

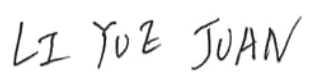


THERMAL PRINT HEAD

3ZX105

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1. Description

This specification is applied to 3ZX105 thermal print head.

2. Scope

The 3ZX105 is a thermal print head which has heat elements which produce 1248 dots with 300 dots/inch by means of a high density thick film process. It also includes C-MOS ICs; Which operate as 1248 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	105.6mm	
Number of heaters	1248 dots	
Heater resolution	300 dots/inch	
Heater pitch	0.0846mm	
Printed dot dimension	0.08mm×0.1 mm	Nominal
Heater resistance	$\bar{R}=600\Omega \pm 3\%$	
Specifications for driver ICs	Table.2	
Number of driver ICs	96bits ×13	
Number of data inputs	13 serial input	
Number of strobes	2	
Logic power supply	3.3 V ×130 mA	at 22 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	0.12mJ/dot	0.41 ms/line
		0.09mJ/dot	0.25 ms/line
Head voltage	VH	25.2 V	Between Connectors
Logic voltage	Vdd	5.5V	
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	
Speed		0.41 ms/line	0.25 ms/line		
Heater power consumption	Po	0.85 W/dot		$\bar{R} = 600 \Omega$	
Heat voltage	VH	24 V		Connectors	
Heater energy consumption	Eo (ts)	5°C	0.10 mJ/dot (0.12 ms)	0.07 mJ/dot (0.08 ms)	$\bar{R} = 600 \Omega$ (Note 1)
		25°C	0.08 mJ/dot (0.09 ms)	0.05 mJ/dot (0.06 ms)	
		40°C	0.06 mJ/dot (0.07 ms)	0.03 mJ/dot (0.03 ms)	
Supply current	Io	37.7mA/dot		$\bar{R} = 600 \Omega$	
Timing chart		Fig. 2			
Platen pressure		14.3 ~ 19.1 N / TPH			
Platen hardness		30~40deg			
Platen diameter		Φ14 Max.			
Scanning resolution		300 line/inch			
Thermal paper		F230AA MITSUBISHI PAPER MILL CO., LTD.			
Optical density		1.1 OD Min.		(Note 2)	

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

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

- $R_{ic} = 24 \Omega$: 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. Printed optical density is measured by a RD-914 reflector optical density meter or equivalent .

6. Life expectancy

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	150 Km	

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

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 Maximum number of heaters for simultaneous is 672.
(The average print duty should be less than 50%)

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

Fig. 1 Recommend Connection

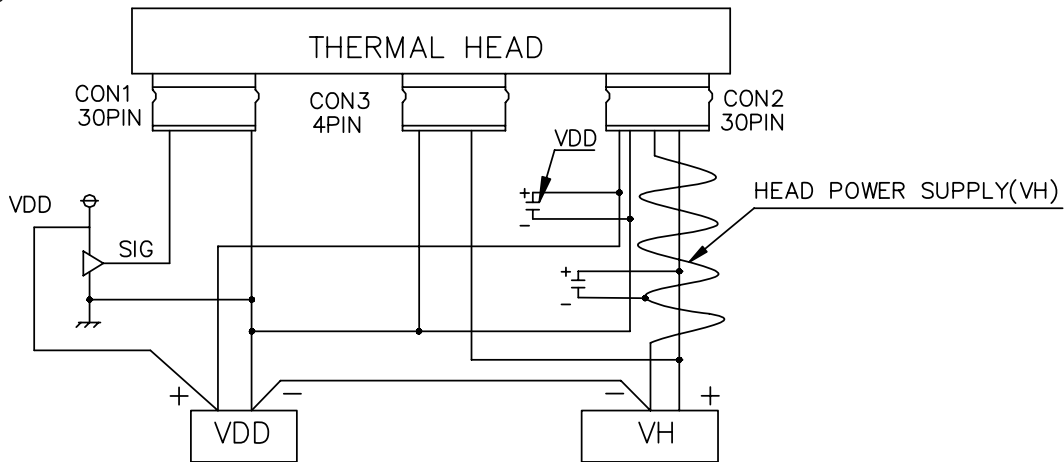


Table. 1 Thermistor

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

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 ~ 6.5	V
	V_H	Surge	0 ~ 28	V
Input voltage for logic	V_{IN}		0 ~ $V_{dd} + 0.3$	V

Recommended operating conditions

Parameter	Symbol	Test conditions	Recommendations			Unit
			Min.	Typ.	Max.	
Supply voltage	V_{dd}		3.0		5.5	V
	V_H	Supply voltage for VH	0		25.2	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}	cascade			30	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) $V_{dd} = 3.3V$ $V_{IH} = 3.3V$			13.0	μA	
	\overline{STROBE}				7.0	μA	
	CLOCK				13.0	μA	
	DATA IN				13.0	μA	
	\overline{LATCH}	I_{IL}	$V_{dd} = 3.3V$ $V_{IL} = 0V$	-780			μA
	\overline{STROBE}			-420			μA
	CLOCK			-13.0			μA
	DATA IN			-13.0			μA
“L” Output voltage of drivers	V_{DOL}	$V_{dd} = 3.3V$ $I_{DOL} = 40mA$		0.96	1.92	V	
Leak current of drivers	I_{LEAK}	$V_{OH} = 24V$			5.0	$\mu A/dot$	
Logic supply current	I_{dd}	$f_{CLK} = 20MHz$			130	mA	
“H” Level output	I_{OH}	SO, $V_{OH} = V_{dd} - 0.4V$			-0.5	mA	
“L” Level output	V_{OL}	SO, $V_{OL} = 0.4V$	0.5			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}	cascade			30	MHz
Clock pulse width	$tw(T)$		14			ns
Data setup time	$tsu(D)$		8			ns
Data hold time	$th(D)$		8			ns
Latch setup time	$tsu(LA)$		20			ns
Latch pulse width	$tw(LA)$		100			ns
Latch to Strobe setup time	$tsu(STB)$		100			ns
Strobe to Latch setup time	$th(STB)$		100			ns
Clock to So delay time	$tds(O)$				28	μs
Strobe to driver Output delay time	$td(DO)r$				60	μs
	$td(DO)f$				15	μs

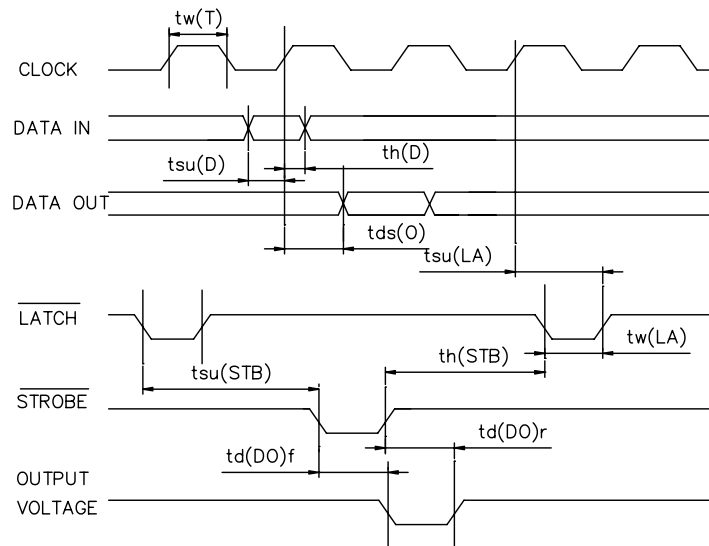


Fig. 2 Thermal Print Head (3ZX105) Timing Chart

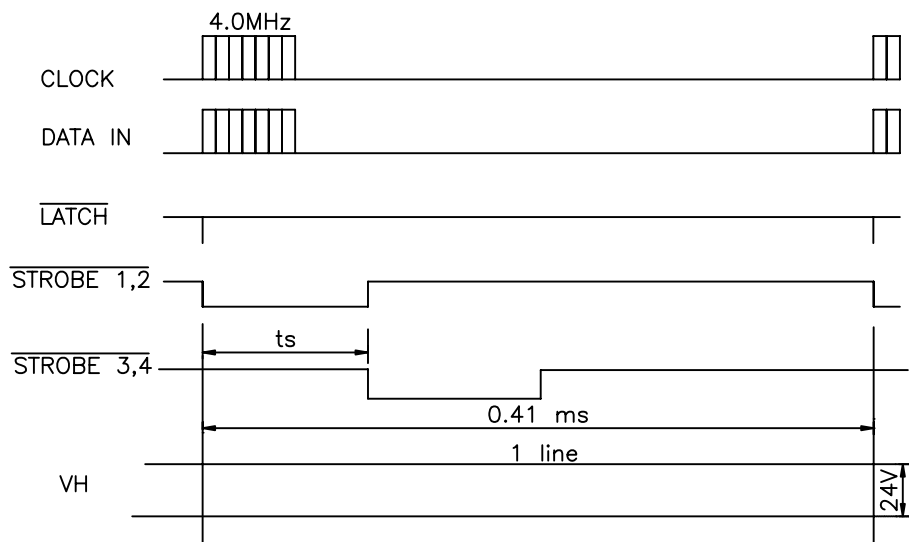


Table. 3 Pin assignment

Connector : S30B-PHDSS-B(LF)(SN) or EQUIVALENT

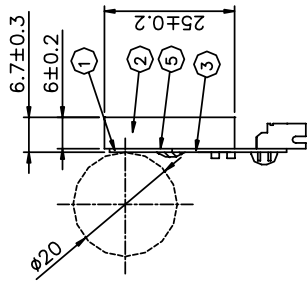
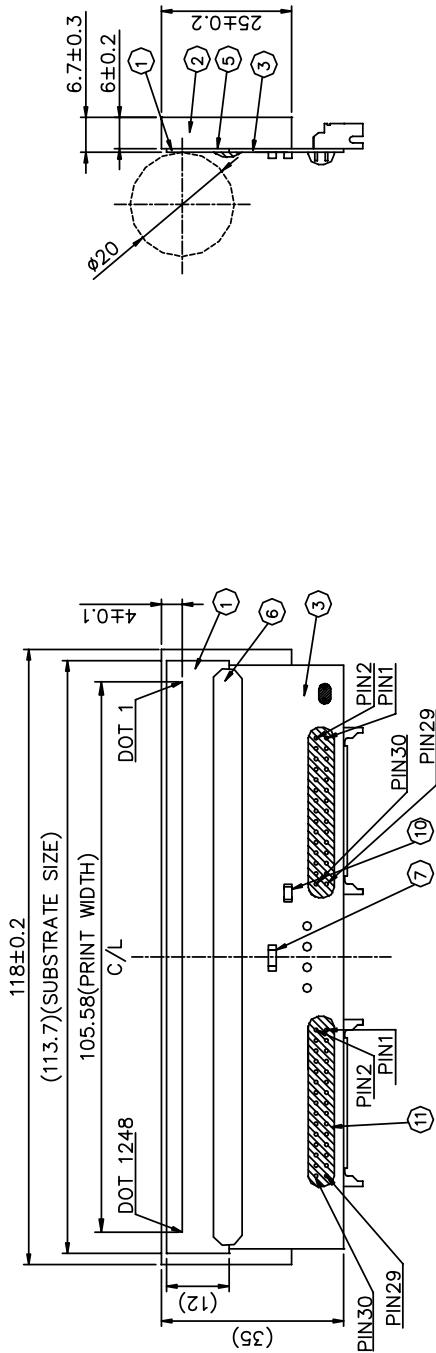
CONNECTOR1 ASSIGNMENT

PIN	NAME	PIN	NAME
1	DATA IN1	16	DATA OUT8
2	DATA OUT1	17	DATA IN9
3	DATA IN2	18	DATA OUT9
4	DATA OUT2	19	DATA IN10
5	DATA IN3	20	DATA OUT10
6	DATA OUT3	21	DATA IN11
7	DATA IN4	22	DATA OUT11
8	DATA OUT4	23	DATA IN12
9	DATA IN5	24	DATA OUT12
10	DATA OUT5	25	DATA IN13
11	DATA IN6	26	DATA OUT13
12	DATA OUT6	27	CLOCK
13	DATA IN7	28	LATCH
14	DATA OUT7	29	<u>STROBE1</u>
15	DATA IN8	30	<u>STROBE2</u>

CONNECTOR2 ASSIGNMENT

PIN	NAME	PIN	NAME
1	VH	16	GND
2	VH	17	GND
3	VH	18	GND
4	VH	19	GND
5	VH	20	GND
6	VH	21	GND
7	VH	22	GND
8	VH	23	GND
9	VH	24	GND
10	VH	25	GND
11	VH	26	GND
12	VH	27	GND
13	VH	28	GND
14	VH	29	VDD
15	GND	30	THERMISTOR

Fig. 5 Dimension



ITEM DESCRIPTION	MATERIAL DEFINITION	SUMMARY
1 SUBSTRATE	CERAMIC	1
2 HEAT SINK	ALUMINIUM	1
3 CIRCUIT BOARD	FR4	1
4 CONNECTOR 1, 2	2 SS308-PH055-B(LF)(SN)	1
5 ADHESIVE		1
6 EPOXY MOLD		1
7 THERMISTOR		1
8 CONNECTOR 3	B4PS-VH(LF)(SN)	1
9 CAPACITOR	47µF35V	1
10 CHIP CAPACITOR	0.1µF25V	1
11 UV EPOXY		1

NOTE:

1. COMPOSITION OF LOT No. 9 03 (2009) (Mar.)
2. IN CASE OF M3 SCREW USED FOR FIXATION. DEPTH IS 3.5 MAX.
3. THIS MODEL COMPLIES WITH THE RoHS DIRECTIVE
4. CONNECTOR 3 STANDBY

