

# Multilayer Ceramic Capacitors for Telecommunications Infrastructure and Industrial Equipment

REFLOW

## PART NUMBER

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M | B | A | S | T | 3 | 1 | L | S | B | 5 | 1 | 0 | 6 | K | T | N | A | 0 | 1 |
| ① |   |   |   | ② | ③ |   | ④ | ⑤ |   | ⑥ |   | ⑦ |   | ⑧ | ⑨ |   |   | ⑩ |   |

## ① Series

| Code<br>(1)(2)(3)(4) |                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MBAS                 | Multilayer Ceramic Capacitor (High dielectric type) for Telecommunications Infrastructure and Industrial Equipment<br>Multilayer Ceramic Capacitor (Temperature compensating type) for Telecommunications Infrastructure and Industrial Equipment<br>Medium-High voltage Multilayer Ceramic Capacitor for Telecommunications Infrastructure and Industrial Equipment |
| MBAR                 | High frequency/Low loss Medium-High Voltage Multilayer Ceramic Capacitor for Telecommunications Infrastructure and Industrial Equipment                                                                                                                                                                                                                              |
| MBJC                 | Soft Termination Multilayer Ceramic Capacitor for Telecommunications Infrastructure and Industrial Equipment                                                                                                                                                                                                                                                         |
| MBRL                 | LW Reversal Decoupling Low ESL Capacitor (LWDC™) for Telecommunications Infrastructure and Industrial Equipment                                                                                                                                                                                                                                                      |

## (1) Product Group

| Code |                              |
|------|------------------------------|
| M    | Multilayer Ceramic Capacitor |

## (2) Category

| Code | Recommended equipment                                      | Quality Grade |
|------|------------------------------------------------------------|---------------|
| B    | Telecommunications Infrastructure and Industrial Equipment | 2             |

## (3) Type

| Code |                  |
|------|------------------|
| A    | 2 terminals      |
| J    | Soft Termination |
| R    | LW reversal      |

## (4) Features, Characteristics

| Code |                                  |
|------|----------------------------------|
| S    | Standard/General                 |
| R    | High frequency/Low loss          |
| C    | Internal code (Soft Termination) |
| L    | Low ESL                          |

## ② Rated voltage

| Code | Rated voltage [VDC] |
|------|---------------------|
| A    | 4                   |
| J    | 6.3                 |
| L    | 10                  |
| E    | 16                  |
| T    | 25                  |
| G    | 35                  |
| U    | 50                  |
| H    | 100                 |
| Q    | 250                 |
| S    | 630                 |

## ④ Thickness

| Code | Thickness [mm]    |
|------|-------------------|
| 3    | 0.3               |
| 5    | 0.5               |
| 7    | 0.7               |
| 8    | 0.8               |
| 9    | 0.85              |
| Q    | 1.15              |
| G    | 1.25              |
| L    | 1.6               |
| N    | 1.9 (0.088 max ※) |
| M    | 2.5               |

Note : ※LW reverse type (MBRL)

## ③ Dimension (L × W)

| Code | L × W [mm]   | JIS(mm) | EIA(inch) |
|------|--------------|---------|-----------|
| 06   | 0.6 × 0.3    | 0603    | 0201      |
| 10   | 1.0 × 0.5    | 1005    | 0402      |
|      | 0.52 × 1.0 ※ | 0510    | 0204      |
| 16   | 1.6 × 0.8    | 1608    | 0603      |
|      | 0.8 × 1.6 ※  | 0816    | 0306      |
| 21   | 2.0 × 1.25   | 2012    | 0805      |
|      | 1.25 × 2.0 ※ | 1220    | 0508      |
| 31   | 3.2 × 1.6    | 3216    | 1206      |
| 32   | 3.2 × 2.5    | 3225    | 1210      |
| 45   | 4.5 × 3.2    | 4532    | 1812      |

Note : ※LW reverse type (MBRL)

## ⑤Dimension tolerance

| Code | Dimension code | L[mm]                 | W[mm]                  | T[mm]                  | Thickness code |
|------|----------------|-----------------------|------------------------|------------------------|----------------|
| A    | 10             | $1.0 \pm 0.10$        | $0.5 \pm 0.10$         | $0.5 \pm 0.10$         | 5              |
|      | 16             | $1.6 + 0.15 / - 0.05$ | $0.8 + 0.15 / - 0.05$  | $0.8 + 0.15 / - 0.05$  | 8              |
|      | 21             | $2.0 + 0.15 / - 0.05$ | $1.25 + 0.15 / - 0.05$ | $1.25 + 0.15 / - 0.05$ | G              |
|      | 31             | $3.2 \pm 0.20$        | $1.6 \pm 0.20$         | $1.15 \pm 0.20$        | Q              |
|      | 32             | $3.2 \pm 0.30$        | $2.5 \pm 0.30$         | $1.6 \pm 0.20$         | L              |
| B    | 10             | $1.0 + 0.15 / - 0.05$ | $0.5 + 0.15 / - 0.05$  | $0.5 + 0.15 / - 0.05$  | 5              |
|      | 16             | $1.6 + 0.20 / - 0$    | $0.8 + 0.20 / - 0$     | $0.8 + 0.20 / - 0$     | 8              |
|      | 21             | $2.0 + 0.20 / - 0$    | $1.25 + 0.20 / - 0$    | $1.25 + 0.20 / - 0$    | G              |
|      | 31             | $3.2 \pm 0.30$        | $1.6 \pm 0.30$         | $1.6 \pm 0.30$         | L              |
| C    | 10             | $1.0 + 0.20 / - 0$    | $0.5 + 0.20 / - 0$     | $0.5 + 0.20 / - 0$     | 5              |
|      | 16             | $1.6 + 0.25 / - 0$    | $0.8 + 0.25 / - 0$     | $0.8 + 0.25 / - 0$     | 8              |
|      | 21             | $2.0 + 0.25 / - 0$    | $1.25 + 0.25 / - 0$    | $1.25 + 0.25 / - 0$    | G              |
| D    | 21             | $2.0 + 0.30 / - 0$    | $1.25 + 0.30 / - 0$    | $1.25 + 0.30 / - 0$    | G              |
| H    | 31             | $3.2 \pm 0.15$        | $1.6 \pm 0.15$         | $1.15 \pm 0.10$        | Q              |
| J    | 21             | $2.0 + 0.15 / - 0.05$ | $1.25 + 0.15 / - 0.05$ | $0.85 \pm 0.10$        | 9              |
| L    | 21             | $2.0 + 0.20 / - 0$    | $1.25 + 0.20 / - 0$    | $0.85 \pm 0.10$        | 9              |
|      | 32             | $3.2 \pm 0.50$        | $2.5 \pm 0.30$         | $2.5 \pm 0.30$         | M              |
| N    | 21             | $2.0 \pm 0.15$        | $1.25 \pm 0.15$        | $0.85 \pm 0.15$        | 9              |
| S    | 06             | $0.6 \pm 0.03$        | $0.3 \pm 0.03$         | $0.3 \pm 0.03$         | 3              |
|      | 10             | $1.0 \pm 0.05$        | $0.5 \pm 0.05$         | $0.5 \pm 0.05$         | 5              |
|      |                | $0.52 \pm 0.05$ ※     | $1.0 \pm 0.05$         | $0.3 \pm 0.05$         | 3              |
|      | 16             | $1.6 \pm 0.10$        | $0.8 \pm 0.10$         | $0.7 \pm 0.10$         | 7              |
|      |                |                       |                        | $0.8 \pm 0.10$         | 8              |
|      |                | $0.8 \pm 0.10$ ※      | $1.6 \pm 0.10$         | $0.5 \pm 0.05$         | 5              |
|      | 21             | $2.0 \pm 0.10$        | $1.25 \pm 0.10$        | $0.85 \pm 0.10$        | 9              |
|      |                |                       |                        | $1.25 \pm 0.10$        | G              |
|      |                | $1.25 \pm 0.15$ ※     | $2.0 \pm 0.15$         | $0.85 \pm 0.10$        | 9              |
|      | 31             | $3.2 \pm 0.15$        | $1.6 \pm 0.15$         | $1.6 \pm 0.20$         | L              |
|      | 32             | $3.2 \pm 0.30$        | $2.5 \pm 0.20$         | $1.9 \pm 0.20$         | N              |
|      |                |                       |                        | $2.5 \pm 0.20$         | M              |
|      | 45             | $4.5 \pm 0.40$        | $3.2 \pm 0.30$         | $2.5 \pm 0.20$         | M              |

Note :※LW reverse type(MBRL)

## ⑥ Temperature characteristics code

## ■ High dielectric type

| Code | Applicable standard |     | Temperature range [°C] | Ref. Temp. [°C] | Capacitance change | Capacitance tolerance | Tolerance code |
|------|---------------------|-----|------------------------|-----------------|--------------------|-----------------------|----------------|
| B5   | EIA                 | X5R | -55 ~ + 85             | 25              | ± 15%              | ± 10%                 | K              |
|      |                     |     |                        |                 |                    | ± 20%                 | M              |
| C6   | EIA                 | X6S | -55 ~ + 105            | 25              | ± 22%              | ± 10%                 | K              |
|      |                     |     |                        |                 |                    | ± 20%                 | M              |
| B7   | EIA                 | X7R | -55 ~ + 125            | 25              | ± 15%              | ± 10%                 | K              |
|      |                     |     |                        |                 |                    | ± 20%                 | M              |
| C7   | EIA                 | X7S | -55 ~ + 125            | 25              | ± 22%              | ± 10%                 | K              |
|      |                     |     |                        |                 |                    | ± 20%                 | M              |
| D7   | EIA                 | X7T | -55 ~ + 125            | 25              | + 22% / - 33%      | ± 10%                 | K              |
|      |                     |     |                        |                 |                    | ± 20%                 | M              |

## ■ Temperature compensating type

| Code | Applicable standard |     | Temperature range[°C] | Ref. Temp.[°C] | Capacitance change | Capacitance tolerance | Tolerance code |
|------|---------------------|-----|-----------------------|----------------|--------------------|-----------------------|----------------|
| CG   | JIS                 | CG  | -55~ +125             | 20             | 0±30ppm/°C         | ±0.05pF               | A              |
|      |                     |     |                       |                |                    | ±0.1pF                | B              |
|      |                     |     |                       |                |                    | ±0.25pF               | C              |
|      | EIA                 | C0G |                       | 25             |                    | ±0.5pF                | D              |
|      |                     |     |                       |                |                    | ±2%                   | G              |
|      |                     |     |                       |                |                    | ±5%                   | J              |
| CH   | JIS                 | CH  | -55~ +125             | 20             | 0±60ppm/°C         | ±0.25pF               | C              |
|      |                     |     |                       |                |                    |                       | ±0.5pF         |
|      | EIA                 | C0H |                       | 25             |                    | ±5%                   | J              |
|      |                     |     |                       |                |                    |                       |                |
| CJ   | JIS                 | CJ  | -55~ +125             | 20             | 0±120ppm/°C        | ±0.25pF               | C              |
|      | EIA                 | C0J |                       | 25             |                    |                       |                |
| CK   | JIS                 | CK  | -55~ +125             | 20             | 0±250ppm/°C        | ±0.25pF               | C              |
|      | EIA                 | C0K |                       | 25             |                    |                       |                |

## ⑦ Nominal capacitance

| Code (example) | Nominal capacitance |
|----------------|---------------------|
| 0R5            | 0.5pF               |
| 010            | 1pF                 |
| 100            | 10pF                |
| 101            | 100pF               |
| 102            | 1,000pF             |
| 103            | 0.01μF              |
| 104            | 0.1μF               |
| 105            | 1μF                 |
| 106            | 10μF                |
| 107            | 100μF               |

Note : R=Decimal point

## ⑧ Capacitance tolerance

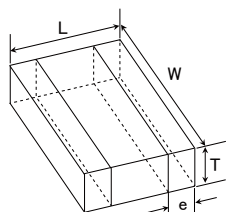
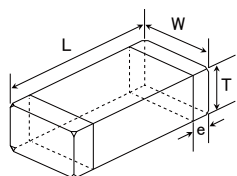
| Code | Capacitance tolerance |
|------|-----------------------|
| A    | ± 0.05pF              |
| B    | ± 0.1pF               |
| C    | ± 0.25pF              |
| D    | ± 0.5pF               |
| G    | ± 2%                  |
| J    | ± 5%                  |
| K    | ± 10%                 |
| M    | ± 20%                 |

## ⑨ Packaging

| Code | Packaging                                                                |
|------|--------------------------------------------------------------------------|
| F    | φ178mm Taping (2mm pitch)                                                |
| R    | φ178mm Embossed Taping (4mm pitch)                                       |
| T    | φ178mm Taping (4mm pitch)                                                |
| P    | φ178mm Taping (4mm pitch, 1000 pcs/reel)<br>3225 type (Thickness code M) |

## ⑩ Internal code

## ■ STANDARD EXTERNAL DIMENSIONS



※LW reverse type

| Type               | JIS<br>(mm) | EIA<br>(inch) | Dimension [mm] (inch)      |                            |                            |    |                                        |
|--------------------|-------------|---------------|----------------------------|----------------------------|----------------------------|----|----------------------------------------|
|                    |             |               | L                          | W                          | T                          | *1 | e                                      |
| MBAS□06            | 0603        | 0201          | 0.6±0.03<br>(0.024±0.001)  | 0.3±0.03<br>(0.012±0.001)  | 0.3±0.03<br>(0.012±0.001)  | 3  | 0.15±0.05<br>(0.006±0.002)             |
| MBAR□10<br>MBAS□10 | 1005        | 0402          | 1.0±0.05<br>(0.039±0.002)  | 0.5±0.05<br>(0.020±0.002)  | 0.5±0.05<br>(0.020±0.002)  | 5  | 0.25±0.10<br>(0.010±0.004)             |
| MBRL□10 ※          | 0510        | 0204          | 0.52±0.05<br>(0.020±0.002) | 1.0±0.05<br>(0.039±0.002)  | 0.3±0.05<br>(0.012±0.002)  | 3  | 0.18±0.08<br>(0.007±0.003)             |
| MBAS□16<br>MBAR□16 | 1608        | 0603          | 1.6±0.10<br>(0.063±0.004)  | 0.8±0.10<br>(0.031±0.004)  | 0.7±0.10<br>(0.028±0.004)  | 7  | 0.35±0.25<br>(0.014±0.010)             |
|                    |             |               |                            |                            | 0.8±0.10<br>(0.031±0.004)  | 8  |                                        |
| MBJC□16            | 1608        | 0603          | 1.6±0.10<br>(0.063±0.004)  | 0.8±0.10<br>(0.031±0.004)  | 0.8±0.10<br>(0.031±0.004)  | 8  | 0.35+0.3/−0.25<br>(0.014+0.012/−0.010) |
| MBRL□16 ※          | 0816        | 0306          | 0.8±0.10<br>(0.031±0.004)  | 1.6±0.10<br>(0.063±0.004)  | 0.5±0.05<br>(0.020±0.002)  | 5  | 0.25±0.15<br>(0.010±0.006)             |
| MBAS□21<br>MBAR□21 | 2012        | 0805          | 2.0±0.10<br>(0.079±0.004)  | 1.25±0.10<br>(0.049±0.004) | 0.85±0.10<br>(0.033±0.004) | 9  | 0.5±0.25<br>(0.020±0.010)              |
|                    |             |               |                            |                            | 1.25±0.10<br>(0.049±0.004) | G  |                                        |
| MBJC□21            | 2012        | 0805          | 2.0±0.10<br>(0.079±0.004)  | 1.25±0.10<br>(0.049±0.004) | 0.85±0.10<br>(0.033±0.004) | 9  | 0.5+0.35/−0.25<br>(0.020+0.014/−0.010) |
|                    |             |               |                            |                            | 1.25±0.10<br>(0.049±0.004) | G  |                                        |
| MBRL□21 ※          | 1220        | 0508          | 1.25±0.15<br>(0.049±0.006) | 2.0±0.15<br>(0.079±0.006)  | 0.85±0.10<br>(0.033±0.004) | 9  | 0.3±0.2<br>(0.012±0.008)               |
| MBAS□31            | 3216        | 1206          | 3.2±0.15<br>(0.126±0.006)  | 1.6±0.15<br>(0.063±0.006)  | 1.15±0.10<br>(0.045±0.004) | Q  | 0.5+0.35/−0.25<br>(0.020+0.014/−0.010) |
|                    |             |               |                            |                            | 1.6±0.20<br>(0.063±0.008)  | L  |                                        |
| MBJC□31            | 3216        | 1206          | 3.2±0.15<br>(0.126±0.006)  | 1.6±0.15<br>(0.063±0.006)  | 1.15±0.10<br>(0.045±0.004) | Q  | 0.6+0.4/−0.3<br>(0.024+0.016/−0.012)   |
|                    |             |               |                            |                            | 1.6±0.20<br>(0.063±0.008)  | L  |                                        |
| MBAS□32            | 3225        | 1210          | 3.2±0.30<br>(0.126±0.012)  | 2.5±0.20<br>(0.098±0.008)  | 1.9±0.20<br>(0.075±0.008)  | N  | 0.6±0.3<br>(0.024±0.012)               |
|                    |             |               |                            |                            | 2.5±0.20<br>(0.098±0.008)  | M  |                                        |
| MBJC□32            | 3225        | 1210          | 3.2±0.30<br>(0.126±0.012)  | 2.5±0.20<br>(0.098±0.008)  | 1.9±0.20<br>(0.075±0.008)  | N  | 0.6+0.4/−0.3<br>(0.024+0.016/−0.012)   |
|                    |             |               |                            |                            | 2.5±0.20<br>(0.098±0.008)  | M  |                                        |
| MBAS□45            | 4532        | 1812          | 4.5±0.40<br>(0.177±0.016)  | 3.2±0.30<br>(0.126±0.012)  | 2.5±0.20<br>(0.098±0.008)  | M  | 0.9±0.6<br>(0.035±0.024)               |

Note :※LW reverse type (MBRL), \*1.Thickness code

## ■ STANDARD QUANTITY

| Type |         |           | Thickness |      | Standard quantity[pcs]     |                            |
|------|---------|-----------|-----------|------|----------------------------|----------------------------|
| Code | JIS(mm) | EIA(inch) | [mm]      | Code | Paper tape                 | Embossed tape              |
| 06   | 0603    | 0201      | 0.3       | 3    | 15000                      | —                          |
| 10   | 1005    | 0402      | 0.5       | 5    | 10000                      | —                          |
|      | 0510 ※  | 0204 ※    | 0.3       | 3    |                            |                            |
| 16   | 1608    | 0603      | 0.7       | 7    | 4000                       | —                          |
|      |         |           | 0.8       | 8    |                            |                            |
|      |         |           | 0.8       | 8    | 3000<br>(Soft Termination) | 3000<br>(Soft Termination) |
|      | 0816 ※  | 0306 ※    | 0.5       | 5    | —                          | 4000                       |
| 21   | 2012    | 0805      | 0.85      | 9    | 4000                       | —                          |
|      |         |           | 1.25      | G    | —                          | 3000                       |
|      |         |           | 1.25      | G    | —                          | 2000<br>(Soft Termination) |
|      | 1220 ※  | 0508 ※    | 0.85      | 9    | 4000                       | —                          |
| 31   | 3216    | 1206      | 1.15      | Q    | —                          | 3000                       |
|      |         |           | 1.6       | L    | —                          | 2000                       |
| 32   | 3225    | 1210      | 1.9       | N    | —                          | 2000                       |
|      |         |           | 2.5       | M    | —                          | 500(T), 1000(P)            |
| 45   | 4532    | 1812      | 2.5       | M    | —                          | 500                        |

Note : ※.LW Reverse type (MBRL)