

SPECIFICATIONS

Customer	
Product Name	MnO ₂ Solid Tantalum Chip Capacitors
Sunlord Part Number	TM Series
Customer Part Number	

[☒New Released, ☐Revised]SPEC No.: **TM05240000**

【This SPEC is total 25 pages】

【ROHS Compliant Parts】

Approved By	Checked By	Issued By

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【For Customer approval Only】

Date: _____

Qualification Status: Full ☐ Restricted ☐ Rejected ☐

Approved By	Verified By	Re-checked By	Checked By

Comments:

【Version change history】

Rev.	Effective Date	Changed Contents	Change reasons	Approved By
01	/	New release	/	Qi Zhaoxiong

Caution:

All products listed in this specification are developed, designed and intended for use in general electronics equipment. The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require especially high reliability, or whose failure, malfunction or trouble might directly cause damage to society, person, or property. Please understand that we are not responsible for any damage or liability caused by use of the products in any of the applications below. Please contact us for more details if you intend to use our products in the following applications.

1. Aircraft equipment
2. Aerospace equipment
3. Undersea equipment
4. Nuclear control equipment
5. Military equipment
6. Power plant equipment
7. Medical equipment
8. Transportation equipment (automobiles, trains, ships, etc.)
9. Traffic signal equipment
10. Disaster prevention / crime prevention equipment
11. Applications of similar complexity or with reliability requirements comparable to the applications listed in the above

1. Scope

This specification applies to TM Series MnO₂ Solid Tantalum Chip Capacitors.

2. Reference

EIA Standard 535BAAC-A Fixed Tantalum Chip Capacitor Style 1 Protected (molded)

GJB 2283A-2014 Established reliability general specification for fixed solid electrolytic tantalum chip capacitor

GJB 360B-2009 Test methods for electronic and electrical component parts

IEC384-3-1 Test Methods for Environmental Testing

3. Product Description and Identification (Part Number)

1) Description

TM Series MnO₂ Solid Tantalum Chip Capacitors.

2) Product Identification (Part Number)

TM	336	B20	K	020	B	600
① Series	② Nominal Capacitance	③ External Dimensions (L×W×H) (mm)	④ Capacitance Tolerance	⑤ Rated DC Voltage	⑥ Internal Code	⑦ ESR
TM=TM Series MnO ₂ Solid Tantalum Chip Capacitor	155=1.5μF	B20=3.5×2.8×2.0	K=±10%	2R5=2.5Vdc	B=Black Molded Case, Laser marking	050=50mΩ
	336=33.0μF	C25=6.0×3.2×2.5	M=±20%	004=4.0Vdc		600=600mΩ
	157=150μF	D20=7.3×4.3×2.0		6R3=6.3Vdc		1K0=1000mΩ
		D20=7.3×4.3×2.0		010=10Vdc		
		D40=7.3×4.3×4.0		016=16Vdc		
				020=20Vdc		

3) Markings

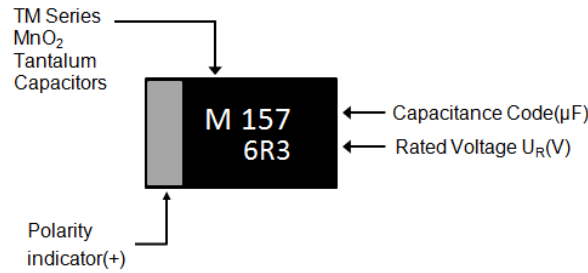
Rated Voltage Code

Rated Voltage (V)	2.5	4	6.3	10	16	20	25	35	50
A Case Code	e	G	J	A	C	D	E	V	T
B/C/D/F/G Case Code	2R5	4V	6R3	10V	16V	20V	25V	35V	50V

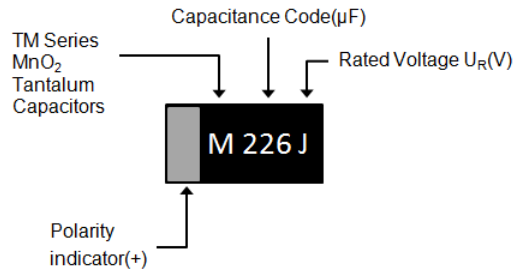
Capacitance Code

Capacitance (μF)	0.1	0.15	0.22	0.33	0.47	0.68	1.0	1.5	2.2	3.3	4.7	6.8
Code	104	154	224	334	474	684	105	155	225	335	475	685
Capacitance (μF)	10	15	22	33	47	68	100	220	330	470	680	
Code	106	156	226	336	476	686	107	227	337	477	687	

Markings:



(TM157B20©6R3B600 6.3V/150μF, B/C/D/F/G Case Marking)



(TM226A16©6R3B2K5, 6.3V/33μF, A Case Marking)

4. Electrical Characteristics

- 1) Operating and storage temperature range (individual chip without packing): -55°C~+125°C
- 2) Storage temperature range (packaging conditions): -10°C~+40°C, RH20%-65%.
- 3)

TM Series MnO₂ Solid Tantalum Chip Capacitors Electrical Characteristics

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
2.5V, +85°C (1.6V @ +125°C)							
2.5	10	A12	TM106A12©2R5B4K0	0.5	6	4000	115
2.5	10	A16	TM106A16©2R5B4K0	0.5	6	4000	123
2.5	15	A12	TM156A12©2R5B4K0	0.5	6	4000	115
2.5	15	A16	TM156A16©2R5B4K0	0.5	6	4000	123
2.5	15	B12	TM156B12©2R5B3K0	0.5	6	3000	147
2.5	15	B15	TM156B15©2R5B3K0	0.5	6	3000	147
2.5	15	B20	TM156B20©2R5B3K0	0.5	6	3000	151
2.5	22	A12	TM226A12©2R5B3K0	0.55	6	3000	132
2.5	22	A16	TM226A16©2R5B3K0	0.55	6	3000	142
2.5	33	A12	TM336A12©2R5B3K0	0.83	6	3000	132
2.5	33	A16	TM336A16©2R5B3K0	0.83	6	3000	142
2.5	47	A12	TM476A12©2R5B3K0	1.18	10	3000	132
2.5	47	A16	TM476A16©2R5B3K0	1.18	10	3000	142
2.5	68	A12	TM686A12©2R5B2K5	1.7	10	2500	145
2.5	68	A16	TM686A16©2R5B2K5	1.7	10	2500	156
2.5	68	B12	TM686B12©2R5B1K8	1.7	6	1800	190
2.5	68	B15	TM686B15©2R5B1K8	1.7	6	1800	190
2.5	68	B20	TM686B20©2R5B1K8	1.7	6	1800	196
2.5	100	A16	TM107A16©2R5B2K0	2.5	20	2000	174
2.5	100	B12	TM107B12©2R5B1K0	2.5	8	1000	255

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
2.5	100	B15	TM107B15◎2R5B1K0	2.5	8	1000	255
2.5	100	B20	TM107B20◎2R5B1K0	2.5	8	1000	262
2.5	150	B15	TM157B15◎2R5B1K5	3.75	10	1500	208
2.5	150	B20	TM157B20◎2R5B1K5	3.75	10	1500	214
2.5	220	B20	TM227B20◎2R5B1K5	5.5	18	1500	214
4.0V, +85°C (2.5V @ +125°C)							
4.0	2.2	A12	TM225A12◎004B6K0	0.5	6	6000	94
4.0	2.2	A16	TM225A16◎004B6K0	0.5	6	6000	101
4.0	3.3	A12	TM335A12◎004B6K0	0.5	6	6000	94
4.0	3.3	A16	TM335A16◎004B6K0	0.5	6	6000	101
4.0	4.7	A12	TM475A12◎004B5K0	0.5	6	5000	103
4.0	4.7	A16	TM475A16◎004B5K0	0.5	6	5000	110
4.0	6.8	A12	TM685A12◎004B4K0	0.5	6	4000	115
4.0	6.8	A16	TM685A16◎004B4K0	0.5	6	4000	123
4.0	10	A12	TM106A12◎004B3K0	0.5	6	3000	132
4.0	10	A16	TM106A16◎004B3K0	0.5	6	3000	142
4.0	10	B12	TM106B12◎004B1K5	0.5	6	1500	208
4.0	10	B15	TM106B15◎004B1K5	0.5	6	1500	208
4.0	10	B20	TM106B20◎004B1K5	0.5	6	1500	214
4.0	15	A12	TM156A12◎004B1K5	0.6	6	1500	187
4.0	15	A16	TM156A16◎004B1K5	0.6	6	1500	201
4.0	15	B12	TM156B12◎004B1K2	0.6	6	1200	232
4.0	15	B15	TM156B15◎004B1K2	0.6	6	1200	232
4.0	15	B20	TM156B20◎004B1K2	0.6	6	1200	240
4.0	22	A12	TM226A12◎004B1K5	0.88	6	1500	187
4.0	22	A16	TM226A16◎004B1K5	0.88	6	1500	201
4.0	22	B12	TM226B12◎004B600	0.88	6	600	329
4.0	22	B15	TM226B15◎004B600	0.88	6	600	329
4.0	22	B20	TM226B20◎004B600	0.88	6	600	339
4.0	33	A12	TM336A12◎004B2K5	1.32	6	2500	145
4.0	33	A16	TM336A16◎004B2K5	1.32	6	2500	156
4.0	33	B12	TM336B12◎004B500	1.32	6	500	360
4.0	33	B15	TM336B15◎004B500	1.32	6	500	360
4.0	33	B20	TM336B20◎004B500	1.32	6	500	371
4.0	33	C20	TM336C20◎004B800	1.32	6	800	318
4.0	33	C25	TM336C25◎004B800	1.32	6	800	334
4.0	47	A12	TM476A12◎004B2K0	1.88	6	2000	162
4.0	47	A16	TM476A16◎004B2K0	1.88	6	2000	174
4.0	47	B12	TM476B12◎004B800	1.88	6	800	285
4.0	47	B15	TM476B15◎004B800	1.88	6	800	285
4.0	47	B20	TM476B20◎004B800	1.88	6	800	293
4.0	47	C20	TM476C20◎004B1K0	1.88	6	1000	285
4.0	47	C25	TM476C25◎004B1K0	1.88	6	1000	298
4.0	68	B12	TM686B12◎004B2K5	2.72	6	2500	161

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
4.0	68	B15	TM686B15◎004B2K5	2.72	6	2500	161
4.0	68	B20	TM686B20◎004B2K5	2.72	6	2500	166
4.0	68	C20	TM686C20◎004B500	2.72	6	500	402
4.0	68	C25	TM686C25◎004B500	2.72	6	500	422
4.0	68	D20	TM686D20◎004B500	2.72	6	500	450
4.0	68	D28	TM686D28◎004B500	2.72	6	500	493
4.0	68	D40	TM686D40◎004B500	2.72	6	500	517
4.0	100	A16	TM107A16◎004B3K0	4	18	3000	142
4.0	100	B15	TM107B15◎004B1K0	4	8	1000	255
4.0	100	B20	TM107B20◎004B1K0	4	8	1000	262
4.0	100	C20	TM107C20◎004B350	4	8	350	481
4.0	100	C25	TM107C25◎004B350	4	8	350	505
4.0	100	D20	TM107D20◎004B200	4	8	200	712
4.0	100	D28	TM107D28◎004B200	4	8	200	779
4.0	100	D40	TM107D40◎004B200	4	8	200	817
4.0	150	B20	TM157B20◎004B1K0	6	15	1000	262
4.0	150	C20	TM157C20◎004B300	6	8	300	520
4.0	150	C25	TM157C25◎004B300	6	8	300	545
4.0	150	D20	TM157D20◎004B200	6	8	200	712
4.0	150	D28	TM157D28◎004B200	6	8	200	779
4.0	150	D40	TM157D40◎004B200	6	8	200	817
4.0	220	B20	TM227B20◎004B400	8.8	18	400	415
4.0	220	C20	TM227C20◎004B500	8.8	8	500	402
4.0	220	C25	TM227C25◎004B500	8.8	8	500	422
4.0	220	D20	TM227D20◎004B300	8.8	8	300	581
4.0	220	D28	TM227D28◎004B300	8.8	8	300	636
4.0	220	D40	TM227D40◎004B300	8.8	8	300	667
4.0	330	B20	TM337B20◎004B700	13.2	18	700	314
4.0	330	C20	TM337C20◎004B800	13.2	8	800	318
4.0	330	C25	TM337C25◎004B800	13.2	8	800	334
4.0	330	D20	TM337D20◎004B200	13.2	8	200	712
4.0	330	D28	TM337D28◎004B200	13.2	8	200	779
4.0	330	D40	TM337D40◎004B200	13.2	8	200	817
4.0	470	D28	TM477D28◎004B200	18.8	8	200	779
4.0	470	D40	TM477D40◎004B200	18.8	8	200	817
4.0	680	D28	TM687D28◎004B200	27.2	8	200	779
4.0	680	D40	TM687D40◎004B200	27.2	8	200	817
6.3V, +85°C (4.0V @ +125°C)							
6.3	1	A12	TM105A12◎6R3B10K	0.5	6	10000	73
6.3	1	A16	TM105A16◎6R3B10K	0.5	6	10000	78
6.3	1.5	A12	TM155A12◎6R3B6K0	0.5	6	6000	94
6.3	1.5	A16	TM155A16◎6R3B6K0	0.5	6	6000	101
6.3	2.2	A12	TM225A12◎6R3B6K0	0.5	6	6000	94
6.3	2.2	A16	TM225A16◎6R3B6K0	0.5	6	6000	101

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
6.3	3.3	A12	TM335A12◎6R3B6K0	0.5	6	6000	94
6.3	3.3	A16	TM335A16◎6R3B6K0	0.5	6	6000	101
6.3	4.7	A12	TM475A12◎6R3B4K0	0.5	6	4000	115
6.3	4.7	A16	TM475A16◎6R3B4K0	0.5	6	4000	123
6.3	6.8	A12	TM685A12◎6R3B3K5	0.5	6	3500	123
6.3	6.8	A16	TM685A16◎6R3B3K5	0.5	6	3500	132
6.3	6.8	B12	TM685B12◎6R3B3K0	0.5	6	3000	147
6.3	6.8	B15	TM685B15◎6R3B3K0	0.5	6	3000	147
6.3	6.8	B20	TM685B20◎6R3B3K0	0.5	6	3000	151
6.3	10	A12	TM106A12◎6R3B2K0	0.63	6	2000	162
6.3	10	A16	TM106A16◎6R3B2K0	0.63	6	2000	174
6.3	10	B12	TM106B12◎6R3B1K0	0.63	6	1000	255
6.3	10	B15	TM106B15◎6R3B1K0	0.63	6	1000	255
6.3	10	B20	TM106B20◎6R3B1K0	0.63	6	1000	262
6.3	15	A12	TM156A12◎6R3B2K0	0.95	6	2000	162
6.3	15	A16	TM156A16◎6R3B2K0	0.95	6	2000	174
6.3	15	B12	TM156B12◎6R3B700	0.95	6	700	304
6.3	15	B15	TM156B15◎6R3B700	0.95	6	700	304
6.3	15	B20	TM156B20◎6R3B700	0.95	6	700	314
6.3	22	A12	TM226A12◎6R3B2K5	1.39	6	2500	145
6.3	22	A16	TM226A16◎6R3B2K5	1.39	6	2500	156
6.3	22	B12	TM226B12◎6R3B800	1.39	6	800	285
6.3	22	B15	TM226B15◎6R3B800	1.39	6	800	285
6.3	22	B20	TM226B20◎6R3B800	1.39	6	800	293
6.3	33	A12	TM336A12◎6R3B1K5	2.08	8	1500	187
6.3	33	A16	TM336A16◎6R3B1K5	2.08	8	1500	201
6.3	33	B12	TM336B12◎6R3B800	2.08	6	800	285
6.3	33	B15	TM336B15◎6R3B800	2.08	6	800	285
6.3	33	B20	TM336B20◎6R3B800	2.08	6	800	293
6.3	33	C20	TM336C20◎6R3B300	2.08	6	300	520
6.3	33	C25	TM336C25◎6R3B300	2.08	6	300	545
6.3	47	A12	TM476A12◎6R3B2K5	2.96	8	2500	145
6.3	47	A16	TM476A16◎6R3B2K5	2.96	8	2500	156
6.3	47	B12	TM476B12◎6R3B500	2.96	6	500	360
6.3	47	B15	TM476B15◎6R3B500	2.96	6	500	360
6.3	47	B20	TM476B20◎6R3B500	2.96	6	500	371
6.3	47	C20	TM476C20◎6R3B300	2.96	6	300	520
6.3	47	C25	TM476C25◎6R3B300	2.96	6	300	545
6.3	68	B12	TM686B12◎6R3B650	4.28	10	650	316
6.3	68	B15	TM686B15◎6R3B650	4.28	10	650	316
6.3	68	B20	TM686B20◎6R3B650	4.28	10	650	325
6.3	68	C20	TM686C20◎6R3B300	4.28	6	300	520
6.3	68	C25	TM686C25◎6R3B300	4.28	6	300	545
6.3	68	D20	TM686D20◎6R3B200	4.28	6	200	712

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
6.3	68	D28	TM686D28◎6R3B200	4.28	6	200	779
6.3	68	D40	TM686D40◎6R3B200	4.28	6	200	817
6.3	100	A16	TM107A16◎6R3B2K0	6.3	20	2000	174
6.3	100	B15	TM107B15◎6R3B1K5	6.3	10	1500	208
6.3	100	B20	TM107B20◎6R3B1K5	6.3	10	1500	214
6.3	100	C20	TM107C20◎6R3B300	6.3	8	300	520
6.3	100	C25	TM107C25◎6R3B300	6.3	8	300	545
6.3	100	D20	TM107D20◎6R3B200	6.3	8	200	712
6.3	100	D28	TM107D28◎6R3B200	6.3	8	200	779
6.3	100	D40	TM107D40◎6R3B200	6.3	8	200	817
6.3	150	B20	TM157B20◎6R3B600	9.45	15	600	339
6.3	150	C20	TM157C20◎6R3B300	9.45	8	300	520
6.3	150	C25	TM157C25◎6R3B300	9.45	8	300	545
6.3	150	D20	TM157D20◎6R3B200	9.45	8	200	712
6.3	150	D28	TM157D28◎6R3B200	9.45	8	200	779
6.3	150	D40	TM157D40◎6R3B200	9.45	8	200	817
6.3	220	B20	TM227B20◎6R3B700	13.86	18	700	314
6.3	220	C20	TM227C20◎6R3B300	13.86	8	300	520
6.3	220	C25	TM227C25◎6R3B300	13.86	8	300	545
6.3	220	D20	TM227D20◎6R3B150	13.86	8	150	822
6.3	220	D28	TM227D28◎6R3B150	13.86	8	150	900
6.3	220	D40	TM227D40◎6R3B150	13.86	8	150	944
6.3	330	D20	TM337D20◎6R3B150	20.79	8	150	822
6.3	330	D28	TM337D28◎6R3B150	20.79	8	150	900
6.3	330	D40	TM337D40◎6R3B150	20.79	8	150	944
6.3	470	D28	TM477D28◎6R3B150	29.61	12	150	900
6.3	470	D40	TM477D40◎6R3B150	29.61	12	150	944
10V, +85°C (6.3V @ +125°C)							
10	1	A12	TM105A12◎010B8K0	0.5	4	8000	81
10	1	A16	TM105A16◎010B8K0	0.5	4	8000	87
10	1.5	A12	TM155A12◎010B6K0	0.5	6	6000	94
10	1.5	A16	TM155A16◎010B6K0	0.5	6	6000	101
10	2.2	A12	TM225A12◎010B6K0	0.5	6	6000	94
10	2.2	A16	TM225A16◎010B6K0	0.5	6	6000	101
10	3.3	A12	TM335A12◎010B4K0	0.5	6	4000	115
10	3.3	A16	TM335A16◎010B4K0	0.5	6	4000	123
10	4.7	A12	TM475A12◎010B3K0	0.5	6	3000	132
10	4.7	A16	TM475A16◎010B3K0	0.5	6	3000	142
10	4.7	B12	TM475B12◎010B1K5	0.5	6	1500	208
10	4.7	B15	TM475B15◎010B1K5	0.5	6	1500	208
10	4.7	B20	TM475B20◎010B1K5	0.5	6	1500	214
10	6.8	A12	TM685A12◎010B3K0	0.68	6	3000	132
10	6.8	A16	TM685A16◎010B3K0	0.68	6	3000	142
10	6.8	B12	TM685B12◎010B1K2	0.68	6	1200	232

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
10	6.8	B15	TM685B15◎010B1K2	0.68	6	1200	232
10	6.8	B20	TM685B20◎010B1K2	0.68	6	1200	240
10	10	A12	TM106A12◎010B1K8	1	6	1800	171
10	10	A16	TM106A16◎010B1K8	1	6	1800	184
10	10	B12	TM106B12◎010B800	1	6	800	285
10	10	B15	TM106B15◎010B800	1	6	800	285
10	10	B20	TM106B20◎010B800	1	6	800	293
10	10	C20	TM106C20◎010B600	1	6	600	367
10	10	C25	TM106C25◎010B600	1	6	600	385
10	15	A12	TM156A12◎010B4K0	1.5	6	4000	115
10	15	A16	TM156A16◎010B4K0	1.5	6	4000	123
10	15	B12	TM156B12◎010B700	1.5	6	700	304
10	15	B15	TM156B15◎010B700	1.5	6	700	304
10	15	B20	TM156B20◎010B700	1.5	6	700	314
10	15	C20	TM156C20◎010B500	1.5	6	500	402
10	15	C25	TM156C25◎010B500	1.5	6	500	422
10	22	A12	TM226A12◎010B2K5	2.2	8	2500	145
10	22	A16	TM226A16◎010B2K5	2.2	8	2500	156
10	22	B12	TM226B12◎010B1K0	2.2	6	1000	255
10	22	B15	TM226B15◎010B1K0	2.2	6	1000	255
10	22	B20	TM226B20◎010B1K0	2.2	6	1000	262
10	22	C20	TM226C20◎010B400	2.2	6	400	450
10	22	C25	TM226C25◎010B400	2.2	6	400	472
10	33	A16	TM336A16◎010B4K0	3.3	15	4000	123
10	33	B12	TM336B12◎010B1K0	3.3	6	1000	255
10	33	B15	TM336B15◎010B1K0	3.3	6	1000	255
10	33	B20	TM336B20◎010B1K0	3.3	6	1000	262
10	33	C20	TM336C20◎010B400	3.3	6	400	450
10	33	C25	TM336C25◎010B400	3.3	6	400	472
10	33	D20	TM336D20◎010B250	3.3	6	250	636
10	33	D28	TM336D28◎010B250	3.3	6	250	697
10	33	D40	TM336D40◎010B250	3.3	6	250	731
10	47	A16	TM476A16◎010B1K5	4.7	15	1500	201
10	47	B15	TM476B15◎010B650	4.7	6	650	316
10	47	B20	TM476B20◎010B650	4.7	6	650	325
10	47	C20	TM476C20◎010B300	4.7	6	300	520
10	47	C25	TM476C25◎010B300	4.7	6	300	545
10	47	D20	TM476D20◎010B220	4.7	6	220	678
10	47	D28	TM476D28◎010B220	4.7	6	220	743
10	47	D40	TM476D40◎010B220	4.7	6	220	779
10	68	B15	TM686B15◎010B1K5	6.8	10	1500	208
10	68	B20	TM686B20◎010B1K5	6.8	10	1500	214
10	68	C20	TM686C20◎010B300	6.8	6	300	520
10	68	C25	TM686C25◎010B300	6.8	6	300	545

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
10	68	D20	TM686D20◎010B200	6.8	6	200	712
10	68	D28	TM686D28◎010B200	6.8	6	200	779
10	68	D40	TM686D40◎010B200	6.8	6	200	817
10	100	B20	TM107B20◎010B1K0	10	15	1000	262
10	100	C20	TM107C20◎010B300	10	8	300	520
10	100	C25	TM107C25◎010B300	10	8	300	545
10	100	D20	TM107D20◎010B150	10	8	150	822
10	100	D28	TM107D28◎010B150	10	8	150	900
10	100	D40	TM107D40◎010B150	10	8	150	944
10	150	C20	TM157C20◎010B700	15	10	700	340
10	150	C25	TM157C25◎010B700	15	10	700	357
10	150	D20	TM157D20◎010B150	15	8	150	822
10	150	D28	TM157D28◎010B150	15	8	150	900
10	150	D40	TM157D40◎010B150	15	8	150	944
10	220	D28	TM227D28◎010B150	22	8	150	900
10	220	D40	TM227D40◎010B150	22	8	150	944
10	330	D28	TM337D28◎010B150	33	10	150	900
10	330	D40	TM337D40◎010B150	33	10	150	944
10	470	D40	TM477D40◎010B200	47	10	200	817
16V, +85°C (10V @ +125°C)							
16	1	A12	TM105A12◎016B8K0	0.5	4	8000	81
16	1	A16	TM105A16◎016B8K0	0.5	4	8000	87
16	1.5	A12	TM155A12◎016B6K0	0.5	6	6000	94
16	1.5	A16	TM155A16◎016B6K0	0.5	6	6000	101
16	2.2	A12	TM225A12◎016B4K0	0.5	6	4000	115
16	2.2	A16	TM225A16◎016B4K0	0.5	6	4000	123
16	2.2	B12	TM225B12◎016B3K0	0.5	6	3000	147
16	2.2	B15	TM225B15◎016B3K0	0.5	6	3000	147
16	2.2	B20	TM225B20◎016B3K0	0.5	6	3000	151
16	3.3	A12	TM335A12◎016B5K0	0.53	6	5000	103
16	3.3	A16	TM335A16◎016B5K0	0.53	6	5000	110
16	3.3	B12	TM335B12◎016B2K5	0.53	6	2500	161
16	3.3	B15	TM335B15◎016B2K5	0.53	6	2500	161
16	3.3	B20	TM335B20◎016B2K5	0.53	6	2500	166
16	4.7	A12	TM475A12◎016B5K0	0.75	6	5000	103
16	4.7	A16	TM475A16◎016B5K0	0.75	6	5000	110
16	4.7	B12	TM475B12◎016B2K5	0.75	6	2500	161
16	4.7	B15	TM475B15◎016B2K5	0.75	6	2500	161
16	4.7	B20	TM475B20◎016B2K5	0.75	6	2500	166
16	4.7	C20	TM475C20◎016B1K5	0.75	6	1500	232
16	4.7	C25	TM475C25◎016B1K5	0.75	6	1500	244
16	6.8	A12	TM685A12◎016B5K0	1.09	6	5000	103
16	6.8	A16	TM685A16◎016B5K0	1.09	6	5000	110
16	6.8	B12	TM685B12◎016B2K5	1.09	6	2500	161

Rated Voltage (V)	Capacitance (μ F)	Case	Part Number	DCL (μ A) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(m Ω)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
16	6.8	B15	TM685B15 $\odot$ 016B2K5	1.09	6	2500	161
16	6.8	B20	TM685B20 $\odot$ 016B2K5	1.09	6	2500	166
16	6.8	C20	TM685C20 $\odot$ 016B1K0	1.09	6	1000	285
16	6.8	C25	TM685C25 $\odot$ 016B1K0	1.09	6	1000	298
16	10	A12	TM106A12 $\odot$ 016B3K0	1.6	8	3000	132
16	10	A16	TM106A16 $\odot$ 016B3K0	1.6	8	3000	142
16	10	B12	TM106B12 $\odot$ 016B800	1.6	6	800	285
16	10	B15	TM106B15 $\odot$ 016B800	1.6	6	800	285
16	10	B20	TM106B20 $\odot$ 016B800	1.6	6	800	293
16	10	C20	TM106C20 $\odot$ 016B1K5	1.6	6	1500	232
16	10	C25	TM106C25 $\odot$ 016B1K5	1.6	6	1500	244
16	15	B12	TM156B12 $\odot$ 016B2K0	2.4	6	2000	180
16	15	B15	TM156B15 $\odot$ 016B2K0	2.4	6	2000	180
16	15	B20	TM156B20 $\odot$ 016B2K0	2.4	6	2000	186
16	15	C20	TM156C20 $\odot$ 016B1K2	2.4	6	1200	260
16	15	C25	TM156C25 $\odot$ 016B1K2	2.4	6	1200	272
16	22	A16	TM226A16 $\odot$ 016B2K0	3.52	15	2000	174
16	22	B12	TM226B12 $\odot$ 016B1K5	3.52	8	1500	208
16	22	B15	TM226B15 $\odot$ 016B1K5	3.52	8	1500	208
16	22	B20	TM226B20 $\odot$ 016B1K5	3.52	8	1500	214
16	22	C20	TM226C20 $\odot$ 016B1K2	3.52	6	1200	260
16	22	C25	TM226C25 $\odot$ 016B1K2	3.52	6	1200	272
16	22	D20	TM226D20 $\odot$ 016B600	3.52	6	600	411
16	22	D28	TM226D28 $\odot$ 016B600	3.52	6	600	450
16	22	D40	TM226D40 $\odot$ 016B600	3.52	6	600	472
16	33	B15	TM336B15 $\odot$ 016B1K0	5.28	8	1000	255
16	33	B20	TM336B20 $\odot$ 016B1K0	5.28	8	1000	262
16	33	C20	TM336C20 $\odot$ 016B1K0	5.28	6	1000	285
16	33	C25	TM336C25 $\odot$ 016B1K0	5.28	6	1000	298
16	33	D20	TM336D20 $\odot$ 016B500	5.28	6	500	450
16	33	D28	TM336D28 $\odot$ 016B500	5.28	6	500	493
16	33	D40	TM336D40 $\odot$ 016B500	5.28	6	500	517
16	47	B20	TM476B20 $\odot$ 016B700	7.52	18	700	314
16	47	C20	TM476C20 $\odot$ 016B800	7.52	6	800	318
16	47	C25	TM476C25 $\odot$ 016B800	7.52	6	800	334
16	47	D20	TM476D20 $\odot$ 016B500	7.52	6	500	450
16	47	D28	TM476D28 $\odot$ 016B500	7.52	6	500	493
16	47	D40	TM476D40 $\odot$ 016B500	7.52	6	500	517
16	68	D20	TM686D20 $\odot$ 016B500	10.88	6	500	450
16	68	D28	TM686D28 $\odot$ 016B500	10.88	6	500	493
16	68	D40	TM686D40 $\odot$ 016B500	10.88	6	500	517
16	100	C20	TM107C20 $\odot$ 016B700	16	10	700	340
16	100	C25	TM107C25 $\odot$ 016B700	16	10	700	357
16	100	D20	TM107D20 $\odot$ 016B500	16	8	500	450

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
16	100	D28	TM107D28◎016B500	16	8	500	493
16	100	D40	TM107D40◎016B500	16	8	500	517
16	150	D28	TM157D28◎016B400	24	12	400	551
16	150	D40	TM157D40◎016B400	24	12	400	578
16	220	D28	TM227D28◎016B600	35.2	15	600	450
16	220	D40	TM227D40◎016B600	35.2	15	600	472
16	330	D40	TM337D40◎016B200	52.8	10	200	817
20V, +85°C (13V @ +125°C)							
20	1	A12	TM105A12◎020B8K0	0.5	4	8000	81
20	1	A16	TM105A16◎020B8K0	0.5	4	8000	87
20	1.5	A12	TM155A12◎020B4K5	0.5	6	4500	108
20	1.5	A16	TM155A16◎020B4K5	0.5	6	4500	116
20	1.5	B12	TM155B12◎020B1K5	0.5	6	1500	208
20	1.5	B15	TM155B15◎020B1K5	0.5	6	1500	208
20	1.5	B20	TM155B20◎020B1K5	0.5	6	1500	214
20	2.2	A12	TM225A12◎020B4K0	0.5	6	4000	115
20	2.2	A16	TM225A16◎020B4K0	0.5	6	4000	123
20	2.2	B12	TM225B12◎020B3K0	0.5	6	3000	147
20	2.2	B15	TM225B15◎020B3K0	0.5	6	3000	147
20	2.2	B20	TM225B20◎020B3K0	0.5	6	3000	151
20	3.3	A12	TM335A12◎020B6K0	0.66	6	6000	94
20	3.3	A16	TM335A16◎020B6K0	0.66	6	6000	101
20	3.3	B12	TM335B12◎020B2K5	0.66	6	2500	161
20	3.3	B15	TM335B15◎020B2K5	0.66	6	2500	161
20	3.3	B20	TM335B20◎020B2K5	0.66	6	2500	166
20	4.7	A12	TM475A12◎020B3K5	0.94	6	3500	123
20	4.7	A16	TM475A16◎020B3K5	0.94	6	3500	132
20	4.7	B12	TM475B12◎020B2K5	0.94	6	2500	161
20	4.7	B15	TM475B15◎020B2K5	0.94	6	2500	161
20	4.7	B20	TM475B20◎020B2K5	0.94	6	2500	166
20	4.7	C20	TM475C20◎020B1K2	0.94	6	1200	260
20	4.7	C25	TM475C25◎020B1K2	0.94	6	1200	272
20	6.8	A12	TM685A12◎020B3K0	1.36	8	3000	132
20	6.8	A16	TM685A16◎020B3K0	1.36	8	3000	142
20	6.8	B12	TM685B12◎020B2K5	1.36	6	2500	161
20	6.8	B15	TM685B15◎020B2K5	1.36	6	2500	161
20	6.8	B20	TM685B20◎020B2K5	1.36	6	2500	166
20	6.8	C20	TM685C20◎020B1K2	1.36	6	1200	260
20	6.8	C25	TM685C25◎020B1K2	1.36	6	1200	272
20	6.8	D20	TM685D20◎020B800	1.36	6	800	356
20	6.8	D28	TM685D28◎020B800	1.36	6	800	390
20	6.8	D40	TM685D40◎020B800	1.36	6	800	409
20	10	B12	TM106B12◎020B2K0	2	6	2000	180
20	10	B15	TM106B15◎020B2K0	2	6	2000	180

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
20	10	B20	TM106B20◎020B2K0	2	6	2000	186
20	10	C20	TM106C20◎020B1K2	2	6	1200	260
20	10	C25	TM106C25◎020B1K2	2	6	1200	272
20	10	D20	TM106D20◎020B800	2	6	800	356
20	10	D28	TM106D28◎020B800	2	6	800	390
20	10	D40	TM106D40◎020B800	2	6	800	409
20	15	C20	TM156C20◎020B1K2	3	6	1200	260
20	15	C25	TM156C25◎020B1K2	3	6	1200	272
20	15	D20	TM156D20◎020B800	3	6	800	356
20	15	D28	TM156D28◎020B800	3	6	800	390
20	15	D40	TM156D40◎020B800	3	6	800	409
20	22	B20	TM226B20◎020B3K0	4.4	8	3000	151
20	22	C20	TM226C20◎020B400	4.4	6	400	450
20	22	C25	TM226C25◎020B400	4.4	6	400	472
20	22	D20	TM226D20◎020B500	4.4	6	500	450
20	22	D28	TM226D28◎020B500	4.4	6	500	493
20	22	D40	TM226D40◎020B500	4.4	6	500	517
20	33	B20	TM336B20◎020B600	6.6	8	600	339
20	33	C20	TM336C20◎020B600	6.6	6	600	367
20	33	C25	TM336C25◎020B600	6.6	6	600	385
20	33	D20	TM336D20◎020B400	6.6	6	400	503
20	33	D28	TM336D28◎020B400	6.6	6	400	551
20	33	D40	TM336D40◎020B400	6.6	6	400	578
20	47	B20	TM476B20◎020B600	9.4	10	600	339
20	47	C25	TM476C25◎020B800	9.4	10	800	334
20	47	D20	TM476D20◎020B600	9.4	6	600	411
20	47	D28	TM476D28◎020B600	9.4	6	600	450
20	47	D40	TM476D40◎020B600	9.4	6	600	472
20	68	C25	TM686C25◎020B450	13.6	8	450	445
20	68	C25	TM686C25◎020B600	13.6	8	600	385
20.0	68	D28	TM686D28◎020B400	13.6	6	400	551
20	68	D40	TM686D40◎020B400	13.6	6	400	578
20	100	D28	TM107D28◎020B200	20	8	200	779
20	100	D40	TM107D40◎020B200	20	8	200	817
20	150	D40	TM157D40◎020B200	30	8	200	817
20	220	D40	TM227D40◎020B200	44	8	200	817
25V, +85°C (16V @ +125°C)							
25	1	A12	TM105A12◎025B6K0	0.5	4	6000	94
25	1	A16	TM105A16◎025B6K0	0.5	4	6000	101
25	1	B12	TM105B12◎025B4K0	0.5	4	4000	127
25	1	B15	TM105B15◎025B4K0	0.5	4	4000	127
25	1	B20	TM105B20◎025B4K0	0.5	4	4000	131
25	1.5	A12	TM155A12◎025B5K0	0.5	6	5000	103
25	1.5	A16	TM155A16◎025B5K0	0.5	6	5000	110

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
25	1.5	B12	TM155B12◎025B3K5	0.5	6	3500	136
25	1.5	B15	TM155B15◎025B3K5	0.5	6	3500	136
25	1.5	B20	TM155B20◎025B3K5	0.5	6	3500	140
25	2.2	A12	TM225A12◎025B4K0	0.55	6	4000	115
25	2.2	A16	TM225A16◎025B4K0	0.55	6	4000	123
25	2.2	B12	TM225B12◎025B3K0	0.55	6	3000	147
25	2.2	B15	TM225B15◎025B3K0	0.55	6	3000	147
25	2.2	B20	TM225B20◎025B3K0	0.55	6	3000	151
25	2.2	C20	TM225C20◎025B2K0	0.55	6	2000	201
25	2.2	C25	TM225C25◎025B2K0	0.55	6	2000	211
25	3.3	A16	TM335A16◎025B3K0	0.83	6	3000	142
25	3.3	B12	TM335B12◎025B2K5	0.83	6	2500	161
25	3.3	B15	TM335B15◎025B2K5	0.83	6	2500	161
25	3.3	B20	TM335B20◎025B2K5	0.83	6	2500	166
25	3.3	C20	TM335C20◎025B2K0	0.83	6	2000	201
25	3.3	C25	TM335C25◎025B2K0	0.83	6	2000	211
25	4.7	A16	TM475A16◎025B3K0	1.18	8	3000	142
25	4.7	B12	TM475B12◎025B1K0	1.18	6	1000	255
25	4.7	B15	TM475B15◎025B1K0	1.18	6	1000	255
25	4.7	B20	TM475B20◎025B1K0	1.18	6	1000	262
25	4.7	C20	TM475C20◎025B600	1.18	6	600	367
25	4.7	C25	TM475C25◎025B600	1.18	6	600	385
25	6.8	B12	TM685B12◎025B1K2	1.7	6	1200	232
25	6.8	B15	TM685B15◎025B1K2	1.7	6	1200	232
25	6.8	B20	TM685B20◎025B1K2	1.7	6	1200	240
25	6.8	C20	TM685C20◎025B800	1.7	6	800	318
25	6.8	C25	TM685C25◎025B800	1.7	6	800	334
25	6.8	D20	TM685D20◎025B500	1.7	6	500	450
25	6.8	D28	TM685D28◎025B500	1.7	6	500	493
25	6.8	D40	TM685D40◎025B500	1.7	6	500	517
25	10	B15	TM106B15◎025B2K0	2.5	6	2000	180
25	10	B20	TM106B20◎025B2K0	2.5	6	2000	186
25	10	C20	TM106C20◎025B1K4	2.5	6	1400	241
25	10	C25	TM106C25◎025B1K4	2.5	6	1400	252
25	10	D20	TM106D20◎025B800	2.5	6	800	356
25	10	D28	TM106D28◎025B800	2.5	6	800	390
25	10	D40	TM106D40◎025B800	2.5	6	800	409
25	15	B20	TM156B20◎025B3K0	3.75	8	3000	151
25	15	C20	TM156C20◎025B1K2	3.75	6	1200	260
25	15	C25	TM156C25◎025B1K2	3.75	6	1200	272
25	15	D20	TM156D20◎025B800	3.75	6	800	356
25	15	D28	TM156D28◎025B800	3.75	6	800	390
25	15	D40	TM156D40◎025B800	3.75	6	800	409
25	22	C20	TM226C20◎025B1K0	5.5	6	1000	285

Rated Voltage (V)	Capacitance (μF)	Case	Part Number	DCL (μA) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(mΩ)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
25	22	C25	TM226C25◎025B1K0	5.5	6	1000	298
25	22	D20	TM226D20◎025B600	5.5	6	600	411
25	22	D28	TM226D28◎025B600	5.5	6	600	450
25	22	D40	TM226D40◎025B600	5.5	6	600	472
25	33	C25	TM336C25◎025B500	8.25	6	500	422
25	33	D20	TM336D20◎025B600	8.25	6	600	411
25	33	D28	TM336D28◎025B600	8.25	6	600	450
25	33	D40	TM336D40◎025B600	8.25	6	600	472
25	47	D28	TM476D28◎025B400	11.75	6	400	551
25	47	D40	TM476D40◎025B400	11.75	6	400	578
25	68	D40	TM686D40◎025B300	17	6	300	667
25	100	D40	TM107D40◎025B300	25	6	300	667
35V, +85°C (20V @ +125°C)							
35	1	A12	TM105A12◎035B8K0	0.5	4	8000	81
35	1	A16	TM105A16◎035B8K0	0.5	4	8000	87
35	1	B12	TM105B12◎035B2K0	0.5	4	2000	180
35	1	B15	TM105B15◎035B2K0	0.5	4	2000	180
35	1	B20	TM105B20◎035B2K0	0.5	4	2000	186
35	1.5	B12	TM155B12◎035B4K0	0.53	6	4000	127
35	1.5	B15	TM155B15◎035B4K0	0.53	6	4000	127
35	1.5	B20	TM155B20◎035B4K0	0.53	6	4000	131
35	1.5	C20	TM155C20◎035B3K0	0.53	6	3000	164
35	1.5	C25	TM155C25◎035B3K0	0.53	6	3000	172
35	2.2	A16	TM225A16◎035B3K0	0.77	6	3000	142
35	2.2	B12	TM225B12◎035B3K0	0.77	6	3000	147
35	2.2	B15	TM225B15◎035B3K0	0.77	6	3000	147
35	2.2	B20	TM225B20◎035B3K0	0.77	6	3000	151
35	2.2	C20	TM225C20◎035B2K5	0.77	6	2500	180
35	2.2	C25	TM225C25◎035B2K5	0.77	6	2500	189
35	3.3	B15	TM335B15◎035B3K0	1.16	6	3000	147
35	3.3	B20	TM335B20◎035B3K0	1.16	6	3000	151
35	3.3	C20	TM335C20◎035B2K0	1.16	6	2000	201
35	3.3	C25	TM335C25◎035B2K0	1.16	6	2000	211
35	4.7	B20	TM475B20◎035B2K0	1.65	6	2000	186
35	4.7	C20	TM475C20◎035B2K0	1.65	6	2000	201
35	4.7	C25	TM475C25◎035B2K0	1.65	6	2000	211
35	4.7	D20	TM475D20◎035B1K0	1.65	6	1000	318
35	4.7	D28	TM475D28◎035B1K0	1.65	6	1000	349
35	4.7	D40	TM475D40◎035B1K0	1.65	6	1000	366
35	6.8	C20	TM685C20◎035B1K2	2.38	6	1200	260
35	6.8	C25	TM685C25◎035B1K2	2.38	6	1200	272
35	6.8	D20	TM685D20◎035B800	2.38	6	800	356
35	6.8	D28	TM685D28◎035B800	2.38	6	800	390
35	6.8	D40	TM685D40◎035B800	2.38	6	800	409

Rated Voltage (V)	Capacitance (μ F)	Case	Part Number	DCL (μ A) +25°C Max.	DF (%) +25°C 120Hz Max.	ESR(m Ω)+2 5°C100kHz Max.	Ripple Current(mArms) ,+ 85°C,100 kHz
35	10	C25	TM106C25◎035B1K5	3.5	6	1500	244
35	10	D20	TM106D20◎035B600	3.5	6	600	411
35	10	D28	TM106D28◎035B600	3.5	6	600	450
35	10	D40	TM106D40◎035B600	3.5	6	600	472
35	15	D28	TM156D28◎035B800	5.25	6	800	390
35	15	D40	TM156D40◎035B800	5.25	6	800	409
35	22	D28	TM226D28◎035B600	7.7	6	600	450
35	22	D40	TM226D40◎035B600	7.7	6	600	472
35	33	D40	TM336D28◎035B500	11.55	6	500	493
35	33	D40	TM336D40◎035B500	11.55	6	500	517
35	47	D40	TM476D40◎035B500	16.45	8	500	517
35	68	D40	TM686D40◎035B500	23.8	6	500	517
50V, +85°C (32V @ +125°C)							
50	1	B12	TM105B12◎050B4K0	0.5	6	4000	127
50	1	B15	TM105B15◎050B4K0	0.5	6	4000	127
50	1	B20	TM105B20◎050B4K0	0.5	6	4000	131
50	1	C20	TM105C20◎050B3K5	0.5	4	3500	152
50	1	C25	TM105C25◎050B3K5	0.5	4	3500	160
50	1.5	B15	TM155B15◎050B3K5	0.75	6	3500	136
50	1.5	B20	TM155B20◎050B3K5	0.75	6	3500	140
50	1.5	C20	TM155C20◎050B2K5	0.75	6	2500	180
50	1.5	C25	TM155C25◎050B2K5	0.75	6	2500	189
50	2.2	B20	TM225B20◎050B1K5	1.1	6	1500	214
50	2.2	C20	TM225C20◎050B3K0	1.1	6	3000	164
50	2.2	C25	TM225C25◎050B3K0	1.1	6	3000	172
50	2.2	D20	TM225D20◎050B2K0	1.1	6	2000	225
50	2.2	D28	TM225D28◎050B2K0	1.1	6	2000	246
50	2.2	D40	TM225D40◎050B2K0	1.1	6	2000	259
50	3.3	B20	TM335B20◎050B3K0	1.65	6	3000	151
50	3.3	C25	TM335C25◎050B2K0	1.65	6	2000	211
50	3.3	D20	TM335D20◎050B1K0	1.65	6	1000	318
50	3.3	D28	TM335D28◎050B1K0	1.65	6	1000	349
50	3.3	D40	TM335D40◎050B1K0	1.65	6	1000	366
50	4.7	D20	TM475D20◎050B800	2.35	6	800	356
50	4.7	D28	TM475D28◎050B800	2.35	6	800	390
50	4.7	D40	TM475D40◎050B800	2.35	6	800	409
50	6.8	D28	TM685D28◎050B700	3.4	6	700	417
50	6.8	D40	TM685D40◎050B700	3.4	6	700	437
50	10	D28	TM106D28◎050B700	5	6	700	417
50	10	D40	TM106D40◎050B700	5	6	700	437
50	15	D40	TM156D40◎050B400	7.5	6	400	578
50	22	D40	TM226D40◎050B400	11	6	400	578

◎ Please: specify the capacitance tolerance code (K=±10%, M=±20%)

□ Please: specify the internal code (B=black molded case, Laser marking)

5. Shape and Dimensions

- 1) Dimensions: See Fig.5-1A, Fig.5-1B, and Table 5-1A, Table 5-1B.

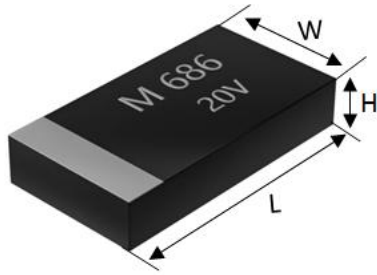


Fig.5-1A

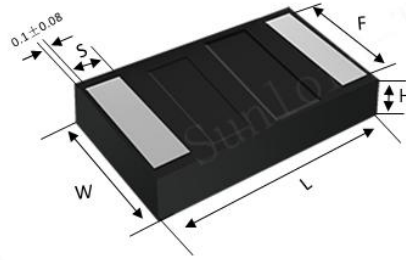


Fig.5-1B

Standard case dimensions:

Tab.5-1A

Unit: mm [inch]

Case Code	EIA	L	W	H	F	S
A16	3216-18	3.20±0.20 [.126±.008]	1.60±0.20 [.063±.008]	1.60±0.20 [.063±.008]	1.20±0.10 [.047±.004]	0.80±0.30 [.031±.012]
B20	3528-22	3.50±0.20 [.138±.008]	2.80±0.20 [.11±.008]	2.00±0.20 [.079±.008]	2.20±0.10 [.087±.004]	0.90±0.30 [.035±.012]
C25	6032-28	6.00±0.30 [.236±.012]	3.20±0.30 [.126±.012]	2.50±0.30 [.098±.012]	2.20±0.10 [.087±.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]

Low profile case dimensions:

Tab.5-1B

Unit: mm [inch]

Case Code	EIA	L	W	H	F	S
A12	3216-13	3.20±0.20 [.126±.008]	1.60±0.20 [.063±.008]	1.20±0.10 [.047±.004]	1.20±0.10 [.047±.004]	0.80±0.30 [.031±.012]
B12	3528-13	3.50±0.20 [.138±.008]	2.80±0.20 [.11±.008]	1.20±0.10 [.047±.004]	2.20±0.10 [.087±.004]	0.90±0.30 [.035±.012]
B15	3528-16	3.50±0.20 [.138±.008]	2.80±0.20 [.11±.008]	1.50±0.10 [.059±.004]	2.20±0.10 [.087±.004]	0.90±0.30 [.035±.012]
C20	6032-21	6.00±0.30 [.236±.012]	3.20±0.30 [.126±.012]	2.00±0.10 [.079±.004]	2.20±0.10 [.087±.004]	1.30±0.30 [.051±.012]
D20	7343-21	7.30±0.30 [.287±.012]	4.30±0.30 [.169±.012]	2.00±0.10 [.079±.004]	2.40±0.10 [.094±.004]	1.30±0.30 [.051±.012]

- 2) Recommended PCB pattern for reflow soldering: See Fig. 5-2 and Tab.5-2

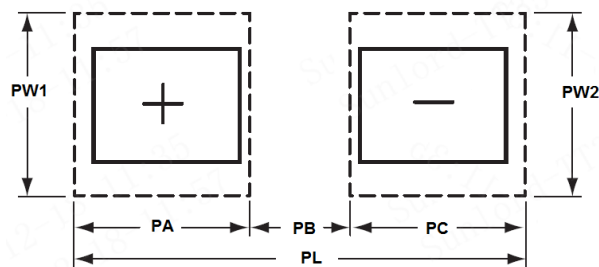


Fig. 5-2

Recommended PCB dimensions:

Tab.5-2

Unit: mm [inch]

Case Code	EIA	PL	PW1	PW2	PA	PB	PC
A12、A16	3216	3.80 [0.15]	1.50 [0.06]	1.50 [0.06]	1.35 [0.05]	1.10 [0.04]	1.35 [0.05]
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]
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]

6. Test and Measurement Procedures

6.1 Test Conditions

Unless other specified, the standard atmospheric conditions for measurement/test as:

- Ambient Temperature: 25±10℃
- Relative Humidity: 50±30%
- Air Pressure: 86kPa ~106kPa

If any doubt on the results, measurements/tests should be made within the following limits:

- Ambient Temperature: 25±1℃
- Relative Humidity: 50±2%
- Air Pressure: 86kPa ~ 106kPa

6.2 Visual Examination

Inspection Equipment: visual;

6.3 Electrical Test

6.3.1 Equivalent Series Resistance (ESR)

- Test frequency: 100±5kHz, Refer to **Electrical Characteristics**
- Test equipment (Analyzer): HP4263B or equal ESR Tester

6.3.2 Capacitance (C)

- Test frequency :120±5Hz, Refer to **Electrical Characteristics**
- Test equipment: HP4263B or equal capacitance tester
- Test signal: 1000mV

6.3.3 Dissipation Factor (tanδ)

- Test frequency: 120±5Hz, Refer to **Electrical Characteristics**
- Test equipment: HP4263B or equal capacitance tester
- Test signal: 1000mV

6.3.4 Leakage Current (I₀)

- Refer to **Electrical Characteristics**
- Test equipment: TH2686 or equivalent I₀ test equipment.
- Measurement method:
 - The chip shall be charged for 5min at most at rated voltage at 25℃
 - Current decreases as time passes, but gets into a stable situation at a certain value which shall be recorded as I₀.

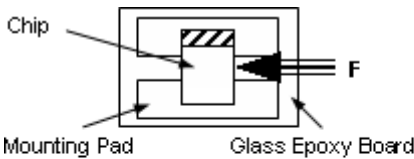
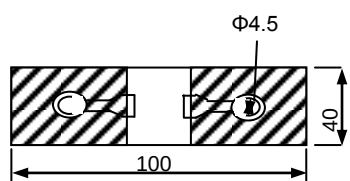
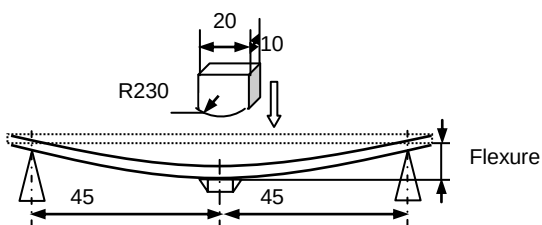
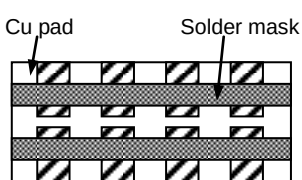
6.3.5 Rated Voltage (U_R)

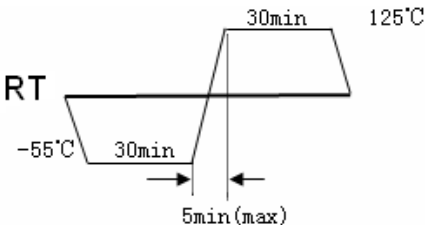
Rated voltage is the maximum DC operating voltage for continuous duty at -55℃~85℃. Capacitor may be operated at 125℃ with voltage derating to two-thirds of rated voltage. The derated voltages at different operating temperatures are listed in the table below.

Surge voltage is the maximum voltage to which capacitors may be subjected under any momentary conditions, including the maximum AC pulse voltage, DC bias voltage and any momentary voltage. Refer to the table below for detail data.

Rated Voltage (U _R)	2.5V	4V	6.3V	10V	16V	20V	25V	35V	50V	@-55℃~85℃
Derated voltage (U _c)	1.6V	2.5V	4V	6.3V	10V	13V	16V	20V	32V	@ +125℃
Surge Voltage (U _s)	3.3V	5.2V	8V	13V	20V	26V	32V	46V	65V	@-55℃~85℃
Surge Voltage (U _s)	2.2V	3.4V	5V	8V	13V	16V	20V	28V	40V	@ +125℃

6.4 Reliability Test

Item	Requirements	Test Methods and Remarks
6.4.1 Terminal Strength	No removal or split of the termination or other defects shall occur.  Fig.6.4.1-1	- Solder the capacitor inductor to the testing jig (glass epoxy board shown in Fig. 6.4.1-1) using eutectic solder. Then apply a force in the direction of the arrow. 5N force - Keep time: 10±1s - Speed: 1.0mm/s
6.4.2 Resistance to Flexure	No visible mechanical damage. Unit: mm  Fig.6.4.2-1	- Solder the capacitor to the test jig (glass epoxy board shown in Tab. 5-1) Using a eutectic solder. Then apply a force in the direction shown in Fig. 6.4.2-1~Fig. 6.4.2-2 - Flexure:1 mm; - Pressurizing Speed: 0.5mm/sec. - Keep time: 10 sec.  Fig.6.4.2-2
6.4.3 Vibration	No visible mechanical damage.  Fig.6.4.3-1	- Solder the capacitor to the testing jig (glass epoxy board shown in Fig.6.4.3-1) using eutectic solder. - The capacitor shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. - The frequency range from 10 to 55 Hz and return to 10 Hz shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours).
6.4.4 Solderability	- No visible mechanical damage. - Wetting shall exceed 95% coverage.	- Solder temperature: 240±2℃ - Duration: 3 sec. - Solder: Sn/3.0Ag/0.5Cu - Flux: 25% Resin and 75% ethanol in weight.
6.4.5 Resistance to Soldering Heat	- No visible mechanical damage. - Wetting shall exceed 95% coverage. - Capacitance change: within ±5%. - tanδ shall not exceed 150% of the initial requirement. - LC shall not exceed the initial I₀.	- Reflow soldering: please refer to Fig. 8-1. - The chip shall be stabilized at normal condition for 1~2 hours before measuring.
6.4.6 Temperature	A. At -55℃ - No visible mechanical damage. - Capacitance change: within - 10%. - tanδ shall not exceed 150% of the initial requirement. B. At 85℃ - No visible mechanical damage. - Capacitance change: within 10% - tanδ shall not exceed 150% of the initial requirement. - L C shall not exceed 10 I₀ C. At 125℃ - No visible mechanical damage.	- Drying 30⁺⁴ min at 125℃ - The chip shall be stabilized at normal condition for 1~2 hours after drying, and measured at 25℃ as initial data. - The chip shall be measured at -55℃ ① After Step A, the chip shall cool to room temperature. ② Measure at 85℃. ① After Step B, the chip shall be measured at 125℃.

Item	Requirements	Test Methods and Remarks
	② Capacitance change: within 12%. ③ $\tan\delta$ shall not exceed 150% of the initial requirement. ④ LC shall not exceed 12.5 I_0 .	
6.4.7 Thermal Shock	① Capacitance change: within $\pm 5\%$. ② $\tan\delta$ shall not exceed the initial requirement. ③ LC shall not exceed the initial I_0 .	① Temperature, Time (Fig.6.4.7) ② -55°C , 30 ± 3 min $\rightarrow$ 125°C , 30 ± 3 min. ③ Transforming interval: Max.5min. ④ Tested cycle: 5 cycles. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring. 
6.4.8 Moisture Resistance	① No visible mechanical damage. ② Capacitance change: $\pm 10\%$. ③ $\tan\delta$ shall not exceed 150% of the initial requirement. ④ LC shall not exceed 2 I_0 .	① Temperature: $40\pm 2^{\circ}\text{C}$. ② Relative Humidity: 90%~95%RH. ③ Duration: 500 ⁺²⁴ hours. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
6.4.9 Life Test	① No visible mechanical damage. ② Capacitance change: $\pm 10\%$. ③ $\tan\delta$ shall not exceed the initial requirement. ④ LC shall not exceed 1.25 I_0 .	① Temperature: $85\pm 2^{\circ}\text{C}$; Rated Voltage ② Duration: 2000 ⁺²⁴ hours ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

7. Packaging, Storage and Transportation

7.1 Packaging

7.1.1 Tape Carrier Packaging:

Refer to **Fig.7.1-1~3** for detail. Tape carrier packaging quantity is listed in the following table:

Case code	EIA size	Package quantity
A12、A16	3216	2000
B12、B15、B20	3528	2000
C20、C25	6032	500
D20、	7343	1000
D28、D40	7343	500

(1) Taping Drawings (Unit: mm)

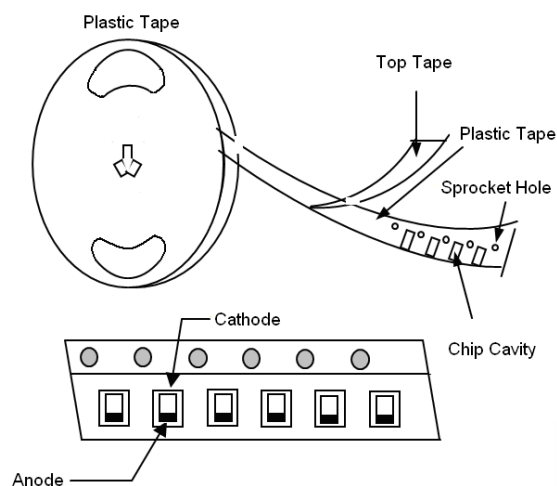


Fig.7.1-1

Remark: The sprocket holes are to the right as the tape is pulled toward the user.

(2) Taping Dimensions (Unit: mm)

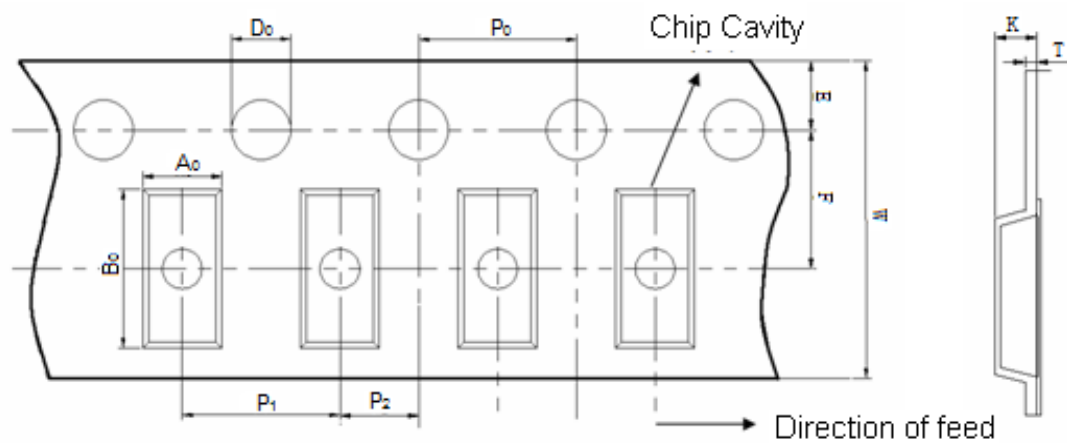


Fig.7.1-2

Case	W	A ₀	B ₀	P ₀	P ₁	P ₂	F	K max	T max
A12	8.0±0.3	1.90±0.20	3.50±0.20	4.0±0.1	4.0±0.1	2.0±0.1	3.5±0.05	1.5	0.3
A16	8.0±0.3	1.90±0.20	3.50±0.20	4.0±0.1	4.0±0.1	2.0±0.1	3.5±0.05	1.9	0.3
B12	8.0±0.3	3.10±0.20	3.80±0.20	4.0±0.1	4.0±0.1	2.0±0.1	3.5±0.05	1.5	0.3
B15	8.0±0.3	3.10±0.20	3.80±0.20	4.0±0.1	4.0±0.1	2.0±0.1	3.5±0.05	1.8	0.3
B20	8.0±0.3	3.10±0.20	3.80±0.20	4.0±0.1	4.0±0.1	2.0±0.1	3.5±0.05	2.3	0.3
C20	12.0±0.3	3.60±0.20	6.40±0.20	4.0±0.1	8.0±0.1	2.0±0.1	5.5±0.05	2.3	0.3
C25	12.0±0.3	3.60±0.20	6.40±0.20	4.0±0.1	8.0±0.1	2.0±0.1	5.5±0.05	2.9	0.3
D20	12.0±0.3	4.60±0.20	7.60±0.20	4.0±0.1	8.0±0.1	2.0±0.1	5.5±0.05	2.3	0.3
D28	12.0±0.3	4.60±0.20	7.60±0.20	4.0±0.1	8.0±0.1	2.0±0.1	5.5±0.05	3.5	0.3
D40	12.0±0.3	4.60±0.20	7.60±0.20	4.0±0.1	8.0±0.1	2.0±0.1	5.5±0.05	4.6	0.3

(3) Reel Dimensions (Unit: mm)

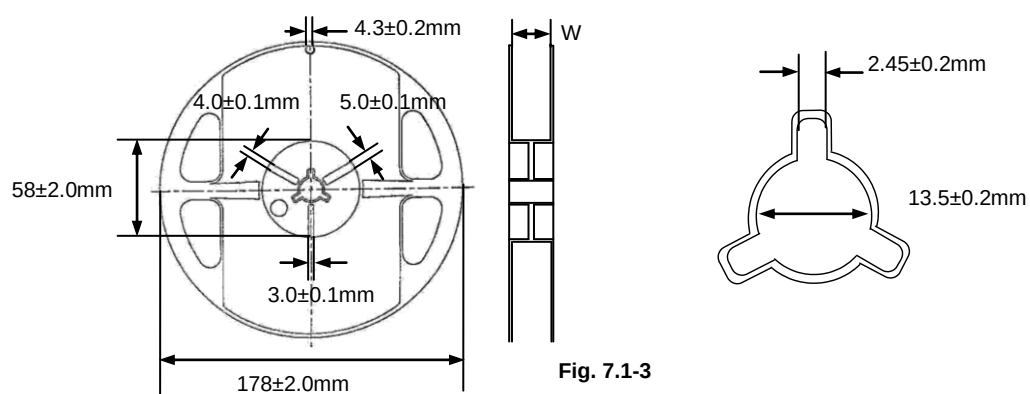


Fig. 7.1-3

Case code	Tape width	W
A12、A16	8mm	10mm
B12、B15、B20	8mm	10mm
C20、C25	12mm	13mm
D20、D28、D40	12mm	13mm

7.2 Storage

- The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to high humidity. Package must be stored at 20℃ or less and 65% RH or less.

- b. The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to dust of harmful gas (e.g. HCl, sulfurous gas of H₂S).
- c. Packaging material may be deformed if package are stored where they are exposed to heat of direct sunlight.
- d. The minimum package and polyethylene package should not be opened until the capacitors are used; once they were opened, use the capacitors as soon as possible.
- e. Solderability specified shall be guaranteed for 3 months from the date of delivery on condition that they are stored at the environment specified in **Clause 4**. For those parts, which passed more than 3 months shall be checked solder-ability before use.

7.3 Transportation

Package should not be destroyed or get wet.

7.4 Precautionary measures

- a. Put on electrostatic prevention to avoid ESD.
- b. Equipments involved in capacitor application (such as soldering tip and tester) should be well grounded.
- c. Avoid touching electrode directly by hand or metal (such as metal table).

7.5 Cautions for Using Tantalum Capacitor

7.5.1 Operating voltage

The ratio of operating voltage to rated voltage has a great influence on capacitor failures. Please take all specified reliabilities into account and derate operating voltage appropriately when a practical circuit is designed.

- a. The operating voltage of tantalum capacitors used in low impedance circuits, such as filters for power supplies (particularly switching power supplies), should be derated to less than one-third of rated voltage. In other case, keep the operating voltage below tow thirds of rated voltage. Refer to **Fig.7.5-1** for detail:

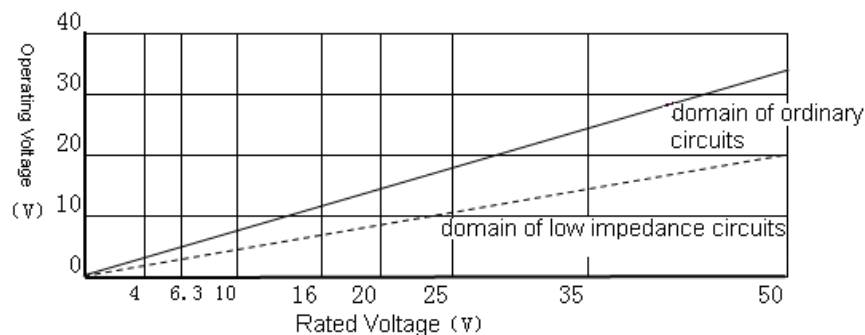


Fig.7.5-1

- b. In low impedance circuits, connecting capacitors in parallel will increase the risk of the failure caused by DC surge current. Please pay attention to the electric charge in capacitor with parallel connection which can be discharged by other capacitors.
- c. Connecting a resistor in series with capacitor is suggested to alleviate the shock caused by excessive momentary current. Please connect a protecting resistor of 3Ω/V or higher in series with the capacitor to keep current below 300mA. If protecting resistors could not be applied; please make sure operating voltage is below one-third of rated voltage (**Fig.7.5-1**).

7.5.2 Reverse voltage

Since tantalum capacitor has polarity, do not apply a reverse voltage to it. Do not apply capacitor to a circuit which only has alternating current.

- a. If there is no alternation, applying a low reverse voltage which is listed below to capacitor in a short time is approved:
 At 25°C: ≤10%U_R (rated voltage) or 1V (whichever is lower);
 At 85°C: ≤5%U_R (rated voltage) or 0.5V (whichever is lower);
 At 125°C: 1% of rated voltage, 0.1V for max.
- a. In principle, testing a circuit with tantalum capacitor or capacitor itself by using a resistor gear of millimeters in ignorance of polarity is forbidden.
- b. During measurement and application, if the tantalum capacitor is subjected to an undesirable reverse voltage due to carelessness, please dispose it, even if its electrical characteristics are still qualified.

7.5.3 Ripple voltage and ripple current

Please use the capacitor within permissible ripple voltage.

- a. The sum of DC bias voltage and the maximum AC branch voltage should not exceed rated voltage during operation.
- b. The sum of negative peak AC value and DC bias voltage should not exceed the specified reverse voltage.
- c. Ripple current applied to capacitor will generate active power loss, which will raise the rate of the failure caused by heat due to self-heat generation of capacitor. Therefore, ripple current and permissible power loss must be in control.
- a. The maximum ripple current of the capacitor is calculated using the formula:

$$I_p = K * F * \sqrt{P/ESR}$$

Where:

I_p = rms ripple current, amperes, and shall not exceed 3A;

ESR= equivalent series resistance, ohms;

K= Temperature correction factor for ripple current:

Temp °C	Correction Factor for ripple current K
25°C	1.00
85°C	0.90
125°C	0.40

F=Frequency correction factor for ripple current:

Frequency	Frequency correction factor for ripple current F
10kHz	0.80
100kHz	1.00
500kHz	1.15
1MHz	1.20

P= Max. power dissipation of capacitor (W):

Case Size	power dissipation (W@100kHz/25°C)
A12	0.065
A16	0.075
B12	0.080
B15	0.080
B20	0.085
C20	0.100
C25	0.110
D20	0.125
D28	0.150
D40	0.165

7.5.4 Mounting

In mounting, if the capacitor has underwent excessive mechanical and thermal shock which may cause deterioration of electrical characteristics, open circuits and short circuits, please confirm the practical mounting conditions before usage.

8. Recommended Soldering Technologies

8.1 Reflowing Profile(Fig. 8-1):

- △ Preheat condition: 150 ~200℃/60~120sec.
- △ Allowed time above 217℃: 60~90sec.
- △ Max temp: 260℃
- △ Max time at max temp: 10sec.
- △ Solder paste: Sn/3.0Ag/0.5Cu
- △ Allowed Reflow time: 2x max

[Note: ①The reflow profile in the above table is only for qualification and is not meant to specify board assembly profiles. Actual board assembly profiles must be based on the customer's specific board design, solder paste and process, and should not exceed the parameters as the Reflow profile shows②. Reflow soldering and iron soldering cannot be used together.]

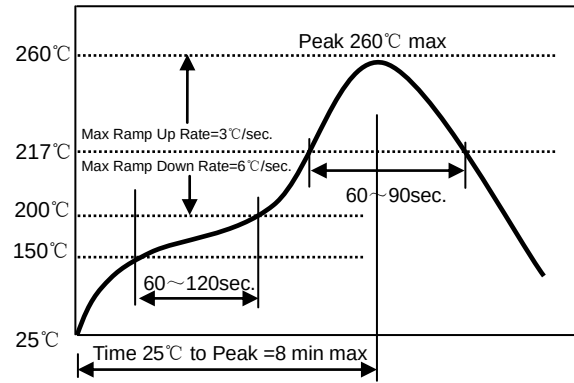


Fig. 8-1

8.2 Iron Soldering Profile (Fig. 8-2):

- △ Iron soldering power: Max.30W
- △ Pre-heating: 150 °C/60sec.
- △ Soldering Tip temperature: 350℃Max.
- △ Soldering time: 3sec. Max.
- △ Solder paste: Sn/3.0Ag/0.5Cu
- △ Max.1 times for iron soldering

[Note: ①Take care not to apply the tip of the soldering iron to the terminal electrodes.

②Reflow soldering and iron soldering cannot be used together.]

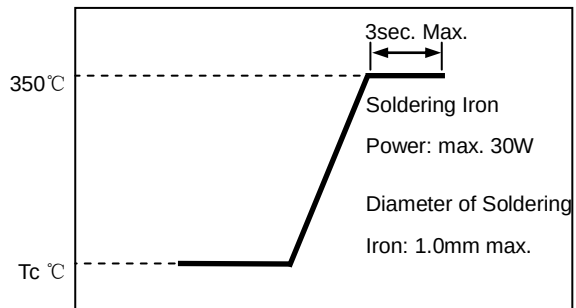


Fig. 8-2

9. Rework

Remove capacitors by electric soldering iron, hot air gun, heating table or other tools. The removed capacitors cannot be used again, please choose unused capacitors for rework. It's recommended to use iron soldering for rework, and please refer to 8.2 for methods.