

- *Long 3000 hour life at 105°C with high ripple current capability*
- *2 and 3 pin versions available*
- *Can vent construction*



|                                        |                                                                                                               |      |      |         |      |      |               |                                              |       |           |      |      |       |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------|------|------|---------|------|------|---------------|----------------------------------------------|-------|-----------|------|------|-------|
| Rated Working Voltage:                 | 10 ~ 250 VDC                                                                                                  |      |      |         |      |      | 385 ~ 450 VDC |                                              |       |           |      |      |       |
| Operating Temperature:                 | -40 ~ +105°C                                                                                                  |      |      |         |      |      | -25 ~ +105°C  |                                              |       |           |      |      |       |
| Nominal Capacitance:                   | 180~68000μF                                                                                                   |      |      |         |      |      | 82~560μF      |                                              |       |           |      |      |       |
| Capacitance Tolerance:                 | ± 20%                                                                                                         |      |      |         |      |      |               |                                              |       |           |      |      |       |
| Dissipation Factor:<br>(120 Hz, +20°C) | Working Voltage [V]:                                                                                          |      | 10   | 16      | 25   | 35   | 50            | 63                                           | 80    | 100 ~ 450 |      |      |       |
|                                        | Max. D.F. (%):                                                                                                |      | 55   | 45      | 35   | 30   | 25            | 20                                           | 17    | 15        |      |      |       |
|                                        | For capacitance values > 33000μF, add the value of: <div>(rated cap. [μF] - 33000)<br/>1000</div>             |      |      |         |      |      |               |                                              |       |           |      |      |       |
| Leakage Current:                       | 3√C (μA) max. after 5 minutes; C = Capacitance in μF, V = WV                                                  |      |      |         |      |      |               |                                              |       |           |      |      |       |
| Ripple Current Multipliers:            | Frequency(Hz):                                                                                                | 50   | 60   | 100~120 | 500  | 1k   | 10k           | Ripple Current Ambient Temperature Factors** |       |           |      |      |       |
|                                        | 16~100WV:                                                                                                     | 0.93 | 0.95 | 1.0     | 1.05 | 1.08 | 1.15          | Temperature (°C):                            | 105°C | 85°C      | 70°C | 60°C | ≤45°C |
|                                        | 160~450WV:                                                                                                    | 0.75 | 0.8  | 1.0     | 1.2  | 1.25 | 1.4           | Multiplier:                                  | 1.0   | 1.7       | 2.0  | 2.2  | 2.35  |
| Endurance:                             | 3000 hours* at +105°C with maximum specified ripple current (see page 4)<br>*2000 hours for 20mm length sizes |      |      |         |      |      |               |                                              |       |           |      |      |       |

| Diameter |      |
|----------|------|
| Diameter | Code |
| 22       | B    |
| 25       | C    |
| 30       | D    |
| 35       | E    |

Technical drawing of a mechanical part showing dimensions: 2.0 max., 0.8  $^{+0.2}_{-0.1}$ , 3.5, 4.0  $\pm 0.1$ , and 1.5  $\pm 0.2$ .

4mm Length: Standard on 3 Pin, Available on 2 Pin Mounting Styles

## TS-HA Standard Ratings

Part numbers shown with 2 pins

| Cap.<br>(μF)                 | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> ) |        | 20°C ESR (Ω, max.) |       | Panasonic Part Number (By Terminal Length) |                       |
|------------------------------|--------------------|------------------------------------|--------|--------------------|-------|--------------------------------------------|-----------------------|
|                              |                    | 120Hz                              | 10kHz~ | 120Hz              | 20kHz | 6.3mm Length Terminal                      | 4.0mm Length Terminal |
| 10 VDC Working, 13 VDC Surge |                    |                                    |        |                    |       |                                            |                       |
| 10000                        | 22 x 25            | 1.80                               | 2.07   | 0.075              | 0.063 | ECOS1AA103BA                               | ECEC1AA103BA          |
| 12000                        | 22 x 30            | 2.20                               | 2.53   | 0.062              | 0.053 | ECOS1AA123BA                               | ECEC1AA123BA          |
| 15000                        | 22 x 35            | 2.30                               | 2.65   | 0.053              | 0.045 | ECOS1AA153BA                               | ECEC1AA153BA          |
|                              | 25 x 25            | 2.30                               | 2.65   | 0.053              | 0.045 | ECOS1AA153CA                               | ECEC1AA153CA          |
| 18000                        | 22 x 40            | 2.40                               | 2.76   | 0.044              | 0.038 | ECOS1AA183BA                               | ECEC1AA183BA          |
|                              | 25 x 30            | 2.40                               | 2.76   | 0.044              | 0.038 | ECOS1AA183CA                               | ECEC1AA183CA          |
| 22000                        | 22 x 45            | 2.60                               | 2.99   | 0.038              | 0.032 | ECOS1AA223BA                               | ECEC1AA223BA          |
|                              | 25 x 35            | 2.60                               | 2.99   | 0.038              | 0.032 | ECOS1AA223CA                               | ECEC1AA223CA          |
|                              | 30 x 25            | 2.60                               | 2.99   | 0.038              | 0.032 | ECOS1AA223DA                               | ECEC1AA223DA          |
| 27000                        | 22 x 50            | 3.10                               | 3.57   | 0.033              | 0.028 | ECOS1AA273BA                               | ECEC1AA273BA          |
|                              | 25 x 40            | 3.10                               | 3.57   | 0.033              | 0.028 | ECOS1AA273CA                               | ECEC1AA273CA          |
|                              | 30 x 30            | 3.10                               | 3.57   | 0.033              | 0.028 | ECOS1AA273DA                               | ECEC1AA273DA          |
|                              | 35 x 25            | 3.10                               | 3.57   | 0.033              | 0.028 | ECOS1AA273EA                               | ECEC1AA273EA          |
| 33000                        | 25 x 45            | 3.40                               | 3.91   | 0.027              | 0.023 | ECOS1AA333CA                               | ECEC1AA333CA          |
|                              | 30 x 35            | 3.40                               | 3.91   | 0.027              | 0.023 | ECOS1AA333DA                               | ECEC1AA333DA          |
|                              | 35 x 30            | 3.40                               | 3.91   | 0.027              | 0.023 | ECOS1AA333EA                               | ECEC1AA333EA          |
| 39000                        | 25 x 50            | 3.70                               | 4.26   | 0.025              | 0.021 | ECOS1AA393CA                               | ECEC1AA393CA          |
|                              | 30 x 40            | 3.70                               | 4.26   | 0.025              | 0.021 | ECOS1AA393DA                               | ECEC1AA393DA          |
|                              | 35 x 30            | 3.70                               | 4.26   | 0.025              | 0.021 | ECOS1AA393EA                               | ECEC1AA393EA          |
| 47000                        | 30 x 45            | 4.20                               | 4.83   | 0.023              | 0.020 | ECOS1AA473DA                               | ECEC1AA473DA          |
|                              | 35 x 35            | 4.20                               | 4.83   | 0.023              | 0.020 | ECOS1AA473EA                               | ECEC1AA473EA          |
| 56000                        | 30 x 50            | 5.00                               | 5.75   | 0.022              | 0.019 | ECOS1AA563DA                               | ECEC1AA563DA          |
|                              | 35 x 40            | 5.00                               | 5.75   | 0.022              | 0.021 | ECOS1AA563EA                               | ECEC1AA563EA          |
| 68000                        | 35 x 50            | 5.50                               | 6.33   | 0.021              | 0.020 | ECOS1AA683EA                               | ECEC1AA683EA          |
| 16 VDC Working, 20 VDC Surge |                    |                                    |        |                    |       |                                            |                       |
| 3300                         | 22 x 20            | 1.30                               | 1.50   | 0.216              | 0.173 | ECOS1CA332BL                               | ECEC1CA332BL          |
| 4700                         | 25 x 20            | 1.60                               | 1.84   | 0.152              | 0.121 | ECOS1CA472CL                               | ECEC1CA472CL          |
| 6800                         | 22 x 25            | 2.20                               | 2.53   | 0.085              | 0.068 | ECOS1CA682BA                               | ECEC1CA682BA          |
|                              | 30 x 20            | 1.80                               | 2.07   | 0.105              | 0.084 | ECOS1CA682DL                               | ECEC1CA682DL          |
| 8200                         | 22 x 30            | 2.40                               | 2.76   | 0.071              | 0.057 | ECOS1CA822BA                               | ECEC1CA822BA          |
| 10000                        | 22 x 30            | 2.60                               | 2.99   | 0.066              | 0.053 | ECOS1CA103BA                               | ECEC1CA103BA          |
|                              | 25 x 25            | 2.60                               | 2.99   | 0.066              | 0.053 | ECOS1CA103CA                               | ECEC1CA103CA          |
|                              | 35 x 20            | 2.40                               | 2.76   | 0.071              | 0.057 | ECOS1CA103EL                               | ECEC1CA103EL          |
| 12000                        | 22 x 35            | 2.90                               | 3.34   | 0.055              | 0.044 | ECOS1CA123BA                               | ECEC1CA123BA          |
|                              | 25 x 30            | 2.90                               | 3.34   | 0.055              | 0.044 | ECOS1CA123CA                               | ECEC1CA123CA          |
|                              | 30 x 25            | 2.90                               | 3.34   | 0.055              | 0.044 | ECOS1CA123DA                               | ECEC1CA123DA          |
| 15000                        | 22 x 40            | 3.20                               | 3.68   | 0.046              | 0.037 | ECOS1CA153BA                               | ECEC1CA153BA          |
|                              | 25 x 35            | 3.20                               | 3.68   | 0.046              | 0.037 | ECOS1CA153CA                               | ECEC1CA153CA          |
|                              | 30 x 30            | 3.20                               | 3.68   | 0.046              | 0.037 | ECOS1CA153DA                               | ECEC1CA153DA          |
| 18000                        | 22 x 45            | 3.50                               | 4.03   | 0.040              | 0.034 | ECOS1CA183BA                               | ECEC1CA183BA          |
|                              | 25 x 40            | 3.50                               | 4.03   | 0.040              | 0.034 | ECOS1CA183CA                               | ECEC1CA183CA          |
|                              | 30 x 30            | 3.50                               | 4.03   | 0.040              | 0.034 | ECOS1CA183DA                               | ECEC1CA183DA          |
|                              | 35 x 25            | 3.50                               | 4.03   | 0.040              | 0.034 | ECOS1CA183EA                               | ECEC1CA183EA          |
| 22000                        | 25 x 45            | 3.80                               | 4.37   | 0.033              | 0.028 | ECOS1CA223CA                               | ECEC1CA223CA          |
|                              | 30 x 35            | 3.80                               | 4.37   | 0.033              | 0.028 | ECOS1CA223DA                               | ECEC1CA223DA          |
|                              | 35 x 30            | 3.80                               | 4.37   | 0.033              | 0.028 | ECOS1CA223EA                               | ECEC1CA223EA          |
| 27000                        | 25 x 50            | 4.20                               | 4.83   | 0.028              | 0.025 | ECOS1CA273CA                               | ECEC1CA273CA          |
|                              | 30 x 40            | 4.20                               | 4.83   | 0.028              | 0.025 | ECOS1CA273DA                               | ECEC1CA273DA          |
|                              | 35 x 30            | 4.20                               | 4.83   | 0.028              | 0.025 | ECOS1CA273EA                               | ECEC1CA273EA          |
| 33000                        | 30 x 45            | 4.70                               | 5.41   | 0.023              | 0.020 | ECOS1CA333DA                               | ECEC1CA333DA          |
|                              | 35 x 35            | 4.70                               | 5.41   | 0.023              | 0.020 | ECOS1CA333EA                               | ECEC1CA333EA          |
| 39000                        | 30 x 50            | 5.10                               | 5.87   | 0.022              | 0.020 | ECOS1CA393DA                               | ECEC1CA393DA          |
|                              | 35 x 40            | 5.10                               | 5.87   | 0.022              | 0.020 | ECOS1CA393EA                               | ECEC1CA393EA          |
| 47000                        | 35 x 45            | 5.50                               | 6.33   | 0.020              | 0.018 | ECOS1CA473EA                               | ECEC1CA473EA          |
| 56000                        | 35 x 50            | 6.00                               | 6.90   | 0.019              | 0.017 | ECOS1CA563EA                               | ECEC1CA563EA          |
| 25 VDC Working, 32 VDC Surge |                    |                                    |        |                    |       |                                            |                       |
| 2200                         | 22 x 20            | 1.30                               | 1.50   | 0.241              | 0.181 | ECOS1EA222BL                               | ECEC1EA222BL          |
| 3300                         | 25 x 20            | 1.60                               | 1.84   | 0.161              | 0.121 | ECOS1EA332CL                               | ECEC1EA332CL          |
| 4700                         | 22 x 25            | 2.00                               | 2.30   | 0.106              | 0.079 | ECOS1EA472BA                               | ECEC1EA472BA          |
|                              | 30 x 20            | 1.80                               | 2.07   | 0.113              | 0.085 | ECOS1EA472DL                               | ECEC1EA472DL          |
| 5600                         | 22 x 30            | 2.20                               | 2.53   | 0.089              | 0.067 | ECOS1EA562BA                               | ECEC1EA562BA          |
| 6800                         | 22 x 30            | 2.40                               | 2.76   | 0.073              | 0.055 | ECOS1EA682BA                               | ECEC1EA682BA          |
|                              | 25 x 25            | 2.40                               | 2.76   | 0.073              | 0.055 | ECOS1EA682CA                               | ECEC1EA682CA          |
|                              | 35 x 20            | 2.30                               | 2.65   | 0.080              | 0.060 | ECOS1EA682EL                               | ECEC1EA682EL          |

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## TS-HA Standard Ratings (continued)

Part numbers shown with 2 pins

| Cap.<br>( $\mu$ F)                       | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ ) |        | 20°C ESR ( $\Omega$ , max.) |       | Panasonic Part Number (By Terminal Length) |                       |
|------------------------------------------|--------------------|------------------------------|--------|-----------------------------|-------|--------------------------------------------|-----------------------|
|                                          |                    | 120Hz                        | 10kHz~ | 120Hz                       | 20kHz | 6.3mm Length Terminal                      | 4.0mm Length Terminal |
| 25 VDC Working, 32 VDC Surge (continued) |                    |                              |        |                             |       |                                            |                       |
| 8200                                     | 22 x 35            | 2.70                         | 3.11   | 0.061                       | 0.045 | ECOS1EA822BA                               | ECEC1EA822BA          |
|                                          | 25 x 30            | 2.70                         | 3.11   | 0.061                       | 0.045 | ECOS1EA822CA                               | ECEC1EA822CA          |
|                                          | 30 x 25            | 2.70                         | 3.11   | 0.061                       | 0.045 | ECOS1EA822DA                               | ECEC1EA822DA          |
| 10000                                    | 22 x 40            | 3.00                         | 3.45   | 0.051                       | 0.039 | ECOS1EA103BA                               | ECEC1EA103BA          |
|                                          | 25 x 35            | 3.00                         | 3.45   | 0.051                       | 0.039 | ECOS1EA103CA                               | ECEC1EA103CA          |
|                                          | 30 x 30            | 3.00                         | 3.45   | 0.051                       | 0.039 | ECOS1EA103DA                               | ECEC1EA103DA          |
| 12000                                    | 22 x 45            | 3.20                         | 3.68   | 0.044                       | 0.033 | ECOS1EA123BA                               | ECEC1EA123BA          |
|                                          | 25 x 40            | 3.20                         | 3.68   | 0.044                       | 0.035 | ECOS1EA123CA                               | ECEC1EA123CA          |
|                                          | 30 x 30            | 3.20                         | 3.68   | 0.044                       | 0.035 | ECOS1EA123DA                               | ECEC1EA123DA          |
|                                          | 35 x 25            | 3.20                         | 3.68   | 0.044                       | 0.035 | ECOS1EA123EA                               | ECEC1EA123EA          |
| 15000                                    | 25 x 45            | 3.60                         | 4.14   | 0.036                       | 0.031 | ECOS1EA153CA                               | ECEC1EA153CA          |
|                                          | 30 x 35            | 3.60                         | 4.14   | 0.036                       | 0.031 | ECOS1EA153DA                               | ECEC1EA153DA          |
|                                          | 35 x 30            | 3.60                         | 4.14   | 0.036                       | 0.031 | ECOS1EA153EA                               | ECEC1EA153EA          |
| 18000                                    | 25 x 50            | 3.90                         | 4.49   | 0.030                       | 0.027 | ECOS1EA183CA                               | ECEC1EA183CA          |
|                                          | 30 x 40            | 3.90                         | 4.49   | 0.030                       | 0.027 | ECOS1EA183DA                               | ECEC1EA183DA          |
|                                          | 35 x 35            | 3.90                         | 4.49   | 0.030                       | 0.027 | ECOS1EA183EA                               | ECEC1EA183EA          |
| 22000                                    | 30 x 45            | 4.30                         | 4.95   | 0.025                       | 0.022 | ECOS1EA223DA                               | ECEC1EA223DA          |
|                                          | 35 x 35            | 4.30                         | 4.95   | 0.025                       | 0.022 | ECOS1EA223EA                               | ECEC1EA223EA          |
| 27000                                    | 35 x 45            | 4.80                         | 5.52   | 0.021                       | 0.019 | ECOS1EA273EA                               | ECEC1EA273EA          |
| 33000                                    | 35 x 50            | 5.50                         | 6.33   | 0.018                       | 0.016 | ECOS1EA333EA                               | ECEC1EA333EA          |
| 35 VDC Working, 44 VDC Surge             |                    |                              |        |                             |       |                                            |                       |
| 1500                                     | 22 x 20            | 1.10                         | 1.27   | 0.287                       | 0.216 | ECOS1VA152BL                               | ECEC1VA152BL          |
| 2200                                     | 25 x 20            | 1.40                         | 1.61   | 0.196                       | 0.147 | ECOS1VA222CL                               | ECEC1VA222CL          |
| 3300                                     | 22 x 25            | 1.90                         | 2.19   | 0.121                       | 0.090 | ECOS1VA332BA                               | ECEC1VA332BA          |
|                                          | 30 x 20            | 1.70                         | 1.96   | 0.131                       | 0.098 | ECOS1VA332DL                               | ECEC1VA332DL          |
| 3900                                     | 22 x 30            | 2.00                         | 2.30   | 0.111                       | 0.083 | ECOS1VA392BA                               | ECEC1VA392BA          |
| 4700                                     | 22 x 35            | 2.20                         | 2.53   | 0.088                       | 0.066 | ECOS1VA472BA                               | ECEC1VA472BA          |
|                                          | 25 x 25            | 2.20                         | 2.53   | 0.088                       | 0.066 | ECOS1VA472CA                               | ECEC1VA472CA          |
|                                          | 35 x 20            | 2.00                         | 2.30   | 0.095                       | 0.071 | ECOS1VA472EL                               | ECEC1VA472EL          |
| 5600                                     | 22 x 35            | 2.40                         | 2.76   | 0.074                       | 0.056 | ECOS1VA562BA                               | ECEC1VA562BA          |
|                                          | 25 x 30            | 2.40                         | 2.76   | 0.074                       | 0.056 | ECOS1VA562CA                               | ECEC1VA562CA          |
|                                          | 30 x 25            | 2.40                         | 2.76   | 0.074                       | 0.056 | ECOS1VA562DA                               | ECEC1VA562DA          |
| 6800                                     | 22 x 40            | 2.60                         | 2.99   | 0.061                       | 0.046 | ECOS1VA682BA                               | ECEC1VA682BA          |
|                                          | 25 x 35            | 2.60                         | 2.99   | 0.061                       | 0.046 | ECOS1VA682CA                               | ECEC1VA682CA          |
|                                          | 30 x 30            | 2.60                         | 2.99   | 0.061                       | 0.046 | ECOS1VA682DA                               | ECEC1VA682DA          |
| 8200                                     | 22 x 50            | 2.90                         | 3.34   | 0.051                       | 0.038 | ECOS1VA822BA                               | ECEC1VA822BA          |
|                                          | 25 x 40            | 2.90                         | 3.34   | 0.051                       | 0.038 | ECOS1VA822CA                               | ECEC1VA822CA          |
|                                          | 30 x 30            | 2.90                         | 3.34   | 0.051                       | 0.038 | ECOS1VA822DA                               | ECEC1VA822DA          |
|                                          | 35 x 25            | 2.90                         | 3.34   | 0.051                       | 0.038 | ECOS1VA822EA                               | ECEC1VA822EA          |
| 10000                                    | 25 x 45            | 3.20                         | 3.68   | 0.041                       | 0.031 | ECOS1VA103CA                               | ECEC1VA103CA          |
|                                          | 30 x 35            | 3.20                         | 3.68   | 0.041                       | 0.031 | ECOS1VA103DA                               | ECEC1VA103DA          |
|                                          | 35 x 30            | 3.20                         | 3.68   | 0.041                       | 0.031 | ECOS1VA103EA                               | ECEC1VA103EA          |
| 12000                                    | 25 x 50            | 3.50                         | 4.03   | 0.035                       | 0.026 | ECOS1VA123CA                               | ECEC1VA123CA          |
|                                          | 30 x 40            | 3.50                         | 4.03   | 0.035                       | 0.026 | ECOS1VA123DA                               | ECEC1VA123DA          |
|                                          | 35 x 30            | 3.50                         | 4.03   | 0.035                       | 0.026 | ECOS1VA123EA                               | ECEC1VA123EA          |
| 15000                                    | 30 x 45            | 3.90                         | 4.49   | 0.030                       | 0.022 | ECOS1VA153DA                               | ECEC1VA153DA          |
|                                          | 35 x 35            | 3.90                         | 4.49   | 0.030                       | 0.022 | ECOS1VA153EA                               | ECEC1VA153EA          |
| 18000                                    | 35 x 40            | 4.30                         | 4.95   | 0.028                       | 0.021 | ECOS1VA183EA                               | ECEC1VA183EA          |
| 22000                                    | 35 x 50            | 5.00                         | 5.75   | 0.023                       | 0.017 | ECOS1VA223EA                               | ECEC1VA223EA          |
| 50 VDC Working, 63 VDC Surge             |                    |                              |        |                             |       |                                            |                       |
| 1000                                     | 22 x 20            | 0.90                         | 1.04   | 0.265                       | 0.199 | ECOS1HA102BL                               | ECEC1HA102BL          |
| 1500                                     | 25 x 20            | 1.20                         | 1.38   | 0.177                       | 0.133 | ECOS1HA152CL                               | ECEC1HA152CL          |
| 1800                                     | 22 x 25            | 1.50                         | 1.73   | 0.129                       | 0.097 | ECOS1HA182BA                               | ECEC1HA182BA          |
| 2200                                     | 22 x 30            | 1.70                         | 1.96   | 0.105                       | 0.079 | ECOS1HA222BA                               | ECEC1HA222BA          |
|                                          | 30 x 20            | 1.40                         | 1.61   | 0.121                       | 0.090 | ECOS1HA222DL                               | ECEC1HA222DL          |
| 2700                                     | 22 x 30            | 1.80                         | 2.07   | 0.086                       | 0.064 | ECOS1HA272BA                               | ECEC1HA272BA          |
|                                          | 25 x 25            | 1.80                         | 2.07   | 0.086                       | 0.064 | ECOS1HA272CA                               | ECEC1HA272CA          |
| 3300                                     | 22 x 35            | 2.00                         | 2.30   | 0.070                       | 0.053 | ECOS1HA332BA                               | ECEC1HA332BA          |
|                                          | 25 x 30            | 2.00                         | 2.30   | 0.070                       | 0.053 | ECOS1HA332CA                               | ECEC1HA332CA          |
|                                          | 35 x 20            | 1.70                         | 1.96   | 0.085                       | 0.064 | ECOS1HA332EL                               | ECEC1HA332EL          |
| 3900                                     | 22 x 40            | 2.20                         | 2.53   | 0.064                       | 0.048 | ECOS1HA392BA                               | ECEC1HA392BA          |
|                                          | 25 x 35            | 2.20                         | 2.53   | 0.064                       | 0.048 | ECOS1HA392CA                               | ECEC1HA392CA          |
|                                          | 30 x 25            | 2.20                         | 2.53   | 0.064                       | 0.048 | ECOS1HA392DA                               | ECEC1HA392DA          |
| 4700                                     | 22 x 45            | 2.50                         | 2.88   | 0.053                       | 0.040 | ECOS1HA472BA                               | ECEC1HA472BA          |
|                                          | 25 x 40            | 2.50                         | 2.88   | 0.053                       | 0.040 | ECOS1HA472CA                               | ECEC1HA472CA          |

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## TS-HA Standard Ratings (continued)

Part numbers shown with 2 pins

| Cap.<br>( $\mu$ F)                       | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ ) |        | 20°C ESR ( $\Omega$ , max.) |       | Panasonic Part Number (By Terminal Length) |                       |
|------------------------------------------|--------------------|------------------------------|--------|-----------------------------|-------|--------------------------------------------|-----------------------|
|                                          |                    | 120Hz                        | 10kHz~ | 120Hz                       | 20kHz | 6.3mm Length Terminal                      | 4.0mm Length Terminal |
| 50 VDC Working, 63 VDC Surge (continued) |                    |                              |        |                             |       |                                            |                       |
| 4700                                     | 30 x 30            | 2.50                         | 2.88   | 0.053                       | 0.040 | ECOS1HA472DA                               | ECEC1HA472DA          |
|                                          | 35 x 25            | 2.50                         | 2.88   | 0.053                       | 0.040 | ECOS1HA472EA                               | ECEC1HA472EA          |
| 5600                                     | 22 x 50            | 2.80                         | 3.22   | 0.050                       | 0.038 | ECOS1HA562BA                               | ECEC1HA562BA          |
|                                          | 25 x 40            | 2.80                         | 3.22   | 0.050                       | 0.038 | ECOS1HA562CA                               | ECEC1HA562CA          |
|                                          | 30 x 35            | 2.80                         | 3.22   | 0.050                       | 0.038 | ECOS1HA562DA                               | ECEC1HA562DA          |
|                                          | 35 x 30            | 2.80                         | 3.22   | 0.050                       | 0.038 | ECOS1HA562EA                               | ECEC1HA562EA          |
| 6800                                     | 25 x 50            | 3.30                         | 3.80   | 0.046                       | 0.035 | ECOS1HA682CA                               | ECEC1HA682CA          |
|                                          | 30 x 40            | 3.30                         | 3.80   | 0.046                       | 0.035 | ECOS1HA682DA                               | ECEC1HA682DA          |
|                                          | 35 x 30            | 3.30                         | 3.80   | 0.046                       | 0.035 | ECOS1HA682EA                               | ECEC1HA682EA          |
| 8200                                     | 30 x 45            | 3.60                         | 4.14   | 0.038                       | 0.029 | ECOS1HA822DA                               | ECEC1HA822DA          |
|                                          | 35 x 35            | 3.60                         | 4.14   | 0.038                       | 0.029 | ECOS1HA822EA                               | ECEC1HA822EA          |
| 10000                                    | 30 x 50            | 4.00                         | 4.60   | 0.033                       | 0.025 | ECOS1HA103DA                               | ECEC1HA103DA          |
|                                          | 35 x 40            | 4.00                         | 4.60   | 0.033                       | 0.025 | ECOS1HA103EA                               | ECEC1HA103EA          |
| 12000                                    | 35 x 45            | 4.50                         | 5.18   | 0.028                       | 0.022 | ECOS1HA123EA                               | ECEC1HA123EA          |
| 15000                                    | 35 x 50            | 4.80                         | 5.52   | 0.022                       | 0.018 | ECOS1HA153EA                               | ECEC1HA153EA          |
| 63 VDC Working, 79 VDC Surge             |                    |                              |        |                             |       |                                            |                       |
| 680                                      | 22 x 20            | 0.90                         | 1.04   | 0.463                       | 0.347 | ECOS1JA681BL                               | ECEC1JA681BL          |
| 1000                                     | 25 x 20            | 1.20                         | 1.38   | 0.315                       | 0.236 | ECOS1JA102CL                               | ECEC1JA102CL          |
| 1200                                     | 22 x 25            | 1.40                         | 1.61   | 0.235                       | 0.176 | ECOS1JA122BA                               | ECEC1JA122BA          |
| 1500                                     | 22 x 30            | 1.50                         | 1.73   | 0.188                       | 0.141 | ECOS1JA152BA                               | ECEC1JA152BA          |
|                                          | 30 x 20            | 1.30                         | 1.50   | 0.210                       | 0.157 | ECOS1JA152DL                               | ECEC1JA152DL          |
| 1800                                     | 22 x 30            | 1.70                         | 1.96   | 0.157                       | 0.117 | ECOS1JA182BA                               | ECEC1JA182BA          |
|                                          | 25 x 25            | 1.70                         | 1.96   | 0.157                       | 0.117 | ECOS1JA182CA                               | ECEC1JA182CA          |
| 2200                                     | 22 x 35            | 2.00                         | 2.30   | 0.128                       | 0.096 | ECOS1JA222BA                               | ECEC1JA222BA          |
|                                          | 25 x 30            | 2.00                         | 2.30   | 0.128                       | 0.096 | ECOS1JA222CA                               | ECEC1JA222CA          |
|                                          | 35 x 20            | 1.50                         | 1.73   | 0.143                       | 0.107 | ECOS1JA222EL                               | ECEC1JA222EL          |
| 2700                                     | 22 x 40            | 2.20                         | 2.53   | 0.104                       | 0.078 | ECOS1JA272BA                               | ECEC1JA272BA          |
|                                          | 25 x 35            | 2.20                         | 2.53   | 0.104                       | 0.078 | ECOS1JA272CA                               | ECEC1JA272CA          |
|                                          | 30 x 25            | 2.20                         | 2.53   | 0.104                       | 0.078 | ECOS1JA272DA                               | ECEC1JA272DA          |
| 3300                                     | 22 x 50            | 2.50                         | 2.88   | 0.090                       | 0.068 | ECOS1JA332BA                               | ECEC1JA332BA          |
|                                          | 25 x 40            | 2.50                         | 2.88   | 0.090                       | 0.068 | ECOS1JA332CA                               | ECEC1JA332CA          |
|                                          | 30 x 30            | 2.50                         | 2.88   | 0.090                       | 0.068 | ECOS1JA332DA                               | ECEC1JA332DA          |
|                                          | 35 x 25            | 2.50                         | 2.88   | 0.090                       | 0.068 | ECOS1JA332EA                               | ECEC1JA332EA          |
| 3900                                     | 25 x 45            | 2.70                         | 3.11   | 0.077                       | 0.057 | ECOS1JA392CA                               | ECEC1JA392CA          |
|                                          | 30 x 35            | 2.70                         | 3.11   | 0.077                       | 0.057 | ECOS1JA392DA                               | ECEC1JA392DA          |
|                                          | 35 x 30            | 2.70                         | 3.11   | 0.077                       | 0.057 | ECOS1JA392EA                               | ECEC1JA392EA          |
| 4700                                     | 25 x 50            | 3.00                         | 3.45   | 0.063                       | 0.048 | ECOS1JA472CA                               | ECEC1JA472CA          |
|                                          | 30 x 40            | 3.00                         | 3.45   | 0.063                       | 0.048 | ECOS1JA472DA                               | ECEC1JA472DA          |
|                                          | 35 x 30            | 3.00                         | 3.45   | 0.063                       | 0.048 | ECOS1JA472EA                               | ECEC1JA472EA          |
| 5600                                     | 30 x 45            | 3.30                         | 3.80   | 0.053                       | 0.040 | ECOS1JA562DA                               | ECEC1JA562DA          |
|                                          | 35 x 35            | 3.30                         | 3.80   | 0.053                       | 0.040 | ECOS1JA562EA                               | ECEC1JA562EA          |
| 6800                                     | 30 x 50            | 3.60                         | 4.14   | 0.049                       | 0.037 | ECOS1JA682DA                               | ECEC1JA682DA          |
|                                          | 35 x 40            | 3.60                         | 4.14   | 0.049                       | 0.037 | ECOS1JA682EA                               | ECEC1JA682EA          |
| 8200                                     | 35 x 45            | 3.90                         | 4.49   | 0.040                       | 0.030 | ECOS1JA822EA                               | ECEC1JA822EA          |
| 10000                                    | 35 x 50            | 4.40                         | 5.06   | 0.033                       | 0.028 | ECOS1JA103EA                               | ECEC1JA103EA          |
| 80 VDC Working, 100 VDC Surge            |                    |                              |        |                             |       |                                            |                       |
| 470                                      | 22 x 20            | 0.80                         | 0.92   | 0.459                       | 0.298 | ECOS1KA471BL                               | ECEC1KA471BL          |
| 560                                      | 25 x 20            | 1.00                         | 1.15   | 0.317                       | 0.206 | ECOS1KA681CL                               | ECEC1KA681CL          |
| 820                                      | 22 x 25            | 1.20                         | 1.38   | 0.222                       | 0.145 | ECOS1KA821BA                               | ECEC1KA821BA          |
| 1000                                     | 22 x 30            | 1.30                         | 1.50   | 0.182                       | 0.119 | ECOS1KA102BA                               | ECEC1KA102BA          |
|                                          | 25 x 25            | 1.30                         | 1.50   | 0.182                       | 0.119 | ECOS1KA102CA                               | ECEC1KA102CA          |
|                                          | 30 x 20            | 1.20                         | 1.38   | 0.216                       | 0.140 | ECOS1KA102DL                               | ECEC1KA102DL          |
| 1200                                     | 22 x 30            | 1.50                         | 1.73   | 0.166                       | 0.116 | ECOS1KA122BA                               | ECEC1KA122BA          |
|                                          | 25 x 25            | 1.50                         | 1.73   | 0.166                       | 0.116 | ECOS1KA122CA                               | ECEC1KA122CA          |
| 1500                                     | 22 x 35            | 1.70                         | 1.96   | 0.133                       | 0.093 | ECOS1KA152BA                               | ECEC1KA152BA          |
|                                          | 25 x 30            | 1.70                         | 1.96   | 0.133                       | 0.093 | ECOS1KA152CA                               | ECEC1KA152CA          |
|                                          | 35 x 20            | 1.40                         | 1.61   | 0.155                       | 0.108 | ECOS1KA152EL                               | ECEC1KA152EL          |
| 1800                                     | 22 x 40            | 1.80                         | 2.07   | 0.111                       | 0.077 | ECOS1KA182BA                               | ECEC1KA182BA          |
|                                          | 25 x 35            | 1.80                         | 2.07   | 0.111                       | 0.077 | ECOS1KA182CA                               | ECEC1KA182CA          |
|                                          | 30 x 25            | 1.80                         | 2.07   | 0.111                       | 0.077 | ECOS1KA182DA                               | ECEC1KA182DA          |
| 2200                                     | 22 x 45            | 2.10                         | 2.42   | 0.090                       | 0.063 | ECOS1KA222BA                               | ECEC1KA222BA          |
|                                          | 25 x 35            | 2.10                         | 2.42   | 0.090                       | 0.063 | ECOS1KA222CA                               | ECEC1KA222CA          |
|                                          | 30 x 30            | 2.10                         | 2.42   | 0.090                       | 0.063 | ECOS1KA222DA                               | ECEC1KA222DA          |
|                                          | 35 x 25            | 2.10                         | 2.42   | 0.090                       | 0.063 | ECOS1KA222EA                               | ECEC1KA222EA          |

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TS-HA/HB Standard Ratings (continued)

Part numbers shown with 2 pins

| Cap.<br>( $\mu$ F)                        | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ ) |        | 20°C ESR ( $\Omega$ , max.) |       | Panasonic Part Number (By Terminal Length) |                       |
|-------------------------------------------|--------------------|------------------------------|--------|-----------------------------|-------|--------------------------------------------|-----------------------|
|                                           |                    | 120Hz                        | 10kHz~ | 120Hz                       | 20kHz | 6.3mm Length Terminal                      | 4.0mm Length Terminal |
| 80 VDC Working, 100 VDC Surge (continued) |                    |                              |        |                             |       |                                            |                       |
| 2700                                      | 25 x 45            | 2.40                         | 2.76   | 0.074                       | 0.055 | ECOS1KA272CA                               | ECEC1KA272CA          |
|                                           | 30 x 35            | 2.40                         | 2.76   | 0.074                       | 0.055 | ECOS1KA272DA                               | ECEC1KA272DA          |
|                                           | 35 x 30            | 2.40                         | 2.76   | 0.074                       | 0.055 | ECOS1KA272EA                               | ECEC1KA272EA          |
| 3300                                      | 25 x 50            | 2.60                         | 2.99   | 0.065                       | 0.049 | ECOS1KA332CA                               | ECEC1KA332CA          |
|                                           | 30 x 40            | 2.60                         | 2.99   | 0.065                       | 0.049 | ECOS1KA332DA                               | ECEC1KA332DA          |
|                                           | 35 x 30            | 2.60                         | 2.99   | 0.065                       | 0.049 | ECOS1KA332EA                               | ECEC1KA332EA          |
| 3900                                      | 30 x 45            | 3.00                         | 3.45   | 0.060                       | 0.045 | ECOS1KA392DA                               | ECEC1KA392DA          |
|                                           | 35 x 35            | 3.00                         | 3.45   | 0.060                       | 0.045 | ECOS1KA392EA                               | ECEC1KA392EA          |
| 4700                                      | 30 x 50            | 3.30                         | 3.80   | 0.049                       | 0.037 | ECOS1KA472DA                               | ECEC1KA472DA          |
|                                           | 35 x 40            | 3.30                         | 3.80   | 0.049                       | 0.037 | ECOS1KA472EA                               | ECEC1KA472EA          |
| 5600                                      | 35 x 45            | 3.70                         | 4.26   | 0.050                       | 0.038 | ECOS1KA562EA                               | ECEC1KA562EA          |
| 6800                                      | 35 x 50            | 3.90                         | 4.49   | 0.041                       | 0.031 | ECOS1KA682EA                               | ECEC1KA682EA          |
| 100 VDC Working, 125 VDC Surge            |                    |                              |        |                             |       |                                            |                       |
| 330                                       | 22 x 20            | 0.80                         | 1.20   | 0.653                       | 0.392 | ECOS2AA331BL                               | ECEC2AA331BL          |
| 470                                       | 25 x 20            | 1.00                         | 1.50   | 0.459                       | 0.275 | ECOS2AA471CL                               | ECEC2AA471CL          |
| 560                                       | 22 x 25            | 1.10                         | 1.65   | 0.296                       | 0.178 | ECOS2AA561BA                               | ECEC2AA561BA          |
| 680                                       | 30 x 20            | 1.10                         | 1.65   | 0.317                       | 0.190 | ECOS2AA681DL                               | ECEC2AA681DL          |
| 820                                       | 22 x 30            | 1.40                         | 2.10   | 0.202                       | 0.121 | ECOS2AA821BA                               | ECEC2AA821BA          |
|                                           | 25 x 25            | 1.40                         | 2.10   | 0.202                       | 0.121 | ECOS2AA821CA                               | ECEC2AA821CA          |
| 1000                                      | 22 x 35            | 1.70                         | 2.55   | 0.182                       | 0.109 | ECOS2AA102BA                               | ECEC2AA102BA          |
|                                           | 25 x 30            | 1.70                         | 2.55   | 0.182                       | 0.109 | ECOS2AA102CA                               | ECEC2AA102CA          |
|                                           | 35 x 20            | 1.20                         | 1.80   | 0.216                       | 0.129 | ECOS2AA102EL                               | ECEC2AA102EL          |
| 1200                                      | 22 x 40            | 1.80                         | 2.70   | 0.152                       | 0.091 | ECOS2AA122BA                               | ECEC2AA122BA          |
|                                           | 25 x 35            | 1.80                         | 2.70   | 0.152                       | 0.091 | ECOS2AA122CA                               | ECEC2AA122CA          |
|                                           | 30 x 25            | 1.80                         | 2.70   | 0.152                       | 0.091 | ECOS2AA122DA                               | ECEC2AA122DA          |
| 1500                                      | 22 x 45            | 2.10                         | 3.15   | 0.122                       | 0.073 | ECOS2AA152BA                               | ECEC2AA152BA          |
|                                           | 25 x 40            | 2.10                         | 3.15   | 0.122                       | 0.079 | ECOS2AA152CA                               | ECEC2AA152CA          |
|                                           | 30 x 30            | 2.10                         | 3.15   | 0.122                       | 0.079 | ECOS2AA152DA                               | ECEC2AA152DA          |
|                                           | 35 x 25            | 2.10                         | 3.15   | 0.122                       | 0.079 | ECOS2AA152EA                               | ECEC2AA152EA          |
| 1800                                      | 25 x 45            | 2.30                         | 3.45   | 0.111                       | 0.072 | ECOS2AA182CA                               | ECEC2AA182CA          |
|                                           | 30 x 35            | 2.30                         | 3.45   | 0.111                       | 0.072 | ECOS2AA182DA                               | ECEC2AA182DA          |
|                                           | 35 x 30            | 2.30                         | 3.45   | 0.111                       | 0.072 | ECOS2AA182EA                               | ECEC2AA182EA          |
| 2200                                      | 25 x 50            | 2.60                         | 3.90   | 0.090                       | 0.059 | ECOS2AA222CA                               | ECEC2AA222CA          |
|                                           | 30 x 40            | 2.60                         | 3.90   | 0.090                       | 0.059 | ECOS2AA222DA                               | ECEC2AA222DA          |
|                                           | 35 x 30            | 2.60                         | 3.90   | 0.090                       | 0.059 | ECOS2AA222EA                               | ECEC2AA222EA          |
| 2700                                      | 30 x 45            | 2.90                         | 4.35   | 0.080                       | 0.052 | ECOS2AA272DA                               | ECEC2AA272DA          |
|                                           | 35 x 35            | 2.90                         | 4.35   | 0.080                       | 0.052 | ECOS2AA272EA                               | ECEC2AA272EA          |
| 3300                                      | 30 x 50            | 3.20                         | 4.80   | 0.075                       | 0.053 | ECOS2AA332DA                               | ECEC2AA332DA          |
|                                           | 35 x 40            | 3.20                         | 4.80   | 0.075                       | 0.053 | ECOS2AA332EA                               | ECEC2AA332EA          |
| 3900                                      | 35 x 45            | 3.60                         | 5.40   | 0.064                       | 0.045 | ECOS2AA392EA                               | ECEC2AA392EA          |
| 4700                                      | 35 x 50            | 3.80                         | 5.70   | 0.053                       | 0.040 | ECOS2AA472EA                               | ECEC2AA472EA          |
| 160 VDC Working, 200 VDC Surge            |                    |                              |        |                             |       |                                            |                       |
| 470                                       | 22 x 30            | 1.40                         | 1.96   | 0.423                       | 0.190 | ECOS2CB471BA                               | ECEC2CB471BA          |
| 560                                       | 22 x 35            | 1.50                         | 2.10   | 0.355                       | 0.160 | ECOS2CB561BA                               | ECEC2CB561BA          |
| 680                                       | 22 x 40            | 1.70                         | 2.38   | 0.293                       | 0.132 | ECOS2CB681BA                               | ECEC2CB681BA          |
|                                           | 25 x 30            | 1.70                         | 2.38   | 0.293                       | 0.132 | ECOS2CB681CA                               | ECEC2CB681CA          |
| 820                                       | 22 x 45            | 2.00                         | 2.80   | 0.243                       | 0.109 | ECOS2CB821BA                               | ECEC2CB821BA          |
|                                           | 25 x 35            | 2.00                         | 2.80   | 0.243                       | 0.109 | ECOS2CB821CA                               | ECEC2CB821CA          |
| 1000                                      | 22 x 50            | 2.20                         | 3.08   | 0.199                       | 0.090 | ECOS2CB102BA                               | ECEC2CB102BA          |
|                                           | 25 x 40            | 2.20                         | 3.08   | 0.199                       | 0.090 | ECOS2CB102CA                               | ECEC2CB102CA          |
|                                           | 30 x 30            | 2.20                         | 3.08   | 0.199                       | 0.090 | ECOS2CB102DA                               | ECEC2CB102DA          |
|                                           | 35 x 25            | 2.20                         | 3.08   | 0.199                       | 0.090 | ECOS2CB102EA                               | ECEC2CB102EA          |
| 1200                                      | 25 x 45            | 2.30                         | 3.22   | 0.180                       | 0.090 | ECOS2CB122CA                               | ECEC2CB122CA          |
|                                           | 30 x 35            | 2.30                         | 3.22   | 0.180                       | 0.090 | ECOS2CB122DA                               | ECEC2CB122DA          |
|                                           | 35 x 30            | 2.30                         | 3.22   | 0.180                       | 0.090 | ECOS2CB122EA                               | ECEC2CB122EA          |
| 1500                                      | 30 x 40            | 2.50                         | 3.50   | 0.144                       | 0.072 | ECOS2CB152DA                               | ECEC2CB152DA          |
|                                           | 35 x 30            | 2.50                         | 3.50   | 0.144                       | 0.072 | ECOS2CB152EA                               | ECEC2CB152EA          |
| 1800                                      | 30 x 45            | 2.70                         | 3.78   | 0.129                       | 0.064 | ECOS2CB182DA                               | ECEC2CB182DA          |
|                                           | 35 x 35            | 2.70                         | 3.78   | 0.129                       | 0.064 | ECOS2CB182EA                               | ECEC2CB182EA          |
| 2200                                      | 35 x 45            | 2.90                         | 4.06   | 0.105                       | 0.063 | ECOS2CB222EA                               | ECEC2CB222EA          |
| 2700                                      | 35 x 50            | 3.10                         | 4.34   | 0.086                       | 0.052 | ECOS2CB272EA                               | ECEC2CB272EA          |
| 200 VDC Working, 250 VDC Surge            |                    |                              |        |                             |       |                                            |                       |
| 390                                       | 22 x 30            | 1.30                         | 1.82   | 0.510                       | 0.230 | ECOS2DB391BA                               | ECEC2DB391BA          |
|                                           | 25 x 25            | 1.30                         | 1.82   | 0.510                       | 0.230 | ECOS2DB391CA                               | ECEC2DB391CA          |
| 470                                       | 22 x 35            | 1.40                         | 1.96   | 0.423                       | 0.190 | ECOS2DB471BA                               | ECEC2DB471BA          |

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## TS-HB Standard Ratings (continued)

Part numbers shown with 2 pins

| Cap.<br>( $\mu$ F)                         | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ ) |        | 20°C ESR ( $\Omega$ , max.) |       | Panasonic Part Number (By Terminal Length) |                       |
|--------------------------------------------|--------------------|------------------------------|--------|-----------------------------|-------|--------------------------------------------|-----------------------|
|                                            |                    | 120Hz                        | 10kHz~ | 120Hz                       | 20kHz | 6.3mm Length Terminal                      | 4.0mm Length Terminal |
| 200 VDC Working, 250 VDC Surge (continued) |                    |                              |        |                             |       |                                            |                       |
| 470                                        | 25 x 30            | 1.40                         | 1.96   | 0.423                       | 0.190 | ECOS2DB471CA                               | ECEC2DB471CA          |
| 560                                        | 22 x 40            | 1.50                         | 2.10   | 0.355                       | 0.160 | ECOS2DB561BA                               | ECEC2DB561BA          |
|                                            | 25 x 30            | 1.50                         | 2.10   | 0.355                       | 0.160 | ECOS2DB561CA                               | ECEC2DB561CA          |
|                                            | 30 x 25            | 1.50                         | 2.10   | 0.355                       | 0.160 | ECOS2DB561DA                               | ECEC2DB561DA          |
| 680                                        | 22 x 45            | 1.70                         | 2.38   | 0.293                       | 0.132 | ECOS2DB681BA                               | ECEC2DB681BA          |
|                                            | 25 x 35            | 1.70                         | 2.38   | 0.293                       | 0.132 | ECOS2DB681CA                               | ECEC2DB681CA          |
| 820                                        | 25 x 45            | 2.00                         | 2.80   | 0.263                       | 0.118 | ECOS2DB821CA                               | ECEC2DB821CA          |
|                                            | 30 x 30            | 2.00                         | 2.80   | 0.263                       | 0.118 | ECOS2DB821DA                               | ECEC2DB821DA          |
|                                            | 35 x 25            | 2.00                         | 2.80   | 0.263                       | 0.118 | ECOS2DB821EA                               | ECEC2DB821EA          |
| 1000                                       | 25 x 50            | 2.20                         | 3.08   | 0.216                       | 0.108 | ECOS2DB102CA                               | ECEC2DB102CA          |
|                                            | 30 x 35            | 2.20                         | 3.08   | 0.216                       | 0.108 | ECOS2DB102DA                               | ECEC2DB102DA          |
|                                            | 35 x 30            | 2.20                         | 3.08   | 0.216                       | 0.108 | ECOS2DB102EA                               | ECEC2DB102EA          |
| 1200                                       | 30 x 40            | 2.30                         | 3.22   | 0.193                       | 0.097 | ECOS2DB122DA                               | ECEC2DB122DA          |
|                                            | 35 x 35            | 2.30                         | 3.22   | 0.193                       | 0.097 | ECOS2DB122EA                               | ECEC2DB122EA          |
| 1500                                       | 30 x 50            | 2.50                         | 3.50   | 0.155                       | 0.077 | ECOS2DB152DA                               | ECEC2DB152DA          |
|                                            | 35 x 40            | 2.50                         | 3.50   | 0.155                       | 0.077 | ECOS2DB152EA                               | ECEC2DB152EA          |
| 1800                                       | 35 x 45            | 2.70                         | 3.78   | 0.129                       | 0.077 | ECOS2DB182EA                               | ECEC2DB182EA          |
| 2200                                       | 35 x 50            | 2.90                         | 4.06   | 0.105                       | 0.063 | ECOS2DB222EA                               | ECEC2DB222EA          |
| 250 VDC Working, 300 VDC Surge             |                    |                              |        |                             |       |                                            |                       |
| 180                                        | 22 x 25            | 0.90                         | 1.26   | 0.921                       | 0.461 | ECOS2EB181BA                               | ECEC2EB181BA          |
| 220                                        | 22 x 30            | 1.00                         | 1.40   | 0.754                       | 0.377 | ECOS2EB221BA                               | ECEC2EB221BA          |
| 270                                        | 22 x 35            | 1.10                         | 1.54   | 0.614                       | 0.307 | ECOS2EB271BA                               | ECEC2EB271BA          |
| 330                                        | 22 x 40            | 1.20                         | 1.68   | 0.502                       | 0.251 | ECOS2EB331BA                               | ECEC2EB331BA          |
|                                            | 25 x 30            | 1.20                         | 1.68   | 0.502                       | 0.251 | ECOS2EB331CA                               | ECEC2EB331CA          |
| 390                                        | 22 x 45            | 1.30                         | 1.82   | 0.425                       | 0.213 | ECOS2EB391BA                               | ECEC2EB391BA          |
|                                            | 30 x 25            | 1.30                         | 1.82   | 0.425                       | 0.213 | ECOS2EB391DA                               | ECEC2EB391DA          |
| 470                                        | 22 x 50            | 1.40                         | 1.96   | 0.353                       | 0.176 | ECOS2EB471BA                               | ECEC2EB471BA          |
|                                            | 25 x 40            | 1.40                         | 1.96   | 0.353                       | 0.176 | ECOS2EB471CA                               | ECEC2EB471CA          |
|                                            | 30 x 30            | 1.40                         | 1.96   | 0.353                       | 0.176 | ECOS2EB471DA                               | ECEC2EB471DA          |
| 560                                        | 25 x 45            | 1.50                         | 2.10   | 0.296                       | 0.148 | ECOS2EB561CA                               | ECEC2EB561CA          |
|                                            | 35 x 25            | 1.50                         | 2.10   | 0.296                       | 0.148 | ECOS2EB561EA                               | ECEC2EB561EA          |
| 680                                        | 25 x 50            | 1.70                         | 2.38   | 0.244                       | 0.134 | ECOS2EB681CA                               | ECEC2EB681CA          |
|                                            | 30 x 40            | 1.70                         | 2.38   | 0.244                       | 0.134 | ECOS2EB681DA                               | ECEC2EB681DA          |
|                                            | 35 x 30            | 1.70                         | 2.38   | 0.244                       | 0.134 | ECOS2EB681EA                               | ECEC2EB681EA          |
| 820                                        | 30 x 45            | 2.00                         | 2.80   | 0.202                       | 0.111 | ECOS2EB821DA                               | ECEC2EB821DA          |
|                                            | 35 x 35            | 2.00                         | 2.80   | 0.202                       | 0.111 | ECOS2EB821EA                               | ECEC2EB821EA          |
| 1000                                       | 30 x 50            | 2.20                         | 3.08   | 0.199                       | 0.109 | ECOS2EB102DA                               | ECEC2EB102DA          |
|                                            | 35 x 40            | 2.20                         | 3.08   | 0.199                       | 0.109 | ECOS2EB102EA                               | ECEC2EB102EA          |
| 1200                                       | 35 x 45            | 2.30                         | 3.22   | 0.166                       | 0.099 | ECOS2EB122EA                               | ECEC2EB122EA          |
| 1500                                       | 35 x 50            | 2.50                         | 3.50   | 0.144                       | 0.093 | ECOS2EB152EA                               | ECEC2EB152EA          |
| 385 VDC Working, 425 VDC Surge             |                    |                              |        |                             |       |                                            |                       |
| 82                                         | 22 x 30            | 0.64                         | 0.90   | 2.022                       | 0.809 | ECOS2TB820BA                               | ECEC2TB820BA          |
| 100                                        | 22 x 30            | 0.69                         | 0.97   | 1.658                       | 0.663 | ECOS2TB101BA                               | ECEC2TB101BA          |
|                                            | 25 x 25            | 0.69                         | 0.97   | 1.658                       | 0.663 | ECOS2TB101CA                               | ECEC2TB101CA          |
| 120                                        | 22 x 35            | 0.75                         | 1.05   | 1.382                       | 0.553 | ECOS2TB121BA                               | ECEC2TB121BA          |
|                                            | 25 x 30            | 0.75                         | 1.05   | 1.382                       | 0.553 | ECOS2TB121CA                               | ECEC2TB121CA          |
| 150                                        | 22 x 40            | 0.82                         | 1.15   | 1.105                       | 0.442 | ECOS2TB151BA                               | ECEC2TB151BA          |
|                                            | 25 x 30            | 0.82                         | 1.15   | 1.105                       | 0.442 | ECOS2TB151CA                               | ECEC2TB151CA          |
|                                            | 30 x 25            | 0.82                         | 1.15   | 1.105                       | 0.442 | ECOS2TB151DA                               | ECEC2TB151DA          |
| 180                                        | 22 x 45            | 0.95                         | 1.33   | 0.921                       | 0.368 | ECOS2TB181BA                               | ECEC2TB181BA          |
|                                            | 25 x 35            | 0.95                         | 1.33   | 0.921                       | 0.368 | ECOS2TB181CA                               | ECEC2TB181CA          |
|                                            | 30 x 30            | 0.95                         | 1.33   | 0.921                       | 0.368 | ECOS2TB181DA                               | ECEC2TB181DA          |
| 220                                        | 25 x 45            | 1.10                         | 1.54   | 0.754                       | 0.301 | ECOS2TB221CA                               | ECEC2TB221CA          |
|                                            | 30 x 30            | 1.10                         | 1.54   | 0.829                       | 0.332 | ECOS2TB221DA                               | ECEC2TB221DA          |
|                                            | 35 x 25            | 1.10                         | 1.54   | 0.829                       | 0.332 | ECOS2TB221EA                               | ECEC2TB221EA          |
| 270                                        | 25 x 50            | 1.20                         | 1.68   | 0.675                       | 0.270 | ECOS2TB271CA                               | ECEC2TB271CA          |
|                                            | 35 x 30            | 1.20                         | 1.68   | 0.675                       | 0.270 | ECOS2TB271EA                               | ECEC2TB271EA          |
| 330                                        | 30 x 45            | 1.35                         | 1.89   | 0.553                       | 0.221 | ECOS2TB331DA                               | ECEC2TB331DA          |
|                                            | 35 x 35            | 1.35                         | 1.89   | 0.553                       | 0.221 | ECOS2TB331EA                               | ECEC2TB331EA          |
| 390                                        | 30 x 50            | 1.55                         | 2.17   | 0.510                       | 0.204 | ECOS2TB391DA                               | ECEC2TB391DA          |
| 470                                        | 35 x 45            | 1.75                         | 2.45   | 0.423                       | 0.212 | ECOS2TB471EA                               | ECEC2TB471EA          |
| 560                                        | 35 x 50            | 1.80                         | 2.52   | 0.355                       | 0.178 | ECOS2TB561EA                               | ECEC2TB561EA          |
| 400 VDC Working, 450 VDC Surge             |                    |                              |        |                             |       |                                            |                       |
| 82                                         | 22 x 30            | 0.64                         | 0.90   | 2.022                       | 0.708 | ECOS2GB820BA                               | ECEC2GB820BA          |
| 100                                        | 22 x 30            | 0.69                         | 0.97   | 1.658                       | 0.580 | ECOS2GB101BA                               | ECEC2GB101BA          |

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## TS-HB Standard Ratings (continued)

Part numbers shown with 2 pins

| Cap.<br>(μF)                               | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> ) |        | 20°C ESR (Ω, max.) |       | Panasonic Part Number (By Terminal Length) |                       |
|--------------------------------------------|--------------------|------------------------------------|--------|--------------------|-------|--------------------------------------------|-----------------------|
|                                            |                    | 120Hz                              | 10kHz~ | 120Hz              | 20kHz | 6.3mm Length Terminal                      | 4.0mm Length Terminal |
| 400 VDC Working, 450 VDC Surge (continued) |                    |                                    |        |                    |       |                                            |                       |
| 100                                        | 25 x 25            | 0.69                               | 0.97   | 1.658              | 0.580 | ECOS2GB101CA                               | ECEC2GB101CA          |
| 120                                        | 22 x 35            | 0.75                               | 1.05   | 1.382              | 0.484 | ECOS2GB121BA                               | ECEC2GB121BA          |
|                                            | 25 x 30            | 0.75                               | 1.05   | 1.382              | 0.484 | ECOS2GB121CA                               | ECEC2GB121CA          |
| 150                                        | 22 x 40            | 0.82                               | 1.15   | 1.105              | 0.387 | ECOS2GB151BA                               | ECEC2GB151BA          |
|                                            | 25 x 30            | 0.82                               | 1.15   | 1.105              | 0.387 | ECOS2GB151CA                               | ECEC2GB151CA          |
|                                            | 30 x 25            | 0.82                               | 1.15   | 1.105              | 0.387 | ECOS2GB151DA                               | ECEC2GB151DA          |
| 180                                        | 22 x 45            | 0.95                               | 1.33   | 0.921              | 0.322 | ECOS2GB181BA                               | ECEC2GB181BA          |
|                                            | 25 x 35            | 0.95                               | 1.33   | 0.921              | 0.322 | ECOS2GB181CA                               | ECEC2GB181CA          |
|                                            | 30 x 30            | 0.95                               | 1.33   | 0.921              | 0.322 | ECOS2GB181DA                               | ECEC2GB181DA          |
| 220                                        | 25 x 45            | 1.10                               | 1.54   | 0.754              | 0.264 | ECOS2GB221CA                               | ECEC2GB221CA          |
|                                            | 30 x 30            | 1.10                               | 1.54   | 0.754              | 0.264 | ECOS2GB221DA                               | ECEC2GB221DA          |
|                                            | 35 x 25            | 1.10                               | 1.54   | 0.754              | 0.264 | ECOS2GB221EA                               | ECEC2GB221EA          |
| 270                                        | 25 x 50            | 1.20                               | 1.68   | 0.614              | 0.215 | ECOS2GB271CA                               | ECEC2GB271CA          |
|                                            | 30 x 35            | 1.20                               | 1.68   | 0.614              | 0.215 | ECOS2GB271DA                               | ECEC2GB271DA          |
|                                            | 35 x 30            | 1.20                               | 1.68   | 0.614              | 0.215 | ECOS2GB271EA                               | ECEC2GB271EA          |
| 330                                        | 30 x 45            | 1.35                               | 1.89   | 0.502              | 0.201 | ECOS2GB331DA                               | ECEC2GB331DA          |
|                                            | 35 x 35            | 1.35                               | 1.89   | 0.502              | 0.201 | ECOS2GB331EA                               | ECEC2GB331EA          |
| 390                                        | 30 x 50            | 1.55                               | 2.17   | 0.425              | 0.170 | ECOS2GB391DA                               | ECEC2GB391DA          |
|                                            | 35 x 40            | 1.55                               | 2.17   | 0.425              | 0.170 | ECOS2GB391EA                               | ECEC2GB391EA          |
| 470                                        | 35 x 45            | 1.75                               | 2.45   | 0.353              | 0.141 | ECOS2GB471EA                               | ECEC2GB471EA          |
| 560                                        | 35 x 50            | 1.80                               | 2.52   | 0.296              | 0.118 | ECOS2GB561EA                               | ECEC2GB561EA          |
| 420 VDC Working, 470 VDC Surge             |                    |                                    |        |                    |       |                                            |                       |
| 100                                        | 22 x 30            | 0.64                               | 0.90   | 1.824              | 0.821 | ECOS2SB101BA                               | ECEC2SB101BA          |
|                                            | 25 x 25            | 0.64                               | 0.90   | 1.824              | 0.821 | ECOS2SB101CA                               | ECEC2SB101CA          |
| 120                                        | 22 x 35            | 0.72                               | 1.01   | 1.520              | 0.684 | ECOS2SB121BA                               | ECEC2SB121BA          |
|                                            | 25 x 30            | 0.72                               | 1.01   | 1.520              | 0.684 | ECOS2SB121CA                               | ECEC2SB121CA          |
| 150                                        | 22 x 40            | 0.79                               | 1.11   | 1.216              | 0.547 | ECOS2SB151BA                               | ECEC2SB151BA          |
|                                            | 25 x 30            | 0.79                               | 1.11   | 1.216              | 0.547 | ECOS2SB151CA                               | ECEC2SB151CA          |
|                                            | 30 x 25            | 0.79                               | 1.11   | 1.216              | 0.547 | ECOS2SB151DA                               | ECEC2SB151DA          |
| 180                                        | 22 x 45            | 0.87                               | 1.22   | 1.013              | 0.456 | ECOS2SB181BA                               | ECEC2SB181BA          |
|                                            | 25 x 40            | 0.87                               | 1.22   | 1.013              | 0.456 | ECOS2SB181CA                               | ECEC2SB181CA          |
|                                            | 30 x 30            | 0.87                               | 1.22   | 1.013              | 0.456 | ECOS2SB181DA                               | ECEC2SB181DA          |
| 220                                        | 25 x 45            | 1.00                               | 1.40   | 0.829              | 0.373 | ECOS2SB221CA                               | ECEC2SB221CA          |
|                                            | 30 x 30            | 1.00                               | 1.40   | 0.829              | 0.373 | ECOS2SB221DA                               | ECEC2SB221DA          |
|                                            | 35 x 25            | 1.00                               | 1.40   | 0.829              | 0.373 | ECOS2SB221EA                               | ECEC2SB221EA          |
| 270                                        | 25 x 50            | 1.19                               | 1.67   | 0.675              | 0.304 | ECOS2SB271CA                               | ECEC2SB271CA          |
|                                            | 30 x 40            | 1.19                               | 1.67   | 0.675              | 0.304 | ECOS2SB271DA                               | ECEC2SB271DA          |
|                                            | 35 x 30            | 1.19                               | 1.67   | 0.675              | 0.304 | ECOS2SB271EA                               | ECEC2SB271EA          |
| 330                                        | 30 x 45            | 1.38                               | 1.93   | 0.553              | 0.249 | ECOS2SB331DA                               | ECEC2SB331DA          |
|                                            | 35 x 35            | 1.38                               | 1.93   | 0.553              | 0.249 | ECOS2SB331EA                               | ECEC2SB331EA          |
| 390                                        | 30 x 50            | 1.55                               | 2.17   | 0.468              | 0.210 | ECOS2SB391DA                               | ECEC2SB391DA          |
|                                            | 35 x 40            | 1.55                               | 2.17   | 0.468              | 0.210 | ECOS2SB391EA                               | ECEC2SB391EA          |
| 470                                        | 35 x 45            | 1.74                               | 2.44   | 0.388              | 0.175 | ECOS2SB471EA                               | ECEC2SB471EA          |
| 560                                        | 35 x 50            | 1.90                               | 2.66   | 0.326              | 0.147 | ECOS2SB561EA                               | ECEC2SB561EA          |
| 450 VDC Working, 500 VDC Surge             |                    |                                    |        |                    |       |                                            |                       |
| 82                                         | 22 x 30            | 0.56                               | 0.78   | 2.022              | 0.708 | ECOS2WB820BA                               | ECEC2WB820BA          |
|                                            | 25 x 25            | 0.56                               | 0.78   | 2.022              | 0.708 | ECOS2WB820CA                               | ECEC2WB820CA          |
| 100                                        | 22 x 35            | 0.64                               | 0.90   | 1.658              | 0.580 | ECOS2WB101BA                               | ECEC2WB101BA          |
|                                            | 25 x 30            | 0.64                               | 0.90   | 1.658              | 0.580 | ECOS2WB101CA                               | ECEC2WB101CA          |
| 120                                        | 22 x 40            | 0.72                               | 1.01   | 1.382              | 0.484 | ECOS2WB121BA                               | ECEC2WB121BA          |
|                                            | 25 x 35            | 0.72                               | 1.01   | 1.382              | 0.484 | ECOS2WB121CA                               | ECEC2WB121CA          |
|                                            | 30 x 25            | 0.72                               | 1.01   | 1.382              | 0.484 | ECOS2WB121DA                               | ECEC2WB121DA          |
| 150                                        | 22 x 50            | 0.79                               | 1.11   | 1.105              | 0.387 | ECOS2WB151BA                               | ECEC2WB151BA          |
|                                            | 25 x 40            | 0.79                               | 1.11   | 1.105              | 0.387 | ECOS2WB151CA                               | ECEC2WB151CA          |
|                                            | 30 x 30            | 0.79                               | 1.11   | 1.105              | 0.387 | ECOS2WB151DA                               | ECEC2WB151DA          |
|                                            | 35 x 25            | 0.79                               | 1.11   | 1.105              | 0.387 | ECOS2WB151EA                               | ECEC2WB151EA          |
| 180                                        | 25 x 45            | 0.87                               | 1.22   | 0.921              | 0.322 | ECOS2WB181CA                               | ECEC2WB181CA          |
|                                            | 30 x 35            | 0.87                               | 1.22   | 0.921              | 0.322 | ECOS2WB181DA                               | ECEC2WB181DA          |
| 220                                        | 25 x 50            | 1.00                               | 1.40   | 0.754              | 0.264 | ECOS2WB221CA                               | ECEC2WB221CA          |
|                                            | 30 x 40            | 1.00                               | 1.40   | 0.754              | 0.264 | ECOS2WB221DA                               | ECEC2WB221DA          |
|                                            | 35 x 30            | 1.00                               | 1.40   | 0.754              | 0.264 | ECOS2WB221EA                               | ECEC2WB221EA          |
| 270                                        | 30 x 45            | 1.19                               | 1.67   | 0.614              | 0.215 | ECOS2WB271DA                               | ECEC2WB271DA          |
|                                            | 35 x 35            | 1.19                               | 1.67   | 0.614              | 0.215 | ECOS2WB271EA                               | ECEC2WB271EA          |
| 330                                        | 30 x 50            | 1.38                               | 1.93   | 0.502              | 0.176 | ECOS2WB331DA                               | ECEC2WB331DA          |
|                                            | 35 x 40            | 1.38                               | 1.93   | 0.502              | 0.176 | ECOS2WB331EA                               | ECEC2WB331EA          |
| 390                                        | 35 x 45            | 1.55                               | 2.17   | 0.425              | 0.149 | ECOS2WB391EA                               | ECEC2WB391EA          |
| 470                                        | 35 x 50            | 1.74                               | 2.44   | 0.353              | 0.123 | ECOS2WB471EA                               | ECEC2WB471EA          |

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