SPECIFICATION FOR APPROVAL

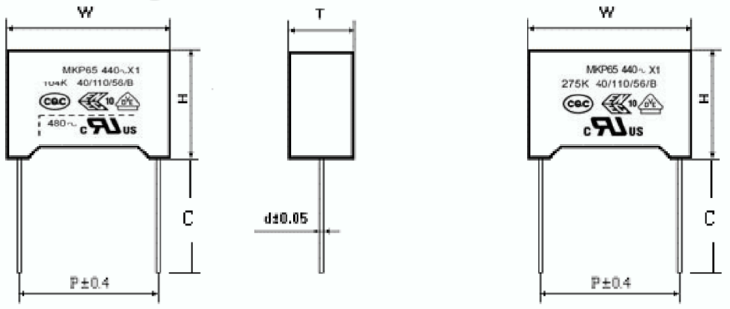
File No.: Q/FRK 0.GS.E.C45-C07

Product Name	Metallized Polypropylene Film Interference Suppression Capacitor (Class X1: 440Vac)
Product Type	MKP65
Type Code	C45
Product Code	
Customer	
Customer Code	
Issue Date	2012-10

Surge Components, Inc.
95 E. Jefryn Blvd
Deer Park, NY 11729
www.surgecomponents.com

Metallized polypropylene film interference suppression capacitor (Class X1, 440Vac)

■ Outline Drawing



$C_R \leq 2.2\mu F$ $C_R > 2.2\mu F$

W±0.4mm, H±0.4mm, T±0.4mm

■ Features

- Compact size
- Withstanding overvoltage stressing
- Excellent active and passive flame resistant abilities
- Widely used in across-the-line, interference suppression circuit, etc.

■ Safety Approvals

•	CQC	CQC	GB/T 14472-1998, X1, 440 Vac, 0.0047μF~4.7μF , 40/110/56/B Certificate No.: CQC06001016942
•	ENEC-VDE	ENEC-VDE	EN 60384-14:2005, X1, 440Vac, 0.0047μF~4.7μF, 40/110/56/B Certificate No.: 40021925
•	c UL us	UL/CUL	UL60384-14:2009, CSA E60384-14:09, X1, 440Vac, 0.0047μF~4.7μF, 40/110/56/B Certificate No.: E186600, CCN: FOWX2/8
			UL1283, CSA C22.2 No.8, 480 Vac, 0.0047μF ~ 2.2μF Certificate No.: E186662, CCN: FOKY2/8
•	**CB TEST CERTIFICATE**		EC 60384-14:2005, X1, 440Vac, 0.0047μF~4.7μF, 40/110/56/B Certificate No.: DE1-46955

■ Specifications

Class	Class X1		
Climatic Category / Passive Flammability Category	40/110/56/B		
Operating Temperature Range	-40℃ ~ +110℃		
Rated Voltage (U_R)	440 Vac, 50/60Hz		
Maximum continuous AC voltage	525 Vac, 50/60Hz		
Maximum continuous DC voltage	1 000 Vdc		
Capacitance Range	0.0047μF~4.7μF		
Capacitance Tolerance	±10%(K), ±20%(M)		
Voltage Proof	Between Terminals:	3400 (Vdc) (2s)	
	Between Termianls To Case:	2550 (Vac) (1min)	
Insulation Resistance	R≥15 000MΩ , $C_R \leq 0.33\mu F$ RC≥5 000s, $C_R > 0.33\mu F$	(20℃, 100V ,1min)	
Dissipation Factor	0.0010μF <$C_R \leq 0.47\mu F$	$\leq 10\times10^{-4}$(1kHz,20℃)	$\leq 20\times10^{-4}$(10kHz,20℃)
	0.47μF<$C_R \leq 1.0\mu F$	$\leq 20\times10^{-4}$(1kHz,20℃)	$\leq 40\times10^{-4}$(10kHz,20℃)
	1.0μF<C_R	$\leq 30\times10^{-4}$(1kHz,20℃)	----------

■ Part number system

The 18 digits part number is formed as follow:

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

Digit 1 to 3 Series code

C45=MKP65

Digit 4 to 5 A.C. rated voltage

S1=440V

Digit 6 to 8 Rated capacitance value

For example : 103=10×10^3 pF= 0.01μF

Digit 9 Capacitance tolerance

K=±10%, M=±20%

Digit 10 Pitch

4=10.0mm 6=15.0mm 9=22.5mm

B=27.5mm F=37.5mm

Digit 11 Internal use

Digit 12 to 15 Lead form and packaging code

Digit 16 to 18 Internal use

Table1 Lead form and packaging code

Digit 12		Digit 13		Digit 14		Digit 15	
code	explanation	code	explanation	code	explanation	code	explanation
A	ammo-pack	4 6	F=10.0mm F=15.0mm	0	straight	5	P3=25.4mm;H=18.5mm (For pitch=10/15mm)
C	straight lead "C" in the figure above	code	explanation			0	Length tolerance ±0.5mm Or standard length
		00 45 35 32	standard lead length (18mm~26mm) lead length 4.5mm lead length 3.5mm lead length 3.2mm				

■ Dimensions(mm)

440Vac						
C_R (μF)	W ±0.4	H ±0.4	T ±0.4	P ±0.4	d	Part number
0.0047	13.0	9.0	4.0	10.0	0.6	C45S1472-4S****+++
0.0056	13.0	9.0	4.0	10.0	0.6	C45S1562-4S****+++
0.0068	13.0	9.0	4.0	10.0	0.6	C45S1682-4S****+++
0.0082	13.0	9.0	4.0	10.0	0.6	C45S1822-4S****+++
0.010	13.0	9.0	4.0	10.0	0.6	C45S1103-4S****+++
0.012	13.0	11.0	5.0	10.0	0.6	C45S1123-4S****+++
0.015	13.0	11.0	5.0	10.0	0.6	C45S1153-4S****+++
0.018	13.0	11.0	5.0	10.0	0.6	C45S1183-4S****+++
0.022	13.0	11.0	5.0	10.0	0.6	C45S1223-4S****+++
0.027	13.0	12.0	6.0	10.0	0.6	C45S1273-4S****+++
0.033	13.0	12.0	6.0	10.0	0.6	C45S1333-4S****+++
0.039	13.0	13.0	7.0	10.0	0.6	C45S1393-4S****+++
0.047M	13.0	13.0	7.0	10.0	0.6	C45S1473M4S****+++
0.047K	13.0	14.0	8.0	10.0	0.6	C45S1473K4S****+++
0.056	13.0	14.0	8.0	10.0	0.6	C45S1563-4S****+++
0.010	17.5	9.5	5.0	15.0	0.6	C45S1103-6S****+++
0.012	17.5	9.5	5.0	15.0	0.6	C45S1123-6S****+++
0.015	17.5	9.5	5.0	15.0	0.6	C45S1153-6S****+++
0.018	17.5	9.5	5.0	15.0	0.6	C45S1183-6S****+++
0.022	17.5	9.5	5.0	15.0	0.6	C45S1223-6S****+++
0.027	17.5	11.0	5.0	15.0	0.6	C45S1273-6S****+++
0.033	17.5	11.0	5.0	15.0	0.6	C45S1333-6S****+++
0.039	17.5	12.0	6.0	15.0	0.6	C45S1393-6S****+++
0.047	17.5	12.0	6.0	15.0	0.6	C45S1473-6S****+++
0.056M	17.5	12.0	6.0	15.0	0.6	C45S1563M6S****+++
0.056K	17.5	12.0	7.0	15.0	0.6	C45S1563K6S****+++
0.068	17.5	13.5	7.5	15.0	0.6	C45S1683-6S****+++
0.068	18.0	12.0	13.0	15.0	0.8	C45S1683-6C****+++
0.082	17.5	14.0	8.0	15.0	0.6	C45S1823-6S****+++
0.10M	17.5	14.0	8.0	15.0	0.6	C45S1104M6S****+++
0.10K	17.5	14.5	8.5	15.0	0.6	C45S1104K6S****+++
0.12	17.5	16.0	10.0	15.0	0.8	C45S1124-6S****+++
0.15M	17.5	16.0	10.0	15.0	0.8	C45S1154M6S****+++
0.15K	17.5	19.0	11.0	15.0	0.8	C45S1154K6S****+++
0.18	17.5	19.0	11.0	15.0	0.8	C45S1184-6S****+++
0.039	26.5	15.0	6.0	22.5	0.8	C45S1393-90****+++
0.047	26.5	15.0	6.0	22.5	0.8	C45S1473-90****+++
0.056	26.5	15.0	6.0	22.5	0.8	C45S1563-90****+++
0.068	26.5	15.0	6.0	22.5	0.8	C45S1683-90****+++
0.082	26.5	15.0	6.0	22.5	0.8	C45S1823-9S****+++
0.10	26.5	15.0	6.0	22.5	0.8	C45S1104-9S****+++
0.12	26.5	15.0	6.0	22.5	0.8	C45S1124-9S****+++
0.15	26.5	16.0	7.0	22.5	0.8	C45S1154-9S****+++
0.18	26.5	17.0	8.5	22.5	0.8	C45S1184-9S****+++
0.22	26.5	17.0	8.5	22.5	0.8	C45S1224-9S****+++
0.27	26.5	18.5	10.0	22.5	0.8	C45S1274-9S****+++
0.33	26.5	20.0	11.0	22.5	0.8	C45S1334-9S****+++
0.39	26.5	20.0	11.0	22.5	0.8	C45S1394-9S****+++
0.47M	26.5	22.0	12.0	22.5	0.8	C45S1474M9S****+++
0.47K	26.5	23.0	13.5	22.5	0.8	C45S1474K9S****+++
0.56M	26.5	23.0	13.5	22.5	0.8	C45S1564M9S****+++
0.56K	26.5	24.5	15.5	22.5	0.8	C45S1564K9S****+++
0.68	26.5	24.5	15.5	22.5	0.8	C45S1684-9S****+++

440Vac						
C_R (μF)	W ±0.4	H ±0.4	T ±0.4	P ±0.4	d	Part number
0.15	32.0	18.0	9.0	27.5	0.8	C45S1154-B0****+++
0.18	32.0	18.0	9.0	27.5	0.8	C45S1184-B0****+++
0.22	32.0	18.0	9.0	27.5	0.8	C45S1224-B0****+++
0.27	32.0	18.0	9.0	27.5	0.8	C45S1274-BS****+++
0.33	32.0	18.0	9.0	27.5	0.8	C45S1334-BS****+++
0.33	32.0	12.0	18.0	27.5	0.8	C45S1334-BC****+++
0.39	32.0	20.0	11.0	27.5	0.8	C45S1394-BS****+++
0.47	32.0	20.0	11.0	27.5	0.8	C45S1474-BS****+++
0.47	32.0	12.0	22.0	27.5	0.8	C45S1474-BC****+++
0.56	32.0	22.0	13.0	27.5	0.8	C45S1564-BS****+++
0.68M	32.0	22.0	13.0	27.5	0.8	C45S1684MBS****+++
0.68K	32.0	25.0	13.0	27.5	0.8	C45S1684KBA****+++
0.68K	32.0	24.5	15.0	27.5	0.8	C45S1684KBS****+++
0.68	32.0	16.0	22.0	27.5	0.8	C45S1684-BC****+++
0.82M	32.0	25.0	13.0	27.5	0.8	C45S1824MBS****+++
0.82K	32.0	24.5	15.0	27.5	0.8	C45S1824KBS****+++
0.82K	32.0	28.0	14.0	27.5	0.8	C45S1824KBA****+++
1.0M	32.0	16.0	27.5	27.5	0.8	C45S1105MBC****+++
1.0K	32.0	18.5	31.0	27.5	0.8	C45S1105KBC****+++
1.0	32.0	28.0	17.0	27.5	0.8	C45S1105-BA****+++
1.0	32.0	30.0	16.0	27.5	0.8	C45S1105-BS****+++
1.2M	32.0	30.0	16.0	27.5	0.8	C45S1125MBS****+++
1.2M	32.0	28.0	17.0	27.5	0.8	C45S1125MBA****+++
1.2K	32.0	29.0	19.0	27.5	0.8	C45S1125KBA****+++
1.2K	32.0	33.0	18.0	27.5	0.8	C45S1125KBS****+++
1.5M	32.0	29.0	19.0	27.5	0.8	C45S1155MBA****+++
1.5M	32.0	18.5	31.0	27.5	0.8	C45S1155MBC****+++
1.5	32.0	33.0	18.0	27.5	0.8	C45S1155-BS****+++
1.8	32.0	37.0	22.0	27.5	0.8	C45S1185-BS****+++
2.2M	32.0	37.0	22.0	27.5	0.8	C45S1225MBS****+++
0.33	41.0	22.0	11.0	37.5	1.0	C45S1334-F0****+++
0.39	41.0	22.0	11.0	37.5	1.0	C45S1394-F0****+++
0.47	41.0	22.0	11.0	37.5	1.0	C45S1474-FS****+++
0.56	41.0	22.0	11.0	37.5	1.0	C45S1564-FS****+++
0.68	41.0	22.0	11.0	37.5	1.0	C45S1684-FS****+++
0.82M	41.0	22.0	11.0	37.5	1.0	C45S1824MFS****+++
0.82K	41.0	24.0	13.0	37.5	1.0	C45S1824KFS****+++
1.0	41.0	24.0	13.0	37.5	1.0	C45S1105-FS****+++
1.0	42.0	15.0	24.0	37.5	1.0	C45S1105-FC****+++
1.2	41.0	26.0	15.0	37.5	1.0	C45S1125-FA****+++
1.2	42.0	28.0	14.0	37.5	1.0	C45S1125-FS****+++
1.5M	41.0	26.0	15.0	37.5	1.0	C45S1155MFA****+++
1.5M	42.0	28.0	14.0	37.5	1.0	C45S1155MFS****+++
1.5K	41.0	30.0	16.0	37.5	1.0	C45S1155KFS****+++
1.5	42.0	19.0	24.0	37.5	1.0	C45S1155-FC****+++
1.8M	41.0	30.0	16.0	37.5	1.0	C45S1185MFS****+++
1.8K	41.0	32.0	17.0	37.5	1.0	C45S1185KFS****+++
2.2M	41.0	32.0	17.0	37.5	1.0	C45S1225MFA****+++
2.2	41.0	33.5	18.5	37.5	1.0	C45S1225-FS****+++
2.7	41.0	37.0	22.0	37.5	1.0	C45S1275-FS****+++
3.3M	41.0	37.0	22.0	37.5	1.0	C45S1335MFS****+++
3.3K	41.0	41.0	26.0	37.5	1.0	C45S1335KFS****+++
3.3K	41.5	37.5	27.5	37.5	1.0	C45S1335KFA****+++
3.9	41.0	41.0	26.0	37.5	1.0	C45S1395-FS****+++
3.9	41.5	37.5	27.5	37.5	1.0	C45S1395-FA****+++
4.7M	41.0	43.0	28.0	37.5	1.0	C45S1475MFS****+++
4.7K	42.0	45.0	30.0	37.5	1.0	C45S1475KFS****+++

Note: 1. "-"=capacitance tolerance code, M=±20%,K=±10%

2. "****"=lead form and packaging code (refer to table 1)

■ Maximum permissible voltage change per unit of time

Rated Voltage（Vac）	dV/dt(V/us) at 680 Vdc				
	P=10mm	P=15mm	P=22.5mm	P=27.5mm	P=37.5mm
440	750	600	300	225	150

Note: 1. Rated voltage pulse slope $(dV/dt)_R$ at rated voltage.

2. 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.

■ Test Method And Performance

No.	Item		Performance	Test Method (GB/T14472，IEC 60384-14)
1	4.5 Solderability		Good quality of tinning	Solder temperature: 245°C ±5°C Immersion time: 2.0s±0.5s
2	4.3 Terminal strength		There shall be no visible damage	Tense: 0.50<d≤0.80, 10N 0.80<d≤1.25, 20N Bend: 0.50<d≤0.80, 5N 0.80<d≤1.25, 10N The terminals shall be bent 2 times in each direction
3	4.4 Resistance to solder heat		There shall be no visible damage ΔC/C ≤±5%(relative to the initial value)	Solder temperature:260°C±5°C Immersion time: 10s±1s
4	4.20 Solvent resistance of the marking		The marking shall be legible	Solvent: Industrial isopropanol. Solvent temperature:23°C±5°C Dipping time: 5min±0.5min Condition: scrub Scrub material: absorbent cotton Reverting time: No
5	4.2 Initial measurement		Capacitance, Tgδ	
	4.6 Rapid change of temperature		There shall be no evidence of deterioration.	θ_A=-40°C, θ_B =+110°C 5 cycles Duration: t=30min
	4.7 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 for each direction,total 6h.
	4.8 Bump		There shall be no evidence of deterioration.	4 000 times, Acceleration: 400m/s^2, Pulse duration, 6ms
	Final measurement		There shall be no visible damage ΔC/C ≤±5%(relative to the initial value)	
6	4.11 Climate sequence	Initial measurement		
		Dry heat		+110℃, 16h
		Damp heat, Cyclic		Test Db, Severity: b, the first cycle
		Cold		-40℃, 2h
		Damp heat, cyclic other		Test Db, Severity b, the other cycles
		Final measurement	There shall be no visible damage, legible marking ΔC/C ≤±5%(relative to the initial value) Increase of tgδ: C_R≤1μF: ≤0.008 (10kHz) C_R>1μF: ≤0.005 (1kHz) Dielectric strength : there shall be no permanent breakdown or flashover I.R.: ≥ 50% of the rated value	

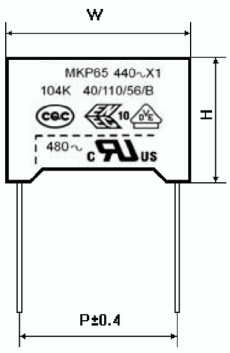
No.	Item	Performance	Test Method (GB/T14472，IEC 60384-14)
7	4.12 Damp heat steady state	There shall be no visible damage, legible marking ΔC/C ≤±5%(relative to the initial value) Increase of tgδ: C_R≤1μF: ≤0.008 (10kHz) C_R>1μF: ≤0.005 (1kHz) Dielectric strength : there shall be no permanent breakdown or flashover I.R.: ≥ 50% of the rated value	Temperature: 40˚C ±2˚C Humidity: 93^{+2}_{-3} %RH Duration: 56 days
8	4.13 Impulse voltage	There are three or more waveforms which indicate that no self-heating breakdown have occurred when it is monitored by the monitor	Each individual capacitor shall be subjected to 24 impulses of the same polarity (when any three successive impulses are shown by the monitor to have a wave form indicating that no self-healing breakdown have taken place the impulses can be stopped), the time between impulses shall not be less than 10s, and the peak value of the voltage impulse: 4.0kV (suitable for C_R≤1μF; When C_R>1μF, the capacitor can endure pulse voltage value is $4.0/\sqrt{C_R}$ kV)
9	4.14 Endurance	There shall be no visible damage, legible marking ΔC/C≤±10%(relative to the initial value) Increase of tgδ: C_R≤1μF: ≤0.008 (10kHz) C_R>1μF: ≤0.005 (1kHz) Dielectric strength : There shall be no breakdown or flashover I.R. : ≥ 50% of the rated value	+110˚C, 1.25U_RVa.c., 1 000h The voltage shall be subjected to 1000Vrms for 0.1s every one hour during test.
10	4.15 Charging and discharging	ΔC/C≤±10%(relative to the initial value) Increase of tgδ: C_R≤1μF: ≤0.008 (10kHz) C_R>1μF: ≤0.005 (1kHz) I.R.: ≥ 50% of the rated value	Times: 10 000 Duration of charging: 0.5s Duration of discharging: 0.5s Charging voltage: $\sqrt{2}U_R$ Vd.c. Charging resistance: 220/C_R(Ω) or the current ≤1.0A (whichever is the minor) Discharging resistance: $R=\frac{\sqrt{2}U_R}{C_R\times\frac{dU}{dt}}(\Omega)$ C_R: Capacitance (μF)
11	4.17 Passive flammability	The flaming time of each capacitor shall not go beyond 10s after it is taken apart from the flame. Drop of each capacitor caused by flame shall not fire the tissue below.	Ref.item 4.17 Needle flame test The category of flammability: B Expose time: 1 time Capacitor Volume Exposing time 250<V(mm^3)≤500 20s 500<V(mm^3)≤1750 30s V(mm^3)>1750 60s

No.	Item	Performance	Test Method (GB/T14472，IEC 60384-14)
12	4.18 Active flammability	The cheese cloth around the capacitor shall not burn with a flame.	The specimens shall be individually wrapped in at least 1,but not more than 2, complete layers of cheesecloth, the cheesecloth shall be untreated pure cotton cloth. Each sample shall be subjected to 20 discharged, the interval between successive discharges shall be 5s. U_i=4.0kV $^{+7}_{0}$ % U_R be applied and be maintained for 120 $^{+10}_{0}$ s after the last discharge.

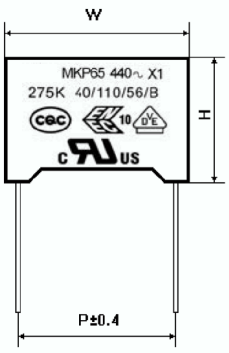
■ Quality ensuring test (before shipment):

Inspection item（each batch）	Inspection level （GB/T 2828.1，ISO2859-1）	
	IL	AQL
Appearance inspection	II	1.5%
Dimensions		
Capacitance	II	0.25%
Tangent of the loss angle		
Dielectric strength		
Insulation resistance		
Solderability	S-3	2.5%

■ Marking



$C_R \leqslant 2.2\mu F$



$C_R > 2.2\mu F$

Marking Introduction:

Sign	explain	Sign	explain
	Brand	40/110/56/B	Climate category / Passive Flammability Class
MKP65	Type		CQC Approval
440~	Rated voltage		ENEC-VDE Approval
X1	Class		UL&CUL Approval
104K/275K	Rated capacitance and tolerance	480~	Rated voltage(UL/CUL)

■ Taping specification for box-type capacitors

▲ Outline Drawing

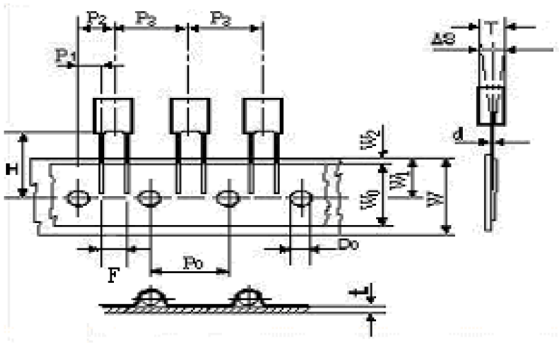


Fig.1 P=5.0、7.5mm

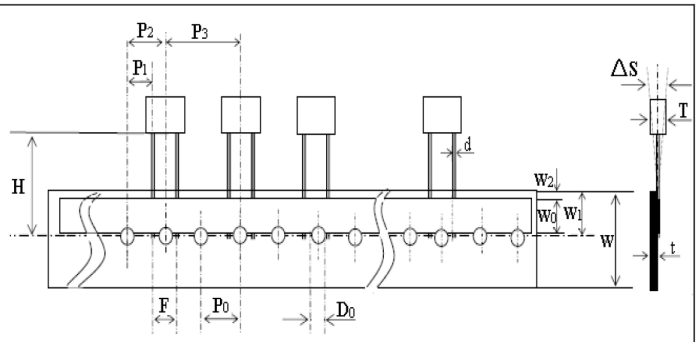


Fig.2 P=10.0、15.0mm

▲ Taping Dimensions(mm)

Technology index title	Code	Dimensions				
		P=5.0	P=7.5	P=10.0	P=15.0	Tolerance
Taping type	—	Fig 1	Fig 1	Fig2	Fig 2	——
Part number Digit12-15	Ammo-pack	A201	A301	A405	A605	
Taping pitch	P_3	12.7	12.7	25.4	25.4	±1.0
Feed hole pitch	P_0	12.7	12.7	12.7	12.7	±0.2
Center of wire	P_1	3.85	2.6	7.7	5.2	±0.7
Center of body	P_2	6.35	6.35	12.7	12.7	±1.3
Pitch of taping wire	F**	5.0	7.5	10.0	15.0	+0.6 -0.1
Component alignment	△S	0	0	0	0	±2.0
Height of component from tape center	H***	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18.0	18.0	18.0	18.0	+1.0 -0.5
Hold down tape width	W_0	6min	10min	10min	10min	——
Hole position	W_1	9.0	9.0	9.0	9.0	±0.5
Hold down tape sition	W_2	3max	3max	3max	3max	——
Feed hole dia.	D_0	4.0	4.0	4.0	4.0	±0.2
Tape thickness	t	0.7	0.7	0.7	0.9	±0.2

▲ Packing Quantity

Pitch (mm)	Box thinkness T(mm)	Ammo-pack (pcs/box)	
		Domestic	Export
5.0	2.5	2500	2 000
	3.5	1 700	1 500
	4.5	1 400	1 300
	5.0	1 200	1 000
	6.0	1 000	800
7.5	3.5	1 700	1 500
	4.0	1 500	1 300
	5.0	1 200	1 000
	6.0	1 000	800
10.0/ 15.0	4.0	750	650
	5.0	600	500
	6.0	500	450
15.0	7.5	400	350
	8.5	350	300
	10.0	300	250
	11.0	250	200

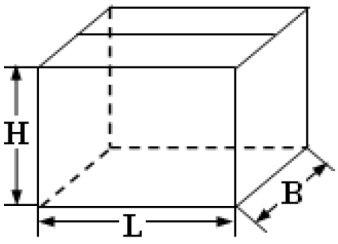
Note: * P_0=15mm is also available;

**F can be other lead spacing;

***H=16.5mm is available;

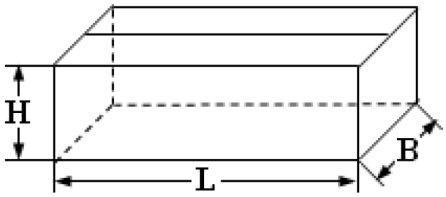
■ Packing box sizes(mm)

1. Out packing box for bulk



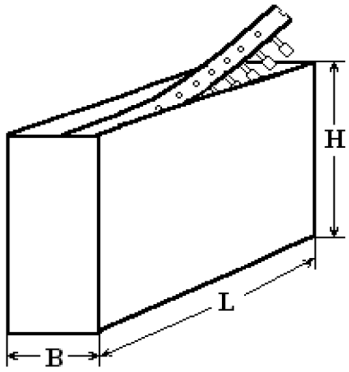
L:375±5
B:375±5
H:265±5

2. Inner packing box for bulk



L:355±3
B:175±3
H:118±3

3. Box sizes for Ammo-pack



L:330±3
B:48±3
H:260±3