

## *Data Sheet*

Customer: \_\_\_\_\_

Product: Multilayer Chip Varistor. C series wide range application

Size : 0402/0603/0805/1206/1210/1812/2220

Issued Date: 1-Sep.-2017

Edition: Ver. 1

### **Record of change**

Date	Ver.	Description	Page
1-Sep.-2017	1		

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1-Sep.-2017	1-Sep.-2017	1-Sep.-2017	
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## ● C Series Wide range Application

Hitano Part no.	Working Voltage (MAX)		Breakdown Voltage	Peak Current	Clamping Voltage (MAX)	
	Condition Unit	AC (V <sub>RMS</sub> )			DC (V)	1mA (V)
0402ML050C	2.5	3.3	5(4.0~6.0)	20	1	12
0402ML080C	4	5.5	8(6.6~9.9)	20	1	18
0402ML120C	7	9	12(10.2~13.8)	20	1	20
0402ML150C	8	11	15(12.75~17.25)	20	1	25
0402ML180C	11	14	18(15.3~20.7)	20	1	30
0402ML220C	12	16.5	22(19.8~24.2)	20	1	36
0402ML240C	14	18	24(21.6~26.4)	20	1	40
0402ML270C	17	22	27(24.3~29.7)	20	1	45
0402ML330C	20	26	33(29.7~36.3)	20	1	54
0402ML390C	25	30	39(35.1~42.9)	20	1	65

Hitano Part no.	Working Voltage (MAX)		Breakdown Voltage	Peak Current	Clamping Voltage (MAX)	
	Condition Unit	AC (V <sub>RMS</sub> )			DC (V)	1mA (V)
0603ML030C	1.4	2	3(2.4~3.6)	20	1	9
0603ML050C	2.4	3.3	5(4.0~6.0)	20	1	12
0603ML080C	4	5.5	8(6.6~9.9)	30	1	18
0603ML120C	7	9	12(10.2~13.8)	30	1	23
0603ML150C	8	11	15(12.75~17.25)	30	1	25
0603ML180C	11	14	18(15.3~20.7)	30	1	30
0603ML220C	12	16	22(19.8~24.2)	30	1	36
0603ML240C	14	18	24(21.6~26.4)	30	1	39
0603ML270C	17	22	27(24.3~29.7)	30	1	44
0603ML300C	18	24	30(27.0~33.0)	30	1	48
0603ML330C	20	26	33(29.7~36.3)	30	1	54
0603ML390C	22	28	36(32.7~39.6)	30	1	59
0603ML390C	25	30	39(35.1~42.9)	30	1	65
0603ML420C	26	33	42(38.1~46.2)	30	1	72
0603ML470C	30	38	47(42.3~51.7)	30	1	77

## ● C Series Wide range Application

Hitano Part no.	Working Voltage (MAX)		Breakdown Voltage	Peak Current	Clamping Voltage (MAX)	
	AC (V <sub>RMS</sub> )	DC (V)			1mA (V)	8/20 $\mu$ s (A)
0805ML030C	1.4	2	3(2.4~3.6)	80	1	9
0805ML050C	2.4	3.3	5(4.0~6.0)	80	1	12
0805ML080C	4	5.5	8(6.6~9.9)	80	1	18
0805ML120C	7	9	12(10.2~13.8)	100	1	24
0805ML150C	8	11	15(12.75~17.25)	100	1	25
0805ML180C	11	14	18(15.3~20.7)	100	1	30
0805ML220C	12	16	22(19.8~24.2)	100	1	36
0805ML240C	14	18	24(21.6~26.4)	100	1	39
0805ML270C	17	22	27(24.3~29.7)	100	1	44
0805ML300C	18	24	30(27.0~33.0)	100	1	48
0805ML330C	20	26	33(29.7~36.3)	100	1	54
0805ML360C	22	28	36(32.7~39.6)	100	1	59
0805ML390C	25	30	39(35.1~42.9)	100	1	65
0805ML420C	26	33	42(38.1~46.2)	100	1	72
0805ML470C	30	38	47(42.3~51.7)	100	1	77
0805ML560C	35	45	56(50.4~61.6)	80	1	90

Hitano Part no.	Working Voltage (MAX)		Breakdown Voltage	Peak Current	Clamping Voltage (MAX)	
	AC (V <sub>RMS</sub> )	DC (V)			1mA (V)	8/20 $\mu$ s (A)
1206ML050C	2.4	3.3	5(4.0~6.0)	100	1	12
1206ML080C	4	5.5	8(6.6~9.9)	100	1	18
1206ML120C	7	9	12(10.2~13.8)	120	1	24
1206ML150C	8	11	15(12.75~17.25)	120	1	25
1206ML180C	11	14	18(15.3~20.7)	120	1	30
1206ML220C	12	16	22(19.8~24.2)	120	1	36
1206ML240C	14	18	24(21.6~26.4)	120	1	38
1206ML270C	17	22	27(24.3~29.7)	120	1	44
1206ML300C	18	24	30(27.0~33.0)	120	1	48
1206ML330C	20	26	33(29.7~36.3)	120	1	54

## ● C Series Wide range Application

Hitano Part no.	Working Voltage (MAX)		Breakdown Voltage	Peak Current	Clamping Voltage (MAX)	
	AC (V <sub>RMS</sub> )	DC (V)			1mA (V)	8/20 $\mu$ s (A)
1206ML360C	22	28	36(32.7~39.6)	120	1	59
1206ML390C	25	30	39(35.1~42.9)	120	1	65
1206ML420C	26	33	42(38.1~46.2)	120	1	72
1206ML470C	30	38	47(42.3~51.7)	120	1	77
1206ML560C	35	45	56(50.4~61.6)	120	1	90
1206ML680C	40	56	68(61.2~74.8)	120	1	110
1206ML760C	45	60	76(69.1~83.6)	120	1	126
1206ML820C	50	65	82(73.8~90.2)	120	1	135
1206ML101C	60	85	100(90~100)	100	1	165
1206ML121C	75	100	120(108~1032)	100	5	200
1206ML171C	110	140	170(154~187)	100	5	300
1206ML201C	130	170	200(185~225)	100	5	340
1206ML221C	140	180	220(198~242)	100	5	360
1206ML241C	150	200	240(216~264)	100	5	395
1206ML391C	250	320	390(351~429)	100	5	650
1206ML471C	300	385	470(423~517)	100	5	775

TO BE CONTINUED

## ● C Series Wide range Application

Hitano Part no.	Working Voltage (MAX)		Breakdown Voltage	Peak Current	Clamping Voltage (MAX)	
	AC (V <sub>RMS</sub> )	DC (V)			(A)	(V)
Unit Condition			1mA (V)	8/20 $\mu$ s (A)		
1210ML050C	2.4	3.3	5(4.0~6.0)	250	1	12
1210ML080C	4	5.5	8(6.6~9.9)	250	1	18
1210ML120C	7	9	12(10.2~13.8)	250	1	24
1210ML150C	8	11	15(12.75~17.25)	250	1	25
1210ML180C	11	14	18(15.3~20.7)	250	1	30
1210ML220C	12	16	22(19.8~24.2)	250	1	36
1210ML240C	14	18	24(21.6~26.4)	250	1	38
1210ML270C	17	22	27(24.3~29.7)	250	1	44
1210ML300C	18	24	30(27.0~33.0)	250	1	48
1210ML330C	20	26	33(29.7~36.3)	250	1	54
1210ML360C	22	28	36(32.7~39.6)	250	1	59
1210ML390C	25	30	39(35.1~42.9)	250	1	65
1210ML420C	26	33	42(38.1~46.2)	250	1	72
1210ML470C	30	38	47(42.3~51.7)	250	1	77
1210ML560C	35	45	56(50.4~61.6)	250	1	90
1210ML680C	40	56	68(61.2~74.8)	250	1	110
1210ML760C	45	60	76(69.1~83.6)	250	1	126
1210ML820C	50	65	82(73.8~90.2)	250	1	135
1210ML101C	60	85	100(90~100)	250	1	165
1210ML121C	75	100	120(108~1032)	200	5	200
1210ML171C	110	140	170(154~187)	200	5	300
1210ML201C	130	170	200(185~225)	200	5	340
1210ML221C	140	180	220(198~242)	200	5	360
1210ML241C	150	200	240(216~264)	200	5	395
1210ML391C	250	320	390(351~429)	200	5	650
1210ML431C	275	350	430(387~473)	200	5	710
1210ML471C	300	385	470(423~517)	200	5	775

TO BE CONTINUED

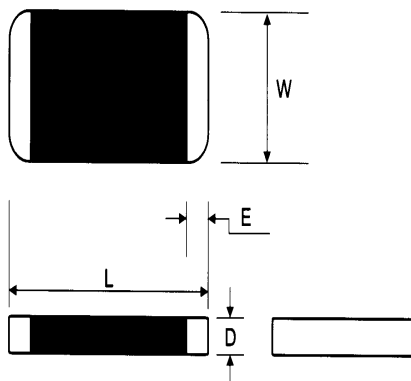
## ● C Series Wide range Application

Hitano Part no.	Working Voltage (MAX)		Breakdown Voltage	Peak Current	Clamping Voltage (MAX)	
	AC (V <sub>RMS</sub> )	DC (V)			1Ma (V)	8/20 $\mu$ s (A)
1812ML080C	4	5.5	8(6.6~9.9)	500	1	18
1812ML120C	7	9	12(10.2~13.8)	500	1	24
1812ML150C	8	11	15(12.75~17.25)	500	1	25
1812ML180C	11	14	18(15.3~20.7)	500	1	30
1812ML220C	12	16	22(19.8~24.2)	500	1	36
1812ML240C	14	18	24(21.6~26.4)	500	1	38
1812ML270C	17	22	27(24.3~29.7)	500	1	44
1812ML300C	18	24	30(27.0~33.0)	500	1	48
1812ML330C	20	26	33(29.7~36.3)	500	1	54
1812ML360C	22	28	36(32.7~39.6)	500	1	59
1812ML390C	25	30	39(35.1~42.9)	500	1	65
1812ML420C	26	33	42(38.1~46.2)	500	1	72
1812ML470C	30	38	47(42.3~51.7)	500	1	77
1812ML560C	35	45	56(50.4~61.6)	500	1	90
1812ML680C	40	56	68(61.2~74.8)	500	1	110
1812ML760C	45	60	76(69.1~83.6)	500	1	126
1812ML820C	50	65	82(73.8~90.2)	500	1	135
1812ML101C	60	85	100(90~100)	500	1	165
1812ML121C	75	100	120(108~1032)	500	1	200
1812ML171C	110	140	170(154~187)	500	5	300
1812ML201C	130	170	200(185~225)	500	5	340
1812ML221C	140	180	220(198~242)	500	5	360
1812ML241C	150	200	240(216~264)	500	5	395
1812ML391C	250	320	390(351~429)	500	5	650
1812ML431C	275	350	430(387~473)	500	5	710
1812ML471C	300	385	470(423~517)	500	5	775
1812ML511C	320	415	510(459~561)	400	5	845

TO BE CONTINUED

● **C Series Wide range Application**

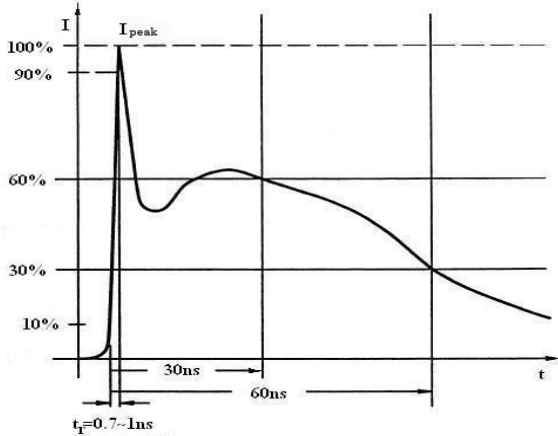
Hitano Part no.	Working Voltage (MAX)		Breakdown Voltage	Peak Current	Clamping Voltage (MAX)	
	AC (V <sub>RMS</sub> )	DC (V)			1Ma (V)	8/20μs (A)
2220ML240C	14	18	24(21.6~26.4)	800	1	38
2220ML270C	17	22	27(24.3~29.7)	800	1	44
2220ML300C	18	24	30(27.0~33.0)	800	1	48
2220ML330C	20	26	33(29.7~36.3)	800	1	54
2220ML360C	22	28	36(32.7~39.6)	800	1	59
2220ML390C	25	30	39(35.1~42.9)	800	1	65
2220ML420C	26	33	42(38.1~46.2)	800	1	72
2220ML470C	30	38	47(42.3~51.7)	800	1	77
2220ML560C	35	45	56(50.4~61.6)	800	1	90
2220ML680C	40	56	68(61.2~74.8)	800	1	110
2220ML760C	45	60	76(69.1~83.6)	800	1	126
2220ML820C	50	65	82(73.8~90.2)	800	1	135
2220ML101C	60	85	100(90~100)	800	1	165
2220ML201C	130	170	200(185~225)	500	5	340
2220ML221C	140	180	220(198~242)	500	5	360
2220ML241C	150	200	240(216~264)	500	5	395
2220ML391C	250	320	390(351~429)	500	5	650
2220ML431C	275	350	430(387~473)	500	5	710
2220ML471C	300	385	470(423~517)	500	5	775
2220ML511C	320	415	510(459~561)	400	5	845



Type	L (mm)	W (mm)	D (mm)	E (mm)
0402	1.00±0.10	0.50±0.10	0.6max.	0.25±0.10
0603	1.60±0.10	0.80±0.15	0.9max.	0.30±0.10
0805	2.00±0.20	1.25±0.15	1.0max.	0.40±0.20
1206	3.20±0.20	1.60±0.15	1.2max.	0.50±0.20
1210	3.20±0.20	2.50±0.20	1.5max.	0.50±0.20
1812	4.50±0.20	3.20±0.20	2.0max.	0.5+0.3/-0.1
2220	5.70±0.20	5.00±0.20	3.0max.	0.5+0.3/-0.1

● **C Series Wide range Application**

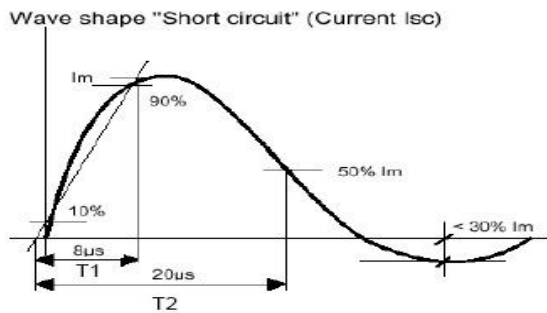
**ESD Wave Form**



SEVERITY LEVEL	AIRDIRCHARGE	DIRECT ISCHARGE
1	2 kV	2 kV
2	4 kV	4 kV
3	8 kV	6 kV
4	15 kV	8 kV

IEC61000-4-2 Compliant ESD Current Pulse Waveform

**Surge Wave Form**



SEVERITY LEVEL	T1	T2
1	8 µS	20 µS

IEC61000-4-5 Standards



### ● C Series Wide range Application

- Environmental Characteristics

Characteristic	Test method and description			
High Temperature Storage	The specimen shall be subjected to 125°C for 1000 hours in a thermostatic bath without load and then stored at room temperature and humidity for 1 to 2 hours. The change of varistor voltage shall be within 10%.			
Temperature Cycle	The temperature cycle of specified temperature shall be repeated five times and then stored at room temperature and humidity for one two hours. The change of varistor voltage shall be within 10% and mechanical damage shall be examined.	Step	Temperature	Period
		1	-40±3°C	30min±3
		2	Room Temperature	1~2hours
		3	125±2°C	30min±3
		4	Room Temperature	1~2hours
High Temperature Load	After being continuously applied the maximum allowable voltage at 85°C for 1000hours, the specimen shall be stored at room temperature and humidity for one or hours, the change of varistor voltage shall be within 10%.			
Damp Heat Load/ Humidity Load	The specimen should be subjected to 40°C,90 to 95%RH environment, and the maximum allowable voltage applied for 1000 hours, then stored at room temperature and humidity for one or two hours. The change of varistor voltage shall be within 10%.			
Low Temperature Storage	The specimen should be subjected to -40°C, without load for 1000 hours and then stored at room temperature for one two hours. The change of varistor voltage shall be within 10%.			

● **C Series Wide range Application**

**Soldering Recommendation**

The principal techniques used for the soldering of components in surface mount technology are infrared reflow and wave soldering.

**Wave Soldering**

When wave soldering, the MLCV is attached to the circuit board by means of an adhesive. The assembly is then placed on a conveyor and run through the soldering process to contact the wave. Wave soldering is the most strenuous of the processes. To avoid the possibility of generating stresses due to thermal shock, a preheat stage in the soldering process is recommended, and the peak temperature of the solder process should be rigidly controlled. The following is the typical profiles.

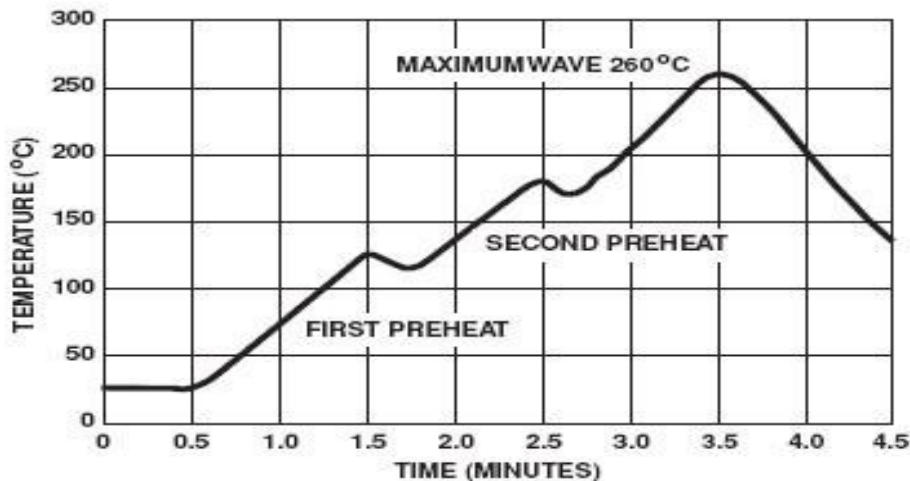


FIGURE 6. WAVE SOLDER PROFILE

## ● C Series Wide range Application

### Reflow Soldering

When reflow soldering, the device is placed a solder paste on the substrate ,as the solder paste is heated, it re-flows and solders the unite to board. When using a reflow process ,care should be taken to ensure that the MLCV is not subjected to an thermal gradient steeper than 4 degrees per second; the ideal gradient being 2degrees per second. During the soldering process, preheating to within 100 degrees of the soldier's peak temperature is essential to minimize thermal shock. The following is typical profile.

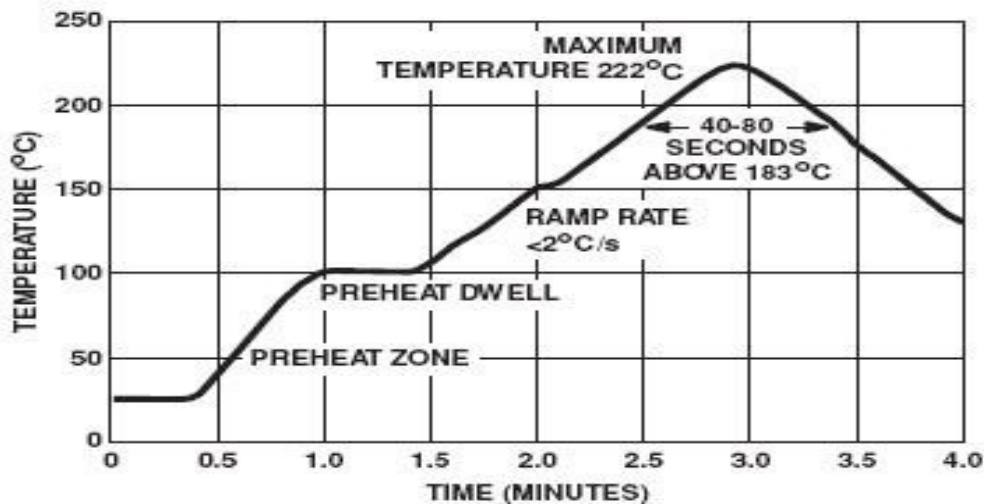
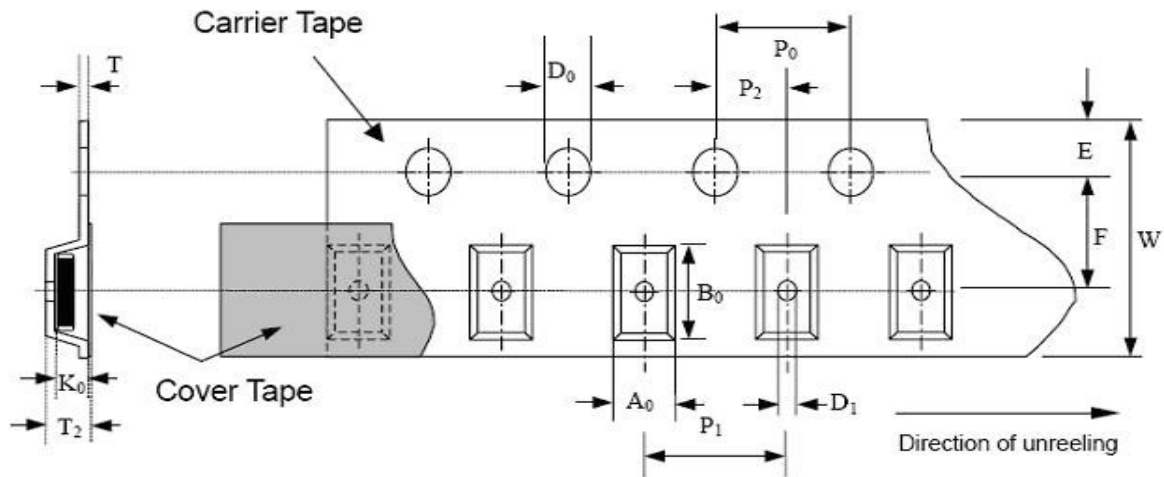


FIGURE 5. REFLOW SOLDER PROFILE

### Packaging Specification

1. Carrier tape transparent cover tape should be heat-sealed to carry the products, and the reel should be used to reel the carrier tape.
2. The adhesion of the heat-sealed cover tape shall be  $40 + 20 / - 15$ grams.
3. Both the head and the end portion of taping shall be empty for reel package and SMT auto-pickup machine. And a normal paper tape shall be connected in the head of taping for the operator handle.

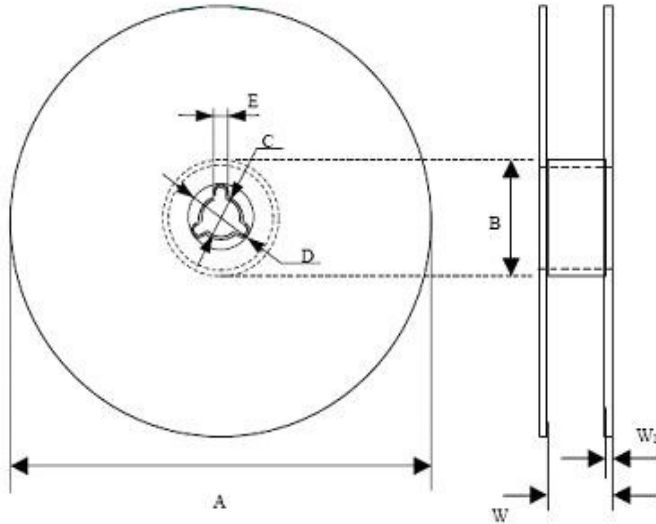
● C Series Wide range Application



Size	A0	B0	K0	T	T2	D0	D1	P1	P2	P0	W	E	F
	±0.10	±0.10	±0.10	±0.05	±0.05	+0.1-0	±0.05	±0.10	±0.05	±0.05	±0.20	±0.10	±0.05
0402	0.85	1.25	0.65	0.22	0.87	1.50	1.00	3.00	2.00	4.00	8.00	1.75	3.50
0603	1.08	1.88	0.95	0.22	1.17	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
0805	1.42	2.30	0.95	0.22	1.26	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
1206	1.88	3.50	1.27	0.20	1.49	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
1210	2.18	3.46	1.45	0.22	1.77	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
1812	3.66	4.95	1.74	0.25	1.99	1.50	1.50	8.00	2.00	4.00	12.00	1.75	5.50
2220	5.10	5.97	2.80	0.25	3.05	1.50	1.50	8.00	2.00	4.00	12.00	1.75	5.50

● **C Series Wide range Application**

**Reel Dimension**



Size	A	B	C	D	E	W	W1
0402	178.0±1.0	60.0±0.5	13.0±0.2	21.0±0.2	2.0±0.5	9.0±0.50	1.5±0.15
0603	178.0±1.0	60.0±0.5	13.0±0.2	21.0±0.2	2.0±0.5	9.0±0.50	1.5±0.15
0805	178.0±1.0	60.0±0.5	13.0±0.2	21.0±0.2	2.0±0.5	9.0±0.50	1.5±0.15
1206	178.0±1.0	60.0±0.5	13.0±0.2	21.0±0.2	2.0±0.5	9.0±0.50	1.5±0.15
1210	178.0±1.0	60.0±0.5	13.0±0.2	21.0±0.2	2.0±0.5	9.0±0.50	1.5±0.15
1812	178.0±1.0	60.0±0.5	13.5±0.1	21.0±0.2	2.0±0.5	13.6±0.2	1.5±0.15
2220	178.0±1.0	60.0±0.5	13.5±0.1	21.0±0.2	2.0±0.5	13.6±0.2	1.5±0.15

Size	0402	0603	0805	1206	1210	1812	2220	
quantity	paper	10000	4000	4000	-	-	-	
	plastic	-	-	-	3000	3000	3000	500/1000
Minimum ordering	-	4000	4000	3000	3000	3000	500/1000	500/1000