

# THERMAL PRINT HEAD

## H Y208-FD2

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### 1. Description

This specification is applied to HY208-FD2 thermal print head.

### 2. Scope

The HY208-FD2 is a thermal print head which has heat elements which produce 1664 dots with 8 dots/mm by means of a high density thick film process. It also includes C-MOS ICs; Which operate as 1664 bits shift-registers, latches and switching transistors to drive heat elements.

### 3. Outline

Item	Specification	Note
Dimension	Fig.5	
Schematic diagram	Fig.3	
Pin assignment	Table.3	
Print width	208 mm	
Number of heaters	1664 dots	
Heater resolution	8 dots/mm	
Heater pitch	0.125 mm	
Printed dot dimension	0.11mm×0.13 mm	Nominal
Heater resistance	$\bar{R}=3500\Omega \pm 3\%$ $R=\bar{R} \pm 15\%$	
Specifications for driver ICs	Table.2	
Number of driver ICs	64bits ×26	
Number of data inputs	1 serial input	
Number of strobes	3	
Logic power supply	3.3 V ×70.2mA	at 4 MHz
Specification for Thermistor	$R_{25}=30K\Omega \pm 5\%$ , $B=3,950K \pm 3\%$	Table. 1

### 4. Maximum ratings

Parameter	Symbol	Specification	Note
Heater energy consumption	Eomax	0.73 mJ/dot	10 ms/line
Head voltage	VH	25.2 V	Between Connectors
Logic voltage	Vdd	Vdd=+3.3V±0.3V	
Environment temperature	Ta	- 5 °C ~ +45 °C	Operating
		- 25 °C ~ +85 °C	Non-operating
Environment humidity		10 ~ 90%RH	Non-condensing
Maximum operating temperature	Ts	80 °C 30min. MAX	
		Detected temperature of Thermistor shall not exceed 80 °C.	Head temperature shall not exceed 85°C.

**5. Standard printing conditions**

Parameter	Symbol	Recommended operating conditions				Note	
		1 0 ms/line					
Heater power consumption	Po	0.15W/dot				$\bar{R}=3500\Omega$	
Heat voltage	VH	24 V				Connectors	
Heater energy consumption	Eo (ts)	5°C	0.38mJ/dot (2.6ms)	0.41mJ/dot (2.8ms)	0.43mJ/dot (2.9 ms)	0.40mJ/dot (2.7ms)	$\bar{R}=3500\Omega$ (Note 1)
		25°C	0.33mJ/dot (2.2ms)	0.36mJ/dot (2.4ms)	0.38mJ/dot (2.6ms)	0.35mJ/dot (2.3ms)	
		40°C	0.29mJ/dot (1.9ms)	0.31mJ/dot (2.1 ms)	0.33mJ/dot (2.2 ms)	0.30mJ/dot (2.0ms)	
Supply current	Io	6.5mA/dot				$\bar{R}=3500\Omega$	
Timing chart		Fig. 2					
Platen pressure		29.4 ~39.2N/ TPH					
Platen hardness		30~40deg					
Platen diameter		Φ12 Max.					
Scanning resolution		7.7 line/mm					
Thermal paper		F24OAC MITSUBISHI PAPER MILL CO., LTD.	KF060-FEAH NEW OJI PAPER CO., LTD.	F70NA FUJI PHOTOFILM CO., LTD.	FV230A1 MITSUBISHI PAPER MILL CO., LTD.		
Optical density		1.1 OD Min.				(Note 2)	

(Note 1) Supply energy is defined by the following formula.

$$E_o = I_o^2 \bar{R} t_s = \frac{(VH - V_{com})^2 \cdot \bar{R} \cdot t_s}{(\bar{R} + R_{ic})^2}$$

- $R_{ic} = 112\Omega$  : Driver IC “ON” resistance
- $t_s$  : Strobe printing pulse width
- $VH$  : Heat voltage
- $\bar{R}$  : Heater average resistance
- $V_{com} = 0.5V$  : Common electrode voltage drop

(Note 2) Printed optical density is measured at 10mm intervals after the starting point. A RD-914 reflector optical density meter or equivalent measure printed optical density.

**6. Life expectancy**

**6.1** The life expectancy under 12.5% printing duty of less at 25°C is defined by the following whichever earlier comes.

Item	Specification	Note
Number of pulses	$1 \times 10^8$ pulses	
Run length	30 Km	

**6.2** MTBF:329,346Hr (reference 0.30% / year...Annual Rate of Breakdown)

## 7. Warning during use

### 7.1 Strobe signal

During head power supply ON/OFF sequence strobes should be kept "disable".

### 7.2 Stability of IC operation

Care should be taken for stable operation of driver ICs as indicated bellow. (Fig.1)

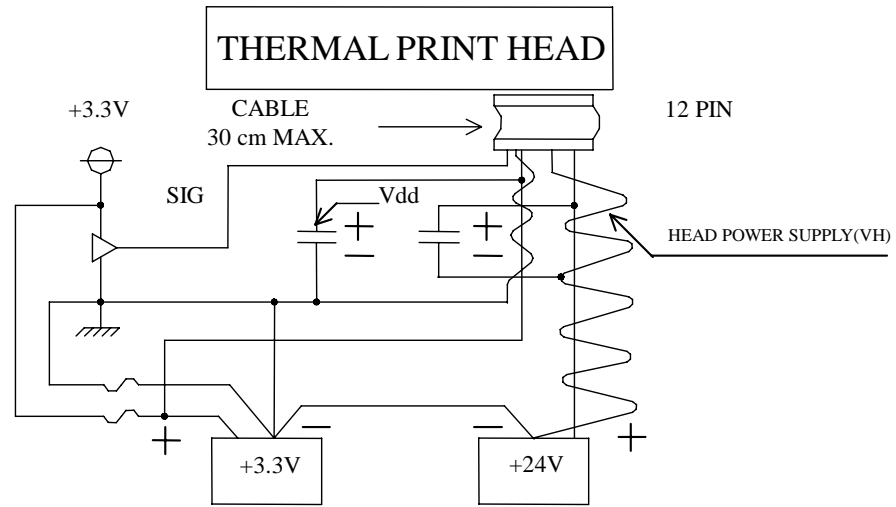
- (1) Insert a capacitor (100  $\mu$ F) for low frequency noise reduction between Vdd (+5V) and GND.
- (2) If the voltage including surge exceeds maximum rating of driver IC, the TPH may burn out by latch-up. Care should be taken especially when head current changes by strobes or at the ON/OFF sequence. The voltage shall be kept within the following voltage.

VH	: 0V ~ +28V
Vdd	: 0V ~ +6.5V
Other signals	: GND -0V ~ Vdd+0.3V

For surge suppression it is recommended to insert a capacitor of 220 $\mu$ F between VH and GND.

- 7.3 The heater and driver ICs are electrostatically sensitive. Care should be taken not to touch connectors with hands or an electrostatically charged object. It is recommended that brushes near the head be provided to discharge electrostatic build up.
- 7.4 On the surface near the heater, do not apply any hard material. The abrasion resistant layer is fragile to mechanical impact.
- 7.5 Ink dregs adhered to the heater should be wiped off softly with a soft cloth dipped alcohol or detergent. Do not use sandpaper or equivalent.
- 7.6 Keep hard particles out of the heater surface. Hard particles may scratch the abrasion resistant layer.
- 7.7 It is recommended that the length of cable be minimized and a flat cable with shield be made use of. Cable length exceeding 30cm may cause noise.
- 7.8 Wiring resistance between power supply and connectors should be kept within 10m $\Omega$  for VH and GND individually.
- 7.9 When connect the TPH and a cable; protect the connector and circuit board from the insert forth.
- 7.10 Maximum number of heaters for simultaneous is 576.
- 7.11 When the printer is on standby, the thermal head (VH) must be switched off.

**Fig. 1 Recommend Connection**



**Table. 1 Thermistor**

$$R_{25} = 30K\Omega \pm 5\%, B_{CONST} = 3950\text{kelvin} \pm 3\%, R = R_{25}e^{B(1/T - 1/T_{25})}$$

Temperature ( ° C )	Thermistor Resistance (R)		
	Min. (KΩ)	Typ. (KΩ)	Max. (KΩ)
-40.0	717	843	989
-35.0	535	623	723
-30.0	405	466	535
-25.0	308	352	400
-20.0	238	269	303
-15.0	185	208	232
-10.0	145	161	178
-5.0	113	124	137
0.0	88.7	96.8	105
5.0	69.9	75.7	81.7
10.0	55.4	59.5	63.8
15.0	44.1	47.1	50.1
20.0	35.4	37.5	39.6
25.0	28.5	30.0	31.5
30.0	22.8	24.2	25.5
35.0	18.3	19.6	20.8
40.0	14.9	15.9	17.1
45.0	12.1	13.1	14.1
50.0	9.92	10.8	11.7
55.0	8.16	8.91	9.7
60.0	6.76	7.41	8.12
65.0	5.62	6.2	6.83
70.0	4.7	5.21	5.77
75.0	3.95	4.4	4.9
80.0	3.34	3.74	4.18

**Table 2 C-MOS Driver IC**

**Table 2.1** Electrical characteristics for driver IC.

Absolute maximum ratings for driver ICs.

Parameter	Symbol	Test conditions	Ratings	Unit
Supply voltage	$V_{dd}$	Surge	-0.4 ~ 7.0	V
	$VH$	Surge	0 ~ 36	V
Input voltage for logic	$V_{IN}$		-0.5 ~ $V_{dd} + 0.5$	V

Recommended operating conditions ( $V_{dd} = 5V \pm 10\%$   $T_a = -10 \sim 80^\circ C$ )

Parameter	Symbol	Test conditions	Recommendations			Unit
			Min.	Typ.	Max.	
Supply voltage	$V_{dd}$		3.0	3.3	3.6	V
	$VH$	Supply voltage for VH			28	V
Input voltage for logic	$V_{IH}$	(Note 1)	$0.7 \times V_{dd}$		$V_{dd}$	V
	$V_{IL}$		0		$0.3 \times V_{dd}$	V
Clock frequency	$f_{CLK}$		-	-	5.0	MHz

(Note 1) Recommended driver IC is 74HC244 or equivalent.

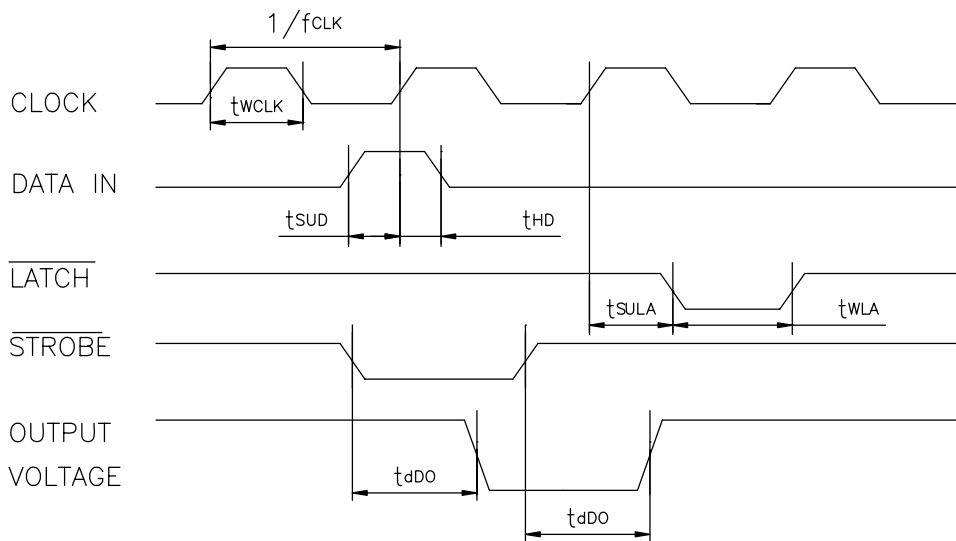
**Table 2.2** Electrical characteristics for driver IC. ( $V_{dd} = 3.3V \pm 10\%$   $T_a = -10 \sim 80^\circ C$ )

Parameter	Symbol	Test conditions	Ratings			Unit	
			Min.	Typ.	Max.		
Input current	$\overline{LATCH}$	(Note 1) $I_{IH}$	$V_{IH} = V_{dd}$			13	$\mu A$
	$\overline{STROBE}$					4.5	$\mu A$
	CLOCK					13	$\mu A$
	DATA IN					0.5	$\mu A$
	$\overline{LATCH}$	$I_{IL}$	$V_{IL} = 0 V$	-13			$\mu A$
	$\overline{STROBE}$			-270			$\mu A$
	CLOCK			-4.5			$\mu A$
	DATA IN			-0.5			$\mu A$
Output voltage of drivers (Heater supply voltage)	$V_{OL}$	$V_{dd} = 3.3 V$ $I_{OL} = 8mA$		0.9	1.7	V	
Leak current of drivers	$I_{LEAK}$	$VH = 28 V$			1.0	$\mu A/dot$	
Logic supply current	$I_{dd}$	$f_{CLK} = 4.0MHz$ SI:HLHL			70.2	mA	

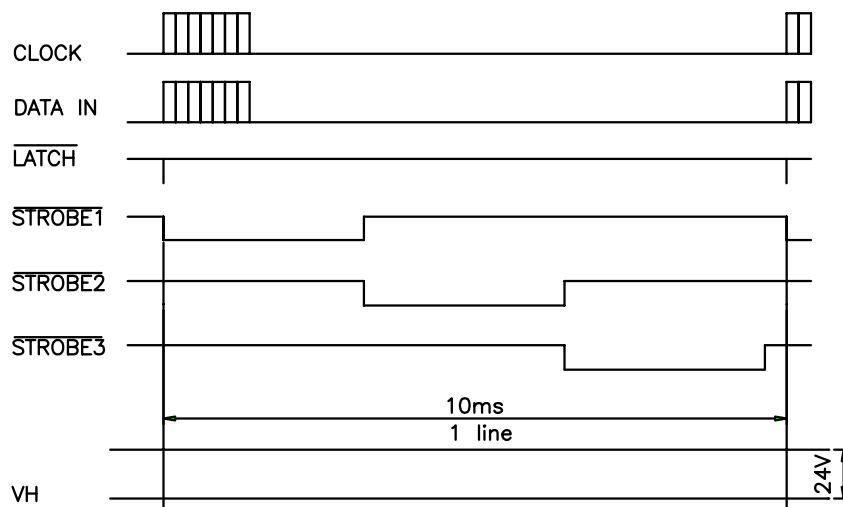
(Note 1) Each  $\overline{STROBE}$  includes pull-up resistance of  $300K\Omega \pm 50\%$  per IC.

**Table 2.3** Switching characteristics for driver ICs. ( $V_{dd} = 3.3V \pm 10\%$   $T_a = -10 \sim 80^\circ C$ )

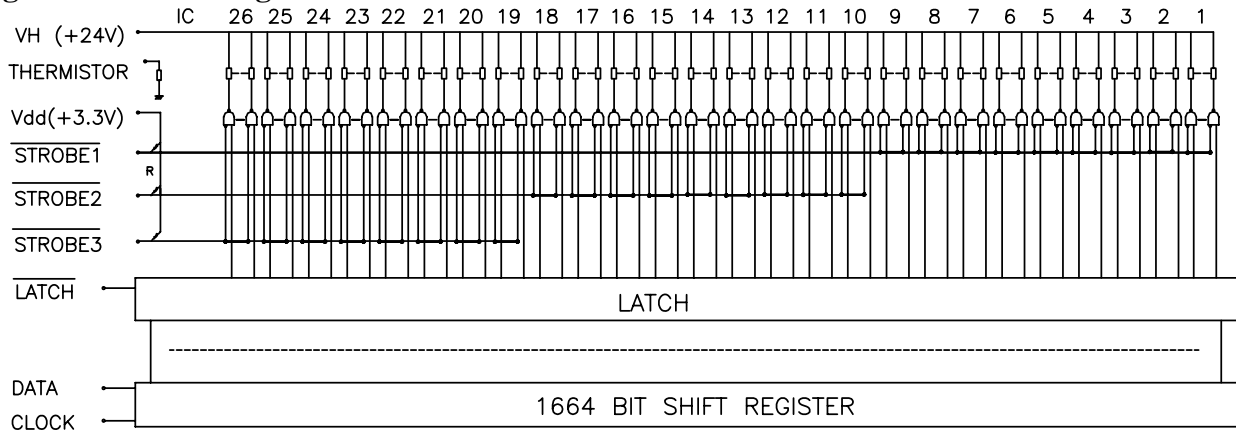
Parameter	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Clock frequency	$f_{MAX}$		-	-	5.0	MHz
Clock pulse width	$t_{w(T)}$		70			ns
Data setup time	$t_{su(D)}$		40			ns
Data hold time	$t_{h(D)}$		40			ns
Latch setup time	$t_{su(LA)}$		100			ns
Latch pulse width	$t_{w(LA)}$		100			ns
Strobe to driver Output delay time	$t_{dDO}$				10	$\mu s$



**Fig. 2 Thermal Print Head (HY208-FD2) Timing Chart**

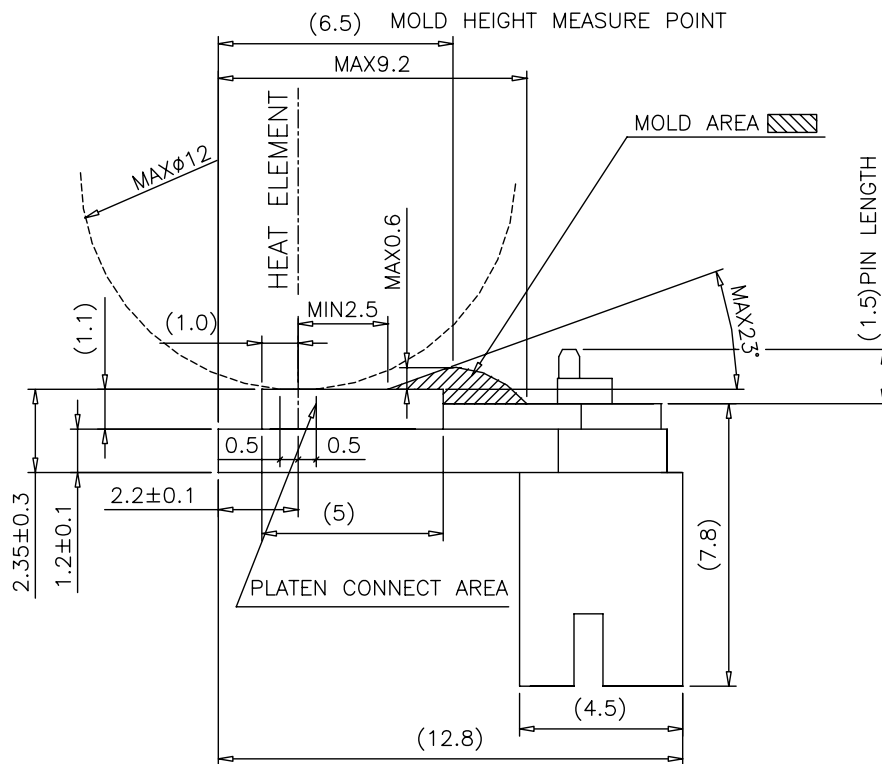


**Fig. 3 Schematic Diagram**



**IC: 64 bits**

**Fig. 4 Cross Section**



**Fig. 5 Dimension**

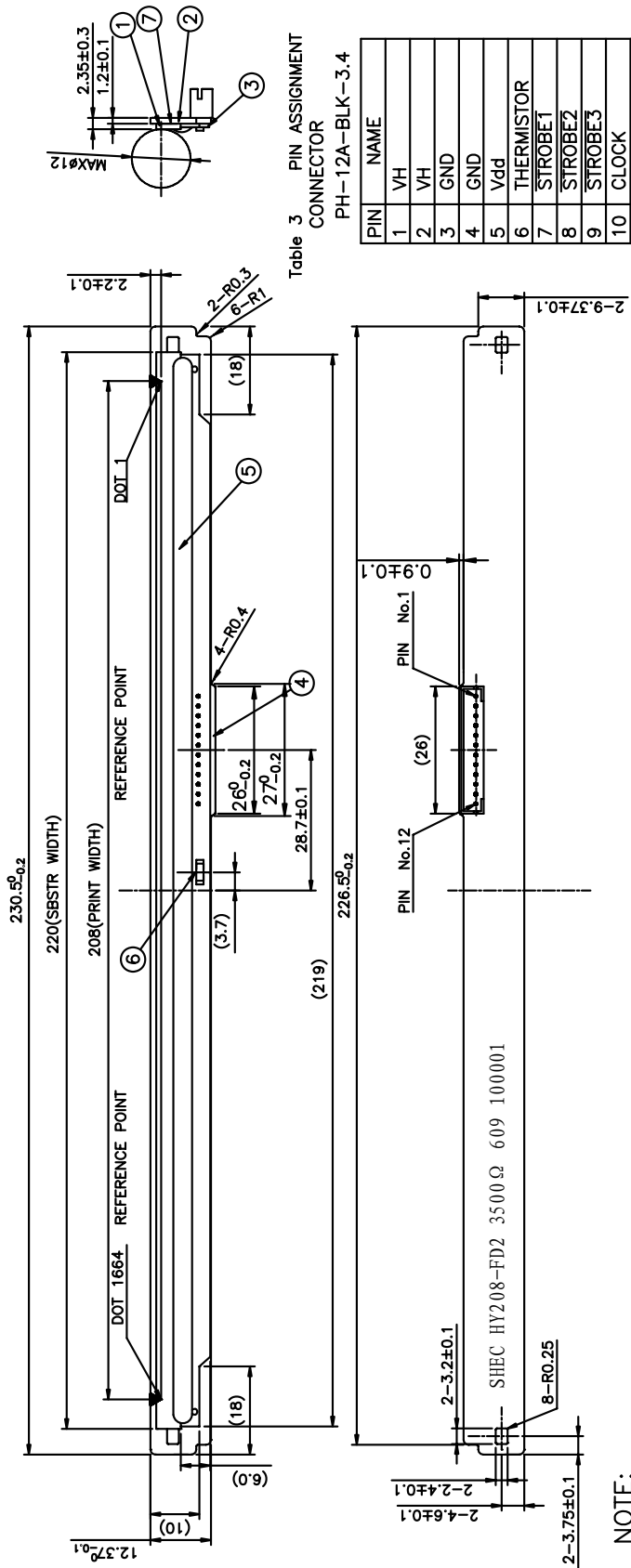


Table 3 PIN ASSIGNMENT  
CONNECTOR  
PH-12A-BLK-3.4

PIN	NAME
1	VH
2	VH
3	GND
4	GND
5	Vdd
6	THERMISTOR
7	STROBE1
8	STROBE2
9	STROBE3
10	CLOCK
11	LATCH
12	DATA IN

ITEM	DESCRIPTION	MATERIAL	DEF	SUMMARYS
①	SUBSTRATE	CERAMIC	1	t=1.1
②	HEAT SINK	galvanized sheet, iron	1	t=1.2
③	CIRCUIT BOARD	FR4	1	t=0.7
④	CONNECTOR		1	PH-12A-BLK-3.4
⑤	RESIN-COAT		0	
⑥	THERMISTOR		1	30KΩ B=3950K
⑦	ADHESIVE		1	

**NOTE:**

1. COMPOSITION OF LOT NO. 6 09 (2006) (Sep)
2. KEEP GOOD FLATNESS AROUND RESISTANCE FOR GOOD PRINTING.
3. HEAT ELEMENTS LOCATED AT 2.2±0.1 FROM THE REFERENCE POINT.
4. MODEL NAME AND LOT NUMBER WILL BE SHOWED BY MEANS OF INK-JET SEAL OR LABEL
5. This product has satisfied European Directive 2002/95/EC for Reduction of Hazardous Substances(RoHS).

CASE STYLE OF THERMAL PRINT HEAD

TYPE:HY208-FD2

This directions is made according to the specification of TPH.

1.Packing

According to the packing drawing

2.Material of packing

- 1) CASE-B Tegular Paper
- 2) CASE-A Paper Box

3.Size & Weight

- 1) TPH 33g/pc
- 2) TPH 20pcs CASE-B W290 × L310 × H23
- 3) TPH 200pcs CASE-A W315 × L350 × H270 9.6Kg ( total)

4.Case Mark

Notice of maintain and transport

Fragile

Keep top side up

Keep dry

5.Others

Make an agreement before change this style of packing.

