

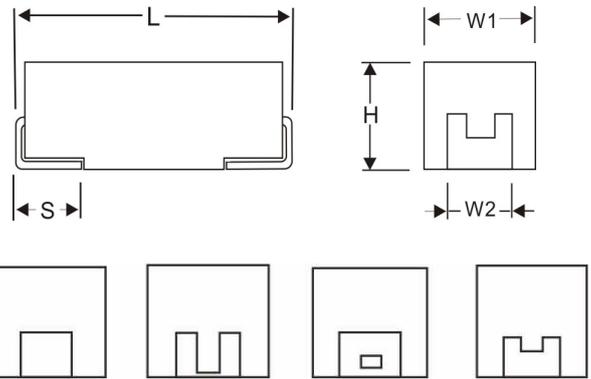
TS20S

FEATURES

- Epoxy molded encapsulation, Chip, Easy for integration, Polarized
- Extremely low ESR , Volumetrically efficient , Stable in electrical & storage performances , Long life-span, High reliability
- Typical applications include DC/DC converters , notebook PCs , portable electronics , telecommunications (mobile phone and base station) , displays ,SSD,HDD and USB

SPECIFICATIONS

Rated Voltage	D.C. 2.5V ~ 63V
Operating Temperature Range	-55°C to +125°C
Rated Capacitance Range	0.47 ~ 1000 μ F at 100 Hz
Capacitance Tolerance	\pm 20%(M)
Leakage Current DCL	0.1CV (μ A)at rated voltage after 5 minutes
Equivalent Series Resistance	Refer to Part Number Electrical Specifications
ESR	Table
Termination Finished	Sn Plating (standard), Gold and SnPb Plating upon request
Resistance to soldering heat	3x260°C peak for max. 10s reflow



DIMENSIONS - MILLIMETERS

Unit:mm

Case Size	L	W1	H	S	W2	
B	1210	3.6 \pm 0.2	2.9 \pm 0.2	2.1 \pm 0.2	0.7 \pm 0.2	2.2 \pm 0.2
C	2312	6.2 \pm 0.2	3.3 \pm 0.2	2.6 \pm 0.2	1.3 \pm 0.2	2.2 \pm 0.2
H	2917	7.4 \pm 0.2	4.4 \pm 0.2	2.0 \pm 0.2	1.3 \pm 0.2	2.4 \pm 0.2
D	2917	7.4 \pm 0.2	4.4 \pm 0.2	3.0 \pm 0.2	1.3 \pm 0.2	2.4 \pm 0.2
E	2917	7.4 \pm 0.4	4.4 \pm 0.4	4.3 \pm 0.4	1.3 \pm 0.2	2.4 \pm 0.2
V	2924	7.5 \pm 0.4	6.2 \pm 0.4	3.8 \pm 0.4	1.4 \pm 0.2	3.0 \pm 0.2

Capacitance And Rated Voltage Range (Letter Denotes Case Size)

Rated Voltage(V)	2.5	4	6.3	10	16
Capacitance(μ F)	Case Size & ESR				
1					B(120)
1.5					B(120)
2.2					B(150)
3.3					B(150,200)
4.7					B(150,180,200), C(80)
6.8					B(150,180,200), C(100)
10				B(120,200,350)	B(150,200,300), C(90)
15		B(150)	B(150)	B(150), C(100)	B(150,180,200), C(80,100), D(60)
22		B(180), C(100)	B(150), C(80)	B(120,180), C(100)	B(150,250,300), C(80,100), D(40,60), E(60)
33		B(180), C(100)	B(90,130,200), C(60,100)	B(150,200,250), C(80,100)	B(100,200), C(80,100), H(25,40), D(40,60), E(50)
47		B(180), C(100)	B(100,200), C(80)	B(80,100,130), C(80,100)	C(100), H(25,50), D(50,70,100), E(40,60)
68		B(100,150,200), C(80)	B(100,150,250), C(80,100), D(60)	C(80,100), H(25,35,50), D(40,60,100)	H(25,50), D(60,80), E(40,60)
100	B(100,150,200)	B(50,100,180), C(80)	B(70,150,350), C(80,100,120), H(35), D(60)	B(70,150,300), C(50,80,100), H(25,50,80), D(25,45,90)	C(80,100), H(40), D(80,100), E(40,60)
150	B(180)	B(40,100,150), C(60,100,120), H(35,70), D(60)	B(100,180,250), C(80,100), H(35,70), D(30,60,100)	C(100), H(25,50), D(40,60,80), E(50)	H(80), D(50,80), E(40,60), V(40)
220	B(100,150,200), C(50,100), H(35,70), D(60)	B(120,250,300), C(60,100), H(35,70), D(60,100)	B(100,180,250), C(40,100), H(25,40,70), D(60,100), E(50)	C(30,60,100), H(25,50,70), D(70,100), E(50)	D(60,100), E(40,70,100), V(30,50)
330	B(150,200), C(50,100), H(35,70), D(60,100,200)	C(80,150), H(35,70), D(70,100), E(50)	H(30,50,80), D(25,30,60), E(50)	H(30,50,80), D(20,70), E(40,60), V(40)	E(40,50,60), V(30,50)
470	D(25,30,40,80)				
680	C(70,100), H(26,30,50), D(50,70,100)	H(25,30,80), D(80,120), E(50)	H(40,80), D(80,100), E(50,100), V(40)		
1000	D(50,100), E(50)	D(100), E(50,100), V(40)	E(50)		

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**Capacitance And Rated Voltage Range
(Letter Denotes Case Size)**

Rated Voltage(V)	20	25	35	50	63
Capacitance(μF)	Case Size & ESR				
0.68		B(200)	B(200)	B(200,250)	
1	B(150)	B(150)	B(200)	B(200,250)	B(200), C(100,120), D(100)
1.5	B(150)	B(150), C(80)	B(200,250), C(100)	B(200,250), C(70,100)	C(100,120), D(100)
2.2	B(150,250)	B(150,250), C(80,100)	B(150,200), C(100)	B(200), C(70,100)	C(100), D(100)
3.3	B(150,250),	B(150,200), C(80,100)	B(150,200), C(100)	C(80), D(60)	C(100), D(100)
4.7	B(180,250), C(80,100)	B(120,160,200), C(80,100)	B(150,200), C(100)	C(100), D(60,200)	C(100), D(60,80,100), E(50)
6.8	B(180,250), C(80,100)	B(150,200,250), C(80,100)	C(80), D(80)	C(80), D(30,80,100), H(25,50)	D(100), E(30,60)
10	B(100,150,200), C(80,100)	B(150,180,200), C(80,100), D(80)	B(150), C(80), D(80) E(50), H(25,50)	D(60,80), E(30,60)	D(100), E(30,40,50)
15	B(200), C(80,100), D(80,120)	B(180,250), C(70), D(80), E(50), H(35)	C(70), D(60,80), E(50), H(25,50)	E(30,60), V(40)	E(30,40,50), V(40)
22	B(150,250,300) C(80,100), D(70,100), E(30,50), H(25,35,50)	B(220), C(70,100), D(80,100,120), E(50) H(25,50)	C(80,150), D(30,70,150), E(50)	E(200), V(40)	
33	C(70), D(60,100), E(30,50), H(35)	D(60,100,150), E(50), H(25,50)	D(60,80), E(30,50,60), V(40)	E(50), V(40)	
47	C(100), D(60,100), E(30,50), H(25,35,50)	D(60,80,100), E(30,60) H(30,80,150)	D(80,150), E(30,60,100) V(40)		
68	D(50,80), E(30,50)	H(50,70), D(80,120),	E(80,100), V(70)		
100	H(80,150), D(100) E(30,60), V(40)	D(100), E(60,80,100), V(40)	E(80,100), V(70)		
150	E(50), V(40)	V(40)			
220	E(50), V(40)				

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Rated Voltage (V)	Rated CAP (μF)	Case Code	Category Temp (°C)	MSL	Max DCL(μA) @25°C	Max DF(%) @25°C 100Hz	Max ESR (mΩ) @25°C 100KHz	100kHz RMS Current (mA)		
								45°C	85°C	125°C
2.5	100	B	125	3	25	8	100	894	805	358
		B	125	3	25	8	150	730	657	292
	B	125	3	25	8	200	632	569	253	
	150	B	125	3	38	6	180	667	600	267
		B	125	3	55	8	100	894	805	358
	220	B	125	3	55	8	150	730	657	292
		B	125	3	55	8	200	632	569	253
		C	125	3	55	8	50	1342	1207	537
		C	125	3	55	8	100	949	854	379
		D	125	3	55	10	60	1384	1246	554
		H	125	3	55	10	35	1732	1559	693
		H	125	3	55	10	70	1225	1102	490
		B	125	3	83	8	150	730	657	292
	330	B	125	3	83	8	200	632	569	253
		C	125	3	83	8	50	1342	1207	537
		C	125	3	83	8	100	949	854	379
		D	125	3	83	8	60	1384	1246	554
		D	125	3	83	8	100	1072	965	429
		D	125	3	83	8	200	758	682	303
		H	125	3	83	10	35	1732	1559	693
		H	125	3	83	10	70	1225	1102	490
	360	D	125	3	90	6	25	2145	1930	858
		D	125	3	90	6	30	1958	1762	783
		D	125	3	90	6	40	1696	1526	678
		D	125	3	90	6	80	1199	1079	480
	470	C	125	3	118	8	70	1134	1021	454
		C	125	3	118	8	100	949	854	379
		D	125	3	118	6	50	1517	1365	607
		D	125	3	118	10	70	1282	1154	513
		D	125	3	118	10	100	1072	965	429
		H	125	3	60	10	26	2010	1809	804
		H	125	3	118	10	30	1871	1684	748
		H	125	3	118	10	50	1449	1304	580
	680	D	125	3	170	10	50	1517	1365	607
		D	125	3	170	10	100	1072	965	429
		E	125	3	170	10	50	1581	1423	632
1000	D	125	3	250	10	100	1072	965	429	
	E	125	3	250	10	50	1581	1423	632	
	V	125	3	250	10	40	1936	1743	775	
4	15	B	125	3	6.0	10	150	730	657	292
		B	125	3	8.8	10	180	667	600	267
	22	C	125	3	8.8	10	100	949	854	379
		B	125	3	13	10	180	667	600	267
	33	C	125	3	13	10	100	949	854	379

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz $U_{-} = 2.2^{0}_{-1} V$, $U_{+} = 1.0^{0}_{-0.5} V$, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +85°C. The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20S

Rated Voltage (V)	Rated CAP (µF)	Case Code	Category Temp (°C)	MSL	Max DCL(µA) @25°C	Max DF(%) @25°C 100Hz	Max ESR (mΩ) @25°C 100KHz	100kHz RMS Current (mA)		
								45°C	85°C	125°C
4	47	B	125	3	19	10	180	667	600	267
		C	125	3	19	10	100	949	854	379
	68	B	125	3	27	8	100	894	805	358
		B	125	3	27	8	150	730	657	292
		B	125	3	27	8	200	632	569	253
	100	C	125	3	27	10	80	1061	955	424
		B	125	3	40	8	50	1265	1138	506
		B	125	3	40	8	100	894	805	358
	150	B	125	3	40	8	180	667	600	267
		C	125	3	40	10	80	1061	955	424
		B	125	3	60	8	40	1414	1273	566
		B	125	3	60	8	100	894	805	358
		B	125	3	60	8	150	730	657	292
		C	125	3	60	8	60	1225	1102	490
		C	125	3	60	8	100	949	854	379
		C	125	3	60	8	120	866	779	346
	220	D	125	3	60	10	60	1384	1246	554
		H	125	3	60	6	35	1732	1559	693
		H	125	3	60	10	70	1225	1102	490
		B	125	3	100	10	120	816	735	327
		B	125	3	100	10	250	566	509	226
		B	125	3	100	10	300	516	465	207
		C	125	3	88	8	60	1225	1102	490
		C	125	3	88	8	100	949	854	379
	330	D	125	3	88	10	60	1384	1246	554
		D	125	3	88	10	100	1072	965	429
		H	125	3	88	10	35	1732	1559	693
		H	125	3	88	10	70	1225	1102	490
		C	125	3	132	8	80	1061	955	424
		C	125	3	132	8	150	775	697	310
		D	125	3	132	10	70	1282	1154	513
	470	D	125	3	132	10	100	1072	965	429
		E	125	3	132	10	50	1581	1423	632
		H	125	3	132	6	35	1732	1559	693
		H	125	3	132	10	70	1225	1102	490
		D	125	3	188	10	80	1199	1079	480
		D	125	3	188	10	120	979	881	392
	680	E	125	3	188	10	50	1581	1423	632
		H	125	3	188	10	25	2049	1844	820
		H	125	3	188	10	30	1871	1684	748
		H	125	3	188	10	80	1146	1031	458
		D	125	3	272	10	100	1072	965	429
E		125	3	272	10	50	1581	1423	632	
	680	E	125	3	272	10	100	1118	1006	447
		V	125	3	272	10	40	1936	1743	775

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Rated Voltage (V)	Rated CAP (µF)	Case Code	Category Temp (°C)	MSL	Max DCL(µA) @25°C	Max DF(%) @25°C 100Hz	Max ESR (mΩ) @25°C 100KHz	100kHz RMS Current (mA)		
								45°C	85°C	125°C
6.3	15	B	125	3	9.5	10	150	730	657	292
	22	B	125	3	14	10	150	730	657	292
		C	125	3	14	10	80	1061	955	424
	33	B	125	3	21	6	90	943	849	377
		B	125	3	21	8	130	784	706	314
		B	125	3	21	10	200	632	569	253
		C	125	3	21	8	60	1225	1102	490
	47	C	125	3	21	10	100	949	854	379
		B	125	3	30	8	100	894	805	358
		B	125	3	30	10	200	632	569	253
	68	C	125	3	30	10	80	1061	955	424
		B	125	3	43	8	100	894	805	358
		B	125	3	43	8	150	730	657	292
		B	125	3	43	8	250	566	509	226
		C	125	3	43	8	80	1061	955	424
	100	C	125	3	43	10	100	949	854	379
		D	125	3	43	10	60	1384	1246	554
		B	125	3	100	10	70	1069	962	428
		B	125	3	100	10	150	730	657	292
		B	125	3	100	10	350	478	430	191
		C	125	3	63	8	80	1061	955	424
		C	125	3	63	8	100	949	854	379
		C	125	3	63	10	120	866	779	346
		D	125	3	63	10	60	1384	1246	554
		H	125	3	63	10	35	1732	1559	693
	150	B	125	3	95	8	100	894	805	358
		B	125	3	95	8	180	667	600	267
		B	125	3	95	8	250	566	509	226
		C	125	3	95	8	80	1061	955	424
		C	125	3	95	8	100	949	854	379
		D	125	3	95	10	30	1958	1762	783
		D	125	3	95	10	60	1384	1246	554
		D	125	3	95	10	100	1072	965	429
		H	125	3	95	10	35	1732	1559	693
	H	125	3	95	10	70	1225	1102	490	
	220	B	125	3	139	8	100	894	805	358
		B	125	3	139	8	180	667	600	267
		B	125	3	139	10	250	566	509	226
		C	125	3	139	8	40	1500	1350	600
		C	125	3	139	8	100	949	854	379
		D	125	3	139	10	60	1384	1246	554
		D	125	3	139	10	100	1072	965	429
		E	125	3	139	10	50	1581	1423	632
		H	125	3	139	6	25	2049	1844	820
		H	125	3	139	10	40	1620	1458	648
330	H	125	3	139	10	70	1225	1102	490	
	C	125	3	208	10	50	1342	1207	537	
	C	125	3	208	10	100	949	854	379	
	D	125	3	208	10	25	2145	1930	858	
	D	125	3	208	10	30	1958	1762	783	
	D	125	3	208	10	60	1384	1246	554	
	E	125	3	208	10	50	1581	1423	632	
	H	125	3	208	10	30	1871	1684	748	
470	H	125	3	208	10	50	1449	1304	580	
	H	125	3	208	10	80	1146	1031	458	
	D	125	3	296	10	80	1199	1079	480	
	D	125	3	296	10	100	1072	965	429	
	E	125	3	296	10	50	1581	1423	632	
	E	125	3	296	10	100	1118	1006	447	
	H	125	3	296	10	40	1620	1458	648	
680	H	125	3	296	10	80	1146	1031	458	
	V	125	3	296	10	40	1936	1743	775	
	E	125	3	428	10	50	1581	1423	632	
	E	125	3	428	10	50	1581	1423	632	

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								45°C	85°C	125°C
10	10	B	125	3	10	10	120	816	735	327
		B	125	3	10	10	200	632	569	253
		B	125	3	10	10	350	478	430	191
	15	B	125	3	15	10	150	730	657	292
		C	125	3	15	10	100	949	854	379
	22	B	125	3	22	6	120	816	735	327
		B	125	3	22	10	180	667	600	267
		C	125	3	22	10	100	949	854	379
	33	B	125	3	33	6	150	730	657	292
		B	125	3	33	8	200	632	569	253
		B	125	3	33	10	250	566	509	226
		C	125	3	33	6	80	1061	955	424
	47	C	125	3	33	10	100	949	854	379
		B	125	3	47	8	80	1000	900	400
		B	125	3	47	8	100	894	805	358
		B	125	3	47	10	130	784	706	314
	68	C	125	3	47	8	80	1061	955	424
		C	125	3	47	10	100	949	854	379
		C	125	3	68	6	80	1061	955	424
		D	125	3	68	10	40	1696	1526	678
		D	125	3	68	10	60	1384	1246	554
		D	125	3	68	10	100	1072	965	429
		H	125	3	68	10	25	2049	1844	820
	100	H	125	3	68	10	35	1732	1559	693
		H	125	3	68	10	50	1449	1304	580
		B	125	3	100	10	70	1069	962	428
		B	125	3	100	10	150	730	657	292
		B	125	3	100	10	300	516	465	207
		C	125	3	100	8	50	1342	1207	537
		C	125	3	100	8	80	1061	955	424
		C	125	3	100	10	100	949	854	379
		D	125	3	100	6	25	2145	1930	858
		D	125	3	100	10	45	1599	1439	639
	150	D	125	3	100	10	90	1130	1017	452
		H	125	3	100	10	25	2049	1844	820
		H	125	3	100	10	50	1449	1304	580
		H	125	3	100	10	80	1146	1031	458
		C	125	3	150	8	100	949	854	379
		D	125	3	150	10	40	1696	1526	678
		D	125	3	150	10	60	1384	1246	554
	220	D	125	3	150	10	80	1199	1079	480
		E	125	3	150	10	50	1581	1423	632
		H	125	3	150	6	25	2049	1844	820
		H	125	3	150	10	50	1449	1304	580
		C	125	3	220	10	30	1732	1559	693
		C	125	3	220	10	60	1225	1102	490
		C	125	3	220	10	100	949	854	379
		D	125	3	220	10	70	1282	1154	513
	330	D	125	3	220	10	100	1072	965	429
		E	125	3	220	10	50	1581	1423	632
		H	125	3	220	6	25	2049	1844	820
		H	125	3	220	10	50	1449	1304	580
		H	125	3	220	10	70	1225	1102	490
		H	125	3	330	10	30	1871	1684	748
		H	125	3	330	10	50	1449	1304	580
		H	125	3	330	10	80	1146	1031	458
		D	125	3	330	8	20	2398	2158	959
	330	D	125	3	330	8	70	1282	1154	513
		E	125	3	330	10	40	1768	1591	707
		E	125	3	330	10	60	1443	1299	577
V		125	3	330	10	40	1936	1743	775	

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_~=2.2^{0.1} V, U_~=1.0^{0.5}V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +85°C. The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20S

Rated Voltage (V)	Rated CAP (μF)	Case Code	Category Temp (°C)	MSL	Max DCL(μA) @25°C	Max DF(%) @25°C 100Hz	Max ESR (mΩ) @25°C 100KHz	100kHz RMS Current (mA)		
								45°C	85°C	125°C
16	1	B	125	3	5.0	10	120	816	735	327
	1.5	B	125	3	5.0	10	150	730	657	292
	2.2	B	125	3	5.0	10	150	730	657	292
	3.3	B	125	3	5.3	10	150	730	657	292
		B	125	3	5.3	10	200	632	569	253
	4.7	B	125	3	7.5	10	150	730	657	292
		B	125	3	7.5	10	180	667	600	267
		B	125	3	7.5	10	200	632	569	253
	6.8	C	125	3	7.5	10	80	1061	955	424
		B	125	3	10.9	10	150	730	657	292
		B	125	3	10.9	10	180	667	600	267
	10	B	125	3	10.9	10	200	632	569	253
		C	125	3	10.9	10	100	949	854	379
		B	125	3	16	6	150	730	657	292
	15	B	125	3	16	10	200	632	569	253
		B	125	3	16	10	300	516	465	207
		C	125	3	16	10	90	1000	900	400
	22	B	125	3	24	6	150	730	657	292
		B	125	3	24	10	180	667	600	267
		B	125	3	24	10	200	632	569	253
	33	C	125	3	24	10	80	1061	955	424
		C	125	3	24	10	100	949	854	379
		D	125	3	24	10	60	1384	1246	554
	47	B	125	3	35	6	150	730	657	292
		B	125	3	35	6	250	566	509	226
		B	125	3	35	6	300	516	465	207
	68	C	125	3	35	10	80	1061	955	424
		C	125	3	35	10	100	949	854	379
		D	125	3	35	10	40	1696	1526	678
	100	D	125	3	35	10	60	1384	1246	554
		E	125	3	35	10	50	1581	1423	632
		H	125	3	35	10	25	2049	1844	820
	150	H	125	3	53	10	100	894	805	358
		B	125	3	53	10	200	632	569	253
		C	125	3	53	10	80	1061	955	424
	220	C	125	3	53	10	100	949	854	379
		D	125	3	53	10	40	1696	1526	678
		D	125	3	53	10	60	1384	1246	554
	33	E	125	3	53	10	50	1581	1423	632
		H	125	3	53	10	25	2049	1844	820
		H	125	3	53	10	40	1620	1458	648
	47	C	125	3	75	10	100	949	854	379
		D	125	3	75	10	50	1517	1365	607
		D	125	3	75	10	70	1282	1154	513
	68	D	125	3	75	10	100	1072	965	429
		E	125	3	75	10	40	1768	1591	707
		E	125	3	75	10	60	1443	1299	577
	100	H	125	3	75	10	25	2049	1844	820
		H	125	3	75	10	50	1449	1304	580
		D	125	3	109	10	60	1384	1246	554
150	D	125	3	109	10	80	1199	1079	480	
	E	125	3	109	10	40	1768	1591	707	
	E	125	3	109	10	60	1443	1299	577	
220	H	125	3	109	10	25	2049	1844	820	
	H	125	3	109	10	50	1449	1304	580	
	C	125	3	160	10	80	1061	955	424	
33	C	125	3	160	10	100	949	854	379	
	D	125	3	160	10	80	1199	1079	480	
	D	125	3	160	10	100	1072	965	429	
47	E	125	3	160	10	40	1768	1591	707	
	E	125	3	160	10	60	1443	1299	577	
	H	125	3	160	10	40	1620	1458	648	
68	H	125	3	240	10	80	1146	1031	458	
	D	125	3	240	10	50	1517	1365	607	
	D	125	3	240	10	80	1199	1079	480	
100	E	125	3	240	10	40	1768	1591	707	
	E	125	3	240	10	60	1443	1299	577	
	V	125	3	240	10	40	1936	1743	775	
150	D	125	3	352	10	60	1384	1246	554	
	D	125	3	352	10	100	1072	965	429	

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_r=2.2⁰₋₁ V, U_~=1.0⁰_{-0.5} V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +85°C The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20S

Rated Voltage (V)	Rated CAP (µF)	Case Code	Category Temp (°C)	MSL	Max DCL(µA) @25°C	Max DF(%) @25°C 100Hz	Max ESR (mΩ) @25°C 100KHz	100kHz RMS Current (mA)		
								45°C	85°C	125°C
16	220	E	125	3	352	10	40	1768	1591	707
		E	125	3	352	10	70	1336	1203	535
		E	125	3	352	10	100	1118	1006	447
		V	125	3	352	10	30	2236	2012	894
	330	V	125	3	352	10	50	1732	1559	693
		E	125	3	528	10	40	1768	1591	707
		E	125	3	528	10	50	1581	1423	632
		E	125	3	528	10	60	1443	1299	577
20	1	V	125	3	528	10	30	2236	2012	894
		V	125	3	528	10	50	1732	1559	693
	1.5	B	125	3	5.0	10	150	730	657	292
		B	125	3	5.0	10	150	730	657	292
	2.2	B	125	3	5.0	10	150	730	657	292
		B	125	3	5.0	10	250	566	509	226
	3.3	B	125	3	5.0	10	150	730	657	292
		B	125	3	5.0	10	250	566	509	226
		C	125	3	5.0	10	100	949	854	379
	4.7	B	125	3	5.0	10	180	667	600	267
		B	125	3	5.0	10	250	566	509	226
		C	125	3	5.0	10	80	1061	955	424
	6.8	C	125	3	5.0	10	100	949	854	379
		B	125	3	5.4	10	180	667	600	267
		B	125	3	5.4	10	250	566	509	226
	10	C	125	3	5.4	10	80	1061	955	424
		C	125	3	5.4	10	100	949	854	379
		B	125	3	8.0	8	100	894	805	358
		B	125	3	8.0	10	150	730	657	292
		B	125	3	8.0	10	200	632	569	253
	15	C	125	3	8.0	10	80	1061	955	424
		C	125	3	8.0	10	100	949	854	379
		B	125	3	12	10	200	632	569	253
		C	125	3	12	10	80	1061	955	424
		C	125	3	12	10	100	949	854	379
	22	D	125	3	12	10	80	1199	1079	480
		D	125	3	12	10	120	979	881	392
		B	125	3	18	10	150	730	657	292
B		125	3	18	10	250	566	509	226	
B		125	3	18	10	300	516	465	207	
C		125	3	18	10	80	1061	955	424	
C		125	3	18	10	100	949	854	379	
D		125	3	18	10	70	1282	1154	513	
D		125	3	18	10	100	1072	965	429	
E		125	3	18	10	30	2041	1837	816	
33	E	125	3	18	10	50	1581	1423	632	
	H	125	3	18	6	25	2049	1844	820	
	H	125	3	18	10	35	1732	1559	693	
	H	125	3	18	10	50	1449	1304	580	
33	C	125	3	26	10	70	1134	1021	454	
	D	125	3	26	10	60	1384	1246	554	
	D	125	3	26	10	100	1072	965	429	
	E	125	3	26	10	30	2041	1837	816	
	E	125	3	26	10	50	1581	1423	632	
H	125	3	26	6	35	1732	1559	693		

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz $U_{-}=2.2^{0}_{-1} V$, $U_{\sim}=1.0^{0}_{-0.5} V$, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +85°C The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20S

Rated Voltage (V)	Rated CAP (μF)	Case Code	Category Temp (°C)	MSL	Max DCL(μA) @25°C	Max DF(%) @25°C 100Hz	Max ESR (mΩ) @25°C 100KHz	100kHz RMS Current (mA)		
								45°C	85°C	125°C
20	47	C	125	3	38	10	100	949	854	379
		D	125	3	38	10	60	1384	1246	554
		D	125	3	38	10	100	1072	965	429
		E	125	3	38	10	30	2041	1837	816
		E	125	3	38	10	50	1581	1423	632
		H	125	3	38	6	25	2049	1844	820
		H	125	3	38	10	35	1732	1559	693
	68	H	125	3	38	10	50	1449	1304	580
		D	125	3	54	6	50	1517	1365	607
		D	125	3	54	10	80	1199	1079	480
		E	125	3	54	6	30	2041	1837	816
	100	E	125	3	54	10	50	1581	1423	632
		H	125	3	80	10	80	1146	1031	458
		H	125	3	80	10	150	837	753	335
		D	125	3	80	10	100	1072	965	429
		E	125	3	80	6	30	2041	1837	816
		E	125	3	80	10	60	1443	1299	577
	150	V	125	3	80	10	40	1936	1743	775
		E	125	3	120	10	50	1581	1423	632
	220	V	125	3	120	10	40	1936	1743	775
E		125	3	176	10	50	1581	1423	632	
0.68	B	125	3	5.0	10	200	632	569	253	
	1	B	125	3	5.0	10	150	730	657	292
1.5	B	125	3	5.0	10	150	730	657	292	
	C	125	3	5.0	10	80	1061	955	424	
2.2	B	125	3	5.0	10	150	730	657	292	
	B	125	3	5.0	10	250	566	509	226	
	C	125	3	5.0	10	80	1061	955	424	
3.3	C	125	3	5.0	10	100	949	854	379	
	B	125	3	5.0	10	150	730	657	292	
	B	125	3	5.0	10	200	632	569	253	
	C	125	3	5.0	10	80	1061	955	424	
4.7	C	125	3	5.0	10	100	949	854	379	
	B	125	3	5.0	6	120	816	735	327	
	B	125	3	5.0	10	160	707	636	283	
	B	125	3	5.0	10	200	632	569	253	
	C	125	3	5.0	10	80	1061	955	424	
6.8	C	125	3	5.0	10	100	949	854	379	
	B	125	3	6.8	6	150	730	657	292	
	B	125	3	6.8	8	200	632	569	253	
	B	125	3	6.8	10	250	566	509	226	
	C	125	3	6.8	10	80	1061	955	424	
10	C	125	3	6.8	10	100	949	854	379	
	B	125	3	10	6	150	730	657	292	
	B	125	3	10	8	180	667	600	267	
	B	125	3	10	10	200	632	569	253	
	C	125	3	10	10	80	1061	955	424	
	C	125	3	10	10	100	949	854	379	
15	D	125	3	10	10	80	1199	1079	480	
	B	125	3	15	6	180	667	600	267	
		B	125	3	15	8	250	566	509	226

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz $U_{-}=2.2^{0}_{-1}V$, $U_{\sim}=1.0^{0}_{-0.5}V$, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +85°C The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20S

Rated Voltage (V)	Rated CAP (μF)	Case Code	Category Temp (°C)	MSL	Max DCL(μA) @25°C	Max DF(%) @25°C 100Hz	Max ESR (mΩ) @25°C 100KHz	100kHz RMS Current (mA)			
								45°C	85°C	125°C	
25	15	C	125	3	15	10	70	1134	1021	454	
		D	125	3	15	10	80	1199	1079	480	
		E	125	3	15	10	50	1581	1423	632	
		H	125	3	15	10	35	1732	1559	693	
	22	B	B	125	3	22	6	220	603	543	241
			C	125	3	22	6	70	1134	1021	454
			C	125	3	22	10	100	949	854	379
			D	125	3	22	6	80	1199	1079	480
		D	D	125	3	22	8	100	1072	965	429
			D	125	3	22	10	120	979	881	392
			E	125	3	22	10	50	1581	1423	632
			H	125	3	22	10	25	2049	1844	820
	33	D	D	125	3	22	10	50	1449	1304	580
			D	125	3	33	6	60	1384	1246	554
			D	125	3	33	6	100	1072	965	429
			D	125	3	33	6	150	876	788	350
		E	E	125	3	33	10	50	1581	1423	632
			H	125	3	33	6	25	2049	1844	820
			H	125	3	33	10	50	1449	1304	580
			D	125	3	47	6	60	1384	1246	554
	47	D	D	125	3	47	8	80	1199	1079	480
			D	125	3	47	10	100	1072	965	429
			E	125	3	47	6	30	2041	1837	816
			E	125	3	47	10	60	1443	1299	577
		H	H	125	3	47	8	30	1871	1684	748
			H	125	3	47	10	80	1146	1031	458
			H	125	3	47	10	150	837	753	335
			H	125	3	47	10	50	1449	1304	580
	68	H	H	125	3	68	8	70	1225	1102	490
			D	125	3	68	8	80	1199	1079	480
			D	125	3	68	10	120	979	881	392
			E	125	3	68	6	30	2041	1837	816
		E	E	125	3	68	10	60	1443	1299	577
			V	125	3	68	10	40	1936	1743	775
			D	125	3	100	10	100	1072	965	429
			E	125	3	100	10	60	1443	1299	577
	100	E	125	3	150	10	80	1250	1125	500	
		E	125	3	100	10	100	1118	1006	447	
		V	125	3	100	10	40	1936	1743	775	
		V	125	3	150	10	40	1936	1743	775	
	35	0.68	B	125	3	5.0	10	200	632	569	253
		1	B	125	3	5.0	10	200	632	569	253
		1.5	B	125	3	5.0	6	200	632	569	253
			C	125	3	5.0	10	100	949	854	379
		2.2	B	125	3	5.0	6	150	730	657	292
			C	125	3	5.0	10	200	632	569	253
		3.3	B	125	3	5.0	10	100	949	854	379
			B	125	3	5.0	6	150	730	657	292
C			125	3	5.0	10	200	632	569	253	
4.7		B	125	3	5.0	10	100	949	854	379	
		B	125	3	6.6	6	150	730	657	292	
		C	125	3	6.6	10	200	632	569	253	

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz $U_{\sim} = 2.2^{0.1} V$, $U_{\sim} = 1.0^{0.05} V$, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +85°C The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20S

Rated Voltage (V)	Rated CAP (µF)	Case Code	Category Temp (°C)	MSL	Max DCL(µA) @25°C	Max DF(%) @25°C 100Hz	Max ESR (mΩ) @25°C 100KHz	100kHz RMS Current (mA)			
								45°C	85°C	125°C	
35	6.8	C	125	3	9.5	10	80	1061	955	424	
		D	125	3	9.5	10	80	1199	1079	480	
	10	B	125	3	14	6	150	730	657	292	
		C	125	3	14	10	80	1061	955	424	
		D	125	3	14	10	80	1199	1079	480	
		E	125	3	14	10	50	1581	1423	632	
		H	125	3	14	6	25	2049	1844	820	
		H	125	3	14	10	50	1449	1304	580	
	15	C	125	3	21	6	70	1134	1021	454	
		D	125	3	21	6	60	1384	1246	554	
		D	125	3	21	6	80	1199	1079	480	
		E	125	3	21	10	50	1581	1423	632	
		H	125	3	21	10	25	2049	1844	820	
	22	H	125	3	21	10	50	1449	1304	580	
		C	125	3	31	6	80	1061	955	424	
		C	125	3	31	6	150	775	697	310	
		D	125	3	31	6	30	1958	1762	783	
		D	125	3	31	6	70	1282	1154	513	
		D	125	3	31	6	150	876	788	350	
	33	E	125	3	31	10	50	1581	1423	632	
		D	125	3	46	6	60	1384	1246	554	
		D	125	3	46	10	80	1199	1079	480	
		E	125	3	46	6	30	2041	1837	816	
		E	125	3	46	8	50	1581	1423	632	
		E	125	3	46	10	60	1443	1299	577	
	47	V	125	3	46	10	40	1936	1743	775	
		D	125	3	66	10	80	1199	1079	480	
		D	125	3	66	10	150	876	788	350	
		E	125	3	66	6	30	2041	1837	816	
		E	125	3	66	8	60	1443	1299	577	
		E	125	3	66	10	100	1118	1006	447	
		V	125	3	66	10	40	1936	1743	775	
	68	E	125	3	95	10	80	1250	1125	500	
		E	125	3	95	10	100	1118	1006	447	
		V	125	3	95	10	70	1464	1317	586	
	100	E	125	3	140	10	80	1250	1125	500	
		E	125	3	140	10	100	1118	1006	447	
		V	125	3	140	10	70	1464	1317	586	
	50	0.68	B	125	3	5.0	6	200	632	569	253
			B	125	3	5.0	10	250	566	509	226
		1	B	125	3	5.0	6	200	632	569	253
			B	125	3	5.0	10	250	566	509	226
		1.5	B	125	3	5.0	6	200	632	569	253
			B	125	3	5.0	10	250	566	509	226
			C	125	3	5.0	6	70	1134	1021	454
			C	125	3	5.0	10	100	949	854	379
		2.2	B	125	3	5.0	10	200	632	569	253
			C	125	3	5.0	6	70	1134	1021	454
3.3		C	125	3	5.0	10	100	949	854	379	
		C	125	3	6.6	10	80	1061	955	424	
4.7		D	125	3	6.6	10	60	1384	1246	554	
		C	125	3	9.4	10	100	949	854	379	
		D	125	3	9.4	10	60	1384	1246	554	
		D	125	3	9.4	10	200	758	682	303	
6.8		C	125	3	14	10	80	1061	955	424	

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz $U_{-} = 2.2^{0.1} V$, $U_{-} \sim 1.0^{0.05} V$, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +85°C. The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20S

Land Dimension / Courtyard

Case Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B : Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
	W	L	S	V1	V2	W	L	S	V1	V2	W	L	S	V1	V2
B	2.35	2.21	0.92	6.32	4.0	2.23	1.8	1.12	5.22	3.5	2.13	1.42	1.28	4.36	3.24
C	2.35	2.77	2.37	8.92	4.5	2.23	2.37	2.57	7.82	4	2.13	1.99	2.73	6.96	3.74
D	2.55	2.77	3.67	10.22	5.6	2.43	2.37	3.87	9.12	5.1	2.33	1.99	4.03	8.26	4.84
E	2.55	2.77	3.67	10.22	5.6	2.43	2.37	3.87	9.12	5.1	2.33	1.99	4.03	8.26	4.84

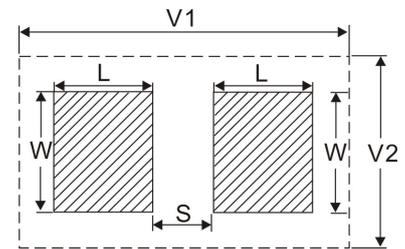
Density Level A: For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.

Density Level B: For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.

Density Level C: For high component density product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC-7351).

1 Height of these chips may create problems in wave soldering.

2 Land pattern geometry is too small for silkscreen outline.



Surface Mount Footprints

Soldering Process

Suntan tantalum capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. Suntan's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J STD 020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

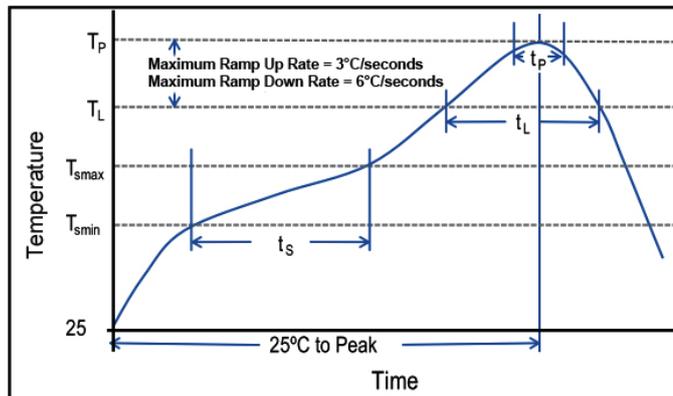
Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. Once reflow occurs, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

Profile Feature	SnPb Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Minimum (T_{smin})	100°C	150°C
Temperature Maximum (T_{smax})	150°C	200°C
Time (ts) from T_{smin} to T_{smax}	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_P)	3°C/seconds maximum	3°C/seconds maximum
Liquidous Temperature (T_L)	183°C	217°C
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds
Peak Temperature (T_P)	220°C* , 235°C**	250°C* , 260°C**
Time within 5°C of Maximum Peak Temperature (t_P)	20 seconds maximum	30 seconds maximum
Ramp-down Rate (T_P to T_L)	6°C/seconds maximum	6°C/seconds maximum
Time 25°C to Peak	6 minutes maximum	8 minutes maximum

Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.

*Case Size D, **Case Size A, B, C



Recommended Reflow Profile

TS20S

Store:

Environmental requirements:

Vacuum storage is recommended. If non vacuum storage is adopted, attention should be paid to the temperature of 10~30°C, humidity \leq 60% RH, no acid, alkali and other corrosive gases.

Storage requirements:

The time for the capacitor to be welded after unpacking the vacuum sealing bag is less than or equal to 48h max (TS20S products prevent moisture absorption).

Product moisture absorption treatment:

If the non vacuum storage period exceeds one year, it is recommended to dry the capacitor (125°C Max / 4h Min) first, and then weld it after passing the test. If you don't have the right equipment to bake the products, you can contact us for assistance.

Welding:

Recommended welding conditions:

Reflow soldering SMT mounting is recommended, but wave soldering and manual soldering are not recommended.

Reflow soldering:

The peak setting temperature T_P of SMT should be \leq 250°C, and the holding time within the range of 0°C ~ -5°C of the peak temperature T_P should be \leq 5s.

Manual welding:

If manual welding is required under special circumstances, the power of electric iron should be \leq 25W, the temperature should be $<$ 300°C, and the welding time should be $<$ 3s.

It is forbidden for the iron head to directly contact the product body, and the solder should be melted to make it contact with the capacitor pin for welding.

Note: Specifications are subject to change without notice. For more detail and update, please visit our website.