PPSH SERIES

ULTRA HIGH dV/dt PULSE CAPACITOR

FILM-FOIL POLYPROPYLENE CAPACITOR ▲ THT type
Ultra-high dV/dt up to 30kV/µs
Flame retardant epoxy resin, UL 94V-0
Self-healing property
Tight capacitance tolerance
Aluminum foil electrodes with metallized PP element

SPECIFICATION

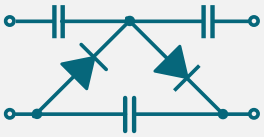
Item		Characteristics			
Related Documents		IEC 60384-13			
Rated Temperature Range		-40°C to +85°C			
Usable Temperature Range Note 1		-40°C to +110°C			
Capacitance Range	C_R	0.001µF to 0.1µF			
Capacitance Tolerance	ΔC	±3% ▲ ±5% ▲ ±10%			
Rated DC Voltage	$V_{R\,DC}$	800V_{DC} ▲ 1000V_{DC} ▲ 1200V_{DC}			
Dissipation Factor	tan δ	f (kHz)	C ≤ 0.1µF	0.1µF < C ≤ 1µF	1µF < C ≤ 2.2µF
		1	≤ 0.05%	≤ 0.05%	≤ 0.05%
		100	≤ 0.15%	-	-
Insulation Resistance Note 2	R_{INS}	C_R ≤ 0.1µF			
		≥ 30GΩ			
Withstand Voltage Note 3	V_W	1.6 x V_R applied for 2 sec. (cut off current 10mA)			

Maximum Pulse Rise Slope dV/dt	Pitch (mm)	800V_{DC}	1000V_{DC}	1200V_{DC}
	15	20000V/µs	28000V/µs	30000V/µs
	17.5	14000V/µs	-	-
	20	9000V/µs	11000V/µs	12000V/µs

Notes:

1: **Derating ratio of rated voltage +85°C to +110°C** **1.5% per °C for rated DC voltage**
2: **Terminal to terminal at 20°C ± 5°C** **Voltage charge time: 1minute; Voltage charge: 500V_{DC}**
3: **Terminal to terminal at 20°C ± 5°C** **Slow-up voltage speed: C ≤ 10µF: 5sec / C > 10µF: 10sec**

APPLICATIONS

Electronic Ballast	High Voltage Cascades	High Frequency Circuits	Switch Mode Power Supplies
			

ELECTRICAL CHARACTERISTICS

V_R	C_R (µF)	Dimensions (mm)			P (mm)	Ød ± 0.05 (mm)	Part Number [Note]
		W + 0.2	H	T			
800V_{DC}	0.01	18	10.5	5.5	15	0.8	PPSH103□0800HB□15□
	0.012	18	11	5.5	15	0.8	PPSH123□0800HB□15□
	0.015	18	11	5.5	15	0.8	PPSH153□0800HB□15□
	0.018	18	11.5	6	15	0.8	PPSH183□0800HB□15□
	0.022	18	12	6.5	15	0.8	PPSH223□0800HB□15□
	0.027	18	14	7	15	0.8	PPSH273□0800HB□15□
	0.033	18	14.5	7.5	15	0.8	PPSH333□0800HB□15□
	0.036	18	15	8	15	0.8	PPSH363□0800HB□15□
	0.039	18	15.5	8.5	15	0.8	PPSH393□0800HB□15□
	0.043	18	16	9	15	0.8	PPSH433□0800HB□15□
	0.047	18	16.5	9.5	15	0.8	PPSH473□0800HB□15□
	0.047	20.5	15.5	8	17.5	0.8	PPSH473□0800HB□17□
	0.056	20.5	16	9	17.5	0.8	PPSH563□0800HB□17□
	0.068	20.5	17	10	17.5	0.8	PPSH683□0800HB□17□
	0.082	20.5	18	11.5	17.5	0.8	PPSH823□0800HB□17□
	0.033	23	13.5	6	20	0.8	PPSH333□0800HB□20□
	0.036	23	13.5	6.5	20	0.8	PPSH363□0800HB□20□
	0.039	23	13.5	6.5	20	0.8	PPSH393□0800HB□20□
	0.043	23	14	7	20	0.8	PPSH433□0800HB□20□
	0.047	23	14.5	7.5	20	0.8	PPSH473□0800HB□20□
	0.056	23	15.5	8	20	0.8	PPSH563□0800HB□20□
	0.068	23	18	8	20	0.8	PPSH683□0800HB□20□
	0.082	23	19	9	20	0.8	PPSH823□0800HB□20□
	0.1	23	20	10	20	0.8	PPSH104□0800HB□20□
1000V_{DC}	0.001	18	10	5	15	0.8	PPSH102□1000HB□15□
	0.0012	18	10	5	15	0.8	PPSH122□1000HB□15□
	0.0015	18	10	5	15	0.8	PPSH152□1000HB□15□
	0.0018	18	10	5.5	15	0.8	PPSH182□1000HB□15□
	0.0022	18	10.5	5.5	15	0.8	PPSH222□1000HB□15□
	0.0027	18	10.5	5.5	15	0.8	PPSH272□1000HB□15□
	0.003	18	10.5	5.5	15	0.8	PPSH302□1000HB□15□
	0.0033	18	10.5	5.5	15	0.8	PPSH332□1000HB□15□
	0.0036	18	10.5	5.5	15	0.8	PPSH362□1000HB□15□
	0.0039	18	10.5	5.5	15	0.8	PPSH392□1000HB□15□
	0.0047	18	10.5	5.5	15	0.8	PPSH472□1000HB□15□
	0.0056	18	10.5	5.5	15	0.8	PPSH562□1000HB□15□
	0.0068	18	10.5	5.5	15	0.8	PPSH682□1000HB□15□
	0.0082	18	12	6	15	0.8	PPSH822□1000HB□15□
	0.01	18	12	6.5	15	0.8	PPSH103□1000HB□15□
	0.012	18	12.5	7	15	0.8	PPSH123□1000HB□15□
	0.015	18	13.5	7	15	0.8	PPSH153□1000HB□15□
	0.018	18	14	7.5	15	0.8	PPSH183□1000HB□15□
	0.022	18	14	8.5	15	0.8	PPSH223□1000HB□15□
	0.027	18	15.5	9.5	15	0.8	PPSH273□1000HB□15□
	0.033	18	15.5	10	15	0.8	PPSH333□1000HB□15□
	0.036	18	16	10.5	15	0.8	PPSH363□1000HB□15□
	0.039	18	16.5	11	15	0.8	PPSH393□1000HB□15□
	0.043	18	18	11	15	0.8	PPSH433□1000HB□15□

Note: **Enter the appropriate tolerance lead length code and lead configuration □ from the product code table**

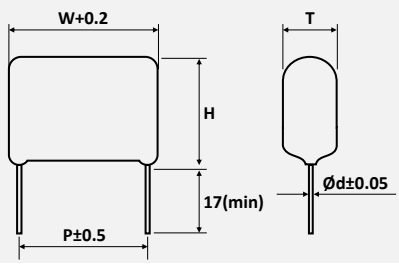
ELECTRICAL CHARACTERISTICS

V_R	C_R (µF)	Dimensions (mm)			P (mm)	Ød ± 0.05 (mm)	Part Number Note
		W + 0.2	H	T			
1000V_{DC}	0.047	18	18.5	11.5	15	0.8	PPSH473□1000HB□15□
	0.033	23	15	8	20	0.8	PPSH333□1000HB□20□
	0.036	23	15.5	8.5	20	0.8	PPSH363□1000HB□20□
	0.039	23	15.5	8.5	20	0.8	PPSH393□1000HB□20□
	0.043	23	16	9.5	20	0.8	PPSH433□1000HB□20□
	0.047	23	16.5	10	20	0.8	PPSH473□1000HB□20□
	0.056	23	17.5	11	20	0.8	PPSH563□1000HB□20□
	0.068	23	18	12	20	0.8	PPSH683□1000HB□20□
	0.082	23	20	13	20	0.8	PPSH823□1000HB□20□
	0.1	23	22	15	20	0.8	PPSH104□1000HB□20□
1200V_{DC}	0.001	18	10	5	15	0.8	PPSH102□1200HB□15□
	0.0012	18	10	5	15	0.8	PPSH122□1200HB□15□
	0.0015	18	10	5	15	0.8	PPSH152□1200HB□15□
	0.0018	18	10	5.5	15	0.8	PPSH182□1200HB□15□
	0.0022	18	10.5	5.5	15	0.8	PPSH222□1200HB□15□
	0.0027	18	10.5	5.5	15	0.8	PPSH272□1200HB□15□
	0.003	18	10.5	5.5	15	0.8	PPSH302□1200HB□15□
	0.0033	18	10.5	5.5	15	0.8	PPSH332□1200HB□15□
	0.0036	18	10.5	5.5	15	0.8	PPSH362□1200HB□15□
	0.0039	18	10.5	5.5	15	0.8	PPSH392□1200HB□15□
	0.0047	18	11	5.5	15	0.8	PPSH472□1200HB□15□
	0.0056	18	11.5	6	15	0.8	PPSH562□1200HB□15□
	0.0068	18	12.5	6.5	15	0.8	PPSH682□1200HB□15□
	0.0082	18	13	7.5	15	0.8	PPSH822□1200HB□15□
	0.01	18	14	8	15	0.8	PPSH103□1200HB□15□
	0.012	18	14.5	9	15	0.8	PPSH123□1200HB□15□
	0.015	18	15.5	10	15	0.8	PPSH153□1200HB□15□
	0.018	18	17	11	15	0.8	PPSH183□1200HB□15□
	0.022	18	18	12.5	15	0.8	PPSH223□1200HB□15□
	0.027	23	17.5	10	20	0.8	PPSH273□1200HB□20□
	0.033	23	18.5	11	20	0.8	PPSH333□1200HB□20□
	0.036	23	19	11.5	20	0.8	PPSH363□1200HB□20□
	0.039	23	19.5	12	20	0.8	PPSH393□1200HB□20□
	0.043	23	20	13	20	0.8	PPSH433□1200HB□20□
	0.047	23	20.5	13.5	20	0.8	PPSH473□1200HB□20□
	0.056	23	22	15	20	0.8	PPSH563□1200HB□20□

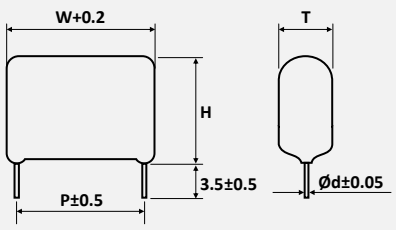
Note: **Enter the appropriate tolerance lead length code and lead configuration □ from the product code table**

PACKAGE OUTLINE ▲ All dimensions in mm

Long Leads

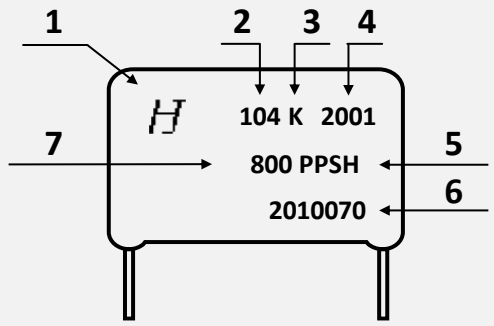


Short Leads



PRODUCT MARKING

Marking	Details



P ≤ 10mm H P 15 to 27.5mm H P > 27.5mm HJC

No.	Description
1	Manufacturer Logo *
2	Nominal capacitance in µF
3	Capacitance tolerance
4	Date code
5	Series name
6	Production no.
7	DC rated voltage

DATE CODE & APPLICATION CATEGORY

Example:

Date code

2001: 2001 = 1st week of 2020

Lot number

2010070: 20 = Year, here 2020
1 = Month, here January
0001 to XXXX = Serial number

20		01	
Year		Week	
19	2019	01	1st
20	2020	02	2nd
21	2021	03	3rd
22	2022	04	4th
23	2023	05	5th
...	...	...	...
30	2030	53	53rd

PRODUCT CODE

Example: PPSH series ▲ 0.1µF ▲ 800V_{DC} ▲ ±10% ▲ P=20mm ▲ Bulk ▲ Straight leads ▲ 17mm lead length

PPSH		104		K		0800		H		B		1		20		1	
Series		Capacitance Code Note1 (pF)		Capacitance Tolerance (%)		Rated Voltage (V_{DC})		Voltage Type		Packaging Type		Lead Configuration Note2		Pitch (mm)		Lead Length (mm)	
Code	Series	Code	µF	Code	Tol.	Code	VDC	Code	Type	Code	Type	Code	Style	Code	mm	Code	mm
PPSH	PPSH	102	0.001	H	±3	0800	800	H	DC	B	Bulk	1	SL	15	15.0	1	17.0
		223	0.22	J	±5	1000	1000							17	17.5	2	3.5
		393	0.39	K	±10	1200	1200							20	20.0		
		104	0.1														

Note:

1 **Capacitance code expressed in pF. The first two digits represent significant figures. The last digit specifies the total number of zeros to be added.**

2 **SL = Straight leads**

REFERENCE DATA

Fig. 1 ▪ Capacitance Drift vs. Ambient Temperature

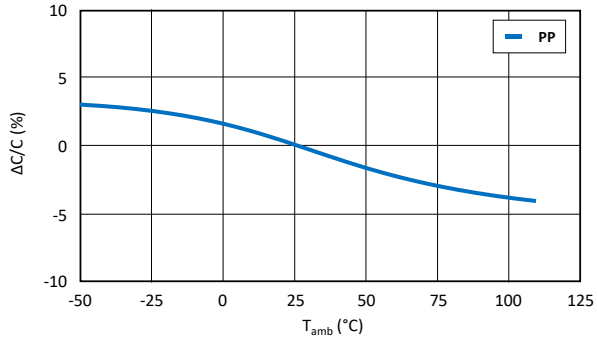


Fig. 2 ▪ Insulation Resistance vs. Ambient Temperature

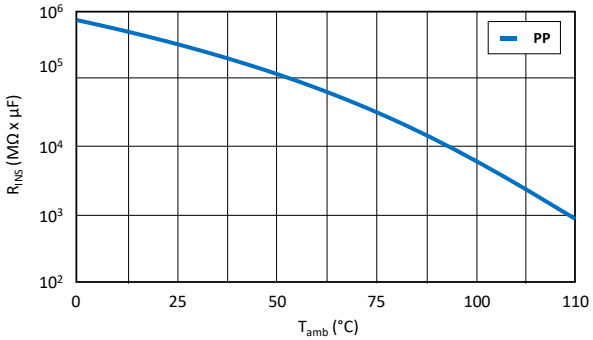


Fig. 3 ▪ Dissipation Factor vs. Ambient Temperature

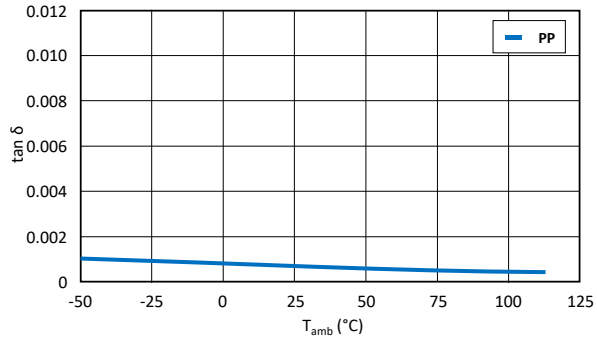


Fig. 4 ▪ Dissipation Factor vs. Frequency

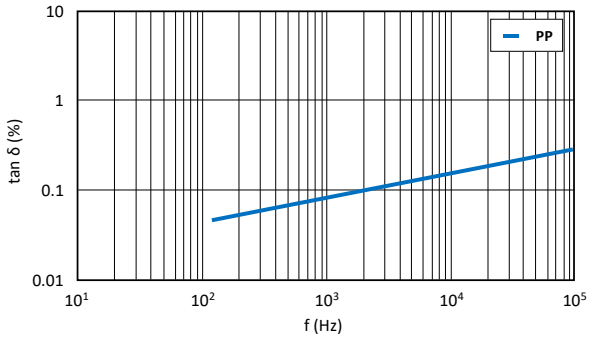


Fig. 5 ▪ Capacitance Drift vs. Frequency

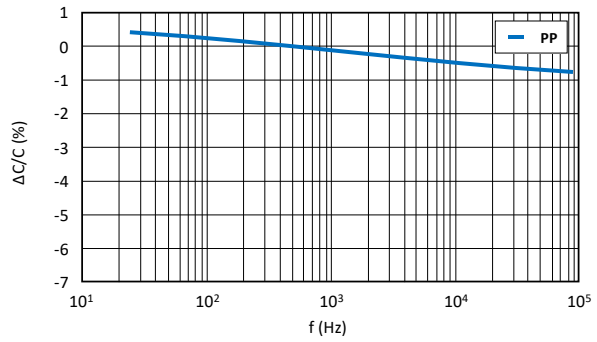


Fig. 6 ▪ Impedance vs. Frequency ▪ Typical Curve

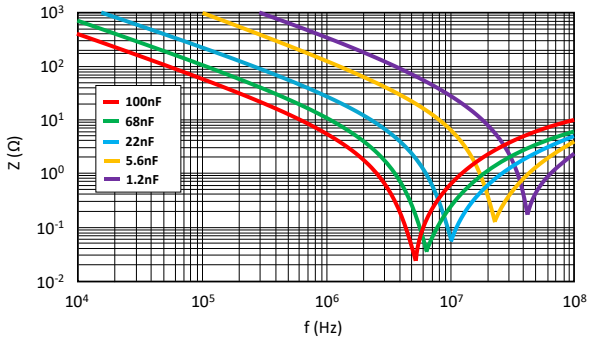


Fig. 7 ▪ Max. RMS Voltage vs. Frequency ▪ 800V$_{DC}$/320V$_{AC}$

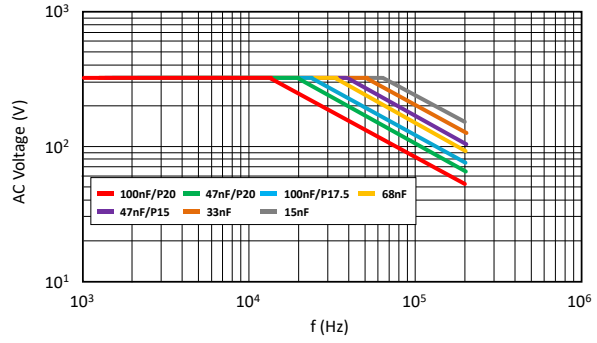
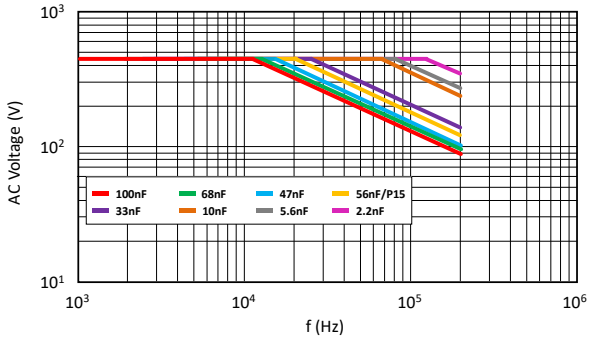


Fig. 8 ▪ Max. RMS Voltage vs. Frequency ▪ 1000V$_{DC}$/450V$_{AC}$



REFERENCE DATA

Fig. 9 ▪ Max. RMS Voltage vs. Frequency ▪ 1200V_{DC}/600V_{AC}

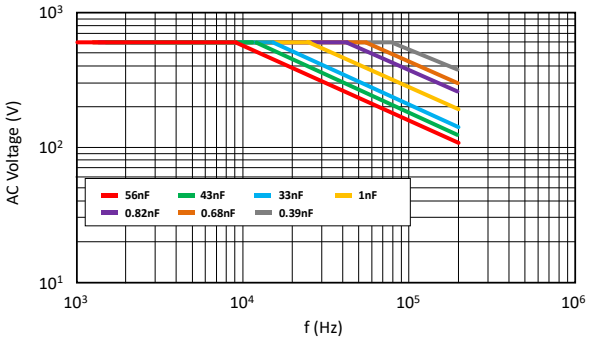


Fig. 10 ▪ Max. DC and AC Voltage vs. Temperature

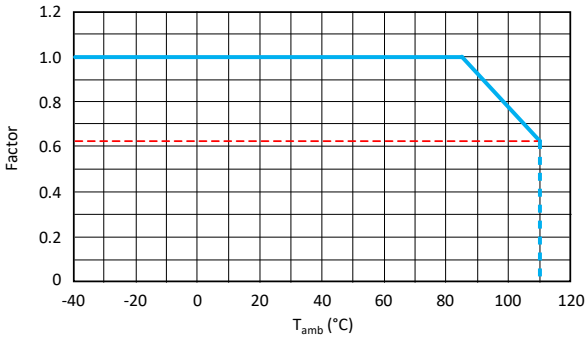


Fig. 11 ▪ Permissible Current Derating by Temperature

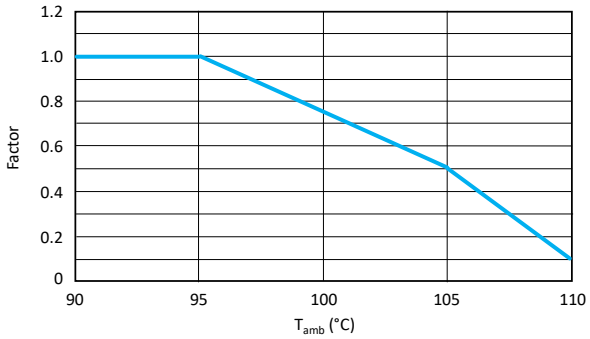
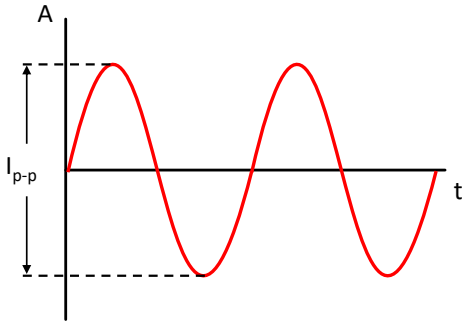


Fig. 12 ▪ Max. RMS Current - Wave Form



MAXIMUM RMS CURRENT

V_R	C_R (µF)	P (mm)	I_{RMS} (A) at f							
			15.75kHz	35kHz	45kHz	65kHz	80kHz	100kHz	130kHz	200kHz
800V_{DC} ▲ 320V_{AC}	0.01	15	0.40	0.88	1.07	1.41	1.58	1.82	1.91	2.14
	0.012	15	0.53	1.03	1.22	1.58	1.78	1.99	2.08	2.39
	0.015	15	0.64	1.15	1.35	1.75	1.93	2.15	2.25	2.55
	0.018	15	0.79	1.35	1.55	1.98	2.15	2.37	2.55	2.95
	0.022	15	1.21	1.85	2.07	2.42	2.64	2.92	3.25	3.85
	0.027	15	1.25	1.95	2.15	2.55	2.75	3.00	3.55	4.15
	0.033	15	1.40	2.12	2.38	2.80	3.10	3.35	3.85	4.55
	0.036	15	1.45	2.20	2.48	2.85	3.15	3.45	4.00	4.65
	0.039	15	1.52	2.40	2.65	3.05	3.25	3.55	4.25	4.95
	0.043	15	1.56	2.50	2.70	3.15	3.33	3.58	4.35	5.10
	0.047	15	1.60	2.60	2.75	3.25	3.40	3.60	4.45	5.25
	0.047	17.5	1.70	2.70	2.85	3.35	3.50	3.70	4.55	5.35
	0.056	17.5	1.95	2.93	3.24	3.68	3.96	4.23	4.82	5.55
	0.068	17.5	2.20	3.19	3.52	4.13	4.51	4.73	5.25	5.75
	0.082	17.5	2.68	3.65	4.07	4.49	4.85	5.25	5.55	6.15
	0.033	20	1.48	2.25	2.58	3.08	3.30	3.68	3.98	4.68
	0.036	20	1.65	2.42	2.75	3.25	3.47	3.85	4.15	4.85
	0.039	20	1.82	2.59	2.86	3.36	3.63	4.02	4.55	5.05
	0.043	20	1.86	2.66	2.93	3.43	3.72	4.11	4.65	5.23
	0.047	20	1.90	2.75	3.00	3.50	3.80	4.20	4.75	5.55
	0.056	20	2.10	3.00	3.35	3.90	4.20	4.65	5.00	6.15
	0.068	20	2.50	3.30	3.80	4.20	4.50	4.85	5.45	6.55
	0.082	20	2.60	3.55	3.95	4.45	4.75	5.00	5.75	6.55
	0.1	20	2.85	3.85	4.25	4.75	5.05	5.45	5.95	6.95

Note: **Maximum capacitor surface temperature $T_S \leq 110°C$; Maximum body temperature rise $\Delta T \leq 10°C$**

$$I_{RMS} = \frac{I_{p-p}}{2 \cdot \sqrt{2}}$$

MAXIMUM RMS CURRENT

V_R	C_R (µF)	P (mm)	I_{RMS} (A) at f							
			15.75kHz	35kHz	45kHz	65kHz	80kHz	100kHz	130kHz	200kHz
1000V_{DC} ▲ 450V_{AC}	0.001	15	0.07	0.17	0.22	0.32	0.40	0.51	0.55	0.60
	0.0012	15	0.09	0.20	0.23	0.35	0.44	0.57	0.61	0.68
	0.0015	15	0.10	0.23	0.30	0.40	0.50	0.64	0.68	0.75
	0.0018	15	0.11	0.24	0.31	0.45	0.55	0.66	0.72	0.80
	0.0022	15	0.12	0.25	0.32	0.45	0.55	0.68	0.75	0.85
	0.0027	15	0.14	0.28	0.35	0.51	0.62	0.76	0.83	0.92
	0.003	15	0.15	0.32	0.41	0.58	0.72	0.88	0.93	1.00
	0.0033	15	0.16	0.35	0.45	0.64	0.79	0.97	1.03	1.11
	0.0036	15	0.17	0.38	0.49	0.71	0.86	1.06	1.12	1.20
	0.0039	15	0.19	0.42	0.54	0.77	0.94	1.15	1.22	1.31
	0.0047	15	0.23	0.51	0.64	0.92	1.13	1.39	1.47	1.58
	0.0056	15	0.27	0.60	0.77	1.10	1.35	1.65	1.75	1.88
	0.0068	15	0.31	0.67	0.87	1.24	1.50	1.87	1.95	2.05
	0.0082	15	0.37	0.79	1.00	1.43	1.76	2.15	2.25	2.40
	0.01	15	0.78	1.24	1.43	1.76	1.98	2.26	2.35	2.55
	0.012	15	0.92	1.37	1.54	1.85	2.03	2.37	2.52	2.68
	0.015	15	0.96	1.49	1.76	2.11	2.53	3.02	3.21	3.45
	0.018	15	1.10	1.60	1.82	2.20	2.59	3.14	3.35	3.55
	0.022	15	1.32	1.93	2.26	2.81	3.19	3.63	3.85	4.00
	0.027	15	1.57	2.04	2.37	2.92	3.30	3.74	4.00	4.25
	0.033	15	1.65	2.15	2.48	3.03	3.47	4.02	4.15	4.45
	0.036	15	1.70	2.25	2.67	3.25	3.72	4.27	4.39	4.65
	0.039	15	1.75	2.37	2.85	3.47	4.02	4.51	4.68	4.85
	0.043	15	1.80	2.52	3.10	3.62	4.10	4.67	4.76	4.92
	0.047	15	1.84	2.70	3.30	3.80	4.18	4.73	4.85	5.00
	0.033	20	1.60	2.35	2.60	3.10	3.40	3.70	3.85	4.00
	0.036	20	1.78	2.50	2.80	3.30	3.58	3.95	4.15	4.35
	0.039	20	1.89	2.60	2.97	3.55	3.90	4.20	4.42	4.66
	0.043	20	2.00	2.70	3.15	3.85	4.20	4.50	4.70	4.90
	0.047	20	2.10	3.10	3.55	4.20	4.60	5.10	5.35	5.45
	0.056	20	2.30	3.30	3.75	4.35	4.78	5.25	5.40	5.60
	0.068	20	2.53	3.55	4.00	4.50	4.95	5.40	5.55	5.75
	0.082	20	3.08	3.96	4.29	4.90	5.30	5.70	5.90	6.15
	0.1	20	3.63	4.73	5.17	5.94	6.38	6.87	7.00	7.25

Note: **Maximum capacitor surface temperature $T_S \leq 110°C$; Maximum body temperature rise $\Delta T \leq 10°C$**

$$I_{RMS} = \frac{I_{p-p}}{2 \cdot \sqrt{2}}$$

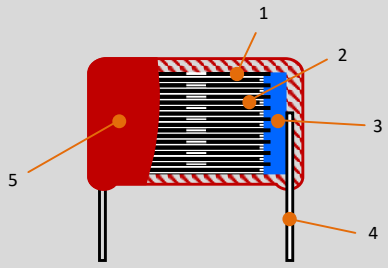
MAXIMUM RMS CURRENT

V_R	C_R (µF)	P (mm)	I_{RMS} (A) at f							
			15.75kHz	35kHz	45kHz	65kHz	80kHz	100kHz	130kHz	200kHz
1200V_{DC} ▲ 600V_{AC}	0.001	15	0.13	0.21	0.35	0.48	0.56	0.61	0.78	0.79
	0.0012	15	0.15	0.24	0.40	0.51	0.59	0.65	0.82	0.86
	0.0015	15	0.17	0.27	0.43	0.54	0.62	0.69	0.86	0.93
	0.0018	15	0.19	0.30	0.47	0.57	0.65	0.73	0.90	1.00
	0.0022	15	0.21	0.33	0.50	0.60	0.68	0.77	0.94	1.05
	0.0027	15	0.25	0.37	0.54	0.63	0.71	0.81	0.99	1.12
	0.003	15	0.29	0.41	0.58	0.67	0.76	0.86	1.06	1.25
	0.0033	15	0.33	0.45	0.63	0.73	0.83	0.93	1.13	1.32
	0.0036	15	0.40	0.52	0.70	0.80	0.90	1.00	1.20	1.40
	0.0039	15	0.46	0.67	0.80	0.90	1.00	1.10	1.30	1.50
	0.0047	15	0.48	0.78	0.90	0.98	1.11	1.21	1.38	1.61
	0.0056	15	0.51	0.90	1.00	1.07	1.23	1.33	1.46	1.73
	0.0068	15	0.55	1.00	1.10	1.15	1.35	1.45	1.55	1.85
	0.0082	15	0.64	0.90	1.00	1.20	1.40	1.50	1.70	2.10
	0.01	15	0.75	1.00	1.20	1.40	1.50	1.70	1.90	2.30
	0.012	15	1.22	1.67	1.84	2.15	2.33	2.67	2.82	2.98
	0.015	15	1.26	1.79	2.06	2.41	2.83	3.32	3.51	3.75
	0.018	15	1.40	1.90	2.12	2.50	2.89	3.44	3.65	3.85
	0.022	15	1.62	2.23	2.56	3.11	3.49	3.93	4.15	4.30
	0.027	20	1.80	2.55	2.80	3.30	3.60	3.90	4.05	4.20
	0.033	20	2.00	2.75	3.00	3.50	3.80	4.10	4.25	4.40
	0.036	20	2.18	2.90	3.20	3.70	3.98	4.35	4.55	4.75
	0.039	20	2.29	3.00	3.37	3.95	4.30	4.60	4.82	5.06
	0.043	20	2.40	3.10	3.55	4.25	4.60	4.90	5.10	5.30
	0.047	20	2.50	3.50	3.95	4.55	4.95	5.45	5.70	5.80
	0.056	20	2.70	3.70	4.15	4.75	5.18	5.60	5.80	5.95
	0.056	20	2.70	3.70	4.15	4.75	5.18	5.60	5.80	5.95

Note: **Maximum capacitor surface temperature $T_S \leq 110°C$; Maximum body temperature rise $\Delta T \leq 10°C$**

$$I_{RMS} = \frac{I_{p-p}}{2 \cdot \sqrt{2}}$$

TECHNICAL SPECIFICATION

No.	Category	Specification			
1	Scope	This specification applies to capacitors for high pulse electronics applications. Reference standards: IEC 60384-13			
2	Product Name	Film-foil polypropylene film capacitor, with ultra-high dV/dt, Type PPSH			
3	Construction	Dimensions:	Refer to dimensions drawing		
					
		1 = Electrodes	Aluminum foil		
		2 = Element	Metallized Polypropylene film		
		3 = Metal spray	Special solder. (Lead Free) compliant to RoHS directive		
		4 = Lead wire	Tinned wire (Cu wire) or tinned copper clad-steel wire (CP wire). (Lead Free) compliant to RoHS directive		
		5 = Coating	Epoxy resin. (UL-94V-0 Standard)		
4	Atmospheric and Temperature Characteristics	**Standard atmospheric conditions.** Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows:			
		Ambient temperature:	15 to 35°C		
		Relative humidity	45% to 85%		
		Air pressure	86 to 106 kPa		
		If there may be any doubt on the results, measurements shall be made within the following limits.			
		Ambient temperature:	20°C ± 5°C		
		Relative humidity:	60 to 70%		
		Operating temperature range			
		Lowest operating temperature:	-40°C		
		Maximum operating temperature:	+110°C (case-temperature) with specified voltage-derating		
		The capacitor can be operated up to 110°C case-temperature (according to the power to be dissipated). Derating ratio of rated voltage +85°C to +110°C: 1.5% per °C for V_{RDC} The temperature is measured at the hottest point of the case when the capacitor has reached its thermal equilibrium.			
		Rated temperature range	-40°C to +85°C		
		Rated temperature range is the range of ambient temperature for which the capacitor can be operated continuously at rated voltage.			
5	Electrical Characteristics	Rated voltage V_R at 85°C:	$800V_{DC}$	$1000V_{DC}$	$1200V_{DC}$
			$320V_{AC}$	$400V_{AC}$	$450V_{AC}$
		Category voltage:	Up to 85°C $V_C = V_{RDC}$		
		Rated upper limit temperature:	+85°C		
		Usable upper limit temperature:	+110°C		
		Capacitance range:	0.001µF to 0.1µF		
		Capacitance tolerance:	±3% (H), ±5% (J), ±10% (K)		Measured at 1kHz, 1V

TECHNICAL SPECIFICATION

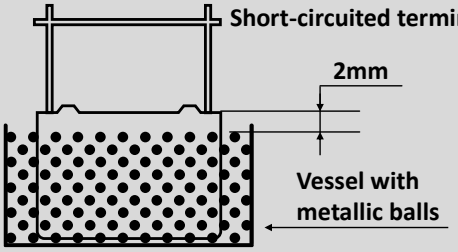
<table>
<tr><th>No.</th><th>Category</th><th>Specification</th></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Electrical Characteristics</td><td>
Dissipation factor tanδ (%): LCR meter: HP-4284A, at 20°C ± 5°C
<table>
<tr><td>f (kHz)</td><td>C ≤ 0.1µF</td><td>0.1 < C ≤ 1µF</td><td>1µF < C ≤ 2.2µF</td></tr>
<tr><td>1</td><td>≤ 0.05%</td><td>≤ 0.05%</td><td>≤ 0.05%</td></tr>
<tr><td>100</td><td>≤ 0.15%</td><td>-</td><td>-</td></tr>
</table>
Insulation resistance between terminals
<table>
<tr><td colspan="2">Test conditions:</td></tr>
<tr><td>Temperature:</td><td>20°C ± 5°C</td></tr>
<tr><td>Voltage charge:</td><td>500V_{DC}</td></tr>
<tr><td rowspan="2">Performance:</td><td>C ≤ 0.1µF</td></tr>
<tr><td>After voltage charge
1 minute > 30GΩ</td></tr>
</table>
Test voltage between terminals
<table>
<tr><td colspan="3">1.6 × V_{RDC} applied for 2 sec, at 20°C ±5°C</td></tr>
<tr><td>Cut off current:</td><td colspan="2">10mA</td></tr>
<tr><td>Ramp/rise time:</td><td>C ≤ 10µF: 5 sec</td><td>C > 10µF: 10 sec</td></tr>
<tr><td>Performance:</td><td colspan="2">There shall be no dielectric breakdown or other damage</td></tr>
</table>
Dielectric strength between terminal and enclosure
<table>
<tr><td>Apply 200% of rated voltage between terminals and enclosure for 2 to 5 sec</td></tr>
<tr><td>Method of the test described as below</td></tr>
<tr><td>Put the small metallic balls with 1 mm diameter in a vessel. The test capacitor shall be submerged with the small metallic balls.
Distance of the metallic balls and the terminals shall be kept about 2 mm as shown in fig. 1.
The test voltage shall be applied between the short-circuited terminals and the metallic balls</td></tr>
<tr><td> 

Fig. 1</td></tr>
</table>
<table>
<tr><td>Performance:</td><td colspan="4">There shall be no dielectric breakdown or other damage</td></tr>
<tr><td rowspan="2">Test Item</td><td colspan="4">The test capacitor shall be kept in the testing oven and kept at condition of following table, and it shall be repeated for 5 cycles successively. After the test, the capacitor shall be let alone at the ordinary condition for 2 hours</td></tr>
<tr><td colspan="3">Conditions</td><td>Performance</td></tr>
<tr><td rowspan="5">Rapid change of temperature (IEC68-2-14 Na)</td><td>Step</td><td>Temperature</td><td>Time</td><td></td></tr>
<tr><td>1</td><td>-40 ± 3°C</td><td>30 ± 3 min</td><td rowspan="4">Capacitance change
|ΔC/C| ≤ ± 10%
tan δ change
≤ 0.1% at 1kHz
R insulation ≥ 50 % of limit value</td></tr>
<tr><td>2</td><td>Ordinary</td><td>3 min or less</td></tr>
<tr><td>3</td><td>+110 ± 2°C</td><td>30 ± 3 min</td></tr>
<tr><td>4</td><td>Ordinary</td><td>3 min or less</td></tr>
</table>
</td></tr>
</table>

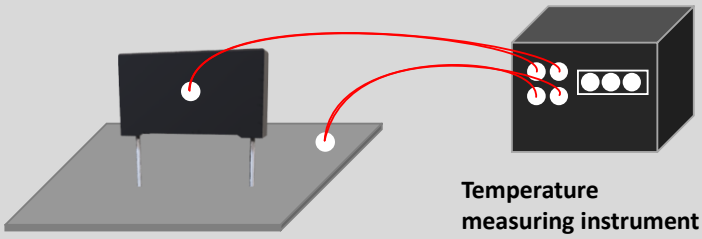
TECHNICAL SPECIFICATION

No.	Category	Specification		
6	**Mechanical Characteristics**	**Test Item**	**Conditions**	**Performance**
		Robustness of terminations (IEC68-2-21)	Tensile Ua1 A load of 10 N (1.0kg) shall be gradually applied to the terminal in the axial direction and held thus for 10 sec Bending Ub methode 1 While a load of 500g applied to the lead wire, the body of the capacitor shall be bent 90° and returned to the original position. This operation shall be conducted in a few seconds. Then the body shall be bent 90° at the same speed in the opposite direction and returned to the original position	There shall be no such mechanical damage as terminal damage etc.
7	**Endurance Characteristics**	Solderability (IEC68-2-20 Ta)	Solder bath: 245°C ± 5°C Immersion time:2.5±0.5sec Visual examination	At least 95% of the circumferential face of lead wire up to immersed level shall be covered with new solder
		Resistance to soldering heat (IEC 68-2-20 Tb)	Solder bath: 260 °C ± 5 °C Immersion time:10±1sec Thickness of heat shunt (Printed wiring board): 1.6mm Capacitance at 1kHz tan δ at 1kHz	Capacitance change |ΔC/C| ≤ ± 1% tan δ change ≤ 0.1% at 1kHz
		Vibration proof (IEC68-2-6 Fc)	The frequency shall be varied form from 10Hz to 55Hz at 1.5mm amplitude and back to 10Hz in approximately 1-minute intervals. This motion shall be applied for a period of 2 hours in each of 3 mutually perpendicular directions. During the last 30 min of vibration in each direction, checks shall be made for open or short-circuit and interruption	Bending strength: There shall be no open or short-circuiting and the connections must be stabilized. Appearance: There shall be no such mechanical damage as terminal damage etc.
		Damp heat steady state (IEC68-2-3 Ca)	The capacitor shall be stored at a temperature of 40 ± 2°C and relative humidity of 90% to 95% for 1000 hours. And then the capacitor shall be subjected to standard atmospheric conditions for 1 to 2 hours, after which measurement shall be made	Capacitance change |ΔC/C| ≤ ± 3% tan δ change ≤ 0.1% at 1kHz R insulation ≥ 50 % of limit value

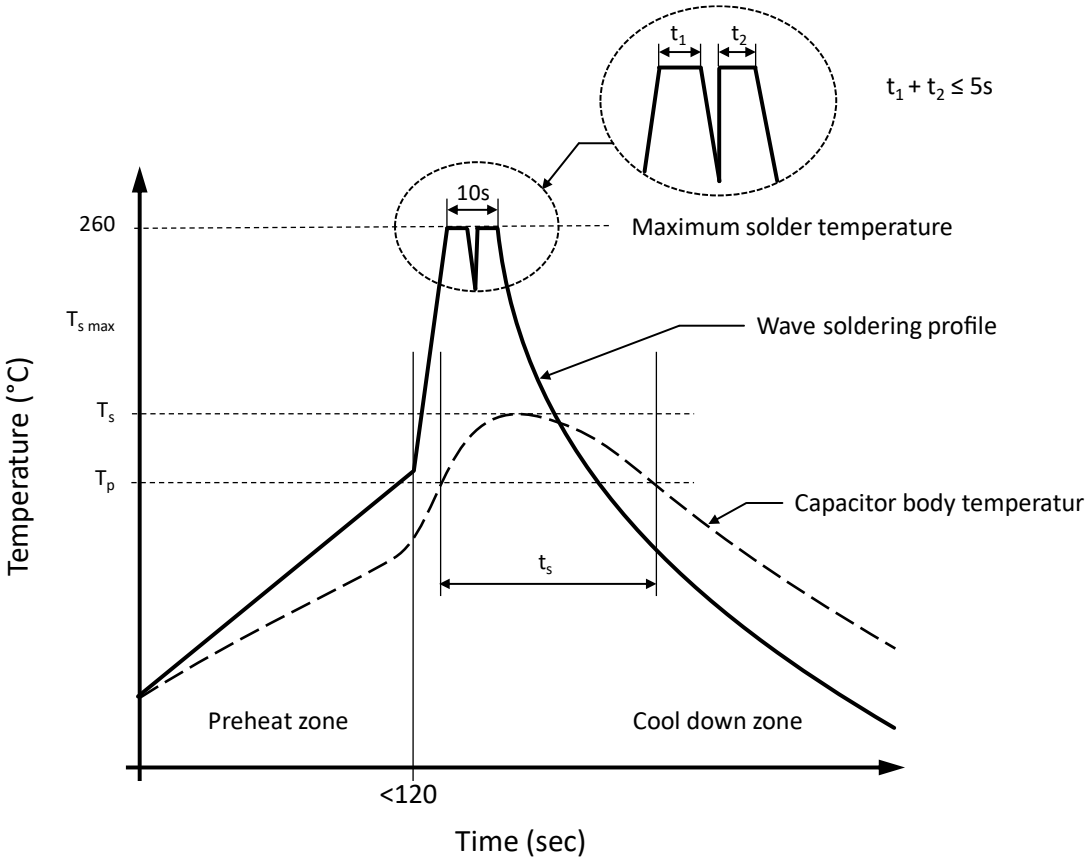
TECHNICAL SPECIFICATION

<table>
<tr><th>No.</th><th>Category</th><th colspan="3">Specification</th></tr>
<tr><td rowspan="4">7</td><td rowspan="4">Endurance Characteristics</td><td>Test Item</td><td>Conditions</td><td>Performance</td></tr>
<tr><td>Electrical endurance (IEC 60384-17)</td><td>125% of category voltage shall be applied to the capacitor at a temperature of 85 ± 2°C for 2000 hours. Then the capacitor shall be subjected to standard atmospheric conditions for 1 to 2 hours, after which measurement shall be made.
The load resistor in series with the capacitor shall be 20Ω to 1kΩ.</td><td>Capacitance change
|ΔC/C| ≤ ± 10%
tan δ change
≤ 0.4% at 1kHz
R insulation ≥ 50 % of limit value</td></tr>
<tr><td>Method of measuring inherent temperature rise ΔT</td><td>Inherent temperature of capacitor shall be measured by keeping away from heat influence of surrounding components after attaching thermocouple to the capacitor as show below.

(They shall be measured in normal temperature).

Measurement shall be down by soldering capacitor on the opposite side of the printed circuit board etc. in case of being influenced by heat of surrounding components.
Besides, they shall be measured in calm condition by putting capacitor into box etc. in case of being influence by convection or wind.</td><td>Less than +10°C</td></tr>
<tr><td colspan="3"> 
</td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Storage conditions</td><td colspan="3">It should be noted that the solderability of the terminals may be deteriorated when stored barely in an atmosphere for a long period.</td></tr>
<tr><td colspan="3">It should not be located in particularly high temperature and high humidity, it must submit to the following conditions (Keeping in the original package)
Temperature: 5°C to 35°C
Relative humidity: ≤ 70%
Storage period: ≤ 12 months
(Following the manufacturing date marked on the label in package bag)</td></tr>
<tr><td colspan="3">Avoid wetting the capacitor by water, oil, salt and/or poisonous gas.</td></tr>
<tr><td colspan="3">If used the capacitor that overdue the storage time, it should be test, the characteristics of the capacitor or contact with our technical engineer.</td></tr>
</table>

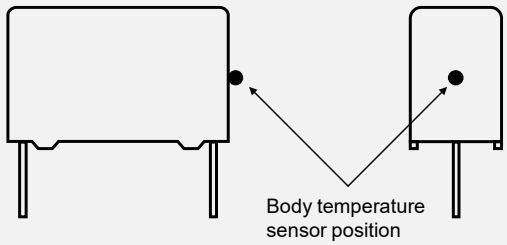
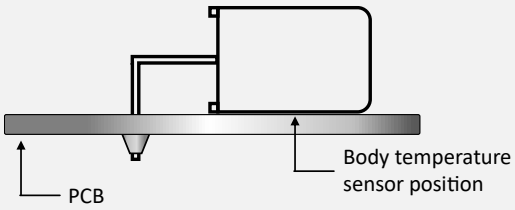
RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE



Capacitor body temperature should follow the description below:

Profile Features		Polypropylene Film Capacitor	Polyester Film Capacitor
Capacitor body maximum temperature at preheating	T_P	≤ 110°C / 120 seconds	≤ 125°C / 120 seconds
Capacitor body maximum temperature at wave soldering	T_S	≤ 120°C / t_s ≤ 45 seconds	≤ 150°C / t_s ≤ 45 seconds

DETERMINING THE CAPACITOR BODY TEMPERATURE

Vertical Mounting	Horizontal Mounting
	
The body temperature sensor position is defined as the highest temperature point around the capacitor body.	If there is 90 degree bending product, the sensor position shall between product and PCB

SOLDERING SUGGESTIONS

When solder a capacitor, heat in soldering is conducted to the element of the capacitor from wire lead and an enclosure, and hence it should be noted that soldering under high temperature and a long period may cause deterioration of breakdown of capacitors. Be sure to solder within the recommended temperature condition range.

HAND SOLDERING

a.) Soldering iron top temperature: ≤ 350°C
b.) Soldering time: ≤ 3sec

If re-work or dipping twice in necessary, it should be done after the capacitor returned to the normal temperature. Suggestion time is 24 hours.

THT film capacitors are not suitable for reflow soldering.

When SMD components are used together with film capacitor, the film capacitor should not pass into the SMD adhesive curing oven. The film capacitor should be assembled after the SMD process.

In order to ensure proper conditions for manual or selective soldering, the body (surface) temperature of the film capacitor (T_s) must be ≤ 120°C.

REVISION TABLE

Revision	Date	Status	Notes
001	01/10/2021	Initial release	Initial publication

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It is subject to the user's duty of care to design and validate his products in such a way that appropriate measures are taken, such as protective circuits or redundant systems to ensure the safety standards required in the application.

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