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High Temperature Metallized Polypropylene DC-Link Film Capacitor - 125 °C, THB and AEC-Q200 Qualified



FEATURES

- Operating temperature up to 125 °C
- THB grade III: high robustness under high humidity - IEC 60384-16 ed. 3 - annex A
- AEC-Q200 qualified, revision E
- High ripple current capability, low ESR, low ESL
- Mounting: radial
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

LINKS TO ADDITIONAL RESOURCES

3D Models

APPLICATIONS

- Automotive power electronics
- Charging systems
- Industrial power conversion

QUICK REFERENCE DATA	
Rated capacitance range	1 µF to 140 µF
Capacitance tolerance	± 5 %, ± 10 %
Climatic testing class	40 / 105 / 56
Rated temperature	85 °C
Maximum operating temperature	125 °C for 500 h
Maximum applicable peak to peak ripple voltage	0.2 x U_{NDC}
Reference standards	IEC 61071, IEC 60068, IEC 60384-16 AEC-Q200 qualified (rev. E) up to 105 °C
Dielectric	Polypropylene film
Electrodes	Metallized dielectric capacitor
Construction	Mono construction
Encapsulation	Plastic case sealed with resin; flame retardant
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 ≤ 1000 V/s
Insulation resistance	RC between leads, after 1 min > 10 000 s, measuring voltage: 500 V
Marking	Manufacturer's name; C-value; tolerance; rated voltage; manufacturer's type designation; code for dielectric material, manufacturer location (F or L), year (yy) and week (ww)

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 Metalized Film Capacitors" (www.vishay.com/doc?28169)

DC VOLTAGE RATINGS						
U_{NDC} at 70 °C	600 V_{DC}	850 V_{DC}	1100 V_{DC}	1200 V_{DC}	1450 V_{DC}	1600 V_{DC}
U_{NDC} at 85 °C	500 V_{DC}	700 V_{DC}	900 V_{DC}	1000 V_{DC}	1200 V_{DC}	1300 V_{DC}
U_{OPDC} at 105 °C	350 V_{DC}	500 V_{DC}	700 V_{DC}	800 V_{DC}	900 V_{DC}	950 V_{DC}
U_{OPDC} at 125 °C	250 V_{DC}	400 V_{DC}	500 V_{DC}	600 V_{DC}	700 V_{DC}	800 V_{DC}

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COMPOSITION OF CATALOG NUMBER

MULTIPLIER (nF)	
10	4
100	5
1000	6
10 000	7

CAPACITANCE (numerically)		
Example:		
510	1000 nF	1 µF
610	10 000 nF	10 µF
710	100 000 nF	100 µF

P1 (mm)	PITCH CODE
22.5	I
27.5	K
37.5	P
52.5	Y

MKP	1848e	6	70	70	J	Y	2

TYPE CONSTRUCTION

METALLIZED POLYPROPYLENE

VOLTAGE
U_{NDC} = 50 = 500 V_{DC} at 85 °C
U_{NDC} = 70 = 700 V_{DC} at 85 °C
U_{NDC} = 90 = 900 V_{DC} at 85 °C
U_{NDC} = 10 = 1000 V_{DC} at 85 °C
U_{NDC} = 12 = 1200 V_{DC} at 85 °C
U_{NDC} = 13 = 1300 V_{DC} at 85 °C

TOLERANCE	
J	± 5 %
K	± 10 %

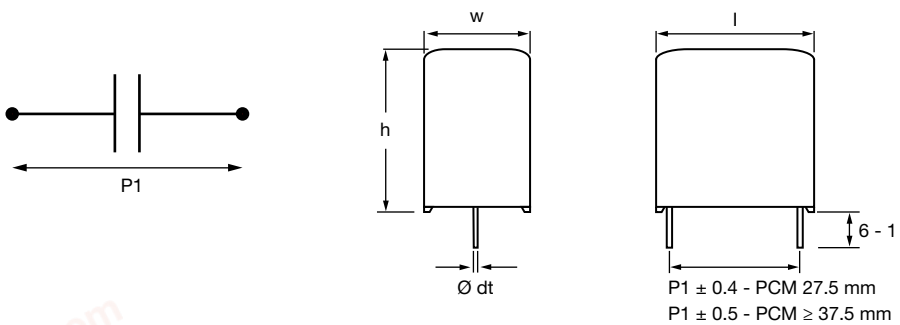
SPECIAL CODE FOR TERMINAL	
2	2 pins
4	4 pins P2 = 10.2 mm
5	4 pins P2 = 20.3 mm
(1)	Customized

Note

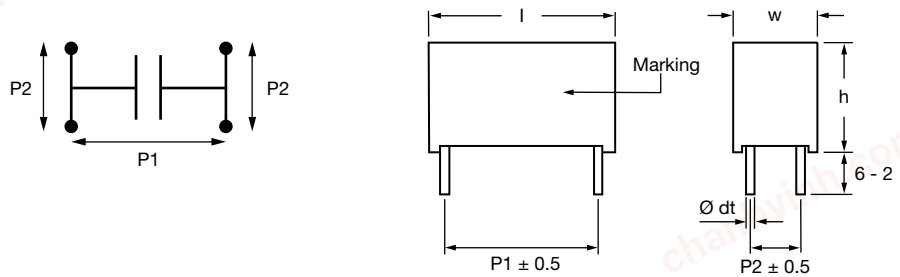
(1) Tabs terminals or customized terminals are available on request

DIMENSIONS in millimeters

2 PINS



4 PINS



Note

- Ø dt ± 10 % of standard diameter specified

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ELECTRICAL DATA AND ORDERING CODE

U_{NDC} 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	
	U_{OPDC} AT 105 °C = 350 V; U_{OPDC} AT 125 °C = 250 V														
500	1	7.0	16.5	26.0	22.5	-	45	45	2.8	-	36.5	-	85	-	MKP1848e51050+I2
	2	8.5	18.0	26.0	22.5	-	45	90	4.0	-	18.0	-	85	-	MKP1848e52050+I2
	3	10.0	19.5	26.0	22.5	-	45	135	5.0	-	14.0	-	85	-	MKP1848e53050+I2
	4	10.0	19.5	26.0	22.5	-	45	180	5.5	-	12.0	-	85	-	MKP1848e54050+I2
	6	12.0	22.0	26.0	22.5	-	45	270	7.5	-	7.0	-	85	-	MKP1848e56050+I2
	9	15.5	26.5	26.5	22.5	-	45	405	10.5	-	4.5	-	85	-	MKP1848e59050+I2
	12	18	29.5	26.5	22.5	-	45	540	12.0	-	3.5	-	85	-	MKP1848e61250+I2
	15	18	29.5	26.5	22.5	-	45	675	15.0	-	3.0	-	85	-	MKP1848e61550+I2
	6	11.0	21.0	32.0	27.5	-	25	150	6.0	-	8.5	-	85	-	MKP1848e56050+K2
	9	13.0	23.0	32.0	27.5	-	25	225	8.0	-	6.0	-	85	-	MKP1848e59050+K2
	12	15.0	25.0	32.0	27.5	-	25	300	9.5	-	5.0	-	85	-	MKP1848e61250+K2
	15	18.0	28.0	32.0	27.5	-	25	375	11.0	-	4.5	-	85	-	MKP1848e61550+K2
	22	21.0	31.0	32.0	27.5	-	25	550	14.5	-	3.0	-	100	-	MKP1848e62250+K2
	30	22.0	38.0	32.0	27.5	-	25	750	18.5	-	2.0	-	120	-	MKP1848e63050+K2
	35	18.5	35.5	42.0	37.5	10.2	10	350	13.0	15.5	4.0	3.5	155	150	MKP1848e63550+P*
	45	21.5	38.5	42.0	37.5	10.2	10	450	16.5	18.0	3.5	3.0	155	150	MKP1848e64550+P*
	60	24.0	44.0	42.0	37.5	10.2	10	600	20.0	25.0	2.5	2.0	160	155	MKP1848e66050+P*
	80	30.0	45.0	42.0	37.5	10.2 / 20.3	10	800	25.0	33.0	2.0	1.5	160	155	MKP1848e68050+P*
	90	25.0	45.0	57.5	52.5	10.2	5	450	20.0	22.5	3.5	3.0	310	310	MKP1848e69050+Y*
	110	30.0	45.0	57.5	52.5	20.3	5	550	23.5	26.0	3.0	2.5	310	310	MKP1848e71150+Y*
	140	35.0	50.0	57.5	52.5	20.3	5	700	31.5	44.5	1.5	1.0	320	315	MKP1848e71450+Y*
700	U_{OPDC} AT 105 °C = 500 V; U_{OPDC} AT 125 °C = 400 V														
	1	10.0	19.5	26.0	22.5	-	75	75	3.0	-	32.0	-	75	-	MKP1848e51070+I2
	2	10.0	19.5	26.0	22.5	-	75	150	4.5	-	25.0	-	75	-	MKP1848e52070+I2
	3	12.0	22.0	26.0	22.5	-	75	225	5.5	-	11.0	-	75	-	MKP1848e53070+I2
	4	15.5	26.5	26.5	22.5	-	75	300	8.0	-	7.5	-	75	-	MKP1848e54070+I2
	5	18.0	29.5	26.5	22.5	-	75	375	9.0	-	6.0	-	75	-	MKP1848e55070+I2
	2	9.0	19.0	32.0	27.5	-	40	80	3.5	-	25.0	-	75	-	MKP1848e52070+K2
	3	11.0	21.0	32.0	27.5	-	40	120	4.5	-	16.5	-	75	-	MKP1848e53070+K2
	4	13.0	23.0	32.0	27.5	-	40	160	5.5	-	12.5	-	75	-	MKP1848e54070+K2
	5	15.0	25.0	32.0	27.5	-	40	200	6.5	-	10.0	-	75	-	MKP1848e55070+K2
	7	18.0	28.0	32.0	27.5	-	40	280	9.0	-	7.0	-	75	-	MKP1848e57070+K2
	10	21.0	31.0	32.0	27.5	-	40	400	11.5	-	5.0	-	85	-	MKP1848e61070+K2
	15	22.0	38.0	32.0	27.5	-	40	600	15.5	-	3.0	-	95	-	MKP1848e61570+K2
	16	18.5	35.5	42.0	37.5	10.2	40	320	11.5	12.5	6.0	5.5	140	135	MKP1848e61670+P*
	20	21.5	38.5	42.0	37.5	10.2	20	400	14.5	15.5	4.5	4.0	140	135	MKP1848e62070+P*
	25	24.0	44.0	42.0	37.5	10.2	20	500	17.5	19.5	3.5	3.0	145	140	MKP1848e62570+P*
	35	30.0	45.0	42.0	37.5	10.2 / 20.3	20	700	25.0	29.0	2.5	2.0	145	140	MKP1848e63570+P*
	40	25.0	45.0	57.5	52.5	10.2	10	400	18.0	19.5	4.5	4.0	270	265	MKP1848e64070+Y*
	50	30.0	45.0	57.5	52.5	20.3	10	500	21.0	23.5	3.5	3.0	270	265	MKP1848e65070+Y*
	70	35.0	50.0	57.5	52.5	20.3	10	700	27.0	31.5	2.5	2.0	270	265	MKP1848e67070+Y*

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ELECTRICAL DATA AND ORDERING CODE

U_{NDC} 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	
900	U_{OPDC} AT 105 °C = 700 V; U_{OPDC} AT 125 °C = 500 V														
	1	10.0	19.5	26.0	22.5	-	90	90	4.0	-	25.0	-	65	-	MKP1848e51090+I2
	2	12.0	22.0	26.0	22.5	-	90	180	6.0	-	15.0	-	65	-	MKP1848e52090+I2
	3	15.5	26.5	26.5	22.5	-	90	270	8.0	-	9.0	-	65	-	MKP1848e53090+I2
	4	18	29.5	26.5	22.5	-	90	360	10.0	-	7.0	-	65	-	MKP1848e54090+I2
	1	9.0	19.0	32.0	27.5	-	50	50	3.0	-	42.0	-	75	-	MKP1848e51090+K2
	2	11.0	21.0	32.0	27.5	-	50	100	4.5	-	21.0	-	75	-	MKP1848e52090+K2
	3	15.0	25.0	32.0	27.5	-	50	150	7.0	-	14.0	-	75	-	MKP1848e53090+K2
	4	18.0	28.0	32.0	27.5	-	50	200	8.5	-	10.5	-	75	-	MKP1848e54090+K2
	5	18.0	28.0	32.0	27.5	-	50	250	9.5	-	8.0	-	75	-	MKP1848e55090+K2
	7	21.0	31.0	32.0	27.5	-	50	350	12.5	-	6.0	-	75	-	MKP1848e57090+K2
	10	22.0	38.0	32.0	27.5	-	50	500	16.5	-	4.0	-	75	-	MKP1848e61090+K2
	11	18.5	35.5	42.0	37.5	10.2	25	275	12.0	12.5	7.0	6.5	115	110	MKP1848e61190+P*
	15	21.5	38.5	42.0	37.5	10.2	25	375	14.5	16.0	5.0	4.5	115	110	MKP1848e61590+P*
	20	24.0	44.0	42.0	37.5	10.2	25	500	18.5	20.0	4.0	3.5	125	120	MKP1848e62090+P*
	25	30.0	45.0	42.0	37.5	10.2 / 20.3	25	625	22.0	25.0	3.0	2.5	135	130	MKP1848e62590+P*
	35	30.0	45.0	57.5	52.5	20.3	12	420	20.0	23.0	4.0	3.5	200	195	MKP1848e63590+Y*
	45	35.0	50.0	57.5	52.5	20.3	12	540	25.0	27.0	3.5	3.0	200	195	MKP1848e64590+Y*
1000	U_{OPDC} AT 105 °C = 800 V; U_{OPDC} AT 125 °C = 600 V														
	1	10.0	19.5	26.0	22.5	-	95	95	4.0	-	26.0	-	55	-	MKP1848e51010+I2
	2	12.5	22.5	26.5	22.5	-	95	190	6.0	-	16.0	-	55	-	MKP1848e52010+I2
	3	15.5	26.5	26.5	22.5	-	95	285	8.0	-	10.0	-	55	-	MKP1848e53010+I2
	4	18	29.5	26.5	22.5	-	95	380	10.0	-	8.0	-	55	-	MKP1848e54010+I2
	1	11.0	21.0	32.0	27.5	-	60	60	3.5	-	39.0	-	65	-	MKP1848e51010+K2
	2	13.0	23.0	32.0	27.5	-	60	120	5.5	-	19.5	-	65	-	MKP1848e52010+K2
	3	15.0	25.0	32.0	27.5	-	60	180	7.0	-	13.0	-	65	-	MKP1848e53010+K2
	4	18.0	28.0	32.0	27.5	-	60	240	9.0	-	9.5	-	65	-	MKP1848e54010+K2
	6	21.0	31.0	32.0	27.5	-	60	360	12.0	-	6.5	-	65	-	MKP1848e56010+K2
	8	22.0	38.0	32.0	27.5	-	60	480	15.0	-	4.5	-	65	-	MKP1848e58010+K2
	9	18.5	35.5	42.0	37.5	10.2	30	270	11.0	11.5	8.0	7.5	90	85	MKP1848e59010+P*
	12	21.5	38.5	42.0	37.5	10.2	30	360	13.5	14.5	6.0	5.5	90	85	MKP1848e61210+P*
	15	24.0	44.0	42.0	37.5	10.2	30	450	16.5	17.5	5.0	4.5	110	105	MKP1848e61510+P*
	20	30.0	45.0	42.0	37.5	10.2 / 20.3	30	600	20.0	23.0	3.5	3.0	120	115	MKP1848e62010+P*
	25	25.0	45.0	57.5	52.5	10.2	15	375	16.5	17.5	6.0	5.5	175	170	MKP1848e62510+Y*
	30	30.0	45.0	57.5	52.5	20.3	15	450	19.0	20.0	5.0	4.5	175	170	MKP1848e63010+Y*
	35	35.0	50.0	57.5	52.5	20.3	15	525	22.0	25.0	4.0	3.5	175	170	MKP1848e63510+Y*

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		w	h	l					2 PINS	4 PINS	2 PINS	4 PINS	2 PINS	4 PINS	
1200	U_{OPDC} AT 105 °C = 900 V; U_{OPDC} AT 125 °C = 700 V														
	1	12.0	22.0	26.0	22.5	-	125	125	5.0	-	22.0	-	50	-	MKP1848e51012+I2
	2	15.5	26.5	26.5	22.5	-	125	250	8.0	-	12.0	-	50	-	MKP1848e52012+I2
	3	18	29.5	26.5	22.5	-	125	375	9.5	-	8.0	-	50	-	MKP1848e53012+I2
	1	11.0	21.0	32.0	27.5	-	70	70	4.0	-	32.0	-	55	-	MKP1848e51012+K2
	2	15.0	25.0	32.0	27.5	-	70	140	6.5	-	16.0	-	55	-	MKP1848e52012+K2
	3	21.0	31.0	32.0	27.5	-	70	210	9.5	-	10.5	-	55	-	MKP1848e53012+K2
	4	21.0	31.0	32.0	27.5	-	70	280	10.5	-	8.0	-	55	-	MKP1848e54012+K2
	5	22.0	38.0	32.0	27.5	-	70	350	13.0	-	6.0	-	55	-	MKP1848e55012+K2
	6	18.5	35.5	42.0	37.5	10.2	35	210	9.5	10.0	11.0	10.0	80	75	MKP1848e56012+P*
	7	21.5	38.5	42.0	37.5	10.2	35	245	11.0	11.5	9.0	8.5	80	75	MKP1848e57012+P*
	10	24.0	44.0	42.0	37.5	10.2	35	350	14.5	15.0	6.5	6.0	90	85	MKP1848e61012+P*
	12	30.0	45.0	42.0	37.5	10.2 / 20.3	35	420	17.0	18.0	5.5	5.0	100	95	MKP1848e61212+P*
	15	25.0	45.0	57.5	52.5	10.2	15	225	13.0	14.0	9.0	8.5	165	160	MKP1848e61512+Y*
	18	30.0	45.0	57.5	52.5	20.3	15	270	15.0	16.0	7.5	7.0	165	160	MKP1848e61812+Y*
	25	35.0	50.0	57.5	52.5	20.3	15	375	19.5	20.5	5.5	5.0	165	160	MKP1848e62512+Y*
1300	U_{OPDC} AT 105 °C = 950 V; U_{OPDC} AT 125 °C = 800 V														
	1	12.5	22.5	26.5	22.5	-	135	135	5.5	-	17.5	-	40	-	MKP1848e51013+I2
	2	18	29.5	26.5	22.5	-	135	270	9.5	-	9.0	-	40	-	MKP1848e52013+I2
	1	11.0	21.0	32.0	27.5	-	85	85	4.5	-	24.0	-	45	-	MKP1848e51013+K2
	2	18.0	28.0	32.0	27.5	-	85	170	7.5	-	14.0	-	45	-	MKP1848e52013+K2
	3	21.0	31.0	32.0	27.5	-	85	255	10.0	-	9.5	-	45	-	MKP1848e53013+K2
	4	22.0	38.0	32.0	27.5	-	85	340	12.5	-	7.0	-	45	-	MKP1848e54013+K2
	5	22.0	38.0	32.0	27.5	-	85	425	14.0	-	5.5	-	45	-	MKP1848e55013+K2
	6	21.5	38.5	42.0	37.5	10.2	40	240	10.5	11.0	10.5	9.5	80	75	MKP1848e56013+P*
	9	24.0	44.0	42.0	37.5	10.2	40	360	13.5	14.0	7.5	6.5	80	75	MKP1848e59013+P*
	12	30.0	45.0	42.0	37.5	10.2 / 20.3	40	480	16.5	18.0	5.5	5.0	80	75	MKP1848e61213+P*
	15	30.0	45.0	57.5	52.5	20.3	15	225	15.5	16.0	7.5	6.5	150	145	MKP1848e61513+Y*
	18	35.0	50.0	57.5	52.5	20.3	15	270	18.0	19.5	5.5	5.5	150	145	MKP1848e61813+Y*
	22	35.0	50.0	57.5	52.5	20.3	15	330	20.0	22.0	4.5	4.5	150	145	MKP1848e62213+Y*

Notes

(1) Change the "*" symbol with special code for the terminals and "+" for tolerance, please consult section "Composition of Catalog Number"
(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 f = 10 kHz, ambient temperature. For other frequencies consult charts
(4) Maximum tan δ values
(5) Standard case dimensions, for maximum and minimum dimension please consult section "Dimensions Tolerances"

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PACKAGING INFORMATION

U_{NDC} AT 85 °C (V)	CAP. (1) (µF)	DIMENSION (mm)			P1 (mm)	P2 (mm)	Ø dt (mm)	ORDERING CODE (2)	MASS (g)	SPQ (3) (pcs)
		w	h	l						
500	U_{OPDC} AT 105 °C = 350 V; U_{OPDC} AT 125 °C = 250 V									
	1	7.0	16.5	26.0	22.5	-	0.8	MKP1848e51050+I2	4.8	200
	2	8.5	18.0	26.0	22.5	-	0.8	MKP1848e52050+I2	5.8	200
	3	10.0	19.5	26.0	22.5	-	0.8	MKP1848e53050+I2	6.4	200
	4	10.0	19.5	26.0	22.5	-	0.8	MKP1848e54050+I2	6.8	200
	6	12.0	22.0	26.0	22.5	-	0.8	MKP1848e56050+I2	7.8	150
	9	15.5	26.5	26.5	22.5	-	0.8	MKP1848e59050+I2	14.0	110
	12	18.0	29.5	26.5	22.5	-	0.8	MKP1848e61250+I2	18.0	90
	15	18.0	29.5	26.5	22.5	-	0.8	MKP1848e61550+I2	18.0	90
	6	11.0	21.0	32.0	27.5	-	0.8	MKP1848e56050+K2	9	130
	9	13.0	23.0	32.0	27.5	-	0.8	MKP1848e59050+K2	11	115
	12	15.0	25.0	32.0	27.5	-	0.8	MKP1848e61250+K2	12.5	100
	15	18.0	28.0	32.0	27.5	-	0.8	MKP1848e61550+K2	17.5	80
	22	21.0	31.0	32.0	27.5	-	0.8	MKP1848e62250+K2	23	65
	30	22.0	38.0	32.0	27.5	-	0.8	MKP1848e63050+K2	30	60
	35	18.5	35.5	42.0	37.5	10.2	1.0	MKP1848e63550+P*	31	105
	45	21.5	38.5	42.0	37.5	10.2	1.0	MKP1848e64550+P*	38.5	91
	60	24.0	44.0	42.0	37.5	10.2	1.0	MKP1848e66050+P*	50.5	77
	80	30.0	45.0	42.0	37.5	10.2 / 20.3	1.0	MKP1848e68050+P*	61.5	63
	90	25.0	45.0	57.5	52.5	10.2	1.2	MKP1848e69050+Y*	72	55
	110	30.0	45.0	57.5	52.5	20.3	1.2	MKP1848e71150+Y*	84.5	45
	140	35.0	50.0	57.5	52.5	20.3	1.2	MKP1848e71450+Y*	110.5	40
700	U_{OPDC} AT 105 °C = 500 V; U_{OPDC} AT 125 °C = 400 V									
	1	10.0	19.5	26.0	22.5	-	0.8	MKP1848e51070+I2	6.8	200
	2	10.0	19.5	26.0	22.5	-	0.8	MKP1848e52070+I2	6.8	200
	3	12.0	22.0	26.0	22.5	-	0.8	MKP1848e53070+I2	7.8	150
	4	15.5	26.5	26.5	22.5	-	0.8	MKP1848e54070+I2	14.0	110
	5	18.0	29.5	26.5	22.5	-	0.8	MKP1848e55070+I2	15.5	90
	2	9.0	19.0	32.0	27.5	-	0.8	MKP1848e52070+K2	7	160
	3	11.0	21.0	32.0	27.5	-	0.8	MKP1848e53070+K2	9	130
	4	13.0	23.0	32.0	27.5	-	0.8	MKP1848e54070+K2	11	115
	5	15.0	25.0	32.0	27.5	-	0.8	MKP1848e55070+K2	13	100
	7	18.0	28.0	32.0	27.5	-	0.8	MKP1848e57070+K2	18	80
	10	21.0	31.0	32.0	27.5	-	0.8	MKP1848e61070+K2	23	65
	15	22.0	38.0	32.0	27.5	-	0.8	MKP1848e61570+K2	30	60
	16	18.5	35.5	42.0	37.5	10.2	1.0	MKP1848e61570+P*	32	105
	20	21.5	38.5	42.0	37.5	10.2	1.0	MKP1848e62070+P*	40	91
	25	24.0	44.0	42.0	37.5	10.2	1.0	MKP1848e62570+P*	52	77
	35	30.0	45.0	42.0	37.5	10.2 / 20.3	1.0	MKP1848e63570+P*	64	63
	40	25.0	45.0	57.5	52.5	10.2	1.2	MKP1848e64070+Y*	74	55
	50	30.0	45.0	57.5	52.5	20.3	1.2	MKP1848e65070+Y*	86	45
	70	35.0	50.0	57.5	52.5	20.3	1.2	MKP1848e67070+Y*	110	40

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PACKAGING INFORMATION

U_{NDC} AT 85 °C (V)	CAP. (1) (µF)	DIMENSION (mm)			P1 (mm)	P2 (mm)	Ø dt (mm)	ORDERING CODE (2)	MASS (g)	SPQ (3) (pcs)
		w	h	l						
900	U_{OPDC} AT 105 °C = 700 V; U_{OPDC} AT 125 °C = 500 V									
	1	10.0	19.5	26.5	22.5	-	0.8	MKP1848e51090+I2	6.8	200
	2	12.0	22.0	26.0	22.5	-	0.8	MKP1848e52090+I2	7.8	150
	3	15.5	26.5	26.5	22.5	-	0.8	MKP1848e53090+I2	14.0	110
	4	18.0	29.5	26.5	22.5	-	0.8	MKP1848e54090+I2	20.5	90
	1	9.0	19.0	32.0	27.5	-	0.8	MKP1848e51090+K2	6	160
	2	11.0	21.0	32.0	27.5	-	0.8	MKP1848e52090+K2	9	130
	3	15.0	25.0	32.0	27.5	-	0.8	MKP1848e53090+K2	13	100
	4	18.0	28.0	32.0	27.5	-	0.8	MKP1848e54090+K2	18	80
	5	18.0	28.0	32.0	27.5	-	0.8	MKP1848e55090+K2	18	80
	7	21.0	31.0	32.0	27.5	-	0.8	MKP1848e57090+K2	23	65
	10	22.0	38.0	32.0	27.5	-	0.8	MKP1848e61090+K2	30	60
	11	18.5	35.5	42.0	37.5	10.2	1.0	MKP1848e61190+P*	32	105
	15	21.5	38.5	42.0	37.5	10.2	1.0	MKP1848e61590+P*	39	91
	20	24.0	44.0	42.0	37.5	10.2	1.0	MKP1848e62090+P*	51	77
	25	30.0	45.0	42.0	37.5	10.2 / 20.3	1.0	MKP1848e62590+P*	63	63
	35	30.0	45.0	57.5	52.5	20.3	1.2	MKP1848e63590+Y*	86	45
	45	35.0	50.0	57.5	52.5	20.3	1.2	MKP1848e64590+Y*	111	40
1000	U_{OPDC} AT 105 °C = 800 V; U_{OPDC} AT 125 °C = 600 V									
	1	10.0	19.5	26.5	22.5	-	0.8	MKP1848e51010+I2	6.8	200
	2	12.0	22.0	26.0	22.5	-	0.8	MKP1848e52010+I2	7.8	150
	3	15.5	26.5	26.5	22.5	-	0.8	MKP1848e53010+I2	14.0	110
	4	18.0	29.5	26.5	22.5	-	0.8	MKP1848e54010+I2	20.5	90
	1	11.0	21.0	32.0	27.5	-	0.8	MKP1848e51010+K2	9.5	130
	2	13.0	23.0	32.0	27.5	-	0.8	MKP1848e52010+K2	11	115
	3	15.0	25.0	32.0	27.5	-	0.8	MKP1848e53010+K2	12.5	100
	4	18.0	28.0	32.0	27.5	-	0.8	MKP1848e54010+K2	17	80
	6	21.0	31.0	32.0	27.5	-	0.8	MKP1848e56010+K2	23	65
	8	22.0	38.0	32.0	27.5	-	0.8	MKP1848e58010+K2	29.5	60
	9	18.5	35.5	42.0	37.5	10.2	1.0	MKP1848e59010+P*	31.5	105
	12	21.5	38.5	42.0	37.5	10.2	1.0	MKP1848e61210+P*	38.5	91
	15	24.0	44.0	42.0	37.5	10.2	1.0	MKP1848e61510+P*	51	77
	20	30.0	45.0	42.0	37.5	10.2 / 20.3	1.0	MKP1848e62010+P*	62.5	63
	25	25.0	45.0	57.5	52.5	10.2	1.2	MKP1848e62510+Y*	71	55
	30	30.0	45.0	57.5	52.5	20.3	1.2	MKP1848e63010+Y*	83.5	45
	35	35.0	50.0	57.5	52.5	20.3	1.2	MKP1848e63510+Y*	114	40

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PACKAGING INFORMATION

U_{NDC} AT 85 °C (V)	CAP. (1) (µF)	DIMENSION (mm)			P1 (mm)	P2 (mm)	Ø dt (mm)	ORDERING CODE (2)	MASS (g)	SPQ (3) (pcs)
		w	h	l						
1200	U_{OPDC} AT 105 °C = 900 V; U_{OPDC} AT 125 °C = 700 V									
	1	12.0	22.0	26.0	22.5	-	0.8	MKP1848e51012+I2	7.8	150
	2	18.0	29.5	26.5	22.5	-	0.8	MKP1848e52012+I2	20.5	90
	1	11.0	21.0	32.0	27.5	-	0.8	MKP1848e51012+K2	9	130
	2	15.0	25.0	32.0	27.5	-	0.8	MKP1848e52012+K2	12.5	100
	3	21.0	31.0	32.0	27.5	-	0.8	MKP1848e53012+K2	24	65
	4	21.0	31.0	32.0	27.5	-	0.8	MKP1848e54012+K2	22.5	65
	5	22.0	38.0	32.0	27.5	-	0.8	MKP1848e55012+K2	30	60
	6	18.5	35.5	42.0	37.5	10.2	1.0	MKP1848e56012+P*	31	105
	7	21.5	38.5	42.0	37.5	10.2	1.0	MKP1848e57012+P*	39.5	91
	10	24.0	44.0	42.0	37.5	10.2	1.0	MKP1848e61012+P*	51	77
	12	30.0	45.0	42.0	37.5	10.2 / 20.3	1.0	MKP1848e61212+P*	63.5	63
	15	25.0	45.0	57.5	52.5	10.2	1.2	MKP1848e61512+Y*	72	55
	18	30.0	45.0	57.5	52.5	20.3	1.2	MKP1848e61812+Y*	85	45
	25	35.0	50.0	57.5	52.5	20.3	1.2	MKP1848e62512+Y*	109	40
1300	U_{OPDC} AT 105 °C = 950 V; U_{OPDC} AT 125 °C = 800 V									
	1	12.5	22.5	26.5	22.5	-	0.8	MKP1848e51013+I2	11.0	140
	2	18.0	29.5	26.5	22.5	-	0.8	MKP1848e52013+I2	20.5	90
	1	11.0	21.0	32.0	27.5	-	0.8	MKP1848e51013+K2	8.5	130
	2	18.0	28.0	32.0	27.5	-	0.8	MKP1848e52013+K2	17.5	80
	3	21.0	31.0	32.0	27.5	-	0.8	MKP1848e53013+K2	23.5	65
	4	22.0	38.0	32.0	27.5	-	0.8	MKP1848e54013+K2	30.5	60
	5	22.0	38.0	32.0	27.5	-	0.8	MKP1848e55013+K2	29	60
	6	21.5	38.5	42.0	37.5	10.2	1.0	MKP1848e56013+P*	39.5	91
	9	24.0	44.0	42.0	37.5	10.2	1.0	MKP1848e59013+P*	50.5	77
	12	30.0	45.0	42.0	37.5	10.2 / 20.3	1.0	MKP1848e61213+P*	62	63
	15	30.0	45.0	57.5	52.5	20.3	1.2	MKP1848e61513+Y*	87	45
	18	35.0	50.0	57.5	52.5	20.3	1.2	MKP1848e61813+Y*	118.5	40
	22	35.0	50.0	57.5	52.5	20.3	1.2	MKP1848e62213+Y*	110.5	40

Notes

(1) Intermediate capacitance values available on request, please contact dc-film@vishay.com

(2) Change the "*" symbol with special code for the terminals, and "+" for tolerance, please consult section "Composition of Catalog Number"

(3) SPQ = Standard Packing Quantity

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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 and minimum product dimensions use the following tolerances:

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

Pitch = 22.5 mm, $\Delta w = \Delta l = \Delta h = 0.5$ mm
Pitch = 27.5 mm, $\Delta w = \Delta l = \Delta h = 0.7$ mm
Pitch = 37.5 mm, $\Delta w = \Delta l = \Delta h = 0.7$ mm
Pitch = 52.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm

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

Pitch ≤ 22.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm
Pitch = 27.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm
Pitch = 37.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm
Pitch = 52.5 mm, $\Delta w = \Delta l = \Delta h = 1.5$ mm

SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD

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

For the maximum product dimensions including excentricity use the following tolerances:

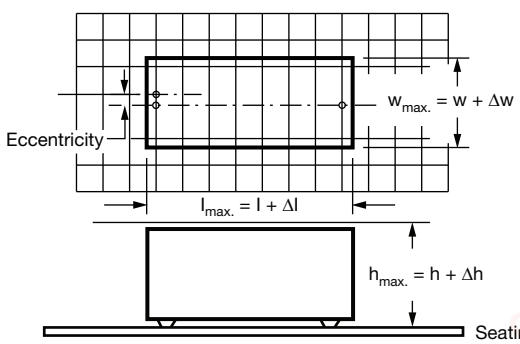
For 2 pins:

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 = 22.5 mm, $\Delta w = \Delta l = \Delta h = 0.5$ mm
- For products with pitch = 27.5 mm, $\Delta w = \Delta l = \Delta h = 0.7$ mm
- For products with pitch = 37.5 mm, $\Delta w = \Delta l = \Delta h = 0.7$ mm
- For products with pitch = 52.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm

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

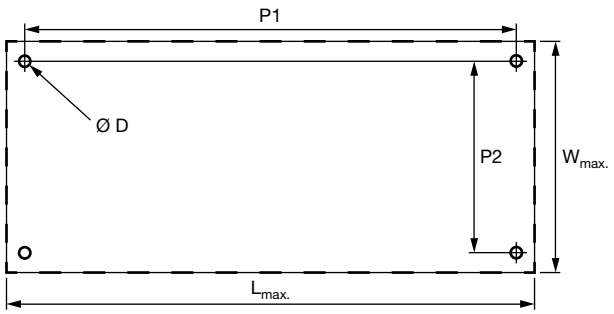
The maximum length and width of film capacitors is shown in the figure.



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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 Guidelines for Film Capacitors”: www.vishay.com/doc?28171

STORAGE TEMPERATURE

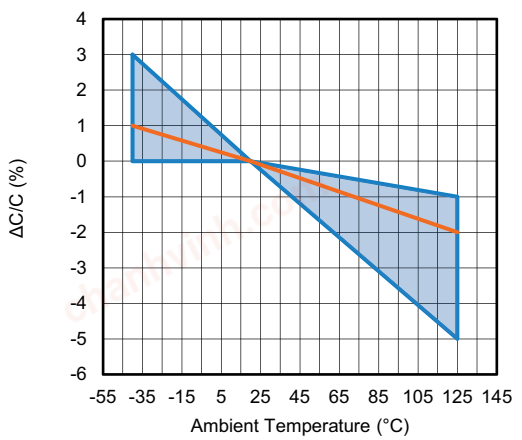
T_{stg} = -25 °C to +35 °C with RH maximum 75 % without condensation.

RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS

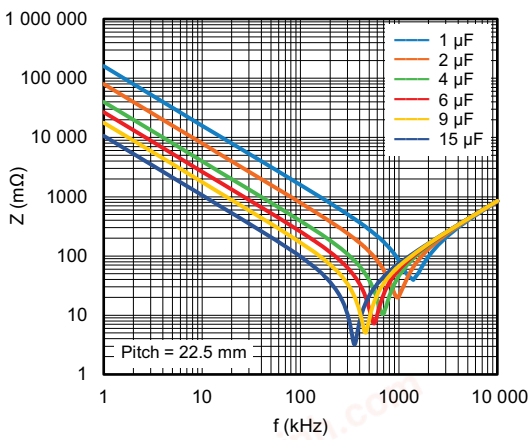
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa, and a relative humidity of 50 % ± 2 %.

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



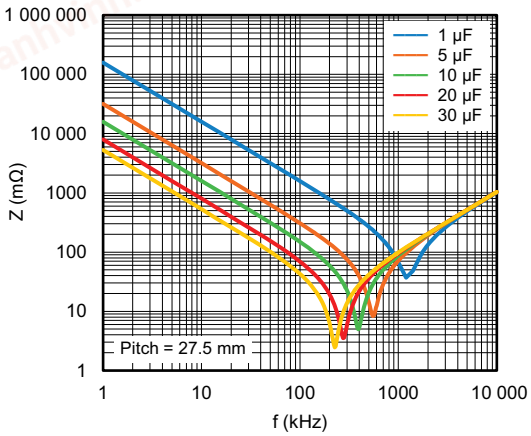
Capacitance as a function of ambient temperature (typical)



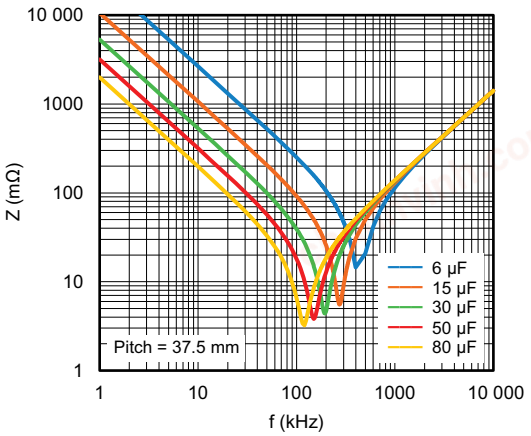
Impedance as a function of frequency (typical)

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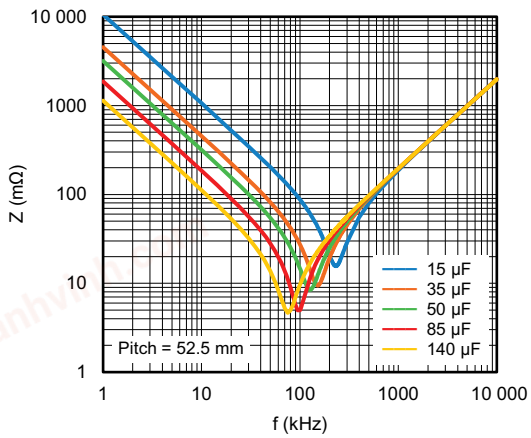
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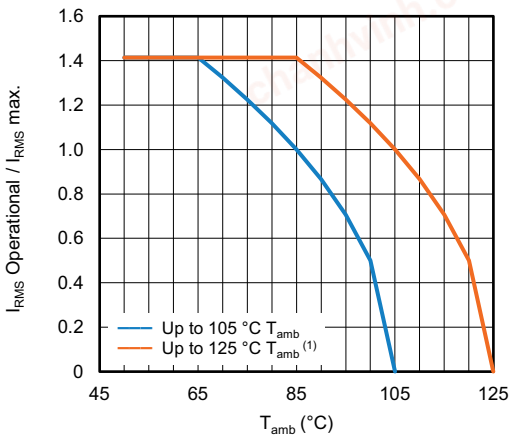
Impedance as a function of frequency (typical)



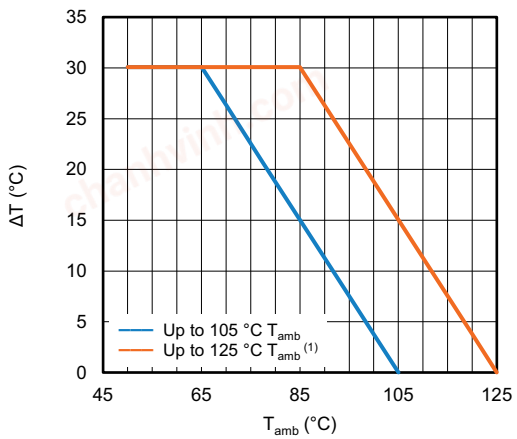
Impedance as a function of frequency (typical)



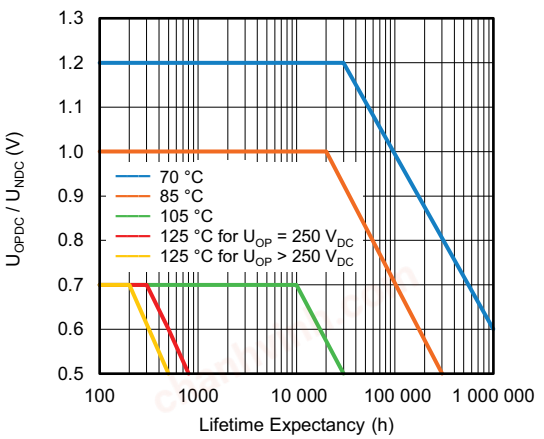
Impedance as a function of frequency (typical)



Maximum I_{RMS} current in function of the ambient temperature (typical curve). Above 85 °C ambient temperature voltage derating must be applicable



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



Lifetime expectancy (typical)

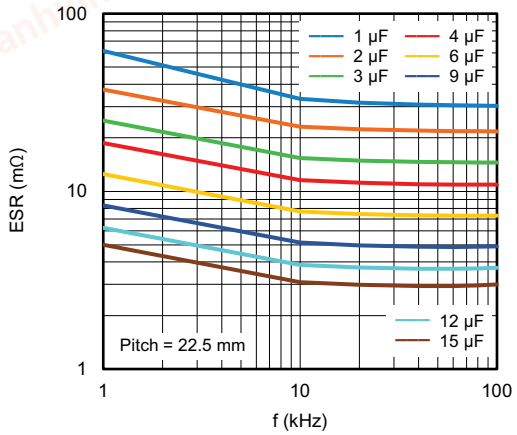
Note

(1) Applicable for a maximum of 500 hours during lifetime

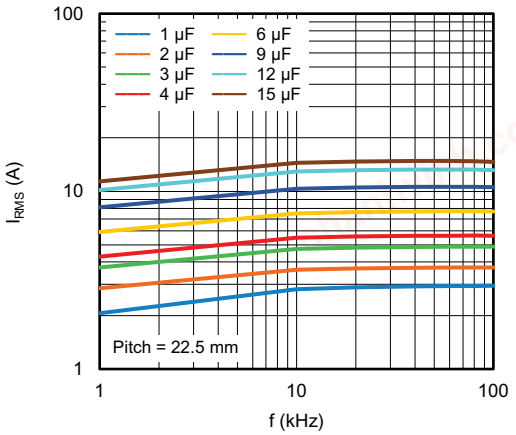
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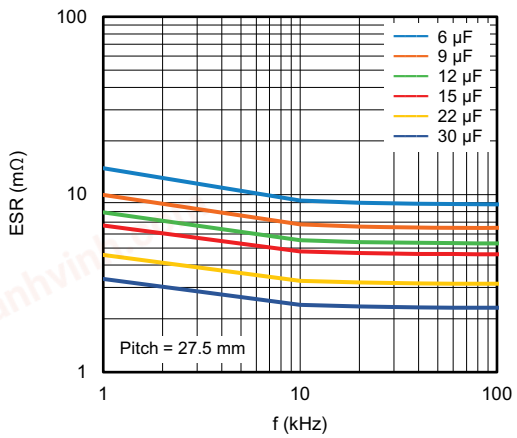
ESR AND I_{RMS} U_{NDC} 85 °C - 500 V



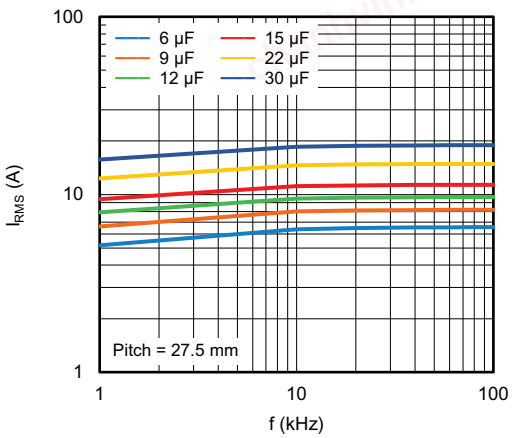
ESR as function of frequency
(typical curve)



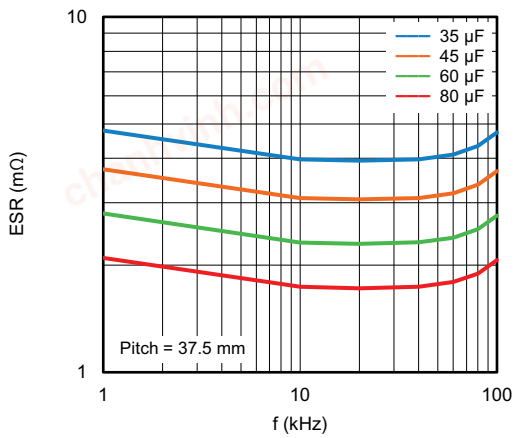
Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



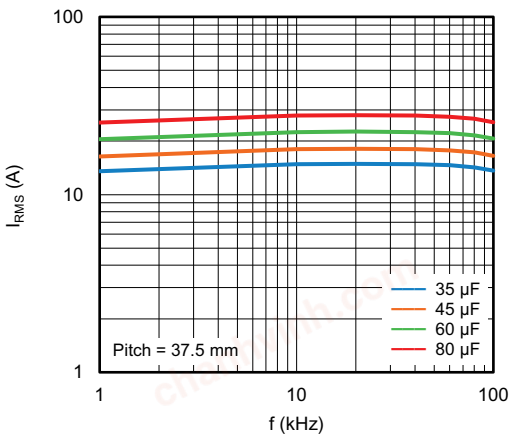
ESR as function of frequency
(typical curve)



Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



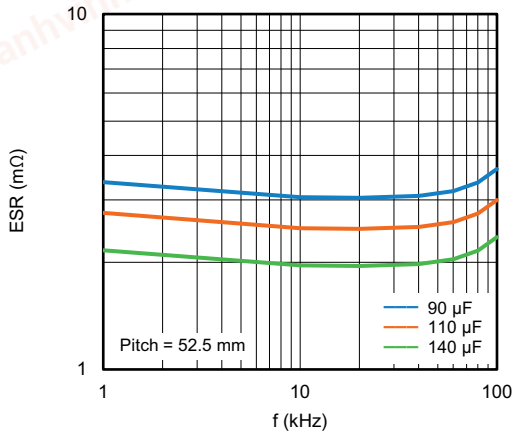
ESR as function of frequency
(typical curve)



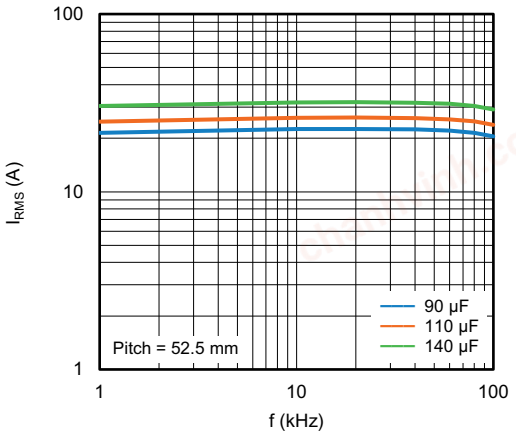
Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

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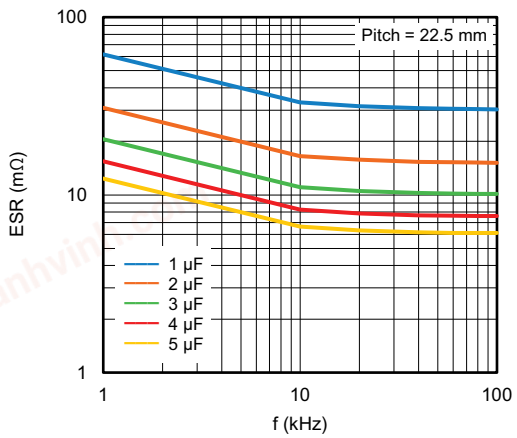


ESR as function of frequency
(typical curve)

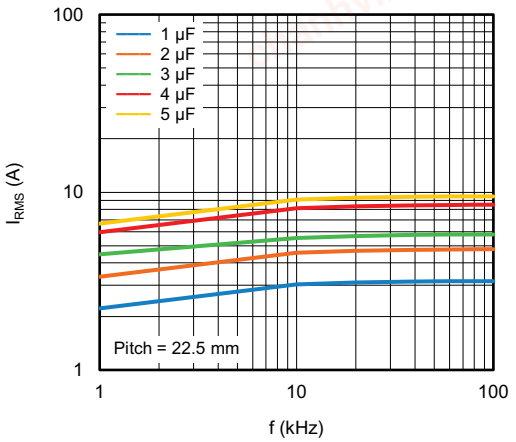


Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

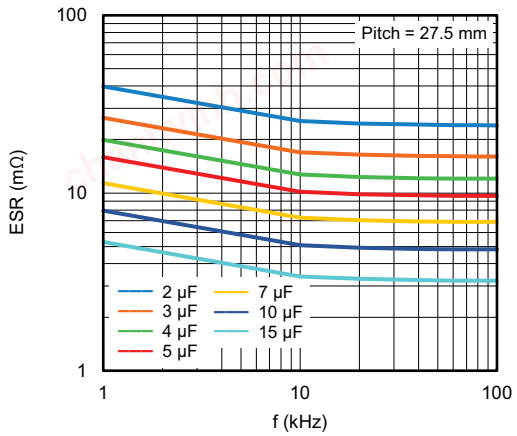
ESR AND I_{RMS} U_{NDC} 85 °C - 700 V



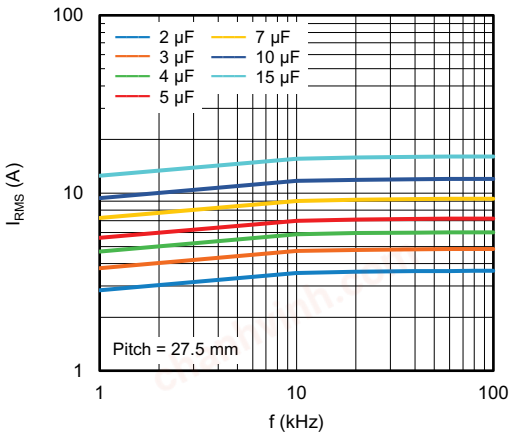
ESR as function of frequency
(typical curve)



Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



ESR as function of frequency
(typical curve)

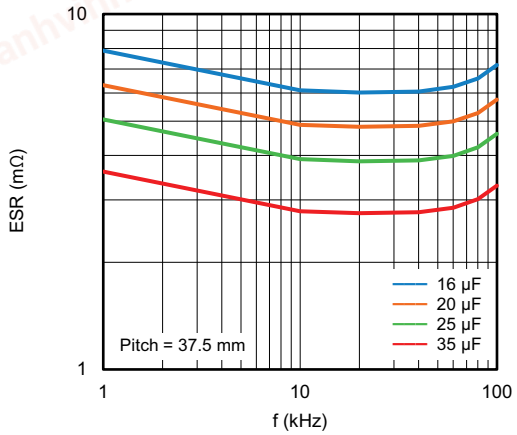


Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

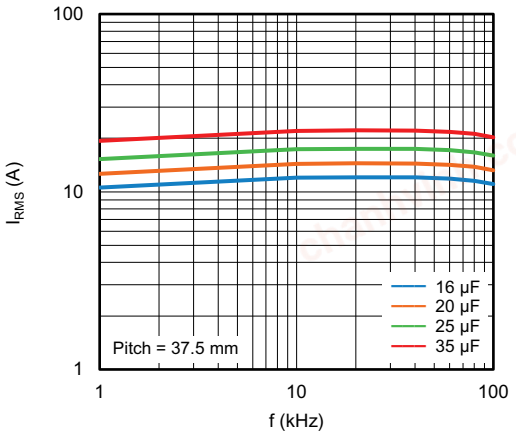
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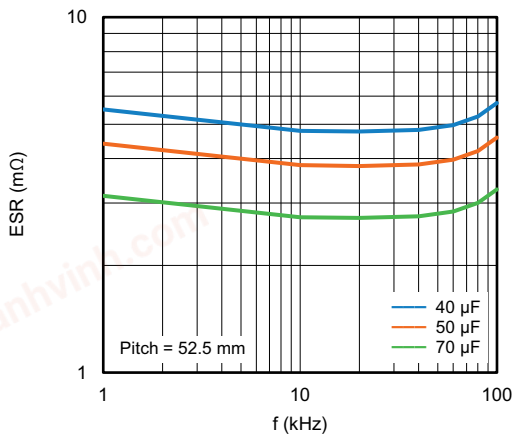
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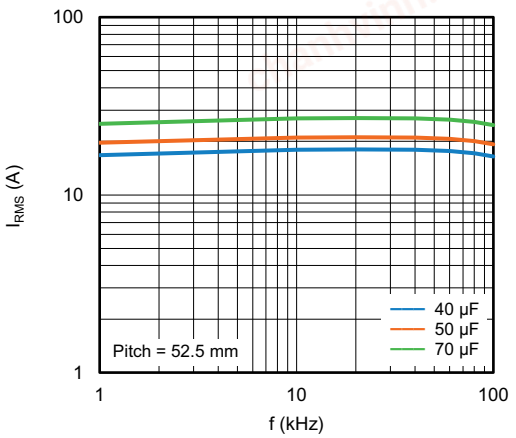
ESR as function of frequency
(typical curve)



Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

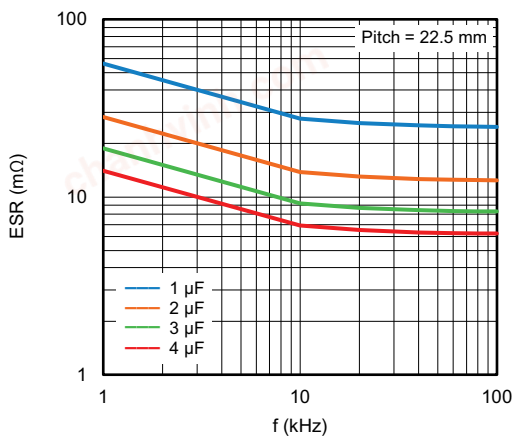


ESR as function of frequency
(typical curve)

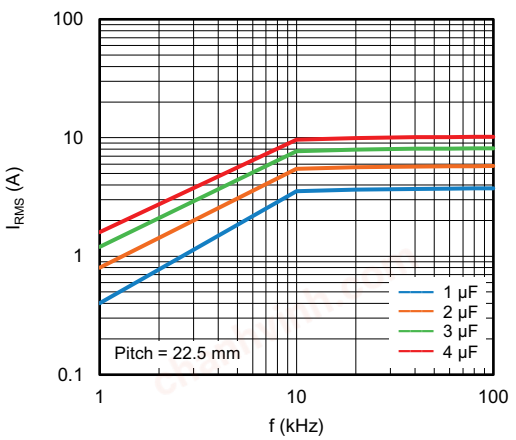


Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

ESR AND I_{RMS} U_{NDC} 85 °C - 900 V



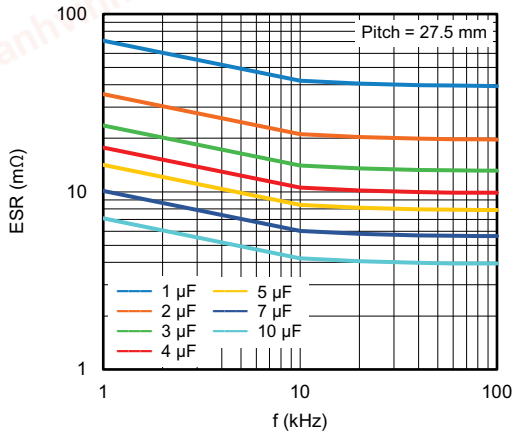
ESR as function of frequency
(typical curve)



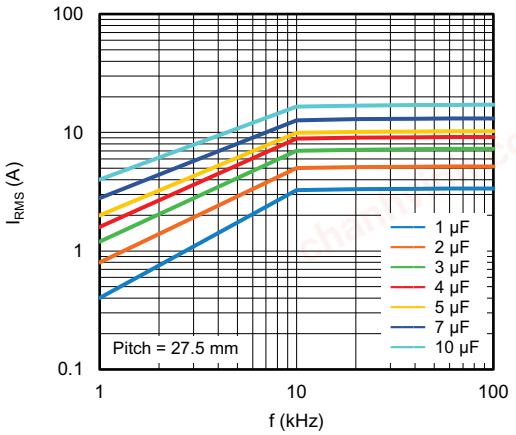
Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

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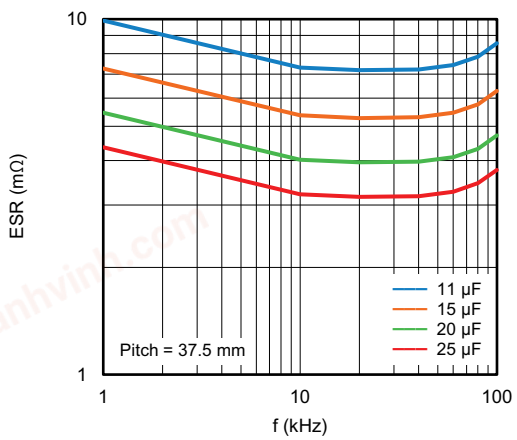
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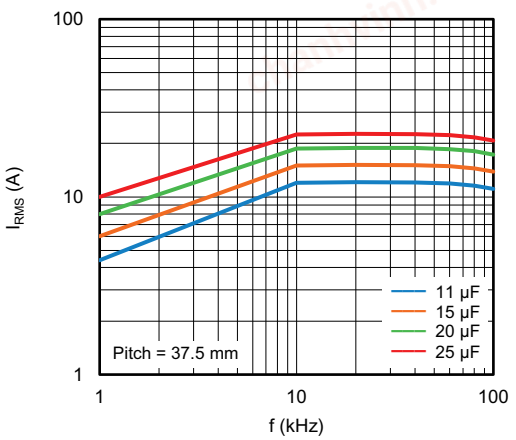
ESR as function of frequency
(typical curve)



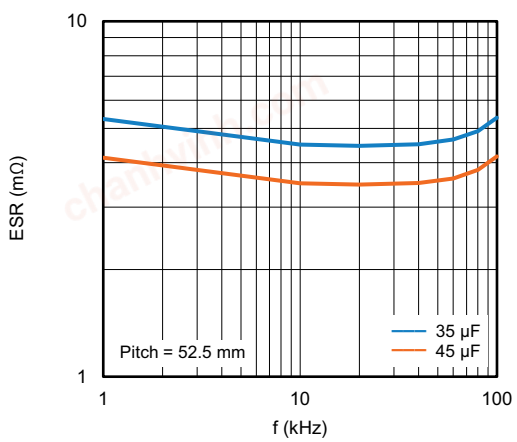
Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



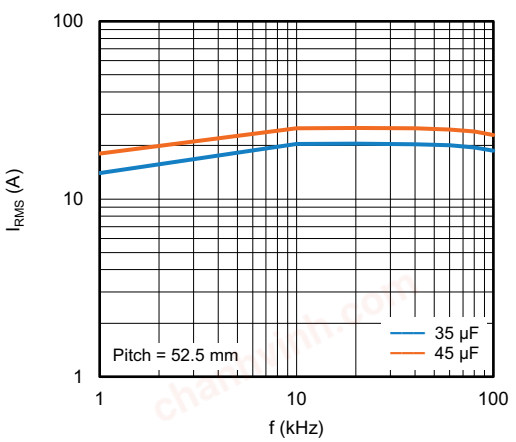
ESR as function of frequency
(typical curve)



Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



ESR as function of frequency
(typical curve)



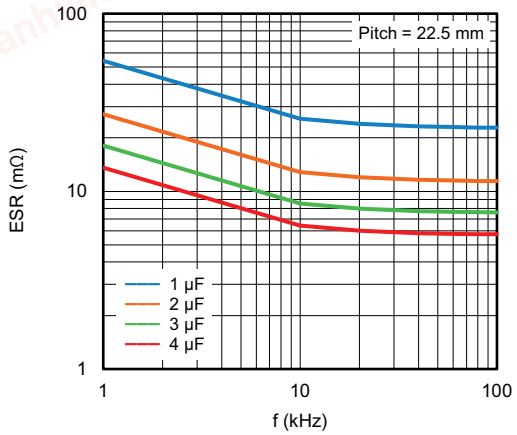
Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

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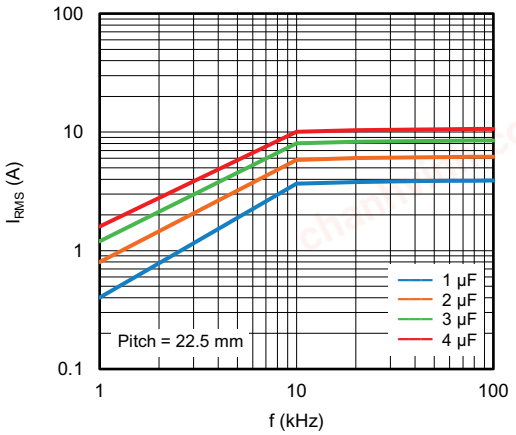
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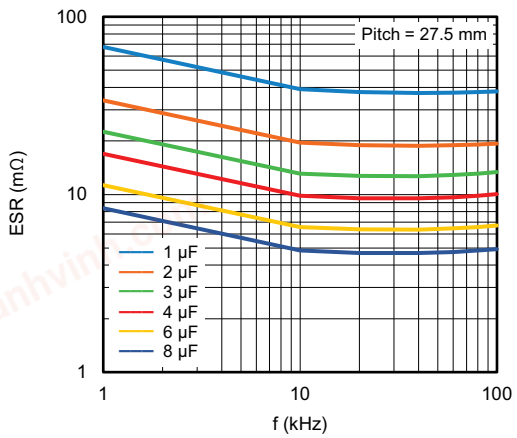
ESR AND I_{RMS} U_{NDC} 85 °C - 1000 V



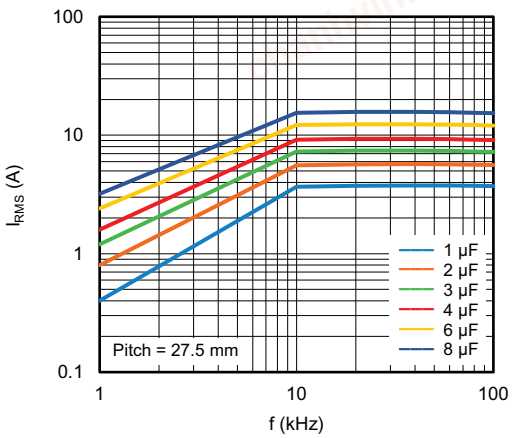
ESR as function of frequency
(typical curve)



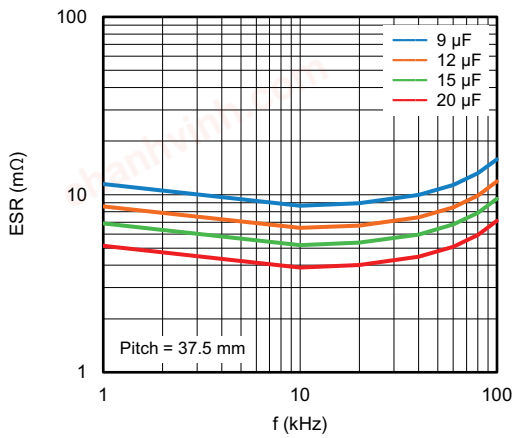
Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



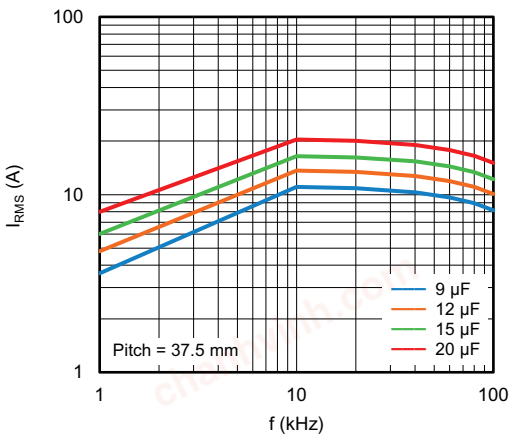
ESR as function of frequency
(typical curve)



Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



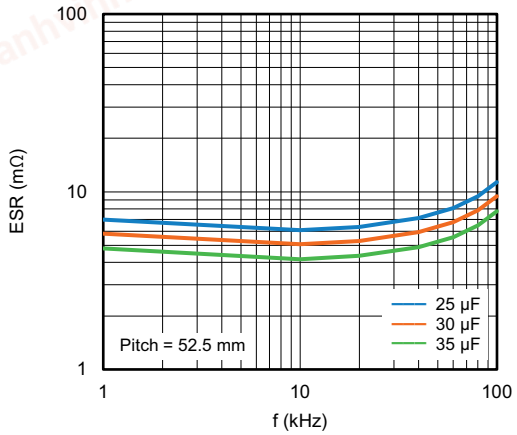
ESR as function of frequency
(typical curve)



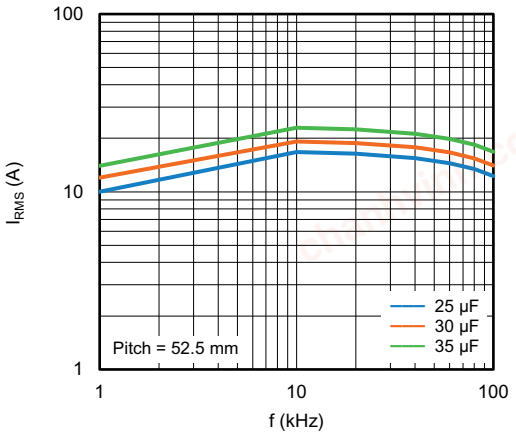
Maximum I_{RMS} current as function of frequency,
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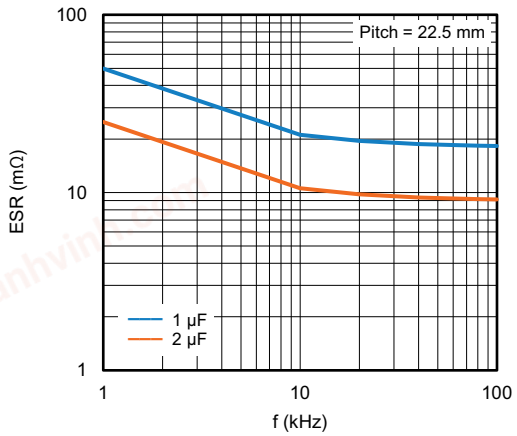


ESR as function of frequency
(typical curve)

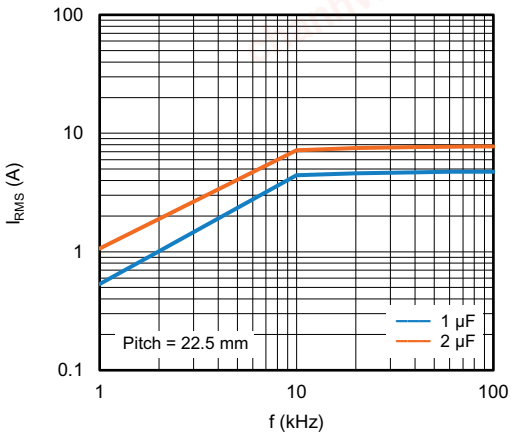


Maximum I_{RMS} current as function of frequency,
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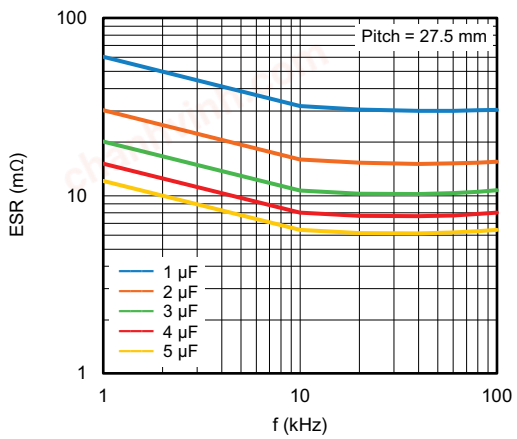
ESR AND I_{RMS} U_{NDC} 85 °C - 1200 V



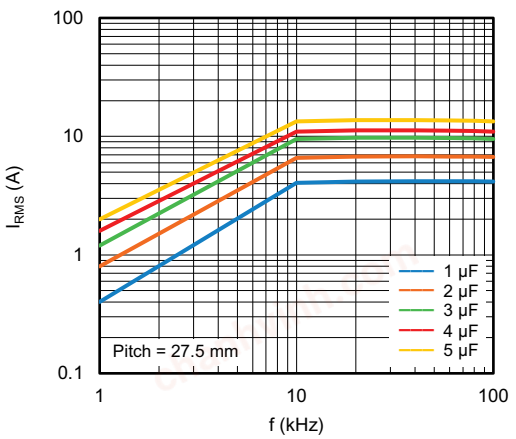
ESR as function of frequency
(typical curve)



Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



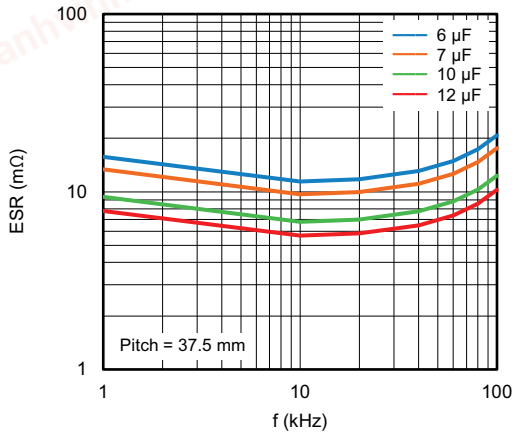
ESR as function of frequency
(typical curve)



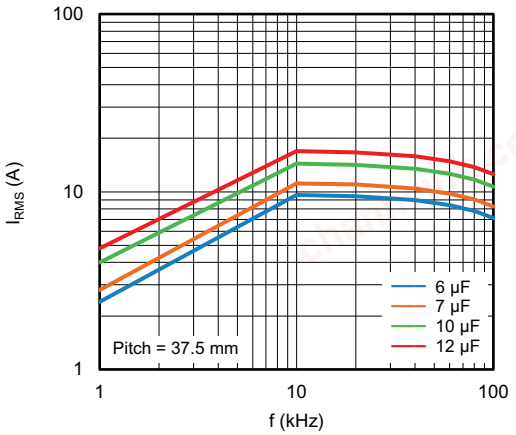
Maximum I_{RMS} current as function of frequency,
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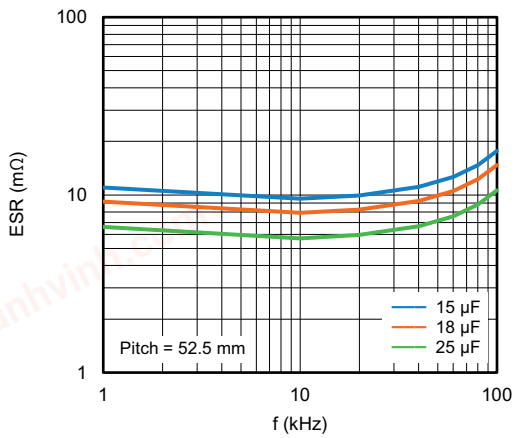
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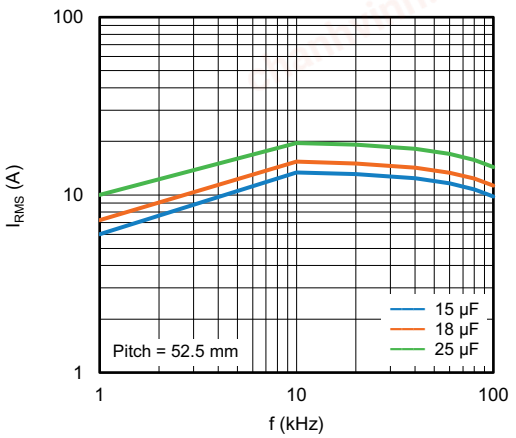
ESR as function of frequency
(typical curve)



Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

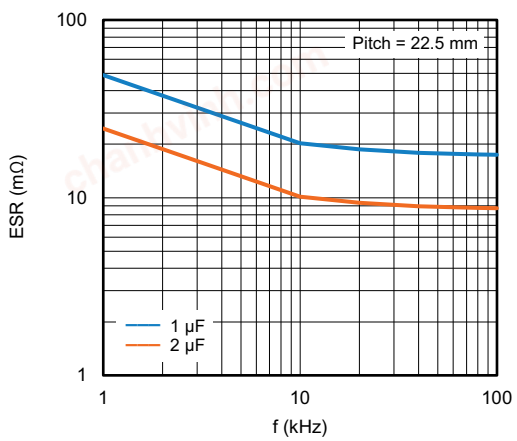


ESR as function of frequency
(typical curve)

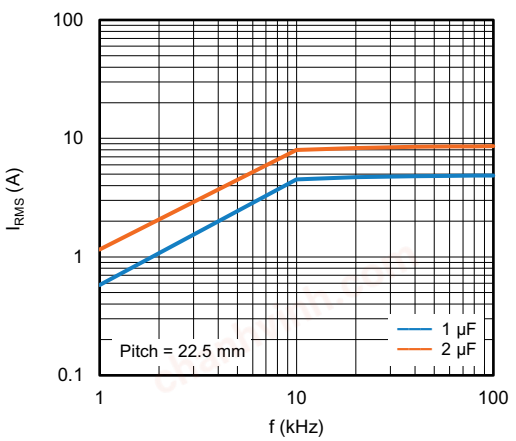


Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)

ESR AND I_{RMS} U_{NDC} 85 °C - 1300 V



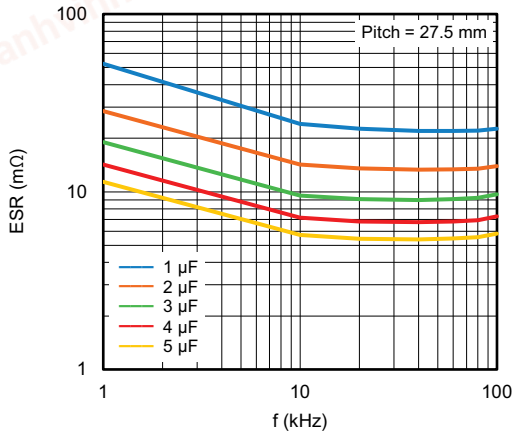
ESR as function of frequency
(typical curve)



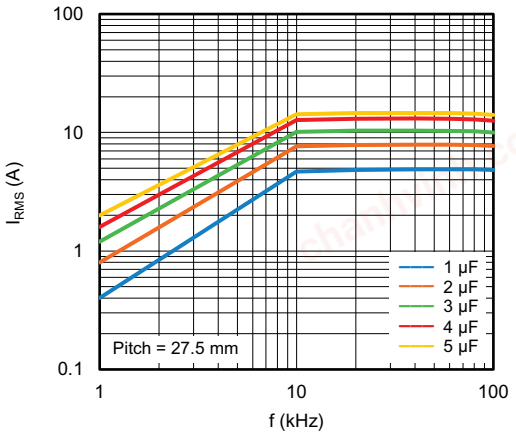
Maximum I_{RMS} current as function of frequency,
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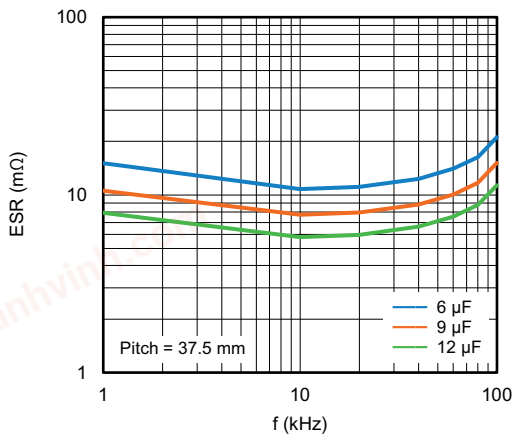
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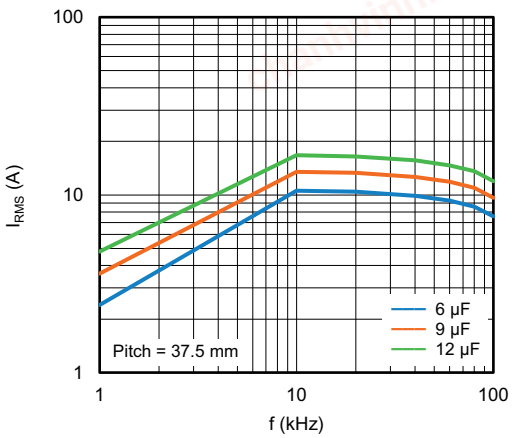
ESR as function of frequency
(typical curve)



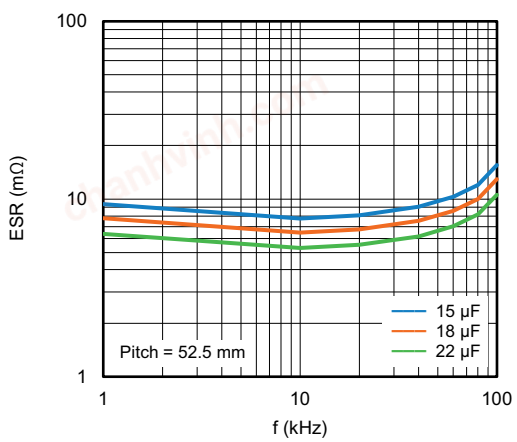
Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



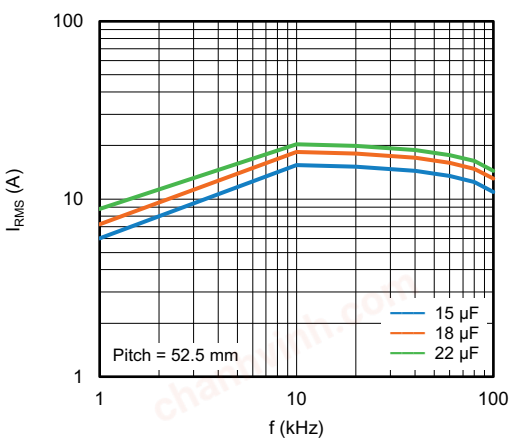
ESR as function of frequency
(typical curve)



Maximum I_{RMS} current as function of frequency,
based T_A + 85 °C, Δt = +15 °C (typical curve)



ESR as function of frequency
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based T_A + 85 °C, Δt = +15 °C (typical curve)

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HEAT CONDUCTIVITY			
DIMENSIONS (mm)			HEAT CONDUCTIVITY (mW/°C)
w	h	l	
6	15.5	26	19
7	16.5	26	22
8.5	18	26	25
10	19.5	26	29
11	21	26.5	32
12	22	26	34
12.5	22.5	26.5	36
15.5	26.5	26.5	45
18.5	29.5	26.5	54
9	19	32	30
11	21	32	35
13	23	32	41
15	25	32	46
18	28	32	55
21	31	32	65
22	38	32	77
18.5	35.5	42	70
21.5	38.5	42	80
24	44	42	94
30	45	42	108
25	45	57.5	113
30	45	57.5	125
35	50	57.5	146

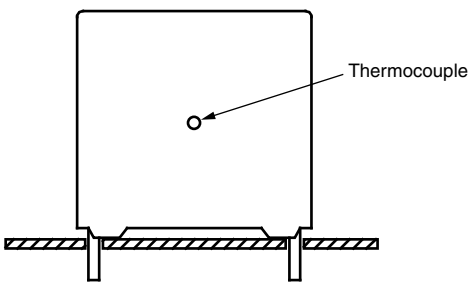
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

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 component temperature rise (ΔT) can be measured 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).

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

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APPLICATION NOTES AND LIMITING CONDITIONS

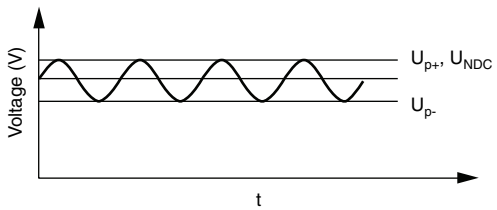
These capacitors are not suitable for mains applications as across-the-line capacitors without additional protection.

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 x (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 x U_{NDC}	30 % on load duration
1.15 x U_{NDC}	30 min
1.2 x U_{NDC}	5 min
1.3 x U_{NDC}	1 min
1.5 x U_{NDC}	110 ms

Note

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

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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			Legible marking as specified
5.14.2-2	Dimensions			See specification drawing
5.3-1	Capacitance	1 kHz at room temperature		See specific reference data
5.3-2	tan δ	10 kHz at room temperature		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 Ua1: duration: 10 s ± 1 s		
		Wire diameter	Section	Load
		d ≤ 0.80 mm	S ≤ 0.5 mm²	10 N (± 10 %)
		d ≤ 1.25 mm	S ≤ 1.2 mm²	20 N (± 10 %)
		Bending, Ub method 1: 4 x 90 °, duration 2 s to 3 s/bend		
		Wire diameter	Section	Load
		d ≤ 0.80 mm	Z_x ≤ 0.050 mm³	5 N (± 10 %)
		d ≤ 1.25 mm	Z_x ≤ 0.019 mm³	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		
5.14.3-1	Vibration IEC 60068-2-6	10 Hz to 55 Hz: amplitude ± 0.35 mm or acceleration 98 m/s² Test duration: 10 frequency cycles (3 axes offset from each other by 90°) 1 octave/min Visual examination		No visible damage
5.14.3-2	Shock or impact IEC 60068-2-6	Pulse shape: half sine Acceleration: 490 m/s² 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

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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 x U_{NDC} at T_{amb} Duration: 60 s	
5.5.3-3 Final measurements	Capacitance tan δ Insulation resistance	|ΔC/C| ≤ 0.5 % Increase of tan δ ≤ 0.0050 IR ≥ 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 x 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 x U_{NDC} at T_{amb} Duration: 60 s	
5.9-3 Final measurements	Capacitance tan δ Insulation resistance	|ΔC/C| ≤ 1.0 % tan δ ≤ 1.2 x initial tan δ + 0.0001 Compared to values measured in 5.9-1 IR ≥ 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 x U_{NDC} Duration: 10 s Increase the voltage at 100 V/s till 5 clearings occur or until voltage reach max. of 2.5 x 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	|ΔC/C| ≤ 0.5 % tan δ ≤ 1.2 x initial tan δ + 0.0001 Compared to values measured in 5.11-1 IR ≥ 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 °C; $T_{min.}$ = -40 °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 °C ± 2 °C; RH = 93 % ± 3 % Duration: 56 days 1.5 x 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 |ΔC/C| ≤ 2 % increase of tan δ ≤ 0.0150 Compared to values measured in 5.13-0 IR ≥ 50 % of specified values

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TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071		
SUB-CLAUSE NUMBER AND TEST	**CONDITIONS**	**PERFORMANCE REQUIREMENTS**
TYPE TEST		
5.13A-0 Initial measurements	Capacitance at 1 kHz tan δ at 1 kHz, 10 kHz ESR at 10 kHz Insulation resistance	
5.13A.2 Accelerate damp heat steady state with load	T = 60 °C; RH = 93 % at U_{NDC}, duration: 56 days	
5.13.3 Final measurements	Capacitance at 1 kHz tan δ at 1 kHz, 10 kHz ESR at 10 kHz Insulation resistance	|ΔC/C| < 10 % For the pitch 27.5 mm: increase of tan δ (10 kHz) ≤ 5 x tan δ For the pitch 37.5 mm and 52.5 mm: increase of tan δ (10 kHz) ≤ 2.5 x tan δ Compared to values measured in 5.13A-0 IR ≥ 0.1 GΩ or 10 % of specified values (if lower)
5.10-0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz Insulation resistance	
5.10-1 Thermal stability test under overload conditions	Natural cooling T_{amb} ± 5 °C 1.21 x $P_{max.}$ = 1.21 x (I^2_{RMS} / w x C) x tan δ (f) with w = 2 x π x f for I_{RMS} see specific reference data f = 10 kHz Duration: 48 h Measure the temperature every 1.5 hour during the last 6 hours	Temperature rise < 1 °C
5.10-2 Final measurements	Capacitance tan δ at 10 kHz Insulation resistance	|ΔC/C| ≤ 2 % Increase of tan δ ≤ 0.0150 IR ≥ 50 % of specified values
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	
5.15-1 Endurance test between terminals	Sequence 1.3 x U_{NDC} at 85 °C 1.3 x U_{OPDC} at 105 °C Duration: 500 h 1000 x discharge at 1.4 x $\hat{I}$ (maximum peak current) 1.3 x U_{NDC} at 85 °C 1.3 x U_{OPDC} at 105 °C Duration: 500 h	
5.15-2 Final measurements	Capacitance tan δ Insulation resistance	|ΔC/C| ≤ 3 % Increase of tan δ ≤ 0.0150 Compared to values measured in 5.15-0 IR ≥ 50 % of specified values

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TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071		
SUB-CLAUSE NUMBER AND TEST	**CONDITIONS**	**PERFORMANCE REQUIREMENTS**
5.16.3-0 Initial measurements	Capacitance at 1 kHz	
5.16.3-1 Destruction test sequence for non-segmented film	The capacitors must be put in an oven at $T_{max.}$ = 85 °C, product enveloped with cheese cloth	
High DC voltage test	Apply DC voltage until repetitive product healings occur, duration: 15 min	Audible healings or check healings with oscilloscope
High AC voltage test	AC_{RMS} voltage = $U_{NDC}/2\ \sqrt{2}$ with min. 250 V_{AC} Duration: 5 min Repeat destruction sequence 3 x	
5.16.3-2 Final measurements	Visual examination	No puncturing, flashover or burning of the cheese cloth Self healing punctures are permitted

Note

Measurement conditions at room temperature:

- Capacitance at 1 kHz
- tan δ 1 kHz, 10 kHz
- ESR 10 kHz
- Insulation resistance 500 V, 1 min after full charge

TEST CONDITIONS AND REQUIREMENTS ACCORDING AEC-Q200 REVISION E				
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	105 °C; unpowered 250 h / 500 h / 1000 h	$\lvert\Delta C/C\rvert \leq 3$ % Increase of tan δ (10 kHz) ≤ 0.010 IR > 50 % of initial specified value
4	Temperature cycling	JESD22 method JA-104	1000 cycles: -40 °C / +105 °C 30 min. dwell time at each temperature extreme Transition time < 1 min.	$\lvert\Delta C/C\rvert \leq 2$ % Increase of tan δ (10 kHz) ≤ 0.010 IR > 50 % of initial specified value
6	Moisture resistance	MIL-STD 202 method 106	10 cycles at 24 h/cycle unpowered	$\lvert\Delta C/C\rvert \leq 2$ % Increase of tan δ (10 kHz) ≤ 0.010 IR > 50 % of initial specified value
7	Biased humidity	MIL-STD 202 method 103	40 °C; 93 % RH; U_{NDC} 250 h / 500 h / 1000 h	$\lvert\Delta C/C\rvert \leq 2$ % Increase of tan δ (10 kHz) ≤ 0.010 IR > 50 % of initial specified value
8	Operational life	MIL-STD 202 method 108	T_{amb} = 105 °C; 1.0 x U_{NDC} 250 h / 500 h / 1000 h	$\lvert\Delta C/C\rvert \leq 5$ % Increase of tan δ (10 kHz) ≤ 0.010 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 (leaded)	MIL-STD 202 method 211	Test leaded 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

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TEST CONDITIONS AND REQUIREMENTS ACCORDING AEC-Q200 REVISION E				
NO.	**TEST NAME**	**REFERENCE**	**TEST CONDITIONS**	**PERFORMANCE REQUIREMENTS**
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 δ (10 kHz) ≤ 0.010 IR > 50 % of initial specified value
18	Solderability	J-STD-002	Leaded: method A at 235 °C, category 3 (245 °C / 5 s)	Good tinning as evidence by free flowing of the solder with wetting of terminations > 95 %
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 room temperature:

- Capacitance at 1 kHz
- tan δ 1 kHz, 10 kHz
- ESR 10 kHz
- Insulation resistance 500 V, 1 min after full charge

TEST CONDITIONS FOR ADDITIONAL TEST AND REQUIREMENTS		
TEST NAME	**TESTS CONDITIONS**	**PERFORMANCE REQUIREMENTS**
1. Operational life	T_A = 125 °C; 1.0 x U_{OPDC} at 125 °C 100 h / 200 h / 300 h / 400 h / 500 h	$\|\Delta C/C\| \leq 5$ % Increase of tan δ (10 kHz) ≤ 2 x tan δ IR > 50 % of initial specified value
2. Temperature cycling	1000 cycles: -40 °C / +125 °C 30 min. dwell time at each temperature extreme Transition time < 1 min	$\|\Delta C/C\| \leq 5$ % Increase of tan δ (10 kHz) ≤ 2 x tan δ IR > 50 % of initial specified value

Note

Measurement conditions at room temperature:

- Capacitance at 1 kHz
- tan δ 1 kHz, 10 kHz
- ESR 10 kHz
- Insulation resistance 500 V, 1 min after full charge

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