

ISO9001
ISO14001



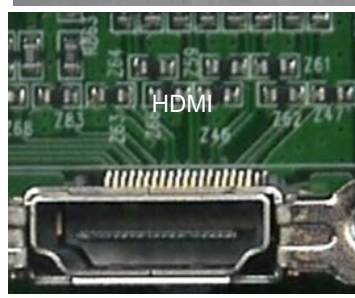
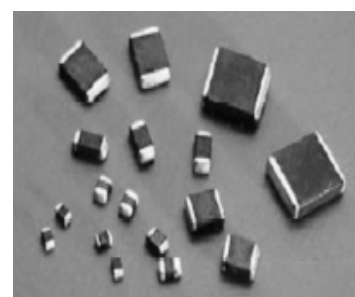
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2011

Electronic Materials Components

ESD Protective Device

- LOPIVA Series
- ECVAL/ECVAS Series



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I. LOPIVA™ : Low Cp ESD Protective Device

1 What is LOPIVA™ ?

LOPIVA™ means the ESD protective device which has a low capacitance value below 1pF, it is suitable for high speed data transmission line or high frequency application to protect the circuit against ESD impulse attack.

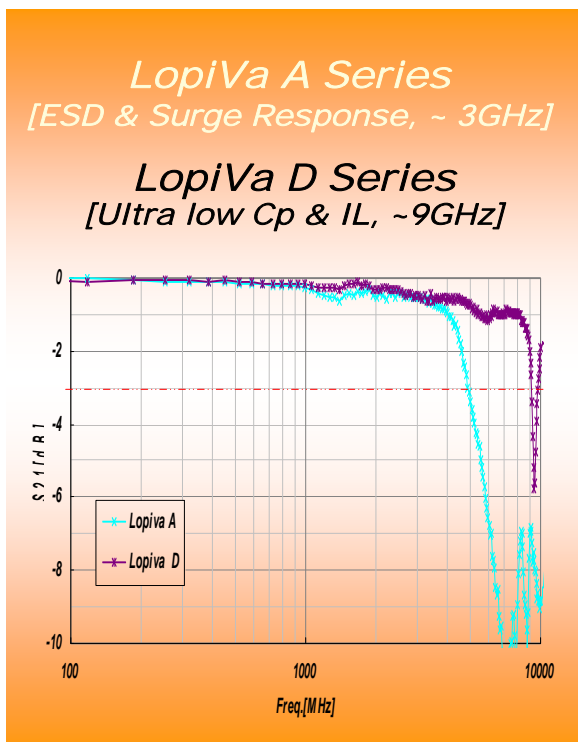
LOPIVA™ construction is quite different to Multilayer Varistor which is made by traditional "sheet stacking" method. It is designed for purpose of a high mechanical strength and low profile with a wide range of Cp, 0.15 to 1pF.

2 Features

- Low Capacitance , High cut-off freq.
- Fast response to ESD : ~ 1ns
- Bi-directional
- IEC61000-4-2 Level 4 & EU-RoHS Compliant

3 Application

- HDMI & USB Interface : TV (LCD, LED, PDP), etc.
- Satellite Radio System, Mobile Phone, Navigation, etc.
- Hand-Held & Home Appliance

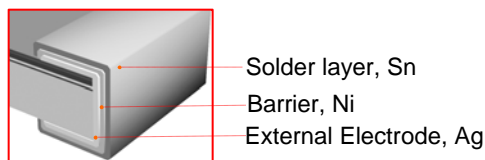
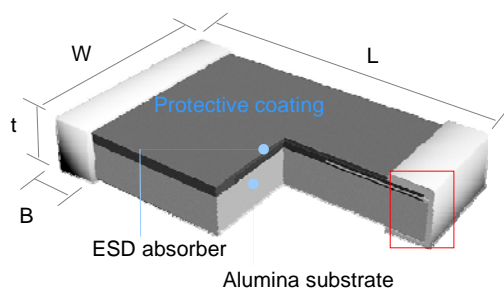


4 How to Order

Part No. : LOPIVA 16 G 12 A
 (1) (2) (3) (4) (5)

(1)	Product	LOPIVA	Low Capacitance ESD Protective Device	(4)	Working Voltage	12	05 : 5.5V, 12 : 12V, 24 : 24V
(2)	Size	05	05 : 1005, 16 : 1608	(5)	Capacitance [typical @1MHz]	A	A : 0.8pF, D : 0.15pF
(3)	ESD Level	G	IEC61000-4-2 Level 4				

5 Dimension



Code [Single]	Dimension [mm]			
	L	W	T	BW
1005	1.0 +/- 0.1	0.5 +/- 0.1	0.5 +/- 0.1	0.2 +/- 0.1
1608	1.6 +/- 0.2	0.8 +/- 0.2	0.8 +/- 0.2	0.4 +/- 0.2

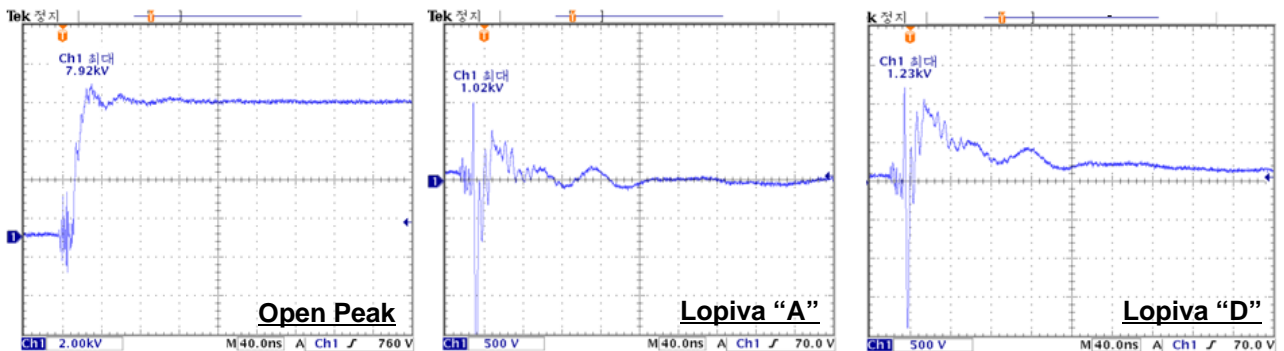
6 Part List

No	Part Number	Size	Cp[pF]		Vw [Vdc]	IL [uA]	ESD			
			Typ.	Max			Capability	Vt[kV]	Vc[V]	Repetitive Withstand
								8kV	30ns	
1	LOPIVA 05G05A	1005	0.8	1	5.5	< 1	IEC61000-4-2 Level 4	< 1.5	< 300	100 times
2	LOPIVA 05G12A	1005	0.8	1	12	< 1			< 300	
3	LOPIVA 16G05A	1608	0.8	1	5.5	< 1			< 300	
4	LOPIVA 16G12A	1608	0.8	1	12	< 1			< 300	
5	LOPIVA 16G14A	1608	0.8	1	14	< 1			< 300	
6	LOPIVA 16G24A	1608	0.8	1	24	< 1			< 300	
7	LOPIVA 05G12D	1005	0.15	0.2	12	< 0.5	< 1.8	< 300	100times	
8	LOPIVA 16G12D	1608	0.15	0.2	12	< 0.5		< 300		
9	LOPIVA 16G24D	1608	0.15	0.2	24	< 0.5		< 300		

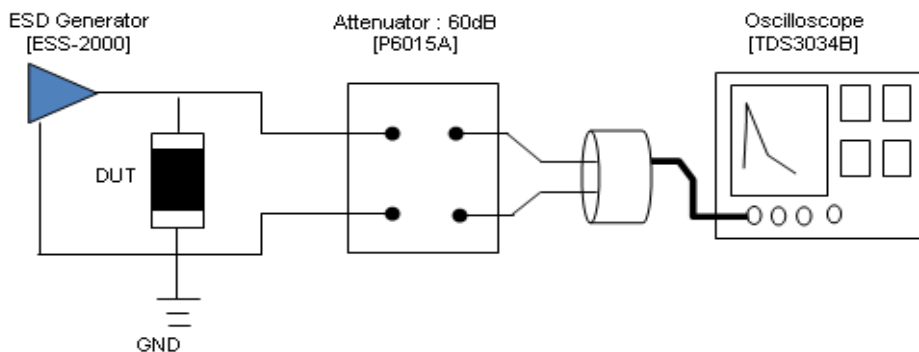
- Vw : Working Voltage
- IL : Leakage Current – The current flow across Lopiva when Vw is applied.
- Vt : ESD trigger voltage
- Vc : ESD clamping voltage – The clamped voltage at the point of 30ns lasting after ESD pulse rising.

7 Electrical Characteristics

ESD Clamping Effect [IEC61000-4-2, Contact 8kV]

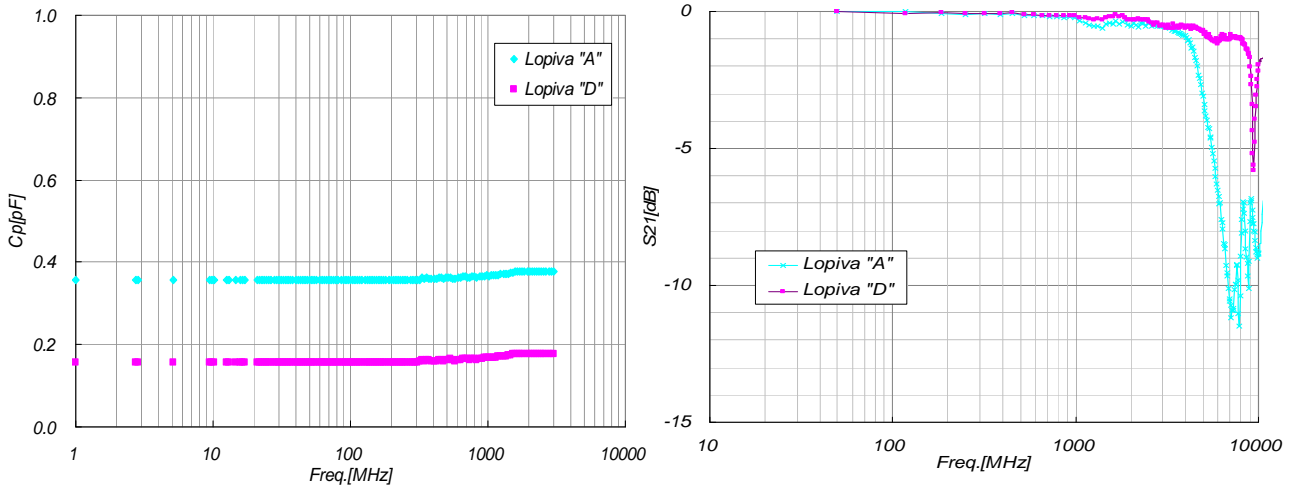


Test Circuit

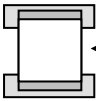


- Above wave form and suppression peak value may be differently shown as test circuit

Frequency Characteristics



8 Specification & Reliability

No	Item	Requirements	Test method
1	Leakage current	1. Satisfaction to the specification, * Refer to the part list	1. Applying working voltage : Keithley 2400
2	Capacitance		1. 1MHz, 0.5Vrms, 25C
4	Solder ability	1. More than 90% of the terminal electrode shall be covered with new solder.	1. Type of solder : H63A 2. Temp & Time : 230+/-5°C, 5+/-1 sec
5	Reflow soldering	1. No Serious mechanical damage 2. More than 50% of the terminal electrode shall be covered with new solder 3. Leakage Current : ≤ 10uA	1. Type of solder : H63A 2. Temp & Time : max 260+/-5°C, min 10sec * Refer to the soldering profile of page 6
6	Adhesive strength	1. No Serious mechanical damage 2.1005 : min 0.5kgf 1608 : min 1.0kgf, 2012 : min 1.2kgf	 W [kgf] min.
Reliability part 1			
7	Humidity	1. No Serious mechanical damage 2. Leakage Current : ≤ 10uA	1. Test Temp. & Relative Humidity & Time : 85+/- 5°C, 85 +/- 5% RH, 500 +/- 12hrs
8	Thermal Shock		1. Step 1 : -40 +/- 5°C, Step 2 : 85 +/- 5°C 2. Cycle : 30min ± 3min, each 5 cycles
9	High Temp. Test		1. Temp. & time : 85+/-5°C , 1000 +/- 24hrs
Reliability part 2.(IEC61000-4-2 standard)			
10	ESD	1. No mechanical damage after test 2. Leakage Current : ≤ 10uA * ESD gun (IEC61000-4-2 standard) * C=150pF R=330Ω	1. Contact Discharge ; +/- 8kV * 10 times within 10sec 2. Air discharge : :+/-15kV * 10 times within 10sec

II. Multilayer Varistor, MLV

ECVAL & ECVAS Series



1 What is MLV?

Multilayer Varistor, MLV means the ESD protective device which is composed of ZnO based ceramic, internal & external electrode by a traditional sheet stacking process. MLV is normally working as a kind of insulator but it is transiently doing as a switching device when ESD impulse is rising, then it comes back to its normal state. Joinset's MLV has a unique insulation coating layer on the body surface for its high reliability.

2 Features

- High Reliability Performance
- Fast response to ESD : ~ 1ns
- Bi-directional
- IEC61000-4-2 Level 4 & EU-RoHS Compliant

3 Application

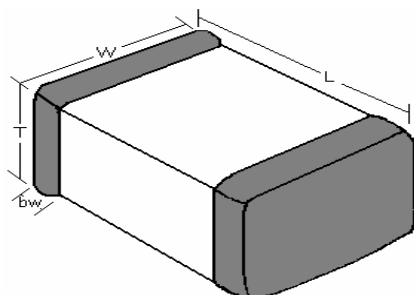
- CMOS, MOSFET Protection
- I/O Interface Protection
- Hand-Held & Home Appliance

4 How to Order

Part No. : ECVAL 0603 05 X 30 015 N B T
 (1) (2) (3) (4) (5) (6) (7) (8) (9)

(1)	Product	ECVAL	Low Cp	(5)	Clamping Voltage	30	Examples 15 : 15.5V, 30 : 30V
		ECVAS	Standard Cp				
(2)	Size	0603	0603, 1005, 1608, 2012, 3216[mm]	(6)	Capacitance	015	Examples < 1nF : 015 ▷ 15pF, 003 ▷ 3pF ≥ 1nF : 102 ▷ 1,000pF
(3)	Working Voltage	05	05 : 5.5V, 09 : 9.0V 12 : 12V, 18 : 18V etc.	(7)	Termination	N	Ni barrier, Solder plating
(4)	Transient Energy	12	Refer to the part list	(8)	Material	B	Pb Free
				(9)	Taping	T	B : Bulk, T : Taping

5 Dimension



Code [Single]	Dimension [mm]			
	L	W	T	BW
0603	0.6 +/- 0.03	0.3 +/- 0.03	0.3 +/- 0.03	Min 0.1
1005	1.0 +/- 0.1	0.5 +/- 0.1	0.5 +/- 0.1	0.2 +/- 0.1
1608	1.6 +/- 0.2	0.8 +/- 0.2	0.8 +/- 0.2	0.4 +/- 0.2
2012	2.0 +/- 0.2	1.25 +/- 0.2	0.8 +/- 0.2	0.5 +/- 0.2
3216	3.2 +/- 0.2	1.6 +/- 0.2	1.1 +/- 0.2	0.6 +/- 0.3

6 Part List

Multilayer Varistor, MLV

ECVAS Series

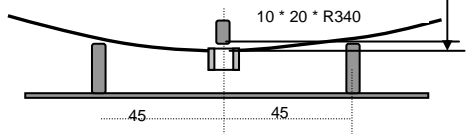
No	Part No	Electrical specifications					
		$V_W[V]$	$V_B[V]$	$V_C[V]$	$I_P[A]$	$E_T[J]$	$C_p[pF]$
		$I_L < 50\mu A$	1mA _{dc}	8/20 μs	8/20 μs	10/1000 μs	1MHz, 0.5V _{rms}
1	ECVAS0603 05X30 100NBT	5.5	7 ~ 18	30	1	0.005	100[1kHz]
2	ECVAS1005 05E15 180NBT	5.5	6.4 ~ 9.6	15.5	5	0.03	180
3	ECVAS1005 05A15 360NBT	5.5	6.4 ~ 9.6	15.5	10	0.05	360
4	ECVAS1005 05A15 480NBT	5.5	6.4 ~ 9.6	15.5	10	0.05	480[1kHz]
5	ECVAS1005 09A20 230NBT	9.0	11 ~ 14	20	20	0.05	230
6	ECVAS1005 14A30 120NBT	14.0	16.5 ~ 20.3	30	15	0.05	120
7	ECVAS1005 14A30 160NBT	14.0	16.5 ~ 20.3	30	15	0.05	160[1kHz]
8	ECVAS1005 18A40 090NBT	18.0	22.9 ~ 28.0	40	20	0.05	90
9	ECVAS1608 05B15 825NBT	5.5	6.4 ~ 9.6	15.5	20	0.1	825
10	ECVAS1608 09B20 550NBT	9.0	11 ~ 14	20	30	0.1	550
11	ECVAS1608 14E30 160NBT	14.0	16.5 ~ 20.3	30	10	0.03	160[1kHz]
12	ECVAS1608 14A35 350NBT	14.0	18 ~ 24	35	10	0.05	350[1kHz]
13	ECVAS1608 14B30 425NBT	14.0	16.5 ~ 20.3	30	30	0.1	425
14	ECVAS1608 18B40 225NBT	18.0	22.9 ~ 28.0	40	30	0.1	225
15	ECVAS1608 26B58 160NBT	26.0	31 ~ 38	58	30	0.1	160
16	ECVAS1608 30B65 150NBT	30.0	37 ~ 46	65	30	0.1	150
17	ECVAS2012 05B15 860NBT	5.5	6.4 ~ 9.6	15.5	20	0.1	860
18	ECVAS2012 09B20 585NBT	9.0	11 ~ 14	20	30	0.1	585
19	ECVAS2012 14B30 280NBT	14.0	16.5 ~ 20.3	30	30	0.1	280
20	ECVAS2012 18B40 275NBT	18.0	22.9 ~ 28.0	40	30	0.1	275
21	ECVAS2012 18B40 350NBT	18.0	22.9 ~ 28.0	40	30	0.1	350
22	ECVAS2012 26B58 110NBT	26.0	31 ~ 38	58	30	0.1	110
23	ECVAS2012 30B65 080NBT	30.0	37 ~ 46	65	30	0.1	80
24	ECVAS3216 05C30 582NBT	5.5	10 ~ 17	30	80	0.2	5800[1kHz]
25	ECVAS3216 33C75 112NBT	33.0	39 ~ 50	75	80	0.2	1100[1kHz]
26	ECVAS3216 42C90 600NBT	42.0	48 ~ 60	90	80	0.2	600[1kHz]
27	ECVAS3216 56C120 400NBT	56.0	62 ~ 78	120	80	0.2	400[1kHz]

ECVAL Series

No	Part No	Electrical specifications					
		V _w [V]	V _B [V]	V _C [V]	I _p [A]	E _T [J]	C _p [pF]
		I _L < 20uA	1mA _{dc}	8/20us	8/20us	10/1000us	1MHz, 0.5V _{rms}
1	ECVAS0603 05X30 015NBT	5.5	9.5 ~ 14.5	30	1	0.005	15
2	ECVAS0603 05X25 033NBT	5.5	9.5 ~ 14.5	25	1	0.005	33
3	ECVAL1005 05X34 010NBT	5.5	10 ~ 14	34	3	0.005	10
4	ECVAL1005 05E20 050NBT	5.5	10 ~ 14	20	5	0.03	50
5	ECVAL1005 05E20 100NBT	5.5	10 ~ 14	20	10	0.03	100
6	ECVAL1005 14E30 050NBT	14.0	16.5 ~ 20.3	30	5	0.03	50
7	ECVAL1005 14E30 100NBT	14.0	16.5 ~ 20.3	30	10	0.03	100
8	ECVAL1005 18X300 003NBT	18.0	90 ~ 160	300	1	0.005	3[1MHz]
9	ECVAL1005 18X50 005NBT	18.0	24 ~ 34	50	3	0.005	5[1MHz]
10	ECVAL1005 18X40 015NBT	18.0	22.9 ~28.0	40	5	0.005	15
11	ECVAL1005 18E40 060NBT	18.0	22.9 ~28.0	40	10	0.03	60
12	ECVAL1005 18A40 120NBT	18.0	22.9 ~28.0	40	20	0.05	120
13	ECVAL1608 05X25 030NBT	5.5	10 ~ 14	25	3	0.005	30
14	ECVAL1608 05E20 100NBT	5.5	10 ~ 14	20	10	0.03	100
15	ECVAL1608 18X300 003NBT	18.0	90 ~ 160	300	1	0.005	3[1MHz]
16	ECVAL1608 18X58 005NBT	18.0	28 ~ 38	58	3	0.005	5
17	ECVAL1608 18X50 012NBT	18.0	24 ~ 34	50	3	0.005	12
18	ECVAL1608 18E50 020NBT	18.0	24 ~ 34	50	10	0.03	20[1MHz]
19	ECVAL1608 18A40 120NBT	18.0	22.9 ~ 28.0	40	20	0.05	120
20	ECVAL2012 18B40 160NBT	18.0	22.9 ~ 28.0	40	25	0.1	160

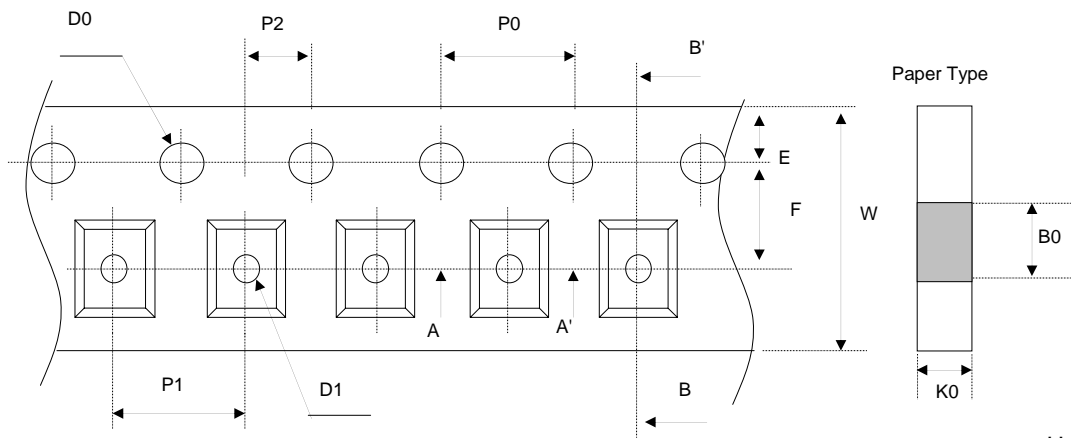
- V_w : Working Voltage
- I_L : Leakage Current – The current flow across Lopiva when V_w is applied.
- V_{1mA} : Breakdown Voltage or Varistor Voltage – The voltage across Lopiva when 1mA is applied.
- V_c : Surge Clamping, 8/20us
- I_p : Max. Surge Current, 8/20us / E_t : Transient Energy, 10/1000us

7 Specification & Reliability

No	Item	Requirements	Test method
1	Operation Temp.	1. -55 ~ 125deg.c	
2	Heat Resistance Test	1. No Serious mechanical damage 2. $\Delta V_B \leq \pm 10\%$ of initial value	1. Temp. & Time * Reflow : min. peak 260C, over 10 sec. * Soldering iron : 400 +/- 5C, max 5 sec.
3			
4	Humidity Load Test	1. No Serious mechanical damage 2. $\Delta V_B \leq \pm 10\%$ of initial value 3. Let it sit at R.T, for 24Hrs then Measure	1. Test Temp. & Relative Humidity & Time : 85+/-5deg.c, 85+/-2% RH, Vw Applied, 500+/- 24Hrs
5	Thermal Shock		1. Step 1 : -40+/-5C, Step 2 : +85+/-5C 2. Cycle : 30min+/-3min, each 100 times
6	High Temp. Test		1. Temp. & time : * 85+/-5C, 1000+/-48Hrs
7	Low Temp. resistance		1. Temp. & Time : * -40+/-5C, 1000Hrs+/-12Hrs
8	Bending Strength	1. No Serious mechanical damage	1. Add load at 0.5mm/sec until glass epoxy board bends up to 1mm [= Bending Depth] 
9	Adhesive strength	1. No Serious mechanical damage	
		Size	0603 1005 1608 ≥ 2012
		W[kgf]	0.2 0.5 1.0
10	Max. Surge Current	1. $\Delta V_B \leq \pm 10\%$ of initial value * IEC 61000-4-5 standard * 1.2/50us - 8/20us V-I Combination Pulse	1. Temp. & humidity : 25 +/- 5C, 30~65%RH 2. Polarity : +, - 3. Number of hit : each 1 time 4. Surge pulse : 8/20us pulse 5. Applied current : * maximum surge current(Ip)
12	ESD	1. No mechanical damage 2. $\Delta V_B \leq \pm 10\%$ of initial vlaue * ESD gun (IEC61000-4-2 standard) * C=150pF R=330 Ω	1. Contact discharge * Voltage : 8kV(Level 4) * Polarity : +, - * Number : 10 times in 10sec 2. Air discharge * Voltage : 15kV(Level 4) * Polarity : +, - * Number : 10 times in 10sec

III. Packing Specifications

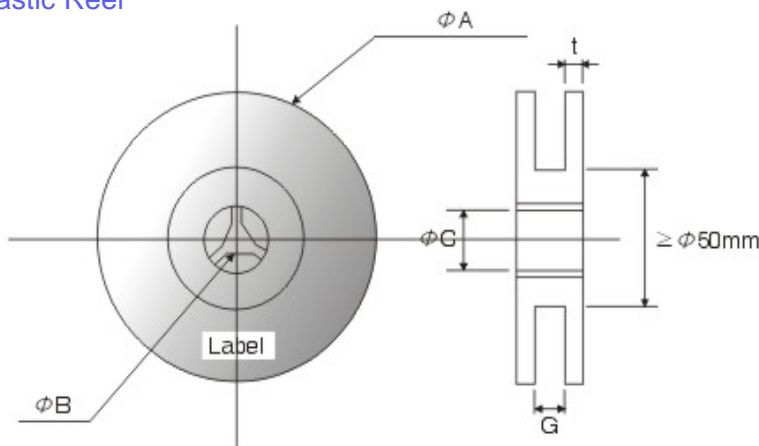
Carrier Pocket



Unit : [mm]

Case	type	A0	B0	W	D0	D1	E	F	P	P0	P2	K0	t
0603	Paper	0.38 +/-0.05	0.68 +/-0.05	8.0 +/-0.2	1.50 +/-0.25	-	1.75 +/-0.1	3.5 +/-0.05	2.0 +/-0.1	4.0 +/-0.1	2.0 +/-0.1	1.1max	
1005	Paper	0.65 +/-0.1	1.15 +/-0.1	8.0 +/-0.2	1.50 +/-0.25	-	1.75 +/-0.1	3.5 +/-0.05	2.0 +/-0.1	4.0 +/-0.1	2.0 +/-0.1	1.1max	
1608	Paper	1.1 +/-0.1	1.9 +/-0.1	8.0 +/-0.2	1.50 +/-0.25	-	1.75 +/-0.1	3.5 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	2.0 +/-0.1	1.1max	-
2012	Paper	1.65 +/-0.2	2.4 +/-0.2	8.00 +/-0.20	1.55 +/-0.25	-	1.75 +/-0.1	3.5 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	2.0 +/-0.1	1.1max	-
3216	Emboss	2.0 +/-0.2	3.5 +/-0.2	8.00 +/-0.20	1.55 +/-0.25	1.50 +/-0.25	1.75 +/-0.1	3.5 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	2.0 +/-0.1	2.0max	0.23 +/-0.1

Plastic Reel



Unit : [mm]

code	0603~3216
ΦA	178+/-2.0
ΦB	13.0+/-0.5
ΦC	22.0+/-2.0
G	10.0+/-1.5
t	2.5+/-0.5

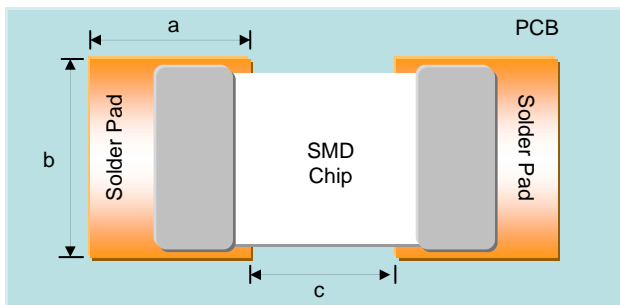
Packing Unit

Size [mm]	0603	1005	1608		2012	3216
			LOPIVA	MLV		
pcs/reel	10,000	10,000	5,000	4,000	4,000	3,000
Inner Box [pcs]	50,000	50,000	25,000	20,000	20,000	15,000
Outer Box [pcs]	500,000	500,000	250,000	200,000	200,000	150,000

IV. Recommended Soldering Condition

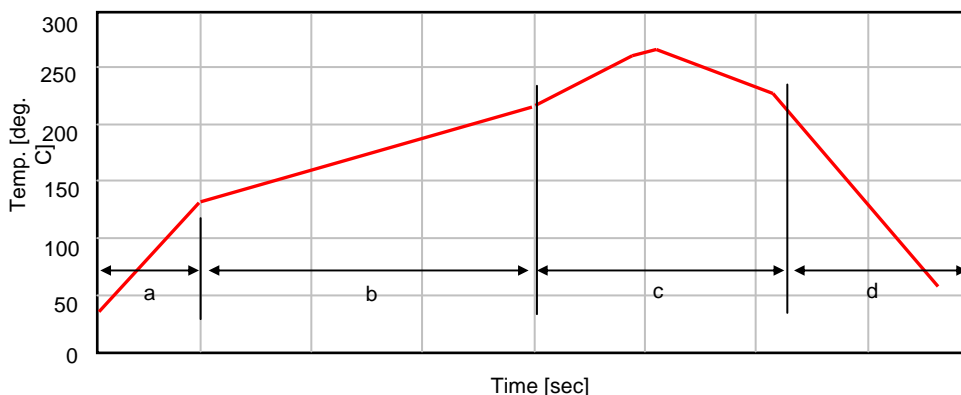
PAD Design

Unit : mm



code	Chip				
	0603	1005	1608	2012	3216
a	0.35	0.50	0.70	0.7	0.9
b	0.40	0.60	0.80	1.1	1.4
c	0.40	0.50	0.80	1.2	2.4

Reflow Soldering



Zone	temp. range [deg. C]	time [sec]	Remark
a	Curing RT ~ 130	60	
b	Preheat max 220	90 ~ 150	* Solder : Sn-Ag-Cu
c	Soldering 220 ~ 260 [max 270]	90 ~ 150	* 260deg. C, over 10sec
d	Cooling 220 ~ RT	min 60	

Soldering Iron

