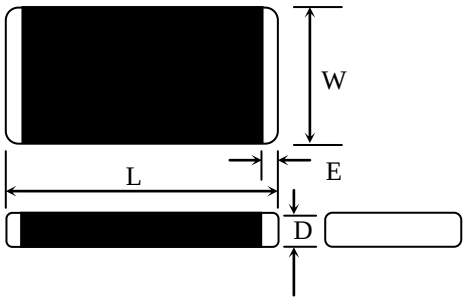
SMD Transient Voltage Suppressors

Feature

- Full range from 0201 to 2220 series.
- Working Voltage form 4 to 60V_{RMS}; 5.5 to 85Vdc
- High surge current ability
- Bidirectional clamping, high energy
- Fast response time <0.5nSec
- Suitable for ESD protection
- **Low capacitance design (<0.2pF) for fast data transmission**
- Array type design
- Very low leakage current
- Good solderability

1. **MLC Series:**
   Multilayer surface mount for wide range applications.
2. **MLA Series:**
   Multilayer surface mount design for high energy and surge application.
3. **ESD Series:**
   Low capacitance design for high data transmission.
4. **Array Series:**
   Multilayer array series surface mount design.



Type	L	W	D	E
	mm	mm	mm	mm
0201	0.60 ± 0.03	0.30 ± 0.03	0.2 max	0.30 ± 0.03
0402	1.00 ± 0.10	0.50 ± 0.10	0.6 max	0.25+0.1/-0.1
0603	1.60 ± 0.15	0.80 ± 0.15	0.9 max	0.30+0.1/-0.1
0805	2.00 ± 0.20	1.25 ± 0.15	1.0 max	0.30+0.1/-0.1
1206	3.20 ± 0.20	1.60 ± 0.15	1.2 max	0.50+0.2/-0.2
1210	3.20 ± 0.20	2.50 ± 0.20	1.5 max	0.50+0.2/-0.2
1812	4.50 ± 0.20	3.20 ± 0.20	2.0 max	0.50+0.3/-0.1
2220	5.70 ± 0.20	5.00 ± 0.20	2.5 max	0.50+0.3/-0.1

Part Number Identification

1. ML Series

0402 ML 240 C -LF

- -LF → Lead Free
- C → **Operating Voltage Form (High Surge)** 11VRMS (14DC) ~ 30VRMS (38VDC)
- A → **Operating Voltage Form (Wide Range)** 4VRMS (5.5VDC) ~ 65VRMS (85VDC)
- 240 → **Varistor Voltage:** 240 = 24 × 10^0 V = 24V; 241 = 24 × 10^1 V = 240V
- ML → **Multilayer SMD Varistor**
- 0402 → **Size:** 0402; 0603; 0805; 1206; 1210; 1812; 2220

2. ESD Series

0402 -050 E 330 N P -LF

- -LF → Lead Free
- P → **Package**:

Mark	Type
P	Taping
C	Bulk

- N → **Cap. Tolerance:**:

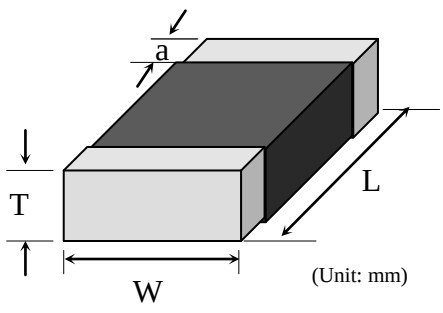
Mark	Type
N	±30%
P	+80%-20

- 330 → **Cap. Value:** 330 = 33 × 10^0 = 33pF; 2R5 = 2.5 × 10^0 = 2.5pF
- E → **Series:** ESD Protect Solution
- -050 → **Max Working Voltage:**

Mark	Voltage
050	5V
120	12V
240	24V

- 0402 → **Size:** Unit: mm

Model	0201	0402	0603	0805
Length (L)	0.60±0.03	1.0±0.15	1.60±0.15	2.00±0.20
Width (W)	0.3±0.03	0.50±0.15	0.50±0.15	1.25±0.15
Thickness (T)	0.2 Max	0.6 Max	0.9 Max	1.0 Max
Termination (a)	0.3±0.03	0.25±0.1	0.3±0.1	0.3±0.1



High Surge Protection Varistor A-series

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance※
Unit Condition	AC （RMS）	DC （V）	1mA(V)	8/20μs (A)	(A)	(V)	10/1000 μs(J)	1KHz (pF)
1206ML180A-LF	11	14	18(15.3~20.7)	200	1.0	30	0.5	1200
1206ML240A-LF	14	18	24(21.6~27)	200	1.0	38	0.5	780
1206ML330A-LF	20	26	33(29.7~36.3)	200	1.0	54	1.0	700
1206ML390A-LF	25	30	39(35.1~42.9)	200	1.0	65	1.0	510
1206ML470A-LF	30	38	47(42.3~51.7)	200	1.0	77	1.1	440
1210ML180A-LF	11	14	18(15.3~20.7)	400	2.5	30	1.2	2000
1210ML240A-LF	14	18	24(21.6~27)	400	2.5	38	1.4	1600
1210ML270A-LF	17	22	27(24.3~29.7)	400	2.5	44	1.7	1500
1210ML330A-LF	20	26	33(29.7~36.3)	400	2.5	54	1.9	880
1210ML390A-LF	25	30	39(35.1~42.9)	400	2.5	65	1.7	800
1210ML470A-LF	30	38	47(42.3~51.7)	400	2.5	77	2.0	530
1812ML240A-LF	14	18	24(21.6~27)	800	5.0	38	2.3	3500
1812ML390A-LF	25	30	39(35.1~42.9)	800	5.0	65	3.7	2350
1812ML470A-LF	30	38	47(42.3~51.7)	800	5.0	77	4.2	1600
1812ML560A-LF	35	45	56(50.4~61.6)	800	5.0	90	4.2	1200
2220ML240A-LF	14	18	24(21.6~27)	1200	10	38	5.8	8500
2220ML270A-LF	17	22	27(24.3~29.7)	1200	10	44	7.2	8300
2220ML390A-LF	25	30	39(35.1~42.9)	1200	10	65	9.6	6000
2220ML470A-LF	30	38	47(42.3~51.7)	1200	10	77	12.0	4000
2220ML560A-LF	35	45	56(50.4~61.6)	1200	10	90	12.0	3500

High Surge Protection Varistor C-series

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance ※
Unit Condition	AC （VRMS）	DC（V）	1mA (V)	8/20μs (A)	(A)	(V)	10/1000μs(J)	1KHz (pF)
0402ML080C-LF	4	5.5	8(8~11)	20	1	20	0.05	200
0402ML120C-LF	6	9	12(10.2~13.8)	20	1	24	0.05	135
0402ML180C-LF	11	14	18(15.3~20.7)	20	1	35	0.05	50
0402ML240C-LF	14	18	24(21.6~26.4)	20	1	40	0.05	45
0603ML080C-LF	4	5.5	8(8~11)	30	1	20	0.1	360
0603ML120C-LF	6	9	12(10.2~13.8)	30	1	24	0.1	300
0603ML180C-LF	11	14	18(15.3~20.7)	30	1	30	0.1	210
0603ML240C-LF	14	18	24(21.6~26.4)	30	1	40	0.1	160
0603ML270C-LF	17	22	27(24.3~29.7)	30	1	54	0.1	145
0603ML390C-LF	25	30	39(35.1~42.9)	30	1	65	0.1	110
0805ML080C-LF	4	5.5	8(8~11)	80	1	20	0.1	1400
0805ML120C-LF	6	9	12(10.2~13.8)	80	1	24	0.1	650
0805ML180C-LF	11	14	18(15.3~20.7)	100	1	30	0.1	350
0805ML240C-LF	14	18	24(21.6~26.4)	100	1	39	0.1	300
0805ML270C-LF	17	22	27(24.3~29.7)	100	1	44	0.2	250
0805ML330C-LF	20	26	33(29.7~36.3)	100	1	54	0.3	220
0805ML390C-LF	25	30	39(35.1~42.9)	100	1	65	0.3	200
0805ML470C-LF	30	38	56(50.4~61.6)	100	1	77	0.3	150
1206ML080C-LF	4	5.5	8(8~11)	100	1	20	0.2	3100
1206ML180C-LF	11	14	18(15.3~20.7)	100	1	30	0.3	800
1206ML240C-LF	14	18	24(21.6~26.4)	100	1	38	0.3	620
1206ML270C-LF	17	22	27(24.3~29.7)	100	1	44	0.4	700
1206ML330C-LF	20	26	33(29.7~36.3)	100	1	54	0.5	480
1206ML390C-LF	25	30	39(35.1~42.9)	100	1	65	0.6	400
1206ML470C-LF	30	38	47(42.3~51.7)	100	1	77	0.7	260
1206ML560C-LF	35	45	56(50.4~61.6)	100	1	90	0.8	230
1206ML680C-LF	40	56	68(61.2~74.8)	100	1	110	1.0	200
1206ML820C-LF	50	65	82(73.8~90.2)	100	1	135	0.5	175
1206ML101C-LF	60	85	100(90~110)	100	1	165	0.6	150

High Surge Protection Varistor C-series

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance ※
Unit Condition	AC （VRMS）	DC（V）	1mA (V)	8/20μs (A)	(A)	(V)	10/1000μs(J)	1KHz (pF)
1210ML240C-LF	14	18	24(21.6~26.4)	250	2.5	38	0.8	1150
1210ML330C-LF	20	26	33(29.7~36.3)	250	2.5	54	1.2	610
1210ML390C-LF	25	30	39(35.1~42.9)	250	2.5	65	1.4	920
1210ML560C-LF	35	45	56(50.4~61.6)	250	2.5	90	2.0	400
1210ML680C-LF	40	56	68(61.2~74.8)	250	2.5	110	2.3	300
1210ML101C-LF	60	85	100(90~110)	200	2.5	165	1.4	210
1812ML240C-LF	14	18	24(21.6~26.4)	500	5	38	1.7	2000
1812ML560C-LF	35	45	56(50.4~61.6)	500	5	90	4.2	1000
2220ML680C-LF	40	56	68(61.2~74.8)	1000	10	110	8.8	4000

SMD Transient Voltage Suppressors

ESD Solutions Suppressor Series

MLE Series is special designed for ESD transients protection. It meets IEC61000-4-2 ESD test Standard level 4. There are several capacitance values to choose. It also can be used as MLCC for EMI function when non-working status.

Part Number Identification

Size	Working Voltage	Series	Capacitance	Tolerance	Lead Free
0402	050	E	330	NP	LF
0201=0.6x0.3(mm)	050=5x10^0=5(V)	MLE	330=33x10^0=33(pF)	NP=±30%	
0402=1.0x0.5(mm)	120=12x10^0=12(V)		2R5=2.5x10^0=2.5(pF)	PP=+80-20%	
0603=1.6x0.8(mm)	240=24x10^0=24(V)				
0805=2.0x1.2(mm)					

Features

- Fast Response < 0.5ns
- Low Clamping Voltage
- Low Leakage Current < 1uA
- Low Working Voltage
- Low Capacitance 0.05pF
- Bi-Directional

Application

- Normal Single I/O
- USB 2.0 / USB 3.0
- Vdd / Reset
- Audio / Video I/O
- HDMI/ DP/ DVI

Specification

0201 Size

Part No,	Working Voltage	ClampingVoltage	Leakage Current	Capacitance Volume	ESD Contact	ESD Air
(Unit)	VDC (max)	Vclamp(max)	uA(max)	pF	KV	KV
0201-050E330NP-LF	5	48	1	33	≧8	≧15
0201-050E100NP-LF	5	72	1	10	≧8	≧15
0201-050E050PP-LF	5	72	1	0.5	≧8	≧15
0201-120E2R5PP-LF	12	130	1	2.5	≧8	≧15
0201-120E0R8PP-LF	12	200	1	0.8	≧8	≧15
0201-120E0R4PP-LF	12	200	1	0.4	≧8	≧15

Specification
(XXXX=0402 and 0603 size)

Part No,	Working Voltage	ClampingVoltage Vclamp(max)		Leakage Current	Capacitance Volume	ESD Contact	ESD Air
(Unit)	VDC (max)	0402	0603	uA(max)	pF	KV	KV
XXXX-050E101NP-LF	5	52	36	1	100	≧8	≧15
XXXX-050E560NP-LF	5	52	36	1	56	≧8	≧15
XXXX-050E330NP-LF	5	52	34	1	33	≧8	≧15
XXXX-050E220NP-LF	5	52	34	1	22	≧8	≧15
XXXX-050E100NP-LF	5	72	65	1	10	≧8	≧15
XXXX-050E050PP-LF	5	72	55	1	4~9	≧8	≧15
XXXX-120E101NP-LF	12	55	55	1	100	≧8	≧15
XXXX-120E560NP-LF	12	55	55	1	56	≧8	≧15
XXXX-120E330NP-LF	12	55	55	1	33	≧8	≧15
XXXX-120E220NP-LF	12	55	55	1	22	≧8	≧15
XXXX-120E100NP-LF	12	72	60	1	10	≧8	≧15
XXXX-120E050PP-LF	12	72	85	1	4 ~9	≧8	≧15
XXXX-240E2R5PP-LF	24	200	240	1	2~4.5	≧8	≧15
XXXX-240E3R0PP-LF	24	200	240	1	1.65~5.4	≧8	≧15
XXXX-240E0R8PP-LF	24	200	200	1	0.8~1.5	≧8	≧15

0805 Size

Part No,	Working Voltage	Clamping Voltage	Leakage Current	Capacitance Volume	ESD Contact	ESD Air
(Unit)	VDC (max)	Vclamp(max)	uA(max)	pF	KV	KV
0805-120E560NP-LF	12	60	1	56	≧8	≧15

1. This clamping Voltage at which the device stabilized during the transition from high to low impedance 8/20μ s waveform current 1A.
2. All capacitance test under 1MHz, and the Leakage current was measured at working voltage.

Low Capacitance series

EH series is special designed for ESD transients protection.
It meets IEC61000-4-2 ESD test Standard level 4. The capacitance value is under 1pF that can apply for ultra high speed data line.

Part Number Identification

Size	Fuction	Working Voltage	Capacitance	Inner Code
0402	EH	240	0R20	P
0402=1.0x0.5(mm)	ESD for High Speed	060=6x10^0=6(V)	0R20=0.2x10^0=0.2(pF)	
0603=1.6x0.8(mm)		120=12x10^0=12(V)		
		240=24x10^0=24(V)		

Features

- ESD function
- 0402~0603
- Capacitance Value <1pF
- Meet IEC61000-4-2 Level 4 ESD standard
- Meet RoHS Requirement

Application

- USB3.0 / HDMI / DP
- Antenna
- Differential Signal

Specification

Part No,	Working Voltage	Trigger Voltage	Clamping Voltage	Leakage Current		Capacitance Value	ESD Contact	ESD Air
(Unit)	VDC (max)	Vtrigger (Typ.)	Vclamp (Typ.)	uA(max) (initial State)	uA(max) (After Test)	pF	KV	KV
0402EH060-0R20P	6	300	30	0.050	10	0.2~0.3	≧8	≧15
0402EH120-0R20P	12	300	30	0.050	10	0.2~0.3	≧8	≧15
0402EH240-0R20P	24	300	30	0.050	10	0.2~0.3	≧8	≧15
0603EH060-0R20P	6	300	30	0.050	10	0.2~0.3	≧8	≧15
0603EH120-0R20P	12	300	30	0.050	10	0.2~0.3	≧8	≧15
0603EH240-0R20P	24	300	30	0.050	10	0.2~0.3	≧8	≧15

High Voltage CH series

CH Series is special designed for surge transients protection. It meet IEC61000-4-5 surge test standard, it provides the SMD package for high working voltage like AC power application.

Part Number Identification

Size	Series	Breakdown Voltage	Inner Code	Lead Free
08	CH	560	KB	LF
08=3.2x2.0(mm)	CH	560=56x10^0=56(V)		
		271=27x10^1=270(V)		

Features

- Surge protection
- size 3220
- Breakdown Voltage 56V~470V
- Meet RoHS Requirement

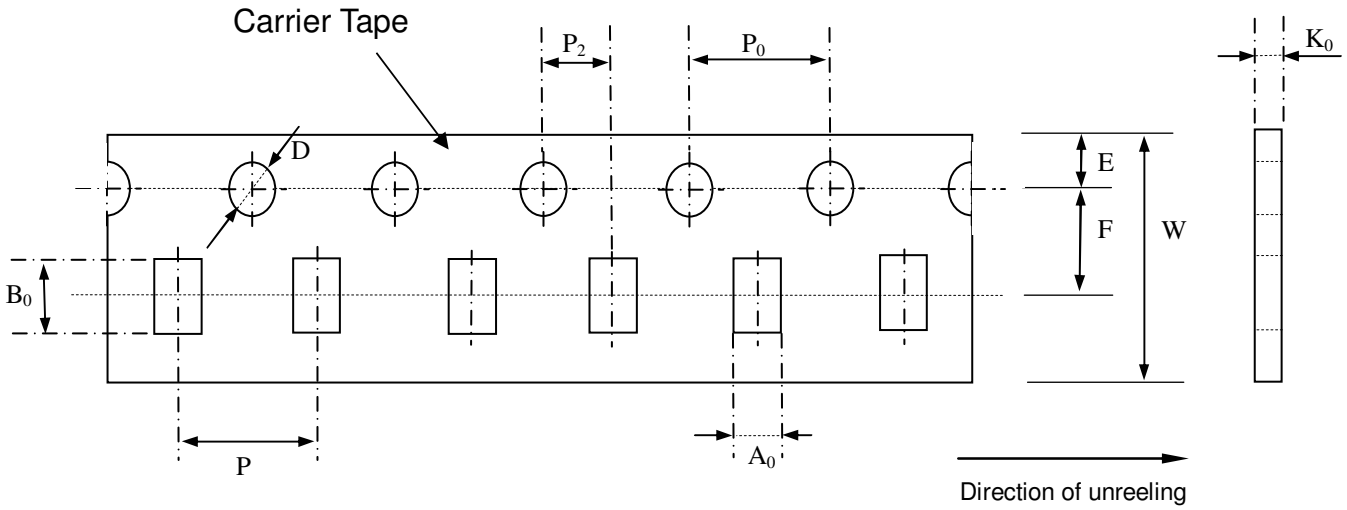
Application

- AC Power
- Industry Control

Specification

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Capacitance	Thickness
Symbol	AC	DC	1mA (V)	8/20μs (A)	(A)	(V)	(J)	1KHz (pF)	mm
08CH560KB-LF	35	45	56 (50.4~61.6)	500	5	106	>2.50	1250	1.5 max
08CH680KB-LF	40	56	68 (61.2~74.8)	500	5	124	>3.20	1050	1.5 max
08CH1211KB-LF	75	102	120 (108~132)	500	10	198	>6.00	600	1.5 max
08CH151KB-LF	95	127	150 (135~165)	500	10	248	>7.50	470	1.5 max
08CH241KB-LF	150	200	240 (216~264)	500	10	390	>14.5	380	1.7 max
08CH271KB-LF	175	225	270 (243~297)	500	10	450	>16.0	340	1.7 max
08CH391KB-LF	250	330	390 (351~429)	500	10	647	>20.0	125	2.2max
08CH431KB-LF	275	369	430 (387~473)	450	10	705	>21.0	120	2.2 max
08CH471KB-LF	300	385	470 (423~517)	400	10	775	>21.6	115	2.2 max

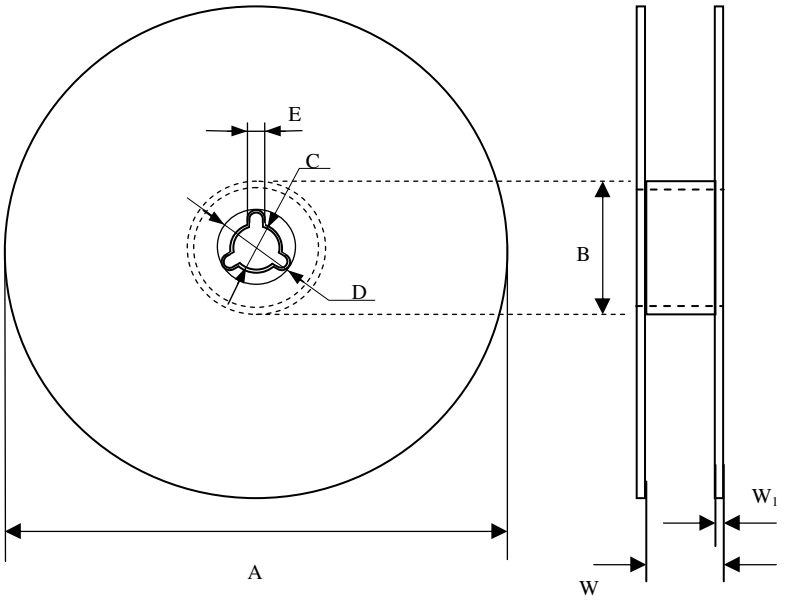
Packing Information



Unit: mm

Symbol	A_0 ±0.10	B_0 ±0.10	K_0 ±0.10	T ±0.05	T_2 ±0.05	D_0 +0.10 -0.00	D_1 ±0.05	P_1 ±0.10	P_2 ±0.05	P_0 ±0.05	W ±0.05	E ±0.10	F ±0.05
0201	0.37	0.67	0.50	0.22	0.57	1.50	1.50	2.00	2.00	4.00	8.00	1.75	3.50
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	1.04	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	0.22	1.49	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
1210	2.78	3.46	1.55	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
08CH	5.50	8.50	2.80	0.30	3.50	1.50	1.50	8.00	2.00	4.00	16.00	1.75	7.50

Reel Dimensions



Unit: mm

Symbol	A	B	C	D	E	W	W_1
0201	178.0 ± 1.0	60.0 ± 0.5	13.0 ± 0.2	21.0 ± 0.2	2.0 ± 0.5	9.0 ± 0.50	1.50 ± 0.15
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	1.50 ± 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	1.50 ± 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	1.50 ± 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	1.50 ± 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	1.50 ± 0.15
1812	178.0 ± 1.0	60.0 ± 0.5	13.0 ± 0.2	21.0 ± 0.2	2.0 ± 0.5	9.0 ± 0.50	1.50 ± 0.15
2220	178.0 ± 1.0	60.0 ± 0.5	13.0 ± 0.2	21.0 ± 0.2	2.0 ± 0.5	9.0 ± 0.50	1.50 ± 0.15
08CH	178.0 ± 1.0	60.0 ± 0.5	13.0 ± 0.2	21.0 ± 0.2	2.0 ± 0.5	9.0 ± 0.50	1.50 ± 0.15

Pieces Packaged Per Reel

Type	**0201**	**0402**	**0603**	**0805**	**1206**	**1210**	**1812**	**2220**	**08CH**
PCS/Reel	15,000	10,000	4,000	3,000	3,000	2,000	1,000	1,000	1,000