Product Specification

Thermal Print Head

Model: MT-S2-8-5ES1

Rev: 0086-6

1. Description

The specification is applicable to thermal print head, model MT-S2-8-5ES1, on which CMOS driver IC's are mounted.

2. Structure and Appearance

2.1 Structure

Two-inch wide side face type thermal print head comprises of a high-density thick film printing technologies on alumina substrate, electric connection method and protective metal shield mounted on an aluminum heat sink.

2.2 Appearance

No scratches, stains and/or warps affecting printing quality are allowed.

3. Mechanical Features

3.1 Dimension

(1) Outline drawing	see Fig. 1
(2) Flatness of heater	not more than 20 μm

3.2 Heater Element

(1) Number of heater element	384 dots
(2) Size of heater element	(X) 0.125 mm
	(Y) 0.130 mm
(3) Pitch between each heater element	0.125 mm
(4) Print width	48.0 mm

4. Electrical Features

4.1 Circuitry

(1) Schematic diagram	see Fig. 2
(2) Timing chart	see Fig. 3
(3) Specifications for driver ICs	see Table 1
(4) Number of driver ICs	64 bits x 6
(5) Logic supply voltage	+ 5 V
(6) Data signal transfer	clocked serial input
(7) Clock rate	4 MHz
(8) Direction of print data inputs	From left to right, Fig. 1

(9) Number of print line separation	5 strobes
(10) Thermistor	103ET-2 R_{25} = 10.0 kΩ ±3.0% B_{25} = 3,250 K ±1.0% Dissipation constant = 0.7 mW / ° C Time constant = 3.4 s

4.2 Resistance of Heater Element (Single Dot)

(1) Average resistance (R_{av})	880 Ω ± 15 %
(2) R_{av} Deviation within one individual dot line	R_{av} ± 15 %

4.3 Pin Connection

see Table 2

5. Operation Characteristics

5.1 Standard Mechanical Parameters

(1) Platen pressure	14.7 ~ 19.6 N/head (1.5 ~ 2.0 kgf/head)
(2) Platen diameter	25.0 mm
(3) Platen hardness	30.0 ~ 50.0 Shore hardness

5.2 Standard Operating Parameters

(1) Pulse width (heating strobe) (P_W)	2.0 ms
(2) Total pulse duration	4.0 ms
(3) Heater power consumption (P)	0.6 W/dot
(4) Heater voltage (Vpp)	24.0 V
(5) Heater element (dot) current	26.1 mA/dot
(6) Thermal paper	TP50KS-4HM or equivalent (Nippon Paper Industries Co., Ltd.)

5.3 Absolute Maximum Rating

(1) Heater energy consumption	1.42 mJ/dot
(2) Heater power consumption	0.7 W/dot
(3) Heater voltage	26.0 V
(4) Duty cycle	60 %
(5) Heatsink temperature	80 ° C

6. Life Expectancy

(1) Dot heating cycle (any one dot) 5.0 x 10^7 pulse (Note 1)

(2) Abrasion life 50.0 km

Note 1. These figures result from life-test performed on MITANI-TPH's in unconditioned "real world" –environment (see also section 5.1 and 5.2). Clean conditions (pollution free, heat controlled and/or anti-static discharge assembly or usage etc) can extend lifetime-figures significantly.

7. Environment

(1) Operating temperature -10 ~ +50 ° C

(2) Operating humidity (non condensing) 10 ~ 90 %RH

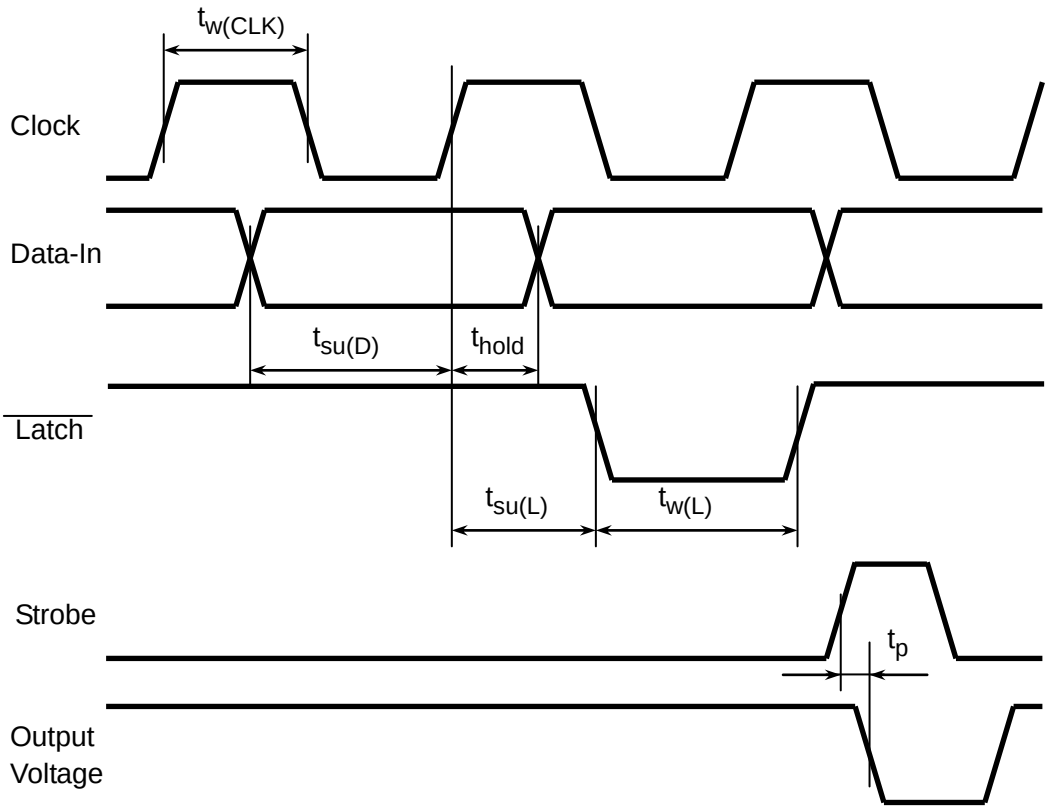
(3) Storage temperature -20 ~ +80 ° C

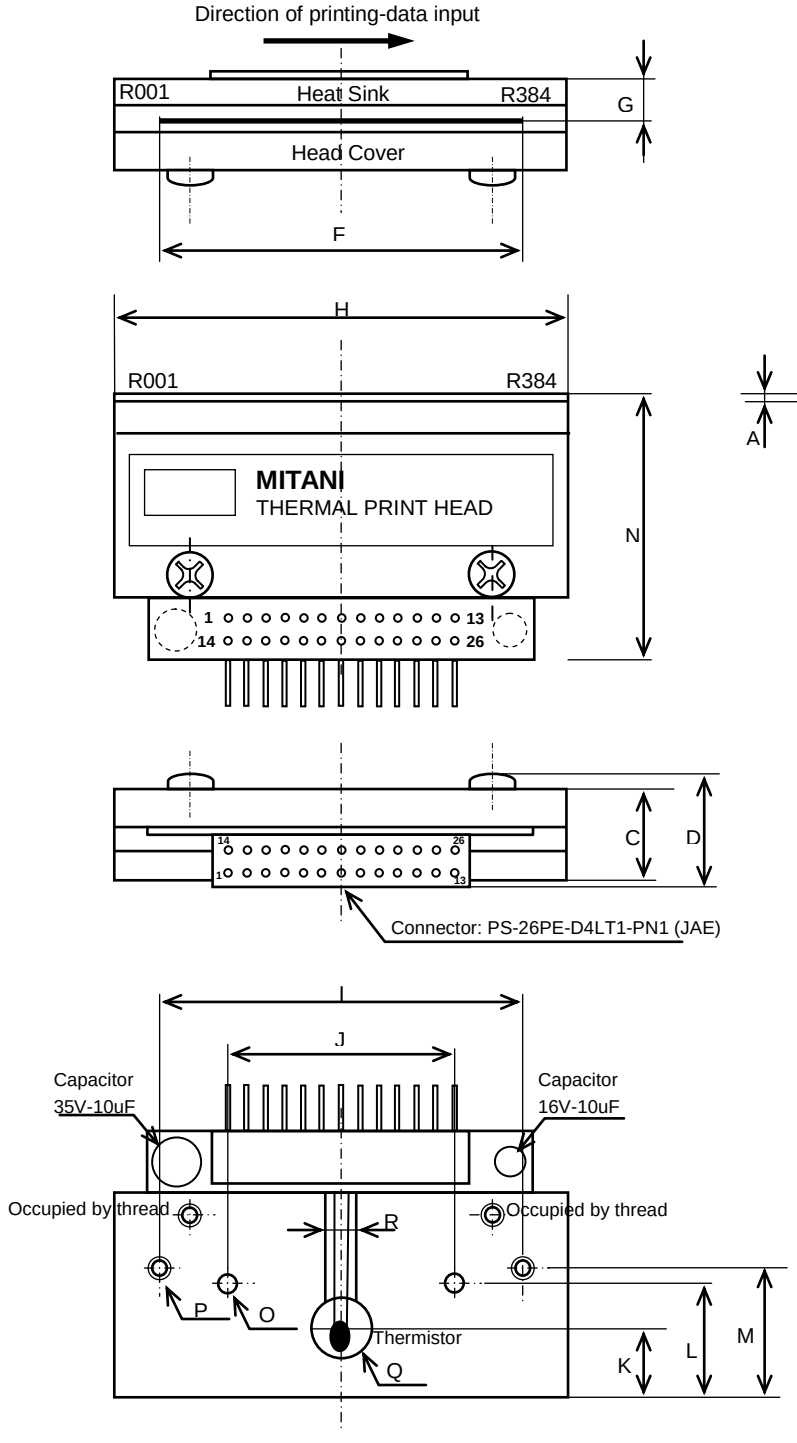
Table 1 CMOS driver IC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply voltage	V_{cc}	4.5	5.0	5.5	V	
Consumption current	I_{cc}	-	0.4	0.8	mA	V_{cc} = 5.0 V F_{ck} = 5 MHz DI/DO fixed
Input voltage	V_{IH}	0.7 V_{cc}	-	V_{cc}	V	
	V_{IL}	0.0	-	0.3 V_{cc}	V	
Input current	I_{IH}	-	-	0.5	μ A	V_{IH} = V_{cc}
	I_{IL}	-	-	0.5	μ A	V_{IL} = 0 V, V_{cc} = 5.0 V
Driver output Voltage Current	V_O		-	26.4	V	
	V_{OL}	-	0.7	2.0	V	at I_{OL} = 100 mA
	I_{OL}	-	-	100.0	mA	

Table 1 CMOS driver IC (continued)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Clock frequency	f_{CLK}	-	-	8.0	MHz	
Clock pulse width	$t_{w(CLK)}$	45.0	-	-	ns	
Data setup time	$t_{su(D)}$	40.0	-	-	ns	Data -> Clock
Latch setup time	$t_{su(L)}$	100.0	-	-	ns	Clock -> Latch
Latch pulse width	$t_{w(L)}$	100.0	-	-	ns	
Data hold time	t_{hold}	10.0	-	-	ns	Clock -> Data In
Output delay time	t_p	-	3.5	10.0	μ s	Strobe -> Data Out





Item	Dimension (Unit in mm)
A	2.0 ± 0.2
B	3.0 ± 0.1
C	12.0 Max
D	16.0 Max
E	5.0 ± 0.1
F	48.0 ± 0.1
G	5.5 ± 0.1
H	60.0 ± 0.1
I	48.0 ± 0.1
J	30.0 ± 0.1
K	11.0 ± 0.2
L	15.0 ± 0.1
M	17.0 ± 0.1
N	35.0 ± 0.3
O	2 – φ2.5 ± 0.1
P	2 – M3, Depth 3.5 Max.
Q	φ8.0 ± 0.2
R	Width 4.0± 0.2 Depth 2.0± 0.2

Fig. 1 Outline

Table 2 Pin Connection

Pin	Name		Pin	Name
1	Thermistor		14	Thermistor
2	V_{TH}		15	V_{TH}
3	Data In		16	Clock
4	Strobe 1		17	Strobe 2
5	Strobe 3		18	NC
6	GND		19	GND
7	GND		20	GND
8	GND		21	GND
9	Strobe 4		22	Strobe 5
10	$\overline{\text{Latch}}$		23	Data Out
11	NC		24	NC
12	V_{CC} (+ 5 V)		25	V_{CC} (+ 5 V)
13	V_{TH}		26	V_{TH}

Note 1. Connector model No. PS-26PE-D4LT1-PN1 (JAE)

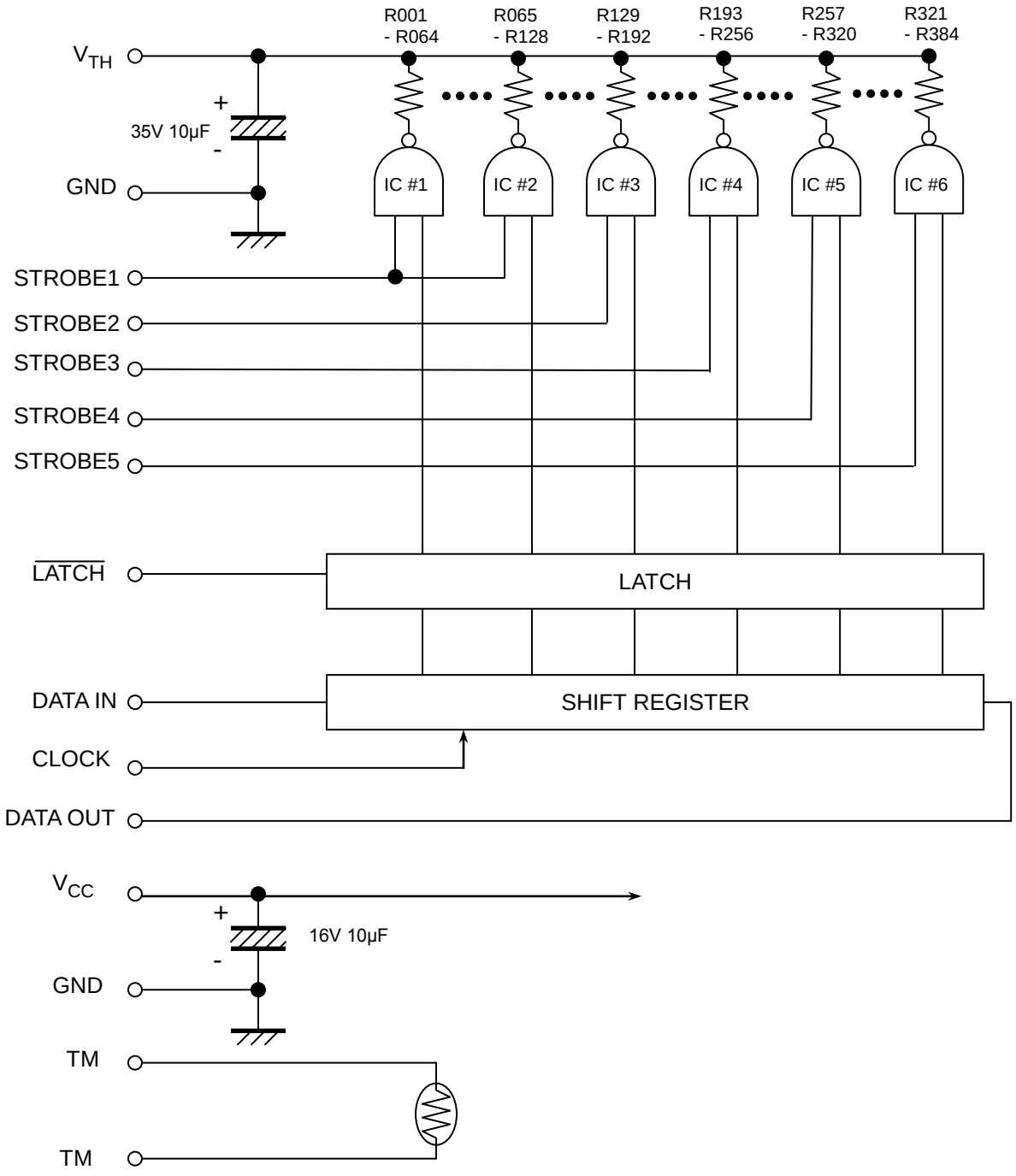


Fig.2 Schematic diagram

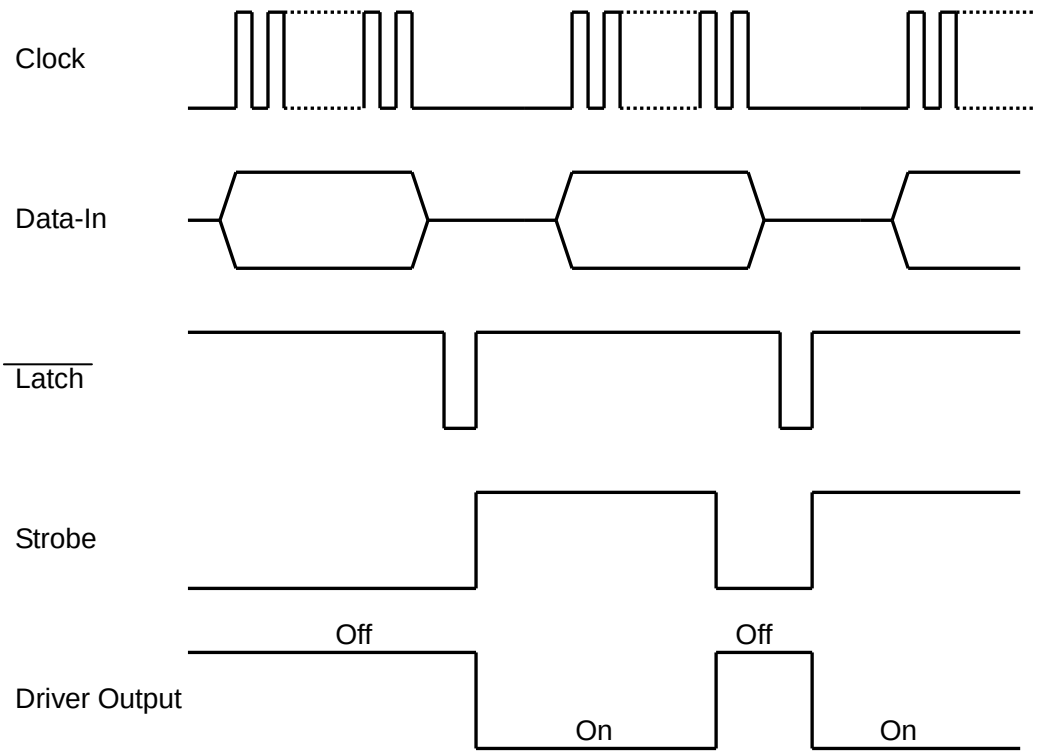


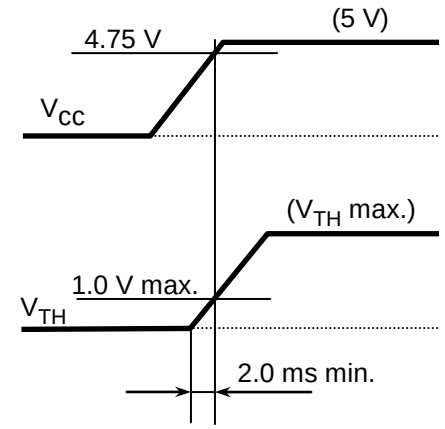
Fig. 3 Timing

8. General Precautions

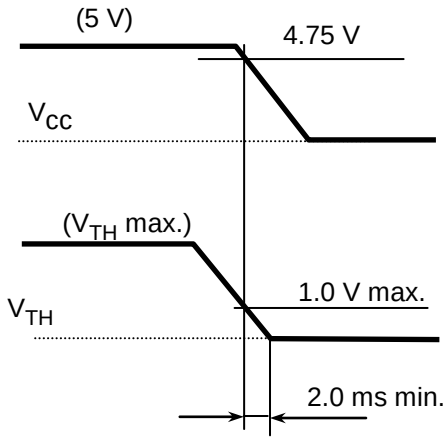
(1) Latch up prevention

Latch-up conditions can cause failures and/or severe damage.
To prevent latch-up each power should be applied to the thermal print head in the following sequences.

Power On:



Power Off:



(2) Overload protection

Strobes should always be at “L” level when the printline is not in contact with a media and/or during “switch-off” in order to prevent “burn-out” of the printing dots.

(3) CMOS protection

The unit is sensitive to static loads (CMOS IC´s). Utmost care should therefore be taken in order to prevent from any static discharge to the thermal print head during storage and handling. Static discharge may deadly damage the thermal print head.

(4) Protective head cover

A metal cover is used to protect the IC’s-area against mechanic force. It should never be removed nor should any high pressure or impact be loaded on the protective head cover.

(5) Connector

Misconnection or loose connection while operating the thermal print head might cause failures or even severe damages.

(6) Mechanical protection

The surface of the thermal print head must never be treated with objects hard enough to cause scratches. Penetration of the protective layers covering the heaters and/or the conductors may result in electrical shorts or conduction breaks.