



## Tantalum Chip Capacitors

SpeedPower, Low ESR

**Series/Type:** B45197A, B45198R, B450,  
B451

**Date:** July 2006



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### Construction

- Polar tantalum capacitors with solid electrolyte
- Conventional, optimized TaMnO<sub>2</sub> technology
- Flame-retardant plastic case (UL 94 V-0)
- Optionally tinned or gold-plated terminals



### Features

- Wide variety of Low ESR values
- High ripple current capability
- High volumetric efficiency
- Excellent solderability
- Stable temperature and frequency characteristics
- Low leakage current, low dissipation factor
- Low self-inductance
- High resistance to shock and vibration
- Suitable for use without series resistor (special operating conditions recommended)
- Lead-free and material content compatible with RoHS
- Some partnumbers are only available in M ( $\pm 20\%$ ) tolerance; these types have a maximum capacitance drift at +125 °C of +20%

### Applications

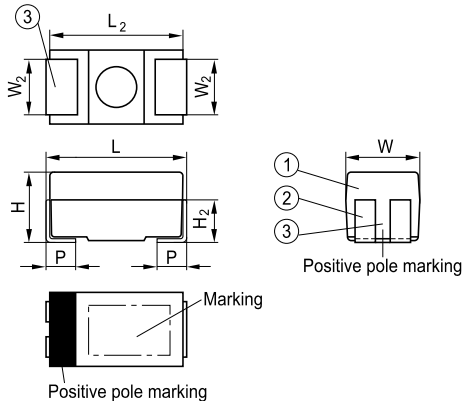
- Telecommunications (e.g. mobile phones, infrastructure)
- Data processing (e.g. laptops, mainframes)
- Measuring and control engineering (e.g. voltage regulators)
- Automotive electronics (e.g. navigation systems, electronic control units)
- Medical engineering
- DC/DC converters

### Soldering

Suitable for reflow soldering (IR and vapor phase, in compliance with JEDEC J-STD-020 C) and wave soldering

### Delivery mode

Taped and reeled in accordance with IEC 60286-3

**Dimensional drawing**


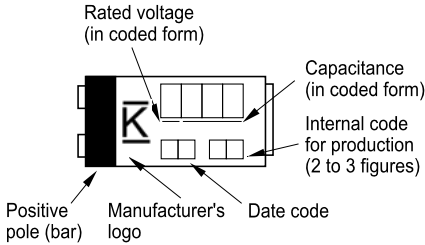
- ① Encapsulation: molded epoxy resin
- ② NiFe; tinned surface Sn100 or gold-plated
- ③ Reduced slot length for case size A

**Dimensions**

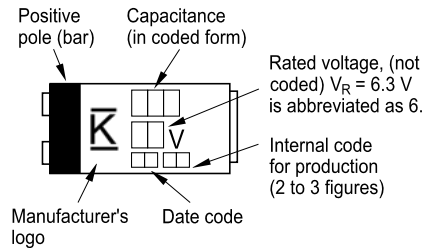
| Case size |          | Dimensions in mm (inches)               |   |   |               |                              |               |                            |
|-----------|----------|---|---|---|---------------|------------------------------|---------------|----------------------------|
| KEMET     | EIA/IECQ | L                                       | W                                       | H                                       | $L_2$ typ.    | $W_2 \pm 0.1$<br>$\pm(.004)$ | $H_2$ typ.    | $P \pm 0.3$<br>$\pm(.012)$ |
| A         | 3216-18  | $3.2 \pm 0.2$<br>(.126<br>$\pm 0.008$ ) | $1.6 \pm 0.2$<br>(.063<br>$\pm 0.008$ ) | $1.6 \pm 0.2$<br>(.063<br>$\pm 0.008$ ) | 3.2<br>(.126) | 1.2<br>(.047)                | 1.3<br>(.051) | 0.8<br>(.031)              |
| B         | 3528-21  | $3.5 \pm 0.2$<br>(.138<br>$\pm 0.008$ ) | $2.8 \pm 0.2$<br>(.110<br>$\pm 0.008$ ) | $1.9 \pm 0.2$<br>(.075<br>$\pm 0.008$ ) | 3.5<br>(.138) | 2.2<br>(.087)                | 1.4<br>(.055) | 0.7<br>(.027)              |
| C         | 6032-28  | $6.0 \pm 0.3$<br>(.236<br>$\pm 0.012$ ) | $3.2 \pm 0.3$<br>(.126<br>$\pm 0.012$ ) | $2.5 \pm 0.3$<br>(.098<br>$\pm 0.012$ ) | 6.1<br>(.240) | 2.2<br>(.087)                | 1.8<br>(.071) | 1.3<br>(.051)              |
| D         | 7343-31  | $7.3 \pm 0.3$<br>(.287<br>$\pm 0.012$ ) | $4.3 \pm 0.3$<br>(.169<br>$\pm 0.012$ ) | $2.8 \pm 0.3$<br>(.110<br>$\pm 0.012$ ) | 7.3<br>(.287) | 2.4<br>(.094)                | 1.8<br>(.071) | 1.3<br>(.051)              |
| E         | 7343-44  | $7.3 \pm 0.3$<br>(.287<br>$\pm 0.012$ ) | $4.3 \pm 0.3$<br>(.169<br>$\pm 0.012$ ) | $4.1 \pm 0.3$<br>(.161<br>$\pm 0.012$ ) | 7.3<br>(.287) | 2.4<br>(.094)                | 1.8<br>(.071) | 1.3<br>(.051)              |

**Marking**

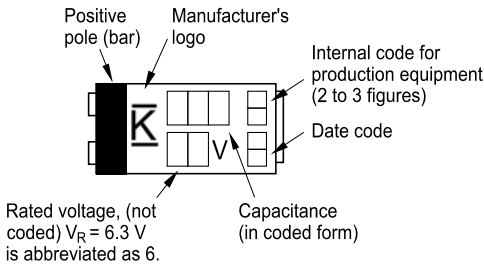
Case size A



Case size B



Case sizes C, D, E



Voltage coding for case size A

|               |     |   |     |    |    |    |    |    |    |
|---------------|-----|---|-----|----|----|----|----|----|----|
| Rated voltage | 2.5 | 4 | 6.3 | 10 | 16 | 20 | 25 | 35 | 50 |
| Code letter   | F   | G | J   | A  | C  | D  | E  | V  | T  |

Capacitance coding

|                   |                   |                        |
|-------------------|-------------------|------------------------|
| 1st and 2nd digit | Capacitance in pF |                        |
| 3rd digit         | Multiplier:       | 6 = 10 <sup>6</sup> pF |
|                   |                   | 7 = 10 <sup>7</sup> pF |
|                   |                   | 8 = 10 <sup>8</sup> pF |

Date coding

|          |              |               |
|----------|--------------|---------------|
| Year     | Month        |               |
| S = 2004 | 1 = January  | 7 = July      |
| T = 2005 | 2 = February | 8 = August    |
| U = 2006 | 3 = March    | 9 = September |
| V = 2007 | 4 = April    | O = October   |
| W = 2008 | 5 = May      | N = November  |
| X = 2009 | 6 = June     | D = December  |

**Specifications and characteristics in brief**

|  |   |   |                     |
|--|---|---|---------------------|
| Series   |   | SpeedPower                                |                     |
| Ordering code  |   | B45197A,<br>B450                          | B45198R,<br>B451    |
| Technology   |   | Ta-MnO <sub>2</sub>                       | Ta-MnO <sub>2</sub> |
| Terminals  |   | Tinned                                    | Gold-plated         |
| Rated voltage (up to 85 °C)  | V <sub>R</sub>                          | 2.5 ... 50                                | VDC                 |
| Rated capacitance (20 °C, 120 Hz)  | C <sub>R</sub>                          | 0.15 ... 1000                             | μF                  |
| Capacitance tolerance  |   | ±20%, ±10%                                |                     |
| Maximum equivalent series resistance (20 °C, 100 kHz)  | ESR <sub>max</sub>                      | 40 ... 15000                              | mΩ                  |
| Operating temperature range  | T <sub>op</sub>                         | -55 ... +125                              | °C                  |
| Failure rate (at 40 °C; ≤ V <sub>R</sub> ,<br>1 fit = 1 · 10 <sup>-9</sup> failures/h)<br>C <sub>R</sub> · V <sub>R</sub> ≤ 330 μF · V<br>C <sub>R</sub> · V <sub>R</sub> > 330 μF · V | R <sub>S</sub> ≤ 0.1 Ω/V                | ≤40<br>≤144 or 288<br>(dependent on type) | fit                 |
| Service life   |   | >500000                                   | h                   |
| Leakage current (V <sub>R</sub> , 5 min, 20 °C)  | I <sub>leak</sub>                       | 10  | nA/μC               |
| Detail specification (tinned terminals)  |   | CECC 30801-805                            |                     |
| Climatic category (to IEC 60068-1)   | (-55 °C/+125 °C/56 days damp heat test) | 55/125/56                                 |                     |

Overview of types ( $C_R$  (μF) and  $V_R$  (VDC))

| $V_R$ (VDC) | 2.5     | 4                                  | 6.3  | 10   | 16                                       | 20                                  | 25                              | 35                                     | 50                    |
|-------------|---------|------------------------------------|--|--|--|-------------------------------------|---------------------------------|--|-----------------------|
| $C_R$ (μF)  |         |                                    |  |  |  |                                     |                                 |  |                       |
| 0.15        |         |                                    |  |  |  |                                     |                                 | A(15000)                               |                       |
| 0.22        |         |                                    |  |  |  |                                     |                                 | A(13000)                               |                       |
| 0.33        |         |                                    |  |  |  |                                     | A(10000)                        | A(8000* 7000)                          |                       |
| 0.47        |         |                                    |  |  |  |                                     | A(7000)                         | B(4000* 7000)<br>B(2500)               |                       |
| 0.68        |         |                                    |  |  |  | A(6000)                             | A(6000)                         | A(4000*.6000)<br>B(2500)               |                       |
| 1.0         |         |                                    |  |  | A(5000)                                  | A(3000*.5000)                       | A(4000*.5000)                   | A(3000)<br>B(2000)                     | C(1500)               |
| 1.5         |         |                                    |  | A(5000)  | A(5000)                                  | A(4500)                             | A(3000*.4000)<br>B(1500)        | A(2000*)<br>B(2000)                    | C(1500)               |
| 2.2         | A(5000) | A(5000)                            | A(5000)  | A(1800*..2000)                                   | A(1800*..2500)                           | A(3000)<br>B(1500)                  | A(3000)<br>B(900*..1200)        | A(1500*)<br>B(750*..2000)              |                       |
| 3.3         | A(3000) | A(3000)                            | A(3000)  | A(2000)  | A(3000)<br>B(2000)                       | A(2500)<br>B(1300)                  | A(1500*)<br>B(750*..1200)       | B(1000)<br>C(550)                      |                       |
| 4.7         | A(3500) | A(3500)                            | A(3500)  | A(1400*..2000)<br>B(1500)                        | A(2000)<br>B(800*..1500)                 | A(1800..2000)<br>B(750..1000)       | B(700*..1000)<br>C(530)         | B(700*..1000*)<br>C(500)<br>D(300)     | D(300)                |
| 6.8         | A(2000) | A(2000)                            | A(1800*..2000)                                   | A(1800*..2000)<br>B(1200)                        | A(1500)<br>B(800*..1200)                 | A(2000*)<br>B(600*..1000)<br>C(480) | B(700*..1000)<br>C(500)         | C(350)<br>D(150*..300)<br>E(300)       | D(300..400)<br>E(300) |
| 10          | A(2000) | A(2000)                            | A(800*..2000)<br>B(1000)                         | A(900*..2000)<br>B(800*..1200)<br>C(450)         | A(1700*..2500)<br>B(500*..800)<br>C(450) | B(500*..1000)<br>C(450)             | B(750*)<br>C(300..450)          | C(400)<br>D(130*..280)<br>E(200..250)  | E(300)                |
| 15          | A(2000) | A(1500..2000)                      | A(700*..2000)<br>B(700)                          | A(1000*..1800)<br>B(450*..800)<br>C(400)         | A(2500*)<br>B(500*..800)<br>C(400)       | B(500*)<br>C(400)                   | C(300)<br>D(230)                | C(350*)<br>D(100*..260)<br>E(200..250) | E(250*..900)          |
| 22          | A(1500) | A(1500)<br>C(380)                  | A(500*..1500)<br>B(380*..500)<br>C(380)          | A(1500)<br>B(400*..800)<br>C(300*..380)          | B(400*..700)<br>C(250..350)              | C(200)<br>D(200)                    | C(200)<br>D(200..230)<br>E(230) | D(200..260)<br>E(130*..260)            |                       |
| 33          | A(1000) | A(1000)<br>C(300)                  | A(600*..1000)<br>B(250*..600)<br>C(300..350)     | A(1000*)<br>B(200*..600)<br>C(300..380)          | B(350*)<br>C230..300)<br>D(200)          | C(200)<br>D(200)<br>E(200)          | D(100*..230)<br>E(100*..200)    | D(200*)<br>E(100*..260)                |                       |
| 47          |         | A(500*..750)<br>C(250)             | A(2000*)<br>B(250*..500)<br>C(250..330)          | B(200*..600)<br>C(300)<br>D(100..200)            | C(300)<br>D(80*..180)                    | D(100*..250)<br>E(70*..150)         | D(100*..250)<br>E(80*..200)     | E(200*..230)                           |                       |
| 68          |         | A(3000*)<br>C(150)                 | B(250*..500)<br>C(150..400)<br>D(180)            | B(250*..350*)<br>C(200..250)<br>D(100..150)      | C(150..250)<br>D(70*..150)<br>E(150)     | D(70*..300)<br>E(130..200)          | E(130*..200)                    |  |                       |
| 100         | B(300)  | A(3000*)<br>B(250*..300)<br>C(150) | B(250*..300)<br>C(150)<br>D(130)                 | B(700*)<br>C(100*..250)<br>D(50*..100)<br>E(100) | C(200*)<br>D(60*..150)<br>E(65*..100)    | D(200*)<br>E(100*..150)             |                                 |  |                       |
| 150         |         | B(250*)<br>C(200)<br>D(100)        | B(700*)<br>C(150*..200)<br>D(50*..100)<br>E(100) | C(200*)<br>D(50*..100)<br>E(100)                 | D(100*..150)<br>E(50*..100)              |                                     |                                 |  |                       |
| 220         |         | B(500*)<br>C(100)<br>D(100)        | C(100*..200)<br>D(50*..100)<br>E(80..100)        | D(50*..100)<br>E(50*..100)                       | D(220*)<br>E(80*..100)                   |                                     |                                 |  |                       |
| 330         |         | C(100*)<br>D(100)<br>E(100)        | C(200*)<br>D(45*..100)<br>E(50*..100)            | D(100..150)<br>E(40*..100)                       | E(100*)                                  |                                     |                                 |  |                       |
| 470         |         | D(100)<br>E(50)                    | D(100..150)<br>E(45*..100)                       | D(150*)<br>E(50*..100)                           |  |                                     |                                 |  |                       |
| 680         |         | D(100*)<br>E(40*..80*)             | D(150*)<br>E(45*..100)                           | E(100*)  |  |                                     |                                 |  |                       |
| 1000        |         | E(50*..100*)                       | E(100*)  |  |  |                                     |                                 |  |                       |

**Overview of types (ESR (mΩ) and V<sub>R</sub> (VDC))**

| V <sub>R</sub> (VDC) | 2.5    | 4   | 6.3  | 10  | 16  | 20   | 25                      | 35                                  | 50                         |
|----------------------|--------|---|--|---|---|--|-------------------------|-------------------------------------|----------------------------|
| ESR (mW)             |        |   |  |   |   |  |                         |                                     |                            |
| 40                   |        | E(680*)   |  | E(330*)   |   |  |                         |                                     |                            |
| 45                   |        |   | D(330*)<br>E(470* 680*)  |   |   |  |                         |                                     |                            |
| 50                   |        |   | D(150* 220*)<br>E(330*)  | D(100* 150*<br>220*)<br>E (220* 330*<br>470*)                                 | E(150*)                                     |  |                         |                                     |                            |
| 55                   |        |   |  |   | E (100*)                                    |  |                         |                                     |                            |
| 60                   |        | E(470 680*)<br>1000*)                                       | E(470 680*)  |   | D(100*)                                     |  |                         |                                     |                            |
| 65                   |        |   | D(150*)  | D(100*)   |   |  |                         |                                     |                            |
| 70                   |        |   |  |   | D(68*)                                      | D(68*)<br>E(47*)                               |                         |                                     |                            |
| 80                   |        |   | D(150)<br>E(220 330)   | D(100)<br>E (220 330<br>470)  | D(47*)<br>E(220*)                           |  | E(47*)                  |                                     |                            |
| 100                  |        | C(220 330*)<br>D(150 220<br>330 470<br>680 1000*)<br>E(330) | C(220*)<br>D(150 220<br>330 470)<br>E(150 220<br>330 470<br>680 1000*) | C(100*)<br>D(47 68 100<br>150 220<br>330)<br>E(100 150<br>220 330<br>470 680) | D(68 100<br>150*)<br>E(100 150<br>220 330*) | D(47*)<br>E(100*)                              | D(33* 47*)<br>E(33*)    | D(15*)<br>E(33*)                    |                            |
| 120                  |        |   |  |   |   |  | E(47)                   |                                     |                            |
| 130                  |        |   | D(100)   |   | D(100 150)                                  | E(47 68)                                       | D(47)<br>E(68*)         | D(10*)<br>E(22*)                    |                            |
| 150                  |        | C(68 100)   | C(68 100<br>150*)<br>D(470 680)  | D(68 330<br>470*)   | D(47 68<br>100 150)<br>E(68)                | D(47 68)<br>E(47 68<br>100)                    | D(33 47)                | D(6.8*)                             |                            |
| 180                  |        |   | D(68)  | C(100)  | C(68)<br>D(47)                              |  | E(33)                   | E(22)                               |                            |
| 200                  |        | C(150)  | C(68 150<br>220 330*)  | C(68 100<br>150*)<br>D(47)  | C(68 100*)<br>D(33)                         | C(22 33)<br>D(22 33 47<br>68 100*)<br>E(33 68) | D(22 33)<br>E(33 47 68) | D(22 33*)<br>E(10 22 47*)           |                            |
| 220                  |        |   |  |   | D(220*)                                     |  |                         |                                     |                            |
| 230                  |        |   |  |   | C(33)                                       |  | D(15 22 33)<br>E(22)    |                                     | E(47)                      |
| 250                  |        | C(47)<br>B(100* 150*)                                       | B(33* 47* 68*<br>100*)<br>C(47)  | B(33* 47* 68*<br>C(68* 100)   | C(22 68)                                    | D(47)  | D(47)                   | E(15 33)                            | E(15*)                     |
| 260                  |        |   |  |   |   |  |                         | D(10 15<br>22)<br>E(10 15 22<br>33) |                            |
| 280                  |        |   |  |   |   |  | C(22)                   |                                     |                            |
| 300                  | B(100) | C(33)<br>B(100)   | B(100)<br>C(33 47)   | C(22* 33 47)  | C(22 33 47)                                 | D(68)  | C(10 15)                | D(4.7 6.8)<br>E(6.8)                | D(4.7 6.8)<br>E(6.8 10 15) |
| 330                  |        |   | C(47)  |   |   |  |                         |                                     |                            |
| 350                  |        |   | B(68)<br>C(33)   | B(68*)<br>C(22)   | B(33*)<br>C(22)                             |  |                         | C(6.8 15*)                          |                            |
| 380                  |        | C(22)   | B(22*)<br>C(22)  | C(22 33)  |   |  |                         |                                     |                            |

| V <sub>R</sub> (VDC) | 2.5          | 4                 | 6.3                         | 10                       | 16               | 20            | 25                   | 35                      | 50     |
|----------------------|--------------|-------------------|-----------------------------|--------------------------|------------------|---------------|----------------------|-------------------------|--------|
| ESR (mW)             |              |                   |                             |                          |                  |               |                      |                         |        |
| 400                  |              |                   | B(47)<br>C(68)              | B(22* 47)<br>C(10 15)    | B(22*)<br>C(15)  | C(15)         |                      | C(10)                   | D(6.8) |
| 450                  |              |                   |                             | B(15*)                   | C(10)            | C(10)         | C(10)                |                         |        |
| 480                  |              |                   |                             |                          |                  | C(6.8)        |                      |                         |        |
| 500                  |              | A(47*)<br>B(220*) | A(22*)<br>B(22 33 47<br>68) | B(47)                    | B(10* 15*)       | C(6.8)        | C(4.7)               |                         |        |
| 530                  |              |                   |                             |                          |                  |               | C(4.7)               |                         |        |
| 550                  |              |                   |                             | B(33)                    |                  |               |                      | C(3.3)                  |        |
| 600                  |              |                   | A(33*)<br>B(33)             | B(10* 15)                | B(6.8*)          | B(6.8*)       |                      |                         |        |
| 650                  |              |                   |                             | B(33 47)                 | B(10 15)         |               |                      |                         |        |
| 700                  |              |                   | A(15*)<br>B(15 150*)        | B(22 100*)               | B(22)            |               | B(4.7* 6.8)          | B(4.7*)                 |        |
| 750                  |              | A(47)             |                             | B(10)                    |                  | B(4.7 6.8)    | B(3.3* 4.7*)<br>10*) | B(2.2*)                 |        |
| 800                  |              |                   | A(10*)                      | B(22)                    | B(4.7* 10<br>15) | B(10)         | B(3.3 4.7)           |                         |        |
| 900                  |              |                   |                             | A(10*)<br>B(15)          | B(6.8)           |               | B(2.2* 4.7)          |                         |        |
| 1000                 | A(33)        | A(33)             | A(33)<br>B(10)              | A(15*)                   | B(4.7)           | B(4.7 6.8 10) | B(4.7 6.8)           | B(3.3 4.7*)             |        |
| 1200                 |              |                   |                             | B(6.8 10)                | B(6.8)           |               | B(2.2 3.3)           |                         |        |
| 1300                 |              |                   |                             |                          |                  | B(3.3)        |                      |                         |        |
| 1400                 |              |                   |                             | A(4.7*)                  |                  |               |                      |                         |        |
| 1500                 | A(22)        | A(15 22)          | A(22)                       | A(22 33*)<br>B(47)       | A(6.8)<br>B(4.7) | B(2.2)        | A(3.3*)<br>B(1.5)    | A(2.2*)<br>B(2.2)       | C(1.5) |
| 1600                 |              |                   |                             |                          |                  |               |                      |                         | C(1)   |
| 1700                 |              |                   |                             |                          | A(10*)           |               |                      |                         |        |
| 1800                 |              |                   | A(6.8*)                     | A(2.2* 6.8* 15)          | A(2.2*)          | A(4.7*)       |                      |                         |        |
| 2000                 | A(6.8 10 15) | A(6.8 10 15)      | A(6.8 10 15<br>47*)         | A(2.2 3.3 4.7<br>6.8 10) | A(4.7)<br>B(3.3) | A(4.7 6.8*)   |                      | A(1.5*)<br>B(1 1.5 2.2) |        |
| 2500                 |              |                   |                             |                          | A(2.2 10 15)     | A(3.3)        |                      | B(0.47 0.68)            |        |
| 3000                 | A(3.3)       | A(3.3 68* 100*)   | A(3.3)                      |                          | A(3.3)           | A(1* 2.2)     | A(1.5*)              | A(1)                    |        |
| 3500                 | A(4.7)       | A(4.7)            | A(4.7)                      |                          |                  |               | A(2.2)               |                         |        |
| 4000                 |              |                   |                             |                          |                  |               | A(1* 1.5)            | A(0.47* 0.68*)          |        |
| 4500                 |              |                   |                             |                          |                  | A(1.5)        |                      |                         |        |
| 5000                 | A(2.2)       | A(2.2)            | A(2.2)                      | A(1.5)                   | A(1 1.5)         | A(1)          | A(1)                 |                         |        |
| 6000                 |              |                   |                             |                          |                  | A(0.68)       | A(0.68)              | A(0.33* 0.68)           |        |
| 7000                 |              |                   |                             |                          |                  |               | A(0.47)              | A(0.33 0.47)            |        |
| 10000                |              |                   |                             |                          |                  |               | A(0.33)              |                         |        |
| 13000                |              |                   |                             |                          |                  |               |                      | A(0.22)                 |        |
| 15000                |              |                   |                             |                          |                  |               |                      | A(0.15)                 |        |



Ordering code structure for SpeedPower series

|  |             |          |            |          |          |          |          |
|--|-------------|----------|------------|----------|----------|----------|----------|
| <b>B45</b>   | <b>197A</b> | <b>1</b> | <b>157</b> | <b>+</b> | <b>4</b> | <b>0</b> | <b>*</b> |
| <b>Tantalum capacitor</b>  |             |          |            |          |          |          |          |
| <b>Series</b><br>197A = SpeedPower, Low ESR, tinned terminals<br>198R = SpeedPower, Low ESR, gold-plated terminals                                     |             |          |            |          |          |          |          |
| <b>Rated voltage</b><br>0 = 4 V, 1 = 6.3 V, 2 = 10 V, 3 = 16 V, 4 = 20 V, 5 = 25 V, 6 = 35 V, 7 = 50 V   |             |          |            |          |          |          |          |
| <b>Rated capacitance + exponent</b><br>C [pF] · 10 <sup>x</sup><br>E.g.: 686 = 68 pF · 10 <sup>6</sup> = 68 μF, 157 = 15 pF · 10 <sup>7</sup> = 150 μF |             |          |            |          |          |          |          |
| <b>Capacitance tolerance</b><br>M = ±20%, K = ±10%   |             |          |            |          |          |          |          |
| <b>Case size</b><br>1 = A<br>2 = B<br>3 = C<br>4 = D<br>5 = E  |             |          |            |          |          |          |          |
| <b>ESR quality</b><br>0 = standard   |             |          |            |          |          |          |          |
| <b>Reel diameter</b><br>9 = 180 mm, 6 = 330 mm   |             |          |            |          |          |          |          |

Ordering code structure for SpeedPower II series and SpeedPower III series

|  |          |           |          |            |          |          |            |
|--|----------|-----------|----------|------------|----------|----------|------------|
| <b>B45</b>   | <b>0</b> | <b>02</b> | <b>D</b> | <b>337</b> | <b>*</b> | <b>+</b> | <b>106</b> |
| <b>Tantalum capacitor</b>  |          |           |          |            |          |          |            |
| <b>Series</b><br>0 = SpeedPower, Low ESR; Low Profile, Low ESR; tinned terminals<br>1 = SpeedPower, Low ESR; gold-plated terminals   |          |           |          |            |          |          |            |
| <b>Rated voltage</b><br>02 = 2.5 V, 04 = 4 V, 06 = 6.3 V, 10 = 10 V, 16 = 16 V, 20 = 20 V, 25 = 25 V, 35 = 35 V, 50 = 50 V   |          |           |          |            |          |          |            |
| <b>Case size</b><br>A, B, C, D, E  |          |           |          |            |          |          |            |
| <b>Rated capacitance + exponent</b><br>C [pF] · 10 <sup>x</sup><br>686 = 68 pF · 10 <sup>6</sup> = 68 μF, 157 = 15 pF · 10 <sup>7</sup> = 150 μF, 108 = 10 pF · 10 <sup>8</sup> = 1000 μF  |          |           |          |            |          |          |            |
| <b>Reel diameter</b><br>9 = 180 mm, 6 = 330 mm   |          |           |          |            |          |          |            |
| <b>Capacitance tolerance</b><br>M = ±20%, K = ±10%   |          |           |          |            |          |          |            |
| <b>ESR value + exponent</b><br>R [nΩ] · 10 <sup>x</sup><br>E.g.: 106 = 10 nΩ · 10 <sup>6</sup> = 10 mΩ, 107 = 10 nΩ · 10 <sup>7</sup> = 100 mΩ, 108 = 10 nΩ · 10 <sup>8</sup> = 1000 mΩ, 109 = 10 nΩ · 10 <sup>9</sup> = 10000 mΩ, |          |           |          |            |          |          |            |

Technical data and ordering codes

| $C_R$<br>(20 °C,<br>120 Hz)<br>$\mu\text{F}$                  | Case size | $DF_{\text{max}}$<br>(20 °C,<br>120 Hz)<br>% | $I_{\text{leak,max}}$<br>(20 °C, $V_R$ ,<br>5 min)<br>$\mu\text{A}$ | $ESR_{\text{max}}$<br>(20 °C,<br>100 kHz)<br>$\text{m}\Omega$ | $I_{\text{AC,max}}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|---|-----------|--|---|---|---|-------------------|
| $V_R$ (up to 85 °C) = 2.5 VDC, $V_R$ (up to 125 °C) = 1.7 VDC |           |  |   |   |   |                   |
| 2.2   | A         | 6  | 0.5   | 5000  | 0.12  | B45002A225*+508   |
| 3.3   | A         | 6  | 0.5   | 3000  | 0.16  | B45002A335*+308   |
| 4.7   | A         | 6  | 0.5   | 3500  | 0.15  | B45002A475*+358   |
| 6.8   | A         | 6  | 0.5   | 2000  | 0.19  | B45002A685*+208   |
| 10  | A         | 6  | 0.5   | 2000  | 0.19  | B45002A106*+208   |
| 15  | A         | 6  | 0.5   | 2000  | 0.19  | B45002A156*+208   |
| 22  | A         | 8  | 0.6   | 1500  | 0.22  | B45002A226*+158   |
| 33  | A         | 10   | 0.8   | 1000  | 0.27  | B45002A336*+108   |
| 100   | B         | 8  | 2.5   | 300   | 0.53  | B45002B107*+307   |
| $V_R$ (up to 85 °C) = 4 VDC, $V_R$ (up to 125 °C) = 2.5 VDC   |           |  |   |   |   |                   |
| 2.2   | A         | 6  | 0.5   | 5000  | 0.12  | B45004A225*+508   |
| 3.3   | A         | 6  | 0.5   | 3000  | 0.16  | B45004A335*+308   |
| 4.7   | A         | 6  | 0.5   | 3500  | 0.15  | B45004A475*+358   |
| 6.8   | A         | 6  | 0.5   | 2000  | 0.19  | B45004A685*+208   |
| 10  | A         | 6  | 0.5   | 2000  | 0.19  | B45004A106*+208   |
| 15  | A         | 6  | 0.6   | 1500  | 0.22  | B45004A156*+158   |
| 15  | A         | 6  | 0.6   | 2000  | 0.19  | B45004A156*+208   |
| 22  | A         | 8  | 0.9   | 1500  | 0.22  | B45004A226*+158   |
| 22  | C         | 6  | 0.9   | 380   | 0.54  | B45004C226*+387   |
| 33  | A         | 10   | 1.3   | 1000  | 0.27  | B45004A336*+108   |
| 33  | C         | 6  | 1.3   | 300   | 0.61  | B45004C336*+307   |
| 47  | A         | 10   | 1.9   | 500   | 0.39  | B45004A476*+507 ● |
| 47  | A         | 10   | 1.9   | 750   | 0.32  | B45004A476*+757   |
| 47  | C         | 6  | 1.9   | 250   | 0.66  | B45004C476*+257   |
| 68  | A         | 30   | 2.7   | 3000  | 0.16  | B45004A686*M308 ● |
| 68  | C         | 6  | 2.7   | 150   | 0.86  | B45004C686*+157   |
| 100   | A         | 30   | 4.0   | 3000  | 0.16  | B45004A107*M308 ● |
| 100   | B         | 8  | 4.0   | 250   | 0.58  | B45004B107*+257 ● |
| 100   | B         | 8  | 4.0   | 300   | 0.53  | B45004B107*+307   |
| 100   | C         | 8  | 4.0   | 150   | 0.86  | B45004C107*+157   |
| 150   | B         | 10   | 6.0   | 250   | 0.58  | B45004B157*+257 ● |
| 150   | C         | 8  | 6.0   | 200   | 0.74  | B45004C157*+207   |

● Preliminary Data

\* = Code number for reel diameter  
6 = 330-mm reel  
9 = 180-mm reel

+ = Capacitance tolerance  
M =  $\pm 20\%$   
K =  $\pm 10\%$

| $C_R$<br>(20 °C,<br>120 Hz)<br>μF | Case size | $DF_{max}$<br>(20 °C,<br>120 Hz)<br>% | $I_{leak,max}$<br>(20 °C, $V_R$ ,<br>5 min)<br>μA | $ESR_{max}$<br>(20 °C,<br>100 kHz)<br>mΩ | $I_{AC,max}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|-----------------------------------|-----------|---------------------------------------|---|--|--|-------------------|
| 150                               | D         | 8                                     | 6.0   | 100                                      | 1.22                                     | B45004D157*+107   |
| 220                               | B         | 20                                    | 8.8   | 500                                      | 0.41                                     | B45004B227*M507 ● |
| 220                               | C         | 15                                    | 8.8   | 100                                      | 1.05                                     | B45004C227*+107   |
| 220                               | D         | 8                                     | 8.8   | 100                                      | 1.22                                     | B45004D227*+107   |
| 330                               | C         | 15                                    | 13.2  | 100                                      | 1.05                                     | B45004C337*+107 ● |
| 330                               | D         | 10                                    | 13.2  | 100                                      | 1.22                                     | B45004D337*+107   |
| 330                               | E         | 8                                     | 13.2  | 100                                      | 1.28                                     | B45004E337*+107   |
| 470                               | D         | 10                                    | 18.8  | 100                                      | 1.22                                     | B45004D477*+107   |
| 470                               | E         | 8                                     | 18.8  | 60                                       | 1.66                                     | B45004E477*+606   |
| 680                               | D         | 12                                    | 27.2  | 100                                      | 1.22                                     | B45004D687*+107 ● |
| 680                               | E         | 12                                    | 27.2  | 40                                       | 2.03                                     | B45004E687*+406 ● |
| 680                               | E         | 12                                    | 27.2  | 60                                       | 1.66                                     | B45004E687*+606 ● |
| 1000                              | E         | 15                                    | 40.0  | 60                                       | 1.66                                     | B45004E108*+606 ● |
| 1000                              | E         | 15                                    | 40.0  | 100                                      | 1.28                                     | B45004E108*+107 ● |

 $V_R$  (up to 85 °C) = 6.3 VDC,  $V_R$  (up to 125 °C) = 4 VDC

|     |   |    |     |      |      |                   |
|-----|---|----|-----|------|------|-------------------|
| 2.2 | A | 6  | 0.5 | 5000 | 0.12 | B45006A225*+508   |
| 3.3 | A | 6  | 0.5 | 3000 | 0.16 | B45006A335*+308   |
| 4.7 | A | 6  | 0.5 | 3500 | 0.15 | B45006A475*+358   |
| 6.8 | A | 6  | 0.5 | 1800 | 0.20 | B45006A685*+188 ● |
| 6.8 | A | 6  | 0.5 | 2000 | 0.19 | B45006A685*+208   |
| 10  | A | 6  | 0.6 | 800  | 0.31 | B45006A106*+807 ● |
| 10  | A | 6  | 0.6 | 2000 | 0.19 | B45006A106*+208   |
| 10  | B | 6  | 0.6 | 1000 | 0.29 | B45197A1106+20*   |
| 15  | A | 6  | 0.9 | 700  | 0.33 | B45006A156*+707 ● |
| 15  | A | 6  | 0.9 | 2000 | 0.19 | B45006A156*+208   |
| 15  | B | 6  | 0.9 | 700  | 0.35 | B45197A1156+20*   |
| 22  | A | 8  | 1.4 | 500  | 0.39 | B45006A226*+507 ● |
| 22  | A | 8  | 1.4 | 1500 | 0.22 | B45006A226*+158   |
| 22  | B | 6  | 1.4 | 380  | 0.47 | B45006B226*+387 ● |
| 22  | B | 6  | 1.4 | 500  | 0.41 | B45006B226*+507   |
| 22  | C | 6  | 1.4 | 380  | 0.54 | B45197A1226+30*   |
| 33  | A | 10 | 2.1 | 600  | 0.35 | B45006A336*+607 ● |
| 33  | A | 10 | 2.1 | 1000 | 0.27 | B45006A336*+108   |
| 33  | B | 6  | 2.1 | 250  | 0.58 | B45006B336*+257 ● |

● Preliminary Data

\* = Code number for reel diameter  
6 = 330-mm reel  
9 = 180-mm reel

+ = Capacitance tolerance  
M = ±20%  
K = ±10%

| $C_R$<br>(20 °C,<br>120 Hz)<br>μF | Case size | $DF_{max}$<br>(20 °C,<br>120 Hz)<br>% | $I_{leak,max}$<br>(20 °C, $V_R$ ,<br>5 min)<br>μA | $ESR_{max}$<br>(20 °C,<br>100 kHz)<br>mΩ | $I_{AC,max}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|-----------------------------------|-----------|---------------------------------------|---|--|--|-------------------|
| 33                                | B         | 6                                     | 2.1   | 500                                      | 0.41                                     | B45006B336*+507   |
| 33                                | B         | 6                                     | 2.1   | 600                                      | 0.35                                     | B45197A1336+20*   |
| 33                                | C         | 6                                     | 2.1   | 300                                      | 0.61                                     | B45006C336*+307   |
| 33                                | C         | 6                                     | 2.1   | 350                                      | 0.56                                     | B45197A1336+30*   |
| 47                                | A         | 15                                    | 3.0   | 2000                                     | 0.19                                     | B45006A476*M208 ● |
| 47                                | B         | 6                                     | 3.0   | 250                                      | 0.58                                     | B45006B476*+257 ● |
| 47                                | B         | 6                                     | 3.0   | 400                                      | 0.46                                     | B45006B476*+407   |
| 47                                | B         | 6                                     | 3.0   | 500                                      | 0.41                                     | B45197A1476+20*   |
| 47                                | C         | 6                                     | 3.0   | 250                                      | 0.66                                     | B45006C476*+257   |
| 47                                | C         | 6                                     | 3.0   | 300                                      | 0.61                                     | B45006C476*+307   |
| 47                                | C         | 6                                     | 3.0   | 330                                      | 0.58                                     | B45197A1476+30*   |
| 68                                | B         | 6                                     | 4.3   | 250                                      | 0.58                                     | B45006B686*+257 ● |
| 68                                | B         | 6                                     | 4.3   | 350                                      | 0.49                                     | B45006B686*+357   |
| 68                                | B         | 6                                     | 4.3   | 500                                      | 0.41                                     | B45197A1686+20*   |
| 68                                | C         | 6                                     | 4.3   | 150                                      | 0.86                                     | B45006C686*+157   |
| 68                                | C         | 6                                     | 4.3   | 200                                      | 0.74                                     | B45006C686*+207   |
| 68                                | C         | 6                                     | 4.3   | 400                                      | 0.52                                     | B45197A1686+30*   |
| 68                                | D         | 6                                     | 4.3   | 180                                      | 0.93                                     | B45197A1686+40*   |
| 100                               | B         | 8                                     | 6.3   | 250                                      | 0.58                                     | B45006B107*+257 ● |
| 100                               | B         | 8                                     | 6.3   | 300                                      | 0.53                                     | B45006B107*+307   |
| 100                               | C         | 8                                     | 6.3   | 150                                      | 0.86                                     | B45197A1107+30*   |
| 100                               | D         | 8                                     | 6.3   | 130                                      | 1.10                                     | B45197A1107+40*   |
| 150                               | B         | 15                                    | 9.5   | 700                                      | 0.35                                     | B45006B157*M707 ● |
| 150                               | C         | 8                                     | 9.5   | 150                                      | 0.86                                     | B45006C157*+157 ● |
| 150                               | C         | 8                                     | 9.5   | 200                                      | 0.74                                     | B45006C157*+207   |
| 150                               | D         | 8                                     | 9.5   | 50                                       | 1.73                                     | B45006D157*+506 ● |
| 150                               | D         | 8                                     | 9.5   | 65                                       | 1.52                                     | B45006D157*+656 ● |
| 150                               | D         | 8                                     | 9.5   | 80                                       | 1.37                                     | B45006D157*+806   |
| 150                               | D         | 8                                     | 9.5   | 100                                      | 1.22                                     | B45197A1157+40*   |
| 150                               | E         | 8                                     | 9.5   | 100                                      | 1.28                                     | B45197A1157+50*   |
| 220                               | C         | 15                                    | 13.9  | 100                                      | 1.05                                     | B45006C227*+107 ● |
| 220                               | C         | 15                                    | 13.9  | 200                                      | 0.74                                     | B45197A1227+30*   |
| 220                               | D         | 10                                    | 13.9  | 50                                       | 1.73                                     | B45006D227*+506 ● |
| 220                               | D         | 8                                     | 13.9  | 100                                      | 1.22                                     | B45197A1227+40*   |

● Preliminary Data

\* = Code number for reel diameter  
6 = 330-mm reel  
9 = 180-mm reel

+ = Capacitance tolerance  
M = ±20%  
K = ±10%

| $C_R$<br>(20 °C,<br>120 Hz)<br>$\mu\text{F}$                 | Case size | $DF_{\text{max}}$<br>(20 °C,<br>120 Hz)<br>% | $I_{\text{leak,max}}$<br>(20 °C, $V_R$ ,<br>5 min)<br>$\mu\text{A}$ | $ESR_{\text{max}}$<br>(20 °C,<br>100 kHz)<br>$\text{m}\Omega$ | $I_{\text{AC,max}}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|--|-----------|--|---|---|---|-------------------|
| 220  | E         | 8  | 13.9  | 80  | 1.44  | B45006E227*+806   |
| 220  | E         | 8  | 13.9  | 100   | 1.28  | B45197A1227+50*   |
| 330  | C         | 15   | 20.8  | 200   | 0.74  | B45006C337*+207 ● |
| 330  | D         | 12   | 20.8  | 45  | 1.83  | B45006D337*+456 ● |
| 330  | D         | 12   | 20.8  | 100   | 1.22  | B45197A1337+40*   |
| 330  | E         | 12   | 20.8  | 50  | 1.82  | B45006E337*+506 ● |
| 330  | E         | 8  | 20.8  | 80  | 1.44  | B45006E337*+806   |
| 330  | E         | 8  | 20.8  | 100   | 1.28  | B45197A1337+50*   |
| 470  | D         | 15   | 29.6  | 100   | 1.22  | B45006D477*+107   |
| 470  | D         | 15   | 29.6  | 150   | 1.00  | B45197A1477+40*   |
| 470  | E         | 12   | 29.6  | 45  | 1.91  | B45006E477*+456 ● |
| 470  | E         | 12   | 29.6  | 60  | 1.66  | B45006E477*+606   |
| 470  | E         | 12   | 29.6  | 100   | 1.28  | B45197A1477+50*   |
| 680  | D         | 15   | 42.8  | 150   | 1.00  | B45006D687*+157 ● |
| 680  | E         | 15   | 42.8  | 45  | 1.91  | B45006E687*+456 ● |
| 680  | E         | 15   | 42.8  | 60  | 1.66  | B45006E687*+606 ● |
| 680  | E         | 15   | 42.8  | 100   | 1.28  | B45197A1687+50*   |
| 1000   | E         | 20   | 63.0  | 100   | 1.28  | B45197A1108+50* ● |
| $V_R$ (up to 85 °C) = 10 VDC, $V_R$ (up to 125 °C) = 6.3 VDC |           |  |   |   |   |                   |
| 1.5  | A         | 6  | 0.5   | 5000  | 0.12  | B45010A155*+508   |
| 2.2  | A         | 6  | 0.5   | 1800  | 0.20  | B45010A225*+188 ● |
| 2.2  | A         | 6  | 0.5   | 2000  | 0.19  | B45010A225*+208   |
| 3.3  | A         | 6  | 0.5   | 2000  | 0.19  | B45010A335*+208   |
| 4.7  | A         | 6  | 0.5   | 1400  | 0.23  | B45010A475*+148 ● |
| 4.7  | A         | 6  | 0.5   | 2000  | 0.19  | B45010A475*+208   |
| 4.7  | B         | 6  | 0.5   | 1500  | 0.24  | B45197A2475+20*   |
| 6.8  | A         | 6  | 0.7   | 1800  | 0.20  | B45010A685*+188 ● |
| 6.8  | A         | 6  | 0.7   | 2000  | 0.19  | B45010A685*+208   |
| 6.8  | B         | 6  | 0.7   | 1200  | 0.27  | B45197A2685+20*   |
| 10   | A         | 6  | 1.0   | 900   | 0.29  | B45010A106*+907 ● |
| 10   | A         | 6  | 1.0   | 2000  | 0.19  | B45010A106*+208   |
| 10   | B         | 6  | 1.0   | 600   | 0.38  | B45010B106*+607 ● |
| 10   | B         | 6  | 1.0   | 750   | 0.34  | B45010B106*+757   |
| 10   | B         | 6  | 1.0   | 1200  | 0.27  | B45197A2106+20*   |

● Preliminary Data

 \* = Code number for reel diameter  
 6 = 330-mm reel  
 9 = 180-mm reel

 + = Capacitance tolerance  
 M =  $\pm 20\%$   
 K =  $\pm 10\%$

| $C_R$<br>(20 °C,<br>120 Hz)<br>μF | Case size | $DF_{max}$<br>(20 °C,<br>120 Hz)<br>% | $I_{leak,max}$<br>(20 °C, $V_R$ ,<br>5 min)<br>μA | $ESR_{max}$<br>(20 °C,<br>100 kHz)<br>mΩ | $I_{AC,max}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|-----------------------------------|-----------|---------------------------------------|---|--|--|-------------------|
| 10                                | C         | 6                                     | 1.0   | 400                                      | 0.52                                     | B45197A2106+30*   |
| 15                                | A         | 6                                     | 1.5   | 1000                                     | 0.27                                     | B45010A156*+108 ● |
| 15                                | A         | 6                                     | 1.5   | 1800                                     | 0.20                                     | B45010A156*+188   |
| 15                                | B         | 6                                     | 1.5   | 450                                      | 0.43                                     | B45010B156*+457 ● |
| 15                                | B         | 6                                     | 1.5   | 600                                      | 0.38                                     | B45010B156*+607   |
| 15                                | B         | 6                                     | 1.5   | 900                                      | 0.31                                     | B45197A2156+20*   |
| 15                                | C         | 6                                     | 1.5   | 400                                      | 0.52                                     | B45197A2156+30*   |
| 22                                | A         | 8                                     | 2.2   | 1500                                     | 0.22                                     | B45010A226*+158   |
| 22                                | B         | 6                                     | 2.2   | 400                                      | 0.46                                     | B45010B226*+407 ● |
| 22                                | B         | 6                                     | 2.2   | 700                                      | 0.35                                     | B45010B226*+707   |
| 22                                | B         | 6                                     | 2.2   | 800                                      | 0.31                                     | B45197A2226+20*   |
| 22                                | C         | 6                                     | 2.2   | 300                                      | 0.61                                     | B45010C226*+307 ● |
| 22                                | C         | 6                                     | 2.2   | 350                                      | 0.56                                     | B45010C226*+357   |
| 22                                | C         | 6                                     | 2.2   | 380                                      | 0.54                                     | B45197A2226+30*   |
| 33                                | A         | 10                                    | 3.3   | 1500                                     | 0.22                                     | B45010A336*M158 ● |
| 33                                | B         | 6                                     | 3.3   | 250                                      | 0.58                                     | B45010B336*+257 ● |
| 33                                | B         | 6                                     | 3.3   | 550                                      | 0.39                                     | B45010B336*+557   |
| 33                                | B         | 6                                     | 3.3   | 650                                      | 0.36                                     | B45197A2336+20*   |
| 33                                | C         | 6                                     | 3.3   | 300                                      | 0.61                                     | B45010C336*+307   |
| 33                                | C         | 6                                     | 3.3   | 380                                      | 0.54                                     | B45197A2336+30*   |
| 47                                | B         | 8                                     | 4.7   | 250                                      | 0.58                                     | B45010B476*+257 ● |
| 47                                | B         | 8                                     | 4.7   | 400                                      | 0.46                                     | B45010B476*+407   |
| 47                                | B         | 8                                     | 4.7   | 500                                      | 0.41                                     | B45010B476*+507   |
| 47                                | B         | 8                                     | 4.7   | 650                                      | 0.36                                     | B45197A2476+20*   |
| 47                                | C         | 6                                     | 4.7   | 300                                      | 0.61                                     | B45197A2476+30*   |
| 47                                | D         | 6                                     | 4.7   | 100                                      | 1.22                                     | B45010D476*+107   |
| 47                                | D         | 6                                     | 4.7   | 200                                      | 0.87                                     | B45197A2476+40*   |
| 68                                | B         | 8                                     | 6.8   | 250                                      | 0.58                                     | B45010B686*+257 ● |
| 68                                | B         | 8                                     | 6.8   | 350                                      | 0.49                                     | B45010B686*+357 ● |
| 68                                | C         | 6                                     | 6.8   | 200                                      | 0.74                                     | B45010C686*+207   |
| 68                                | C         | 6                                     | 6.8   | 250                                      | 0.66                                     | B45197A2686+30*   |
| 68                                | D         | 6                                     | 6.8   | 100                                      | 1.22                                     | B45010D686*+107   |
| 68                                | D         | 6                                     | 6.8   | 150                                      | 1.00                                     | B45197A2686+40*   |
| 100                               | B         | 12                                    | 10.0  | 700                                      | 0.35                                     | B45010B107*M707 ● |

● Preliminary Data

\* = Code number for reel diameter  
6 = 330-mm reel  
9 = 180-mm reel

+ = Capacitance tolerance  
M = ±20%  
K = ±10%

| $C_R$<br>(20 °C,<br>120 Hz)<br>μF                           | Case size | $DF_{max}$<br>(20 °C,<br>120 Hz)<br>% | $I_{leak,max}$<br>(20 °C, $V_R$ ,<br>5 min)<br>μA | $ESR_{max}$<br>(20 °C,<br>100 kHz)<br>mΩ | $I_{AC,max}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|---|-----------|---------------------------------------|---|--|--|-------------------|
| 100   | C         | 8                                     | 10.0  | 100                                      | 1.05                                     | B45010C107*+107 ● |
| 100   | C         | 8                                     | 10.0  | 180                                      | 0.78                                     | B45010C107*+187   |
| 100   | C         | 8                                     | 10.0  | 200                                      | 0.74                                     | B45010C107*+207   |
| 100   | C         | 8                                     | 10.0  | 250                                      | 0.66                                     | B45197A2107*+30*  |
| 100   | D         | 8                                     | 10.0  | 50                                       | 1.73                                     | B45010D107*+506 ● |
| 100   | D         | 8                                     | 10.0  | 65                                       | 1.52                                     | B45010D107*+656 ● |
| 100   | D         | 8                                     | 10.0  | 80                                       | 1.37                                     | B45010D107*+806   |
| 100   | D         | 8                                     | 10.0  | 100                                      | 1.22                                     | B45197A2107*+40*  |
| 100   | E         | 8                                     | 10.0  | 100                                      | 1.28                                     | B45197A2107*+50*  |
| 150   | C         | 10                                    | 15.0  | 200                                      | 0.74                                     | B45010C157*+207 ● |
| 150   | D         | 8                                     | 15.0  | 50                                       | 1.73                                     | B45010D157*+506 ● |
| 150   | D         | 8                                     | 15.0  | 100                                      | 1.22                                     | B45197A2157*+40*  |
| 150   | E         | 8                                     | 15.0  | 100                                      | 1.28                                     | B45197A2157*+50*  |
| 220   | D         | 10                                    | 22.0  | 50                                       | 1.73                                     | B45010D227*+506 ● |
| 220   | D         | 10                                    | 22.0  | 100                                      | 1.22                                     | B45197A2227*+40*  |
| 220   | E         | 8                                     | 20.0  | 50                                       | 1.82                                     | B45010E227*+506 ● |
| 220   | E         | 10                                    | 22.0  | 80                                       | 1.44                                     | B45010E227*+806   |
| 220   | E         | 8                                     | 22.0  | 100                                      | 1.28                                     | B45197A2227*+50*  |
| 330   | D         | 12                                    | 33.0  | 100                                      | 1.22                                     | B45010D337*+107   |
| 330   | D         | 12                                    | 33.0  | 150                                      | 1.00                                     | B45197A2337*+40*  |
| 330   | E         | 10                                    | 33.0  | 40                                       | 2.03                                     | B45010E337*+406 ● |
| 330   | E         | 10                                    | 33.0  | 50                                       | 1.82                                     | B45010E337*+506 ● |
| 330   | E         | 10                                    | 33.0  | 80                                       | 1.44                                     | B45010E337*+806   |
| 330   | E         | 10                                    | 33.0  | 100                                      | 1.28                                     | B45197A2337*+50*  |
| 470   | D         | 15                                    | 47.0  | 150                                      | 1.00                                     | B45010D477*+157 ● |
| 470   | E         | 12                                    | 47.0  | 50                                       | 1.82                                     | B45010E477*+506 ● |
| 470   | E         | 12                                    | 47.0  | 80                                       | 1.44                                     | B45010E477*+806   |
| 470   | E         | 12                                    | 47.0  | 100                                      | 1.28                                     | B45197A2477*+50*  |
| 680   | E         | 15                                    | 68.0  | 100                                      | 1.28                                     | B45010E687*+107 ● |
| $V_R$ (up to 85 °C) = 16 VDC, $V_R$ (up to 125 °C) = 10 VDC |           |                                       |   |  |  |                   |
| 1   | A         | 6                                     | 0.5   | 5000                                     | 0.12                                     | B45016A105*+508   |
| 1.5   | A         | 6                                     | 0.5   | 5000                                     | 0.12                                     | B45016A155*+508   |
| 2.2   | A         | 6                                     | 0.5   | 1800                                     | 0.20                                     | B45016A225*+188 ● |
| 2.2   | A         | 6                                     | 0.5   | 2500                                     | 0.17                                     | B45016A225*+258   |

● Preliminary Data

\* = Code number for reel diameter  
 6 = 330-mm reel  
 9 = 180-mm reel

+ = Capacitance tolerance  
 M = ±20%  
 K = ±10%



| $C_R$<br>(20 °C,<br>120 Hz)<br>μF | Case size | $DF_{max}$<br>(20 °C,<br>120 Hz)<br>% | $I_{leak,max}$<br>(20 °C, $V_R$ ,<br>5 min)<br>μA | $ESR_{max}$<br>(20 °C,<br>100 kHz)<br>mΩ | $I_{AC,max}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|-----------------------------------|-----------|---------------------------------------|---|--|--|-------------------|
| 3.3                               | A         | 6                                     | 0.5   | 3000                                     | 0.16                                     | B45016A335*+308   |
| 3.3                               | B         | 6                                     | 0.5   | 2000                                     | 0.21                                     | B45197A3335+20*   |
| 4.7                               | A         | 6                                     | 0.8   | 2000                                     | 0.19                                     | B45016A475*+208   |
| 4.7                               | B         | 6                                     | 0.8   | 800                                      | 0.33                                     | B45016B475*+807 ● |
| 4.7                               | B         | 6                                     | 0.8   | 1000                                     | 0.29                                     | B45016B475*+108   |
| 4.7                               | B         | 6                                     | 0.8   | 1500                                     | 0.24                                     | B45197A3475+20*   |
| 6.8                               | A         | 6                                     | 1.1   | 1500                                     | 0.22                                     | B45016A685*+158   |
| 6.8                               | B         | 6                                     | 1.1   | 600                                      | 0.38                                     | B45016B685*+607 ● |
| 6.8                               | B         | 6                                     | 1.1   | 900                                      | 0.31                                     | B45016B685*+907   |
| 6.8                               | B         | 6                                     | 1.1   | 1200                                     | 0.27                                     | B45197A3685+20*   |
| 10                                | A         | 6                                     | 1.6   | 1700                                     | 0.21                                     | B45016A106*+178 ● |
| 10                                | A         | 6                                     | 1.6   | 2500                                     | 0.17                                     | B45016A106*+258   |
| 10                                | B         | 6                                     | 1.6   | 500                                      | 0.41                                     | B45016B106*+507 ● |
| 10                                | B         | 6                                     | 1.6   | 650                                      | 0.36                                     | B45016B106*+657   |
| 10                                | B         | 6                                     | 1.6   | 800                                      | 0.31                                     | B45197A3106+20*   |
| 10                                | C         | 6                                     | 1.6   | 450                                      | 0.49                                     | B45197A3106+30*   |
| 15                                | A         | 8                                     | 2.4   | 2500                                     | 0.17                                     | B45016A156*+258 ● |
| 15                                | B         | 6                                     | 2.4   | 500                                      | 0.41                                     | B45016B156*+507 ● |
| 15                                | B         | 6                                     | 2.4   | 650                                      | 0.36                                     | B45016B156*+657   |
| 15                                | B         | 6                                     | 2.4   | 800                                      | 0.33                                     | B45197A3156+20*   |
| 15                                | C         | 6                                     | 2.4   | 400                                      | 0.52                                     | B45197A3156+30*   |
| 22                                | B         | 6                                     | 3.5   | 400                                      | 0.46                                     | B45016B226*+407 ● |
| 22                                | B         | 6                                     | 3.5   | 700                                      | 0.35                                     | B45016B226*+707   |
| 22                                | C         | 6                                     | 3.5   | 250                                      | 0.66                                     | B45016C226*+257   |
| 22                                | C         | 6                                     | 3.5   | 300                                      | 0.61                                     | B45016C226*+307   |
| 22                                | C         | 6                                     | 3.5   | 350                                      | 0.56                                     | B45197A3226+30*   |
| 33                                | B         | 8                                     | 5.3   | 350                                      | 0.49                                     | B45016B336*+357 ● |
| 33                                | C         | 6                                     | 5.3   | 230                                      | 0.69                                     | B45016C336*+237   |
| 33                                | C         | 6                                     | 5.3   | 300                                      | 0.61                                     | B45197A3336+30*   |
| 33                                | D         | 6                                     | 5.3   | 200                                      | 0.87                                     | B45197A3336+40*   |
| 47                                | C         | 6                                     | 7.5   | 300                                      | 0.61                                     | B45197A3476+30*   |
| 47                                | D         | 6                                     | 7.5   | 80                                       | 1.37                                     | B45016D476*+806 ● |
| 47                                | D         | 6                                     | 7.5   | 150                                      | 1.00                                     | B45016D476*+157   |
| 47                                | D         | 6                                     | 7.5   | 180                                      | 0.93                                     | B45197A3476+40*   |

● Preliminary Data

\* = Code number for reel diameter  
 6 = 330-mm reel  
 9 = 180-mm reel

+ = Capacitance tolerance  
 M = ±20%  
 K = ±10%

| $C_R$<br>(20 °C,<br>120 Hz)<br>$\mu\text{F}$ | Case size | $DF_{\text{max}}$<br>(20 °C,<br>120 Hz)<br>% | $I_{\text{leak,max}}$<br>(20 °C, $V_R$ ,<br>5 min)<br>$\mu\text{A}$ | $ESR_{\text{max}}$<br>(20 °C,<br>100 kHz)<br>m $\Omega$ | $I_{\text{AC,max}}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|--|-----------|--|---|---|---|-------------------|
| 68   | C         | 6  | 10.9  | 180   | 0.78  | B45016C686*+187   |
| 68   | C         | 6  | 10.9  | 200   | 0.74  | B45016C686*+207   |
| 68   | C         | 6  | 10.9  | 250   | 0.66  | B45197A3686+30*   |
| 68   | D         | 6  | 10.9  | 70  | 1.46  | B45016D686*+706 ● |
| 68   | D         | 6  | 10.9  | 100   | 1.22  | B45016D686*+107   |
| 68   | D         | 6  | 10.9  | 150   | 1.00  | B45197A3686+40*   |
| 68   | E         | 6  | 10.9  | 150   | 1.05  | B45197A3686+50*   |
| 100  | C         | 10   | 16.0  | 200   | 0.74  | B45016C107*+207 ● |
| 100  | D         | 8  | 16.0  | 60  | 1.58  | B45016D107*+606 ● |
| 100  | D         | 8  | 16.0  | 100   | 1.22  | B45016D107*+107   |
| 100  | D         | 8  | 16.0  | 130   | 1.07  | B45016D107*+137   |
| 100  | D         | 8  | 16.0  | 150   | 1.00  | B45197A3107+40*   |
| 100  | E         | 8  | 16.0  | 55  | 1.73  | B45016E107*+556 ● |
| 100  | E         | 8  | 16.0  | 100   | 1.28  | B45197A3107+50*   |
| 150  | D         | 8  | 24.0  | 100   | 1.22  | B45016D157*+107 ● |
| 150  | D         | 10   | 24.0  | 130   | 1.07  | B45016D157*+137   |
| 150  | D         | 10   | 24.0  | 150   | 1.00  | B45197A3157+40*   |
| 150  | E         | 8  | 24.0  | 50  | 1.82  | B45016E157*+506 ● |
| 150  | E         | 8  | 24.0  | 100   | 1.28  | B45197A3157+50*   |
| 220  | D         | 12   | 35.2  | 220   | 0.87  | B45016D227*+227 ● |
| 220  | E         | 10   | 35.2  | 80  | 1.44  | B45016E227*+806 ● |
| 220  | E         | 10   | 35.2  | 100   | 1.28  | B45197A3227+50*   |
| 330  | E         | 12   | 52.8  | 100   | 1.28  | B45016E337*+107 ● |

 $V_R$  (up to 85 °C) = 20 VDC,  $V_R$  (up to 125 °C) = 13 VDC

|      |   |   |     |      |      |                   |
|------|---|---|-----|------|------|-------------------|
| 0.68 | A | 6 | 0.5 | 6000 | 0.11 | B45020A684*+608   |
| 1    | A | 6 | 0.5 | 3000 | 0.16 | B45020A105*+308 ● |
| 1    | A | 6 | 0.5 | 5000 | 0.12 | B45020A105*+508   |
| 1.5  | A | 6 | 0.5 | 4500 | 0.13 | B45020A155*+458   |
| 2.2  | A | 6 | 0.5 | 3000 | 0.16 | B45020A225*+308   |
| 2.2  | B | 6 | 0.5 | 1500 | 0.24 | B45197A4225+20*   |
| 3.3  | A | 6 | 0.7 | 2500 | 0.17 | B45020A335*+258   |
| 3.3  | B | 6 | 0.7 | 1300 | 0.26 | B45197A4335+20*   |
| 4.7  | A | 6 | 0.9 | 1800 | 0.20 | B45020A475*+188 ● |
| 4.7  | A | 6 | 0.9 | 2000 | 0.19 | B45020A475*+208   |

● Preliminary Data

\* = Code number for reel diameter  
6 = 330-mm reel  
9 = 180-mm reel

+ = Capacitance tolerance  
M =  $\pm 20\%$   
K =  $\pm 10\%$

| $C_R$<br>(20 °C,<br>120 Hz)<br>μF | Case size | $DF_{max}$<br>(20 °C,<br>120 Hz)<br>% | $I_{leak,max}$<br>(20 °C, $V_R$ ,<br>5 min)<br>μA | $ESR_{max}$<br>(20 °C,<br>100 kHz)<br>mΩ | $I_{AC,max}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|-----------------------------------|-----------|---------------------------------------|---|--|--|-------------------|
| 4.7                               | B         | 6                                     | 0.9   | 750                                      | 0.34                                     | B45020B475*+757   |
| 4.7                               | B         | 6                                     | 0.9   | 1000                                     | 0.29                                     | B45197A4475+20*   |
| 6.8                               | A         | 6                                     | 1.4   | 2000                                     | 0.19                                     | B45020A685*+208 ● |
| 6.8                               | B         | 6                                     | 1.4   | 600                                      | 0.38                                     | B45020B685*+607 ● |
| 6.8                               | B         | 6                                     | 1.4   | 750                                      | 0.34                                     | B45020B685*+757   |
| 6.8                               | B         | 6                                     | 1.4   | 1000                                     | 0.29                                     | B45197A4685+20*   |
| 6.8                               | C         | 6                                     | 1.4   | 480                                      | 0.48                                     | B45197A4685+30*   |
| 10                                | B         | 6                                     | 2.0   | 500                                      | 0.41                                     | B45020B106*+507 ● |
| 10                                | B         | 6                                     | 2.0   | 800                                      | 0.33                                     | B45020B106*+807   |
| 10                                | B         | 6                                     | 2.0   | 1000                                     | 0.29                                     | B45197A4106+20*   |
| 10                                | C         | 6                                     | 2.0   | 450                                      | 0.49                                     | B45197A4106+30*   |
| 15                                | B         | 6                                     | 3.0   | 500                                      | 0.41                                     | B45020B156*+507 ● |
| 15                                | C         | 6                                     | 3.0   | 400                                      | 0.52                                     | B45197A4156+30*   |
| 22                                | C         | 6                                     | 4.4   | 200                                      | 0.74                                     | B45020C226*+207   |
| 22                                | D         | 6                                     | 4.4   | 200                                      | 0.87                                     | B45197A4226+40*   |
| 33                                | C         | 6                                     | 6.6   | 200                                      | 0.74                                     | B45020C336*+207   |
| 33                                | D         | 6                                     | 6.6   | 200                                      | 0.87                                     | B45197A4336+40*   |
| 33                                | E         | 6                                     | 6.6   | 200                                      | 0.91                                     | B45197A4336+50*   |
| 47                                | D         | 6                                     | 9.4   | 100                                      | 1.22                                     | B45020D476*+107 ● |
| 47                                | D         | 6                                     | 9.4   | 150                                      | 1.00                                     | B45020D476*+157   |
| 47                                | D         | 6                                     | 9.4   | 200                                      | 0.87                                     | B45020D476*+207   |
| 47                                | D         | 6                                     | 9.4   | 250                                      | 0.77                                     | B45197A4476+40*   |
| 47                                | E         | 6                                     | 9.4   | 70                                       | 1.54                                     | B45020E476*+706 ● |
| 47                                | E         | 6                                     | 9.4   | 130                                      | 1.13                                     | B45020E476*+137   |
| 47                                | E         | 6                                     | 9.4   | 150                                      | 1.05                                     | B45197A4476+50*   |
| 68                                | D         | 6                                     | 13.6  | 70                                       | 1.46                                     | B45020D686*+706 ● |
| 68                                | D         | 6                                     | 13.6  | 150                                      | 1.00                                     | B45020D686*+157   |
| 68                                | D         | 6                                     | 13.6  | 200                                      | 0.87                                     | B45020D686*+207   |
| 68                                | D         | 6                                     | 13.6  | 300                                      | 0.71                                     | B45197A4686+40*   |
| 68                                | E         | 6                                     | 13.6  | 130                                      | 1.13                                     | B45020E686*+137   |
| 68                                | E         | 6                                     | 13.6  | 150                                      | 1.05                                     | B45020E686*+157   |
| 68                                | E         | 6                                     | 13.6  | 200                                      | 0.91                                     | B45197A4686+50*   |
| 100                               | D         | 8                                     | 20.0  | 200                                      | 0.87                                     | B45020D107*+207 ● |
| 100                               | E         | 8                                     | 20.0  | 100                                      | 1.28                                     | B45020E107*+107 ● |

● Preliminary Data

\* = Code number for reel diameter  
6 = 330-mm reel  
9 = 180-mm reel

+ = Capacitance tolerance  
M = ±20%  
K = ±10%

| $C_R$<br>(20 °C,<br>120 Hz)<br>$\mu\text{F}$                | Case size | $DF_{\text{max}}$<br>(20 °C,<br>120 Hz)<br>% | $I_{\text{leak,max}}$<br>(20 °C, $V_R$ ,<br>5 min)<br>$\mu\text{A}$ | $ESR_{\text{max}}$<br>(20 °C,<br>100 kHz)<br>$\text{m}\Omega$ | $I_{\text{AC,max}}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|---|-----------|--|---|---|---|-------------------|
| 100   | E         | 8  | 20.0  | 150   | 1.05  | B45197A4107+50*   |
| $V_R$ (up to 85 °C) = 25 VDC, $V_R$ (up to 125 °C) = 16 VDC |           |  |   |   |   |                   |
| 0.33  | A         | 4  | 0.5   | 10000   | 0.09  | B45025A334*+109   |
| 0.47  | A         | 4  | 0.5   | 7000  | 0.10  | B45025A474*+708   |
| 0.68  | A         | 4  | 0.5   | 6000  | 0.11  | B45025A684*+608   |
| 1   | A         | 4  | 0.5   | 4000  | 0.14  | B45025A105*+408 ● |
| 1   | A         | 4  | 0.5   | 5000  | 0.12  | B45025A105*+508   |
| 1.5   | A         | 6  | 0.5   | 3000  | 0.16  | B45025A155*+308 ● |
| 1.5   | A         | 6  | 0.5   | 4000  | 0.14  | B45025A155*+408   |
| 1.5   | B         | 4  | 0.5   | 1500  | 0.24  | B45197A5155+20*   |
| 2.2   | A         | 6  | 0.6   | 3500  | 0.15  | B45025A225*+358   |
| 2.2   | B         | 4  | 0.6   | 900   | 0.31  | B45025B225*+907 ● |
| 2.2   | B         | 4  | 0.6   | 1200  | 0.27  | B45197A5225+20*   |
| 3.3   | A         | 6  | 0.8   | 1500  | 0.22  | B45025A335*+158 ● |
| 3.3   | B         | 4  | 0.8   | 750   | 0.34  | B45025B335*+757 ● |
| 3.3   | B         | 4  | 0.8   | 800   | 0.33  | B45025B335*+807   |
| 3.3   | B         | 4  | 0.8   | 1200  | 0.27  | B45197A5335+20*   |
| 4.7   | B         | 4  | 1.2   | 700   | 0.35  | B45025B475*+707 ● |
| 4.7   | B         | 4  | 1.2   | 750   | 0.34  | B45025B475*+757 ● |
| 4.7   | B         | 4  | 1.2   | 800   | 0.33  | B45025B475*+807   |
| 4.7   | B         | 4  | 1.2   | 900   | 0.31  | B45025B475*+907   |
| 4.7   | B         | 4  | 1.2   | 1000  | 0.29  | B45197A5475+20*   |
| 4.7   | C         | 6  | 1.2   | 530   | 0.46  | B45197A5475+30*   |
| 6.8   | B         | 6  | 1.7   | 700   | 0.35  | B45025B685*+707   |
| 6.8   | B         | 6  | 1.7   | 1000  | 0.29  | B45197A5685+20*   |
| 6.8   | C         | 6  | 1.7   | 500   | 0.47  | B45197A5685+30*   |
| 10  | B         | 6  | 2.5   | 750   | 0.34  | B45025B106*+757 ● |
| 10  | C         | 6  | 2.5   | 300   | 0.61  | B45025C106*+307   |
| 10  | C         | 6  | 2.5   | 450   | 0.49  | B45197A5106+30*   |
| 15  | C         | 6  | 3.8   | 300   | 0.61  | B45025C156*+307   |
| 15  | D         | 6  | 3.8   | 230   | 0.81  | B45197A5156+40*   |
| 22  | C         | 6  | 5.5   | 280   | 0.63  | B45025C226*+287   |
| 22  | D         | 6  | 5.5   | 200   | 0.87  | B45025D226*+207   |
| 22  | D         | 6  | 5.5   | 230   | 0.81  | B45197A5226+40*   |

● Preliminary Data

 \* = Code number for reel diameter  
 6 = 330-mm reel  
 9 = 180-mm reel

 + = Capacitance tolerance  
 M =  $\pm 20\%$   
 K =  $\pm 10\%$

| $C_R$<br>(20 °C,<br>120 Hz)<br>$\mu\text{F}$   | Case size | $DF_{\text{max}}$<br>(20 °C,<br>120 Hz)<br>% | $I_{\text{leak,max}}$<br>(20 °C, $V_R$ ,<br>5 min)<br>$\mu\text{A}$ | $ESR_{\text{max}}$<br>(20 °C,<br>100 kHz)<br>$\text{m}\Omega$ | $I_{\text{AC,max}}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|--|-----------|--|---|---|---|-------------------|
| 22   | E         | 6  | 5.5   | 230   | 0.85  | B45197A5226+50*   |
| 33   | D         | 6  | 8.3   | 100   | 1.22  | B45025D336*+107 ● |
| 33   | D         | 6  | 8.3   | 150   | 1.00  | B45025D336*+157   |
| 33   | D         | 6  | 8.3   | 200   | 0.87  | B45025D336*+207   |
| 33   | D         | 6  | 8.3   | 230   | 0.81  | B45197A5336+40*   |
| 33   | E         | 6  | 8.3   | 100   | 1.28  | B45025E336*+107 ● |
| 33   | E         | 6  | 8.3   | 180   | 0.96  | B45025E336*+187   |
| 33   | E         | 6  | 8.3   | 200   | 0.91  | B45197A5336+50*   |
| 47   | D         | 6  | 11.8  | 100   | 1.22  | B45025D476*+107 ● |
| 47   | D         | 6  | 11.8  | 130   | 1.07  | B45025D476*+137   |
| 47   | D         | 6  | 11.8  | 150   | 1.00  | B45025D476*+157   |
| 47   | D         | 6  | 11.8  | 250   | 0.77  | B45197A5476+40*   |
| 47   | E         | 6  | 11.8  | 80  | 1.44  | B45025E476*+806 ● |
| 47   | E         | 6  | 11.8  | 120   | 1.17  | B45025E476*+127   |
| 47   | E         | 6  | 11.8  | 200   | 0.91  | B45197A5476+50*   |
| 68   | E         | 6  | 17.0  | 130   | 1.13  | B45025E686*+137 ● |
| 68   | E         | 6  | 17.0  | 200   | 0.91  | B45197A5686+50*   |
| <b><math>V_R</math> (up to 85 °C) = 35 VDC, <math>V_R</math> (up to 125 °C) = 23 VDC</b> |           |  |   |   |   |                   |
| 0.15   | A         | 4  | 0.5   | 15000   | 0.07  | B45035A154*+159   |
| 0.22   | A         | 4  | 0.5   | 13000   | 0.08  | B45035A224*+139   |
| 0.33   | A         | 4  | 0.5   | 6000  | 0.11  | B45035A334*+608 ● |
| 0.33   | A         | 4  | 0.5   | 7000  | 0.10  | B45035A334*+708   |
| 0.47   | A         | 4  | 0.5   | 4000  | 0.14  | B45035A474*+408 ● |
| 0.47   | A         | 4  | 0.5   | 7000  | 0.10  | B45035A474*+708   |
| 0.47   | B         | 4  | 0.2   | 2500  | 0.18  | B45197A6474+20*   |
| 0.68   | A         | 4  | 0.5   | 4000  | 0.14  | B45035A684*+408 ● |
| 0.68   | A         | 4  | 0.5   | 6000  | 0.11  | B45035A684*+608   |
| 0.68   | B         | 4  | 0.2   | 2500  | 0.18  | B45197A6684+20*   |
| 1  | A         | 4  | 0.5   | 3000  | 0.16  | B45035A105*+308   |
| 1  | B         | 4  | 0.4   | 2000  | 0.21  | B45197A6105+20*   |
| 1.5  | A         | 6  | 0.5   | 2000  | 0.19  | B45035A155*+208 ● |
| 1.5  | B         | 6  | 0.5   | 2000  | 0.21  | B45197A6155+20*   |
| 2.2  | A         | 6  | 0.8   | 1500  | 0.22  | B45035A225*+158 ● |
| 2.2  | B         | 6  | 0.8   | 750   | 0.34  | B45035B225*+757 ● |

● Preliminary Data

\* = Code number for reel diameter  
 6 = 330-mm reel  
 9 = 180-mm reel

+ = Capacitance tolerance  
 M =  $\pm 20\%$   
 K =  $\pm 10\%$

| $C_R$<br>(20 °C,<br>120 Hz)<br>μF | Case size | $DF_{max}$<br>(20 °C,<br>120 Hz)<br>% | $I_{leak,max}$<br>(20 °C, $V_R$ ,<br>5 min)<br>μA | $ESR_{max}$<br>(20 °C,<br>100 kHz)<br>mΩ | $I_{AC,max}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|-----------------------------------|-----------|---------------------------------------|---|--|--|-------------------|
| 2.2                               | B         | 6                                     | 0.8   | 1500                                     | 0.24                                     | B45035B225*+158   |
| 2.2                               | B         | 6                                     | 0.8   | 2000                                     | 0.21                                     | B45197A6225+20*   |
| 3.3                               | B         | 6                                     | 1.2   | 1000                                     | 0.29                                     | B45035B335*+108   |
| 3.3                               | C         | 6                                     | 1.2   | 550                                      | 0.45                                     | B45197A6335+30*   |
| 4.7                               | B         | 6                                     | 1.6   | 700                                      | 0.35                                     | B45035B475*+707 ● |
| 4.7                               | B         | 6                                     | 1.6   | 1000                                     | 0.29                                     | B45035B475*+108 ● |
| 4.7                               | C         | 6                                     | 1.6   | 500                                      | 0.47                                     | B45035C475*+507   |
| 4.7                               | D         | 6                                     | 1.6   | 300                                      | 0.71                                     | B45197A6475+40*   |
| 6.8                               | C         | 6                                     | 2.4   | 350                                      | 0.56                                     | B45035C685*+357   |
| 6.8                               | D         | 6                                     | 2.4   | 150                                      | 1.00                                     | B45035D685*+157 ● |
| 6.8                               | D         | 6                                     | 2.4   | 300                                      | 0.71                                     | B45197A6685+40*   |
| 6.8                               | E         | 6                                     | 2.4   | 300                                      | 0.74                                     | B45197A6685+50*   |
| 10                                | C         | 6                                     | 3.5   | 400                                      | 0.52                                     | B45035C106*+407   |
| 10                                | D         | 6                                     | 3.5   | 130                                      | 1.07                                     | B45035D106*+137 ● |
| 10                                | D         | 6                                     | 3.5   | 260                                      | 0.76                                     | B45197A6106+40*   |
| 10                                | E         | 6                                     | 3.5   | 200                                      | 0.91                                     | B45035E106*+207   |
| 10                                | E         | 6                                     | 3.5   | 260                                      | 0.80                                     | B45197A6106+50*   |
| 15                                | C         | 6                                     | 5.3   | 350                                      | 0.56                                     | B45035C156*+357 ● |
| 15                                | D         | 6                                     | 5.3   | 100                                      | 1.22                                     | B45035D156*+107 ● |
| 15                                | D         | 6                                     | 5.3   | 260                                      | 0.76                                     | B45197A6156+40*   |
| 15                                | E         | 6                                     | 5.3   | 250                                      | 0.81                                     | B45035E156*+257   |
| 15                                | E         | 6                                     | 5.3   | 260                                      | 0.80                                     | B45197A6156+50*   |
| 22                                | D         | 6                                     | 7.7   | 200                                      | 0.87                                     | B45035D226*+207   |
| 22                                | D         | 6                                     | 7.7   | 260                                      | 0.76                                     | B45197A6226+40*   |
| 22                                | E         | 6                                     | 7.7   | 130                                      | 1.13                                     | B45035E226*+137 ● |
| 22                                | E         | 6                                     | 7.7   | 180                                      | 0.96                                     | B45035E226*+187   |
| 22                                | E         | 6                                     | 7.7   | 200                                      | 0.91                                     | B45035E226*+207   |
| 22                                | E         | 6                                     | 7.7   | 260                                      | 0.80                                     | B45197A6226+50*   |
| 33                                | D         | 6                                     | 11.6  | 200                                      | 0.87                                     | B45035D336*+207 ● |
| 33                                | E         | 6                                     | 11.6  | 100                                      | 1.28                                     | B45035E336*+107 ● |
| 33                                | E         | 6                                     | 11.6  | 250                                      | 0.81                                     | B45035E336*+257   |
| 33                                | E         | 6                                     | 11.6  | 260                                      | 0.80                                     | B45197A6336+50*   |
| 47                                | E         | 6                                     | 16.5  | 200                                      | 0.91                                     | B45035E476*+207 ● |
| 47                                | E         | 6                                     | 16.5  | 230                                      | 0.85                                     | B45197A6476+50*   |

● Preliminary Data

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 M = ±20%  
 K = ±10%

| $C_R$<br>(20 °C,<br>120 Hz)<br>$\mu\text{F}$                | Case size | $DF_{\text{max}}$<br>(20 °C,<br>120 Hz)<br>% | $I_{\text{leak,max}}$<br>(20 °C, $V_R$ ,<br>5 min)<br>$\mu\text{A}$ | $ESR_{\text{max}}$<br>(20 °C,<br>100 kHz)<br>$\text{m}\Omega$ | $I_{\text{AC,max}}$<br>(20 °C,<br>100 kHz)<br>A | Ordering code     |
|---|-----------|--|---|---|---|-------------------|
| $V_R$ (up to 85 °C) = 50 VDC, $V_R$ (up to 125 °C) = 33 VDC |           |  |   |   |   |                   |
| 1   | C         | 6  | 0.5   | 1600  | 0.26  | B45050C105*+168   |
| 1.5   | C         | 6  | 0.8   | 1500  | 0.27  | B45050C155*+158   |
| 4.7   | D         | 6  | 2.4   | 300   | 0.71  | B45197A7475+40*   |
| 6.8   | D         | 6  | 3.4   | 300   | 0.71  | B45050D685*+307   |
| 6.8   | D         | 6  | 3.4   | 400   | 0.61  | B45197A7685+50*   |
| 6.8   | E         | 6  | 3.4   | 300   | 0.74  | B45197A7685+50*   |
| 10  | E         | 6  | 5.0   | 300   | 0.74  | B45197A7106+50*   |
| 15  | E         | 6  | 7.5   | 250   | 0.81  | B45050E156*+257 ● |
| 15  | E         | 6  | 7.5   | 300   | 0.74  | B45197A7156+50*   |

● Preliminary Data

\* = Code number for reel diameter  
6 = 330-mm reel  
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+ = Capacitance tolerance  
M =  $\pm 20\%$   
K =  $\pm 10\%$

## Cautions and warnings

When using tantalum capacitors with a manganese dioxide coating, the following cautions and warnings should be taken into account:

### Polarity

Because tantalum capacitors are *polar capacitors*, it is important to observe their polarity markings (positive pole on the anode, negative pole on the cathode). Any incorrect polarity resulting from the sum of the AC and DC voltage components must be smaller than or equal to the permitted *polarity reversal voltage*. To avoid reducing their reliability, this voltage may only occur for a short time, at most five times for a duration of one minute per hour.

### Voltage

The *maximum continuous voltage* depends on the ambient temperature. Within the temperature range of  $-55$  to  $+85$  °C, the rated voltage is equal to the maximum continuous voltage. Between  $+85$  and  $+125$  °C the maximum continuous voltage must be reduced linearly from the full rated voltage to 2/3 of it (derating). At  $150$  °C (only B4519\*P series) the voltage must be reduced to 1/2 and at  $175$  °C (only B4519\*T series) to 1/3 of the rated voltage. Operation below the maximum continuous voltage has a positive effect on the capacitor's failure rate. The maximum continuous voltage must not be exceeded.

All unfavorable operating conditions (such as possible line overvoltages, unfavorable tolerances of the transformation ratio of the line transformer in the equipment, repeated overvoltages when the equipment is switched on, high ambient temperatures) must be taken into account when determining the *operating voltage*.

The *surge voltage* is the maximum voltage (peak value) that may be applied to the capacitor for short periods, at most five times for a total duration of up to 1 minute per hour. The surge voltage must not be applied for periodic charging and discharging in the course of normal operation and cannot be part of the operating voltage. The permissible surge voltage for all capacitors in this data book is  $1.3 \times$  the rated voltage. The occurrence of voltage impulses (transient voltages) that exceed the surge voltage may lead to irreparable damage.

### Capacitance

The actual *capacitance* of a capacitor can deviate from the rated capacitance by as much as the full magnitude of the tolerance at delivery. The capacitance varies with the temperature (at  $+125$  °C  $+12\%$  up to  $+20\%$ ) and decreases with increasing frequency.



**Low-resistance applications and voltage networks**

For *low-resistance applications*, KEMET recommends a maximum operating voltage of half the permissible maximum continuous voltage, so that the capacitors have sufficient tolerance to withstand voltage peaks. Depending on the conditions of use, the early failure rate is higher here by a factor of 2 to 20 than in the range with a constant failure rate as specified in the data book.

When operated directly in a *voltage network*, the capacitor should be protected against overvoltage, e.g. by a suppressor diode, and against polarity reversal by a diode. If a capacitor is operated in an unprotected low-impedance circuit and fails because the permissible conditions for the forward DC voltage, reverse DC voltage, surge current, power dissipation or temperature are exceeded, the continued current flow through the overstressed capacitor may produce overheating. The overheated capacitor may damage the surrounding components and the circuit board.

**Storage conditions**

Capacitors with solid electrolyte may be stored at temperatures down to  $-80\text{ °C}$ . The upper *storage temperature* must not exceed  $+85\text{ °C}$  (for blister tape the temperature limit is  $+40\text{ °C}$ ). The storage conditions should not exceed  $+40\text{ °C}$  and 70% R. H. A drypack is useful to prevent the effects of humidity.

**Important notes**

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, KEMET is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a KEMET product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of passive electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of a passive electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of a passive electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as “hazardous”)**. Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.  
We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available.
6. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the “General Terms of Delivery for Products and Services in the Electrical Industry” published by the German Electrical and Electronics Industry Association (ZVEI)**.