

THERMAL PRINT HEAD

HA216-FD

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REVISION					<u>Approved</u>
Rev	Description	Date	Approved	Drawn	
A	-----	03-10-9	S.Hosokawa	YJ.LI	
B	B1 Add note 5 B2 Change the type of connector Was:S15B-PH-K-S-2.2:JST	05-4-26	H.Sugihara	HX.Cong	
					<u>Checked</u>
					<u>Drawn</u>

1. Description

This specification is applied to HA216-FD thermal print head.

2. Scope

The HA216-FD is a thermal print head which has heat elements which produce 1728 dots with 8 dots/mm by means of a high density thick film process. It also includes C-MOS ICs; Which operate as 1728 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	216 mm	
Number of heaters	1728 dots	
Heater resolution	8 dots/mm	
Heater pitch	0.125 mm	
Printed dot dimension	0.11mm×0.13 mm	Nominal
Heater resistance	$\bar{R}=3000\Omega \pm 3\%$ $R=\bar{R} +15\%-20\%$	
Specifications for driver ICs	Table.2	
Number of driver ICs	64bits ×27	
Number of data inputs	1 serial input	
Number of strobes	4	
Logic power supply	5 V ×122 mA	at 2 MHz
Specification for Thermistor	$R_{25}=30K\Omega \pm 5\%$, $B=3,950K \pm 2\%$	Table. 1

4. Maximum ratings

Parameter	Symbol	Specification	Note
Heater energy consumption	Eomax	0.43 mJ/dot	10 ms/line
Head voltage	VH	25.2 V	Between Connectors
Logic voltage	Vdd	Vdd=+5V±0.25V	
Environment temperature	Ta	+5 °C ~ +50 °C	Operating
		- 40 °C ~ +80 °C	Non-operating
Environment humidity		10 ~ 90%RH	Non-condensing
Maximum operating temperature	Ts	65 °C 30min. MAX	
		Detected temperature of Thermistor shall not exceed 65 °C.	Head temperature shall not exceed 70 °C.

5. Standard printing conditions

Parameter	Symbol	Recommended operating conditions				Note	
		1 0 ms/line					
Heater power consumption	Po	0.18 W/dot				$\bar{R}=3000\Omega$	
Heat voltage	VH	24 V				Connectors	
Heater energy consumption	Eo (ts)	5°C	0.38mJ/dot (2.2 ms)	0.41mJ/dot (2.4 ms)	0.42mJ/dot (2.45 ms)	0.4mJ/dot (2.3 ms)	$\bar{R}=3000\Omega$ (Note 1)
		25°C	0.33mJ/dot (1.9 ms)	0.36mJ/dot (2.1 ms)	0.38mJ/dot (2.2 ms)	0.35mJ/dot (2.0 ms)	
		40°C	0.29mJ/dot (1.6 ms)	0.31mJ/dot (1.8 ms)	0.33mJ/dot (1.9 ms)	0.29mJ/dot (1.7 ms)	
Supply current	Io	7.7 mA/dot				$\bar{R}=3000\Omega$	
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.

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

- $R_{ic}=70\Omega$: 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	1×10^8 pulses	
Run length	30 Km	

6.2 MTBF:304,080Hr (reference 0.33% / 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) 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 μ 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 300 mm may cause noise.

7.8 Maximum number of heaters for simultaneous is 448.

7.9 When the printer is on standby, the thermal head (VH) must be switched off.

Fig. 1 Recommend Connection

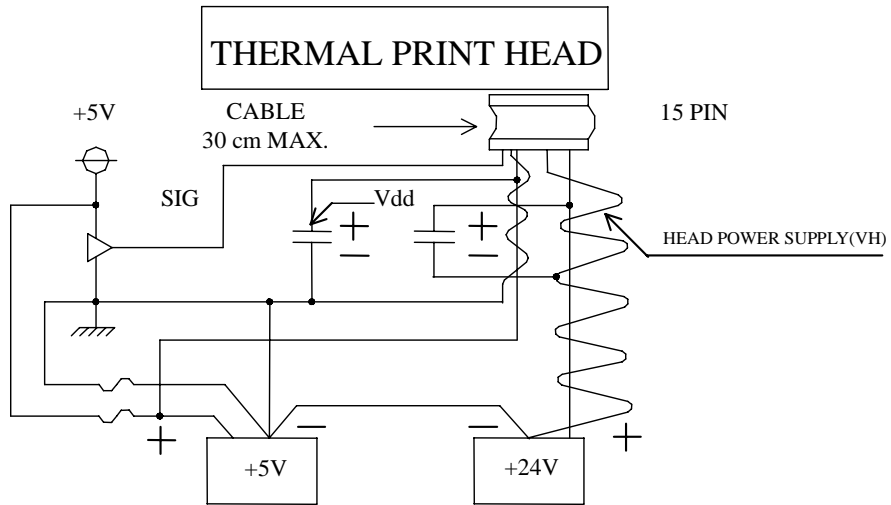


Table. 1 Thermistor

$$R_{25} = 30K\Omega \pm 5\%, B_{CONST} = 3950\text{kelvin} \pm 2\%, R = R_{25}e^{B(1/T - 1/T_{25})}$$

Temperature (°C)	Thermistor Resistance (R)		
	Min. (KΩ)	Typ. (KΩ)	Max. (KΩ)
-40.0	924.3	1048	1184
-35.0	667.4	751.1	843.1
-30.0	487.6	545.0	607.6
-25.0	360.0	399.9	442.9
-20.0	268.8	296.6	326.5
-15.0	202.7	222.3	243.2
-10.0	154.2	168.2	182.9
-5.0	118.4	128.4	138.9
0.0	91.70	98.90	106.4
5.0	71.65	76.71	82.10
10.0	56.20	59.99	63.88
15.0	44.50	47.27	50.10
20.0	35.49	37.53	39.58
25.0	28.50	30.00	31.50
30.0	22.84	24.14	25.46
35.0	18.42	19.55	20.71
40.0	14.95	15.93	16.94
45.0	12.20	13.06	13.94
50.0	10.02	10.76	11.54
55.0	8.271	8.920	9.596
60.0	6.864	7.430	8.021
65.0	5.726	6.219	6.738
70.0	4.799	5.230	5.686
75.0	4.041	4.418	4.819
80.0	3.418	3.749	4.102

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	-0.5 ~ 6.5	V
	VH	Surge	0 ~ 28	V
Input voltage for logic	V_{IN}		$0 \sim V_{dd} + 0.3$	V

Recommended operating conditions

Parameter	Symbol	Test conditions	Recommendations			Unit
			Min.	Typ.	Max.	
Supply voltage	V_{dd}		4.75	5.0	5.25	V
	VH	Supply voltage for VH	23.5	24	24.5	V
Input voltage for logic	V_{IH}	(Note 1)	$0.8 \times V_{dd}$		V_{dd}	V
	V_{IL}		0		$0.2 \times V_{dd}$	V
Clock frequency	f_{CLK}	duty 50%	0.1	1.0	3.5	MHz

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

Table 2.2 Electrical characteristics for driver IC.

Parameter	Symbol	Test conditions	Ratings			Unit	
			Min.	Typ.	Max.		
Input current	\overline{LATCH}	(Note 1) I_{IH}	$V_{dd} = 5.75V$ $V_{IH} = 5.75V$			13.5	μA
	\overline{STROBE}					3.5	μA
	CLOCK					13.5	μA
	DATA IN					0.5	μA
	\overline{LATCH}	I_{IL}	$V_{dd} = 5.75V$ $V_{IL} = 0V$	-13.5			μA
	\overline{STROBE}			-385			μA
	CLOCK			-13.5			μA
	DATA IN			-0.5			μA
Output voltage of drivers (Heater supply voltage)	V_{OL}	$V_{dd} = 5V$ $I_{OL} = 15mA$	$T_j = 0^\circ C$ $T_j = 70^\circ C$		1.1 1.5	1.7 2.3	V
Leak current of drivers	I_{OH}	$V_{dd} = 4.25V$ $VH = 24V$				1.0	$\mu A/dot$
Logic supply current	I_{dd}	$V_{dd} = 5.25V$ ALL WHITE $f_{CLK} = 2.0MHz$				122	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.

Parameter	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Clock frequency	f_{MAX}				4.0	MHz
Clock pulse width	$tw(T)$		70			ns
Data setup time	$tsu(D)$		50			ns
Data hold time	$th(D)$		40			ns
Latch setup time	$tsu(LA)$		100			ns
Latch pulse width	$tw(LA)$		100			ns
Strobe setup time	$tsu(\overline{STB})$		100			ns
Strobe to driver Output delay time	$tpLH$ $tpHL$				3.5	μs

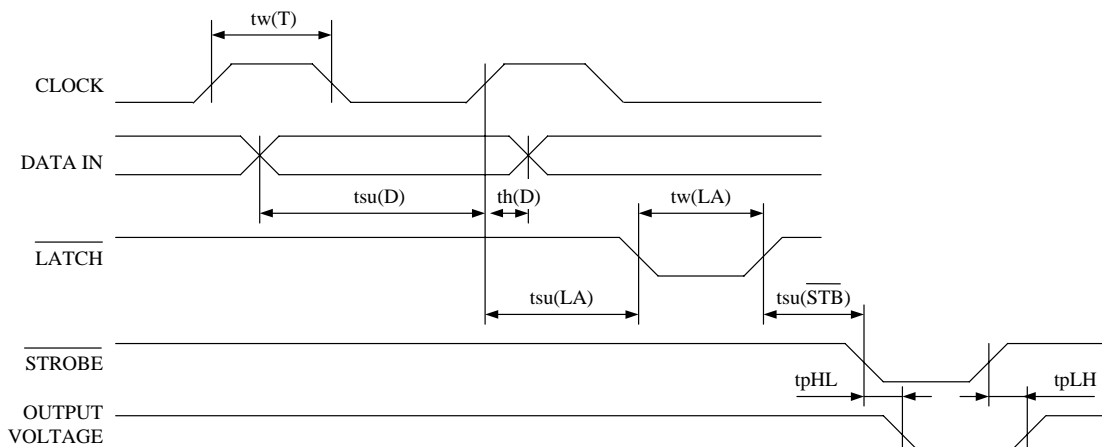


Fig. 2 Thermal Print Head (HA216-FD) Timing Chart

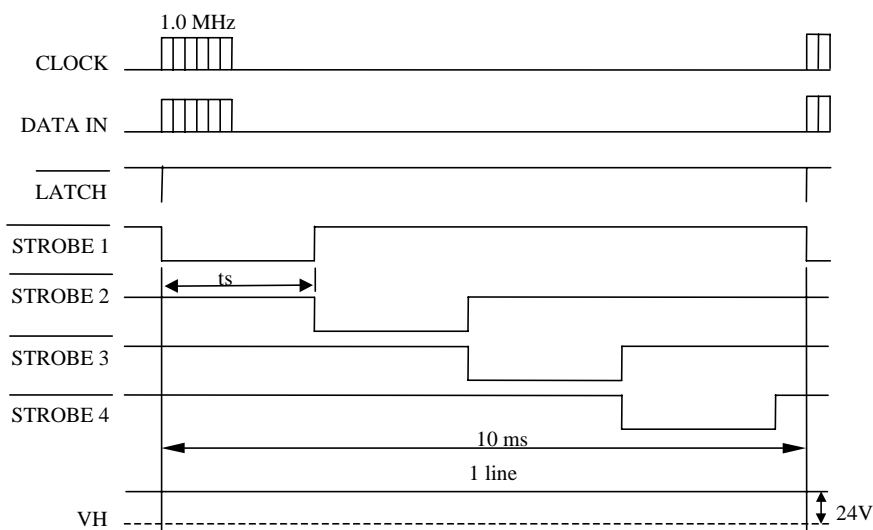
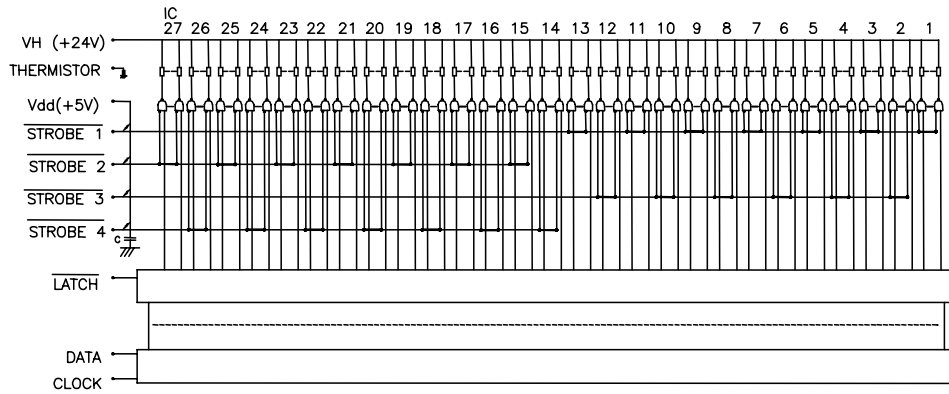


Fig. 3 Schematic Diagram



IC: 64 bits

Fig. 4 Cross Section

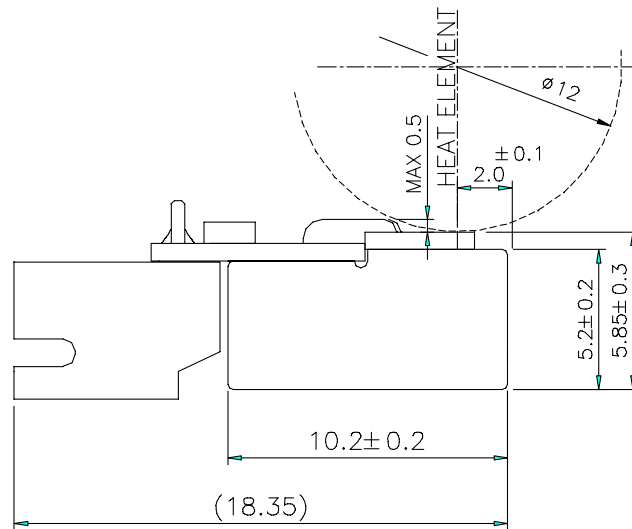
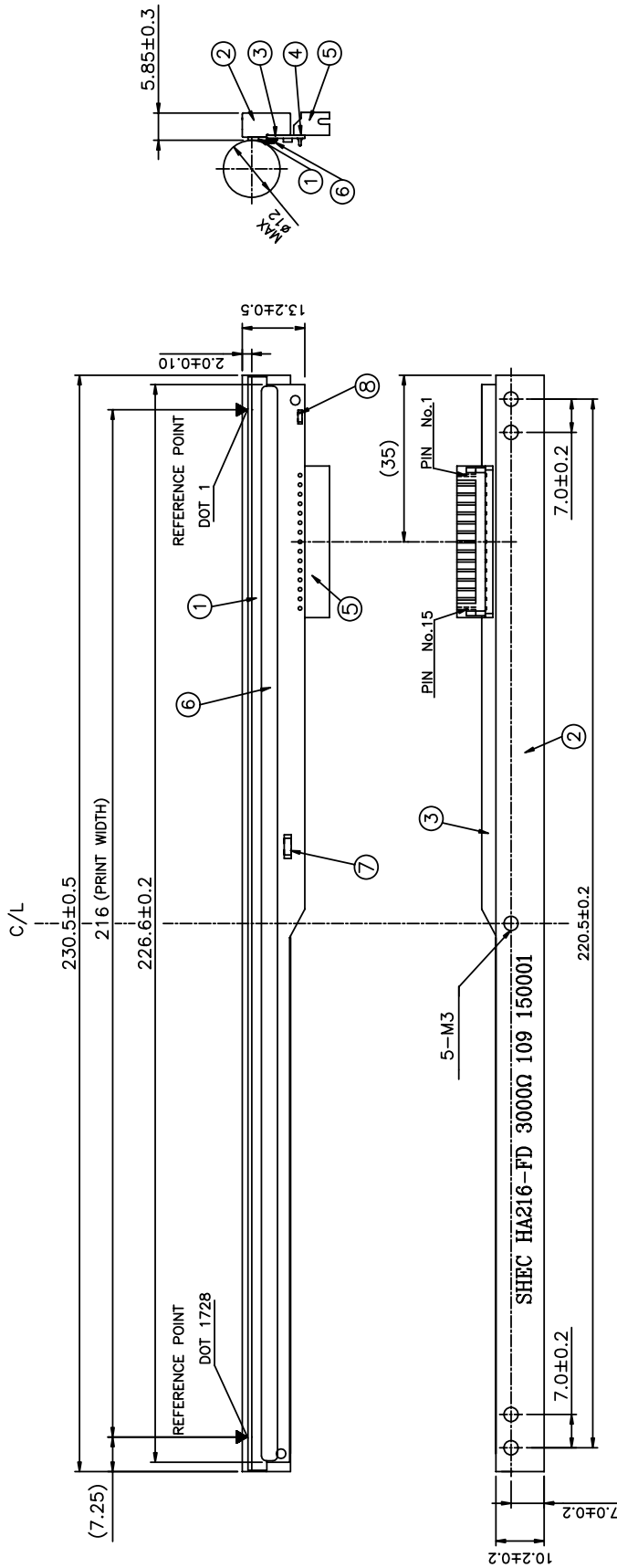


Table. 3 Pin assignment

Connector: (PH-15AW)

PIN	NAME	PIN	NAME
1	VH	9	$\overline{STROBE1}$
2	VH	10	$\overline{STROBE2}$
3	VH	11	$\overline{STROBE3}$
4	GND	12	$\overline{STROBE4}$
5	GND	13	CLOCK
6	GND	14	\overline{LATCH}
7	Vdd	15	DATA IN
8	THERMISTOR		

Fig. 5 Dimension



ITEM	DESCRIPTION	MATERIAL	DEF	SUMMARYS
①	SUBSTRATE	CERAMIC	1	
②	HEAT SINK	ALUMINIUM	1	
③	CIRCUIT BOARD	FR4	1	M2V0
④	ADHESIVE		2	
⑤	CONNECTOR		1	PH-15AW
⑥	RESIN-COAT		0	
⑦	THERMISTOR		1	
⑧	C-CERAMIC		1	0.1uF

NOTE:

1. FLATNESS OF HEAT ELEMENTS MUST BE WIDTHIN $+0.19$ -0.08
2. IN CASE OF M3 SCREW USED FOR FIXATION DEPTH IS 3.5 MAX
- 3.COMPOSITION OF LOT NO. 1 09 (2001) (Sep.)
4. HEAT ELEMENTS LOCATED AT 2.0 ± 0.10 FROM THE REFERENCE POINT.
- 5.THIS MODEL COMPLIES WITH ROHS DIRECTIVE

B2

B1