

# Multilayer Ceramic Capacitors

## for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

REFLOW

## PART NUMBER

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

## ①Series

Code (1)(2)(3)(4)	
MLAS	Multilayer Ceramic Capacitor (High dielectric type) for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II) Multilayer Ceramic Capacitor (Temperature compensating type) for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II) Medium-High Voltage Multilayer Ceramic Capacitor for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)
MLAY	Low distortion design/Audible/Good bias Multilayer Ceramic Capacitor for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)
MLRL	LW Reversal Decoupling Low ESL Capacitor(LWDC™) for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

## (1) Product Group

Code	
M	Multilayer Ceramic Capacitor

## (2) Category

Code	Recommended equipment	Quality Grade
L	Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)	3

## (3) Type

Code	
A	2 terminals
R	LW reversal

## (4) Features, Characteristics

Code	
S	Standard/General
Y	Low distortion design/Audible/Good bias
L	Low ESL

## ②Rated voltage

Code	Rated voltage [VDC]
P	2.5
A	4
J	6.3
L	10
E	16
T	25
G	35
U	50
H	100
Q	250
S	630
X	2000

## ④Thickness

Code	Thickness [mm]
H	0.13 (1.5 max ※)
E	0.18 (1.1 max ※)
2	0.2
3	0.3
K	0.45
5	0.5
8	0.8
9	0.85
Q	1.15
G	1.25
L	1.6
N	1.9 (0.088 ※)
Y	2.0 max
M	2.5

Note : ※LW reverse type (MLRL)

## ③Dimension

Code	(L × W) [mm]	JIS(mm)	EIA(inch)
04	0.4 × 0.2	0402	01005
06	0.6 × 0.3	0603	0201
1L	1.0 × 0.5	1005	0402
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 (MLRL)

## ⑤Dimension tolerance

Code	Dimension code	L[mm]	W[mm]	T[mm]	Thickness code
A	06	$0.6 \pm 0.05$	$0.3 \pm 0.05$	$0.3 \pm 0.05$	3
	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	$3.2 \pm 0.20$	$1.6 \pm 0.20$	$1.6 \pm 0.20$	L
	32	$3.2 \pm 0.30$	$2.5 \pm 0.30$	$2.5 \pm 0.30$	M
	45	$4.5 \pm 0.40$	$3.2 \pm 0.30$	$2.0 + 0 / - 0.30$	Y
B	06	$0.6 \pm 0.09$	$0.3 \pm 0.09$	$0.3 \pm 0.09$	3
	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
	32	$3.2 \pm 0.30$	$2.5 \pm 0.20$	$1.9 + 0.1 / - 0.20$	Y
C	10	$1.0 + 0.20 / - 0$	$0.5 + 0.20 / - 0$	$0.5 + 0.20 / - 0$	5
E	06	$0.6 + 0.25 / - 0$	$0.3 + 0.25 / - 0$	$0.3 + 0.25 / - 0$	3
H	31	$3.2 \pm 0.15$	$1.6 \pm 0.15$	$0.85 \pm 0.10$	9
				$1.15 \pm 0.10$	Q
J	16	$1.6 + 0.20 / - 0$	$0.8 + 0.20 / - 0$	$0.45 \pm 0.05$	K
	21	$2.0 + 0.15 / - 0.05$	$1.25 + 0.15 / - 0.05$	$0.85 \pm 0.10$	9
	32	$3.2 \pm 0.30$	$2.5 \pm 0.20$	$0.85 \pm 0.10$	9
L	31	$3.2 \pm 0.20$	$1.6 \pm 0.20$	$1.15 \pm 0.10$	Q
				$0.85 \pm 0.10$	9
L	21	$2.0 + 0.20 / - 0$	$1.25 + 0.20 / - 0$	$0.85 \pm 0.10$	9
	31	$3.2 \pm 0.20$	$1.6 \pm 0.20$	$0.85 \pm 0.10$	9
S	04	$0.4 \pm 0.02$	$0.2 \pm 0.02$	$0.2 \pm 0.02$	2
	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
				$0.52 \pm 0.05$ ※	3
	16	$1.6 \pm 0.10$	$0.8 \pm 0.10$	$0.8 \pm 0.10$	8
				$0.8 \pm 0.10$ ※	5
	21	$2.0 \pm 0.10$	$1.25 \pm 0.10$	$0.85 \pm 0.10$	9
				$1.25 \pm 0.10$	G
				$1.25 \pm 0.15$ ※	9
	31	$3.2 \pm 0.15$	$1.6 \pm 0.15$	$1.6 \pm 0.20$	L
	32	$3.2 \pm 0.30$	$2.5 \pm 0.20$	$2.5 \pm 0.20$	M
$1.9 \pm 0.20$				N	
45	$4.5 \pm 0.40$	$3.2 \pm 0.30$	$2.5 \pm 0.20$	M	
T	16	$1.6 \pm 0.10$	$0.8 \pm 0.10$	$0.45 \pm 0.05$	K
X	1L	$1.0 \pm 0.05$	$0.5 \pm 0.05$	$0.13 \pm 0.02$	H
				$0.18 \pm 0.02$	E
				$0.2 \pm 0.02$	2
Y	1L	$1.0 \pm 0.05$	$0.5 \pm 0.05$	$0.3 \pm 0.03$	3

Note :※LW reverse type (MLRL)

⑥ Temperature characteristics code

■ High dielectric type (SD: Excluding Low distortion design/Audible/Good bias Multilayer Ceramic Capacitor)

Code	Applicable standard		Temperature range [°C]	Ref. Temp. [°C]	Capacitance change	Capacitance tolerance	Tolerance code
B5	JIS	B	-25 ~ + 85	20	± 10%	± 10%	K
						± 20%	M
	EIA	X5R	-55 ~ + 85	25	± 15%	± 10%	K
						± 20%	M
B7	EIA	X7R	-55 ~ + 125	25	± 15%	± 10%	K
						± 20%	M
C6	EIA	X6S	-55 ~ + 105	25	± 22%	± 10%	K
						± 20%	M
C7	EIA	X7S	-55 ~ + 125	25	± 22%	± 10%	K
						± 20%	M
LD(※)	EIA	X5R	-55 ~ + 85	25	± 15%	± 10%	K
						± 20%	M

Note : ※.LD: Low distortion design/Audible/Good bias Multilayer Ceramic Capacitor

■ 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							
	± 0.5pF	D							
	EIA	C0G		25		± 5%	J		
	JIS	CH		-55 ~ + 125		20	0 ± 60ppm/°C	± 0.1pF	B
								± 0.25pF	C
EIA	C0H		25			± 0.5pF		D	
						± 5%		J	
CJ	JIS		CJ	-55 ~ + 125		20	0 ± 120ppm/°C	± 0.05pF	A
								± 0.1pF	B
	EIA	C0J			25			± 0.25pF	C
CK	JIS	CK		-55 ~ + 125	20		0 ± 250ppm/°C	± 0.05pF	A
								± 0.1pF	B
	EIA	C0K			25			± 0.25pF	C

⑥ Series code

• Low distortion design/Audible/Good bias Multilayer Ceramic Capacitor

Code	Series code
SD	Standard

• Medium-High Voltage Multilayer Ceramic Capacitor

Code	Series code
SD	Standard

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%

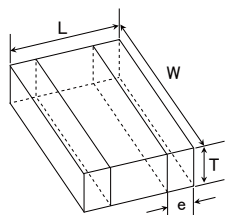
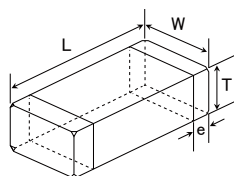
⑨ Packaging

Code	Packaging
F	φ178mm Taping (2mm pitch)
T	φ178mm Taping (4mm pitch)
P	φ178mm Taping (4mm pitch, 1000 pcs/reel) 3225 type (Thickness code M)
R	φ178mm Embossed Taping 1005type (2mm pitch) 1608type (4mm pitch)
W	φ178mm Embossed Taping (1mm pitch) 0402type

⑩ Internal code

▶ This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>).

## STANDARD EXTERNAL DIMENSIONS



※LW reverse type

Type	JIS (mm)	EIA (inch)	Dimension [mm]				
			L	W	T	*1	e
MLAS□04	0402	01005	$0.4 \pm 0.02$	$0.2 \pm 0.02$	$0.2 \pm 0.02$	2	$0.1 \pm 0.03$
MLAS□06	0603	0201	$0.6 \pm 0.03$	$0.3 \pm 0.03$	$0.3 \pm 0.03$	3	$0.15 \pm 0.05$
MLAS□1L	1005	0402	$1.0 \pm 0.05$	$0.5 \pm 0.05$	$0.13 \pm 0.02$	H	$0.25 \pm 0.10$
					$0.18 \pm 0.02$	E	
					$0.2 \pm 0.02$	2	
					$0.3 \pm 0.03$	3	
MLAS□10	1005	0402	$1.0 \pm 0.05$	$0.5 \pm 0.05$	$0.5 \pm 0.05$	5	$0.25 \pm 0.10$
MLAY□1L	1005	0402	$1.0 \pm 0.05$	$0.5 \pm 0.05$	$0.3 \pm 0.03$	3	$0.25 \pm 0.10$
MLAY□10	1005	0402	$1.0 \pm 0.05$	$0.5 \pm 0.05$	$0.5 \pm 0.05$	5	$0.25 \pm 0.10$
MLRL□10 ※	0510	0204	$0.52 \pm 0.05$	$1.0 \pm 0.05$	$0.3 \pm 0.05$	3	$0.18 \pm 0.08$
MLAS□16	1608	0603	$1.6 \pm 0.10$	$0.8 \pm 0.10$	$0.45 \pm 0.05$	K	$0.35 \pm 0.25$
					$0.8 \pm 0.10$	8	
MLAY□16	1608	0603	$1.6 \pm 0.10$	$0.8 \pm 0.10$	$0.8 \pm 0.10$	8	$0.35 \pm 0.25$
MLRL□16 ※	0816	0306	$0.8 \pm 0.10$	$1.6 \pm 0.10$	$0.5 \pm 0.05$	5	$0.25 \pm 0.15$
MLAS□21	2012	0805	$2.0 \pm 0.10$	$1.25 \pm 0.10$	$0.85 \pm 0.10$	9	$0.5 \pm 0.25$
MLAY□21					$1.25 \pm 0.10$	G	
MLRL□21 ※	1220	0508	$1.25 \pm 0.15$	$2.0 \pm 0.15$	$0.85 \pm 0.10$	9	$0.3 \pm 0.2$
MLAS□31	3216	1206	$3.2 \pm 0.15$	$1.6 \pm 0.15$	$0.85 \pm 0.10$	9	$0.5 + 0.35 / - 0.25$
					$1.15 \pm 0.10$	Q	
					$1.6 \pm 0.20$	L	
MLAY□31	3216	1206	$3.2 \pm 0.15$	$1.6 \pm 0.15$	$1.15 \pm 0.10$	Q	$0.5 + 0.35 / - 0.25$
					$1.6 \pm 0.20$	L	
					$0.85 \pm 0.10$	9	
MLAS□32	3225	1210	$3.2 \pm 0.30$	$2.5 \pm 0.20$	$1.15 \pm 0.10$	Q	$0.6 \pm 0.3$
					$1.9 \pm 0.20$	N	
					$1.9 + 0.1 / - 0.20$	Y	
					$2.5 \pm 0.20$	M	
					$1.9 \pm 0.20$	N	
MLAY□32	3225	1210	$3.2 \pm 0.30$	$2.5 \pm 0.20$	$1.9 \pm 0.20$	N	$0.6 \pm 0.3$
					$2.5 \pm 0.20$	M	
					$2.0 + 0 / - 0.30$	Y	
MLAS□45	4532	1812	$4.5 \pm 0.40$	$3.2 \pm 0.30$	$2.0 + 0 / - 0.30$	Y	$0.6 \pm 0.4$
					$2.5 \pm 0.20$	M	

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

## ■ STANDARD QUANTITY

Type			Thickness		Standard quantity [pcs]	
Code	JIS(mm)	EIA(inch)	[mm]	Code	Paper tape	Embossed tape
04	0402	01005	0.2	2	—	40000
06	0603	0201	0.3	3	15000	—
1L	1005	0402	0.13	H	—	20000
			0.18	E	—	15000
			0.2	2	20000	—
			0.3	3	15000	—
10	1005	0402	0.5	5	10000	—
	0510 ※	0204 ※	0.3	3		
16	1608	0603	0.45	K	4000	—
			0.8	8		
	0816 ※	0306 ※	0.5	5	—	4000
21	2012	0805	0.85	9	4000	—
			1.25	G	—	3000
	1220 ※	0508 ※	0.85	9	4000	—
31	3216	1206	0.85	9	4000	—
			1.15	Q	—	3000
			1.6	L	—	2000
32	3225	1210	0.85	9	—	2000
			1.15	Q		
			1.9	N		
			2.0 max	Y		
			2.5	M		
45	4532	1812	2.0 max	Y	—	1000
			2.5	M	—	500

Note : ※.LW Reverse type (MLRL)