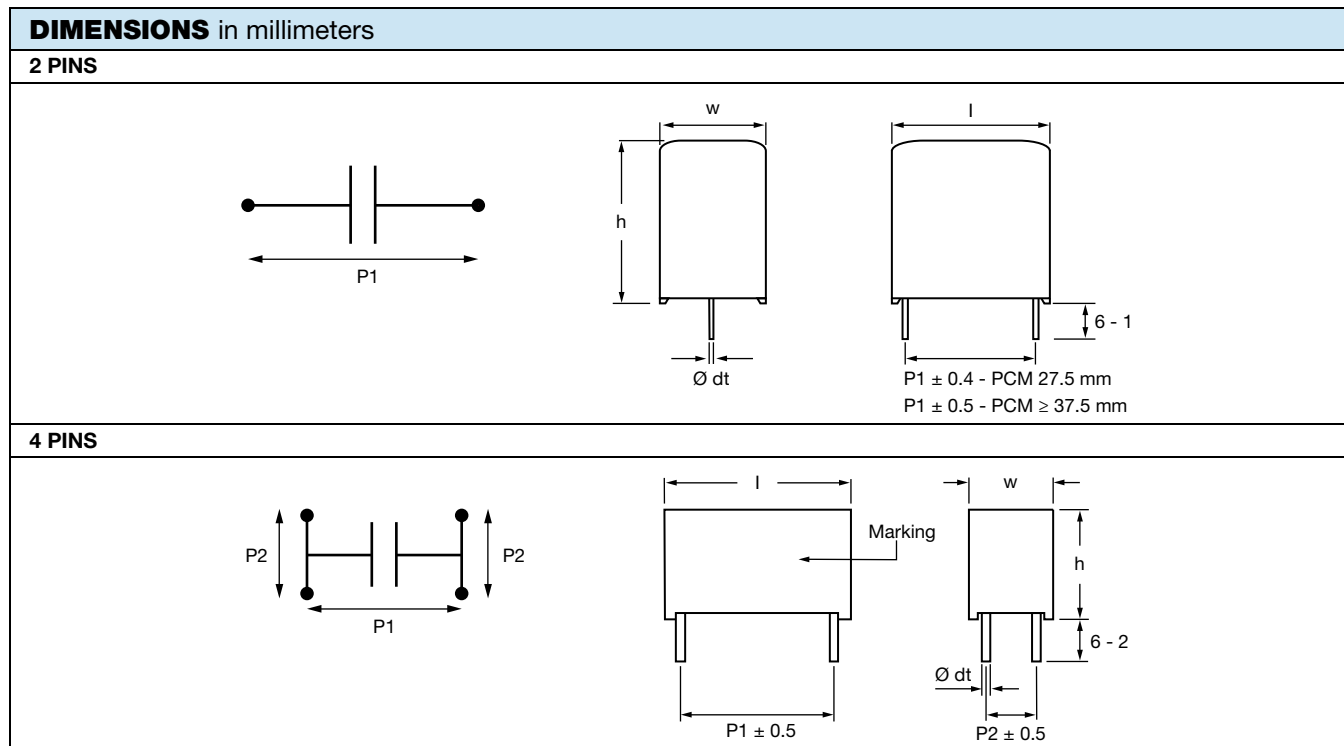
Notes

- For more detailed data and test requirements, contact dc-film@vishay.com
 - For general information like characteristics and definitions used for film capacitors follow the link: www.vishay.com/doc?28147
- ⁽¹⁾ See document "Voltage Proof Test for Metallized Film Capacitors" (www.vishay.com/doc?28169)
- ⁽²⁾ Statements about life time results from calculations which are based on internal tests. They have to be understood exclusively as estimations. Also due to external factors, the life time in the field application may deviate from the calculated life time

DC VOLTAGE RATINGS					
U_{NDC} at 85 °C	500 V	700 V	800 V	920 V	1200 V
U_{OPDC} at 70 °C	600 V	800 V	960 V	1100 V	1440 V
U_{OPDC} at 105 °C	350 V	450 V	560 V	650 V	850 V

COMPOSITION OF CATALOG NUMBER

Note

(1) Tabs terminals or customized terminals are available on request


Note

- $\varnothing dt \pm 10 \%$ of standard diameter specified



ELECTRICAL DATA AND ORDERING CODE

U _{ND} C AT 85 °C (V)	CAP. (μF)	DIMENSION ⁽⁵⁾ (mm)			P1 (mm)	P2 (mm)	du/dt (V/μs)	I _{PEAK} (A)	I _{RMS} ⁽²⁾ (A)		ESR ⁽³⁾ 10 kHz (mΩ)		tan δ ⁽⁴⁾ 10 kHz < (x 10 ⁻⁴)		ORDERING CODE ⁽¹⁾
		w	h	l					2 PINS	4 PINS	2 PINS	4 PINS	2 PINS	4 PINS	
500	U _{OPDC} AT 70 °C = 600 V; U _{OPDC} AT 105 °C = 350 V														
	5	15.0	25.0	32.0	27.5	-	40	200	7.0	-	10.1	-	65	-	MKP1848H55050+K2
	6	15.0	25.0	32.0	27.5	-	40	240	7.6	-	8.6	-	65	-	MKP1848H56050+K2
	7	18.0	28.0	32.0	27.5	-	40	280	8.8	-	7.6	-	65	-	MKP1848H57050+K2
	8	18.0	28.0	32.0	27.5	-	40	320	9.3	-	6.8	-	65	-	MKP1848H58050+K2
	10	21.0	31.0	32.0	27.5	-	40	400	11.0	-	5.7	-	65	-	MKP1848H61050+K2
	12	21.0	31.0	32.0	27.5	-	40	480	11.7	-	5.0	-	65	-	MKP1848H61250+K2
	15	22.0	38.0	32.0	27.5	-	40	600	13.9	-	4.3	-	65	-	MKP1848H61550+K2
	20	21.5	38.5	42.0	37.5	10.2	20	400	13.6	14.4	5.3	4.8	145	130	MKP1848H62050+P*
	22	21.5	38.5	42.0	37.5	10.2	20	440	14.1	14.8	5.0	4.5	145	130	MKP1848H62250+P*
	25	21.5	38.5	42.0	37.5	10.2	20	500	14.7	15.5	4.6	4.1	145	130	MKP1848H62550+P*
	30	30.0	45.0	42.0	37.5	10.2 / 20.3	20	600	18.1	19.1	4.1	3.7	145	130	MKP1848H63050+P*
	35	30.0	45.0	42.0	37.5	10.2 / 20.3	20	700	18.9	19.9	3.8	3.4	145	130	MKP1848H63550+P*
	40	30.0	45.0	42.0	37.5	10.2 / 20.3	20	800	19.6	20.7	3.5	3.2	145	130	MKP1848H64050+P*
	45	30.0	45.0	42.0	37.5	10.2 / 20.3	20	900	20.2	21.3	3.3	3.0	145	130	MKP1848H64550+P*
	50	30.0	45.0	57.5	52.5	20.3	10	500	20.9	22.0	3.9	3.5	250	225	MKP1848H65050+Y*
	55	30.0	45.0	57.5	52.5	20.3	10	550	21.2	22.3	3.8	3.4	250	225	MKP1848H65550+Y*
	60	30.0	45.0	57.5	52.5	20.3	10	600	21.4	22.5	3.7	3.3	250	225	MKP1848H66050+Y*
	65	30.0	45.0	57.5	52.5	20.3	10	650	21.6	22.7	3.6	3.3	250	225	MKP1848H66550+Y*
	70	35.0	50.0	57.5	52.5	20.3	10	700	23.5	24.8	3.6	3.2	250	225	MKP1848H67050+Y*
	75	35.0	50.0	57.5	52.5	20.3	10	750	23.6	24.9	3.5	3.2	250	225	MKP1848H67550+Y*
	80	35.0	50.0	57.5	52.5	20.3	10	800	23.8	25.1	3.5	3.2	250	225	MKP1848H68050+Y*
700	U _{OPDC} AT 70 °C = 800 V; U _{OPDC} AT 105 °C = 450 V														
	4	15.0	25.0	32.0	27.5	-	50	200	7.0	-	10.0	-	55	-	MKP1848H54070+K2
	5	18.0	28.0	32.0	27.5	-	50	250	8.4	-	8.2	-	55	-	MKP1848H55070+K2
	6	18.0	28.0	32.0	27.5	-	50	300	9.1	-	7.0	-	55	-	MKP1848H56070+K2
	7	21.0	31.0	32.0	27.5	-	50	350	10.6	-	6.2	-	55	-	MKP1848H57070+K2
	8	21.0	31.0	32.0	27.5	-	50	400	11.1	-	5.6	-	55	-	MKP1848H58070+K2
	10	22.0	38.0	32.0	27.5	-	50	500	13.3	-	4.7	-	55	-	MKP1848H61070+K2
	12	22.0	38.0	32.0	27.5	-	50	600	14.2	-	4.1	-	55	-	MKP1848H61270+K2
	15	21.5	38.5	42.0	37.5	10.2	25	375	14.6	15.3	4.7	4.2	100	90	MKP1848H61570+P*
	20	21.5	38.5	42.0	37.5	10.2	25	500	15.6	16.5	4.0	3.6	100	90	MKP1848H62070+P*
	22	30.0	45.0	42.0	37.5	10.2 / 20.3	25	550	18.7	19.7	3.9	3.5	100	90	MKP1848H62270+P*
	25	30.0	45.0	42.0	37.5	10.2 / 20.3	25	625	19.2	20.2	3.7	3.3	100	90	MKP1848H62570+P*
	30	30.0	45.0	42.0	37.5	10.2 / 20.3	25	750	19.9	21.0	3.4	3.1	100	90	MKP1848H63070+P*
	35	30.0	45.0	57.5	52.5	20.3	12	420	19.7	20.8	4.3	3.9	215	195	MKP1848H63570+Y*
	40	30.0	45.0	57.5	52.5	20.3	12	480	20.1	21.2	4.2	3.8	215	195	MKP1848H64070+Y*
	45	30.0	45.0	57.5	52.5	20.3	12	540	20.5	21.6	4.0	3.6	215	195	MKP1848H64570+Y*
	50	35.0	50.0	57.5	52.5	20.3	12	600	22.4	23.6	3.9	3.5	215	195	MKP1848H65070+Y*
	55	35.0	50.0	57.5	52.5	20.3	12	660	22.7	23.9	3.9	3.5	215	195	MKP1848H65570+Y*
	60	35.0	50.0	57.5	52.5	20.3	12	720	22.9	24.1	3.8	3.4	215	195	MKP1848H66070+Y*



ELECTRICAL DATA AND ORDERING CODE

U _{ND} C AT 85 °C (V)	CAP. (μF)	DIMENSION ⁽⁵⁾ (mm)			P1 (mm)	P2 (mm)	du/dt (V/μs)	I _{PEAK} (A)	I _{RMS} ⁽²⁾ (A)		ESR ⁽³⁾ 10 kHz (mΩ)		tan δ ⁽⁴⁾ 10 kHz < (x 10 ⁻⁴)		ORDERING CODE ⁽¹⁾
		w	h	l					2 PINS	4 PINS	2 PINS	4 PINS	2 PINS	4 PINS	
800	U _{OPDC} AT 70 °C = 960 V; U _{OPDC} AT 105 °C = 560 V														
	3	15.0	25.0	32.0	27.5	-	60	180	6.3	-	12.3	-	50	-	MKP1848H53080+K2
	4	18.0	28.0	32.0	27.5	-	60	240	7.7	-	9.8	-	50	-	MKP1848H54080+K2
	5	21.0	31.0	32.0	27.5	-	60	300	9.1	-	8.4	-	50	-	MKP1848H55080+K2
	6	21.0	31.0	32.0	27.5	-	60	360	9.7	-	7.4	-	50	-	MKP1848H56080+K2
	7	21.0	31.0	32.0	27.5	-	60	420	10.1	-	6.7	-	50	-	MKP1848H57080+K2
	8	22.0	38.0	32.0	27.5	-	60	480	11.6	-	6.2	-	50	-	MKP1848H58080+K2
	10	22.0	38.0	32.0	27.5	-	60	600	12.3	-	5.4	-	50	-	MKP1848H61080+K2
	12	21.5	38.5	42.0	37.5	10.2	30	360	11.8	12.5	7.1	6.4	100	90	MKP1848H61280+P*
	15	21.5	38.5	42.0	37.5	10.2	30	450	12.8	13.5	6.1	5.5	100	90	MKP1848H61580+P*
	20	30.0	45.0	42.0	37.5	10.2 / 20.3	30	600	16.3	17.2	5.1	4.6	100	90	MKP1848H62080+P*
	22	30.0	45.0	42.0	37.5	10.2 / 20.3	30	660	16.8	17.7	4.8	4.3	100	90	MKP1848H62280+P*
	25	30.0	45.0	42.0	37.5	10.2 / 20.3	30	750	17.4	18.3	4.5	4.0	100	90	MKP1848H62580+P*
	30	30.0	45.0	57.5	52.5	20.3	15	450	17.4	18.3	5.6	5.0	210	190	MKP1848H63080+Y*
	35	30.0	45.0	57.5	52.5	20.3	15	525	18.3	19.3	5.0	4.5	210	190	MKP1848H63580+Y*
	40	35.0	50.0	57.5	52.5	20.3	15	600	20.7	21.8	4.6	4.2	210	190	MKP1848H64080+Y*
45	35.0	50.0	57.5	52.5	20.3	15	675	21.5	22.7	4.3	3.9	210	190	MKP1848H64580+Y*	
50	35.0	50.0	57.5	52.5	20.3	15	750	22.2	23.4	4.0	3.6	210	190	MKP1848H65080+Y*	
920	U _{OPDC} AT 70 °C = 1100 V; U _{OPDC} AT 105 °C = 650 V														
	2	15.0	25.0	32.0	27.5	-	65	130	5.7	-	15.2	-	40	-	MKP1848H52090+K2
	3	18.0	28.0	32.0	27.5	-	65	195	7.4	-	10.8	-	40	-	MKP1848H53090+K2
	4	18.0	28.0	32.0	27.5	-	65	260	8.3	-	8.5	-	40	-	MKP1848H54090+K2
	5	21.0	31.0	32.0	27.5	-	65	325	9.8	-	7.2	-	40	-	MKP1848H55090+K2
	6	22.0	38.0	32.0	27.5	-	65	390	11.5	-	6.3	-	40	-	MKP1848H56090+K2
	7	22.0	38.0	32.0	27.5	-	65	455	12.1	-	5.6	-	40	-	MKP1848H57090+K2
	8	22.0	38.0	32.0	27.5	-	65	520	12.6	-	5.2	-	40	-	MKP1848H58090+K2
	10	21.5	38.5	42.0	37.5	10.2	35	350	11.8	12.4	7.2	6.4	90	80	MKP1848H61090+P*
	12	30.0	45.0	42.0	37.5	10.2 / 20.3	35	420	14.6	15.4	6.3	5.7	90	80	MKP1848H61290+P*
	15	30.0	45.0	42.0	37.5	10.2 / 20.3	35	525	15.7	16.5	5.5	4.9	90	80	MKP1848H61590+P*
	20	30.0	45.0	42.0	37.5	10.2 / 20.3	35	700	17.0	18.0	4.7	4.2	90	80	MKP1848H62090+P*
	22	30.0	45.0	57.5	52.5	20.3	18	396	16.3	17.2	6.4	5.7	150	135	MKP1848H62290+Y*
	25	30.0	45.0	57.5	52.5	20.3	18	450	17.2	18.2	5.7	5.1	150	135	MKP1848H62590+Y*
	30	30.0	45.0	57.5	52.5	20.3	18	540	18.5	19.5	4.9	4.4	150	135	MKP1848H63090+Y*
	35	35.0	50.0	57.5	52.5	20.3	18	630	21.2	22.4	4.4	3.9	150	135	MKP1848H63590+Y*
40	35.0	50.0	57.5	52.5	20.3	18	720	22.3	23.5	4.0	3.6	150	135	MKP1848H64090+Y*	
1200	U _{OPDC} AT 70 °C = 1440 V; U _{OPDC} AT 105 °C = 850 V														
	1	15.0	25.0	32.0	27.5	-	85	85	4.5	-	24.8	-	35	-	MKP1848H51012+K2
	2	18.0	28.0	32.0	27.5	-	85	170	6.5	-	13.7	-	35	-	MKP1848H52012+K2
	3	21.0	31.0	32.0	27.5	-	85	255	8.3	-	10.0	-	35	-	MKP1848H53012+K2
	4	22.0	38.0	32.0	27.5	-	85	340	10.0	-	8.2	-	35	-	MKP1848H54012+K2
	5	21.5	38.5	42.0	37.5	10.2	40	200	9.8	10.4	10.3	9.2	55	50	MKP1848H55012+P*
	6	21.5	38.5	42.0	37.5	10.2	40	240	10.7	11.2	8.7	7.8	55	50	MKP1848H56012+P*
	7	30.0	45.0	42.0	37.5	10.2 / 20.3	40	280	13.3	14.0	7.6	6.9	55	50	MKP1848H57012+P*
	8	30.0	45.0	42.0	37.5	10.2 / 20.3	40	320	14.1	14.9	6.8	6.1	55	50	MKP1848H58012+P*
	10	30.0	45.0	42.0	37.5	10.2 / 20.3	40	400	15.5	16.3	5.6	5.1	55	50	MKP1848H61012+P*
	12	30.0	45.0	57.5	52.5	20.3	20	240	13.8	14.6	8.9	8.0	120	105	MKP1848H61212+Y*
	15	30.0	45.0	57.5	52.5	20.3	20	300	15.2	16.0	7.3	6.6	120	105	MKP1848H61512+Y*
	20	35.0	50.0	57.5	52.5	20.3	20	400	18.5	19.5	5.8	5.2	120	105	MKP1848H62012+Y*
	22	35.0	50.0	57.5	52.5	20.3	20	440	19.2	20.2	5.4	4.8	120	105	MKP1848H62212+Y*

Notes

- (1) Change the “*” symbol with special code for the terminals and “+” for tolerance
- (2) Maximum RMS current at 10 kHz, +85 °C, Δt = +15 °C, capacitance tolerance ± 5 %, a typical ESR value at 10 kHz
- (3) Equivalent series resistance typical values at 10 kHz
- (4) Maximum tan δ values at 10 kHz
- (5) Standard dimensions, for maximum dimension please consult “Dimensions Tolerances”



PACKAGING INFORMATION								
U _{NDC} AT 85 °C (V)	CAP. ⁽¹⁾ (µF)	DIMENSION (mm)			Ø dt (mm)	ORDERING CODE ⁽²⁾	MASS (g)	SPQ ⁽³⁾ (pcs)
		w	h	l				
500	U _{OPDC} AT 70 °C = 600 V; U _{OPDC} AT 105 °C = 350 V							
	5	15.0	25.0	32.0	0.8	MKP1848H55050+K2	14.5	100
	6	15.0	25.0	32.0	0.8	MKP1848H56050+K2	14.5	100
	7	18.0	28.0	32.0	0.8	MKP1848H57050+K2	20.5	80
	8	18.0	28.0	32.0	0.8	MKP1848H58050+K2	20.5	80
	10	21.0	31.0	32.0	0.8	MKP1848H61050+K2	27.5	56
	12	21.0	31.0	32.0	0.8	MKP1848H61250+K2	27	56
	15	22.0	38.0	32.0	0.8	MKP1848H61550+K2	34	56
	20	21.5	38.5	42.0	1.0	MKP1848H62050+P*	42.5	91
	22	21.5	38.5	42.0	1.0	MKP1848H62250+P*	42	91
	25	21.5	38.5	42.0	1.0	MKP1848H62550+P*	41	91
	30	30.0	45.0	42.0	1.0	MKP1848H63050+P*	70.5	63
	35	30.0	45.0	42.0	1.0	MKP1848H63550+P*	73	63
	40	30.0	45.0	42.0	1.0	MKP1848H64050+P*	70.5	63
	45	30.0	45.0	42.0	1.0	MKP1848H64550+P*	69.5	63
	50	30.0	45.0	57.5	1.2	MKP1848H65050+Y*	95.5	45
	55	30.0	45.0	57.5	1.2	MKP1848H65550+Y*	94	45
	60	30.0	45.0	57.5	1.2	MKP1848H66050+Y*	91.5	45
	65	30.0	45.0	57.5	1.2	MKP1848H66550+Y*	89.5	45
	70	35.0	50.0	57.5	1.2	MKP1848H67050+Y*	127	40
	75	35.0	50.0	57.5	1.2	MKP1848H67550+Y*	124.5	40
	80	35.0	50.0	57.5	1.2	MKP1848H68050+Y*	120.5	40
700	U _{OPDC} AT 70 °C = 800 V; U _{OPDC} AT 105 °C = 450 V							
	4	15.0	25.0	32.0	0.8	MKP1848H54070+K2	14.5	100
	5	18.0	28.0	32.0	0.8	MKP1848H55070+K2	20.5	80
	6	18.0	28.0	32.0	0.8	MKP1848H56070+K2	20	80
	7	21.0	31.0	32.0	0.8	MKP1848H57070+K2	27	56
	8	21.0	31.0	32.0	0.8	MKP1848H58070+K2	26.5	56
	10	22.0	38.0	32.0	0.8	MKP1848H61070+K2	33.5	56
	12	22.0	38.0	32.0	0.8	MKP1848H61270+K2	33.5	56
	15	21.5	38.5	42.0	1.0	MKP1848H61570+P*	42	91
	20	21.5	38.5	42.0	1.0	MKP1848H62070+P*	39	91
	22	30.0	45.0	42.0	1.0	MKP1848H62270+P*	71	63
	25	30.0	45.0	42.0	1.0	MKP1848H62570+P*	69	63
	30	30.0	45.0	42.0	1.0	MKP1848H63070+P*	70	63
	35	30.0	45.0	57.5	1.2	MKP1848H63570+Y*	91.5	45
	40	30.0	45.0	57.5	1.2	MKP1848H64070+Y*	93.5	45
	45	30.0	45.0	57.5	1.2	MKP1848H64570+Y*	90	45
	50	35.0	50.0	57.5	1.2	MKP1848H65070+Y*	119	40
	55	35.0	50.0	57.5	1.2	MKP1848H65570+Y*	123	40
	60	35.0	50.0	57.5	1.2	MKP1848H66070+Y*	120	40



PACKAGING INFORMATION

U _{NDC} AT 85 °C (V)	CAP. ⁽¹⁾ (µF)	DIMENSION (mm)			Ø dt (mm)	ORDERING CODE ⁽²⁾	MASS (g)	SPQ ⁽³⁾ (pcs)
		w	h	l				
800	U _{OPDC} AT 70 °C = 960 V; U _{OPDC} AT 105 °C = 560 V							
	3	15.0	25.0	32.0	0.8	MKP1848H53080+K2	14.5	100
	4	18.0	28.0	32.0	0.8	MKP1848H54080+K2	20.5	80
	5	21.0	31.0	32.0	0.8	MKP1848H55080+K2	26.5	56
	6	21.0	31.0	32.0	0.8	MKP1848H56080+K2	27	56
	7	21.0	31.0	32.0	0.8	MKP1848H57080+K2	26.5	56
	8	22.0	38.0	32.0	0.8	MKP1848H58080+K2	33	56
	10	22.0	38.0	32.0	0.8	MKP1848H61080+K2	33	56
	12	21.5	38.5	42.0	1.0	MKP1848H61280+P*	42	91
	15	21.5	38.5	42.0	1.0	MKP1848H61580+P*	40.5	91
	20	30.0	45.0	42.0	1.0	MKP1848H62080+P*	69	63
	22	30.0	45.0	42.0	1.0	MKP1848H62280+P*	71	63
	25	30.0	45.0	42.0	1.0	MKP1848H62580+P*	69.5	63
	30	30.0	45.0	57.5	1.2	MKP1848H63080+Y*	89	45
	35	30.0	45.0	57.5	1.2	MKP1848H63580+Y*	91.5	45
	40	35.0	50.0	57.5	1.2	MKP1848H64080+Y*	119	40
45	35.0	50.0	57.5	1.2	MKP1848H64580+Y*	124	40	
50	35.0	50.0	57.5	1.2	MKP1848H65080+Y*	119.5	40	
920	U _{OPDC} AT 70 °C = 1100 V; U _{OPDC} AT 105 °C = 650 V							
	2	15.0	25.0	32.0	0.8	MKP1848H52090+K2	15	100
	3	18.0	28.0	32.0	0.8	MKP1848H53090+K2	20.5	80
	4	18.0	28.0	32.0	0.8	MKP1848H54090+K2	20	80
	5	21.0	31.0	32.0	0.8	MKP1848H55090+K2	27	56
	6	22.0	38.0	32.0	0.8	MKP1848H56090+K2	34.5	56
	7	22.0	38.0	32.0	0.8	MKP1848H57090+K2	34	56
	8	22.0	38.0	32.0	0.8	MKP1848H58090+K2	33.5	56
	10	21.5	38.5	42.0	1.0	MKP1848H61090+P*	42	91
	12	30.0	45.0	42.0	1.0	MKP1848H61290+P*	77	63
	15	30.0	45.0	42.0	1.0	MKP1848H61590+P*	74	63
	20	30.0	45.0	42.0	1.0	MKP1848H62090+P*	69.5	63
	22	30.0	45.0	57.5	1.2	MKP1848H62290+Y*	98	45
	25	30.0	45.0	57.5	1.2	MKP1848H62590+Y*	94	45
	30	30.0	45.0	57.5	1.2	MKP1848H63090+Y*	89.5	45
	35	35.0	50.0	57.5	1.2	MKP1848H63590+Y*	124	40
40	35.0	50.0	57.5	1.2	MKP1848H64090+Y*	119.5	40	
1200	U _{OPDC} AT 70 °C = 1440 V; U _{OPDC} AT 105 °C = 850 V							
	1	15.0	25.0	32.0	0.8	MKP1848H51012+K2	15	100
	2	18.0	28.0	32.0	0.8	MKP1848H52012+K2	20	80
	3	21.0	31.0	32.0	0.8	MKP1848H53012+K2	26.5	56
	4	22.0	38.0	32.0	0.8	MKP1848H54012+K2	33.5	56
	5	21.5	38.5	42.0	1.0	MKP1848H55012+P*	42.5	91
	6	21.5	38.5	42.0	1.0	MKP1848H56012+P*	41	91
	7	30.0	45.0	42.0	1.0	MKP1848H57012+P*	76	63
	8	30.0	45.0	42.0	1.0	MKP1848H58012+P*	74.5	63
	10	30.0	45.0	42.0	1.0	MKP1848H61012+P*	70.5	63
	12	30.0	45.0	57.5	1.2	MKP1848H61212+Y*	97.5	45
	15	30.0	45.0	57.5	1.2	MKP1848H61512+Y*	92.5	45
	20	35.0	50.0	57.5	1.2	MKP1848H62012+Y*	122.5	40
	22	35.0	50.0	57.5	1.2	MKP1848H62212+Y*	119.5	40

Notes

- (1) Intermediate capacitance values available on request
 (2) Change the “*” symbol with special code for the terminals, and “+” for tolerance
 (3) SPQ = Standard Packing Quantity

CONSTRUCTION DESCRIPTION

Low inductive wound cell elements of metallized polypropylene film, potted with resin in a flame retardant case.

SPECIFIC METHOD OF MOUNTING TO WITHSTAND VIBRATION AND SHOCK

The capacitor unit is designed for mounting on a printed circuit board.

In order to withstand vibration and shock tests, it must be insured that the stand-off pips are in good contact with the printed circuit board.

The capacitors shall be mechanically fixed by the leads and the body clamped.

DIMENSIONS TOLERANCES

For the maximum product dimensions for length ($l_{max.}$), width ($w_{max.}$), and height ($h_{max.}$) use the following tolerances:

$$l_{max.} = l + \Delta l, w_{max.} = w + \Delta w, \text{ and } h_{max.} = h + \Delta h$$

$$\text{Pitch} = 27.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 0.7 \text{ mm}$$

$$\text{Pitch} = 37.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 0.7 \text{ mm}$$

$$\text{Pitch} = 52.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 1.0 \text{ mm}$$

$$l_{min.} = l - \Delta l, w_{min.} = w - \Delta w, \text{ and } h_{min.} = h - \Delta h$$

$$\text{Pitch} = 27.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 1.0 \text{ mm}$$

$$\text{Pitch} = 37.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 1.0 \text{ mm}$$

$$\text{Pitch} = 52.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 1.5 \text{ mm}$$

SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD

For product height with seating plane as given by "IEC 60717" as reference.

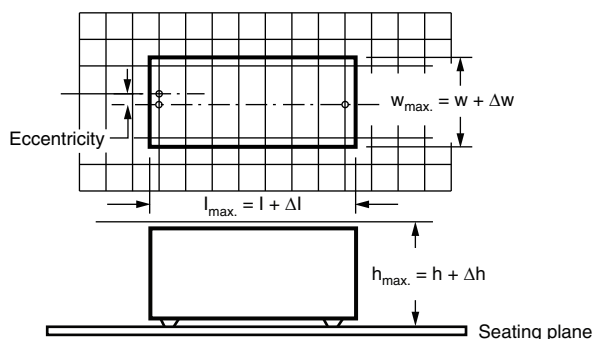
For 2 pins:

The maximum space for length ($l_{max.}$), width ($w_{max.}$), and height ($h_{max.}$) of film capacitors to take in account on the printed circuit board is shown in the drawings.

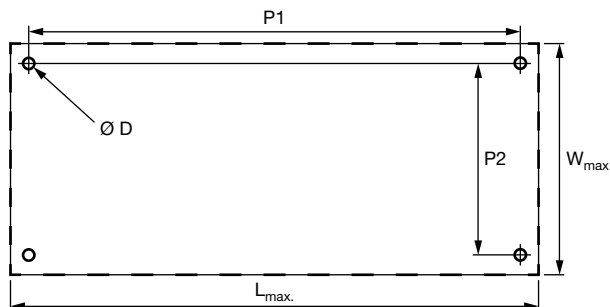
- For products with pitch $\leq 27.5 \text{ mm}$, $\Delta w = \Delta l = \Delta h = 0.7 \text{ mm}$
- For products with pitch $= 37.5 \text{ mm}$, $\Delta w = \Delta l = \Delta h = 0.7 \text{ mm}$
- For products with pitch $= 52.5 \text{ mm}$, $\Delta w = \Delta l = \Delta h = 1.0 \text{ mm}$

Eccentricity defined as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned.

The maximum length and width of film capacitors is shown in the figure.



For 4 pins:





P1 (mm)	L _{max.} (mm)	W _{max.} (mm)	Ø D (mm)	Δh (mm)
37.5	l + 1.5	w + 1.8	1.5	h + 0.7
52.5	l + 1.8	w + 2.0	1.7	h + 0.7

SOLDERING CONDITIONS

For general soldering conditions and wave soldering profile we refer to the document "Soldering Conditions Vishay Film Capacitors": www.vishay.com/doc?28171

STORAGE TEMPERATURE

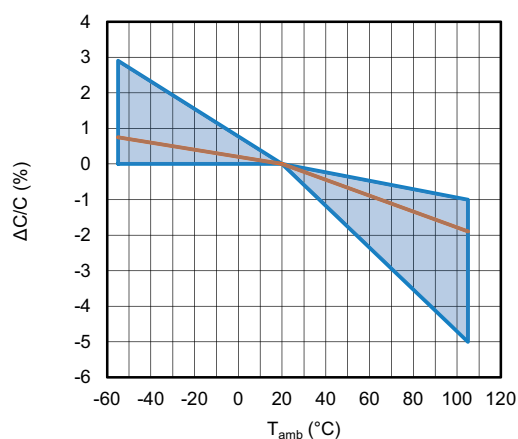
T_{stg} = -25 °C to +35 °C with RH maximum 75 % without condensation.

RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS

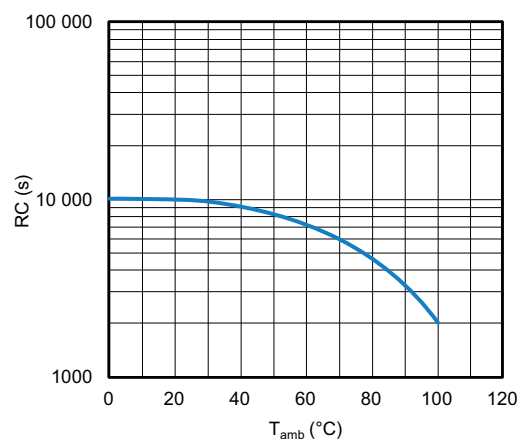
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa, and a relative humidity of 50 % ± 2 %.

For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

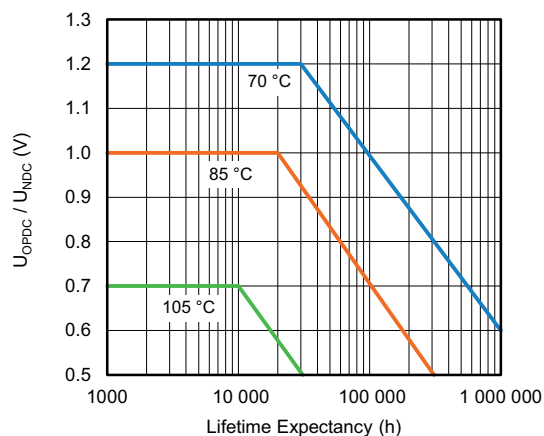
CHARACTERISTICS



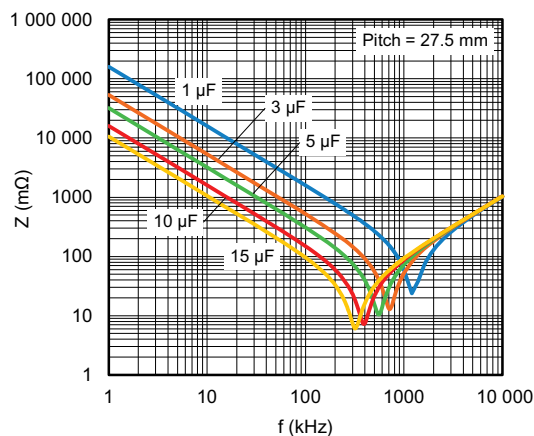
Capacitance as a function of ambient temperature (typical)



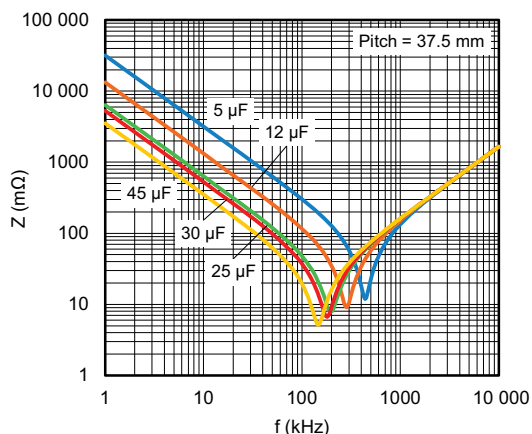
Insulation resistance as a function of ambient temperature (typical)



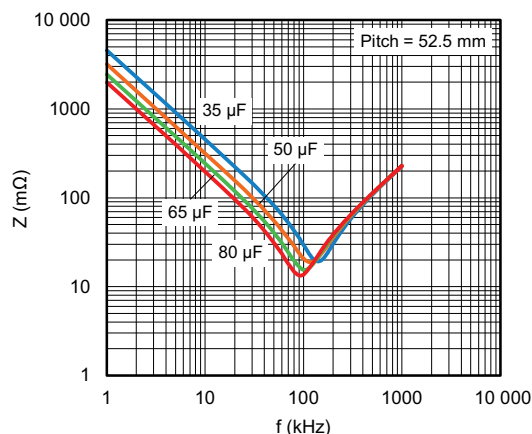
Lifetime expectancy by case temperature (typical)



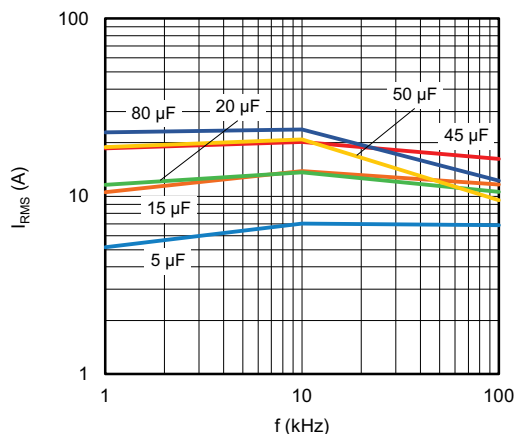
Impedance as a function of frequency (typical)



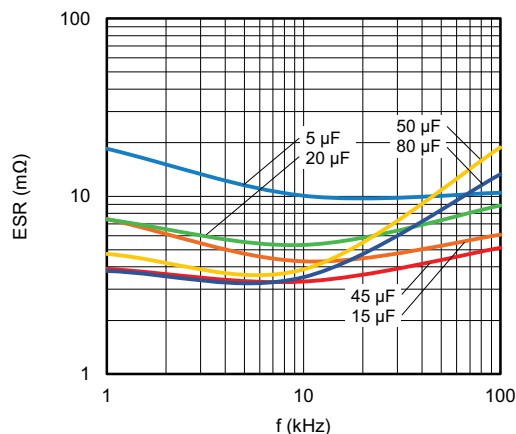
Impedance as a function of frequency
(typical)



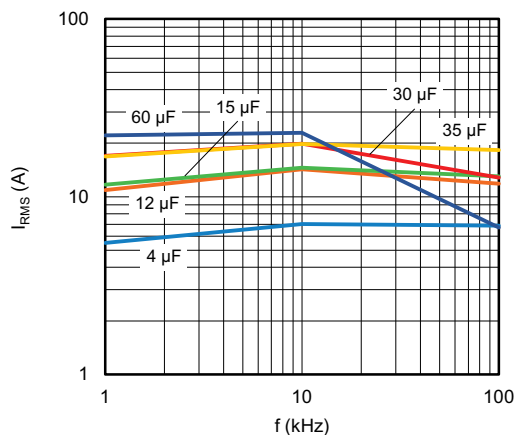
Impedance as a function of frequency
(typical)



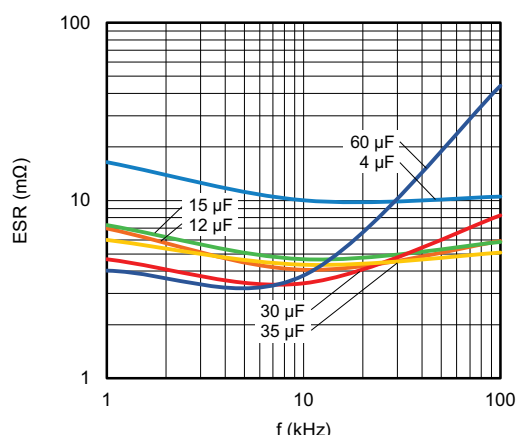
Maximum I_{RMS} current as function of frequency (500 V_{DC}),
based $T_A + 85^\circ C$, $\Delta t = +15^\circ C$, capacitance tolerance $\pm 5\%$,
(typical curve)



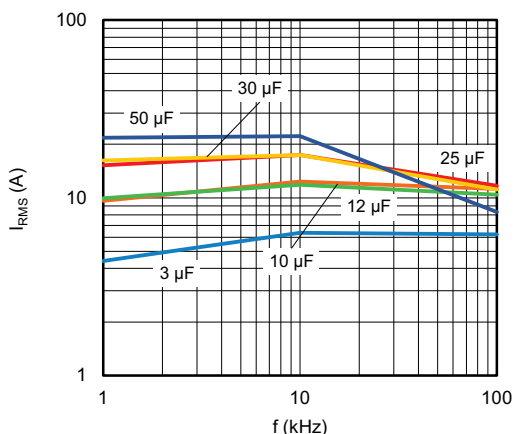
ESR as function of frequency (500 V_{DC})
(typical curve)



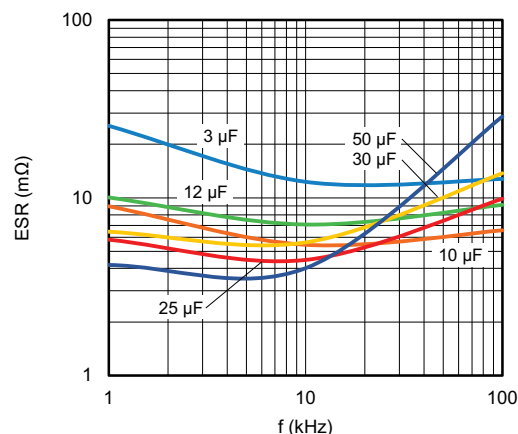
Maximum I_{RMS} current as function of frequency (700 V_{DC}),
based $T_A + 85^\circ C$, $\Delta t = +15^\circ C$, capacitance tolerance $\pm 5\%$,
(typical curve)



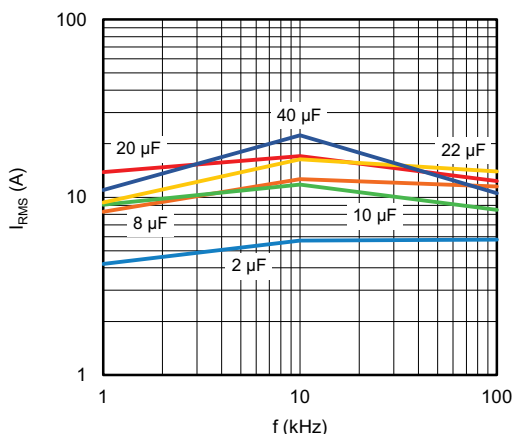
ESR as function of frequency (700 V_{DC})
(typical curve)



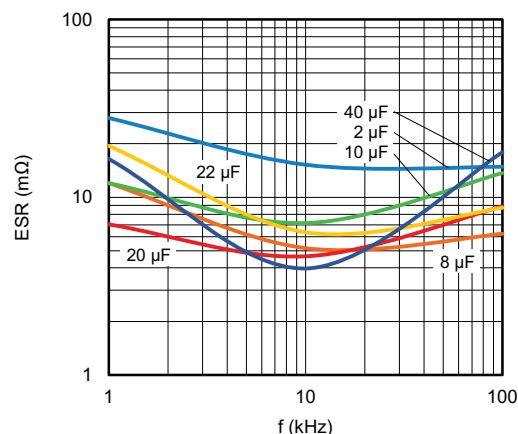
Maximum I_{RMS} current as function of frequency (800 V_{DC}), based $T_A + 85^\circ C$, $\Delta t = +15^\circ C$, capacitance tolerance $\pm 5\%$, (typical curve)



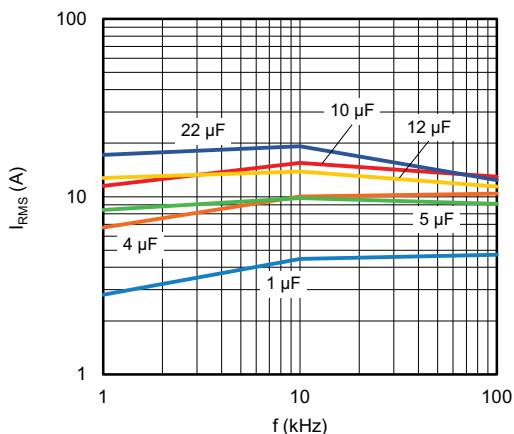
ESR as function of frequency (800 V_{DC}) (typical curve)



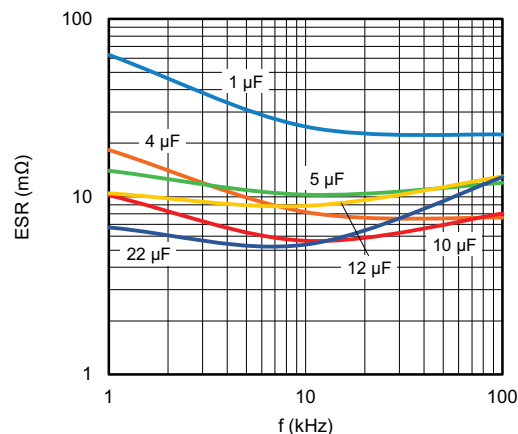
Maximum I_{RMS} current as function of frequency (920 V_{DC}), based $T_A + 85^\circ C$, $\Delta t = +15^\circ C$, capacitance tolerance $\pm 5\%$, (typical curve)



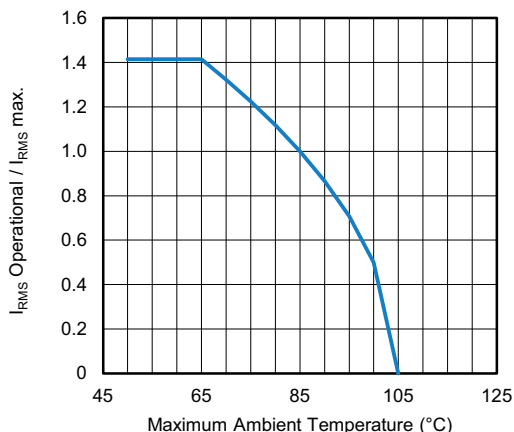
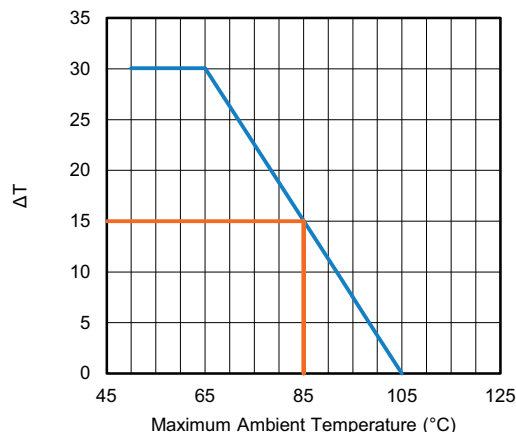
ESR as function of frequency (920 V_{DC}) (typical curve)



Maximum I_{RMS} current as function of frequency (1200 V_{DC}), based $T_A + 85^\circ C$, $\Delta t = +15^\circ C$, capacitance tolerance $\pm 5\%$, (typical curve)



ESR as function of frequency (1200 V_{DC}) (typical curve)


Maximum I_{RMS} current in function of the ambient temperature

Maximum allowed component temperature rise (ΔT) as a function of ambient temperature (T_{amb})

HEAT CONDUCTIVITY

DIMENSIONS (mm)			HEAT CONDUCTIVITY (mW/°C)
w	h	l	
15.0	25.0	32.0	33
18.0	28.0	32.0	39
21.0	31.0	32.0	46
22.0	38.0	32.0	55
21.5	38.5	42.0	66
30.0	45.0	42.0	90
30.0	45.0	57.5	113
35.0	50.0	57.5	132

POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

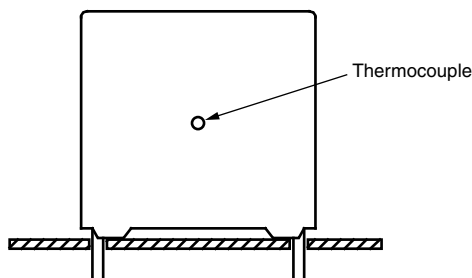
The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free air ambient temperature.

The power dissipation can be calculated according type detail specification www.vishay.com/doc?28147

The component temperature rise (ΔT) can be measured (see section “Measuring the Component Temperature” for more details) or calculated by $\Delta T = P/G$:

- $\Delta T = T_C - T_{amb}$ = case temperature rise (°C) with a maximum of 15 °C at rated temperature
- $P = I_{RMS}^2 \times ESR$ = power dissipation of the component (mW)
- G = heat conductivity of the component (mW/°C)

MEASURING THE COMPONENT TEMPERATURE



The case temperature is measured in unloaded condition (T_{amb}) and loaded condition (T_C).

The temperature rise is given by $\Delta T = T_C - T_{amb}$

To avoid external thermal radiation or convection, the capacitor must be tested in a closed area, free from air circulation.

APPLICATION NOTES AND LIMITING CONDITIONS

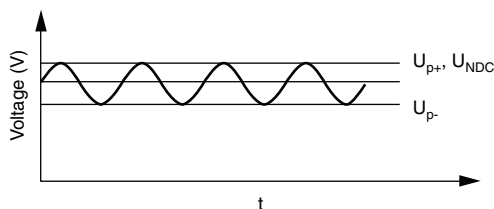
These capacitors are not suitable for mains applications as across-the-line capacitors without additional protection.

These mains applications are strictly regulated in safety standards and therefore electromagnetic interference suppression capacitors conforming the standards must be used.

To select the capacitor for a certain application, the following conditions must be checked:

1. The continuous peak voltage (U_{p+}) shall not exceed the DC voltage rating (U_{NDC})
2. The peak-to-peak ripple voltage (U_{PP}) shall not be greater than $0.2 \times (U_{NDC})$

Non reversing recurrent waveform



3. For capacitors connected in parallel, normally the proof voltage and possibly the rated voltage must be reduced. For information depending of the capacitance value and the number of parallel connections contact: dc-film@vishay.com
4. The voltage peak slope (du/dt) shall not exceed the pulse slope at the DC voltage rating.
If the pulse voltage is lower than the rated DC voltage, the rated voltage pulse slope may be multiplied by U_{NDC} and divided by the applied voltage.

For all other pulses following equation must be fulfilled:

$$2 \times \int_0^T \left(\frac{du}{dt} \right)^2 \times dt < U_{NDC} \times \left(\frac{du}{dt} \right)_{rated}$$

T is the pulse duration

MAXIMUM REPETITIVE PEAK VOLTAGES	
REPETITIVE SURGE VOLTAGE	MAXIMUM DURATION PER DAY
$1.1 \times U_{NDC}$	30 % on load duration
$1.15 \times U_{NDC}$	30 min
$1.2 \times U_{NDC}$	5 min
$1.3 \times U_{NDC}$	1 min
$1.5 \times U_{NDC}$	110 ms

Note

- The capacitor unit may be subjected to the surge above without any significant reduction of lifetime expectancy



TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071					
SUB-CLAUSE NUMBER AND TEST		CONDITIONS			PERFORMANCE REQUIREMENTS
ROUTINE TEST - FINAL INSPECTION					
5.14.2-1	External inspection, visual examination	1 kHz at room temperature			Legible marking as specified
5.14.2-2	Dimensions				See specification drawing
5.3-1	Capacitance				See specific reference data
5.3-2	tan δ				See specific reference data
5.5.1-2	DC voltage test between terminals	1.5 x U _{NDC} at T _{amb} Duration: 10 s			No visible damage or puncture No flashover
5.7	Insulation resistance	Measuring voltage 500 V at room temperature Duration: 1 min			See specific reference data
TYPE TESTS					
5.14.2	External inspection	Check for finish, marking, and overall dimensions			Legible marking and finish as specified Dimensions: see specific drawing
5.14.0	Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz			
5.14.1-1/4	Robustness of terminations IEC 60068-2-21	Tensile U _{a1} : duration: 10 s ± 1 s			
		Wire diameter	Section	Load	
		d ≤ 0.80 mm	S ≤ 0.5 mm ²	10 N (± 10 %)	
		d ≤ 1.25 mm	S ≤ 1.2 mm ²	20 N (± 10 %)	
		Bending, U _b method 1: 4 x 90 °, duration 2 s to 3 s/bend			
		Wire diameter	Section	Load	
		d ≤ 0.80 mm	Z _x ≤ 0.050 mm ³	5 N (± 10 %)	
		d ≤ 1.25 mm	Z _x ≤ 0.019 mm ³	10 N (± 10 %)	
5.14.1-6	Resistance to soldering heat IEC 60068-2-20	No predrying, method 1A Solder bath: 280 °C ± 5 °C Duration: 10 s ± 1 s			
5.14.4	Final measurements	Capacitance tan δ			ΔC/C ≤ 0.5 % Increase of tan δ ≤ 0.0050 Compared to values measured in 5.14.0
5.14.0	Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz			No visible damage
5.14.3-1	Vibration IEC 60068-2-6	10 Hz to 55 Hz: amplitude ± 0.35 mm or acceleration 98 m/s ² Test duration: 10 frequency cycles (3 axes offset from each other by 90°) 1 octave/min Visual examination			
5.14.3-2	Shock or impact IEC 60068-2-6	Pulse shape: half sine Acceleration: 490 m/s ² Duration of pulse: 11 ms			
5.14.4	Final measurements	Visual examination Capacitance tan δ			
		No visible damage ΔC/C ≤ 0.5 % Increase of tan δ ≤ 0.0050 Compared to values measured in 5.14.0			



TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071		
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
TYPE TESTS		
5.5.3-1 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz Insulation resistance	
5.5.3-2 DC voltage test between terminals	$1.5 \times U_{NDC}$ at T_{amb} Duration: 60 s	
5.5.3-3 Final measurements	Capacitance tan δ Insulation resistance	$ \Delta C/C \leq 0.5 \%$ Increase of tan $\delta \leq 0.0050$ IR $\geq 50 \%$ of specified values
5.9-1 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz Insulation resistance	
5.9-2 Surge discharge test	$1.1 \times U_{NDC}$ Number of discharges: 5 Time lapse: every 2 min (10 min total)	
5.9-2 DC voltage test between terminals	Within 5 min after the surge discharge test $1.5 \times U_{NDC}$ at T_{amb} Duration: 60 s	
5.9-3 Final measurements	Capacitance tan δ Insulation resistance	$ \Delta C/C \leq 1.0 \%$ tan $\delta \leq 1.2 \times \text{initial tan } \delta + 0.0001$ Compared to values measured in 5.9-1 IR $\geq 50 \%$ of specified values
5.11-1 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz Insulation resistance	
5.11-2 Self healing test	$1.5 \times U_{NDC}$ Duration: 10 s increase the voltage at 100 V/s till 5 clearings occur or until voltage reach max. of $2.5 \times U_{NDC}$ for a duration of 10 s	Number of clearings ≤ 5 Clearing = voltage drop of 5 %
5.11-3 Final measurements	Capacitance tan δ Insulation resistance	$ \Delta C/C \leq 0.5 \%$ tan $\delta \leq 1.2 \times \text{initial tan } \delta + 0.0001$ Compared to values measured in 5.11.1 IR $\geq 50 \%$ of specified values
5.13-0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz Insulation resistance	
5.13-1 Change of temperature acc. to IEC 60068-2-14	Test Nb $T_{max.} = 85^\circ\text{C}$ $T_{min.} = -40^\circ\text{C}$ Transition time: 1 h, equivalent to 1°C/min 5 cycles	
5.13.2 Damp heat steady state acc. to IEC 60068-2-78	Test Ca $T = 40^\circ\text{C} \pm 2^\circ\text{C}$ RH = $93\% \pm 3\%$ Duration: 56 days	
5.5.3-2 DC voltage test between terminals	$1.5 \times U_{NDC}$ at ambient temperature Duration: 60 s	
5.13.3 Final measurements	Visual examination Capacitance tan δ Insulation resistance	No puncturing or flashover Self healing punctures are permitted $ \Delta C/C \leq 2.0 \%$ Increase of tan $\delta \leq 0.0150$ Compared to values measured in 5.13-0 IR $\geq 50 \%$ of specified values



TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071		
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
TYPE TESTS		
5.13A-0 Initial measurements	Capacitance at 1 kHz tan δ at 1 kHz Insulation resistance	$ \Delta C/C < 10\%$ Increase of tan $\delta \leq 0.0100$ Compared to values measured in 5.13A.0 IR $\geq 50\%$ of specified values
5.13A.2 Accelerate damp heat steady state with load	$T = 85\text{ }^{\circ}\text{C}$ RH = 85 % at U_{NDC} Duration 1000 h	
5.13.3 Final measurements	Capacitance at 1 kHz tan δ at 1 kHz Insulation resistance	
5.10-0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz Insulation resistance	Temperature rise $< 1\text{ }^{\circ}\text{C}$ $ \Delta C/C \leq 2\%$ Increase of tan $\delta \leq 0.0150$ IR $\geq 50\%$ of specified values
5.10-1 Thermal stability test under overload conditions	Natural cooling $T_{\text{amb}} \pm 5\text{ }^{\circ}\text{C}$ $1.21 \times P_{\text{max.}} = 1.21 \times (I_{\text{RMS}}^2/w \times C) \times \tan \delta(f)$ with $w = 2 \times \pi \times f$ for I_{RMS} see specific reference data $f = 10\text{ kHz}$ Duration: 48 h	
5.10-2 Final measurements	Measure the temperature every 1.5 h during the last 6 h Capacitance tan δ at 10 kHz Insulation resistance	
5.12 Resonance frequency measurement	Impedance analyzer at T_{amb}	> 0.9 times the value as specified in typical curve "Resonant frequency" of this specification
5.15-0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz Insulation resistance	$ \Delta C/C \leq 3\%$ Increase of tan $\delta \leq 0.0150$ Compared to values measured in 5.15-0 IR $\geq 50\%$ of specified values
5.15-1 Endurance test between terminals	Sequence $1.3 \times U_{\text{NDC}}$ at $85\text{ }^{\circ}\text{C}$ $1.3 \times U_{\text{OPDC}}$ at $105\text{ }^{\circ}\text{C}$ Duration: 500 h $1000 \times$ discharge at $1.4 \times \hat{I}$ (maximum peak current) $1.3 \times U_{\text{NDC}}$ at $85\text{ }^{\circ}\text{C}$ $1.3 \times U_{\text{OPDC}}$ at $105\text{ }^{\circ}\text{C}$ Duration: 500 h	
5.15-2 Final measurements	Capacitance tan δ Insulation resistance	
5.16.3-0 Initial measurements	Capacitance at 1 kHz	Audible healings or check healings with oscilloscope No puncturing, flashover or burning of the cheese cloth Self healing punctures are permitted
5.16.3-1 Destruction test sequence for non-segmented film	The capacitors must be put in an oven at $T_{\text{max.}} = 85\text{ }^{\circ}\text{C}$, product enveloped with cheese cloth	
High DC voltage test	$3 \times U_{\text{NDC}}$ or DC voltage until repetitive product healings occur, duration: 15 min	
High AC voltage test	AC_{RMS} voltage = $U_{\text{NDC}}/2 \sqrt{2}$ with min. 250 V _{AC} Duration: 5 min Repeat destruction sequence 3 x	
5.16.3-2 Final measurements	Visual examination	

TEST CONDITIONS AND REQUIREMENTS ACCORDING AEC-Q200 REVISION D				
NO.	TEST NAME	REFERENCE	TEST CONDITIONS	PERFORMANCE REQUIREMENTS
1	Pre- and post-stress electrical test	Spec.	-	-
3	High temperature exposure (storage)	MIL-STD 202 method 108	85 °C; unpowered 250 h / 500 h / 1000 h	$ \Delta C/C \leq 3 \%$ Increase of $\tan \delta$ (10 kHz) ≤ 0.005 IR > 50 % of initial specified value
4	Temperature cycling	JESD22 method JA-104	1000 cycles: -40 °C / +85 °C 30 min. dwell time at each temperature extreme Transition time < 1 min.	$ \Delta C/C \leq 2 \%$ Increase of $\tan \delta$ (10 kHz) ≤ 0.005 IR > 50 % of initial specified value
6	Moisture resistance	MIL-STD 202 method 106	10 cycles at 24 h/cycle unpowered	$ \Delta C/C \leq 2 \%$ Increase of $\tan \delta$ (10 kHz) ≤ 0.005 IR > 50 % of initial specified value
7	Biased humidity	MIL-STD 202 method 103	40 °C; 93 % RH; U_{RDC} 250 h / 500 h / 1000 h	$ \Delta C/C \leq 2 \%$ Increase of $\tan \delta$ (10 kHz) ≤ 0.005 IR > 50 % of initial specified value
8	Operational life	MIL-STD 202 method 108	$T_{amb} = 85 \text{ °C}$; $1.25 \times U_{RDC}$ 250 h / 500 h / 1000 h	$ \Delta C/C \leq 3 \%$ Increase of $\tan \delta$ (10 kHz) ≤ 0.005 IR > 50 % of initial specified value
9	External visual	MIL-STD 883 method 2009	Device construction, marking, and workmanship	Device construction and workmanship; legible marking
10	Physical dimension	JESD22 method JB-100	Spec.	Datasheet
11	Terminal strength (lead)	MIL-STD 202 method 211	Test lead device lead integrity only. - A (pull-test): 44.1 N (10 s) - C (wire-lead bend test): 227 g (3 x 3 s)	No visual damage
12	Resistance to solvents	MIL-STD 202 method 215	Also aqueous chemical - OKEM clean or equivalent. Do not use banned solvents.	No visual damage Legible marking
13	Mechanical shock	MIL-STD 202 method 213	100 g's; 6 ms half-sine; 3.75 m/s	No visual damage
14	Vibration	MIL-STD 202 method 204	5 g's for 20 min; 12 cycles x 3 directions 10 Hz to 2000 Hz	No visual damage
15	Resistance to soldering heat	MIL-STD 202 method 210	280 °C; 10 s solder within 1.5 mm of device body	$ \Delta C/C \leq 0.5 \%$ Increase of $\tan \delta$ (10 kHz) ≤ 0.005 IR > 50 % of initial specified value
17	ESD	-	-	-
18	Solderability	J-STD-002	Leaded: method A at 235 °C, category 3 (245 °C / 3 s)	Good tinning as evidence by free flowing of the solder with wetting of terminations > 95 %
19	Electrical characterization	-	-	-
20	Flammability	UL-94 IEC 60384-1	One flame application Class B	V-0 or V-1 are acceptable. Class B or C acc. IEC is also acceptable

Note

Measurement conditions at 23 °C:

- Capacitance at 1 kHz
- $\tan \delta$ 10 kHz (additional 1 kHz and ESR 10 kHz)
- Insulation resistance 500 V, 1 min after full charge
- Dimensions w x h x l



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.