



## Wet Tantalum Capacitors, Military Established Reliability, MIL-PRF-39006/22/25 Qualified Styles CLR79, CLR81



### FEATURES

- Hermetically sealed
- Metal cased
- Axial lead
- Tubular

### STYLE, MILITARY SPECIFICATION

- CLR79, M39006/22 MIL-PRF-39006/22
- CLR81, M39006/25 MIL-PRF-39006/25

### PERFORMANCE CHARACTERISTICS

**Operating Temperature:** - 55 °C to + 125 °C

**Capacitance Range:** M39006/22 - 1.7  $\mu$ F to 1200  $\mu$ F;  
M39006/25 - 6.8  $\mu$ F to 2200  $\mu$ F

**Capacitance Tolerance:**  $\pm 5\%$ ,  $\pm 10\%$ ,  $\pm 20\%$

**Voltage Rating:** 6 V<sub>DC</sub> to 125 V<sub>DC</sub>

**Established Reliability Tantalum Capacitors to Military Specification MIL-PRF-39006:** In accordance with the military specification MIL-PRF-39006 all capacitors are marked with the military part number (M39006/xx-xxxx) rather than the older style designation (CLR79, CLR81) and should be ordered as such.

For information on the performance characteristics of these capacitors, please refer to the latest issue of the Military Specification. MIL-PRF-39006 establishes 1000 h failure

rate levels of 1 %, 0.1 %, and 0.01 %. When ordering these parts, care must be exercised that the correct part number expressing the appropriate failure level be specified.

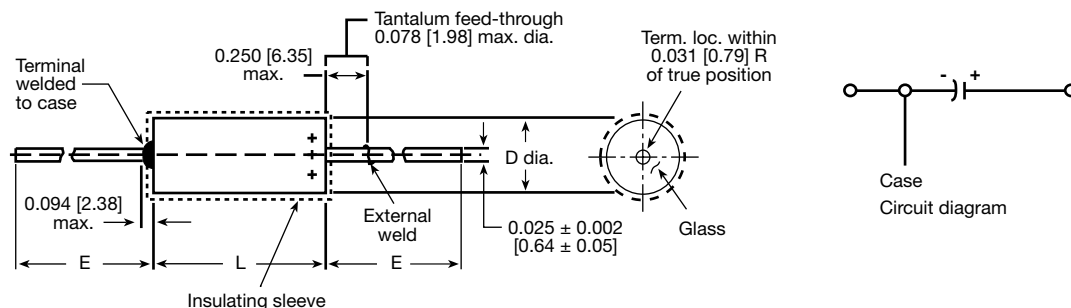
Each order for military style capacitors requiring government inspection must state whether inspection is to be at the destination or at the Vishay plant. Orders requiring source inspection cannot be shipped until this has been accomplished.

### ORDERING INFORMATION

| M39006                                                              | /22                                                                         | -0441                                           | H                                           |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------|
| BASIC<br>DOCUMENT NUMBER                                            | SLASH SHEET                                                                 | DASH NUMBER                                     | DESIGNATION OF HIGH<br>VIBRATION (OPTIONAL) |
| Indicates the basic<br>specification; in this case<br>MIL-PRF-39006 | Indicates the specification<br>sheet of the basic<br>military specification | Taken from Standard/<br>Extended Ratings tables | H, optional, if specified                   |

**DIMENSIONS** in inches [millimeters]

Style CLR79  
Style CLR81



| CASE CODE | BARE CASE                      |                                                | WITH INSULATING SLEEVE |                  | E<br>LEAD LENGTH                | WEIGHT<br>(oz./g)<br>(Max.) |
|-----------|--------------------------------|------------------------------------------------|------------------------|------------------|---------------------------------|-----------------------------|
|           | D                              | L                                              | D (Max.)               | L (Max.)         |                                 |                             |
| T1        | 0.188 ± 0.016<br>[4.78 ± 0.41] | 0.453 + 0.031/- 0.016<br>[11.51 + 0.79/- 0.41] | 0.219<br>[5.56]        | 0.515<br>[13.08] | 1.500 ± 0.250<br>[38.10 ± 6.35] | 0.09<br>[2.6]               |
| T2        | 0.281 ± 0.016<br>[7.14 ± 0.41] | 0.641 + 0.031/- 0.016<br>[16.28 + 0.79/- 0.41] | 0.312<br>[7.92]        | 0.704<br>[17.88] | 2.250 ± 0.250<br>[57.15 ± 6.35] | 0.22<br>[6.2]               |
| T3        | 0.375 ± 0.016<br>[9.53 ± 0.41] | 0.766 + 0.031/- 0.016<br>[19.46 + 0.79/- 0.41] | 0.406<br>[10.31]       | 0.828<br>[21.03] | 2.250 ± 0.250<br>[57.15 ± 6.35] | 0.41<br>[11.6]              |
| T4        | 0.375 ± 0.016<br>[9.53 ± 0.41] | 1.062 + 0.031/- 0.016<br>[26.97 + 0.79/- 0.41] | 0.406<br>[10.31]       | 1.126<br>[28.60] | 2.250 ± 0.250<br>[57.15 ± 6.35] | 0.62<br>[17.7]              |

**RATINGS AND CASE CODES - M39006/22**

| μF  | 6  | 8  | 10 | 15 | 25 | 30 | 50 | 60 | 75 | 100 | 125 |
|-----|----|----|----|----|----|----|----|----|----|-----|-----|
| 1.7 |    |    |    |    |    |    |    |    |    |     | T1  |
| 2.5 |    |    |    |    |    |    |    |    |    | T1  |     |
| 3.5 |    |    |    |    |    |    |    |    | T1 |     |     |
| 3.6 |    |    |    |    |    |    |    |    |    |     | T1  |
| 4.0 |    |    |    |    |    |    |    | T1 |    |     |     |
| 4.7 |    |    |    |    |    |    |    |    |    | T1  |     |
| 5.0 |    |    |    |    |    |    | T1 |    |    |     |     |
| 6.8 |    |    |    |    |    |    |    |    | T1 |     |     |
| 8.0 |    |    |    |    |    | T1 |    |    |    |     |     |
| 8.2 |    |    |    |    |    |    |    | T1 |    |     |     |
| 9.0 |    |    |    |    |    |    |    |    |    |     | T2  |
| 10  |    |    |    |    | T1 |    | T1 |    |    |     |     |
| 11  |    |    |    |    |    |    |    |    |    | T2  |     |
| 14  |    |    |    |    |    |    |    |    |    |     | T2  |
| 15  |    |    |    | T1 |    | T1 |    |    | T2 |     |     |
| 18  |    |    |    |    |    |    |    |    |    |     | T3  |
| 20  |    |    | T1 |    |    |    |    | T2 |    |     |     |
| 22  |    |    |    |    | T1 |    |    |    |    | T2  |     |
| 25  |    | T1 |    |    |    |    | T2 |    |    |     | T3  |
| 30  | T1 |    |    |    |    |    |    |    |    | T3  |     |
| 33  |    |    |    | T1 |    |    |    |    | T2 |     |     |
| 39  |    |    |    |    |    |    |    | T2 |    |     |     |
| 40  |    |    |    |    |    | T2 |    |    | T3 |     |     |
| 43  |    |    |    |    |    |    |    |    |    | T3  |     |
| 47  |    |    | T1 |    |    |    | T2 |    |    |     |     |
| 50  |    |    |    |    | T2 |    |    | T3 |    |     |     |
| 56  |    | T1 |    |    |    |    |    |    | T3 |     | T4  |
| 60  |    |    |    |    |    |    | T3 |    |    |     |     |
| 68  | T1 |    |    |    |    | T2 |    | T3 |    |     |     |
| 70  |    |    |    | T2 |    |    |    |    |    |     |     |
| 82  |    |    |    |    |    |    | T3 |    |    |     |     |

**RATINGS AND CASE CODES - M39006/22**

| $\mu\text{F}$ | 6  | 8  | 10 | 15 | 25 | 30 | 50 | 60 | 75 | 100 | 125 |
|---------------|----|----|----|----|----|----|----|----|----|-----|-----|
| 86            |    |    |    |    |    |    |    |    |    | T4  |     |
| 100           |    |    | T2 |    | T2 | T3 |    |    |    |     |     |
| 110           |    |    |    |    |    |    |    |    | T4 |     |     |
| 120           |    | T2 |    | T2 | T3 |    |    |    |    |     |     |
| 140           | T2 |    |    |    |    |    |    | T4 |    |     |     |
| 150           |    |    |    |    |    | T3 |    |    |    |     |     |
| 160           |    |    |    |    |    |    | T4 |    |    |     |     |
| 170           |    |    |    | T3 |    |    |    |    |    |     |     |
| 180           |    |    | T2 |    | T3 |    |    |    |    |     |     |
| 220           |    | T2 |    |    |    |    |    |    |    |     |     |
| 250           |    |    | T3 |    |    |    |    |    |    |     |     |
| 270           | T2 |    |    | T3 |    |    |    |    |    |     |     |
| 290           |    | T3 |    |    |    |    |    |    |    |     |     |
| 300           |    |    |    |    |    | T4 |    |    |    |     |     |
| 330           | T3 |    |    |    |    |    |    |    |    |     |     |
| 350           |    |    |    |    | T4 |    |    |    |    |     |     |
| 390           |    |    | T3 |    |    |    |    |    |    |     |     |
| 430           |    | T3 |    |    |    |    |    |    |    |     |     |
| 540           |    |    |    | T4 |    |    |    |    |    |     |     |
| 560           | T3 |    |    |    |    |    |    |    |    |     |     |
| 750           |    |    | T4 |    |    |    |    |    |    |     |     |
| 850           |    | T4 |    |    |    |    |    |    |    |     |     |
| 1200          | T4 |    |    |    |    |    |    |    |    |     |     |

**RATINGS AND CASE CODES - M39006/25**

| $\mu\text{F}$ | 6  | 8  | 10 | 15 | 25 | 30 | 50 | 60 | 75 | 100 | 125 |
|---------------|----|----|----|----|----|----|----|----|----|-----|-----|
| 6.8           |    |    |    |    |    |    |    |    |    |     | T1  |
| 10            |    |    |    |    |    |    |    |    |    | T1  |     |
| 22            |    |    |    |    |    |    |    |    | T1 |     |     |
| 27            |    |    |    |    |    |    |    | T1 |    |     | T2  |
| 33            |    |    |    |    |    |    | T1 |    |    |     |     |
| 39            |    |    |    |    |    |    |    |    |    | T2  |     |
| 47            |    |    |    |    |    |    |    |    |    |     | T3  |
| 56            |    |    |    |    |    | T1 |    |    |    |     |     |
| 68            |    |    |    |    | T1 |    |    |    |    | T3  |     |
| 82            |    |    |    |    |    |    |    |    | T2 |     | T4  |
| 100           |    |    |    | T1 |    |    |    | T2 |    |     |     |
| 120           |    |    |    |    |    |    | T2 |    |    | T4  |     |
| 150           |    |    | T1 |    |    |    |    |    |    |     |     |
| 180           |    | T1 |    |    |    |    |    |    | T3 |     |     |
| 220           | T1 |    |    |    |    | T2 |    | T3 | T4 |     |     |
| 270           |    |    |    |    | T2 |    | T3 | T4 |    |     |     |
| 330           |    |    |    |    |    |    | T4 |    |    |     |     |
| 390           |    |    |    | T2 |    |    |    |    |    |     |     |
| 470           |    |    |    |    |    | T3 |    |    |    |     |     |
| 560           |    |    | T2 |    | T3 | T4 |    |    |    |     |     |
| 680           |    | T2 |    |    | T4 |    |    |    |    |     |     |
| 820           | T2 |    |    | T3 |    |    |    |    |    |     |     |
| 1000          |    |    |    | T4 |    |    |    |    |    |     |     |
| 1200          |    |    | T3 |    |    |    |    |    |    |     |     |
| 1500          | T3 | T3 | T4 |    |    |    |    |    |    |     |     |
| 1800          |    | T4 |    |    |    |    |    |    |    |     |     |
| 2200          | T4 |    |    |    |    |    |    |    |    |     |     |

**STANDARD RATINGS/EXTENDED RATINGS: CLR79, M39006/22-XXXX**

| CAPACITANCE<br>(μF)                                          | CASE<br>CODE | CAP.<br>TOL.<br>(± %) | PART NO. M39006/22- <sup>(1)</sup><br>FAILURE RATE LEVEL<br>(%/1000 h) |      |      | MAX. DCL (μA)<br>AT |                     | MAX.<br>DF<br>AT | MAX.<br>IMP.<br>AT | MAX. CAPACITANCE<br>CHANGE (%) AT |         |          | MAX. <sup>(2)</sup><br>RIPPLE<br>CURRENT<br>AT + 85 °C |
|--------------------------------------------------------------|--------------|-----------------------|------------------------------------------------------------------------|------|------|---------------------|---------------------|------------------|--------------------|-----------------------------------|---------|----------|--------------------------------------------------------|
|                                                              |              |                       | M                                                                      | P    | R    | + 25 °C             | + 85 °C<br>+ 125 °C | + 25 °C<br>(%)   | - 55 °C<br>(Ω)     | - 55 °C                           | + 85 °C | + 125 °C | AT + 85 °C<br>40 kHz<br>(mA)                           |
|                                                              |              |                       | 1.0                                                                    | 0.1  | 0.01 |                     |                     |                  |                    |                                   |         |          |                                                        |
| 6 V <sub>DC</sub> AT + 85 °C; 4 V <sub>DC</sub> AT + 125 °C  |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 30                                                           | T1           | 20                    | 0001                                                                   | 0221 | 0441 | 1.0                 | 2.0                 | 9                | 100                | - 40                              | + 10.5  | + 12     | 820                                                    |
| 30                                                           | T1           | 10                    | 0002                                                                   | 0222 | 0442 | 1.0                 | 2.0                 | 9                | 100                | - 40                              | + 10.5  | + 12     | 820                                                    |
| 30                                                           | T1           | 5                     | 0003                                                                   | 0223 | 0443 | 1.0                 | 2.0                 | 9                | 100                | - 40                              | + 10.5  | + 12     | 820                                                    |
| 68                                                           | T1           | 20                    | 0004                                                                   | 0224 | 0444 | 1.0                 | 2.0                 | 15               | 60                 | - 40                              | + 14    | + 16     | 960                                                    |
| 68                                                           | T1           | 10                    | 0005                                                                   | 0225 | 0445 | 1.0                 | 2.0                 | 15               | 60                 | - 40                              | + 14    | + 16     | 960                                                    |
| 68                                                           | T1           | 5                     | 0006                                                                   | 0226 | 0446 | 1.0                 | 2.0                 | 15               | 60                 | - 40                              | + 14    | + 16     | 960                                                    |
| 140                                                          | T2           | 20                    | 0007                                                                   | 0227 | 0447 | 1.0                 | 3.0                 | 21               | 40                 | - 40                              | + 14    | + 16     | 1200                                                   |
| 140                                                          | T2           | 10                    | 0008                                                                   | 0228 | 0448 | 1.0                 | 3.0                 | 21               | 40                 | - 40                              | + 14    | + 16     | 1200                                                   |
| 140                                                          | T2           | 5                     | 0009                                                                   | 0229 | 0449 | 1.0                 | 3.0                 | 21               | 40                 | - 40                              | + 14    | + 16     | 1200                                                   |
| 270                                                          | T2           | 20                    | 0010                                                                   | 0230 | 0450 | 1.0                 | 6.5                 | 45               | 25                 | - 44                              | + 17.5  | + 20     | 1375                                                   |
| 270                                                          | T2           | 10                    | 0011                                                                   | 0231 | 0451 | 1.0                 | 6.5                 | 45               | 25                 | - 44                              | + 17.5  | + 20     | 1375                                                   |
| 270                                                          | T2           | 5                     | 0012                                                                   | 0232 | 0452 | 1.0                 | 6.5                 | 45               | 25                 | - 44                              | + 17.5  | + 20     | 1375                                                   |
| 330                                                          | T3           | 20                    | 0013                                                                   | 0233 | 0453 | 2.0                 | 7.9                 | 36               | 20                 | - 44                              | + 14    | + 16     | 1800                                                   |
| 330                                                          | T3           | 10                    | 0014                                                                   | 0234 | 0454 | 2.0                 | 7.9                 | 36               | 20                 | - 44                              | + 14    | + 16     | 1800                                                   |
| 330                                                          | T3           | 5                     | 0015                                                                   | 0235 | 0455 | 2.0                 | 7.9                 | 36               | 20                 | - 44                              | + 14    | + 16     | 1800                                                   |
| 560                                                          | T3           | 20                    | 0016                                                                   | 0236 | 0456 | 2.0                 | 13.0                | 55               | 25                 | - 64                              | + 17.5  | + 20     | 1900                                                   |
| 560                                                          | T3           | 10                    | 0017                                                                   | 0237 | 0457 | 2.0                 | 13.0                | 55               | 25                 | - 64                              | + 17.5  | + 20     | 1900                                                   |
| 560                                                          | T3           | 5                     | 0018                                                                   | 0238 | 0458 | 2.0                 | 13.0                | 55               | 25                 | - 64                              | + 17.5  | + 20     | 1900                                                   |
| 1200                                                         | T4           | 20                    | 0019                                                                   | 0239 | 0459 | 3.0                 | 14.0                | 90               | 20                 | - 80                              | + 25    | + 25     | 2265                                                   |
| 1200                                                         | T4           | 10                    | 0020                                                                   | 0240 | 0460 | 3.0                 | 14.0                | 90               | 20                 | - 80                              | + 25    | + 25     | 2265                                                   |
| 8 V <sub>DC</sub> AT + 85 °C; 5 V <sub>DC</sub> AT + 125 °C  |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 25                                                           | T1           | 20                    | 0021                                                                   | 0241 | 0461 | 1.0                 | 2.0                 | 7.5              | 100                | - 40                              | + 10.5  | + 12     | 820                                                    |
| 25                                                           | T1           | 10                    | 0022                                                                   | 0242 | 0462 | 1.0                 | 2.0                 | 7.5              | 100                | - 40                              | + 10.5  | + 12     | 820                                                    |
| 25                                                           | T1           | 5                     | 0023                                                                   | 0243 | 0463 | 1.0                 | 2.0                 | 7.5              | 100                | - 40                              | + 10.5  | + 12     | 820                                                    |
| 56                                                           | T1           | 20                    | 0024                                                                   | 0244 | 0464 | 1.0                 | 2.0                 | 14               | 59                 | - 40                              | + 14    | + 16     | 900                                                    |
| 56                                                           | T1           | 10                    | 0025                                                                   | 0245 | 0465 | 1.0                 | 2.0                 | 14               | 59                 | - 40                              | + 14    | + 16     | 900                                                    |
| 56                                                           | T1           | 5                     | 0026                                                                   | 0246 | 0466 | 1.0                 | 2.0                 | 14               | 59                 | - 40                              | + 14    | + 16     | 900                                                    |
| 120                                                          | T2           | 20                    | 0027                                                                   | 0247 | 0467 | 1.0                 | 2.0                 | 20               | 50                 | - 44                              | + 17.5  | + 20     | 1220                                                   |
| 120                                                          | T2           | 10                    | 0028                                                                   | 0248 | 0468 | 1.0                 | 2.0                 | 20               | 50                 | - 44                              | + 17.5  | + 20     | 1220                                                   |
| 120                                                          | T2           | 5                     | 0029                                                                   | 0249 | 0469 | 1.0                 | 2.0                 | 20               | 50                 | - 44                              | + 17.5  | + 20     | 1220                                                   |
| 220                                                          | T2           | 20                    | 0030                                                                   | 0250 | 0470 | 1.0                 | 7.0                 | 37               | 30                 | - 44                              | + 17.5  | + 20     | 1370                                                   |
| 220                                                          | T2           | 10                    | 0031                                                                   | 0251 | 0471 | 1.0                 | 7.0                 | 37               | 30                 | - 44                              | + 17.5  | + 20     | 1370                                                   |
| 220                                                          | T2           | 5                     | 0032                                                                   | 0252 | 0472 | 1.0                 | 7.0                 | 37               | 30                 | - 44                              | + 17.5  | + 20     | 1370                                                   |
| 290                                                          | T3           | 20                    | 0033                                                                   | 0253 | 0473 | 2.0                 | 6.0                 | 34               | 25                 | - 64                              | + 17.5  | + 20     | 1770                                                   |
| 290                                                          | T3           | 10                    | 0034                                                                   | 0254 | 0474 | 2.0                 | 6.0                 | 34               | 25                 | - 64                              | + 17.5  | + 20     | 1770                                                   |
| 290                                                          | T3           | 5                     | 0035                                                                   | 0255 | 0475 | 2.0                 | 6.0                 | 34               | 25                 | - 64                              | + 17.5  | + 20     | 1770                                                   |
| 430                                                          | T3           | 20                    | 0036                                                                   | 0256 | 0476 | 2.0                 | 14.0                | 46               | 25                 | - 64                              | + 17.5  | + 20     | 1825                                                   |
| 430                                                          | T3           | 10                    | 0037                                                                   | 0257 | 0477 | 2.0                 | 14.0                | 46               | 25                 | - 64                              | + 17.5  | + 20     | 1825                                                   |
| 430                                                          | T3           | 5                     | 0038                                                                   | 0258 | 0478 | 2.0                 | 14.0                | 46               | 25                 | - 64                              | + 17.5  | + 20     | 1825                                                   |
| 850                                                          | T4           | 20                    | 0039                                                                   | 0259 | 0479 | 4.0                 | 16.0                | 60               | 22                 | - 80                              | + 25    | + 25     | 2330                                                   |
| 850                                                          | T4           | 10                    | 0040                                                                   | 0260 | 0480 | 4.0                 | 16.0                | 60               | 22                 | - 80                              | + 25    | + 25     | 2330                                                   |
| 10 V <sub>DC</sub> AT + 85 °C; 7 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 20                                                           | T1           | 20                    | 0041                                                                   | 0261 | 0481 | 1.0                 | 2.0                 | 6                | 175                | - 32                              | + 10.5  | + 12     | 820                                                    |
| 20                                                           | T1           | 10                    | 0042                                                                   | 0262 | 0482 | 1.0                 | 2.0                 | 6                | 175                | - 32                              | + 10.5  | + 12     | 820                                                    |
| 20                                                           | T1           | 5                     | 0043                                                                   | 0263 | 0483 | 1.0                 | 2.0                 | 6                | 175                | - 32                              | + 10.5  | + 12     | 820                                                    |
| 47                                                           | T1           | 20                    | 0044                                                                   | 0264 | 0484 | 1.0                 | 2.0                 | 13               | 100                | - 36                              | + 14    | + 16     | 855                                                    |
| 47                                                           | T1           | 10                    | 0045                                                                   | 0265 | 0485 | 1.0                 | 2.0                 | 13               | 100                | - 36                              | + 14    | + 16     | 855                                                    |
| 47                                                           | T1           | 5                     | 0046                                                                   | 0266 | 0486 | 1.0                 | 2.0                 | 13               | 100                | - 36                              | + 14    | + 16     | 855                                                    |
| 100                                                          | T2           | 20                    | 0047                                                                   | 0267 | 0487 | 1.0                 | 4.0                 | 15               | 60                 | - 36                              | + 14    | + 16     | 1200                                                   |
| 100                                                          | T2           | 10                    | 0048                                                                   | 0268 | 0488 | 1.0                 | 4.0                 | 15               | 60                 | - 36                              | + 14    | + 16     | 1200                                                   |
| 100                                                          | T2           | 5                     | 0049                                                                   | 0269 | 0489 | 1.0                 | 4.0                 | 15               | 60                 | - 36                              | + 14    | + 16     | 1200                                                   |
| 180                                                          | T2           | 20                    | 0050                                                                   | 0270 | 0490 | 1.0                 | 7.0                 | 30               | 40                 | - 36                              | + 14    | + 16     | 1365                                                   |

**Notes**

- (1) Dash number will include the letter "H" to indicate the optional vibration and shock requirements (i.e., 51 g random vibration, 80 g sinusoidal vibration and 500 g shock).
- (2) For ripple current limits at various temperatures, voltages and frequencies, see Ripple Current table.

**STANDARD RATINGS/EXTENDED RATINGS: CLR79, M39006/22-XXXX**

| CAPACITANCE<br>(μF)                                           | CASE<br>CODE | CAP.<br>TOL.<br>(± %) | PART NO. M39006/22- <sup>(1)</sup><br>FAILURE RATE LEVEL<br>(%/1000 h) |      |      | MAX. DCL (μA)<br>AT |                     | MAX.<br>DF<br>AT | MAX.<br>IMP.<br>AT | MAX. CAPACITANCE<br>CHANGE (%) AT |         |          | MAX. <sup>(2)</sup><br>RIPPLE<br>CURRENT<br>AT + 85 °C<br>40 kHz<br>(mA) |
|---------------------------------------------------------------|--------------|-----------------------|------------------------------------------------------------------------|------|------|---------------------|---------------------|------------------|--------------------|-----------------------------------|---------|----------|--------------------------------------------------------------------------|
|                                                               |              |                       | M                                                                      | P    | R    | + 25 °C             | + 85 °C<br>+ 125 °C | + 25 °C<br>(%)   | - 55 °C<br>(Ω)     | - 55 °C                           | + 85 °C | + 125 °C |                                                                          |
|                                                               |              |                       | 1.0                                                                    | 0.1  | 0.01 |                     |                     |                  |                    |                                   |         |          |                                                                          |
| 10 V <sub>DC</sub> AT + 85 °C; 7 V <sub>DC</sub> AT + 125 °C  |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                                          |
| 180                                                           | T2           | 10                    | 0051                                                                   | 0271 | 0491 | 1.0                 | 7.0                 | 30               | 40                 | - 36                              | + 14    | + 16     | 1365                                                                     |
| 180                                                           | T2           | 5                     | 0052                                                                   | 0272 | 0492 | 1.0                 | 7.0                 | 30               | 40                 | - 36                              | + 14    | + 16     | 1365                                                                     |
| 250                                                           | T3           | 20                    | 0053                                                                   | 0273 | 0493 | 2.0                 | 10.0                | 30               | 30                 | - 40                              | + 14    | + 16     | 1720                                                                     |
| 250                                                           | T3           | 10                    | 0054                                                                   | 0274 | 0494 | 2.0                 | 10.0                | 30               | 30                 | - 40                              | + 14    | + 16     | 1720                                                                     |
| 250                                                           | T3           | 5                     | 0055                                                                   | 0275 | 0495 | 2.0                 | 10.0                | 30               | 30                 | - 40                              | + 14    | + 16     | 1720                                                                     |
| 390                                                           | T3           | 20                    | 0056                                                                   | 0276 | 0496 | 2.0                 | 16.0                | 44               | 25                 | - 64                              | + 17.5  | + 20     | 1800                                                                     |
| 390                                                           | T3           | 10                    | 0057                                                                   | 0277 | 0497 | 2.0                 | 16.0                | 44               | 25                 | - 64                              | + 17.5  | + 20     | 1800                                                                     |
| 390                                                           | T3           | 5                     | 0058                                                                   | 0278 | 0498 | 2.0                 | 16.0                | 44               | 25                 | - 64                              | + 17.5  | + 20     | 1800                                                                     |
| 750                                                           | T4           | 20                    | 0059                                                                   | 0279 | 0499 | 4.0                 | 16.0                | 50               | 23                 | - 80                              | + 25    | + 25     | 2360                                                                     |
| 750                                                           | T4           | 10                    | 0060                                                                   | 0280 | 0500 | 4.0                 | 16.0                | 50               | 23                 | - 80                              | + 25    | + 25     | 2360                                                                     |
| 15 V <sub>DC</sub> AT + 85 °C; 10 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                                          |
| 15                                                            | T1           | 20                    | 0061                                                                   | 0281 | 0501 | 1.0                 | 2.0                 | 5                | 155                | - 24                              | + 10.5  | + 12     | 780                                                                      |
| 15                                                            | T1           | 10                    | 0062                                                                   | 0282 | 0502 | 1.0                 | 2.0                 | 5                | 155                | - 24                              | + 10.5  | + 12     | 780                                                                      |
| 15                                                            | T1           | 5                     | 0063                                                                   | 0283 | 0503 | 1.0                 | 2.0                 | 5                | 155                | - 24                              | + 10.5  | + 12     | 780                                                                      |
| 33                                                            | T1           | 20                    | 0064                                                                   | 0284 | 0504 | 1.0                 | 2.0                 | 10               | 90                 | - 28                              | + 14    | + 16     | 820                                                                      |
| 33                                                            | T1           | 10                    | 0065                                                                   | 0285 | 0505 | 1.0                 | 2.0                 | 10               | 90                 | - 28                              | + 14    | + 16     | 820                                                                      |
| 33                                                            | T1           | 5                     | 0066                                                                   | 0286 | 0506 | 1.0                 | 2.0                 | 10               | 90                 | - 28                              | + 14    | + 16     | 820                                                                      |
| 70                                                            | T2           | 20                    | 0067                                                                   | 0287 | 0507 | 1.0                 | 4.0                 | 13               | 75                 | - 28                              | + 14    | + 16     | 1150                                                                     |
| 70                                                            | T2           | 10                    | 0068                                                                   | 0288 | 0508 | 1.0                 | 4.0                 | 13               | 75                 | - 28                              | + 14    | + 16     | 1150                                                                     |
| 70                                                            | T2           | 5                     | 0069                                                                   | 0289 | 0509 | 1.0                 | 4.0                 | 13               | 75                 | - 28                              | + 14    | + 16     | 1150                                                                     |
| 120                                                           | T2           | 20                    | 0070                                                                   | 0290 | 0510 | 1.0                 | 7.0                 | 18               | 50                 | - 28                              | + 17.5  | + 20     | 1450                                                                     |
| 120                                                           | T2           | 10                    | 0071                                                                   | 0291 | 0511 | 1.0                 | 7.0                 | 18               | 50                 | - 28                              | + 17.5  | + 20     | 1450                                                                     |
| 120                                                           | T2           | 5                     | 0072                                                                   | 0292 | 0512 | 1.0                 | 7.0                 | 18               | 50                 | - 28                              | + 17.5  | + 20     | 1450                                                                     |
| 170                                                           | T3           | 20                    | 0073                                                                   | 0293 | 0513 | 2.0                 | 10.0                | 25               | 35                 | - 32                              | + 14    | + 16     | 1480                                                                     |
| 170                                                           | T3           | 10                    | 0074                                                                   | 0294 | 0514 | 2.0                 | 10.0                | 25               | 35                 | - 32                              | + 14    | + 16     | 1480                                                                     |
| 170                                                           | T3           | 5                     | 0075                                                                   | 0295 | 0515 | 2.0                 | 10.0                | 25               | 35                 | - 32                              | + 14    | + 16     | 1480                                                                     |
| 270                                                           | T3           | 20                    | 0076                                                                   | 0296 | 0516 | 2.0                 | 16.0                | 32               | 30                 | - 56                              | + 17.5  | + 20     | 1740                                                                     |
| 270                                                           | T3           | 10                    | 0077                                                                   | 0297 | 0517 | 2.0                 | 16.0                | 32               | 30                 | - 56                              | + 17.5  | + 20     | 1740                                                                     |
| 270                                                           | T3           | 5                     | 0078                                                                   | 0298 | 0518 | 2.0                 | 16.0                | 32               | 30                 | - 56                              | + 17.5  | + 20     | 1740                                                                     |
| 540                                                           | T4           | 20                    | 0079                                                                   | 0299 | 0519 | 6.0                 | 24.0                | 40               | 23                 | - 80                              | + 25    | + 25     | 2330                                                                     |
| 540                                                           | T4           | 10                    | 0080                                                                   | 0300 | 0520 | 6.0                 | 24.0                | 40               | 23                 | - 80                              | + 25    | + 25     | 2330                                                                     |
| 25 V <sub>DC</sub> AT + 85 °C; 15 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                                          |
| 10                                                            | T1           | 20                    | 0081                                                                   | 0301 | 0521 | 1.0                 | 2.0                 | 4                | 220                | - 16                              | + 8     | + 9      | 715                                                                      |
| 10                                                            | T1           | 10                    | 0082                                                                   | 0302 | 0522 | 1.0                 | 2.0                 | 4                | 220                | - 16                              | + 8     | + 9      | 715                                                                      |
| 10                                                            | T1           | 5                     | 0083                                                                   | 0303 | 0523 | 1.0                 | 2.0                 | 4                | 220                | - 16                              | + 8     | + 9      | 715                                                                      |
| 22                                                            | T1           | 20                    | 0084                                                                   | 0304 | 0524 | 1.0                 | 2.0                 | 6.6              | 140                | - 20                              | + 10.5  | + 12     | 825                                                                      |
| 22                                                            | T1           | 10                    | 0085                                                                   | 0305 | 0525 | 1.0                 | 2.0                 | 6.6              | 140                | - 20                              | + 10.5  | + 12     | 825                                                                      |
| 22                                                            | T1           | 5                     | 0086                                                                   | 0306 | 0526 | 1.0                 | 2.0                 | 6.6              | 140                | - 20                              | + 10.5  | + 12     | 825                                                                      |
| 50                                                            | T2           | 20                    | 0087                                                                   | 0307 | 0527 | 1.0                 | 2.0                 | 11.0             | 70                 | - 28                              | + 13    | + 15     | 1130                                                                     |
| 50                                                            | T2           | 10                    | 0088                                                                   | 0308 | 0528 | 1.0                 | 2.0                 | 11.0             | 70                 | - 28                              | + 13    | + 15     | 1130                                                                     |
| 50                                                            | T2           | 5                     | 0089                                                                   | 0309 | 0529 | 1.0                 | 2.0                 | 11.0             | 70                 | - 28                              | + 13    | + 15     | 1130                                                                     |
| 100                                                           | T2           | 20                    | 0090                                                                   | 0310 | 0530 | 1.0                 | 10.0                | 15               | 50                 | - 28                              | + 13    | + 15     | 1435                                                                     |
| 100                                                           | T2           | 10                    | 0091                                                                   | 0311 | 0531 | 1.0                 | 10.0                | 15               | 50                 | - 28                              | + 13    | + 15     | 1435                                                                     |
| 100                                                           | T2           | 5                     | 0092                                                                   | 0312 | 0532 | 1.0                 | 10.0                | 15               | 50                 | - 28                              | + 13    | + 15     | 1435                                                                     |
| 120                                                           | T3           | 20                    | 0093                                                                   | 0313 | 0533 | 2.0                 | 6.0                 | 21               | 38                 | - 32                              | + 13    | + 15     | 1450                                                                     |
| 120                                                           | T3           | 10                    | 0094                                                                   | 0314 | 0534 | 2.0                 | 6.0                 | 21               | 38                 | - 32                              | + 13    | + 15     | 1450                                                                     |
| 120                                                           | T3           | 5                     | 0095                                                                   | 0315 | 0535 | 2.0                 | 6.0                 | 21               | 38                 | - 32                              | + 13    | + 15     | 1450                                                                     |
| 180                                                           | T3           | 20                    | 0096                                                                   | 0316 | 0536 | 2.0                 | 18.0                | 26               | 32                 | - 48                              | + 13    | + 15     | 1525                                                                     |
| 180                                                           | T3           | 10                    | 0097                                                                   | 0317 | 0537 | 2.0                 | 18.0                | 26               | 32                 | - 48                              | + 13    | + 15     | 1525                                                                     |
| 180                                                           | T3           | 5                     | 0098                                                                   | 0318 | 0538 | 2.0                 | 18.0                | 26               | 32                 | - 48                              | + 13    | + 15     | 1525                                                                     |
| 350                                                           | T4           | 20                    | 0099                                                                   | 0319 | 0539 | 7.0                 | 28.0                | 35               | 24                 | - 70                              | + 25    | + 25     | 1970                                                                     |
| 350                                                           | T4           | 10                    | 0100                                                                   | 0320 | 0540 | 7.0                 | 28.0                | 35               | 24                 | - 70                              | + 25    | + 25     | 1970                                                                     |

**Notes**

(1) Dash number will include the letter "H" to indicate the optional vibration and shock requirements (i.e., 51 g random vibration, 80 g sinusoidal vibration and 500 g shock).

(2) For ripple current limits at various temperatures, voltages and frequencies, see Ripple Current table.

**STANDARD RATINGS/EXTENDED RATINGS: CLR79, M39006/22-XXXX**

| CAPACITANCE<br>(μF)                                           | CASE<br>CODE | CAP.<br>TOL.<br>(± %) | PART NO. M39006/22- <sup>(1)</sup><br>FAILURE RATE LEVEL<br>(%/1000 h) |      |      | MAX. DCL (μA)<br>AT |                     | MAX.<br>DF<br>AT | MAX.<br>IMP.<br>AT | MAX. CAPACITANCE<br>CHANGE (%) AT |         |          | MAX. <sup>(2)</sup><br>RIPPLE<br>CURRENT<br>AT + 85 °C |
|---------------------------------------------------------------|--------------|-----------------------|------------------------------------------------------------------------|------|------|---------------------|---------------------|------------------|--------------------|-----------------------------------|---------|----------|--------------------------------------------------------|
|                                                               |              |                       | M                                                                      | P    | R    | + 25 °C             | + 85 °C<br>+ 125 °C | + 25 °C<br>(%)   | - 55 °C<br>(Ω)     | - 55 °C                           | + 85 °C | + 125 °C | 40 kHz<br>(mA)                                         |
|                                                               |              |                       | 1.0                                                                    | 0.1  | 0.01 |                     |                     |                  |                    |                                   |         |          |                                                        |
| 30 V <sub>DC</sub> AT + 85 °C; 20 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 8.0                                                           | T1           | 20                    | 0101                                                                   | 0321 | 0541 | 1.0                 | 2.0                 | 4                | 275                | - 16                              | + 8     | + 12     | 640                                                    |
| 8.0                                                           | T1           | 10                    | 0102                                                                   | 0322 | 0542 | 1.0                 | 2.0                 | 4                | 275                | - 16                              | + 8     | + 12     | 640                                                    |
| 8.0                                                           | T1           | 5                     | 0103                                                                   | 0323 | 0543 | 1.0                 | 2.0                 | 4                | 275                | - 16                              | + 8     | + 12     | 640                                                    |
| 15                                                            | T1           | 20                    | 0104                                                                   | 0324 | 0544 | 1.0                 | 2.0                 | 5                | 175                | - 20                              | + 10.5  | + 12     | 780                                                    |
| 15                                                            | T1           | 10                    | 0105                                                                   | 0325 | 0545 | 1.0                 | 2.0                 | 5                | 175                | - 20                              | + 10.5  | + 12     | 780                                                    |
| 15                                                            | T1           | 5                     | 0106                                                                   | 0326 | 0546 | 1.0                 | 2.0                 | 5                | 175                | - 20                              | + 10.5  | + 12     | 780                                                    |
| 40                                                            | T2           | 20                    | 0107                                                                   | 0327 | 0547 | 1.0                 | 5.0                 | 10               | 65                 | - 24                              | + 10.5  | + 12     | 1120                                                   |
| 40                                                            | T2           | 10                    | 0108                                                                   | 0328 | 0548 | 1.0                 | 5.0                 | 10               | 65                 | - 24                              | + 10.5  | + 12     | 1120                                                   |
| 40                                                            | T2           | 5                     | 0109                                                                   | 0329 | 0549 | 1.0                 | 5.0                 | 10               | 65                 | - 24                              | + 10.5  | + 12     | 1120                                                   |
| 68                                                            | T2           | 20                    | 0110                                                                   | 0330 | 0550 | 1.0                 | 8.0                 | 13               | 60                 | - 24                              | + 13    | + 15     | 1285                                                   |
| 68                                                            | T2           | 10                    | 0111                                                                   | 0331 | 0551 | 1.0                 | 8.0                 | 13               | 60                 | - 24                              | + 13    | + 15     | 1285                                                   |
| 68                                                            | T2           | 5                     | 0112                                                                   | 0332 | 0552 | 1.0                 | 8.0                 | 13               | 60                 | - 24                              | + 13    | + 15     | 1285                                                   |
| 100                                                           | T3           | 20                    | 0113                                                                   | 0333 | 0553 | 2.0                 | 12.0                | 17               | 40                 | - 28                              | + 10.5  | + 12     | 1450                                                   |
| 100                                                           | T3           | 10                    | 0114                                                                   | 0334 | 0554 | 2.0                 | 12.0                | 17               | 40                 | - 28                              | + 10.5  | + 12     | 1450                                                   |
| 100                                                           | T3           | 5                     | 0115                                                                   | 0335 | 0555 | 2.0                 | 12.0                | 17               | 40                 | - 28                              | + 10.5  | + 12     | 1450                                                   |
| 150                                                           | T3           | 20                    | 0116                                                                   | 0336 | 0556 | 2.0                 | 18.0                | 23               | 35                 | - 48                              | + 13    | + 15     | 1525                                                   |
| 150                                                           | T3           | 10                    | 0117                                                                   | 0337 | 0557 | 2.0                 | 18.0                | 23               | 35                 | - 48                              | + 13    | + 15     | 1525                                                   |
| 150                                                           | T3           | 5                     | 0118                                                                   | 0338 | 0558 | 2.0                 | 18.0                | 23               | 35                 | - 48                              | + 13    | + 15     | 1525                                                   |
| 300                                                           | T4           | 20                    | 0119                                                                   | 0339 | 0559 | 8.0                 | 32.0                | 31               | 25                 | - 60                              | + 25    | + 25     | 1950                                                   |
| 300                                                           | T4           | 10                    | 0120                                                                   | 0340 | 0560 | 8.0                 | 32.0                | 31               | 25                 | - 60                              | + 25    | + 25     | 1950                                                   |
| 50 V <sub>DC</sub> AT + 85 °C; 30 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 5.0                                                           | T1           | 20                    | 0121                                                                   | 0341 | 0561 | 1.0                 | 2.0                 | 3                | 400                | - 16                              | + 5     | + 6      | 580                                                    |
| 5.0                                                           | T1           | 10                    | 0122                                                                   | 0342 | 0562 | 1.0                 | 2.0                 | 3                | 400                | - 16                              | + 5     | + 6      | 580                                                    |
| 5.0                                                           | T1           | 5                     | 0123                                                                   | 0343 | 0563 | 1.0                 | 2.0                 | 3                | 400                | - 16                              | + 5     | + 6      | 580                                                    |
| 10                                                            | T1           | 20                    | 0124                                                                   | 0344 | 0564 | 1.0                 | 2.0                 | 4                | 250                | - 24                              | + 8     | + 9      | 715                                                    |
| 10                                                            | T1           | 10                    | 0125                                                                   | 0345 | 0565 | 1.0                 | 2.0                 | 4                | 250                | - 24                              | + 8     | + 9      | 715                                                    |
| 10                                                            | T1           | 5                     | 0126                                                                   | 0346 | 0566 | 1.0                 | 2.0                 | 4                | 250                | - 24                              | + 8     | + 9      | 715                                                    |
| 25                                                            | T2           | 20                    | 0127                                                                   | 0347 | 0567 | 1.0                 | 5.0                 | 8                | 95                 | - 20                              | + 10.5  | + 12     | 1005                                                   |
| 25                                                            | T2           | 10                    | 0128                                                                   | 0348 | 0568 | 1.0                 | 5.0                 | 8                | 95                 | - 20                              | + 10.5  | + 12     | 1005                                                   |
| 25                                                            | T2           | 5                     | 0129                                                                   | 0349 | 0569 | 1.0                 | 5.0                 | 8                | 95                 | - 20                              | + 10.5  | + 12     | 1005                                                   |
| 47                                                            | T2           | 20                    | 0130                                                                   | 0350 | 0570 | 1.0                 | 9.0                 | 11               | 70                 | - 28                              | + 13    | + 15     | 1155                                                   |
| 47                                                            | T2           | 10                    | 0131                                                                   | 0351 | 0571 | 1.0                 | 9.0                 | 11               | 70                 | - 28                              | + 13    | + 15     | 1155                                                   |
| 47                                                            | T2           | 5                     | 0132                                                                   | 0352 | 0572 | 1.0                 | 9.0                 | 11               | 70                 | - 28                              | + 13    | + 15     | 1155                                                   |
| 60                                                            | T3           | 20                    | 0133                                                                   | 0353 | 0573 | 2.0                 | 12.0                | 12               | 45                 | - 16                              | + 10.5  | + 12     | 1335                                                   |
| 60                                                            | T3           | 10                    | 0134                                                                   | 0354 | 0574 | 2.0                 | 12.0                | 12               | 45                 | - 16                              | + 10.5  | + 12     | 1335                                                   |
| 60                                                            | T3           | 5                     | 0135                                                                   | 0355 | 0575 | 2.0                 | 12.0                | 12               | 45                 | - 16                              | + 10.5  | + 12     | 1335                                                   |
| 82                                                            | T3           | 20                    | 0136                                                                   | 0356 | 0576 | 2.0                 | 16.0                | 15               | 45                 | - 32                              | + 13    | + 15     | 1400                                                   |
| 82                                                            | T3           | 10                    | 0137                                                                   | 0357 | 0577 | 2.0                 | 16.0                | 15               | 45                 | - 32                              | + 13    | + 15     | 1400                                                   |
| 82                                                            | T3           | 5                     | 0138                                                                   | 0358 | 0578 | 2.0                 | 16.0                | 15               | 45                 | - 32                              | + 13    | + 15     | 1400                                                   |
| 160                                                           | T4           | 20                    | 0139                                                                   | 0359 | 0579 | 8.0                 | 32.0                | 17               | 27                 | - 50                              | + 25    | + 25     | 1900                                                   |
| 160                                                           | T4           | 10                    | 0140                                                                   | 0360 | 0580 | 8.0                 | 32.0                | 17               | 27                 | - 50                              | + 25    | + 25     | 1900                                                   |
| 60 V <sub>DC</sub> AT + 85 °C; 40 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 4.0                                                           | T1           | 20                    | 0141                                                                   | 0361 | 0581 | 1.0                 | 2.0                 | 2.8              | 550                | - 16                              | + 5     | + 6      | 525                                                    |
| 4.0                                                           | T1           | 10                    | 0142                                                                   | 0362 | 0582 | 1.0                 | 2.0                 | 2.8              | 550                | - 16                              | + 5     | + 6      | 525                                                    |
| 4.0                                                           | T1           | 5                     | 0143                                                                   | 0363 | 0583 | 1.0                 | 2.0                 | 2.8              | 550                | - 16                              | + 5     | + 6      | 525                                                    |
| 8.2                                                           | T1           | 20                    | 0144                                                                   | 0364 | 0584 | 1.0                 | 2.0                 | 4                | 275                | - 24                              | + 8     | + 9      | 625                                                    |
| 8.2                                                           | T1           | 10                    | 0145                                                                   | 0365 | 0585 | 1.0                 | 2.0                 | 4                | 275                | - 24                              | + 8     | + 9      | 625                                                    |
| 8.2                                                           | T1           | 5                     | 0146                                                                   | 0366 | 0586 | 1.0                 | 2.0                 | 4                | 275                | - 24                              | + 8     | + 9      | 625                                                    |
| 20                                                            | T2           | 20                    | 0147                                                                   | 0367 | 0587 | 1.0                 | 5.0                 | 7                | 105                | - 16                              | + 10.5  | + 12     | 930                                                    |
| 20                                                            | T2           | 10                    | 0148                                                                   | 0368 | 0588 | 1.0                 | 5.0                 | 7                | 105                | - 16                              | + 10.5  | + 12     | 930                                                    |
| 20                                                            | T2           | 5                     | 0149                                                                   | 0369 | 0589 | 1.0                 | 5.0                 | 7                | 105                | - 16                              | + 10.5  | + 12     | 930                                                    |
| 39                                                            | T2           | 20                    | 0150                                                                   | 0370 | 0590 | 1.0                 | 9.0                 | 10               | 90                 | - 28                              | + 10.5  | + 12     | 1110                                                   |

**Notes**

- (1) Dash number will include the letter "H" to indicate the optional vibration and shock requirements (i.e., 51 g random vibration, 80 g sinusoidal vibration and 500 g shock).
- (2) For ripple current limits at various temperatures, voltages and frequencies, see Ripple Current table.

**STANDARD RATINGS/EXTENDED RATINGS: CLR79, M39006/22-XXXX**

| CAPACITANCE<br>(μF)                                            | CASE<br>CODE | CAP.<br>TOL.<br>(± %) | PART NO. M39006/22- <sup>(1)</sup><br>FAILURE RATE LEVEL<br>(%/1000 h) |      |      | MAX. DCL (μA)<br>AT |          | MAX.<br>DF<br>AT<br>+ 25 °C<br>(%) | MAX.<br>IMP.<br>AT<br>- 55 °C<br>(Ω) | MAX. CAPACITANCE<br>CHANGE (%) AT |         |          | MAX. <sup>(2)</sup><br>RIPPLE<br>CURRENT<br>AT + 85 °C<br>40 kHz<br>(mA) |
|----------------------------------------------------------------|--------------|-----------------------|------------------------------------------------------------------------|------|------|---------------------|----------|------------------------------------|--------------------------------------|-----------------------------------|---------|----------|--------------------------------------------------------------------------|
|                                                                |              |                       | M                                                                      | P    | R    | + 25 °C             | + 85 °C  |                                    |                                      | - 55 °C                           | + 85 °C | + 125 °C |                                                                          |
|                                                                |              |                       | 1.0                                                                    | 0.1  | 0.01 |                     | + 125 °C |                                    |                                      |                                   |         |          |                                                                          |
| 60 V <sub>DC</sub> AT + 85 °C; 40 V <sub>DC</sub> AT + 125 °C  |              |                       |                                                                        |      |      |                     |          |                                    |                                      |                                   |         |          |                                                                          |
| 39                                                             | T2           | 10                    | 0151                                                                   | 0371 | 0591 | 1.0                 | 9.0      | 10                                 | 90                                   | - 28                              | + 10.5  | + 12     | 1110                                                                     |
| 39                                                             | T2           | 5                     | 0152                                                                   | 0372 | 0592 | 1.0                 | 9.0      | 10                                 | 90                                   | - 28                              | + 10.5  | + 12     | 1110                                                                     |
| 50                                                             | T3           | 20                    | 0153                                                                   | 0373 | 0593 | 2.0                 | 12.0     | 10                                 | 50                                   | - 16                              | + 10.5  | + 12     | 1330                                                                     |
| 50                                                             | T3           | 10                    | 0154                                                                   | 0374 | 0594 | 2.0                 | 12.0     | 10                                 | 50                                   | - 16                              | + 10.5  | + 12     | 1330                                                                     |
| 50                                                             | T3           | 5                     | 0155                                                                   | 0375 | 0595 | 2.0                 | 12.0     | 10                                 | 50                                   | - 16                              | + 10.5  | + 12     | 1330                                                                     |
| 68                                                             | T3           | 20                    | 0156                                                                   | 0376 | 0596 | 2.0                 | 16.0     | 13                                 | 50                                   | - 32                              | + 10.5  | + 12     | 1365                                                                     |
| 68                                                             | T3           | 10                    | 0157                                                                   | 0377 | 0597 | 2.0                 | 16.0     | 13                                 | 50                                   | - 32                              | + 10.5  | + 12     | 1365                                                                     |
| 68                                                             | T3           | 5                     | 0158                                                                   | 0378 | 0598 | 2.0                 | 16.0     | 13                                 | 50                                   | - 32                              | + 10.5  | + 12     | 1365                                                                     |
| 140                                                            | T4           | 20                    | 0159                                                                   | 0379 | 0599 | 8.0                 | 32.0     | 16                                 | 28                                   | - 40                              | + 20    | + 20     | 1850                                                                     |
| 140                                                            | T4           | 10                    | 0160                                                                   | 0380 | 0600 | 8.0                 | 32.0     | 16                                 | 28                                   | - 40                              | + 20    | + 20     | 1850                                                                     |
| 75 V <sub>DC</sub> AT + 85 °C; 50 V <sub>DC</sub> AT + 125 °C  |              |                       |                                                                        |      |      |                     |          |                                    |                                      |                                   |         |          |                                                                          |
| 3.5                                                            | T1           | 20                    | 0161                                                                   | 0381 | 0601 | 1.0                 | 2.0      | 2.5                                | 650                                  | - 16                              | + 5     | + 6      | 525                                                                      |
| 3.5                                                            | T1           | 10                    | 0162                                                                   | 0382 | 0602 | 1.0                 | 2.0      | 2.5                                | 650                                  | - 16                              | + 5     | + 6      | 525                                                                      |
| 3.5                                                            | T1           | 5                     | 0163                                                                   | 0383 | 0603 | 1.0                 | 2.0      | 2.5                                | 650                                  | - 16                              | + 5     | + 6      | 525                                                                      |
| 6.8                                                            | T1           | 20                    | 0164                                                                   | 0384 | 0604 | 1.0                 | 2.0      | 3.5                                | 300                                  | - 20                              | + 8     | + 9      | 610                                                                      |
| 6.8                                                            | T1           | 10                    | 0165                                                                   | 0385 | 0605 | 1.0                 | 2.0      | 3.5                                | 300                                  | - 20                              | + 8     | + 9      | 610                                                                      |
| 6.8                                                            | T1           | 5                     | 0166                                                                   | 0386 | 0606 | 1.0                 | 2.0      | 3.5                                | 300                                  | - 20                              | + 8     | + 9      | 610                                                                      |
| 15                                                             | T2           | 20                    | 0167                                                                   | 0387 | 0607 | 1.0                 | 5.0      | 6                                  | 150                                  | - 16                              | + 8     | + 9      | 890                                                                      |
| 15                                                             | T2           | 10                    | 0168                                                                   | 0388 | 0608 | 1.0                 | 5.0      | 6                                  | 150                                  | - 16                              | + 8     | + 9      | 890                                                                      |
| 15                                                             | T2           | 5                     | 0169                                                                   | 0389 | 0609 | 1.0                 | 5.0      | 6                                  | 150                                  | - 16                              | + 8     | + 9      | 890                                                                      |
| 33                                                             | T2           | 20                    | 0170                                                                   | 0390 | 0610 | 1.0                 | 10.0     | 10                                 | 90                                   | - 24                              | + 10.5  | + 15     | 1000                                                                     |
| 33                                                             | T2           | 10                    | 0171                                                                   | 0391 | 0611 | 1.0                 | 10.0     | 10                                 | 90                                   | - 24                              | + 10.5  | + 15     | 1000                                                                     |
| 33                                                             | T2           | 5                     | 0172                                                                   | 0392 | 0612 | 1.0                 | 10.0     | 10                                 | 90                                   | - 24                              | + 10.5  | + 15     | 1000                                                                     |
| 40                                                             | T3           | 20                    | 0173                                                                   | 0393 | 0613 | 2.0                 | 12.0     | 9                                  | 60                                   | - 16                              | + 10.5  | + 12     | 1250                                                                     |
| 40                                                             | T3           | 10                    | 0174                                                                   | 0394 | 0614 | 2.0                 | 12.0     | 9                                  | 60                                   | - 16                              | + 10.5  | + 12     | 1250                                                                     |
| 40                                                             | T3           | 5                     | 0175                                                                   | 0395 | 0615 | 2.0                 | 12.0     | 9                                  | 60                                   | - 16                              | + 10.5  | + 12     | 1250                                                                     |
| 56                                                             | T3           | 20                    | 0176                                                                   | 0396 | 0616 | 2.0                 | 17.0     | 11                                 | 60                                   | - 28                              | + 10.5  | + 15     | 1335                                                                     |
| 56                                                             | T3           | 10                    | 0177                                                                   | 0397 | 0617 | 2.0                 | 17.0     | 11                                 | 60                                   | - 28                              | + 10.5  | + 15     | 1335                                                                     |
| 56                                                             | T3           | 5                     | 0178                                                                   | 0398 | 0618 | 2.0                 | 17.0     | 11                                 | 60                                   | - 28                              | + 10.5  | + 15     | 1335                                                                     |
| 110                                                            | T4           | 20                    | 0179                                                                   | 0399 | 0619 | 9.0                 | 36.0     | 12                                 | 29                                   | - 35                              | + 20    | + 20     | 1850                                                                     |
| 110                                                            | T4           | 10                    | 0180                                                                   | 0400 | 0620 | 9.0                 | 36.0     | 12                                 | 29                                   | - 35                              | + 20    | + 20     | 1850                                                                     |
| 100 V <sub>DC</sub> AT + 85 °C; 65 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |          |                                    |                                      |                                   |         |          |                                                                          |
| 2.5                                                            | T1           | 20                    | 0181                                                                   | 0401 | 0621 | 1.0                 | 2.0      | 2                                  | 950                                  | - 16                              | + 7     | + 8      | 505                                                                      |
| 2.5                                                            | T1           | 10                    | 0182                                                                   | 0402 | 0622 | 1.0                 | 2.0      | 2                                  | 950                                  | - 16                              | + 7     | + 8      | 505                                                                      |
| 2.5                                                            | T1           | 5                     | 0183                                                                   | 0403 | 0623 | 1.0                 | 2.0      | 2                                  | 950                                  | - 16                              | + 7     | + 8      | 505                                                                      |
| 4.7                                                            | T1           | 20                    | 0184                                                                   | 0404 | 0624 | 1.0                 | 2.0      | 3                                  | 500                                  | - 16                              | + 7     | + 8      | 565                                                                      |
| 4.7                                                            | T1           | 10                    | 0185                                                                   | 0405 | 0625 | 1.0                 | 2.0      | 3                                  | 500                                  | - 16                              | + 7     | + 8      | 565                                                                      |
| 4.7                                                            | T1           | 5                     | 0186                                                                   | 0406 | 0626 | 1.0                 | 2.0      | 3                                  | 500                                  | - 16                              | + 7     | + 8      | 565                                                                      |
| 11                                                             | T2           | 20                    | 0187                                                                   | 0407 | 0627 | 1.0                 | 4.0      | 5                                  | 200                                  | - 16                              | + 8     | + 8      | 835                                                                      |
| 11                                                             | T2           | 10                    | 0188                                                                   | 0408 | 0628 | 1.0                 | 4.0      | 5                                  | 200                                  | - 16                              | + 8     | + 8      | 835                                                                      |
| 11                                                             | T2           | 5                     | 0189                                                                   | 0409 | 0629 | 1.0                 | 4.0      | 5                                  | 200                                  | - 16                              | + 8     | + 8      | 835                                                                      |
| 22                                                             | T2           | 20                    | 0190                                                                   | 0410 | 0630 | 1.0                 | 9.0      | 7.5                                | 100                                  | - 16                              | + 8     | + 8      | 965                                                                      |
| 22                                                             | T2           | 10                    | 0191                                                                   | 0411 | 0631 | 1.0                 | 9.0      | 7.5                                | 100                                  | - 16                              | + 8     | + 8      | 965                                                                      |
| 22                                                             | T2           | 5                     | 0192                                                                   | 0412 | 0632 | 1.0                 | 9.0      | 7.5                                | 100                                  | - 16                              | + 8     | + 8      | 965                                                                      |
| 30                                                             | T3           | 20                    | 0193                                                                   | 0413 | 0633 | 2.0                 | 12.0     | 7                                  | 80                                   | - 16                              | + 8     | + 8      | 1240                                                                     |
| 30                                                             | T3           | 10                    | 0194                                                                   | 0414 | 0634 | 2.0                 | 12.0     | 7                                  | 80                                   | - 16                              | + 8     | + 8      | 1240                                                                     |
| 30                                                             | T3           | 5                     | 0195                                                                   | 0415 | 0635 | 2.0                 | 12.0     | 7                                  | 80                                   | - 16                              | + 8     | + 8      | 1240                                                                     |
| 43                                                             | T3           | 20                    | 0196                                                                   | 0416 | 0636 | 2.0                 | 17.0     | 8.5                                | 70                                   | - 20                              | + 8     | + 8      | 1335                                                                     |
| 43                                                             | T3           | 10                    | 0197                                                                   | 0417 | 0637 | 2.0                 | 17.0     | 8.5                                | 70                                   | - 20                              | + 8     | + 8      | 1335                                                                     |
| 43                                                             | T3           | 5                     | 0198                                                                   | 0418 | 0638 | 2.0                 | 17.0     | 8.5                                | 70                                   | - 20                              | + 8     | + 8      | 1335                                                                     |
| 86                                                             | T4           | 20                    | 0199                                                                   | 0419 | 0639 | 9.0                 | 36.0     | 10                                 | 30                                   | - 25                              | + 15    | + 15     | 1800                                                                     |
| 86                                                             | T4           | 10                    | 0200                                                                   | 0420 | 0640 | 9.0                 | 36.0     | 10                                 | 30                                   | - 25                              | + 15    | + 15     | 1800                                                                     |

**Notes**

(1) Dash number will include the letter "H" to indicate the optional vibration and shock requirements (i.e., 51 g random vibration, 80 g sinusoidal vibration and 500 g shock).

(2) For ripple current limits at various temperatures, voltages and frequencies, see Ripple Current table.

**STANDARD RATINGS/EXTENDED RATINGS: CLR79, M39006/22-XXXX**

| CAPACITANCE<br>(μF)                                            | CASE<br>CODE | CAP.<br>TOL.<br>(± %) | PART NO. M39006/22- <sup>(1)</sup><br>FAILURE RATE LEVEL<br>(%/1000 h) |      |      | MAX. DCL (μA)<br>AT |                     | MAX.<br>DF<br>AT | MAX.<br>IMP.<br>AT | MAX. CAPACITANCE<br>CHANGE (%) AT |         |          | MAX. <sup>(2)</sup><br>RIPPLE<br>CURRENT<br>AT + 85 °C |
|----------------------------------------------------------------|--------------|-----------------------|------------------------------------------------------------------------|------|------|---------------------|---------------------|------------------|--------------------|-----------------------------------|---------|----------|--------------------------------------------------------|
|                                                                |              |                       | M                                                                      | P    | R    | + 25 °C             | + 85 °C<br>+ 125 °C | + 25 °C<br>(%)   | - 55 °C<br>(Ω)     | - 55 °C                           | + 85 °C | + 125 °C | AT + 85 °C<br>40 kHz<br>(mA)                           |
|                                                                |              |                       | 1.0                                                                    | 0.1  | 0.01 |                     |                     |                  |                    |                                   |         |          |                                                        |
| 125 V <sub>DC</sub> AT + 85 °C; 85 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 1.7                                                            | T1           | 20                    | 0201                                                                   | 0421 | 0641 | 1.0                 | 2.0                 | 2                | 1250               | - 16                              | + 7     | + 8      | 415                                                    |
| 1.7                                                            | T1           | 10                    | 0202                                                                   | 0422 | 0642 | 1.0                 | 2.0                 | 2                | 1250               | - 16                              | + 7     | + 8      | 415                                                    |
| 1.7                                                            | T1           | 5                     | 0203                                                                   | 0423 | 0643 | 1.0                 | 2.0                 | 2                | 1250               | - 16                              | + 7     | + 8      | 415                                                    |
| 3.6                                                            | T1           | 20                    | 0204                                                                   | 0424 | 0644 | 1.0                 | 2.0                 | 2.7              | 600                | - 16                              | + 7     | + 8      | 520                                                    |
| 3.6                                                            | T1           | 10                    | 0205                                                                   | 0425 | 0645 | 1.0                 | 2.0                 | 2.7              | 600                | - 16                              | + 7     | + 8      | 520                                                    |
| 3.6                                                            | T1           | 5                     | 0206                                                                   | 0426 | 0646 | 1.0                 | 2.0                 | 2.7              | 600                | - 16                              | + 7     | + 8      | 520                                                    |
| 9.0                                                            | T2           | 20                    | 0207                                                                   | 0427 | 0647 | 1.0                 | 5.0                 | 5                | 240                | - 16                              | + 7     | + 8      | 755                                                    |
| 9.0                                                            | T2           | 10                    | 0208                                                                   | 0428 | 0648 | 1.0                 | 5.0                 | 5                | 240                | - 16                              | + 7     | + 8      | 755                                                    |
| 9.0                                                            | T2           | 5                     | 0209                                                                   | 0429 | 0649 | 1.0                 | 5.0                 | 5                | 240                | - 16                              | + 7     | + 8      | 755                                                    |
| 14                                                             | T2           | 20                    | 0210                                                                   | 0430 | 0650 | 1.0                 | 7.0                 | 6                | 167                | - 16                              | + 7     | + 8      | 860                                                    |
| 14                                                             | T2           | 10                    | 0211                                                                   | 0431 | 0651 | 1.0                 | 7.0                 | 6                | 167                | - 16                              | + 7     | + 8      | 860                                                    |
| 14                                                             | T2           | 5                     | 0212                                                                   | 0432 | 0652 | 1.0                 | 7.0                 | 6                | 167                | - 16                              | + 7     | + 8      | 860                                                    |
| 18                                                             | T3           | 20                    | 0213                                                                   | 0433 | 0653 | 2.0                 | 9.0                 | 5                | 129                | - 16                              | + 7     | + 8      | 1130                                                   |
| 18                                                             | T3           | 10                    | 0214                                                                   | 0434 | 0654 | 2.0                 | 9.0                 | 5                | 129                | - 16                              | + 7     | + 8      | 1130                                                   |
| 18                                                             | T3           | 5                     | 0215                                                                   | 0435 | 0655 | 2.0                 | 9.0                 | 5                | 129                | - 16                              | + 7     | + 8      | 1130                                                   |
| 25                                                             | T3           | 20                    | 0216                                                                   | 0436 | 0656 | 2.0                 | 13.0                | 6                | 93                 | - 16                              | + 7     | + 8      | 1200                                                   |
| 25                                                             | T3           | 10                    | 0217                                                                   | 0437 | 0657 | 2.0                 | 13.0                | 6                | 93                 | - 16                              | + 7     | + 8      | 1200                                                   |
| 25                                                             | T3           | 5                     | 0218                                                                   | 0438 | 0658 | 2.0                 | 13.0                | 6                | 93                 | - 16                              | + 7     | + 8      | 1200                                                   |
| 56                                                             | T4           | 20                    | 0219                                                                   | 0439 | 0659 | 10.0                | 40.0                | 6.5              | 32                 | - 25                              | + 15    | + 15     | 1800                                                   |
| 56                                                             | T4           | 10                    | 0220                                                                   | 0440 | 0660 | 10.0                | 40.0                | 6.5              | 32                 | - 25                              | + 15    | + 15     | 1800                                                   |

**Notes**

- (1) Dash number will include the letter "H" to indicate the optional vibration and shock requirements (i.e., 51 g random vibration, 80 g sinusoidal vibration and 500 g shock).
- (2) For ripple current limits at various temperatures, voltages and frequencies, see Ripple Current table.

**STANDARD RATINGS/EXTENDED RATINGS: CLR81, M39006/25-XXXX**

| CAPACITANCE<br>(μF)                                         | CASE<br>CODE | CAP.<br>TOL.<br>(± %) | PART NO. M39006/25- <sup>(1)</sup><br>FAILURE RATE LEVEL<br>(%/1000 h) |      |      | MAX. DCL (μA)<br>AT |                     | MAX.<br>DF<br>AT | MAX.<br>IMP.<br>AT | MAX. CAPACITANCE<br>CHANGE (%) AT |         |          | MAX. <sup>(1)</sup><br>RIPPLE<br>CURRENT<br>AT + 85 °C |
|-------------------------------------------------------------|--------------|-----------------------|------------------------------------------------------------------------|------|------|---------------------|---------------------|------------------|--------------------|-----------------------------------|---------|----------|--------------------------------------------------------|
|                                                             |              |                       | M                                                                      | P    | R    | + 25 °C             | + 85 °C<br>+ 125 °C | + 25 °C<br>(%)   | - 55 °C<br>(Ω)     | - 55 °C                           | + 85 °C | + 125 °C | AT + 85 °C<br>40 kHz<br>(mA)                           |
|                                                             |              |                       | 1.0                                                                    | 0.1  | 0.01 |                     |                     |                  |                    |                                   |         |          |                                                        |
| 6 V <sub>DC</sub> AT + 85 °C; 4 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 220                                                         | T1           | 20                    | 0001                                                                   | 0089 | 0177 | 2.0                 | 9.0                 | 50               | 36                 | - 64                              | + 13    | + 16     | 1000                                                   |
| 220                                                         | T1           | 10                    | 0002                                                                   | 0090 | 0178 | 2.0                 | 9.0                 | 50               | 36                 | - 64                              | + 13    | + 16     | 1000                                                   |
| 820                                                         | T2           | 20                    | 0003                                                                   | 0091 | 0179 | 3.0                 | 14.0                | 155              | 18                 | - 88                              | + 16    | + 20     | 1500                                                   |
| 820                                                         | T2           | 10                    | 0004                                                                   | 0092 | 0180 | 3.0                 | 14.0                | 155              | 18                 | - 88                              | + 16    | + 20     | 1500                                                   |
| 1500                                                        | T3           | 20                    | 0005                                                                   | 0093 | 0181 | 5.0                 | 20.0                | 172              | 18                 | - 90                              | + 20    | + 25     | 1900                                                   |
| 1500                                                        | T3           | 10                    | 0006                                                                   | 0094 | 0182 | 5.0                 | 20.0                | 172              | 18                 | - 90                              | + 20    | + 25     | 1900                                                   |
| 2200                                                        | T4           | 20                    | 0007                                                                   | 0095 | 0183 | 6.0                 | 24.0                | 170              | 13                 | - 90                              | + 25    | + 30     | 2300                                                   |
| 2200                                                        | T4           | 10                    | 0008                                                                   | 0096 | 0184 | 6.0                 | 24.0                | 170              | 13                 | - 90                              | + 25    | + 30     | 2300                                                   |
| 8 V <sub>DC</sub> AT + 85 °C; 5 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 180                                                         | T1           | 20                    | 0009                                                                   | 0097 | 0185 | 2.0                 | 9.0                 | 41               | 45                 | - 60                              | + 13    | + 16     | 1000                                                   |
| 180                                                         | T1           | 10                    | 0010                                                                   | 0098 | 0186 | 2.0                 | 9.0                 | 41               | 45                 | - 60                              | + 13    | + 16     | 1000                                                   |
| 680                                                         | T2           | 20                    | 0011                                                                   | 0099 | 0187 | 3.0                 | 14.0                | 130              | 22                 | - 83                              | + 16    | + 20     | 1500                                                   |
| 680                                                         | T2           | 10                    | 0012                                                                   | 0100 | 0188 | 3.0                 | 14.0                | 130              | 22                 | - 83                              | + 16    | + 20     | 1500                                                   |
| 1500                                                        | T3           | 20                    | 0013                                                                   | 0101 | 0189 | 5.0                 | 20.0                | 170              | 18                 | - 90                              | + 20    | + 25     | 1900                                                   |
| 1500                                                        | T3           | 10                    | 0014                                                                   | 0102 | 0190 | 5.0                 | 20.0                | 170              | 18                 | - 90                              | + 20    | + 25     | 1900                                                   |
| 1800                                                        | T4           | 20                    | 0015                                                                   | 0103 | 0191 | 7.0                 | 25.0                | 138              | 14                 | - 90                              | + 25    | + 30     | 2300                                                   |
| 1800                                                        | T4           | 10                    | 0016                                                                   | 0104 | 0192 | 7.0                 | 25.0                | 138              | 14                 | - 90                              | + 25    | + 30     | 2300                                                   |

**Notes**

- (1) Dash number will include the letter "H" to indicate the optional vibration and shock requirements (i.e., 51 g random vibration, 80 g sinusoidal vibration and 500 g shock).
- (2) For ripple current limits at various temperatures, voltages and frequencies, see Ripple Current table.

**STANDARD RATINGS/EXTENDED RATINGS: CLR81, M39006/25-XXXX**

| CAPACITANCE<br>(μF)                                           | CASE<br>CODE | CAP.<br>TOL.<br>(± %) | PART NO. M39006/25- <sup>(1)</sup><br>FAILURE RATE LEVEL<br>(%/1000 h) |      |      | MAX. DCL (μA)<br>AT |                     | MAX.<br>DF<br>AT | MAX.<br>IMP.<br>AT | MAX. CAPACITANCE<br>CHANGE (%) AT |         |          | MAX. <sup>(1)</sup><br>RIPPLE<br>CURRENT<br>AT + 85 °C |
|---------------------------------------------------------------|--------------|-----------------------|------------------------------------------------------------------------|------|------|---------------------|---------------------|------------------|--------------------|-----------------------------------|---------|----------|--------------------------------------------------------|
|                                                               |              |                       | M                                                                      | P    | R    | + 25 °C             | + 85 °C<br>+ 125 °C | + 25 °C<br>(%)   | - 55 °C<br>(Ω)     | - 55 °C                           | + 85 °C | + 125 °C | AT + 85 °C<br>40 kHz<br>(mA)                           |
|                                                               |              |                       | 1.0                                                                    | 0.1  | 0.01 |                     |                     |                  |                    |                                   |         |          |                                                        |
| 10 V <sub>DC</sub> AT + 85 °C; 7 V <sub>DC</sub> AT + 125 °C  |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 150                                                           | T1           | 20                    | 0017                                                                   | 0105 | 0193 | 2.0                 | 9.0                 | 34               | 54                 | - 55                              | + 13    | + 16     | 900                                                    |
| 150                                                           | T1           | 10                    | 0018                                                                   | 0106 | 0194 | 2.0                 | 9.0                 | 34               | 54                 | - 55                              | + 13    | + 16     | 900                                                    |
| 560                                                           | T2           | 20                    | 0019                                                                   | 0107 | 0195 | 3.0                 | 16.0                | 106              | 27                 | - 77                              | + 16    | + 20     | 1450                                                   |
| 560                                                           | T2           | 10                    | 0020                                                                   | 0108 | 0196 | 3.0                 | 16.0                | 106              | 27                 | - 77                              | + 16    | + 20     | 1450                                                   |
| 1200                                                          | T3           | 20                    | 0021                                                                   | 0109 | 0197 | 5.0                 | 20.0                | 137              | 18                 | - 88                              | + 20    | + 25     | 1850                                                   |
| 1200                                                          | T3           | 10                    | 0022                                                                   | 0110 | 0198 | 5.0                 | 20.0                | 137              | 18                 | - 88                              | + 20    | + 25     | 1850                                                   |
| 1500                                                          | T4           | 20                    | 0023                                                                   | 0111 | 0199 | 7.0                 | 25.0                | 114              | 15                 | - 88                              | + 25    | + 30     | 2300                                                   |
| 1500                                                          | T4           | 10                    | 0024                                                                   | 0112 | 0200 | 7.0                 | 25.0                | 114              | 15                 | - 88                              | + 25    | + 30     | 2300                                                   |
| 15 V <sub>DC</sub> AT + 85 °C; 10 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 100                                                           | T1           | 20                    | 0025                                                                   | 0113 | 0201 | 2.0                 | 9.0                 | 30               | 72                 | - 44                              | + 13    | + 16     | 900                                                    |
| 100                                                           | T1           | 10                    | 0026                                                                   | 0114 | 0202 | 2.0                 | 9.0                 | 30               | 72                 | - 44                              | + 13    | + 16     | 900                                                    |
| 390                                                           | T2           | 20                    | 0027                                                                   | 0115 | 0203 | 3.0                 | 16.0                | 74               | 31                 | - 66                              | + 16    | + 20     | 1450                                                   |
| 390                                                           | T2           | 10                    | 0028                                                                   | 0116 | 0204 | 3.0                 | 16.0                | 74               | 31                 | - 66                              | + 16    | + 20     | 1450                                                   |
| 820                                                           | T3           | 20                    | 0029                                                                   | 0117 | 0205 | 6.0                 | 24.0                | 111              | 22                 | - 77                              | + 20    | + 25     | 1800                                                   |
| 820                                                           | T3           | 10                    | 0030                                                                   | 0118 | 0206 | 6.0                 | 24.0                | 111              | 22                 | - 77                              | + 20    | + 25     | 1800                                                   |
| 1000                                                          | T4           | 20                    | 0031                                                                   | 0119 | 0207 | 8.0                 | 32.0                | 92               | 17                 | - 77                              | + 25    | + 30     | 2300                                                   |
| 1000                                                          | T4           | 10                    | 0032                                                                   | 0120 | 0208 | 8.0                 | 32.0                | 92               | 17                 | - 77                              | + 25    | + 30     | 2300                                                   |
| 25 V <sub>DC</sub> AT + 85 °C; 15 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 68                                                            | T1           | 20                    | 0033                                                                   | 0121 | 0209 | 2.0                 | 9.0                 | 22               | 90                 | - 40                              | + 12    | + 15     | 850                                                    |
| 68                                                            | T1           | 10                    | 0034                                                                   | 0122 | 0210 | 2.0                 | 9.0                 | 22               | 90                 | - 40                              | + 12    | + 15     | 850                                                    |
| 270                                                           | T2           | 20                    | 0035                                                                   | 0123 | 0211 | 3.0                 | 16.0                | 55               | 33                 | - 62                              | + 13    | + 16     | 1400                                                   |
| 270                                                           | T2           | 10                    | 0036                                                                   | 0124 | 0212 | 3.0                 | 16.0                | 55               | 33                 | - 62                              | + 13    | + 16     | 1400                                                   |
| 560                                                           | T3           | 20                    | 0037                                                                   | 0125 | 0213 | 7.0                 | 28.0                | 76               | 24                 | - 72                              | + 20    | + 25     | 1750                                                   |
| 560                                                           | T3           | 10                    | 0038                                                                   | 0126 | 0214 | 7.0                 | 28.0                | 76               | 24                 | - 72                              | + 20    | + 25     | 1750                                                   |
| 680                                                           | T4           | 20                    | 0039                                                                   | 0127 | 0215 | 8.0                 | 32.0                | 63               | 19                 | - 72                              | + 25    | + 30     | 2100                                                   |
| 680                                                           | T4           | 10                    | 0040                                                                   | 0128 | 0216 | 8.0                 | 32.0                | 63               | 19                 | - 72                              | + 25    | + 30     | 2100                                                   |
| 30 V <sub>DC</sub> AT + 85 °C; 20 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 56                                                            | T1           | 20                    | 0041                                                                   | 0129 | 0217 | 2.0                 | 9.0                 | 22               | 100                | - 38                              | + 12    | + 15     | 800                                                    |
| 56                                                            | T1           | 10                    | 0042                                                                   | 0130 | 0218 | 2.0                 | 9.0                 | 22               | 100                | - 38                              | + 12    | + 15     | 800                                                    |
| 220                                                           | T2           | 20                    | 0043                                                                   | 0131 | 0219 | 3.0                 | 16.0                | 42               | 36                 | - 60                              | + 13    | + 16     | 1200                                                   |
| 220                                                           | T2           | 10                    | 0044                                                                   | 0132 | 0220 | 3.0                 | 16.0                | 42               | 36                 | - 60                              | + 13    | + 16     | 1200                                                   |
| 470                                                           | T3           | 20                    | 0045                                                                   | 0133 | 0221 | 8.0                 | 32.0                | 64               | 25                 | - 65                              | + 20    | + 25     | 1500                                                   |
| 470                                                           | T3           | 10                    | 0046                                                                   | 0134 | 0222 | 8.0                 | 32.0                | 64               | 25                 | - 65                              | + 20    | + 25     | 1500                                                   |
| 560                                                           | T4           | 20                    | 0047                                                                   | 0135 | 0223 | 9.0                 | 36.0                | 55               | 20                 | - 65                              | + 25    | + 30     | 2000                                                   |
| 560                                                           | T4           | 10                    | 0048                                                                   | 0136 | 0224 | 9.0                 | 36.0                | 55               | 20                 | - 65                              | + 25    | + 30     | 2000                                                   |
| 50 V <sub>DC</sub> AT + 85 °C; 30 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 33                                                            | T1           | 20                    | 0049                                                                   | 0137 | 0225 | 2.0                 | 9.0                 | 12.3             | 135                | - 29                              | + 10    | + 12     | 700                                                    |
| 33                                                            | T1           | 10                    | 0050                                                                   | 0138 | 0226 | 2.0                 | 9.0                 | 12.3             | 135                | - 29                              | + 10    | + 12     | 700                                                    |
| 120                                                           | T2           | 20                    | 0051                                                                   | 0139 | 0227 | 4.0                 | 24.0                | 22.5             | 49                 | - 42                              | + 12    | + 15     | 1200                                                   |
| 120                                                           | T2           | 10                    | 0052                                                                   | 0140 | 0228 | 4.0                 | 24.0                | 22.5             | 49                 | - 42                              | + 12    | + 15     | 1200                                                   |
| 270                                                           | T3           | 20                    | 0053                                                                   | 0141 | 0229 | 8.0                 | 32.0                | 37               | 29                 | - 46                              | + 20    | + 25     | 1450                                                   |
| 270                                                           | T3           | 10                    | 0054                                                                   | 0142 | 0230 | 8.0                 | 32.0                | 37               | 29                 | - 46                              | + 20    | + 25     | 1450                                                   |
| 330                                                           | T4           | 20                    | 0055                                                                   | 0143 | 0231 | 9.0                 | 36.0                | 38               | 22                 | - 46                              | + 25    | + 30     | 1900                                                   |
| 330                                                           | T4           | 10                    | 0056                                                                   | 0144 | 0232 | 9.0                 | 36.0                | 38               | 22                 | - 46                              | + 25    | + 30     | 1900                                                   |
| 60 V <sub>DC</sub> AT + 85 °C; 40 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 27                                                            | T1           | 20                    | 0057                                                                   | 0145 | 0233 | 3.0                 | 12.0                | 10.2             | 144                | - 24                              | + 10    | + 12     | 700                                                    |
| 27                                                            | T1           | 10                    | 0058                                                                   | 0146 | 0234 | 3.0                 | 12.0                | 10.2             | 144                | - 24                              | + 10    | + 12     | 700                                                    |
| 100                                                           | T2           | 20                    | 0059                                                                   | 0147 | 0235 | 4.0                 | 20.0                | 19               | 54                 | - 36                              | + 12    | + 15     | 1100                                                   |
| 100                                                           | T2           | 10                    | 0060                                                                   | 0148 | 0236 | 4.0                 | 20.0                | 19               | 54                 | - 36                              | + 12    | + 15     | 1100                                                   |
| 220                                                           | T3           | 20                    | 0061                                                                   | 0149 | 0237 | 8.0                 | 32.0                | 30               | 29                 | - 40                              | + 16    | + 20     | 1400                                                   |
| 220                                                           | T3           | 10                    | 0062                                                                   | 0150 | 0238 | 8.0                 | 32.0                | 30               | 29                 | - 40                              | + 16    | + 20     | 1400                                                   |
| 270                                                           | T4           | 20                    | 0063                                                                   | 0151 | 0239 | 9.0                 | 36.0                | 27               | 23                 | - 45                              | + 20    | + 25     | 1850                                                   |
| 270                                                           | T4           | 10                    | 0064                                                                   | 0152 | 0240 | 9.0                 | 36.0                | 27               | 23                 | - 45                              | + 20    | + 25     | 1850                                                   |

**Notes**

- (1) Dash number will include the letter "H" to indicate the optional vibration and shock requirements (i.e., 51 g random vibration, 80 g sinusoidal vibration and 500 g shock).
- (2) For ripple current limits at various temperatures, voltages and frequencies, see Ripple Current table.

**STANDARD RATINGS/EXTENDED RATINGS: CLR81, M39006/25-XXXX**

| CAPACITANCE<br>(μF)                                            | CASE<br>CODE | CAP.<br>TOL.<br>(± %) | PART NO. M39006/25- <sup>(1)</sup><br>FAILURE RATE LEVEL<br>(%/1000 h) |      |      | MAX. DCL (μA)<br>AT |                     | MAX.<br>DF<br>AT | MAX.<br>IMP.<br>AT | MAX. CAPACITANCE<br>CHANGE (%) AT |         |          | MAX. <sup>(1)</sup><br>RIPPLE<br>CURRENT<br>AT + 85 °C |
|----------------------------------------------------------------|--------------|-----------------------|------------------------------------------------------------------------|------|------|---------------------|---------------------|------------------|--------------------|-----------------------------------|---------|----------|--------------------------------------------------------|
|                                                                |              |                       | M                                                                      | P    | R    | + 25 °C             | + 85 °C<br>+ 125 °C | + 25 °C<br>(%)   | - 55 °C<br>(Ω)     | - 55 °C                           | + 85 °C | + 125 °C | 40 kHz<br>(mA)                                         |
|                                                                |              |                       | 1.0                                                                    | 0.1  | 0.01 |                     |                     |                  |                    |                                   |         |          |                                                        |
| 75 V <sub>DC</sub> AT + 85 °C; 50 V <sub>DC</sub> AT + 125 °C  |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 22                                                             | T1           | 20                    | 0065                                                                   | 0153 | 0241 | 3.0                 | 12.0                | 8.5              | 157                | - 19                              | + 10    | + 12     | 600                                                    |
| 22                                                             | T1           | 10                    | 0066                                                                   | 0154 | 0242 | 3.0                 | 12.0                | 8.5              | 157                | - 19                              | + 10    | + 12     | 600                                                    |
| 82                                                             | T2           | 20                    | 0067                                                                   | 0155 | 0243 | 4.0                 | 24.0                | 15.2             | 63                 | - 30                              | + 12    | + 15     | 1000                                                   |
| 82                                                             | T2           | 10                    | 0068                                                                   | 0156 | 0244 | 4.0                 | 24.0                | 15.2             | 63                 | - 30                              | + 12    | + 15     | 1000                                                   |
| 180                                                            | T3           | 20                    | 0069                                                                   | 0157 | 0245 | 9.0                 | 36.0                | 24.4             | 30                 | - 35                              | + 16    | + 20     | 1300                                                   |
| 180                                                            | T3           | 10                    | 0070                                                                   | 0158 | 0246 | 9.0                 | 36.0                | 24.4             | 30                 | - 35                              | + 16    | + 20     | 1300                                                   |
| 220                                                            | T4           | 20                    | 0071                                                                   | 0159 | 0247 | 10.0                | 40.0                | 37.0             | 24                 | - 40                              | + 20    | + 25     | 1800                                                   |
| 220                                                            | T4           | 10                    | 0072                                                                   | 0160 | 0248 | 10.0                | 40.0                | 37.0             | 24                 | - 40                              | + 20    | + 25     | 1800                                                   |
| 100 V <sub>DC</sub> AT + 85 °C; 65 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 10                                                             | T1           | 20                    | 0073                                                                   | 0161 | 0249 | 3.0                 | 12.0                | 4.5              | 200                | - 17                              | + 10    | + 12     | 800                                                    |
| 10                                                             | T1           | 10                    | 0074                                                                   | 0162 | 0250 | 3.0                 | 12.0                | 4.5              | 200                | - 17                              | + 10    | + 12     | 800                                                    |
| 39                                                             | T2           | 20                    | 0075                                                                   | 0163 | 0251 | 5.0                 | 24.0                | 10.4             | 80                 | - 20                              | + 12    | + 15     | 1300                                                   |
| 39                                                             | T2           | 10                    | 0076                                                                   | 0164 | 0252 | 5.0                 | 24.0                | 10.4             | 80                 | - 20                              | + 12    | + 15     | 1300                                                   |
| 68                                                             | T3           | 20                    | 0077                                                                   | 0165 | 0253 | 10.0                | 40.0                | 11.3             | 40                 | - 30                              | + 14    | + 16     | 1600                                                   |
| 68                                                             | T3           | 10                    | 0078                                                                   | 0166 | 0254 | 10.0                | 40.0                | 11.3             | 40                 | - 30                              | + 14    | + 16     | 1600                                                   |
| 120                                                            | T4           | 20                    | 0079                                                                   | 0167 | 0255 | 12.0                | 48.0                | 25               | 30                 | - 35                              | + 15    | + 17     | 2000                                                   |
| 120                                                            | T4           | 10                    | 0080                                                                   | 0168 | 0256 | 12.0                | 48.0                | 25               | 30                 | - 35                              | + 15    | + 17     | 2000                                                   |
| 125 V <sub>DC</sub> AT + 85 °C; 85 V <sub>DC</sub> AT + 125 °C |              |                       |                                                                        |      |      |                     |                     |                  |                    |                                   |         |          |                                                        |
| 6.8                                                            | T1           | 20                    | 0081                                                                   | 0169 | 0257 | 3.0                 | 12.0                | 6.0              | 300                | - 14                              | + 10    | + 12     | 700                                                    |
| 6.8                                                            | T1           | 10                    | 0082                                                                   | 0170 | 0258 | 3.0                 | 12.0                | 6.0              | 300                | - 14                              | + 10    | + 12     | 700                                                    |
| 27                                                             | T2           | 20                    | 0083                                                                   | 0171 | 0259 | 5.0                 | 24.0                | 7.2              | 90                 | - 18                              | + 12    | + 15     | 1200                                                   |
| 27                                                             | T2           | 10                    | 0084                                                                   | 0172 | 0260 | 5.0                 | 24.0                | 7.2              | 90                 | - 18                              | + 12    | + 15     | 1200                                                   |
| 47                                                             | T3           | 20                    | 0085                                                                   | 0173 | 0261 | 10.0                | 40.0                | 7.9              | 50                 | - 26                              | + 14    | + 16     | 1500                                                   |
| 47                                                             | T3           | 10                    | 0086                                                                   | 0174 | 0262 | 10.0                | 40.0                | 7.9              | 50                 | - 26                              | + 14    | + 16     | 1500                                                   |
| 82                                                             | T4           | 20                    | 0087                                                                   | 0175 | 0263 | 12.0                | 48.0                | 17.4             | 32                 | - 30                              | + 15    | + 17     | 1900                                                   |
| 82                                                             | T4           | 10                    | 0088                                                                   | 0176 | 0264 | 12.0                | 48.0                | 17.4             | 32                 | - 30                              | + 15    | + 17     | 1900                                                   |

**Notes**

- (1) Dash number will include the letter "H" to indicate the optional vibration and shock requirements (i.e., 51 g random vibration, 80 g sinusoidal vibration and 500 g shock).
- (2) For ripple current limits at various temperatures, voltages and frequencies, see Ripple Current table.

**CLR79, CLR81 RIPPLE CURRENT MULTIPLIERS VS. FREQUENCY, TEMPERATURE AND APPLIED PEAK VOLTAGE**

| FREQUENCY OF<br>APPLIED RIPPLE<br>CURRENT |          | 120 Hz  |      |      |      | 800 Hz  |      |      |      | 1 kHz   |      |      |      | 10 kHz  |      |      |      | 40 kHz  |      |      |      | 100 kHz |      |      |      |
|-------------------------------------------|----------|---------|------|------|------|---------|------|------|------|---------|------|------|------|---------|------|------|------|---------|------|------|------|---------|------|------|------|
| AMBIENT<br>STILL AIR                      |          | TEMP °C |      |      |      | TEMP °C |      |      |      | TEMP °C |      |      |      | TEMP °C |      |      |      | TEMP °C |      |      |      | TEMP °C |      |      |      |
|                                           |          | ≤ 55    | 85   | 105  | 125  | ≤ 55    | 85   | 105  | 125  | ≤ 55    | 85   | 105  | 125  | ≤ 55    | 85   | 105  | 125  | ≤ 55    | 85   | 105  | 125  | ≤ 55    | 85   | 105  | 125  |
| % OF<br>APPLIED<br>VOLTAGE                | 100 %    | 0.60    | 0.39 | -    | -    | 0.71    | 0.43 | -    | -    | 0.72    | 0.46 | -    | -    | 0.88    | 0.55 | -    | -    | 1.0     | 0.63 | -    | -    | 1.1     | 0.69 | -    | -    |
|                                           | 90 %     | 0.60    | 0.46 | -    | -    | 0.71    | 0.55 | -    | -    | 0.72    | 0.55 | -    | -    | 0.88    | 0.67 | -    | -    | 1.0     | 0.77 | -    | -    | 1.1     | 0.85 | -    | -    |
|                                           | 80 %     | 0.60    | 0.52 | 0.35 | -    | 0.71    | 0.62 | 0.42 | -    | 0.72    | 0.62 | 0.42 | -    | 0.88    | 0.76 | 0.52 | -    | 1.0     | 0.87 | 0.59 | -    | 1.1     | 0.96 | 0.65 | -    |
|                                           | 70 %     | 0.60    | 0.58 | 0.44 | -    | 0.71    | 0.69 | 0.52 | -    | 0.72    | 0.70 | 0.52 | -    | 0.88    | 0.85 | 0.64 | -    | 1.0     | 0.97 | 0.73 | -    | 1.1     | 1.07 | 0.80 | -    |
|                                           | 66 2/3 % | 0.60    | 0.60 | 0.46 | 0.27 | 0.71    | 0.71 | 0.55 | 0.32 | 0.72    | 0.72 | 0.55 | 0.32 | 0.88    | 0.88 | 0.68 | 0.40 | 1.0     | 1.0  | 0.77 | 0.45 | 1.1     | 1.1  | 0.85 | 0.50 |

**Notes**

- At + 125 °C the rated voltage of the capacitors decreases to 66 2/3 % of the + 85 °C rated voltage.
- The peak of the applied AC ripple voltage plus the applied DC voltage must not exceed the DC voltage rating of the capacitor either forward or reverse.
- The ripple current listed represents a rating calculated using a maximum internal temperature rise ( $\Delta T$ ) of + 50 °C at 40 kHz at + 85 °C ambient with a maximum peak rated voltage of 66 2/3 % of the + 85 °C peak voltage rating.
- The maximum allowable internal temperature rise ( $\Delta T$ ) decreases linearly to a calculated + 10 °C rise at + 125 °C ambient.
- The internal temperature rise is directly proportional to the equivalent series resistance of the capacitor and equivalent series resistance increases with decreasing frequency.



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