



SPECIFICATION FOR APPROVAL

File No.: Q/FRK 0.GS.E.C28-A01

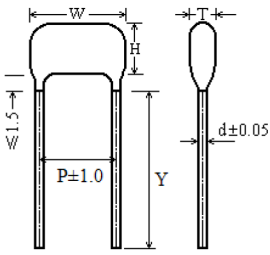
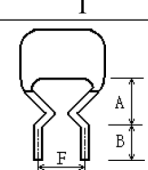
Product Name	Metallized Polyester Film Capacitor(dipped type and stacked version)
Product Type:	C28
Product Code	
Customer	
Customer Code	
Issue Date	2010-09



Surge Components, Inc.
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Deer Park, NY 11729
www.surgecomponents.com

Metallized polyester film capacitor(dipped type and stacked version)

■ **Outline Drawing**

Forming Lead Shapes					
					
	<table border="1"> <tr> <td>P=5.0</td> <td>P=7.5</td> </tr> <tr> <td>F=5.0</td> <td>F=5.0/7.5</td> </tr> </table>	P=5.0	P=7.5	F=5.0	F=5.0/7.5
	P=5.0	P=7.5			
	F=5.0	F=5.0/7.5			
<p>F±0.5mm; A≤5.0mm; B=4.5±0.5mm</p>					

■ **Features**

- Metallized polyester film, stacked construction
- Flame retardation epoxy resin powder coated(UL94 V-0)
- High dv/dt ability

■ **Typical Applications:**

- By-passing, blocking, coupling, decoupling,
- Pulse logic, timing, oscillator circuits.
- Inverter for LCD monitors, automotive DC motor suppression

■ **Specifications**

Reference Standard	GB 7332(IEC 60384-2)		
Climatic Category	55/105/56		
Rated temperature	85°C		
Operating temperature	-55°C~105°C (+85°C to +105°C: decreasing factor 1.25% per °C for VR(dc))		
Rated Voltage	50/63V, 100V, 250V		
Capacitance Range	0.01μF ~ 3.3μF		
Capacitance Tolerance	±5%(J), ±10%(K), ±20%(M)		
Voltage Proof	1.4U _R (5s)		
Dissipation Factor	Frequency	C _R ≤ 0.1μF	C _R > 0.1μF
	1kHz	≤1.0%	≤1.0%
	10kHz	≤1.5%	≤1.5%
	100kHz	≤3.0%	-
Insulation Resistance	U _R >100V	≥3 000MΩ, C _R ≤0.33μF ≥10 000s, C _R >0.33μF (20°C, 100V, 1min)	
	U _R ≤100V	≥15 000MΩ, C _R ≤0.33μF ≥5 000s, C _R >0.33μF (20°C, 10V, 1min)	

Part number system

The 18 digits part number is formed as follow:

C28

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C	2	8							2	0							

Digit 1 to 3 Series code of film capacitor

C28

Digit 4 to 5 DC rated voltage

1H=50V 1J=63V 2A=100V 2E=250V

Digit 6 to 8 Rated capacitance value

For example : 103=10×10³pF=0.01uF

Digit 9 Capacitance tolerance

J=±5%,K=±10%, M=±20%

Digit 10 Lead pitch

2=5.0 3=7.5

Digit 11 Internal use

Digit 12 to 15 Lead form and packaging code

Digit 16 to 18 Internal use

Table 1 lead dimensions and packaging code

Digit 12		Digit 13		Digit 14		Digit 15	
code	explanation	code	explanation	code	explanation	code	explanation
A	ammo-pack	2 3	F=5.0mm F=7.5mm	1	kinked	A	each cap. between two consecutive holes P3=12.7mm,H=20.0mm (For pitch=5.0/7.5mm)
F	lead kinked	2 3	F=5.0mm F=7.5mm	0	B=4.5mm (the length of B)	0	B Length tolerance ±0.5mm
Y	straight lead "Y" in the figure above	code	explanation			0	Length tolerance ±0.5mm
		45	lead length 4.5mm				
Digit12-15 code "C000" means standard lead length (20mm ~ 30mm)							

■ Dimensions(mm)

50Vdc (30Vac)						
C (μF)	W max	H max	T max	P	d	Part number
0.010	7.3	5.5	3.2	5.0	0.5	C281H103-20****+++
0.012	7.3	5.5	3.2	5.0	0.5	C281H123-20****+++
0.015	7.3	5.5	3.2	5.0	0.5	C281H153-20****+++
0.018	7.3	5.5	3.2	5.0	0.5	C281H183-20****+++
0.022	7.3	5.5	3.2	5.0	0.5	C281H223-20****+++
0.027	7.3	5.5	3.2	5.0	0.5	C281H273-20****+++
0.033	7.3	5.5	3.2	5.0	0.5	C281H333-20****+++
0.039	7.3	5.5	3.2	5.0	0.5	C281H393-20****+++
0.047	7.3	5.5	3.2	5.0	0.5	C281H473-20****+++
0.056	7.3	5.5	3.2	5.0	0.5	C281H563-20****+++
0.068	7.3	5.5	3.2	5.0	0.5	C281H683-20****+++
0.082	7.3	5.5	3.2	5.0	0.5	C281H823-20****+++
0.10	7.3	5.5	3.2	5.0	0.5	C281H104-20****+++
0.12	7.3	5.5	3.2	5.0	0.5	C281H124-20****+++
0.15	7.3	5.5	3.5	5.0	0.5	C281H154-20****+++
0.18	7.3	5.5	4.0	5.0	0.5	C281H184-20****+++
0.22	7.3	5.5	4.3	5.0	0.5	C281H224-20****+++
0.27	7.3	7.0	4.3	5.0	0.5	C281H274-20****+++
0.33	7.3	7.0	4.8	5.0	0.5	C281H334-20****+++
0.39	7.3	7.0	5.0	5.0	0.5	C281H394-20****+++
0.47	7.3	8.5	5.5	5.0	0.5	C281H474-20****+++
0.56	7.3	8.5	5.8	5.0	0.5	C281H564-20****+++
0.68	7.3	8.5	6.5	5.0	0.5	C281H684-20****+++
0.82	7.3	9.5	6.5	5.0	0.5	C281H824-20****+++
1.0	7.3	10.0	7.5	5.0	0.5	C281H105-20****+++
1.2	10.0	9.5	5.5	7.5	0.5	C281H125-30****+++
1.5	10.0	9.5	6.5	7.5	0.5	C281H155-30****+++
1.8	10.0	11.0	6.5	7.5	0.5	C281H185-30****+++
2.2	10.0	11.0	7.0	7.5	0.5	C281H225-30****+++
2.7	10.0	13.5	7.0	7.5	0.5	C281H275-30****+++
3.3	10.0	13.5	8.0	7.5	0.5	C281H335-30****+++

63Vdc (40Vac)						
C (μF)	W max	H max	T max	P	d	Part number
0.010	7.3	5.5	3.2	5.0	0.5	C281J103-20****+++
0.012	7.3	5.5	3.2	5.0	0.5	C281J123-20****+++
0.015	7.3	5.5	3.2	5.0	0.5	C281J153-20****+++
0.018	7.3	5.5	3.2	5.0	0.5	C281J183-20****+++
0.022	7.3	5.5	3.2	5.0	0.5	C281J223-20****+++
0.027	7.3	5.5	3.2	5.0	0.5	C281J273-20****+++
0.033	7.3	5.5	3.2	5.0	0.5	C281J333-20****+++
0.039	7.3	5.5	3.2	5.0	0.5	C281J393-20****+++
0.047	7.3	5.5	3.2	5.0	0.5	C281J473-20****+++
0.056	7.3	5.5	3.2	5.0	0.5	C281J563-20****+++
0.068	7.3	5.5	3.2	5.0	0.5	C281J683-20****+++
0.082	7.3	5.5	3.2	5.0	0.5	C281J823-20****+++
0.10	7.3	5.5	3.2	5.0	0.5	C281J104-20****+++
0.12	7.3	5.5	3.2	5.0	0.5	C281J124-20****+++
0.15	7.3	5.5	3.5	5.0	0.5	C281J154-20****+++
0.18	7.3	5.5	4.0	5.0	0.5	C281J184-20****+++
0.22	7.3	5.5	4.3	5.0	0.5	C281J224-20****+++
0.27	7.3	7.0	4.3	5.0	0.5	C281J274-20****+++
0.33	7.3	7.0	4.8	5.0	0.5	C281J334-20****+++
0.39	7.3	7.0	5.0	5.0	0.5	C281J394-20****+++
0.47	7.3	8.5	5.5	5.0	0.5	C281J474-20****+++
0.56	7.3	8.5	5.8	5.0	0.5	C281J564-20****+++
0.68	7.3	8.5	6.5	5.0	0.5	C281J684-20****+++
0.82	7.3	9.5	6.5	5.0	0.5	C281J824-20****+++
1.0	7.3	10.0	7.5	5.0	0.5	C281J105-20****+++
1.2	10.0	9.5	5.5	7.5	0.5	C281J125-30****+++
1.5	10.0	9.5	6.5	7.5	0.5	C281J155-30****+++
1.8	10.0	11.0	6.5	7.5	0.5	C281J185-30****+++
2.2	10.0	11.0	7.0	7.5	0.5	C281J225-30****+++
2.7	10.0	13.5	7.0	7.5	0.5	C281J275-30****+++
3.3	10.0	13.5	8.0	7.5	0.5	C281J335-30****+++

- Note: 1. “-”=capacitance tolerance code, M=±20%,K=±10%,J=±5%
 2. “****”=lead form and packing code (refer to table 1)

100 Vdc (63Vac)						
C (μF)	W max	H max	T max	P	d	Part number
0.010	7.3	5.5	3.2	5.0	0.5	C282A103-20****+++
0.012	7.3	5.5	3.2	5.0	0.5	C282A 123-20****+++
0.015	7.3	5.5	3.2	5.0	0.5	C282A 153-20****+++
0.018	7.3	5.5	3.2	5.0	0.5	C282A 183-20****+++
0.022	7.3	5.5	3.2	5.0	0.5	C282A 223-20****+++
0.027	7.3	5.5	3.2	5.0	0.5	C282A 273-20****+++
0.033	7.3	5.5	3.2	5.0	0.5	C282A 333-20****+++
0.039	7.3	5.5	3.2	5.0	0.5	C282A 393-20****+++
0.047	7.3	5.5	3.2	5.0	0.5	C282A 473-20****+++
0.056	7.3	5.5	3.2	5.0	0.5	C282A 563-20****+++
0.068	7.3	5.5	3.2	5.0	0.5	C282A 683-20****+++
0.082	7.3	5.5	3.2	5.0	0.5	C282A 823-20****+++
0.10	7.3	5.5	3.2	5.0	0.5	C282A 104-20****+++
0.12	7.3	5.5	3.2	5.0	0.5	C282A 124-20****+++
0.15	7.3	5.5	3.5	5.0	0.5	C282A 154-20****+++
0.18	7.3	5.5	4.0	5.0	0.5	C282A 184-20****+++
0.22	7.3	5.5	4.3	5.0	0.5	C282A 224-20****+++
0.27	7.3	7.0	4.3	5.0	0.5	C282A 274-20****+++
0.33	7.3	7.0	4.8	5.0	0.5	C282A 334-20****+++
0.39	7.3	7.0	5.0	5.0	0.5	C282A 394-20****+++
0.47	7.3	8.5	5.5	5.0	0.5	C282A 474-20****+++
0.56	7.3	8.5	5.8	5.0	0.5	C282A 564-20****+++
0.68	7.3	8.5	6.5	5.0	0.5	C282A 684-20****+++
0.82	7.3	9.5	6.5	5.0	0.5	C282A 824-20****+++
1.0	7.3	11.0	7.5	5.0	0.5	C282A 105-20****+++

250 Vdc (140Vac)						
C (μF)	W max	H max	T max	P	d	Part number
0.010	7.3	5.5	3.2	5.0	0.5	C282E103-20****+++
0.012	7.3	6.0	3.2	5.0	0.5	C282E 123-20****+++
0.015	7.3	6.0	3.2	5.0	0.5	C282E 153-20****+++
0.018	7.3	6.0	3.2	5.0	0.5	C282E 183-20****+++
0.022	7.3	6.0	3.5	5.0	0.5	C282E 223-20****+++
0.027	7.3	6.0	3.5	5.0	0.5	C282E 273-20****+++
0.033	7.3	6.5	3.5	5.0	0.5	C282E 333-20****+++
0.039	7.3	6.5	4.8	5.0	0.5	C282E 393-20****+++
0.047	7.3	6.8	3.3	5.0	0.5	C282E 473-20****+++
0.056	7.3	7.0	4.2	5.0	0.5	C282E 563-20****+++
0.068	7.3	7.5	4.2	5.0	0.5	C282E 683-20****+++
0.082	7.3	7.5	4.5	5.0	0.5	C282E 823-20****+++
0.10	7.3	8.3	4.3	5.0	0.5	C282E 104-20****+++
0.12	7.3	8.5	5.0	5.0	0.5	C282E 124-20****+++
0.15	7.3	10.0	5.0	5.0	0.5	C282E 154-20****+++
0.18	7.3	11.0	5.2	5.0	0.5	C282E 184-20****+++
0.22	7.3	13.0	5.2	5.0	0.5	C282E 224-20****+++

- Note: 1. “-”=capacitance tolerance code, M=±20%,K=±10%,J=±5%
 2. “****”=lead form and packing code (refer to table 1).

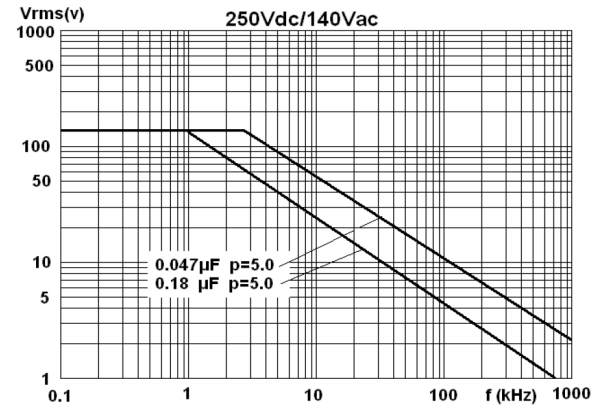
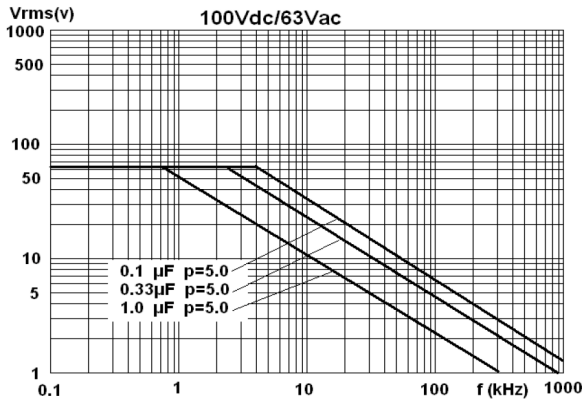
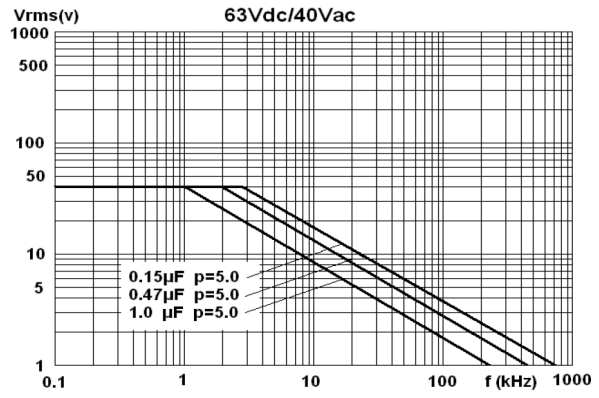
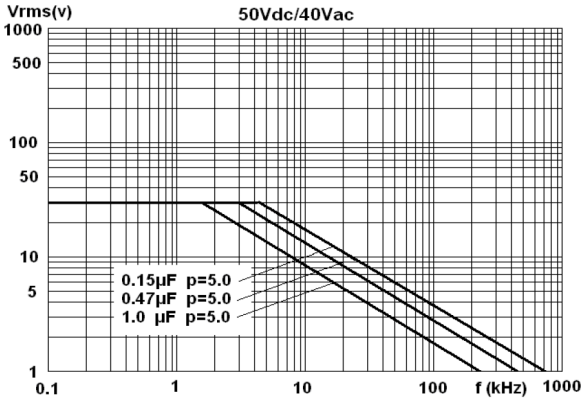
Maximum permissible voltage change per unit of time

Rated Voltage (V)	Max dv/dt(V/us)
50/63	250
100	300
250	100

Note:

- Rated voltage pulse slope (dv/dt)_R at rated voltage.
- If the working voltage(U) is lower than the rated voltage(U_R),the capacitor can be worked at a higher dv/dt. In this case, the maximum allowed dv/dt is obtain by multiplying the right value with U_R/U.

MAX. VOLTAGE(Vr.m.s) VERSUS FREQUENCY



Note: sinusoidal wave-form, environment temperature $\leq 75^{\circ}\text{C}$, internal temperature rise $\Delta T=10^{\circ}\text{C}$, p (pitch) in mm..

2 Test Method And Performance

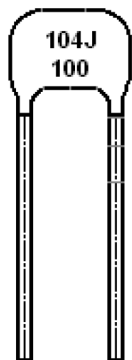
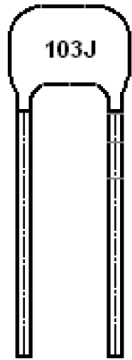
No.	Item	Performance	Test method (IEC60384-2)
1	Capacitance tolerance	J($\pm 5\%$), K($\pm 10\%$), M($\pm 20\%$)	1kHz, 3%U _R (V _{rms})max.
2	Tangent of the loss angle	tg δ \leq 0.010(1kHz) tg δ \leq 0.015(10kHz) tg δ \leq 0.030(100kHz, C<0.1 μ F)	1KHz or 10 KHz or 100 KHz \leq 3%U _R (V _{rms}) or 1 V _{rms} (whichever is the minor)
3	Dielectric strength	There shall be no breakdown or flashover.	1.4U _R , 5s
4	Insulation resistance	U _R \leq 100V C _R \leq 0.33 μ F, \geq 15 000M Ω C _R $>$ 0.33 μ F, \geq 5 000s U _R $>$ 100V C _R \leq 0.33 μ F, \geq 3 0000M Ω C _R $>$ 0.33 μ F, \geq 10 000s	U _R \leq 100V, Charging voltage 10V U _R $>$ 100V, Charging voltage 100V 20°C, measuring after applying voltage for 1 minute
5	Solderability	Good quality of tinning	Solder temperature:245°C \pm 5°C Immersion time: 2.0s \pm 0.5s
6	Initial measurement	Capacitance、Tg δ (10kHz)	
	Terminal strength	There shall be no visible damage	Tension U _{al} : Pull: ϕ d=0.5mm,5N; ϕ d=0.6mm,10N Bend U _b : The pull of bend: ϕ d=0.5mm, 2.5N ϕ d=0.6mm, 5N The terminals shall be bent 2 times in each direction.
	Resistance to solder heat at	There shall be no visible damage	Solder temperature:260°C \pm 5°C Immersion time: 10s \pm 1s
	Final measurement	Δ C/C \leq \pm 2%(relative to the initial value) Increase of tg δ : \leq 0.003(10kHz)	
7	Component's resistance of solvents	The dimensions shall reach the requirement of Table 1, and the change of capacitor weight shall not beyond 1%.	Solvent: Industrial isopropanol. Solvent temperature:23°C \pm 5°C Immersion time:5min \pm 0.5min Reverting time:48h
8	Initial measurement	Capacitance、Tg δ (10kHz)	
	Rapid change of temperature	There shall be no evidence of deterioration.	θ _A =-55°C, θ _B =+100°C 5 cycles, Duration: t=30min
	Vibration	There shall be no evidence of deterioration.	Amplitude 0.75mm or acceleration 98m/s ² (whichever is the smaller severity), f: 10Hz to 500Hz.Three directions, 2h foreach direction, total 6h.
	Bump	There shall be no evidence of deterioration.	4 000 times, Acceleration: 390m/s ² ,Pulse duration, 6ms
	Final measurement	Δ C/C \leq \pm 5%(relative to the initial value) Increase of tg δ : \leq 0.003 (10kHz) IR: \geq 50% of the rated value	
9	climate sequence	Initial measurement	Capacitance、Tg δ (10kHz)
		Dry heat	+100°C,16h

No.	Item	Performance	Test method (IEC60384-2)
9	Damp heat, Cyclic		Test Db, Severity: b, the first cycle
	Cold		-55°C, 2h
	Low air pressure	There shall be no permanent break down, flashover or other harmful deformation when applying U_R at the last 1 minute.	15°C~35°C, 8.5kPa, 1h,
	Damp heat, cyclic other		Test Db, Severity b, the other cycles, Applying U_R for 1 minute after the test finished.
	Final measurement	There shall be no evidence of deterioration and the marking shall be legible. $\Delta C/C \leq \pm 5\%$ (relative to the initial value) Increase of $\text{tg}\delta$: $\leq 0.005(10\text{kHz})$ IR: $\geq 50\%$ of the rated value	
10	Damp heat steady state	There shall be no evidence of deterioration and the marking shall be legible. $\Delta C/C \leq \pm 5\%$ (relative to the initial value) Increase of $\text{tg}\delta \leq 0.005(10\text{kHz})$ IR: $\geq 50\%$ of the rated value	Temperature: $40^\circ\text{C} \pm 2^\circ\text{C}$ Humidity: $93 \pm 2\%$ RH Duration: 56 days
11	Endurance	There shall be no evidence of deterioration and the marking shall be legible. $\Delta C/C \leq \pm 5\%$ (relative to the initial value) Increase of $\text{tg}\delta$: $\leq 0.003 (10\text{kHz})$ IR: $\geq 50\%$ of the rated value	Temperature: $+85^\circ\text{C}/+100^\circ\text{C}$ Voltage: $1.25 \times U_R / 1.25 \times U_c$ ($U_c = 0.8 U_R$) Duration: 2 000h
12	Temperature characteristic	Measuring capacitance at test point b, d, f: Characteristic at lower category temperature -55°C : $-10\% \leq (C_b - C_d) / C_d \leq 0\%$ Characteristic at upper category temperature $+105^\circ\text{C}$: $0\% \leq (C_f - C_d) / C_d \leq +10\%$ I.R. (test at point f): $U_R \leq 100\text{V}$: $\geq 75\text{M}\Omega$ ($C \leq 0.33\mu\text{F}$) $\geq 25\text{s}$ ($C > 0.33\mu\text{F}$) $U_R > 100\text{V}$: $\geq 150\text{M}\Omega$ ($C \leq 0.33\mu\text{F}$) $\geq 50\text{s}$ ($C > 0.33\mu\text{F}$)	Static method: The Capacitors should be kept at the following temperature in turn: a(20 ± 2) °C, b(-55 ± 3) °C, d(20 ± 2) °C, f($+105 \pm 2$) °C, g(20 ± 2) °C

No.	Item	Performance	Test method (IEC60384-2)
13	Charging and discharging	$\Delta C/C \leq \pm 5\%$ (relative to the initial value) Increase of $tg\delta$: ≤ 0.003 (10kHz, $C \leq 1.0\mu F$) ≤ 0.002 (1kHz, $C > 1.0\mu F$) IR: $\geq 50\%$ of the rated value	Times: 10 000 Duration of charging: 0.5s Duration of discharging: 0.5s Charging voltage: rated voltage Charging resistance: $220/C_R(\Omega)$ Discharging resistance: $R = 10/C_R(\Omega)$ or 20Ω (whichever is the greater) C_R : rated capacitance (μF)

Note: Please test it follow the serial number.

3 Marking



4 Taping specification for box-type capacitor

■ Outline Drawing

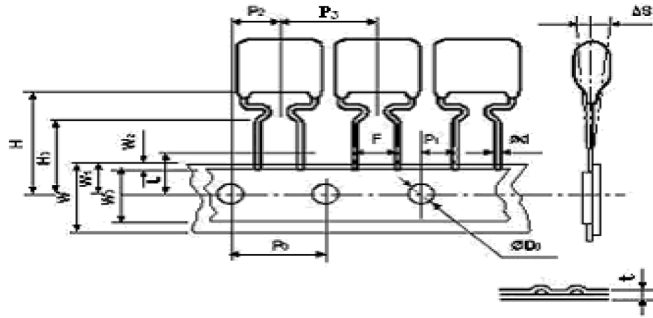


Fig.1

■ Taping Dimensions(mm)

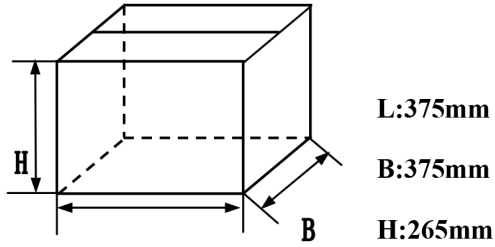
Technology index title	代号	尺寸(mm)		
		P=5.0	P=7.5	误差
Taping type	—	Fig 1	Fig 1	—
Part number Digit12-15	Ammo-pack	A21A	A31A	
Taping pitch	P ₃	12.7	12.7	±1.0
Feed hole pitch	P ₀	12.7	12.7	±0.3
Center of wire	P ₁	3.85	2.60	±0.7
Center of body	P ₂	6.35	6.35	±1.3
Pitch of taping wire	F	5.0	7.5	+0.8 -0.2
Component alignment	△S	0	0	±2.0
Height of crangle from tape center	H	20.0	20.0	±1.0
Height of component from tape center	H ₀	16.0	16.0	±0.5
Carrier tape width	W	18.0	18.0	+1.0 -0.5
Hold down tape width	W ₀	13	13	±0.5
Hole position	W ₁	9.0	9.0	+0.75 -0.5
Hold down tape sition	W ₂	≤3	≤3	—
Feed hole dia.	D ₀	4.0	4.0	±0.3
Tape thickness	t	0.7	0.7	±0.2

Note: * P₀=15mm is also available

5 Packing in bulk

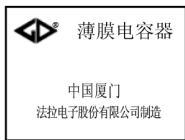
5 Packing in bulk

5.1 Out packing box for bulk

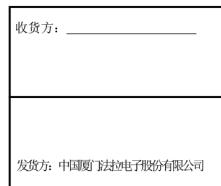


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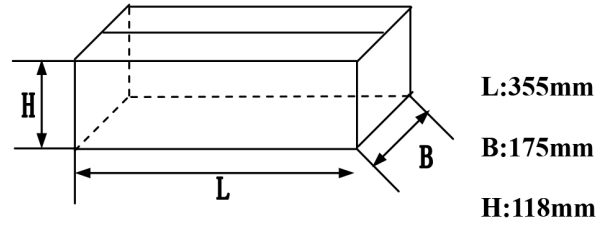
Plane drawing



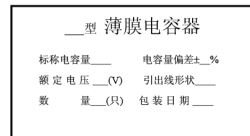
Overlooking Drawing



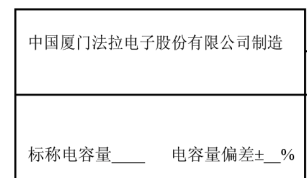
5.2 Inner packing box for bulk



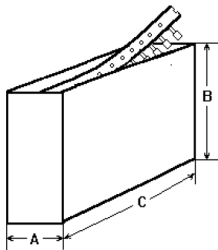
Plane drawing



Overlooking Drawing



5.3 (Box size for Ammo-pack)



A=48±3; B=260±3; C=330±3