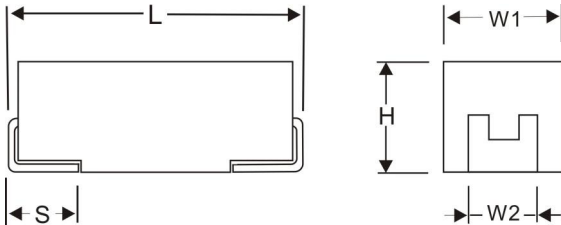


TS20L

FEATURES

- Low ESR, Volumetrically efficient, Stable in electrical & storage performances, Long lifespan, High reliability.
- Epoxy molded encapsulation, Chip, Easy for integration, Polarized.
- Typical applications include decoupling and filtering in industrial and automotive end applications, such as DC/DC converters, portable electronics, telecommunications and control units.



| case | EIA Code | L | W ₁ | H | W ₂ | S |
|------|----------|---------|----------------|---------|----------------|---------|
| A | 1206 | 3.2±0.2 | 1.6±0.2 | 1.6±0.2 | 0.8±0.2 | 1.2±0.2 |
| B | 1210 | 3.5±0.2 | 2.8±0.2 | 1.9±0.2 | 0.8±0.2 | 2.2±0.2 |
| C | 2312 | 6.0±0.2 | 3.2±0.2 | 2.5±0.2 | 1.3±0.2 | 2.2±0.2 |
| D | 2917 | 7.3±0.2 | 4.3±0.2 | 2.8±0.2 | 1.3±0.2 | 2.4±0.2 |
| E | 2917 | 7.3±0.4 | 4.3±0.4 | 4.1±0.4 | 1.3±0.2 | 2.4±0.2 |
| V | 2924 | 7.3±0.4 | 6.1±0.4 | 3.6±0.4 | 1.35±0.2 | 3.0±0.2 |



Technical Specifications

| Technical Data | | All technical data relate to an ambient temperature of +25°C | | | | | | | | | |
|------------------------------------|---|--|-----|-----|----|----|----|----|----|----|--|
| Capacitance Range | 0.47µF ~ 1000µF | | | | | | | | | | |
| Capacitance Tolerance | ±10% ; ±20% | | | | | | | | | | |
| Rated Voltage (V _R) | ≤+85°C: | 4 | 6.3 | 10 | 16 | 20 | 25 | 35 | 50 | 63 | |
| Category Voltage (V _C) | ≤+125°C: | 2.7 | 4 | 6.3 | 10 | 15 | 17 | 23 | 33 | 40 | |
| Surge Voltage (V _S) | ≤+85°C: | 5.2 | 8 | 13 | 20 | 26 | 32 | 46 | 65 | 82 | |
| Surge Voltage (V _S) | ≤+125°C: | 3.4 | 5 | 8 | 13 | 16 | 20 | 28 | 40 | 50 | |
| Temperature Range | -55°C to +125°C | | | | | | | | | | |
| Termination Finished | Sn Plating (standard), Gold and SnPb Plating upon request | | | | | | | | | | |

Capacitance And Rated Voltage Range (Letter Denotes Case Size)

| Rated Voltage(V) | 4 | 6.3 | 10 | 16 |
|------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Capacitance(µF) | Case Size & ESR | | | |
| 6.8 | | | | A(2000,2500),B(1200,2000) |
| 10 | | | | A(1700),B(1200,2000) |
| 15 | | | A(1000,1800),B(600,900) | B(800,1000),C(600) |
| 22 | | | A(1200,1500),B(400,500) | B(700,1000),C(500,700),D(500) |
| 33 | | A(1500,2000),B(600) | B(450,700),C(400,600),D(300,500) | C(500,700),D(300,500) |
| 47 | A(1500,2000),B(900,1500) | B(600,800),C(300,500) | B(500,700),C(400,600),D(300,500) | C(300,500),D(300,500),E(200,600) |
| 68 | B(1000,1500),C(600,C(1000) | B(500,700),C(500,700),D(250,500) | C(200,500),D(150,400) | C(1000),D(200,450),E(200,600) |
| 100 | B(450,800),C(500,1000) | B(400,700),C(300,500),D(300,500) | C(250,500),D(200,400),E(150) | C(800),D(200,500),E(200,600) |
| 150 | C(500,900),D(350,700),E(200,600) | C(300,500),D(300,500),E(150,300) | D(200,400),E(150,300) | D(500,600),E(200,250) |
| 220 | C(500,900),D(300,600),E(100,500) | C(200,500),D(150,300),E(150,300) | D(200,400),E(200,400),V(200,400) | E(200,400),V(200,400) |
| 330 | D(400,600),E(200,600),V(200,600) | D(150,300),E(150,300) | D(150,250),E(150,200),V(150,200) | E(180,500),V(180,500) |
| 470 | D(200,350),E(150,350),V(150,350) | E(150,300) | E(150,200) | E(450,600) |
| 680 | E(150,200) | E(150,300) | E(150,200) | |
| 1000 | E(150,200) | | | |

| Rated Voltage(V) | 20 | 25 | 35 | 50 | 63 |
|------------------|--|---------------------------------------|--------------------------------------|---------------------------|--------------|
| Capacitance(µF) | Case Size & ESR | | | | |
| 0.47 | | | A(4000,A(8000) | A(3000,6000) | |
| 0.68 | | | A(6000,A(7000) | B(3000,6000) | |
| 1 | | | A(6000,7000),B(2500,3000) | B(2500,4000),C(1800,4000) | C(2000) |
| 1.5 | | A(4500,7500),B(3000,5000) | B(3000,4000),C(2500,3000) | C(1800,3000),D(1000,2500) | D(2500) |
| 2.2 | | A(3000,8000),B(2500,5000) | B(2500,3000),C(2000,2500) | C(1500,2000),D(700,1000) | D(1500) |
| 3.3 | A(4000,5000),B(3000,4000) | B(2000,3000),C(1200,2000) | B(2500,3000),C(1200,2000) | C(700,1500),D(700,1500) | D(1200) |
| 4.7 | A(2500,5000),B(1500,3000),C(1000,2500) | B(1000,1200),C(1000,2000) | B(2000,2500),C(800,1000),D(700,1000) | C(700,1000),D(600,1000) | E(800) |
| 6.8 | B(1000,1800),C(800,1200) | B(2000,2500),C(1000,1500),D(700,1000) | C(700,1200),D(600,1000) | D(600,800),E(500,1000) | E(600) |
| 10 | B(1200,1800),C(600,1000),D(500,1000) | B(1500,2000),C(900,1200),D(450,800) | C(700,1000),D(400,800) | D(400,600),E(400,800) | E(450) |
| 15 | B(1500,1800),C(800,1000),D(600,800) | C(500,1000),D(400,600) | D(350,600),E(300,600) | E(400,500) | E(300)V(300) |
| 22 | C(600,900),D(400,600) | C(800,1000),D(400,600) | D(400,500),E(300,400) | E(400,500) | V(300) |
| 33 | C(600,900),D(400,600) | D(300,500),E(250,500) | D(500,700),E(300,600) | | |
| 47 | C(300,400),D(250,500),E(250,500) | D(350,500),E(300,600) | D(400,900),E(400,600) | | |
| 68 | D(250,300),E(250,500) | E(250,500),V(250,600) | E(800) | | |
| 100 | D(300,400),E(250,300) | E(200,250),V(200,250) | | | |
| 150 | D(450,600),E(180,250) | E(600),V(300) | | | |
| 220 | E(450,600),V(250,400) | | | | |
| 330 | E(450,600),V(450,600) | | | | |

TS20L

| Rated Voltage (V) | Rated CAP (µF) | Case Code | Rated Temp (°C) | Category Temp (°C) | Category Voltage (V) | Max DCL(µA) @25°C | Max DF(%) @25°C 100Hz | Max ESR (mΩ) @25°C 100KHz | Max Ripple @100kHz IRMS(A) | | |
|-------------------|----------------|-----------|-----------------|--------------------|----------------------|-------------------|-----------------------|---------------------------|----------------------------|-------|-------|
| | | | | | | | | | 25°C | 85°C | 125°C |
| 4 | 47 | A | 85 | 125 | 2.7 | 1.9 | 11 | 1500 | 0.208 | 0.125 | 0.083 |
| | | A | 85 | 125 | 2.7 | 1.9 | 11 | 2000 | 0.180 | 0.108 | 0.072 |
| | | B | 85 | 125 | 2.7 | 1.9 | 8 | 900 | 0.289 | 0.173 | 0.115 |
| | | B | 85 | 125 | 2.7 | 1.9 | 8 | 1500 | 0.224 | 0.134 | 0.089 |
| | 68 | B | 85 | 125 | 2.7 | 2.7 | 8 | 1000 | 0.274 | 0.164 | 0.110 |
| | | B | 85 | 125 | 2.7 | 2.7 | 8 | 1500 | 0.224 | 0.134 | 0.089 |
| | | C | 85 | 125 | 2.7 | 2.7 | 6 | 600 | 0.387 | 0.232 | 0.155 |
| | | C | 85 | 125 | 2.7 | 2.7 | 6 | 1000 | 0.300 | 0.180 | 0.120 |
| | 100 | B | 85 | 125 | 2.7 | 4.0 | 10 | 450 | 0.408 | 0.245 | 0.163 |
| | | B | 85 | 125 | 2.7 | 4.0 | 10 | 800 | 0.306 | 0.184 | 0.122 |
| | | C | 85 | 125 | 2.7 | 4.0 | 10 | 500 | 0.424 | 0.255 | 0.170 |
| | 150 | C | 85 | 125 | 2.7 | 4.0 | 10 | 1000 | 0.300 | 0.180 | 0.120 |
| | | C | 85 | 125 | 2.7 | 6.0 | 10 | 500 | 0.424 | 0.255 | 0.170 |
| | | C | 85 | 125 | 2.7 | 6.0 | 10 | 900 | 0.316 | 0.190 | 0.126 |
| | | D | 85 | 125 | 2.7 | 6.0 | 8 | 350 | 0.548 | 0.329 | 0.219 |
| | | D | 85 | 125 | 2.7 | 6.0 | 8 | 700 | 0.387 | 0.232 | 0.155 |
| | | E | 85 | 125 | 2.7 | 6.0 | 8 | 200 | 0.791 | 0.474 | 0.316 |
| | 220 | E | 85 | 125 | 2.7 | 6.0 | 8 | 600 | 0.456 | 0.274 | 0.183 |
| | | C | 85 | 125 | 2.7 | 8.8 | 12 | 500 | 0.424 | 0.255 | 0.170 |
| | | C | 85 | 125 | 2.7 | 8.8 | 12 | 900 | 0.316 | 0.190 | 0.126 |
| | | D | 85 | 125 | 2.7 | 8.8 | 10 | 300 | 0.592 | 0.355 | 0.237 |
| | | D | 85 | 125 | 2.7 | 8.8 | 10 | 600 | 0.418 | 0.251 | 0.167 |
| | 330 | E | 85 | 125 | 2.7 | 8.8 | 10 | 100 | 1.118 | 0.671 | 0.447 |
| | | E | 85 | 125 | 2.7 | 8.8 | 10 | 500 | 0.500 | 0.300 | 0.200 |
| | | D | 85 | 125 | 2.7 | 13.2 | 14 | 400 | 0.512 | 0.307 | 0.205 |
| | | D | 85 | 125 | 2.7 | 13.2 | 14 | 600 | 0.418 | 0.251 | 0.167 |
| | | E | 85 | 125 | 2.7 | 13.2 | 12 | 200 | 0.791 | 0.474 | 0.316 |
| | | E | 85 | 125 | 2.7 | 13.2 | 12 | 600 | 0.456 | 0.274 | 0.183 |
| | 470 | V | 85 | 125 | 2.7 | 13.2 | 12 | 200 | 0.866 | 0.520 | 0.346 |
| | | V | 85 | 125 | 2.7 | 13.2 | 12 | 600 | 0.500 | 0.300 | 0.200 |
| | | D | 85 | 125 | 2.7 | 18.8 | 14 | 200 | 0.725 | 0.435 | 0.290 |
| | | D | 85 | 125 | 2.7 | 18.8 | 14 | 350 | 0.548 | 0.329 | 0.219 |
| E | | 85 | 125 | 2.7 | 18.8 | 12 | 150 | 0.913 | 0.548 | 0.365 | |
| E | | 85 | 125 | 2.7 | 18.8 | 12 | 350 | 0.598 | 0.359 | 0.239 | |
| 680 | V | 85 | 125 | 2.7 | 18.8 | 12 | 150 | 1.000 | 0.600 | 0.400 | |
| | V | 85 | 125 | 2.7 | 18.8 | 12 | 350 | 0.655 | 0.393 | 0.262 | |
| | E | 85 | 125 | 2.7 | 27.2 | 14 | 150 | 0.913 | 0.548 | 0.365 | |
| 1000 | E | 85 | 125 | 2.7 | 27.2 | 14 | 200 | 0.791 | 0.474 | 0.316 | |
| | E | 85 | 125 | 2.7 | 40.0 | 15 | 150 | 0.913 | 0.548 | 0.365 | |
| E | E | 85 | 125 | 2.7 | 40.0 | 15 | 200 | 0.791 | 0.474 | 0.316 | |
| | E | 85 | 125 | 2.7 | 40.0 | 15 | 200 | 0.791 | 0.474 | 0.316 | |
| 6.3 | 33 | A | 85 | 125 | 4 | 2.1 | 8 | 1500 | 0.208 | 0.125 | 0.083 |
| | | A | 85 | 125 | 4 | 2.1 | 8 | 2000 | 0.180 | 0.108 | 0.072 |
| | | B | 85 | 125 | 4 | 2.1 | 8 | 600 | 0.354 | 0.212 | 0.141 |
| | 47 | B | 85 | 125 | 4 | 3.0 | 8 | 600 | 0.354 | 0.212 | 0.141 |
| | | B | 85 | 125 | 4 | 3.0 | 8 | 800 | 0.306 | 0.184 | 0.122 |
| | | C | 85 | 125 | 4 | 3.0 | 6 | 300 | 0.548 | 0.329 | 0.219 |
| | | C | 85 | 125 | 4 | 3.0 | 6 | 500 | 0.424 | 0.255 | 0.170 |
| | 68 | B | 85 | 125 | 4 | 4.3 | 10 | 500 | 0.387 | 0.232 | 0.155 |
| | | B | 85 | 125 | 4 | 4.3 | 10 | 700 | 0.327 | 0.196 | 0.131 |
| | | C | 85 | 125 | 4 | 4.3 | 8 | 500 | 0.424 | 0.255 | 0.170 |
| | | C | 85 | 125 | 4 | 4.3 | 8 | 700 | 0.359 | 0.215 | 0.143 |
| | | D | 85 | 125 | 4 | 4.3 | 6 | 250 | 0.648 | 0.389 | 0.259 |
| | | D | 85 | 125 | 4 | 4.3 | 6 | 500 | 0.458 | 0.275 | 0.183 |
| | 100 | B | 85 | 125 | 4 | 6.3 | 14 | 400 | 0.433 | 0.260 | 0.173 |

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_{DC} =2.2 1.0V U_{AC}~1.0 0.5V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +125 The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20L

| Rated Voltage (V) | Rated CAP (µF) | Case Code | Rated Temp (°C) | Category Temp (°C) | Category Voltage (V) | Max DCL(µA) @25°C | Max DF(%) @25°C 100Hz | Max ESR (mΩ) @25°C 100KHz | Max Ripple @100kHz IRMS(A) | | |
|-------------------|----------------|-----------|-----------------|--------------------|----------------------|-------------------|-----------------------|---------------------------|----------------------------|-------|-------|
| | | | | | | | | | 25°C | 85°C | 125°C |
| 6.3 | 100 | B | 85 | 125 | 4 | 6.3 | 14 | 700 | 0.327 | 0.196 | 0.131 |
| | | C | 85 | 125 | 4 | 6.3 | 8 | 300 | 0.548 | 0.329 | 0.219 |
| | | C | 85 | 125 | 4 | 6.3 | 8 | 500 | 0.424 | 0.255 | 0.170 |
| | | D | 85 | 125 | 4 | 6.3 | 8 | 300 | 0.592 | 0.355 | 0.237 |
| | 150 | D | 85 | 125 | 4 | 6.3 | 8 | 500 | 0.458 | 0.275 | 0.183 |
| | | C | 85 | 125 | 4 | 9.5 | 12 | 300 | 0.548 | 0.329 | 0.219 |
| | | C | 85 | 125 | 4 | 9.5 | 12 | 500 | 0.424 | 0.255 | 0.170 |
| | | D | 85 | 125 | 4 | 9.5 | 10 | 300 | 0.592 | 0.355 | 0.237 |
| | | D | 85 | 125 | 4 | 9.5 | 10 | 500 | 0.458 | 0.275 | 0.183 |
| | | E | 85 | 125 | 4 | 9.5 | 10 | 150 | 0.913 | 0.548 | 0.365 |
| | 220 | E | 85 | 125 | 4 | 9.5 | 10 | 300 | 0.645 | 0.387 | 0.258 |
| | | C | 85 | 125 | 4 | 13.9 | 14 | 200 | 0.671 | 0.402 | 0.268 |
| | | C | 85 | 125 | 4 | 13.9 | 14 | 500 | 0.424 | 0.255 | 0.170 |
| | | D | 85 | 125 | 4 | 13.9 | 12 | 150 | 0.837 | 0.502 | 0.335 |
| | | D | 85 | 125 | 4 | 13.9 | 12 | 300 | 0.592 | 0.355 | 0.237 |
| | | E | 85 | 125 | 4 | 13.9 | 12 | 150 | 0.913 | 0.548 | 0.365 |
| | 330 | E | 85 | 125 | 4 | 13.9 | 12 | 300 | 0.645 | 0.387 | 0.258 |
| | | D | 85 | 125 | 4 | 20.8 | 14 | 150 | 0.837 | 0.502 | 0.335 |
| | | D | 85 | 125 | 4 | 20.8 | 14 | 300 | 0.592 | 0.355 | 0.237 |
| | | E | 85 | 125 | 4 | 20.8 | 14 | 150 | 0.913 | 0.548 | 0.365 |
| | 470 | E | 85 | 125 | 4 | 20.8 | 14 | 300 | 0.645 | 0.387 | 0.258 |
| | | E | 85 | 125 | 4 | 29.6 | 14 | 150 | 0.913 | 0.548 | 0.365 |
| | 680 | E | 85 | 125 | 4 | 29.6 | 14 | 300 | 0.645 | 0.387 | 0.258 |
| | | E | 85 | 125 | 4 | 42.8 | 14 | 150 | 0.913 | 0.548 | 0.365 |
| 10 | 15 | E | 85 | 125 | 4 | 42.8 | 14 | 300 | 0.645 | 0.387 | 0.258 |
| | | A | 85 | 125 | 6.3 | 1.5 | 8 | 1000 | 0.255 | 0.153 | 0.102 |
| | | A | 85 | 125 | 6.3 | 1.5 | 8 | 1800 | 0.190 | 0.114 | 0.076 |
| | | B | 85 | 125 | 6.3 | 1.5 | 6 | 600 | 0.354 | 0.212 | 0.141 |
| | 22 | B | 85 | 125 | 6.3 | 1.5 | 6 | 900 | 0.289 | 0.173 | 0.115 |
| | | A | 85 | 125 | 6.3 | 2.2 | 12 | 1200 | 0.233 | 0.140 | 0.093 |
| | | A | 85 | 125 | 6.3 | 2.2 | 12 | 1500 | 0.208 | 0.125 | 0.083 |
| | | B | 85 | 125 | 6.3 | 2.2 | 6 | 400 | 0.433 | 0.260 | 0.173 |
| | | B | 85 | 125 | 6.3 | 2.2 | 6 | 500 | 0.387 | 0.232 | 0.155 |
| | | B | 85 | 125 | 6.3 | 2.2 | 6 | 500 | 0.387 | 0.232 | 0.155 |
| | 33 | B | 85 | 125 | 6.3 | 3.3 | 8 | 450 | 0.408 | 0.245 | 0.163 |
| | | B | 85 | 125 | 6.3 | 3.3 | 8 | 700 | 0.327 | 0.196 | 0.131 |
| | | C | 85 | 125 | 6.3 | 3.3 | 6 | 400 | 0.474 | 0.285 | 0.190 |
| | | C | 85 | 125 | 6.3 | 3.3 | 6 | 600 | 0.387 | 0.232 | 0.155 |
| | | D | 85 | 125 | 6.3 | 3.3 | 6 | 300 | 0.592 | 0.355 | 0.237 |
| | | D | 85 | 125 | 6.3 | 3.3 | 6 | 500 | 0.458 | 0.275 | 0.183 |
| | 47 | B | 85 | 125 | 6.3 | 3.3 | 6 | 500 | 0.458 | 0.275 | 0.183 |
| | | B | 85 | 125 | 6.3 | 4.7 | 10 | 500 | 0.387 | 0.232 | 0.155 |
| | | B | 85 | 125 | 6.3 | 4.7 | 10 | 700 | 0.327 | 0.196 | 0.131 |
| | | C | 85 | 125 | 6.3 | 4.7 | 8 | 400 | 0.474 | 0.285 | 0.190 |
| | | C | 85 | 125 | 6.3 | 4.7 | 8 | 600 | 0.387 | 0.232 | 0.155 |
| | | D | 85 | 125 | 6.3 | 4.7 | 6 | 300 | 0.592 | 0.355 | 0.237 |
| | 68 | D | 85 | 125 | 6.3 | 4.7 | 6 | 500 | 0.458 | 0.275 | 0.183 |
| | | C | 85 | 125 | 6.3 | 6.8 | 8 | 200 | 0.671 | 0.402 | 0.268 |
| | | C | 85 | 125 | 6.3 | 6.8 | 8 | 500 | 0.424 | 0.255 | 0.170 |
| | | D | 85 | 125 | 6.3 | 6.8 | 6 | 150 | 0.837 | 0.502 | 0.335 |
| | 100 | D | 85 | 125 | 6.3 | 6.8 | 6 | 400 | 0.512 | 0.307 | 0.205 |
| | | C | 85 | 125 | 6.3 | 10.0 | 10 | 250 | 0.600 | 0.360 | 0.240 |
| C | | 85 | 125 | 6.3 | 10.0 | 10 | 500 | 0.424 | 0.255 | 0.170 | |
| D | | 85 | 125 | 6.3 | 10.0 | 8 | 200 | 0.725 | 0.435 | 0.290 | |
| D | | 85 | 125 | 6.3 | 10.0 | 8 | 400 | 0.512 | 0.307 | 0.205 | |
| E | 85 | 125 | 6.3 | 10.0 | 8 | 150 | 0.913 | 0.548 | 0.365 | | |

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_{DC} =2.2 1.0V U_{AC}~1.0 0.5V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +125 The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20L

| Rated Voltage (V) | Rated CAP (µF) | Case Code | Rated Temp (°C) | Category Temp (°C) | Category Voltage (V) | Max DCL(µA) @25°C | Max DF(%) @25°C 100Hz | Max ESR (mΩ) @25°C 100KHz | Max Ripple @100kHz IRMS(A) | | |
|-------------------|----------------|-----------|-----------------|--------------------|----------------------|-------------------|-----------------------|---------------------------|----------------------------|-------|-------|
| | | | | | | | | | 25°C | 85°C | 125°C |
| 16 | 100 | E | 85 | 125 | 10 | 16.0 | 8 | 600 | 0.456 | 0.274 | 0.183 |
| | 150 | D | 85 | 125 | 10 | 24.0 | 12 | 500 | 0.458 | 0.275 | 0.183 |
| | | D | 85 | 125 | 10 | 24.0 | 12 | 600 | 0.418 | 0.251 | 0.167 |
| | | E | 85 | 125 | 10 | 24.0 | 10 | 200 | 0.791 | 0.474 | 0.316 |
| | | E | 85 | 125 | 10 | 24.0 | 10 | 250 | 0.707 | 0.424 | 0.283 |
| | 220 | E | 85 | 125 | 10 | 35.2 | 12 | 200 | 0.791 | 0.474 | 0.316 |
| | | E | 85 | 125 | 10 | 35.2 | 12 | 400 | 0.559 | 0.335 | 0.224 |
| | | V | 85 | 125 | 10 | 35.2 | 12 | 200 | 0.866 | 0.520 | 0.346 |
| | | V | 85 | 125 | 10 | 35.2 | 12 | 400 | 0.612 | 0.367 | 0.245 |
| | 330 | E | 85 | 125 | 10 | 52.8 | 12 | 180 | 0.833 | 0.500 | 0.333 |
| | | E | 85 | 125 | 10 | 52.8 | 12 | 500 | 0.500 | 0.300 | 0.200 |
| | | V | 85 | 125 | 10 | 52.8 | 12 | 180 | 0.913 | 0.548 | 0.365 |
| | | V | 85 | 125 | 10 | 52.8 | 12 | 500 | 0.548 | 0.329 | 0.219 |
| | 470 | E | 85 | 125 | 10 | 75.2 | 16 | 450 | 0.527 | 0.316 | 0.211 |
| | | E | 85 | 125 | 10 | 75.2 | 16 | 600 | 0.456 | 0.274 | 0.183 |
| | 20 | 3.3 | A | 85 | 125 | 15 | 0.7 | 6 | 4000 | 0.127 | 0.076 |
| A | | | 85 | 125 | 15 | 0.7 | 6 | 5000 | 0.114 | 0.068 | 0.046 |
| B | | | 85 | 125 | 15 | 0.7 | 6 | 3000 | 0.158 | 0.095 | 0.063 |
| B | | | 85 | 125 | 15 | 0.7 | 6 | 4000 | 0.137 | 0.082 | 0.055 |
| 4.7 | | A | 85 | 125 | 15 | 0.9 | 6 | 2500 | 0.161 | 0.097 | 0.064 |
| | | A | 85 | 125 | 15 | 0.9 | 6 | 5000 | 0.114 | 0.068 | 0.046 |
| | | B | 85 | 125 | 15 | 0.9 | 6 | 1500 | 0.224 | 0.134 | 0.089 |
| | | B | 85 | 125 | 15 | 0.9 | 6 | 3000 | 0.158 | 0.095 | 0.063 |
| | | C | 85 | 125 | 15 | 0.9 | 6 | 1000 | 0.300 | 0.180 | 0.120 |
| 6.8 | | C | 85 | 125 | 15 | 0.9 | 6 | 2500 | 0.190 | 0.114 | 0.076 |
| | | B | 85 | 125 | 15 | 1.4 | 6 | 1000 | 0.274 | 0.164 | 0.110 |
| | | B | 85 | 125 | 15 | 1.4 | 6 | 1800 | 0.204 | 0.122 | 0.082 |
| | | C | 85 | 125 | 15 | 1.4 | 6 | 800 | 0.335 | 0.201 | 0.134 |
| 10 | | C | 85 | 125 | 15 | 1.4 | 6 | 1200 | 0.274 | 0.164 | 0.110 |
| | | B | 85 | 125 | 15 | 2.0 | 6 | 1200 | 0.250 | 0.150 | 0.100 |
| | | B | 85 | 125 | 15 | 2.0 | 6 | 1800 | 0.204 | 0.122 | 0.082 |
| | | C | 85 | 125 | 15 | 2.0 | 6 | 600 | 0.387 | 0.232 | 0.155 |
| | | C | 85 | 125 | 15 | 2.0 | 6 | 1000 | 0.300 | 0.180 | 0.120 |
| 15 | | D | 85 | 125 | 15 | 2.0 | 6 | 500 | 0.458 | 0.275 | 0.183 |
| | | D | 85 | 125 | 15 | 2.0 | 6 | 1000 | 0.324 | 0.194 | 0.130 |
| | | B | 85 | 125 | 15 | 3.0 | 6 | 1500 | 0.224 | 0.134 | 0.089 |
| | | B | 85 | 125 | 15 | 3.0 | 6 | 1800 | 0.204 | 0.122 | 0.082 |
| | | C | 85 | 125 | 15 | 3.0 | 6 | 800 | 0.335 | 0.201 | 0.134 |
| | | C | 85 | 125 | 15 | 3.0 | 6 | 1000 | 0.300 | 0.180 | 0.120 |
| 22 | | D | 85 | 125 | 15 | 3.0 | 6 | 600 | 0.418 | 0.251 | 0.167 |
| | | D | 85 | 125 | 15 | 3.0 | 6 | 800 | 0.362 | 0.217 | 0.145 |
| | | C | 85 | 125 | 15 | 4.4 | 6 | 600 | 0.387 | 0.232 | 0.155 |
| | | C | 85 | 125 | 15 | 4.4 | 6 | 900 | 0.316 | 0.190 | 0.126 |
| 33 | | D | 85 | 125 | 15 | 4.4 | 6 | 400 | 0.512 | 0.307 | 0.205 |
| | | D | 85 | 125 | 15 | 4.4 | 6 | 600 | 0.418 | 0.251 | 0.167 |
| | | C | 85 | 125 | 15 | 6.6 | 6 | 600 | 0.387 | 0.232 | 0.155 |
| | | C | 85 | 125 | 15 | 6.6 | 6 | 900 | 0.316 | 0.190 | 0.126 |
| 47 | D | 85 | 125 | 15 | 6.6 | 6 | 400 | 0.512 | 0.307 | 0.205 | |
| | D | 85 | 125 | 15 | 6.6 | 6 | 600 | 0.418 | 0.251 | 0.167 | |
| | C | 85 | 125 | 15 | 9.4 | 8 | 300 | 0.548 | 0.329 | 0.219 | |
| | C | 85 | 125 | 15 | 9.4 | 8 | 400 | 0.474 | 0.285 | 0.190 | |
| | D | 85 | 125 | 15 | 9.4 | 8 | 250 | 0.648 | 0.389 | 0.259 | |
| | | E | 85 | 125 | 15 | 9.4 | 8 | 500 | 0.458 | 0.275 | 0.183 |
| | | E | 85 | 125 | 15 | 9.4 | 6 | 250 | 0.707 | 0.424 | 0.283 |

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_{DC} =2.2 1.0V U_{AC}~1.0 0.5V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +125 The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20L

| Rated Voltage (V) | Rated CAP (µF) | Case Code | Rated Temp (°C) | Category Temp (°C) | Category Voltage (V) | Max DCL(µA) @25°C | Max DF(%) @25°C 100Hz | Max ESR (mΩ) @25°C 100KHz | Max Ripple @100kHz IRMS(A) | | |
|-------------------|----------------|-----------|-----------------|--------------------|----------------------|-------------------|-----------------------|---------------------------|----------------------------|-------|-------|
| | | | | | | | | | 25°C | 85°C | 125°C |
| 20 | 47 | E | 85 | 125 | 15 | 9.4 | 6 | 500 | 0.500 | 0.300 | 0.200 |
| | 68 | D | 85 | 125 | 15 | 13.6 | 8 | 250 | 0.648 | 0.389 | 0.259 |
| | | D | 85 | 125 | 15 | 13.6 | 8 | 300 | 0.592 | 0.355 | 0.237 |
| | | E | 85 | 125 | 15 | 13.6 | 6 | 250 | 0.707 | 0.424 | 0.283 |
| | | E | 85 | 125 | 15 | 13.6 | 6 | 500 | 0.500 | 0.300 | 0.200 |
| | 100 | D | 85 | 125 | 15 | 20.0 | 10 | 300 | 0.592 | 0.355 | 0.237 |
| | | D | 85 | 125 | 15 | 20.0 | 10 | 400 | 0.512 | 0.307 | 0.205 |
| | | E | 85 | 125 | 15 | 20.0 | 10 | 250 | 0.707 | 0.424 | 0.283 |
| | | E | 85 | 125 | 15 | 20.0 | 10 | 300 | 0.645 | 0.387 | 0.258 |
| | 150 | D | 85 | 125 | 15 | 30.0 | 10 | 450 | 0.483 | 0.290 | 0.193 |
| | | D | 85 | 125 | 15 | 30.0 | 10 | 600 | 0.418 | 0.251 | 0.167 |
| | | E | 85 | 125 | 15 | 30.0 | 10 | 180 | 0.833 | 0.500 | 0.333 |
| | | E | 85 | 125 | 15 | 30.0 | 10 | 250 | 0.707 | 0.424 | 0.283 |
| | 220 | E | 85 | 125 | 15 | 44.0 | 12 | 450 | 0.527 | 0.316 | 0.211 |
| | | E | 85 | 125 | 15 | 44.0 | 12 | 600 | 0.456 | 0.274 | 0.183 |
| | | V | 85 | 125 | 15 | 44.0 | 12 | 250 | 0.775 | 0.465 | 0.310 |
| | | V | 85 | 125 | 15 | 44.0 | 12 | 400 | 0.612 | 0.367 | 0.245 |
| | 330 | E | 85 | 125 | 15 | 66.0 | 12 | 450 | 0.527 | 0.316 | 0.211 |
| | | E | 85 | 125 | 15 | 66.0 | 12 | 600 | 0.456 | 0.274 | 0.183 |
| | | V | 85 | 125 | 15 | 66.0 | 12 | 450 | 0.577 | 0.346 | 0.231 |
| V | | 85 | 125 | 15 | 66.0 | 12 | 600 | 0.500 | 0.300 | 0.200 | |
| 25 | 1.5 | A | 85 | 125 | 17 | 0.5 | 6 | 4500 | 0.120 | 0.072 | 0.048 |
| | | A | 85 | 125 | 17 | 0.5 | 6 | 7500 | 0.093 | 0.056 | 0.037 |
| | | B | 85 | 125 | 17 | 0.5 | 6 | 3000 | 0.158 | 0.095 | 0.063 |
| | | B | 85 | 125 | 17 | 0.5 | 6 | 5000 | 0.122 | 0.073 | 0.049 |
| | 2.2 | A | 85 | 125 | 17 | 0.6 | 6 | 3000 | 0.147 | 0.088 | 0.059 |
| | | A | 85 | 125 | 17 | 0.6 | 6 | 8000 | 0.090 | 0.054 | 0.036 |
| | | B | 85 | 125 | 17 | 0.6 | 6 | 2500 | 0.173 | 0.104 | 0.069 |
| | | B | 85 | 125 | 17 | 0.6 | 6 | 5000 | 0.122 | 0.073 | 0.049 |
| | 3.3 | B | 85 | 125 | 17 | 0.8 | 6 | 2000 | 0.194 | 0.116 | 0.077 |
| | | B | 85 | 125 | 17 | 0.8 | 6 | 3000 | 0.158 | 0.095 | 0.063 |
| | | C | 85 | 125 | 17 | 0.8 | 6 | 1200 | 0.274 | 0.164 | 0.110 |
| | | C | 85 | 125 | 17 | 0.8 | 6 | 2000 | 0.212 | 0.127 | 0.085 |
| | 4.7 | B | 85 | 125 | 17 | 1.2 | 6 | 1000 | 0.274 | 0.164 | 0.110 |
| | | B | 85 | 125 | 17 | 1.2 | 6 | 1200 | 0.250 | 0.150 | 0.100 |
| | | C | 85 | 125 | 17 | 1.2 | 6 | 1000 | 0.300 | 0.180 | 0.120 |
| | | C | 85 | 125 | 17 | 1.2 | 6 | 2000 | 0.212 | 0.127 | 0.085 |
| | 6.8 | B | 85 | 125 | 17 | 1.7 | 6 | 2000 | 0.194 | 0.116 | 0.077 |
| | | B | 85 | 125 | 17 | 1.7 | 6 | 2500 | 0.173 | 0.104 | 0.069 |
| | | C | 85 | 125 | 17 | 1.7 | 6 | 1000 | 0.300 | 0.180 | 0.120 |
| | | C | 85 | 125 | 17 | 1.7 | 6 | 1500 | 0.245 | 0.147 | 0.098 |
| | | D | 85 | 125 | 17 | 1.7 | 6 | 700 | 0.387 | 0.232 | 0.155 |
| | | D | 85 | 125 | 17 | 1.7 | 6 | 1000 | 0.324 | 0.194 | 0.130 |
| | 10 | B | 85 | 125 | 17 | 2.5 | 8 | 1500 | 0.224 | 0.134 | 0.089 |
| | | B | 85 | 125 | 17 | 2.5 | 8 | 2000 | 0.194 | 0.116 | 0.077 |
| | | C | 85 | 125 | 17 | 2.5 | 6 | 900 | 0.316 | 0.190 | 0.126 |
| | | C | 85 | 125 | 17 | 2.5 | 6 | 1200 | 0.274 | 0.164 | 0.110 |
| | | D | 85 | 125 | 17 | 2.5 | 6 | 450 | 0.483 | 0.290 | 0.193 |
| | | D | 85 | 125 | 17 | 2.5 | 6 | 800 | 0.362 | 0.217 | 0.145 |
| | 15 | C | 85 | 125 | 17 | 3.8 | 6 | 500 | 0.424 | 0.255 | 0.170 |
| | | C | 85 | 125 | 17 | 3.8 | 6 | 1000 | 0.300 | 0.180 | 0.120 |
| | | D | 85 | 125 | 17 | 3.8 | 6 | 400 | 0.512 | 0.307 | 0.205 |
| | | D | 85 | 125 | 17 | 3.8 | 6 | 600 | 0.418 | 0.251 | 0.167 |
| 22 | C | 85 | 125 | 17 | 5.5 | 6 | 800 | 0.335 | 0.201 | 0.134 | |

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_{max}=2.2 1.0V U_{min}=1.0 0.5V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +125 The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20L

| Rated Voltage (V) | Rated CAP (µF) | Case Code | Rated Temp (°C) | Category Temp (°C) | Category Voltage (V) | Max DCL(µA) @25°C | Max DF(%) @25°C 100Hz | Max ESR (mΩ) @25°C 100KHz | Max Ripple @100kHz IRMS(A) | | | |
|-------------------|----------------|-----------|-----------------|--------------------|----------------------|-------------------|-----------------------|---------------------------|----------------------------|-------|-------|-------|
| | | | | | | | | | 25°C | 85°C | 125°C | |
| 25 | 22 | C | 85 | 125 | 17 | 5.5 | 6 | 1000 | 0.300 | 0.180 | 0.120 | |
| | | D | 85 | 125 | 17 | 5.5 | 6 | 400 | 0.512 | 0.307 | 0.205 | |
| | | D | 85 | 125 | 17 | 5.5 | 6 | 600 | 0.418 | 0.251 | 0.167 | |
| | 33 | D | 85 | 125 | 17 | 8.3 | 8 | 300 | 0.592 | 0.355 | 0.237 | |
| | | D | 85 | 125 | 17 | 8.3 | 8 | 500 | 0.458 | 0.275 | 0.183 | |
| | | E | 85 | 125 | 17 | 8.3 | 6 | 250 | 0.707 | 0.424 | 0.283 | |
| | 47 | E | 85 | 125 | 17 | 8.3 | 6 | 500 | 0.500 | 0.300 | 0.200 | |
| | | D | 85 | 125 | 17 | 11.8 | 8 | 350 | 0.548 | 0.329 | 0.219 | |
| | | D | 85 | 125 | 17 | 11.8 | 8 | 500 | 0.458 | 0.275 | 0.183 | |
| | 68 | E | 85 | 125 | 17 | 11.8 | 6 | 300 | 0.645 | 0.387 | 0.258 | |
| | | E | 85 | 125 | 17 | 11.8 | 6 | 600 | 0.456 | 0.274 | 0.183 | |
| | | V | 85 | 125 | 17 | 17.0 | 8 | 250 | 0.707 | 0.424 | 0.283 | |
| | 100 | E | 85 | 125 | 17 | 17.0 | 8 | 500 | 0.500 | 0.300 | 0.200 | |
| | | V | 85 | 125 | 17 | 17.0 | 8 | 250 | 0.775 | 0.465 | 0.310 | |
| | | V | 85 | 125 | 17 | 17.0 | 8 | 600 | 0.500 | 0.300 | 0.200 | |
| | 150 | E | 85 | 125 | 17 | 25.0 | 10 | 200 | 0.791 | 0.474 | 0.316 | |
| | | E | 85 | 125 | 17 | 25.0 | 10 | 250 | 0.707 | 0.424 | 0.283 | |
| | | V | 85 | 125 | 17 | 25.0 | 10 | 250 | 0.866 | 0.520 | 0.346 | |
| 35 | 0.47 | A | 85 | 125 | 23 | 0.5 | 6 | 4000 | 0.127 | 0.076 | 0.051 | |
| | | A | 85 | 125 | 23 | 0.5 | 6 | 8000 | 0.090 | 0.054 | 0.036 | |
| | 0.68 | A | 85 | 125 | 23 | 0.5 | 6 | 6000 | 0.104 | 0.062 | 0.042 | |
| | | A | 85 | 125 | 23 | 0.5 | 6 | 7000 | 0.096 | 0.058 | 0.039 | |
| | 1 | A | 85 | 125 | 23 | 0.5 | 6 | 6000 | 0.104 | 0.062 | 0.042 | |
| | | A | 85 | 125 | 23 | 0.5 | 6 | 7000 | 0.096 | 0.058 | 0.039 | |
| | | B | 85 | 125 | 23 | 0.5 | 4 | 2500 | 0.173 | 0.104 | 0.069 | |
| | 1.5 | B | 85 | 125 | 23 | 0.5 | 4 | 3000 | 0.158 | 0.095 | 0.063 | |
| | | B | 85 | 125 | 23 | 0.5 | 6 | 3000 | 0.158 | 0.095 | 0.063 | |
| | | C | 85 | 125 | 23 | 0.5 | 6 | 4000 | 0.137 | 0.082 | 0.055 | |
| | 2.2 | C | 85 | 125 | 23 | 0.5 | 6 | 2500 | 0.190 | 0.114 | 0.076 | |
| | | C | 85 | 125 | 23 | 0.5 | 6 | 3000 | 0.173 | 0.104 | 0.069 | |
| | | B | 85 | 125 | 23 | 0.8 | 6 | 2500 | 0.173 | 0.104 | 0.069 | |
| | 3.3 | B | 85 | 125 | 23 | 0.8 | 6 | 3000 | 0.158 | 0.095 | 0.063 | |
| | | C | 85 | 125 | 23 | 0.8 | 6 | 2000 | 0.212 | 0.127 | 0.085 | |
| | | C | 85 | 125 | 23 | 0.8 | 6 | 2500 | 0.190 | 0.114 | 0.076 | |
| | 4.7 | B | 85 | 125 | 23 | 1.2 | 6 | 2500 | 0.173 | 0.104 | 0.069 | |
| | | B | 85 | 125 | 23 | 1.2 | 6 | 3000 | 0.158 | 0.095 | 0.063 | |
| | | C | 85 | 125 | 23 | 1.2 | 6 | 1200 | 0.274 | 0.164 | 0.110 | |
| | | C | 85 | 125 | 23 | 1.2 | 6 | 2000 | 0.212 | 0.127 | 0.085 | |
| | | D | 85 | 125 | 23 | 1.6 | 8 | 2000 | 0.194 | 0.116 | 0.077 | |
| | 6.8 | B | 85 | 125 | 23 | 1.6 | 8 | 2500 | 0.173 | 0.104 | 0.069 | |
| | | C | 85 | 125 | 23 | 1.6 | 6 | 800 | 0.335 | 0.201 | 0.134 | |
| | | C | 85 | 125 | 23 | 1.6 | 6 | 1000 | 0.300 | 0.180 | 0.120 | |
| | | D | 85 | 125 | 23 | 1.6 | 6 | 700 | 0.387 | 0.232 | 0.155 | |
| | | D | 85 | 125 | 23 | 1.6 | 6 | 1000 | 0.324 | 0.194 | 0.130 | |
| | 10 | C | 85 | 125 | 23 | 2.4 | 6 | 700 | 0.359 | 0.215 | 0.143 | |
| | | C | 85 | 125 | 23 | 2.4 | 6 | 1200 | 0.274 | 0.164 | 0.110 | |
| | | D | 85 | 125 | 23 | 2.4 | 6 | 600 | 0.418 | 0.251 | 0.167 | |
| | 10 | D | 85 | 125 | 23 | 2.4 | 6 | 1000 | 0.324 | 0.194 | 0.130 | |
| | | C | 85 | 125 | 23 | 3.5 | 6 | 700 | 0.359 | 0.215 | 0.143 | |
| | | D | 85 | 125 | 23 | 3.5 | 6 | 1000 | 0.300 | 0.180 | 0.120 | |
| | | | D | 85 | 125 | 23 | 3.5 | 6 | 400 | 0.512 | 0.307 | 0.205 |

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_{DC} =2.2 1.0V U_{AC}~1.0 0.5V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +125 The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20L

| Rated Voltage (V) | Rated CAP (µF) | Case Code | Rated Temp (°C) | Category Temp (°C) | Category Voltage (V) | Max DCL(µA) @25°C | Max DF(%) @25°C 100Hz | Max ESR (mΩ) @25°C 100KHz | Max Ripple @100kHz IRMS(A) | | |
|-------------------|----------------|-----------|-----------------|--------------------|----------------------|-------------------|-----------------------|---------------------------|----------------------------|-------|-------|
| | | | | | | | | | 25°C | 85°C | 125°C |
| 35 | 10 | D | 85 | 125 | 23 | 3.5 | 6 | 800 | 0.362 | 0.217 | 0.145 |
| | 15 | D | 85 | 125 | 23 | 5.3 | 6 | 350 | 0.548 | 0.329 | 0.219 |
| | | D | 85 | 125 | 23 | 5.3 | 6 | 600 | 0.418 | 0.251 | 0.167 |
| | | E | 85 | 125 | 23 | 5.3 | 6 | 300 | 0.645 | 0.387 | 0.258 |
| | | E | 85 | 125 | 23 | 5.3 | 6 | 600 | 0.456 | 0.274 | 0.183 |
| | 22 | D | 85 | 125 | 23 | 7.7 | 6 | 400 | 0.512 | 0.307 | 0.205 |
| | | D | 85 | 125 | 23 | 7.7 | 6 | 500 | 0.458 | 0.275 | 0.183 |
| | | E | 85 | 125 | 23 | 7.7 | 6 | 300 | 0.645 | 0.387 | 0.258 |
| | | E | 85 | 125 | 23 | 7.7 | 6 | 400 | 0.559 | 0.335 | 0.224 |
| | 33 | D | 85 | 125 | 23 | 11.6 | 8 | 500 | 0.458 | 0.275 | 0.183 |
| | | D | 85 | 125 | 23 | 11.6 | 8 | 700 | 0.387 | 0.232 | 0.155 |
| | | E | 85 | 125 | 23 | 11.6 | 6 | 300 | 0.645 | 0.387 | 0.258 |
| | | E | 85 | 125 | 23 | 11.6 | 6 | 600 | 0.456 | 0.274 | 0.183 |
| | 47 | D | 85 | 125 | 23 | 16.5 | 8 | 400 | 0.512 | 0.307 | 0.205 |
| | | D | 85 | 125 | 23 | 16.5 | 8 | 900 | 0.342 | 0.205 | 0.137 |
| | | E | 85 | 125 | 23 | 16.5 | 6 | 400 | 0.559 | 0.335 | 0.224 |
| E | | 85 | 125 | 23 | 16.5 | 6 | 600 | 0.456 | 0.274 | 0.183 | |
| 68 | E | 85 | 125 | 23 | 23.8 | 8 | 800 | 0.395 | 0.237 | 0.158 | |
| 50 | 0.47 | A | 85 | 125 | 33 | 0.5 | 6 | 3000 | 0.147 | 0.088 | 0.059 |
| | | A | 85 | 125 | 33 | 0.5 | 6 | 6000 | 0.104 | 0.062 | 0.042 |
| | 0.68 | B | 85 | 125 | 33 | 0.5 | 6 | 3000 | 0.158 | 0.095 | 0.063 |
| | | B | 85 | 125 | 33 | 0.5 | 6 | 6000 | 0.112 | 0.067 | 0.045 |
| | 1 | B | 85 | 125 | 33 | 0.5 | 6 | 2500 | 0.173 | 0.104 | 0.069 |
| | | B | 85 | 125 | 33 | 0.5 | 6 | 4000 | 0.137 | 0.082 | 0.055 |
| | | C | 85 | 125 | 33 | 0.5 | 4 | 1800 | 0.224 | 0.134 | 0.089 |
| | | C | 85 | 125 | 33 | 0.5 | 4 | 4000 | 0.150 | 0.090 | 0.060 |
| | 1.5 | C | 85 | 125 | 33 | 0.8 | 6 | 1800 | 0.224 | 0.134 | 0.089 |
| | | C | 85 | 125 | 33 | 0.8 | 6 | 3000 | 0.173 | 0.104 | 0.069 |
| | | D | 85 | 125 | 33 | 0.8 | 6 | 1000 | 0.324 | 0.194 | 0.130 |
| | 2.2 | D | 85 | 125 | 33 | 0.8 | 6 | 2500 | 0.205 | 0.123 | 0.082 |
| | | C | 85 | 125 | 33 | 1.1 | 6 | 1500 | 0.245 | 0.147 | 0.098 |
| | | C | 85 | 125 | 33 | 1.1 | 6 | 2000 | 0.212 | 0.127 | 0.085 |
| | | D | 85 | 125 | 33 | 1.1 | 6 | 700 | 0.387 | 0.232 | 0.155 |
| | 3.3 | D | 85 | 125 | 33 | 1.1 | 6 | 1000 | 0.324 | 0.194 | 0.130 |
| | | C | 85 | 125 | 33 | 1.7 | 6 | 700 | 0.359 | 0.215 | 0.143 |
| | | C | 85 | 125 | 33 | 1.7 | 6 | 1500 | 0.245 | 0.147 | 0.098 |
| | | D | 85 | 125 | 33 | 1.7 | 6 | 700 | 0.387 | 0.232 | 0.155 |
| | 4.7 | D | 85 | 125 | 33 | 1.7 | 6 | 1500 | 0.265 | 0.159 | 0.106 |
| | | C | 85 | 125 | 33 | 2.4 | 6 | 700 | 0.359 | 0.215 | 0.143 |
| | | C | 85 | 125 | 33 | 2.4 | 6 | 1000 | 0.300 | 0.180 | 0.120 |
| | | D | 85 | 125 | 33 | 2.4 | 6 | 600 | 0.418 | 0.251 | 0.167 |
| | 6.8 | D | 85 | 125 | 33 | 2.4 | 6 | 1000 | 0.324 | 0.194 | 0.130 |
| | | D | 85 | 125 | 33 | 3.4 | 6 | 600 | 0.418 | 0.251 | 0.167 |
| | | D | 85 | 125 | 33 | 3.4 | 6 | 800 | 0.362 | 0.217 | 0.145 |
| | | E | 85 | 125 | 33 | 3.4 | 6 | 500 | 0.500 | 0.300 | 0.200 |
| | 10 | E | 85 | 125 | 33 | 3.4 | 6 | 1000 | 0.354 | 0.212 | 0.141 |
| | | D | 85 | 125 | 33 | 5.0 | 6 | 400 | 0.512 | 0.307 | 0.205 |
| | | D | 85 | 125 | 33 | 5.0 | 6 | 600 | 0.418 | 0.251 | 0.167 |
| | | E | 85 | 125 | 33 | 5.0 | 6 | 400 | 0.559 | 0.335 | 0.224 |
| | 15 | E | 85 | 125 | 33 | 5.0 | 6 | 800 | 0.395 | 0.237 | 0.158 |
| E | | 85 | 125 | 33 | 7.5 | 6 | 400 | 0.559 | 0.335 | 0.224 | |
| E | | 85 | 125 | 33 | 7.5 | 6 | 500 | 0.500 | 0.300 | 0.200 | |
| 22 | E | 85 | 125 | 33 | 11.0 | 8 | 400 | 0.559 | 0.335 | 0.224 | |
| | E | 85 | 125 | 33 | 11.0 | 8 | 500 | 0.500 | 0.300 | 0.200 | |

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_{DC} =2.2 1.0V U_{AC}~1.0 0.5V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +125 The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

TS20L

| Rated Voltage (V) | Rated CAP (µF) | Case Code | Rated Temp (°C) | Category Temp (°C) | Category Voltage (V) | Max DCL(µA) @ 25°C | Max DF(%) @ 25°C 100Hz | Max ESR (mΩ) @ 25°C 100KHz | Max Ripple @ 100kHz IRMS(A) | | |
|-------------------|----------------|-----------|-----------------|--------------------|----------------------|--------------------|------------------------|----------------------------|-----------------------------|-------|-------|
| | | | | | | | | | 25°C | 85°C | 125°C |
| 63 | 1 | C | 85 | 125 | 40 | 0.6 | 6 | 2000 | 0.212 | 0.127 | 0.085 |
| | 1.5 | D | 85 | 125 | 40 | 0.9 | 6 | 2500 | 0.205 | 0.123 | 0.082 |
| | 2.2 | D | 85 | 125 | 40 | 1.4 | 6 | 1500 | 0.265 | 0.159 | 0.106 |
| | 3.3 | D | 85 | 125 | 40 | 2.1 | 6 | 1200 | 0.296 | 0.177 | 0.118 |
| | 4.7 | E | 85 | 125 | 40 | 3.0 | 6 | 800 | 0.395 | 0.237 | 0.158 |
| | 6.8 | E | 85 | 125 | 40 | 4.3 | 6 | 600 | 0.456 | 0.274 | 0.183 |
| | 10 | E | 85 | 125 | 40 | 6.3 | 8 | 450 | 0.527 | 0.316 | 0.211 |
| | 15 | E | 85 | 125 | 40 | 9.5 | 8 | 300 | 0.645 | 0.387 | 0.258 |
| | | V | 85 | 125 | 40 | 9.5 | 8 | 300 | 0.707 | 0.424 | 0.283 |
| 22 | V | 85 | 125 | 40 | 13.9 | 8 | 300 | 0.707 | 0.424 | 0.283 | |

1. Please do not use multimeter through the measuring procedures.
2. Capacitance and DF measured at :100Hz U_{max} =2.2 1.0V U_{min}~1.0 0.5V, Frequency=100Hz. Test only applied in series equivalent circuit.
3. Voltage derating is applied at +125 The DCL parameter should be read after 5 minutes when it connected to the circuit
4. Special size and demand could consult with us.

Land Dimension / Courtyard

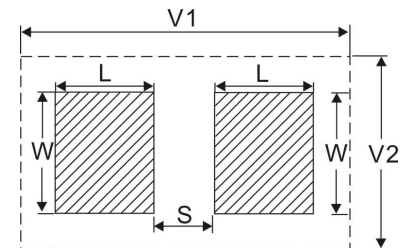
| Case Code | Density Level A: Maximum (Most) Land Protrusion (mm) | | | | | Density Level B : Median (Nominal) Land Protrusion (mm) | | | | | Density Level C: Minimum (Least) Land Protrusion (mm) | | | | |
|-----------|--|------|------|-------|-----|---|------|------|------|-----|---|------|------|------|------|
| | W | L | S | V1 | V2 | W | L | S | V1 | V2 | W | L | S | V1 | V2 |
| A | 1.35 | 2.20 | 0.62 | 6.02 | 2.8 | 1.23 | 1.8 | 0.82 | 4.92 | 2.3 | 1.13 | 1.42 | 0.98 | 4.06 | 2.04 |
| 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.

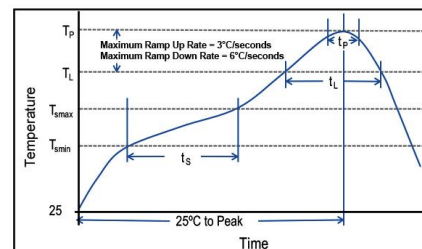
Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. 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 Temperature | 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, E**Case Size A, B, C



Recommended Reflow Profile

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