

Chip Solid Polymer Tantalum Capacitors – TP Series



Operating Temp ◆ -55°C ~+125°C

Features

- ◆ Polymer cathode technology, safe failure mode
- ◆ Ultra-low ESR
- ◆ Self-healing capability, high reliability
- ◆ Excellent stability of capacitance within operating temperature range
- ◆ High volume utilization
- ◆ Ultra-low leakage current
- ◆ Thinning

Applications

- ◆ Communication products
- ◆ Consumer electronics
- ◆ Instrumentations
- ◆ AI Servers
- ◆ Big data

Product Identification

1	2	3	4	5	6	7
TP	157	D20	M	6R3	B	045

1	Type
TP	Polymer Solid Tantalum Chip Capacitor

2	Nominal Capacitance
Example	Nominal Value
155	1.5μF
106	10μF
157	150μF

3	External Dimensions (L×W×H) (mm)
B20	3.5×2.8×2.0
C25	6.0×3.2×2.5
D20	7.3×4.3×2.0
D40	7.3×4.3×4.0

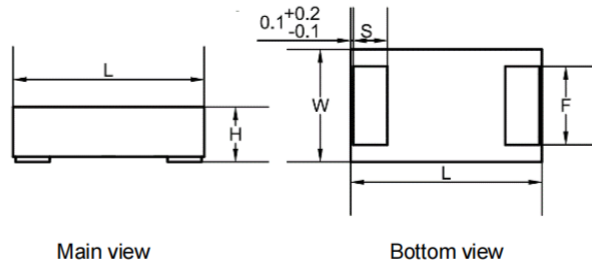
4	Capacitance Tolerance
K	±10%
M	±20%

5	Rated DC Voltage
2R0	2Vdc
004	4Vdc
6R3	6.3Vdc
010	10Vdc
016	16Vdc
063	63Vdc

6	Internal Code
B	Black Molded Case, Laser Marking

7	ESR
045	45mΩ
050	50mΩ
100	100mΩ

Shape and Dimensions

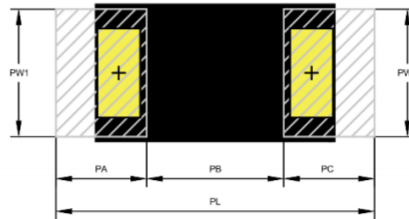


Standard case dimensions:

Unit: mm [inch]

Case Code	EIA	L	W	H	F	S
B12	3528-12	3.50±0.20 [.138±.008]	2.80±0.20 [.11±.008]	1.10±0.10 [.043±.004]	2.20±0.10 [.087±.004]	0.80±0.30 [.031±.012]
B15	3528-15	3.50±0.20 [.138±.008]	2.80±0.20 [.11±.008]	1.40±0.10 [.055±.004]	2.20±0.10 [.087±.004]	0.80±0.30 [.031±.012]
B20	3528-20	3.50±0.20 [.138±.008]	2.80±0.20 [.11±.008]	1.90±0.10 [.075±.004]	2.20±0.10 [.087±.004]	0.80±0.30 [.031±.012]
C20	6032-19	6.00±0.30 [.236±.012]	3.20±0.20 [.126±.008]	1.80±0.10 [.071±.004]	2.20±0.10 [.087±.004]	1.30±0.30 [.051±.012]
C25	6032-28	6.00±0.30 [.236±.012]	3.20±0.20 [.126±.008]	2.50±0.30 [.098±.012]	2.20±0.10 [.087±.004]	1.30±0.30 [.051±.012]
D15	7343-15	7.30±0.30 [.287±.012]	4.30±0.30 [.169±.012]	1.40±0.10 [.055±.004]	2.40±0.10 [.094±.004]	1.30±0.30 [.051±.012]
D20	7343-20	7.30±0.30 [.287±.012]	4.30±0.30 [.169±.012]	1.90±0.10 [.075±.004]	2.40±0.10 [.094±.004]	1.30±0.30 [.051±.012]
D28	7343-31	7.30±0.30 [.287±.012]	4.30±0.30 [.169±.012]	2.80±0.30 [.11±.012]	2.40±0.10 [.094±.004]	1.30±0.30 [.051±.012]
D40	7343-43	7.30±0.30 [.287±.012]	4.30±0.30 [.169±.012]	4.00±0.30 [.157±.012]	2.40±0.10 [.094±.004]	1.30±0.30 [.051±.012]
F20	7360-20	7.30±0.30 [.287±.012]	6.00±0.30 [.236±.012]	1.90±0.10 [.075±.004]	3.00±0.10 [.118±.004]	1.50±0.30 [.059±.012]
F35	7360-37	7.30±0.30 [.287±.012]	6.00±0.30 [.236±.012]	3.50±0.20 [.138±.012]	3.00±0.10 [.118±.004]	1.50±0.30 [.059±.012]

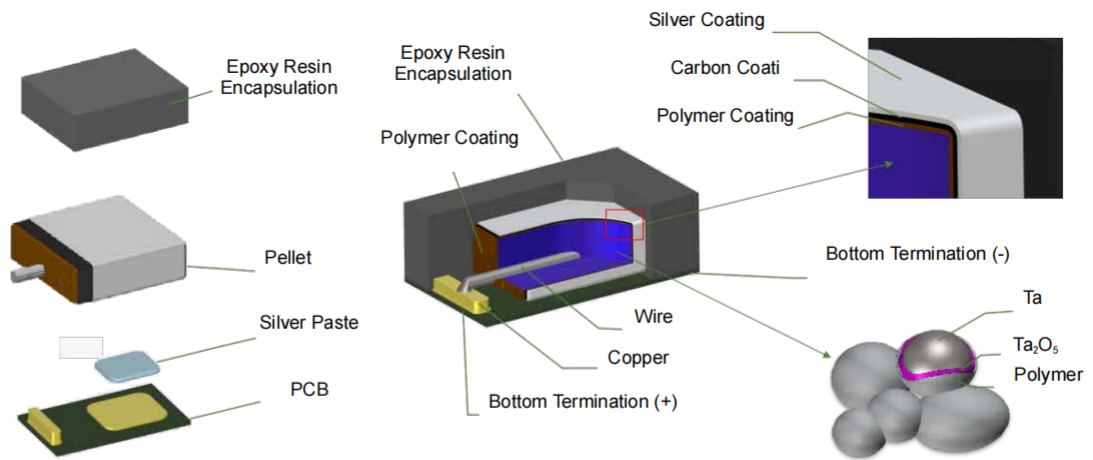
PCB Pads



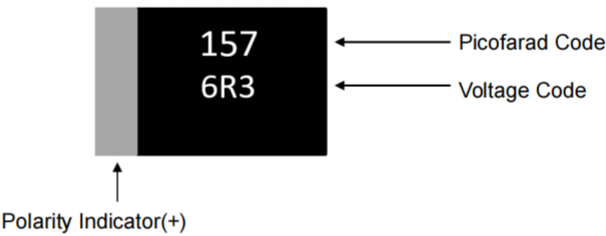
Unit: mm [inch]

Case Code	EIA	PL	PW1	PW2	PA	PB	PC
B12、B15、B20	3528	4.10 [0.16]	2.70 [0.11]	2.70 [0.11]	1.35 [0.05]	1.40 [0.06]	1.35 [0.05]
C20、C25	6032	6.90 [0.27]	2.70 [0.11]	2.70 [0.11]	2.00 [0.08]	2.90 [0.11]	2.00 [0.08]
D15、D20、 D28、D40	7343	8.20 [0.32]	2.90 [0.11]	2.90 [0.11]	2.05 [0.08]	4.10 [0.16]	2.05 [0.08]
F20、F35、	7360	8.20 [0.32]	2.90 [0.11]	2.90 [0.11]	2.05 [0.08]	4.10 [0.16]	2.05 [0.08]

Construction



Marking



Rated Voltage Code

	2.0	2.5	4	6.3	8.0	10	16	20	25	35	50	63	75	100
电压代码 Voltage Code	2R0	2R5	4V	6R3	8R0	10V	16V	20V	25V	35V	50V	63V	75V	100V

Capacitance Code

Capacitance (μF)	1.0	3.3	4.7	6.8	10	15	22	33	47	68
Capacitance Code	105	335	475	685	106	156	226	336	476	686
Capacitance (μF)	100	150	220	330	470	680	1000	1200	1500	/
Capacitance Code	107	157	227	337	477	687	108	128	158	/

Specifications

Rated Voltage VDC	Rated Cap	Case Code/ Case size	Part Number	DCL +25°C 5 Mins Max.	DF +25°C 120Hz Max.	ESR +25°C 100kHz Max.	Ripple Current (rms) +45°C 100 kHz Max.	Maximum Operating Temperature	Derating Category
V	μF	-	-	μA	%	mΩ	mA	°C	-
2	470	D20/7343-20	TP477D20 ◎ 2R0B040	94	10	40	2600	105	2
2.5	100	B12/3528-12	TP107B12 ◎ 2R5B070	25	8	70	1300	105	2
2.5	100	B20/3528-20	TP107B20 ◎ 2R5B070	25	8	70	1700	105	2
2.5	220	B12/3528-12	TP227B12 ◎ 2R5B070	55	10	70	1300	105	2
2.5	220	B20/3528-20	TP227B20 ◎ 2R5B070	55	10	70	1700	105	2
2.5	220	C25/6032-28	TP227C25 ◎ 2R5B045	55	8	45	2400	105	2
2.5	220	D15/7343-15	TP227D15 ◎ 2R5B040	55	10	40	2500	105	2
2.5	220	D20/7343-20	TP227D20 ◎ 2R5B040	55	10	40	2600	105	2
2.5	220	D28/7343-31	TP227D28 ◎ 2R5B040	55	10	40	2800	105	2
2.5	330	B20/3528-20	TP337B20 ◎ 2R5B070	82.5	8	70	2100	105	2
2.5	330	C20/6032-19	TP337C20 ◎ 2R5B045	82.5	8	45	2200	105	2
2.5	330	C25/6032-28	TP337C25 ◎ 2R5B045	82.5	8	45	2400	105	2
2.5	330	D15/7343-15	TP337D15 ◎ 2R5B040	82.5	10	40	2500	105	2
2.5	330	D20/7343-20	TP337D20 ◎ 2R5B040	82.5	10	40	2600	105	2
2.5	330	D28/7343-31	TP337D28 ◎ 2R5B040	82.5	10	40	2800	105	2
2.5	470	D20/7343-20	TP477D20 ◎ 2R5B040	117.5	10	40	2600	105	2
2.5	470	D28/7343-31	TP477D28 ◎ 2R5B040	117.5	10	40	2800	105	2
2.5	680	D28/7343-31	TP687D28 ◎ 2R5B040	170	10	40	2800	105	2
2.5	680	D40/7343-43	TP687D40 ◎ 2R5B040	170	10	40	3200	105	2
2.5	1000	D40/7343-43	TP108D40 ◎ 2R5B040	250	10	40	3200	105	2
4	47	B12/3528-12	TP476B12 ◎ 004B070	18.8	8	70	1300	105	2
4	68	B20/3528-20	TP686B20 ◎ 004B070	27.2	8	70	1700	105	2
4	100	B12/3528-12	TP107B12 ◎ 004B150	40	8	150	900	105	2
4	100	B12/3528-12	TP107B12 ◎ 004B070	40	8	70	1300	105	2
4	100	B20/3528-20	TP107B20 ◎ 004B070	40	8	70	1700	105	2
4	150	B20/3528-20	TP157B20 ◎ 004B070	60	8	70	1700	105	2
4	150	C25/6032-28	TP157C25 ◎ 004B100	60	8	100	1600	105	2
4	150	C25/6032-28	TP157C25 ◎ 004B050	60	8	50	2200	105	2
4	220	B20/3528-20	TP227B20 ◎ 004B070	88	8	70	1700	105	2
4	220	C25/6032-28	TP227C25 ◎ 004B055	88	8	55	2100	105	2
4	220	D15/7343-15	TP227D15 ◎ 004B050	88	10	50	2300	105	2
4	220	D20/7343-20	TP227D20 ◎ 004B050	88	10	50	2300	105	2
4	220	D20/7343-20	TP227D20 ◎ 004B045	88	10	45	2400	105	2
4	330	C25/6032-28	TP337C25 ◎ 004B055	132	8	55	2100	105	2
4	330	D20/7343-20	TP337D20 ◎ 004B045	132	10	45	2400	105	2
4	330	D28/7343-31	TP337D28 ◎ 004B050	132	10	50	2500	105	2
4	470	D28/7343-31	TP477D28 ◎ 004B050	188	10	50	2500	105	2
4	470	D40/7343-43	TP477D40 ◎ 004B050	188	10	50	2800	105	2
4	680	D40/7343-43	TP687D40 ◎ 004B050	272	10	50	2800	105	2
6.3	15	B12/3528-12	TP156B12 ◎ 6R3B100	9.5	8	100	1100	105	2
6.3	22	B12/3528-12	TP226B12 ◎ 6R3B100	13.9	8	100	1100	105	2
6.3	33	B12/3528-12	TP336B12 ◎ 6R3B070	20.8	8	70	1300	105	2
6.3	33	B15/3528-15	TP336B15 ◎ 6R3B070	20.8	8	70	1500	105	2
6.3	33	C20/6032-19	TP336C20 ◎ 6R3B100	20.8	8	100	1500	105	2
6.3	47	B12/3528-12	TP476B12 ◎ 6R3B070	29.6	8	70	1300	105	2
6.3	47	B15/3528-15	TP476B15 ◎ 6R3B070	29.6	8	70	1500	105	2
6.3	68	B12/3528-12	TP686B12 ◎ 6R3B150	42.8	8	150	900	105	2
6.3	68	B15/3528-15	TP686B15 ◎ 6R3B070	42.8	8	70	1500	105	2
6.3	68	C25/6032-28	TP686C25 ◎ 6R3B100	42.8	8	100	1600	105	2
6.3	100	B12/3528-12	TP107B12 ◎ 6R3B070	63	8	70	1300	105	2
6.3	100	B20/3528-20	TP107B20 ◎ 6R3B070	63	8	70	1700	105	2
6.3	100	C20/6032-19	TP107C20 ◎ 6R3B045	63	8	45	2200	105	2

Specifications

Rated Voltage VDC	Rated Cap	Case Code/ Case size	Part Number	DCL +25℃ 5 Mins Max.	DF +25℃ 120Hz Max.	ESR +25℃ 100kHz Max.	Ripple Current (rms) +45℃ 100 kHz Max.	Maximum Operating Temperature	Derating Category
V	μF	-	-	μA	%	mΩ	mA	℃	-
6.3	100	D15/7343-15	TP107D15 ◎ 6R3B040	63	10	40	2500	105	2
6.3	150	B12/3528-12	TP157B12 ◎ 6R3B060	94.5	8	60	1400	105	2
6.3	150	B15/3528-15	TP157B15 ◎ 6R3B200	94.5	8	200	900	105	2
6.3	150	B15/3528-15	TP157B15 ◎ 6R3B070	94.5	8	70	1500	105	2
6.3	150	B20/3528-20	TP157B20 ◎ 6R3B070	94.5	8	70	1700	105	2
6.3	150	C20/6032-19	TP157C20 ◎ 6R3B045	94.5	8	45	2200	105	2
6.3	150	C25/6032-28	TP157C25 ◎ 6R3B055	94.5	8	55	2100	105	2
6.3	150	D15/7343-15	TP157D15 ◎ 6R3B040	94.5	10	40	2500	105	2
6.3	150	D20/7343-20	TP157D20 ◎ 6R3B045	94.5	10	45	2400	105	2
6.3	150	D28/7343-31	TP157D28 ◎ 6R3B055	94.5	10	55	2400	105	2
6.3	220	C25/6032-28	TP227C25 ◎ 6R3B045	138.6	8	45	2400	105	2
6.3	220	D20/7343-20	TP227D20 ◎ 6R3B040	138.6	10	40	2600	105	2
6.3	220	D28/7343-31	TP227D28 ◎ 6R3B050	138.6	10	50	2500	105	2
6.3	330	D20/7343-20	TP337D20 ◎ 6R3B045	207.9	10	45	2400	105	2
6.3	330	D28/7343-31	TP337D28 ◎ 6R3B045	207.9	10	45	2600	105	2
6.3	330	D40/7343-43	TP337D40 ◎ 6R3B040	207.9	10	40	3200	105	2
6.3	470	D15/7343-15	TP477D15 ◎ 6R3B055	296.1	10	55	2200	85	1
6.3	470	D20/7343-20	TP477D20 ◎ 6R3B055	296.1	10	55	2200	105	1
6.3	470	D40/7343-43	TP477D40 ◎ 6R3B040	296.1	10	40	3200	105	2
6.3	680	D40/7343-43	TP687D40 ◎ 6R3B035	428.4	10	35	3400	105	2
6.3	1000	F20/7360-20	TP108F20 ◎ 6R3B060	630	20	60	2700	85	1
6.3	1200	F35/7360-37	TP128F35 ◎ 6R3B070	756	20	70	2700	85	1
6.3	1500	F35/7360-37	TP158F35 ◎ 6R3B055	945	20	55	3000	85	1
8	22	B12/3528-12	TP226B12 ◎ 008B070	17.6	8	70	1300	105	2
8	33	B15/3528-15	TP336B15 ◎ 008B070	26.4	8	70	1500	105	2
8	47	B15/3528-15	TP476B15 ◎ 008B070	37.6	8	70	1500	105	2
8	150	D20/7343-20	TP157D20 ◎ 008B040	120	10	40	2600	105	2
8	150	D28/7343-31	TP157D28 ◎ 008B055	120	10	55	2400	105	2
10	33	B12/3528-12	TP336B12 ◎ 010B070	33	8	70	1300	105	2
10	33	B20/3528-20	TP336B20 ◎ 010B070	33	8	70	1700	105	2
10	47	B20/3528-20	TP476B20 ◎ 010B070	47	8	70	1700	105	2
10	47	C25/6032-28	TP476C25 ◎ 010B100	47	8	100	1600	105	2
10	68	C25/6032-28	TP686C25 ◎ 010B045	68	8	45	2400	105	2
10	68	D15/7343-15	TP686D15 ◎ 010B040	68	10	40	2500	105	2
10	68	D20/7343-20	TP686D20 ◎ 010B100	68	10	100	1600	105	2
10	68	D20/7343-20	TP686D20 ◎ 010B045	68	10	45	2400	105	2
10	68	D20/7343-20	TP686D20 ◎ 010B040	68	10	40	2600	105	2
10	100	B20/3528-20	TP107B20 ◎ 010B070	100	8	70	1700	105	2
10	100	C25/6032-28	TP107C25 ◎ 010B045	100	8	45	2400	105	2
10	100	D15/7343-15	TP107D15 ◎ 010B040	100	10	40	2500	105	2
10	100	D20/7343-20	TP107D20 ◎ 010B055	100	10	55	2200	105	2
10	100	D20/7343-20	TP107D20 ◎ 010B050	100	10	50	2300	105	2
10	100	D20/7343-20	TP107D20 ◎ 010B045	100	10	45	2400	105	2
10	100	D28/7343-31	TP107D28 ◎ 010B080	100	10	80	2000	105	2
10	150	C25/6032-28	TP157C25 ◎ 010B055	150	8	55	2100	105	2
10	150	D20/7343-20	TP157D20 ◎ 010B040	150	10	40	2600	105	2
10	150	D28/7343-31	TP157D28 ◎ 010B040	150	10	40	2800	105	2
10	220	D20/7343-20	TP227D20 ◎ 010B045	220	10	45	2400	105	2
10	220	D20/7343-20	TP227D20 ◎ 010B040	220	10	40	2600	105	2
10	220	D28/7343-31	TP227D28 ◎ 010B040	220	10	40	2800	105	2
10	220	D40/7343-43	TP227D40 ◎ 010B040	220	10	40	3200	105	2
10	330	D40/7343-43	TP337D40 ◎ 010B040	330	10	40	3200	105	2

Specifications

Rated Voltage VDC	Rated Cap	Case Code/ Case size	Part Number	DCL +25°C 5 Mins Max.	DF +25°C 120Hz Max.	ESR +25°C 100kHz Max.	Ripple Current (rms) +45°C 100 kHz Max.	Maximum Operating Temperature	Derating Category
V	μF	-	-	μA	%	mΩ	mA	°C	-
10	470	D40/7343-43	TP477D40 010B040	470	10	40	3200	105	2
16	10	B20/3528-20	TP106B20 016B100	16	8	100	1400	125	4
16	15	B20/3528-20	TP156B20 016B090	24	8	90	1500	125	4
16	22	B20/3528-20	TP226B20 016B090	35.2	8	90	1500	125	4
16	22	C25/6032-28	TP226C25 016B080	35.2	8	80	1800	125	4
16	33	D15/7343-15	TP336D15 016B045	52.8	10	45	2400	125	4
16	33	D20/7343-20	TP336D20 016B070	52.8	10	70	2000	125	4
16	33	D20/7343-20	TP336D20 016B045	52.8	10	45	2400	125	4
16	47	D15/7343-15	TP476D15 016B045	75.2	10	45	2400	125	4
16	47	D20/7343-20	TP476D20 016B045	75.2	10	45	2400	125	4
16	68	D15/7343-15	TP686D15 016B100	108.8	10	100	1600	125	4
16	68	D15/7343-15	TP686D15 016B070	108.8	10	70	1900	125	4
16	68	D15/7343-15	TP686D15 016B050	108.8	10	50	2300	125	4
16	68	D20/7343-20	TP686D20 016B050	108.8	10	50	2300	125	4
16	100	D15/7343-15	TP107D15 016B100	160	10	100	1600	125	4
16	100	D15/7343-15	TP107D15 016B070	160	10	70	1900	125	4
16	100	D20/7343-20	TP107D20 016B050	160	10	50	2300	125	4
16	100	D28/7343-31	TP107D28 016B050	160	10	50	2500	125	4
16	150	D20/7343-20	TP157D20 016B070	240	10	70	2000	125	4
16	150	D28/7343-31	TP157D28 016B050	240	10	50	2500	125	4
16	150	D40/7343-43	TP157D40 016B040	240	10	40	3200	125	4
16	150	D40/7343-43	TP157D40 016B080	240	10	80	2200	125	4
16	220	D20/7343-20	TP227D20 016B050	352	10	50	2300	125	4
16	220	D28/7343-31	TP227D28 016B070	352	10	70	2100	85	1
16	220	D40/7343-43	TP227D40 016B050	352	10	50	2800	85	1
16	220	F20/7360-20	TP227F20 016B070	352	10	70	2500	85	1
16	330	F20/7360-20	TP337F20 016B070	528	10	70	2500	85	1
20	10	B20/3528-20	TP106B20 020B100	20	10	100	1400	125	4
20	15	B20/3528-20	TP156B20 020B090	30	10	90	1500	125	4
20	22	B20/3528-20	TP226B20 020B090	44	8	90	1500	125	4
20	22	D15/7343-15	TP226D15 020B070	44	10	70	1900	125	4
20	22	D15/7343-15	TP226D15 020B055	44	10	55	2200	125	4
20	22	D20/7343-20	TP226D20 020B055	44	10	55	2200	125	4
20	33	B20/3528-20	TP336B20 020B090	66	10	90	1500	125	4
20	47	D15/7343-15	TP476D15 020B055	94	9	55	2200	125	4
20	47	D20/7343-20	TP476D20 020B055	94	9	55	2200	125	4
20	68	D20/7343-20	TP686D20 020B100	136	10	100	1600	125	4
20	68	D20/7343-20	TP686D20 020B050	136	10	50	2300	125	4
20	100	D15/7343-15	TP107D15 020B100	200	10	100	1600	125	4
20	100	D20/7343-20	TP107D20 020B100	200	10	100	1600	125	4
20	100	D28/7343-31	TP107D28 020B055	200	10	55	2400	125	4
20	150	D20/7343-20	TP157D20 020B100	300	10	100	1600	125	4
20	150	D28/7343-31	TP157D28 020B100	300	10	100	1800	125	4
25	6.8	B12/3528-12	TP685B12 025B100	17	8	100	1100	125	4
25	10	B12/3528-12	TP106B12 025B100	25	8	100	1100	125	4
25	10	B20/3528-20	TP106B20 025B100	25	8	100	1400	125	4
25	15	B20/3528-20	TP156B20 025B100	37.5	8	100	1400	125	4
25	22	B20/3528-20	TP226B20 025B100	55	8	100	1400	125	4
25	22	D15/7343-15	TP226D15 025B070	55	10	70	1900	125	4
25	22	D20/7343-20	TP226D20 025B070	55	10	70	2000	125	4
25	33	D15/7343-15	TP336D15 025B070	82.5	10	70	1900	125	4
25	33	D20/7343-20	TP336D20 025B070	82.5	10	70	2000	125	4

Specifications

Rated Voltage VDC	Rated Cap	Case Code/ Case size	Part Number	DCL +25°C 5 Mins Max.	DF +25°C 120Hz Max.	ESR +25°C 100kHz Max.	Ripple Current (rms) +45°C 100 kHz Max.	Maximum Operating Temperature	Derating Category
V	μF	-	-	μA	%	mΩ	mA	°C	-
25	33	D28/7343-31	TP336D28 ◎ 025B070	82.5	10	70	2100	125	4
25	47	D15/7343-15	TP476D15 ◎ 025B100	117.5	10	100	1600	125	4
25	47	D20/7343-20	TP476D20 ◎ 025B100	117.5	10	100	1600	125	4
25	47	D28/7343-31	TP476D28 ◎ 025B100	117.5	10	100	1800	125	4
25	68	D20/7343-20	TP686D20 ◎ 025B070	170	10	70	2000	125	4
25	68	D28/7343-31	TP686D28 ◎ 025B070	170	10	70	2100	125	4
25	100	D20/7343-20	TP107D20 ◎ 025B070	250	10	70	2000	125	4
25	100	D28/7343-31	TP107D28 ◎ 025B070	250	10	70	2100	125	4
25	100	D40/7343-43	TP107D40 ◎ 025B050	250	10	50	2800	125	4
25	150	D28/7343-31	TP157D28 ◎ 025B090	375	10	90	1900	125	4
25	150	D40/7343-43	TP157D40 ◎ 025B060	375	10	60	2600	125	4
35	1	B12/3528-12	TP105B12 ◎ 035B600	3.5	8	600	400	125	4
35	3.3	B20/3528-20	TP335B20 ◎ 035B200	11.6	8	200	1000	125	4
35	3.3	B20/3528-20	TP335B20 ◎ 035B150	11.6	8	150	1200	125	4
35	4.7	B20/3528-20	TP475B20 ◎ 035B200	16.5	8	200	1000	125	4
35	4.7	B20/3528-20	TP475B20 ◎ 035B150	16.5	8	150	1200	125	4
35	6.8	B20/3528-20	TP685B20 ◎ 035B200	23.8	8	200	1000	125	4
35	6.8	B20/3528-20	TP685B20 ◎ 035B150	23.8	8	150	1200	125	4
35	10	B20/3528-20	TP106B20 ◎ 035B200	35	8	200	1000	125	4
35	10	B20/3528-20	TP106B20 ◎ 035B150	35	8	150	1200	125	4
35	22	D15/7343-15	TP226D15 ◎ 035B100	77	10	100	1600	125	4
35	22	D20/7343-20	TP226D20 ◎ 035B100	77	10	100	1600	125	4
35	22	D28/7343-31	TP226D28 ◎ 035B100	77	10	100	1800	125	4
35	33	D20/7343-20	TP336D20 ◎ 035B100	115.5	10	100	1600	125	4
35	33	D28/7343-31	TP336D28 ◎ 035B100	115.5	10	100	1800	125	4
35	47	D15/7343-15	TP476D15 ◎ 035B100	164.5	10	100	1600	125	4
35	47	D15/7343-15	TP476D15 ◎ 035B090	164.5	10	90	1700	125	4
35	47	D20/7343-20	TP476D20 ◎ 035B100	164.5	10	100	1600	125	4
35	47	D28/7343-31	TP476D28 ◎ 035B070	164.5	10	70	2100	125	4
35	68	D20/7343-20	TP686D20 ◎ 035B100	238	10	100	1600	125	4
35	68	D28/7343-31	TP686D28 ◎ 035B100	238	10	100	1800	125	4
35	68	D40/7343-43	TP686D40 ◎ 035B100	238	10	100	2000	125	4
50	3.3	B20/3528-20	TP335B20 ◎ 050B450	16.5	6	450	700	125	4
63	1	B20/3528-20	TP105B20 ◎ 063B450	6.3	6	450	700	125	4
63	4.7	C25/6032-28	TP475C25 ◎ 063B200	29.6	6	200	1100	125	4
75	4.7	D20/7343-20	TP475D20 ◎ 075B200	35.3	10	200	1200	125	4
75	10	D20/7343-20	TP106D20 ◎ 075B150	75	10	150	1300	125	4
100	3.3	D28/7343-31	TP335D28 ◎ 100B600	33	10	600	700	125	4

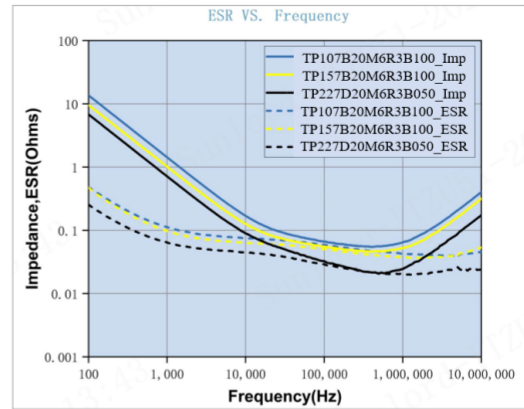
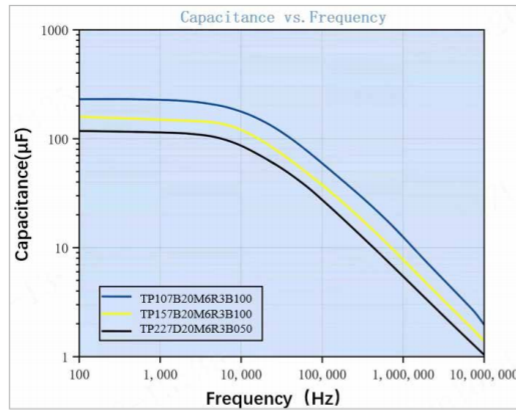
※ ◎ : Capacitance tolerance code (K=±10%, M=±20%);

※Note: TP series' moisture sensitivity level (MSL): 3, for more details, please refer to the cautions on the package bag of products ;

※The derating category, please refer to the derating guidelines.

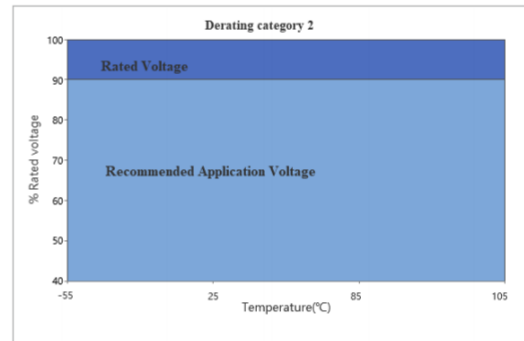
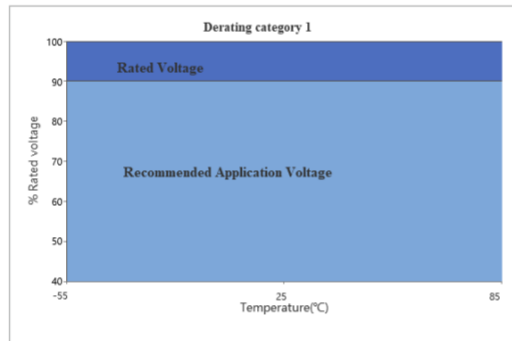
※: Products with other electrical characteristics can be provided upon customer's request. Please contact your local sales.

Electrical Characteristics



Derating Guidelines

TP capacitors are solid state capacitors that demonstrate no wearout mechanism when operated within their recommended guidelines. While the TP capacitors can be operated at full rated voltage, most circuit designers want a minimum level of assurance in long term reliability, which should be demonstrated with data. A voltage derating can provide the desired level of demonstrated reliability based on industry accepted acceleration models. Since most applications do require long term reliability, it is recommended that designers consider voltage derating, as shown in the graph, for the maximum steady state voltage.



Ripple Voltage and Ripple Current

Permissible AC ripple voltage and current are related to equivalent series resistance (ESR) and the power dissipation capabilities of the device. Permissible AC ripple voltage, which may be applied is limited by two criteria:

- The positive peak AC voltage plus the DC bias voltage, if any, must not exceed the DC voltage rating of the capacitor.
- The negative peak AC voltage, in combination with bias voltage, if any, must not exceed the allowable limits specified for reverse voltage.

The maximum power dissipation must be reduced with increasing environmental operating temperatures. Refer to the table below for temperature compensation requirements.

Temperature Compensation Multipliers for Maximum Ripple Current				
Max Operational Temperature (Series)	-55°C ≤ T ≤ 45°C	45°C < T ≤ 85°C	85°C < T ≤ 105°C	105°C < T ≤ 125°C
85°C	1	0.7	-	-
105°C	1	0.7	0.25	-
125°C	1	1	0.7	0.25

**Ripple Voltage
and Ripple
Current**

T=Environmental Temperature

Case Code	EIA Case Code	Maximum Power Dissipation (Pmax) mWatts at 45°C with +30°C Rise
B12	3528-12	120
B15	3528-15	160
B20	3528-20	200
C20	6032-19	220
C25	6032-28	250
D15	7343-15	255
D20	7343-20	270
D28	7343-31	315
D40	7343-43	400
F20	7360-20	440
F35	7360-37	500

Surge Voltage

Surge voltage is the maximum voltage (peak value) which may be applied to the capacitor. The surge voltage must not be applied for periodic charging and discharging in course of normal operation and cannot be part of the application voltage. Surge voltage capability is demonstrated by application of 1,000 cycles at operating temperature. The parts are charged through a 33 Ohm resistor for 30 seconds and then discharged through a 33 Ohm resistor for each cycle.

Rated Voltage (V)	Surge Voltage (V)	Category Voltage (V)	Category Surge Voltage (V)
-55°C to 105°C		up to 125°C	
2.0	2.6	-	-
2.5	3.3	-	-
4.0	5.2	-	-
6.3	8.2	-	-
8.0	10.4	-	-
10	13.0	-	-
16	20.8	-	-
20	26.0	13.4	17.4
25	32.5	16.8	21.8
35	45.5	23.5	30.5
50	65.0	33.5	43.6
63	81.9	42.2	54.9
75	97.5	50.3	65.3
100	110	75.0	87.1

**Electrical
Characteristics**

Polymer electrolytic capacitors are polar devices and may be permanently damaged or destroyed if connected in the wrong polarity. As shown in the table below, these devices will withstand a small degree of transient voltage reversal for short periods.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
55°C	10% of Rated Voltage
85°C	5% of Rated Voltage
105°C	3% of Rated Voltage
125°C	1% of Rated Voltage

Reliability

The actual life expectancy of TP polymer capacitors increases when application voltage, U_A , and application temperature, T_A , are lower than U_C and T_C . As a general guideline, when $U_A < 0.9 * U_C$ and $T_A < 85^\circ\text{C}$, the life expectancy will typically exceed the useful lifetime of most hardware (> 10 years).

The lifetime of a TP polymer capacitor at a specific application voltage and temperature can be modeled using the following equations. A failure is defined as passing enough current to blow a 1-amp fuse. The calculation is an estimation based on empirical results and is not a guarantee.

$VAF = \left(\frac{U_C}{U_A}\right)^n$ where: VAF = acceleration factor due to voltage, unitless U_C = V category voltage, volt U_A = V application voltage, volt n = 16 exponent	$TAF = e^{\left[\frac{E_a}{k} \left(\frac{1}{273+T_A} - \frac{1}{273+T_C}\right)\right]}$ where: TAF = acceleration factor due to temperature, unitless E_a = activation energy, 1.4 eV k = Boltzmann's constant, 8.617E-5 eV/K T_A = application temperature, °C, T_C = category temperature, °C
$AF = VAF * TAF$ where: AF = acceleration factor, unitless TAF = acceleration factor due to temperature, unitless VAF = acceleration factor due to voltage, unitless	$Life_{U_A, T_A} = Life_{U_C, T_C} * AF$ where: TAF = acceleration factor due to temperature, unitless E_a = activation energy, 1.4 eV k = Boltzmann's constant, 8.617E-5 eV/K T_A = application temperature, °C, T_C = category temperature, °C

Terms:

Category voltage, U_C : maximum recommended peak DC operating voltage for continuous operation at the category temperature, T_C .

Rated voltage, U_R : maximum recommended peak DC operating voltage for continuous operation up to the rated temperature, T_R .

Category temperature, T_C : maximum recommended operating temperature. Voltage derating may be required at T_C .

Rated temperature, T_R : maximum recommended operating temperature without voltage derating. T_R is equal to or lower than T_C .

Reliability

Reliability Table – Common temperature range classifications															
85°C (T_R)/ 85°C (T_C)	Rated Voltage (U_R)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0	100.0
	Category Voltage (U_C)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0	100.0
105°C (T_R)/ 105°C (T_C)	Rated Voltage (U_R)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0	100.0
	Category Voltage (U_C)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0	100.0
105°C (T_R)/ 125°C (T_C)	Rated Voltage (U_R)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0	100.0
	Category Voltage (U_C)	1.7	2.7	4.2	5.4	6.7	8.4	10.7	13.4	16.8	23.5	33.5	42.2	50.3	66.7