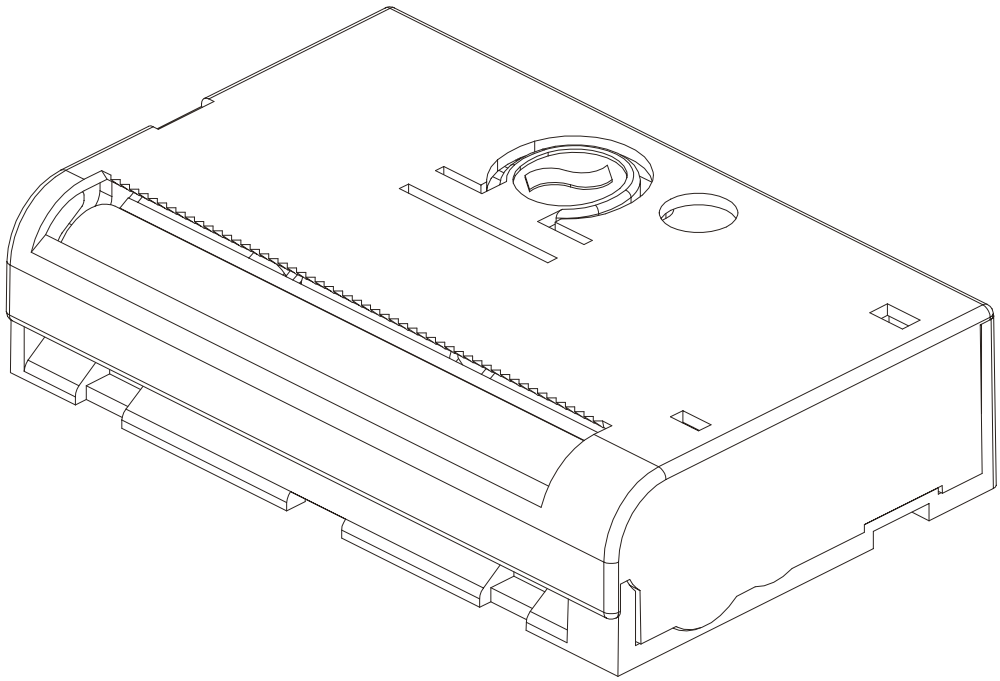
Thermal Line Printer
CE58
User's Manual

Printer Models

1- CE58 : Paper And Sensor
2- CE58M : Paper And Sensor And Marker Sensor



COD. DOME - CE58 REV. 1.00

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INTRODUCTION

1. CONNECTIONS

2. PRINT HEAD

3. STEPPER MOTOR

4. SENSOR

5. DIMENSIONS

CONVENTIONS USED IN THE MANUAL

N.B.
Gives important information or suggestions relative to the use of the printer

WARNING
The information marked with this symbol must be carefully heeded to safeguard against damaging the printer

DANGER
The information marked with this symbol must be carefully heeded to safeguard against injury to the operator.

GENERAL SPECIFICATIONS

Item	Specification
Printing method	Thermal line dot method
Effective printing width	48mm
Head configuration	384 dots/line
Dot Pitch	0.125 mm horizontal 0.125 mm vertical
Printing Speed	60 mm/sec at 7.5 Vcc (see power consumption and energy for dots)
Paper width	58 ± 0.1 mm
Paper feed method	Friction feed, 1 dot line/2 pulses, bipolar 1-2 phase excitation
Paper feed accuracy	± 2% at fixed speed feed with the back tension of approx. 50 gr
Paper feed tension	
Head temperature sensor	Thermistor
Paper detection	Photo interrupter reflessive
Mark detection	Photo interrupter reflessive (only CE58M)
External dimensions (W x D x H)	42.1 x 65.7 16 mm including cover (H = 15mm excluding cover)
Weight	47 gr cover included
Operation Voltage range logic	5 Vcc ± 5%
Operation Voltage dotline head	4.2 to 8.5 Vcc
Current consumption	Printing at 5Vcc : • 1.9 A (head with 64 dots ON made simultaneously) • 420 mA stepper motor • 48 mA Logic current
Life	50 km of printed paper or 100 milion of pulses (dot)
Recommanded paper	Kanzan KF50 or equivalent
Operating temperature range	0 - 50°C
Operating humidity	20 - 85% RH no condensation
Storage environmental	-15 + 70°C Humidity 10 - 95% no condensation, Paper excluded

(Tab.1)

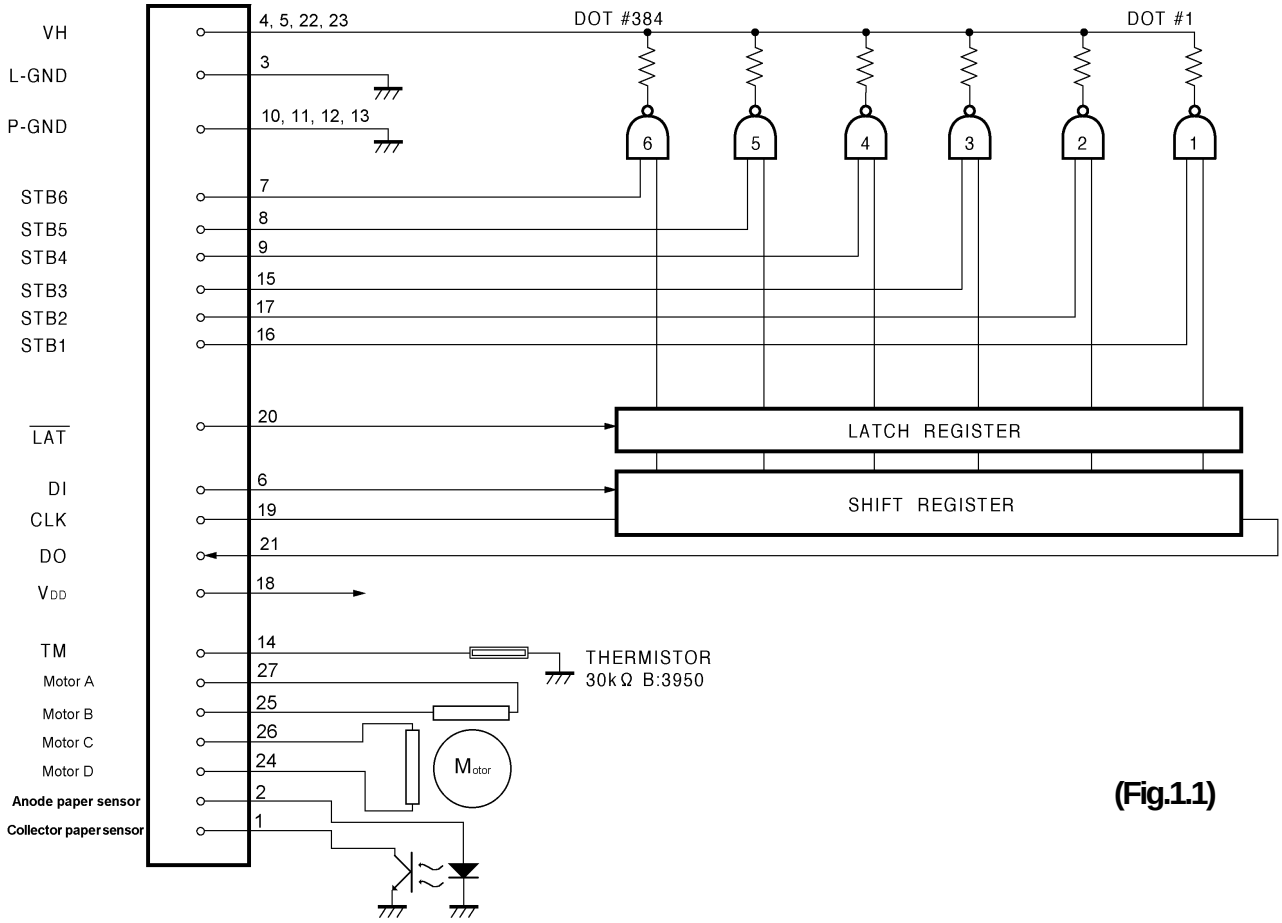
DESCRIPTION OF THE PRINTER

The Ce58 is a 2 inches very small and compact thermal line printer.The CE58 is a lightweight and high-speed printer equipped with a line dot thermal head with 8 dot/mm resolution (203 dpi). CE58 mechanism is a 5 volts printer and it has been especially designed to suit applications like handheld terminal, where size, weight and cost are the major issues.

CE58 MAIN FEATURES

- High speed up 60 mm/sec
- Wide range voltage supply 4,7 – 7,2 Vcc (head)
- High resolution 8 dots/mm 203 dpi
- Mark detection (CE58M) two sensors: paper end and mark sensor
- Life 50 Km Printed paper or 100 millions of pulses.

ELECTRICAL CIRCUIT BLOCK DIAGRAM OF CE58 MODEL



(Fig.1.1)

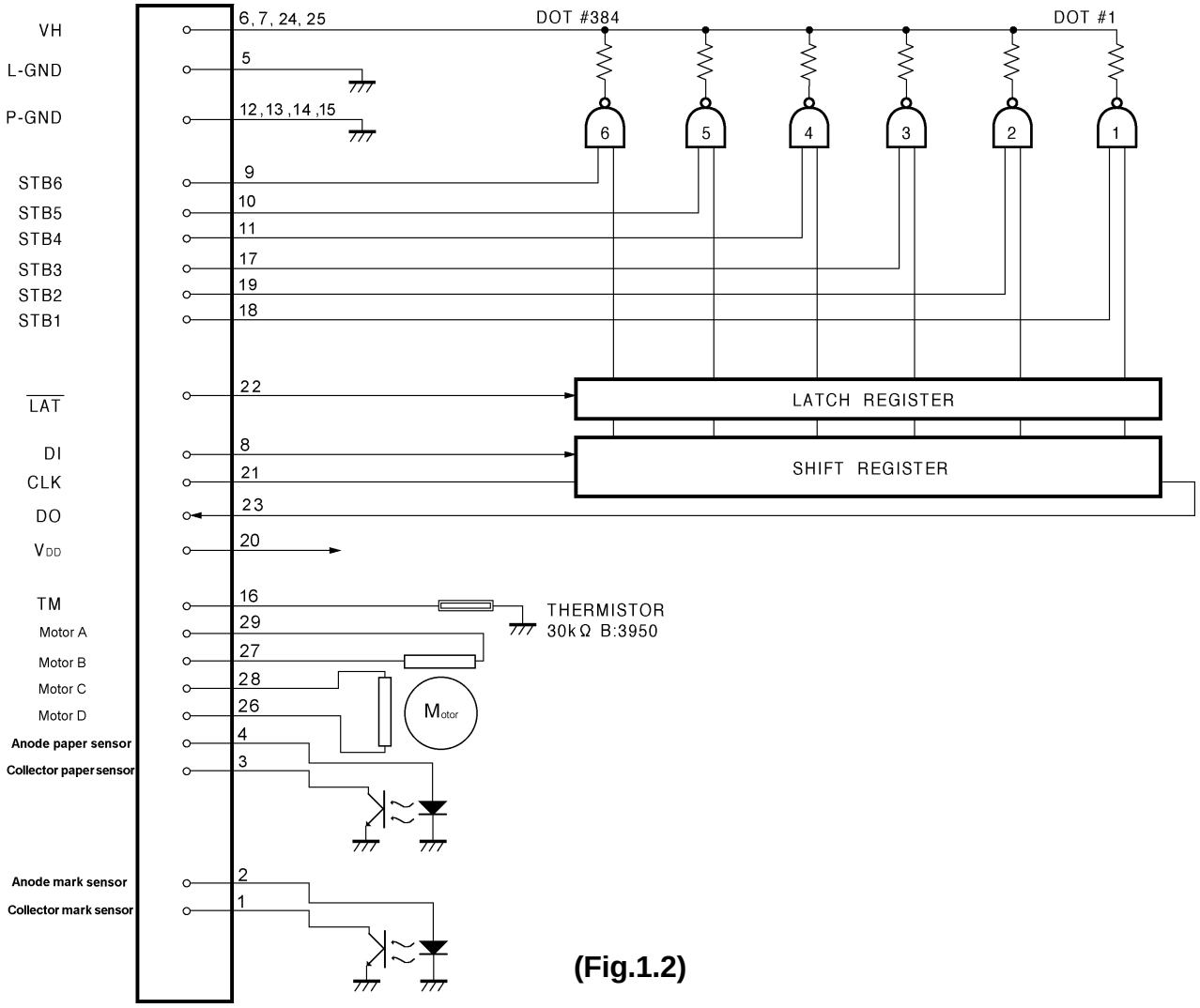
Pin assignments

(Tab.1.1)

No.	Signal	Function
1	CP	COLLECTOR PHOTO TRANSISTOR PAPER
2	AP	ANODE DIODE PAPER
3	L_GND	LOGIC GROUND
4	VH	DOTLINE VOLTAGE
5	VH	DOTLINE VOLTAGE
6	DI	DATA INPUT
7	STB6	STROBE6 SIGNAL
8	STB5	STROBE5 SIGNAL
9	STB4	STROBE4 SIGNAL
10	P_GND	DOTLINE GROUND
11	P_GND	DOTLINE GROUND
12	P_GND	DOTLINE GROUND
13	P_GND	DOTLINE GROUND
14	TM	THERMISTOR

No.	Signal	Function
15	STB3	STROBE3 SIGNAL
16	STB2	STROBE2 SIGNAL
17	STB1	STROBE1 SIGNAL
18	VDD	LOGIC VOLTAGE
19	CLK	SERIAL CLOCK
20	LATCH	LATCH
21	DO	DATA OUTPUT
22	VH	DOTLINE VOLTAGE
23	VH	DOTLINE VOLTAGE
24	SM4	STEPPER MOTOR PHASE4 COIL B
25	SM3	STEPPER MOTOR PHASE3 COIL A
26	SM2	STEPPER MOTOR PHASE2 COIL B
27	SM1	STEPPER MOTOR PHASE1 COIL A

ELECTRICAL CIRCUIT BLOCK DIAGRAM OF CE58M MODEL



(Fig.1.2)

Pin assignments

(Tab.1.2)

No.	Signal	Function
1	CM	COLLECTOR PHOTO TRANSISTOR MARKER
2	AM	ANODE DIODE MARKER
3	CP	COLLECTOR PHOTO TRANSISTOR PAPER
4	AP	ANODE DIODE PAPER
5	L_GND	LOGIC GROUND
6	VH	DOTLINE VOLTAGE
7	VH	DOTLINE VOLTAGE
8	DI	DATA INPUT
9	STB6	STROBE6 SIGNAL
10	STB5	STROBE5 SIGNAL
11	STB4	STROBE4 SIGNAL
12	P_GND	DOTLINE GROUND
13	P_GND	DOTLINE GROUND
14	P_GND	DOTLINE GROUND
15	P_GND	DOTLINE GROUND

No.	Signal	Function
16	TM	THERMISTOR
17	STB3	STROBE3 SIGNAL
18	STB2	STROBE2 SIGNAL
19	STB1	STROBE1 SIGNAL
20	VDD	LOGIC VOLTAGE
21	CLK	SERIAL CLOCK
22	LATCH	LATCH
23	DO	DATA OUTPUT
24	VH	DOTLINE VOLTAGE
25	VH	DOTLINE VOLTAGE
26	SM4	STEPPER MOTOR PHASE4 COIL B
27	SM3	STEPPER MOTOR PHASE3 COIL A
28	SM2	STEPPER MOTOR PHASE2 COIL B
29	SM1	STEPPER MOTOR PHASE1 COIL A

2.1 PRINT HEAD

CE58 has a thickfilm thermal printhead and is allowed to have 5.0A maximum power absorbed, the print density variation may become larger if the number of dots energized at same time becomes greater than 64.
Scanning Line Time (SLT) is the time to print one complete line using all strobes available.
The relation between the printhead supply voltage and “On Time” (Ton) is as follows:

$$Po = Io^2 \times Rav = \frac{Vset^2 \times Rav}{(Rcom \times N + Rav + Ric + Rlead)^2}$$

$$Ton = \frac{Eo}{Po}$$

or

$$Po = \frac{Eo}{Ton}$$

$$Vset = \sqrt{\frac{Po}{Rav}} \times (Rcom \times N + Rav + Ric + Rlead)$$

Rav	Average resistance	142	Ohm
N	Number of burning dots at same time	(example 64)	
Rcom	Common Resistance	0.05	Ohm
Ric	Driver Saturated Resistance	15	Ohm
Rlead	Lead Resistance	10	

(Tab.2.1)

Maximum conditions

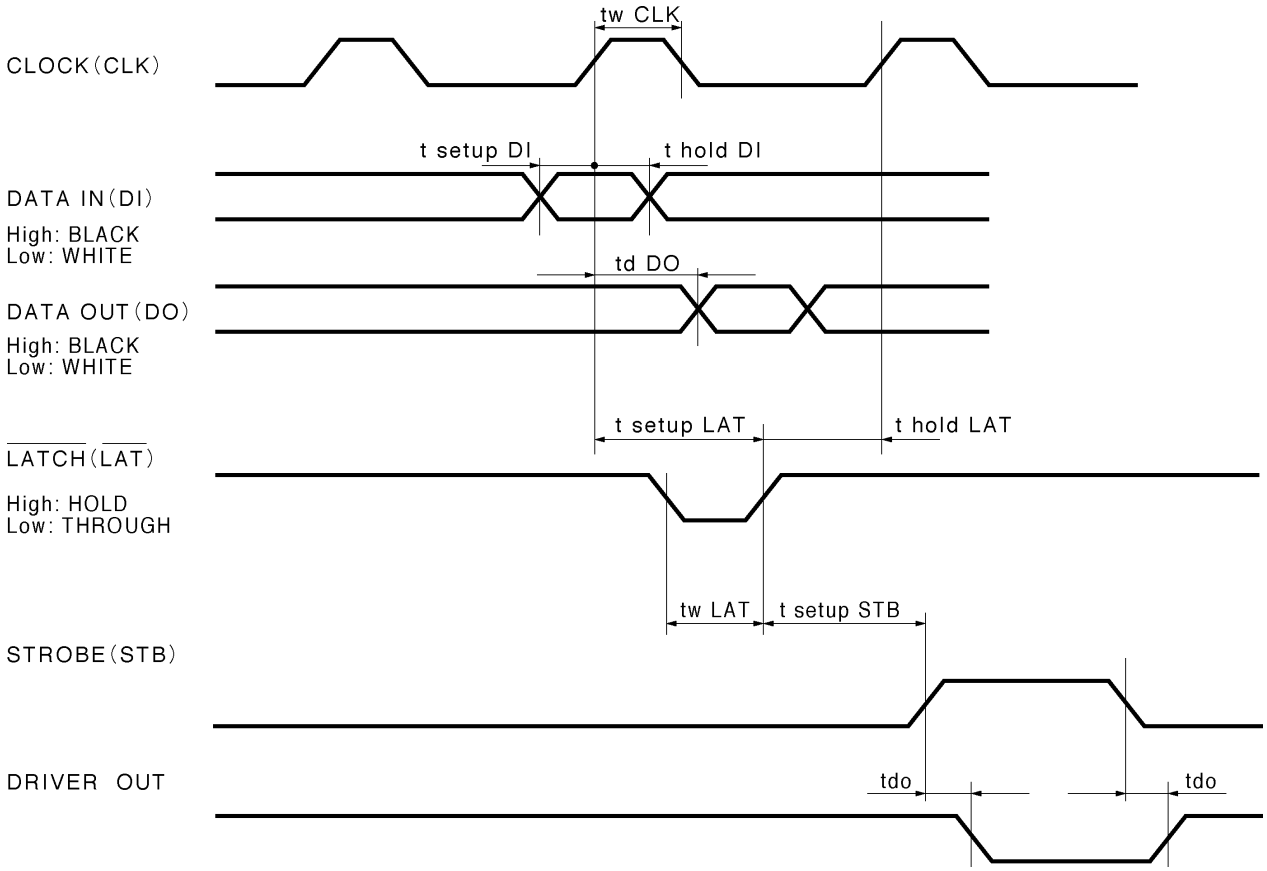
Item	Maximum Conditions	Unit	Conditions
Print Cycle (SLT)	5.0	Ms/line	Tsub = 25°C
Supply Energy	0.7	Mj/dot	Tsub = 25°C
Supply Voltage	8.5	V	Just after battery charge (if battery power) 7.2V at all time
Substrate Temperature	65	°C	
Number of Dots to be Energized simultaneously	64	Dots	
Logic Supply Voltage (Vdd)	7	V	
Logic Input Voltage (Vin)	-0.5 ~ Vdd + 0.5	V	

(Tab.2.2)

2.2 OPERATION PRECAUTIONS

1. When continuous printing is performed the supply energy should be reduced so that the substrate temperature show in Maximum Condition Table at 25 °C
2. Power On and Off sequence must be in the following order to prevent the dot element damage: Turn On= Apply the logic supply voltage (Vdd) first and the printhead supply voltage. Turn Off= Switch off the printhead supply voltage first and turn the logic voltage off.
3. The printhead shall be disabled in STB during Power ON/OFF, or Power (VH)-Logic(Vdd) sequence described in note 2 shall be kept.
4. Heat elements and IC's shall be anti-electrostatic in order to prevent the electrostatic destruction. Do not touch the connector pins with naked hands.
5. The printhead substrate surface is coated with glass and mechanical stress or shock (including dust scratch damage) should be avoided to prevent damage.
6. When the printhead operation is finished, printsupply voltage (including the charged voltage with capacitor) should be reduced to the ground level and remained until next printhead operation occur.
7. Condensation should be avoided. If condensation occurred, do not switch on the printhead power until condensation disappear.
8. If printing sound, for example sticking sound, occured, please adjust the paper feed speed or pulse to avoid these kind of mechanical resonance.
9. Please pay attention that the paper used does not include bad factor to affect printhead life.

2.3 Timing chart



(Fig.2.1)

2.4 Electrical characteristics of circuit

Item	SYMBOL	MINI	TYP.	MAXI.	Unit
Print Voltage	VH	3.5	5.0	8.5	V
Logic Voltage	Vdd	4.75	5.0	5.25	V
Logic Current	Idd	-	-	48	mA
Input Voltage (High)	VIH	0.8 Vdd	-	Vdd	V
Input Voltage (Low)	VIL	0	-	0.2 Vdd	V
Data input current (DI) High	ILHDI	-	-	0.5	uA
Data input current (DI) Low	ILLDI	-	-	-0.5	uA
STB 1 to 6 input current (High)	IIHSTR	-	-	30	uA
STB 1 to 6 input current (Low)	IILSTR	-	-	-30	uA
Clock input current (High)	ILHCLK	-	-	3	uA
Clock input current (Low)	IILLCLK	-	-	-3	uA
Latch input current (High)	IIHLAT	-	-	3	uA
Latch input current (Low)	IILLAT	-	-	-3	uA
Data out output voltage (High)	VDOH	4.45	-	-	V
Data out output voltage (Low)	VDOL	-	-	0.05	V
Clock frequency	FCLK	-	-	8	Mhz
Clock width	twCLK	30	-	-	ns
Data setup time	tsetupD	30	-	-	ns
Data hold time	tholdD	10	-	-	ns
Latch width	twLAT	100	-	-	ns
Latch setup time	tsetupLAT	200	-	-	ns
Latch hold time	tholdLAT	50	-	-	ns
Data out delay time	tdDO	-	-	-	ns
STR setup time	tsetupSTB	300	-	-	ns
Driver out delay time	tdo	-	-	5	ns

(Tab.2.3)

Thermistor:
the thermistor is very importanrt to adjust the strobe time (Tstrobe) ~ (SLT) in function of the head temperature and the paper sensityvity, and to monitor the temperature to prevent the head damage if the temperature is over the limit described in the Maximum contitions table

- Resistance R25 = 30 Kohm +/- 5%& at 25°C
- Operating temperature –20 ~ + 80°C
- Time costant 30 sec.

Then the resistance value, R, versus temperature , T (in °C) is given by the formula :

$$R(T) = R25 * e\ [3950*(1/T+273 – 1/(25+273))]$$

3.1 STEPPER MOTOR

The paper feed pitch for stepper motor is 2 steps for one dotline (0.125 mm).

Drive mode	Bipolar drive
Resistance for phase	12 Ohm +/- 7% at 25 °C
Max motor temperature	Up 110 °C internal temperature
Insulation resistance	100 Mohm min. dc 500 V
Dielectric strength	AC 500V * 1 minute leak. Curr. 5mA

(Tab.3.1)

Precaution :

1. Drive the motor with mosfet driver to obtain the maximum torque force instead transistor driver , transistor driver lose voltage VCEsat *2
2. Please check the ratio print/pause to prevent the overtemperature on stepper motor
3. If the motor is driven by more than 5 volts we suggest to use a chopper driving, in order to reduce current, please contact Custom Engineering for further information.

CE58

PHASE	Pin 24 Coil A	Pin 25 Coil A	Pin 26 Coil B	Pin 27 Coil B
1	-	+	-	+
2	-	+	+	-
3	+	-	+	-
4	+	-	-	+

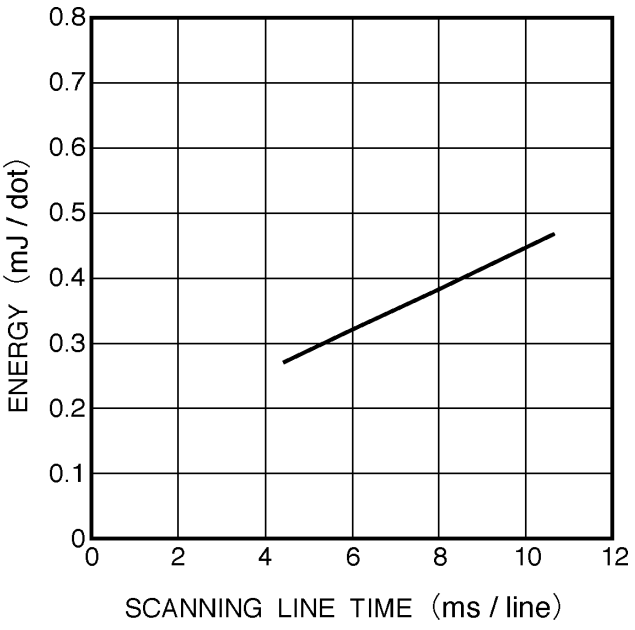
(Tab.3.2)

CE58M

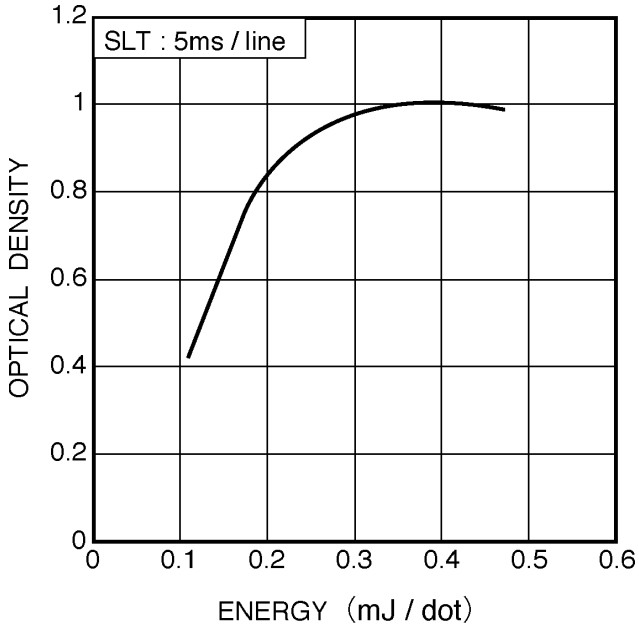
PHASE	Pin 26 Coil A	Pin 27 Coil A	Pin 28 Coil B	Pin 29 Coil B
1	-	+	-	+
2	-	+	+	-
3	+	-	+	-
4	+	-	-	+

(Tab.3.3)

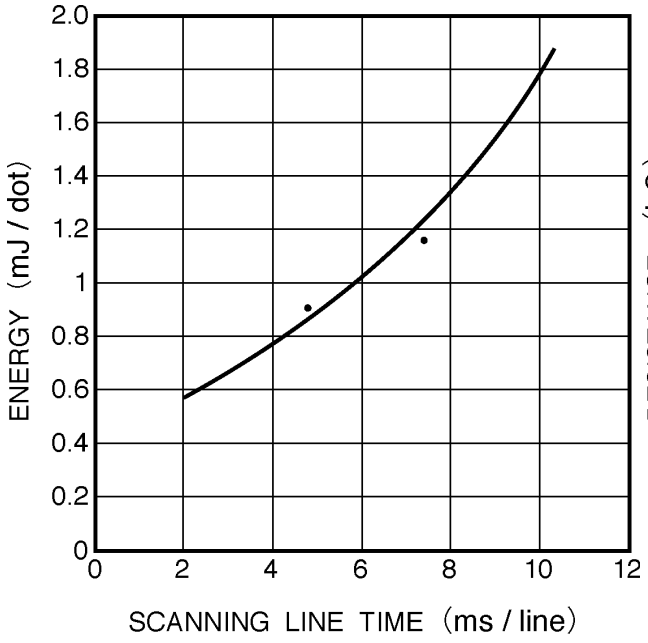
Print Head characteristics curves



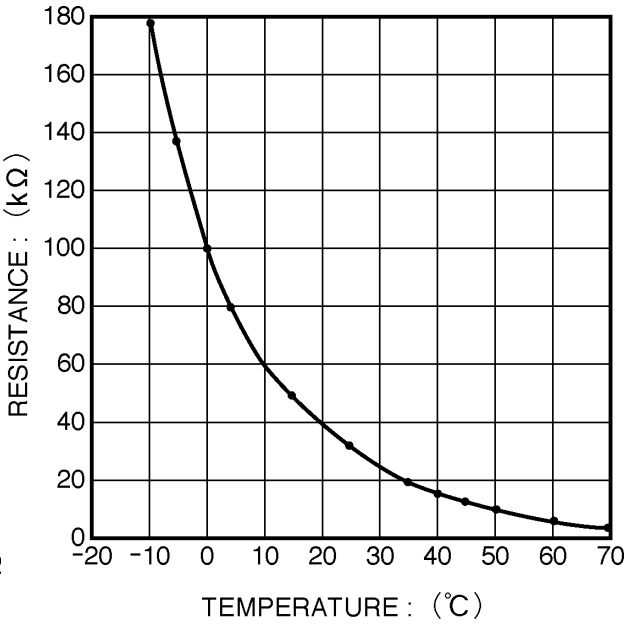
(Fig.3.1) Adaptive speed chart



(Fig.3.2) Representative density curve



(Fig.3.3) Maximum energy curve



(Fig.3.4) Thermistor curve

4.1 SENSOR

Absolute Maximum Ratings (Ta = 25°C) (Tab.4.1)

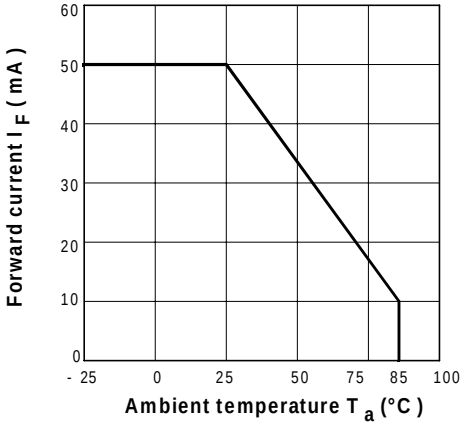
Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	Reverse voltage	V_R	6	V
	Power dissipation	P	75	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	20	mA
	Collector power dissipation	P_C	75	mW
	Total power dissipation	P_{TOT}	100	mW

Electro-optical Characteristics (Ta = 25°C) (Tab.4.2)

Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	I_F = 20mA	-	1.2	1.4	V
	Reverse current		I_R	V_R = 6V	-	-	10	μA
Output	Collector dark current		I_{CEO}	V_{CE} = 20V	-	10^{-9}	10^{-7}	A
Transfer characteristics	*3Collector current		I_C	I_F = 4mA, V_{CE} = 2V	20	45	120	μA
	Response time	Rise time	t_r	V_{CE} = 2V, I_C = 100 μA R_L = 1KΩ, d = 1mm	-	20	100	μs
		Fall time	t_f		-	20	100	μs
	*4Leak current		I_{LEAK}	I_F = 4mA, V_{CE} = 2V	-	-	0.1	μA

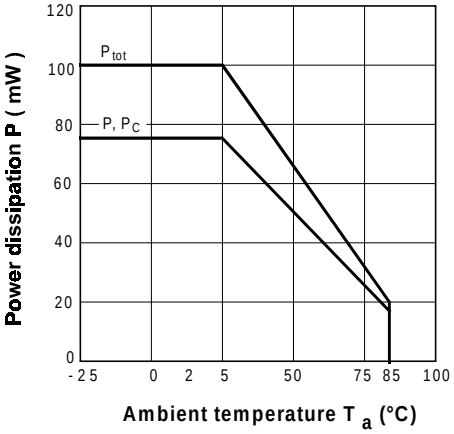
*3 The condition and arrangement of the reflective object are shown below.
*4 Without reflective object

Forward Current vs. Ambient Temperature



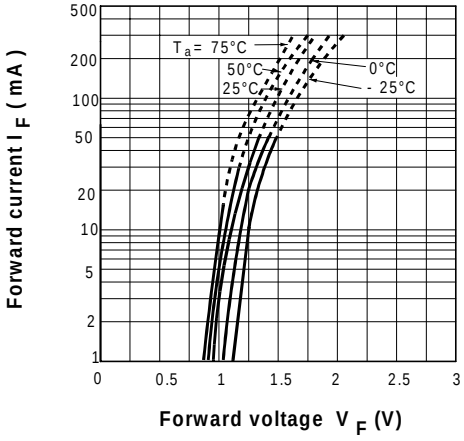
(Fig.4.1)

Power Dissipation vs. Ambient Temperature



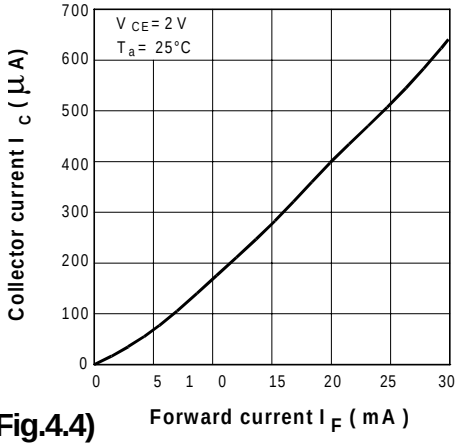
(Fig.4.2)

Forward Current vs. Forward Voltage



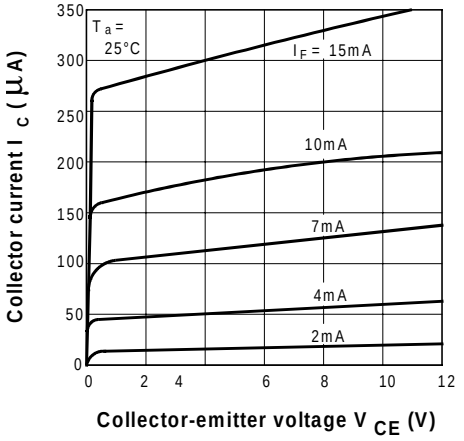
(Fig.4.3)

Collector Current vs. Forward Current



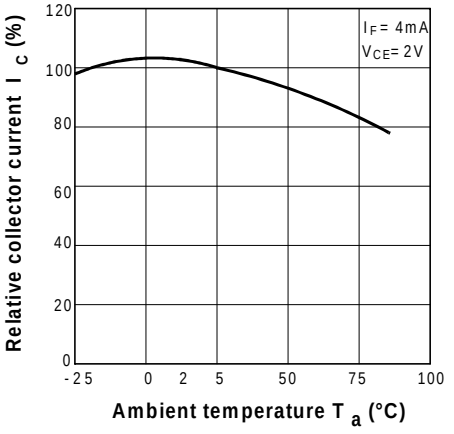
(Fig.4.4)

Collector Current vs. Collector-Emitter Voltage



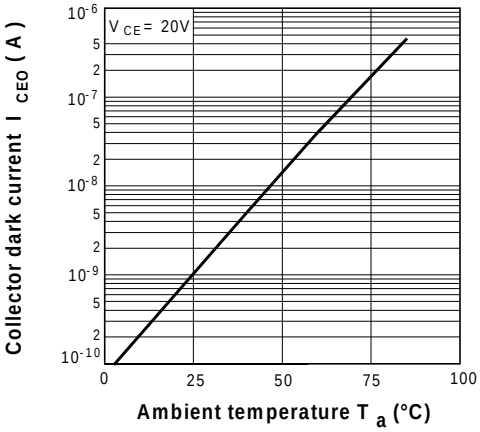
(Fig.4.5)

Relative Collector Current vs. Ambient Temperature



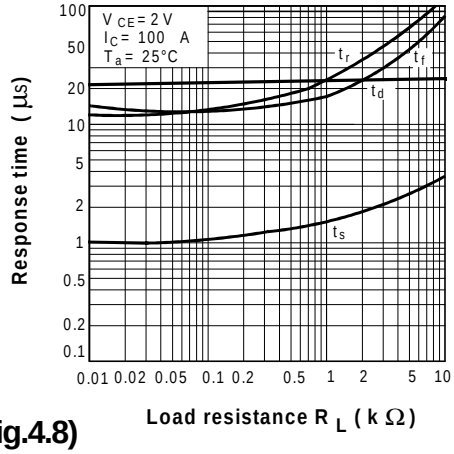
(Fig.4.6)

Collector Dark Current vs. Ambient Temperature



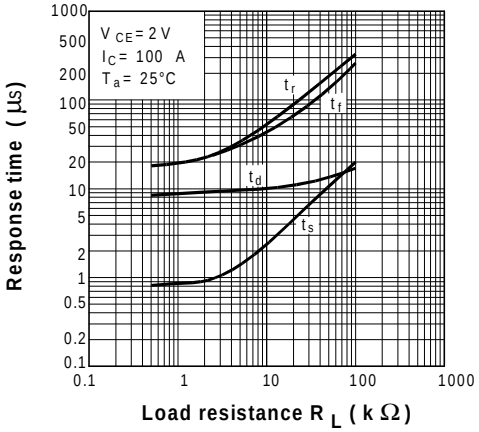
(Fig.4.7)

Response Time vs. Load Resistance



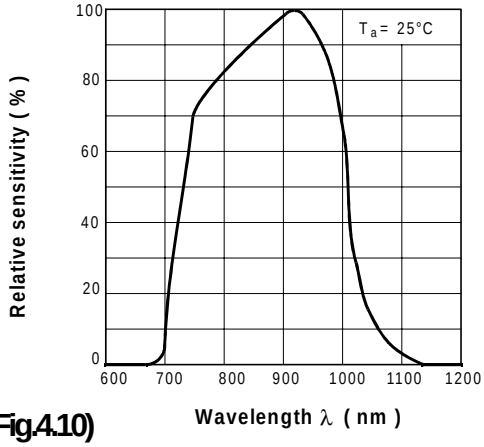
(Fig.4.8)

Response Time vs. Load Resistance



(Fig.4.9)

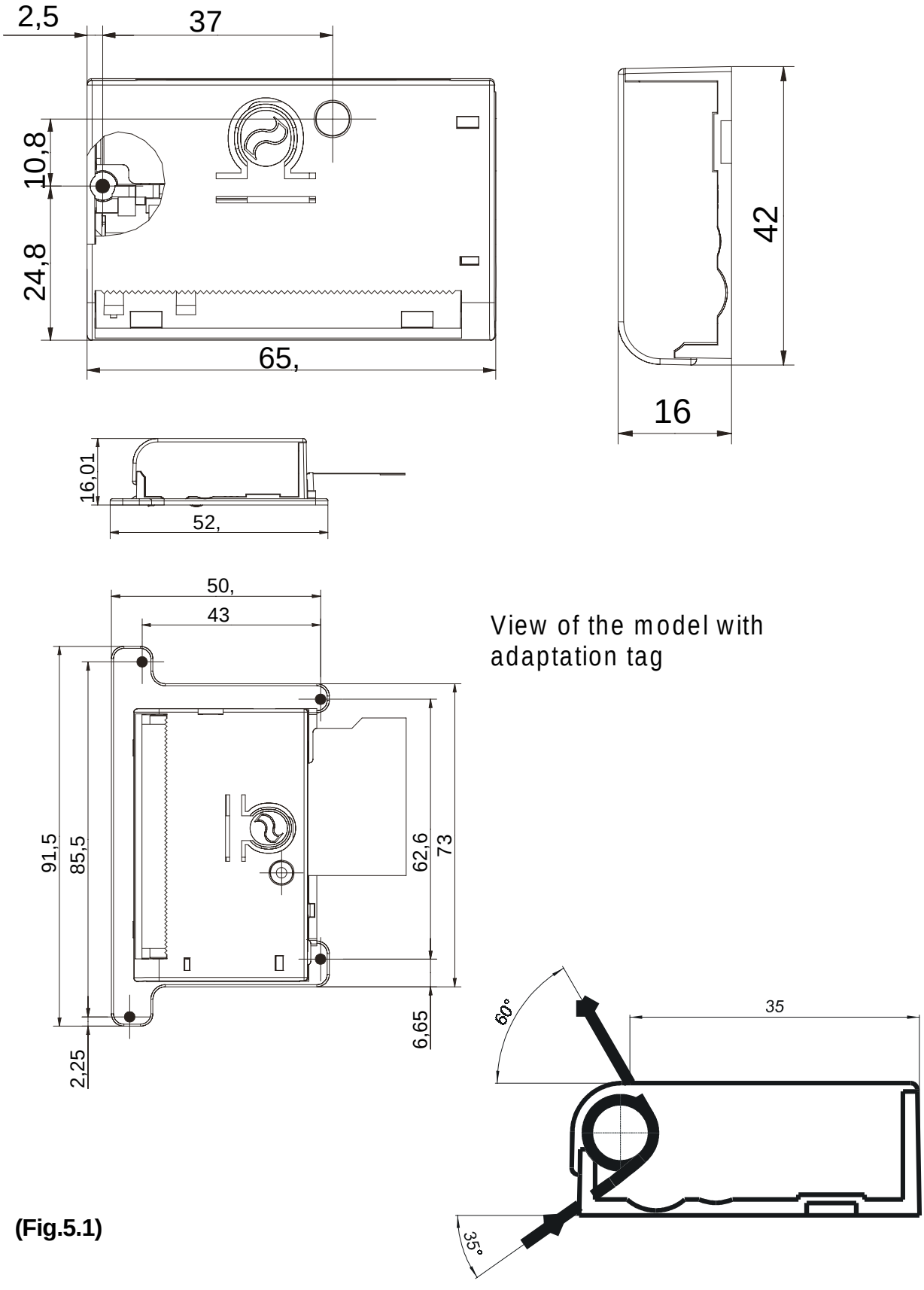
Spectral Sensitivity (Detecting Side)



(Fig.4.10)

5.1 DIMENSIONS

The dimensions of the CE58 thermal line printer are shown in figure 5.1.



(Fig.5.1)