OEM

USER MANUAL

MT2460

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TABLE OF CONTENTS

1 INTRODUCTION

1.1 General safety information

- Read and keep the instructions which follow.
- Follow all warnings and instructions indicated.
- Before cleaning the mechanism, disconnect the power supply.
- Clean the mechanism with a damp cloth. Do not use liquid or spray products.
- Do not operate the mechanism near water.
- Do not use the mechanism on unstable surfaces that might cause it to fall and be seriously damaged.
- During the integration of the printer, we strongly warn to keep an adeguate paper loop outlet underneath the presenter, in order to allow the receipt being properly printed out.
- Only use the mechanism on hard surfaces and in environments that guarantee proper ventilation.
- Make sure the mechanism is placed in such a way as to avoid damage to its wiring.
- Use the type of electrical power supply indicated. If in doubt, contact your retailer.
- Do not introduce foreign objects of any kind into the mechanism as this could cause a short circuit or damage parts that could jeopardize mechanism functioning.
- Do not spill liquids onto the mechanism.
- Do not carry out technical operations on the mechanism, with the exception of the scheduled maintenance procedures specifically indicated in the user manual.

1.2 General features

PAPER WIDTH	60 mm
RESOLUTIONS	8 dot/mm (203dpi)
PRINTING SPEED	150 mm/sec.
LOGIC VOLTAGE	3,3 V. 5V
SENSORS	Paper end, head up detection, temperature thermistor 30K
LIFE	50 Km printed paper
AUTOLOADING CAPABILITY	
COMPACT LAYOUT	
HIGH TORQUE PAPER-PULLING MOTOR	
SILICON RUBBER PAPER FEEDING ROLL	

1.3 Print head specifications

PRINTING METHOD	Thermal line dot method
EFFECTIVE PRINTING WIDTH	56 mm
HEAD CONFIGURATION (DOTS/LINE)	448
DOT PITCH	0,125 mm
PRINTING SPEED (see power consumption and energy dots)	150mm/sec.
PAPER WIDTH (MM)	60 mm
PAPER FEED METHOD	Friction feed, 1 dot line/1 pulses, bipolar 2-2 phase excitation
HEAD TEMPERATURE SENSOR	Thermistor
PAPER DETECTION	Reflective type photosensor
MAXIMUM NUMBER OF DOTS ACTIVATED AT A TIME	192
DOT RESISTANCE (RAV)	700 Ω

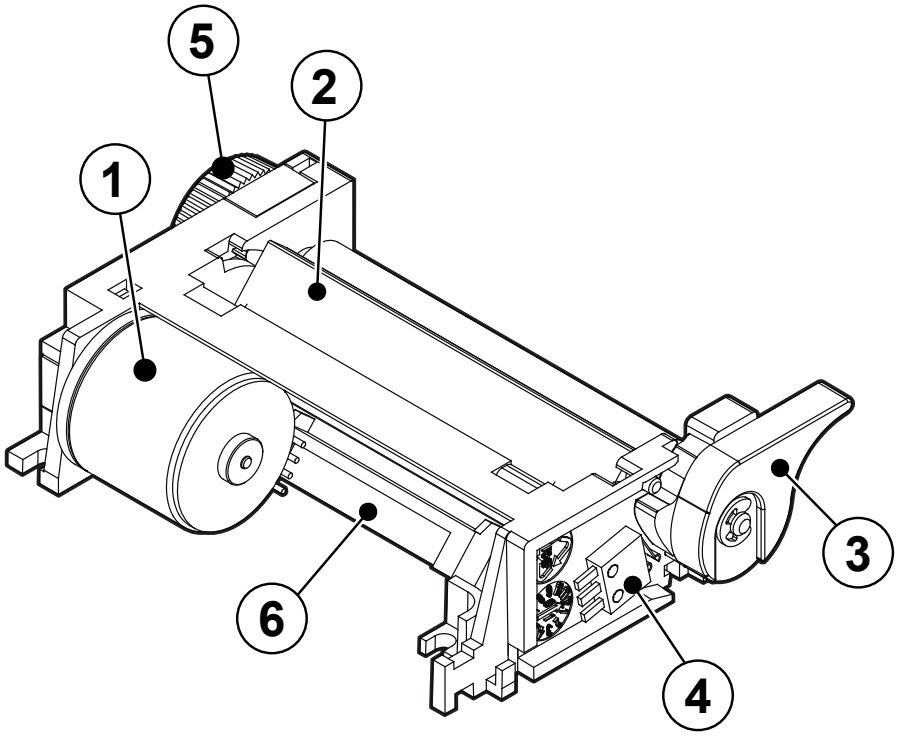
NUMBER OF STROBES	3
HEATER ENERGY	
5°C	0,18 mJ/dot (0,24 ms)
25°C	0,15 mJ/dot (0,20 ms)
45°C	0,14 mJ/dot (0,19 ms)
DRIVER SATURATED RESISTANCE (RIC)	33 Ω
EXTERNAL DIMENSIONS (W x D x H)	85,4 x 49 x 20
WEIGHT	72 gr
OPERATION VOLTAGE RANGE LOGIC	3,3 V, 5 V
OPERATION VOLTAGE DOTLINE HEAD	24V± 5%
CURRENT CONSUMPTION	32,5 mA/dots ($\overline{R}$ = 700 Ω)
LIFE / REABILITY	50 Km 1 x 10^8 pulse
RECOMMENDED PAPER WEIGTH	55 g/m^2
RECOMMENDED PAPER	KF-50HDA or equivalent
HEAD VOLTAGE	V_H = 25,2 V (note between connectors)
SUPPLY VOLTAGE	V_{DD} = 5,5 V
SUBSTRATE TEMPERATURE	65 °C
ENVIRONMENT OPERATING TEMPERATURE RANGE	5 ÷ 50°C
OPERATING HUMIDITY	10 ÷ 90 % RH no condensation
ENVIRONMENT STORAGE TEMPERATURE (EXCEPT PAPER)	-40 ÷ 80 °C

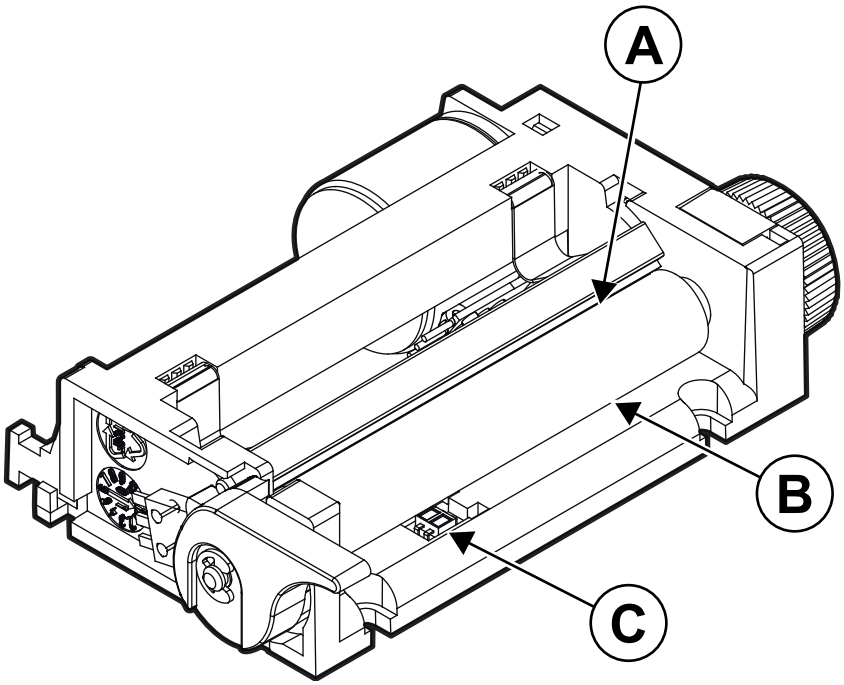
2 INSTALLATION AND USE

2.1 Front exterior view of MT2460

1. Motor
2. Print Head
3. Head up lever
4. Sensor Head up detection
5. Knob paper feed
6. Thermal Head connector

A- Paper outfeed
B- Paper input
C- Paper end sensor

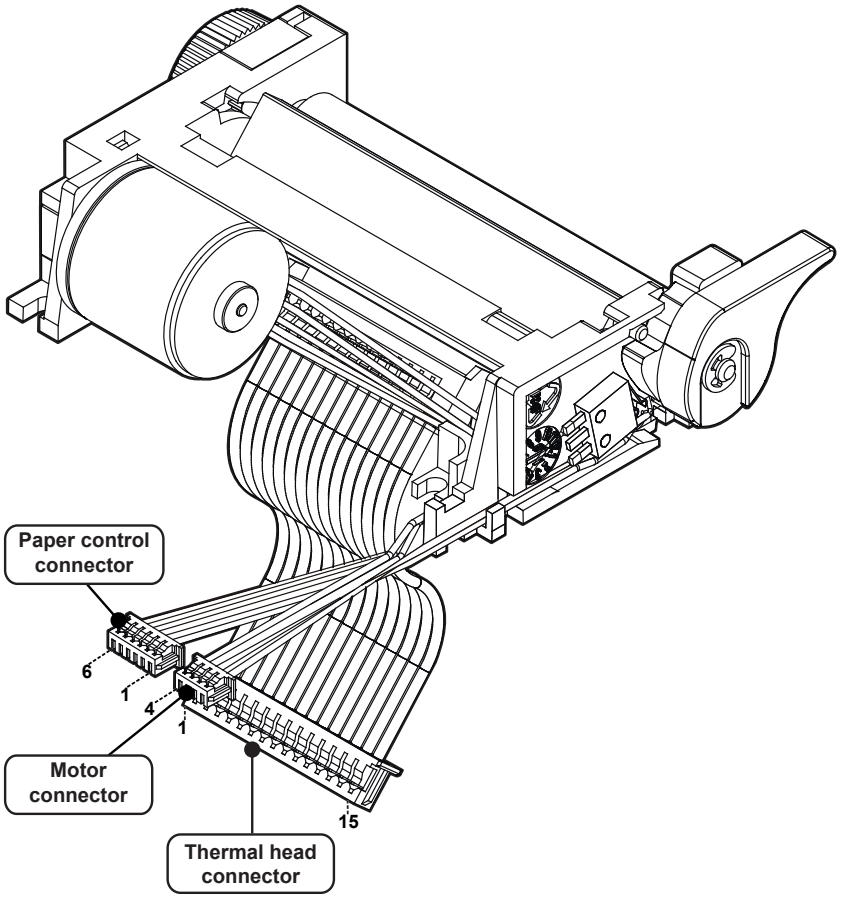




3 CONNECTIONS

3.1 Connections terminals

The mechanism has three interface connectors (see following figure), that includes the thermal head connector, motor connector and paper control connector.



In the table below are described the connector specifications and functions:

No.	Connector	Pin No.	TYPE
1	Thermal head connector	15	JST connector (or equivalent) Male S15B-PH-K-S
2	Head-up sensor Paper end sensor	6	Molex connector (or equivalent) female housing 51021-0600 terminal 50058-8000
3	Motor connecotr	4	Molex connector female housing 51021-0400(white) terminal 50058-8000

3.1.1 Thermal head connector

The connector's pin assignments is as follows:

No.	SIGNAL	FUNCTION
1	VH	Head power supply
2	VH	Head power supply
3	VH	Head power supply
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	VDD	Logic power supply
8	TM	Thermistor
9	$\overline{\text{STB1}}$	Strobe1 signal *(Active low)*
10	$\overline{\text{STB2}}$	Strobe2 signal *(Active low)*
11	$\overline{\text{STB3}}$	Strobe3 signal *(Active low)*
12	NC	Not connected
13	CLK	Serial clock
14	$\overline{\text{LATCH}}$	Latch *(Active low signal)*
15	DATA IN	Data input

Connector type: JST connector (or equivalent)
Male S15B-PH-K-S

NOTE: The symbol " —— " means a negative logical signal.

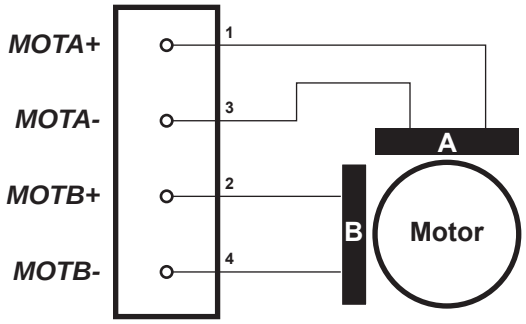
3.1.2 Motor connector

The connector's pin assignments is as follows:

No.	SIGNAL	FUNCTION
1	MOTA+	Phase 1 coil
2	MOTB+	Phase 2 coil
3	MOTA-	Phase 1 coil
4	MOTB-	Phase 2 coil

Connector type: Molex connector female housing 51021-0400
terminal 50058-8000

3.1.3 Electrical circuit block diagrams of motor



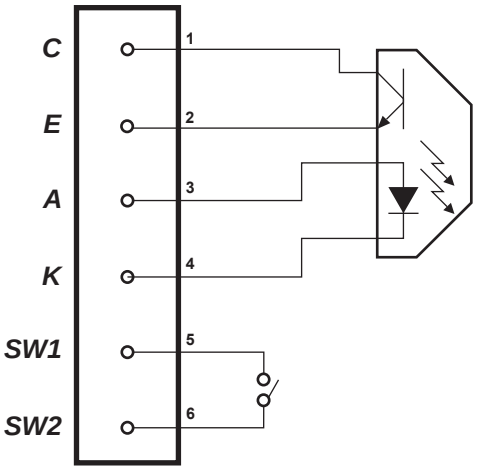
3.1.4 Paper-end/Head-up sensor connector

The connector's pin assignments is as follows:

No.	SIGNAL	FUNCTION
1	C	Collector photo transistor paper
2	E	Emitter photo transistor paper
3	A	LED Anode paper
4	K	LED Cathode paper
5	SW1	Switch signal 1 of head-up sensor output
6	SW2	Switch signal 2 of head-up sensor output

Connector type: Molex connector female housing 51021-0600
terminal 50058-8000

3.1.5 Electrical circuit block diagrams of Paper-end/Head-up sensor



4 PRINT HEAD

MT2460 has a thickfilm thermal printhead. 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:

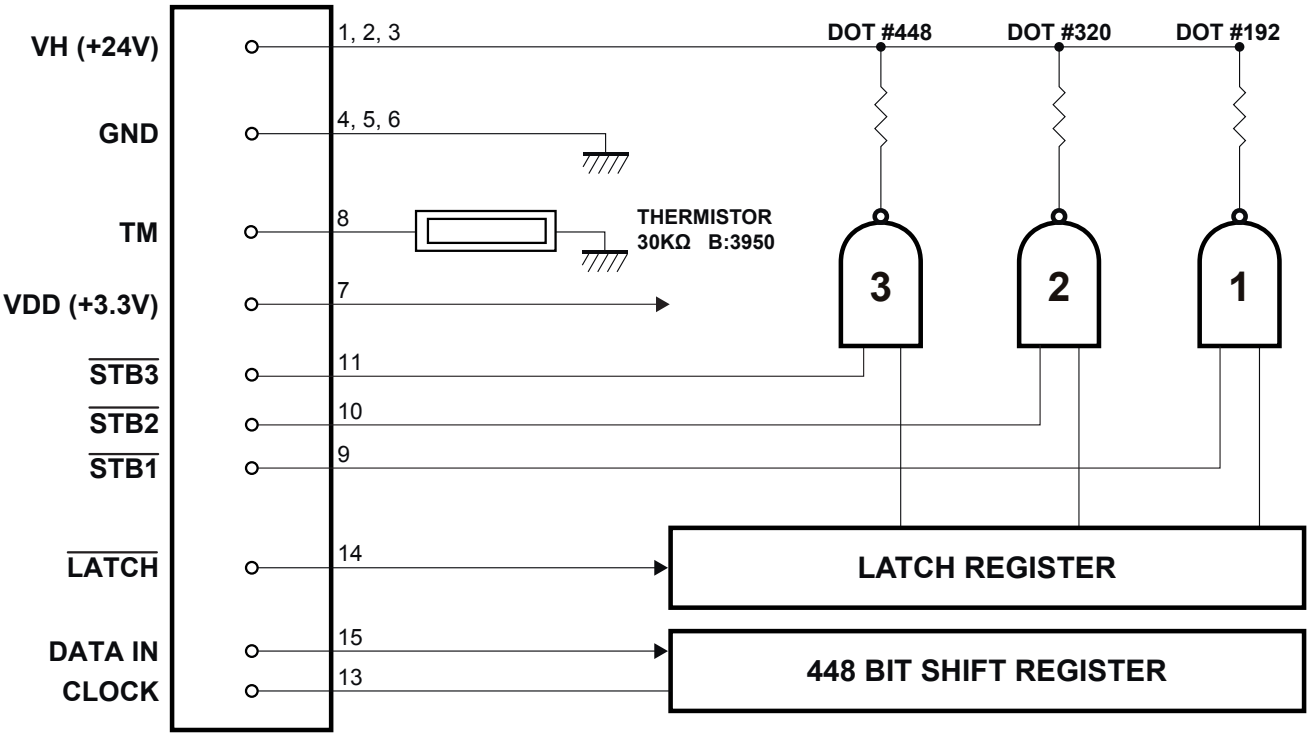
$$Po = Io^2 \times Rav = \frac{VH^2 \times Rav}{(Rav + Ric)^2} \qquad Ton = \frac{Eo}{Po}$$

SYMBOL	PARAMETER	VALUE	UNIT
Rav	Average resistance	700	Ω
Ric	Driver saturated resistance	23	Ω

4.1 Operation precautions

1. When continuous printing is performed the supply energy should be reduced so that the substrate temperature show in Maximum Condition Table.
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 then the printhead supply voltage (VH). Turn Off= Switch off the printhead supply voltage (VH) first and then turn the logic voltage (Vdd) 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 review and adjust the paper feed mechanism and the electrical 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.
10. The print density variation may become larger if the number of dots energized at same time becomes greater than 192 value.

4.2 Block diagram of the electrical circuit

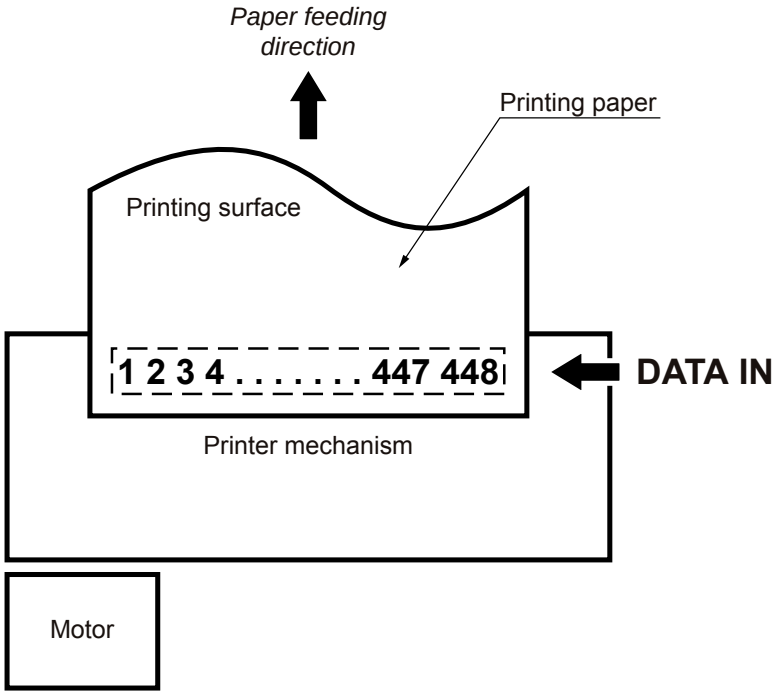


Each STB Line is pulled-down within the driver IC

STB No.	Dot No.	Dots/STB
1	1 ~ 192	192
2	193~ 320	128
3	321 ~ 448	128

4.3 Printing data and printing position

Print data of 448-bits length (1 to 448), transferred by DATA IN(DI), are printed in the arrangement as shown in the following figure :



4.4 Electrical characteristics of circuit

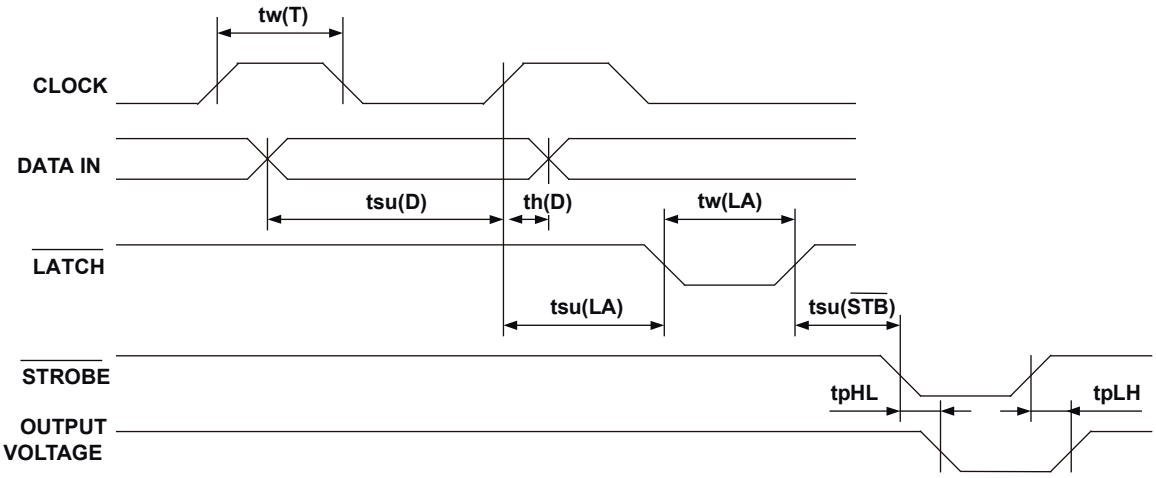
ITEM		SYMBOL	MINI	TYP.	MAXI.	UNIT	CONDITIONS
Head power supply		V_H	23.5	24.0	24.5	V	
Logic power supply		V_{DD}	3.00	3.3	5.5	V	
Logic supply current		I_{DD}	-	5.6	17.5	mA	VDD = 3.3 V fCLK = 5 MHz SI = fCLK/2
Input Voltage	High	V_{IH}	0.8 x V_{DD}	-	V_{DD}	V	STB, DI, LAT, CLK
	Low	V_{IL}	0	-	0.2 x V_{DD}	V	
Data input current (DI)	High(1)	I_{IH} DI	-	-	0.5	µA	VDD = 3.3V VIH = 5V TA = 25°C
	Low	I_{IL} DI	-0.5	-	-	µA	VDD = 3.3V VIL = 0V
STB input current (STB)	High(1)	I_{IH} STB	-	-	1.5	µA	VDD = 3.3V VIH = 5V TA = 25°C
	Low	I_{IL} STB	-66	-	-	µA	VDD = 3.3V VIL = 0V
Clock input current (CLK)	High(1)	I_{IH} CLK	-	-	3.5	µA	VDD = 3.3V VIH = 5V TA = 25°C
	Low	I_{IL} CLK	-3.5	-	-	µA	VDD = 3.3V VIL = 0V
Latch input current (LAT)	High(1)	I_{IH} LAT	-	-	3.5	µA	VDD = 3.3V VIH = 5V
	Low	I_{IL} LAT	-3.5	-	-3	µA	VDD = 3.3V VIL = 0V

(1) **Note:** Each strobe includes pull-up resistance of 300KΩ ± 50% per IC.

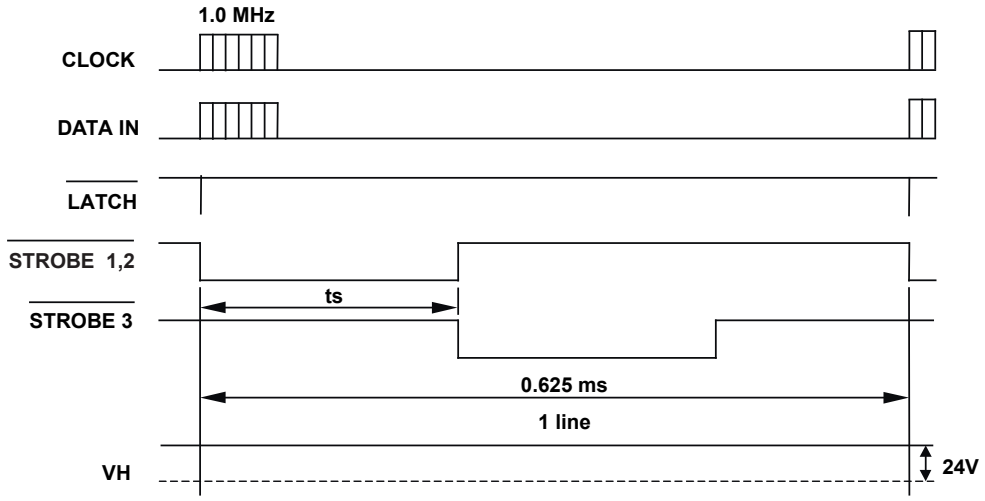
4.5 Switching characteristics of circuit

The switching characteristic summarized in the following table :

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock frequency	fMAX	-	-	5.0	MHz
Clock pulse width	tw(T)	70	-	-	ns
Data set-up time	tsu(D)	40	-	-	ns
Data hold time	th(D)	40	-	-	ns
Latch set-up time	tsu(LA)	100	-	-	ns
Latch pulse width	tw(LA)	100	-	-	ns
Strobe set-up time	tsu($\overline{STB}$)	100	-	-	ns
Strobe to driver Output delay time	tpLH tpHL	-	-	18	µs



4.6 Timing chart



NOTES: The symbol " ———— " means a negative logical signal.

4.7 Thermistor

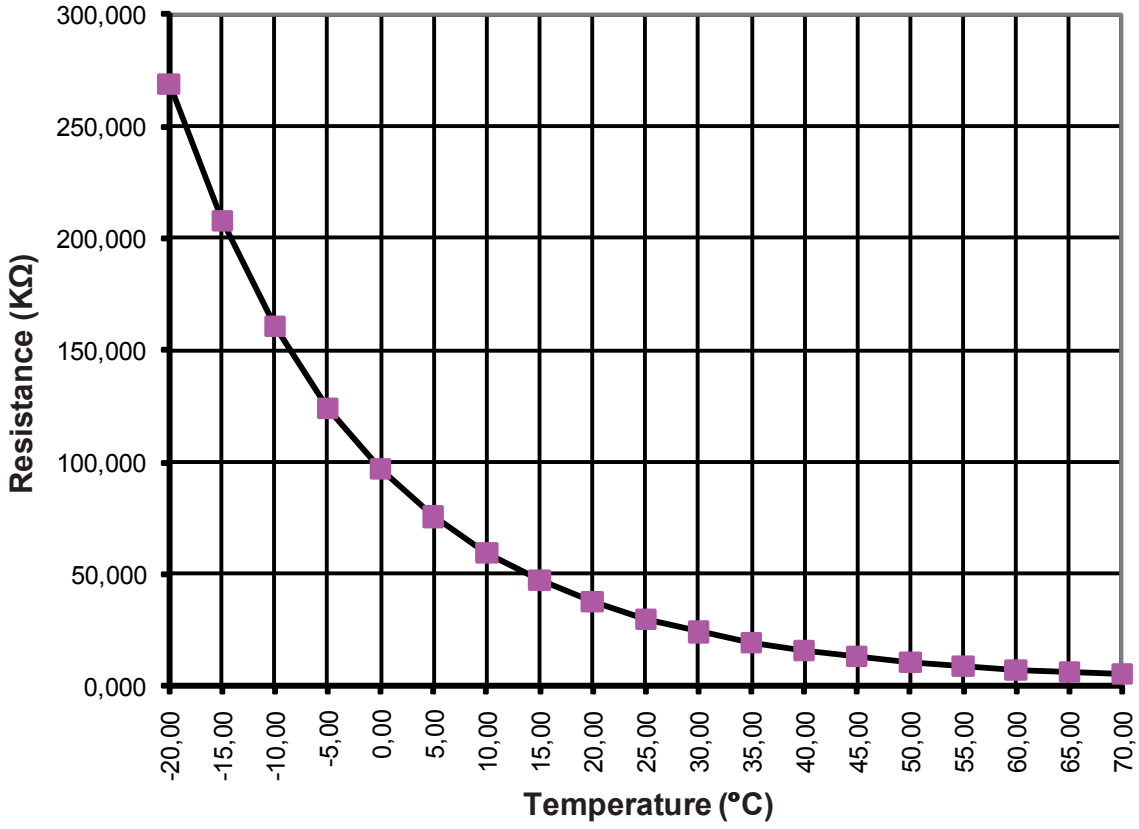
The thermistor is very important to adjust the strobe time (Tstrobe) ~ (SLT) in function of the head temperature and to monitor the temperature to prevent the head damage if the temperature is over the limit described in the Maximum conditions table.

- Resistance R25: 30 KΩ ± 5% at 25°C
- B value: 3950 K ± 3%
- Operating temperature: –20 ~ + 80°C
- Time costant: Max. 30 sec.(in the air)

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

$R(T) = R25 \times e \{ B \times (1/TX - 1/T25) \}$

4.7.1 Thermistore Curves



5 STEPPER MOTOR

The paper feed pitch for stepper motor is 2 steps for one dotline(1).

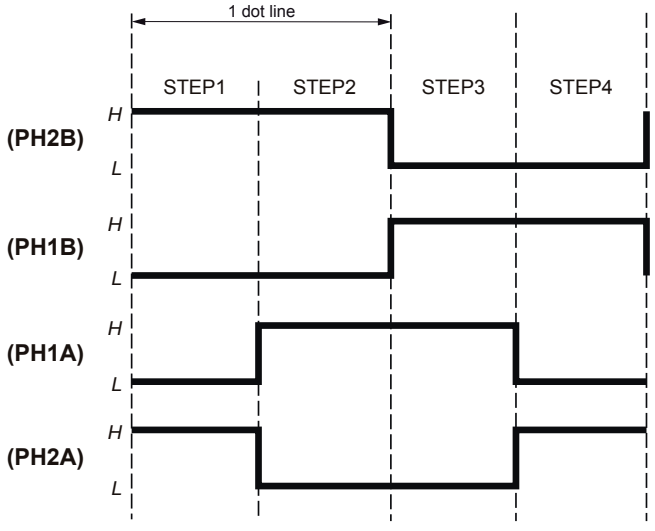
(1) Note: 1 dotline = 0.125 mm.

5.1 Technical specifications

ITEM	SPECIFICATION
Drive voltage	DC 24 V
No. of phases	2
Drive mode	Bipolar drive
Step angle	18° ± 10%
Rated current	350 mA / Phase
Resistance	12Ω ± 7% at 25 °C (each phase)
Inductance	5.7 mH ± 25% at 25°C (1kHz. 1Vrms)
Holding torque	85 gf-cm MIN
Pull-out torque	45 gf-cm MIN
Insulation resistance	100 MΩ MIN (500 Vdc)
Insulation class	Class E
Dielectric strength	5 mA (at 600V AC 1.0 sec.)
Life	210 Hr min.
Maximum coil temperature	115°C

5.2 Excitation sequence

The motor is driven in the forward direction if its excitation phases are switched as per the following steps:



Excitation Voltage Waveforms

SEQUENCE	SIGNAL			
	PH2B	PH1B	PH1A	PH2A
Step1	*High*	*Low*	*Low*	*High*
Step2	*High*	*Low*	*High*	*Low*
Step3	*Low*	*High*	*High*	*Low*
Step4	*Low*	*High*	*Low*	*High*

5.3 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 24 volts we suggest to use a chopper driving, in order to reduce current, please contact CUSTOM ENGINEERING SPA for further information.

6 SENSOR

Maximum Ratings (Ta = 25°C)

PARAMETER		SYMBOL	RATING	UNIT
Input	Power dissipation	P_D	75	mW
	Reverse voltage	V_R	5	V
	Forward current	I_F	50	mA
	Pulse forward current(1)	I_{FP}	1	A
Output	Collector power dissipation	P_C	50	mW
	Collector current	I_C	20	mA
	Collector-emitter voltage	V_{CEO}	30	V
	Emitter-collector voltage	V_{ECO}	3	V
Operating temperature range		T_{OPR}	-20 ~ 85	°C
Storage temperature range		T_{STG}	-30 ~ 100	°C

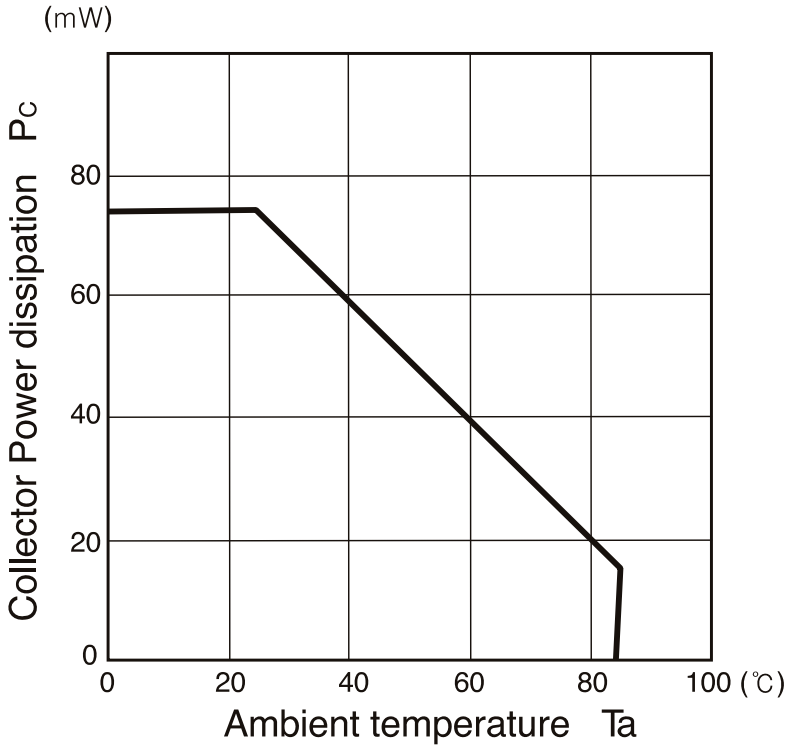
(1) Note: Pulse width ≤ 100 μs, Repetitive frequency = 100 Hz.

Opto-electrical characteristics (Ta = 25°C)

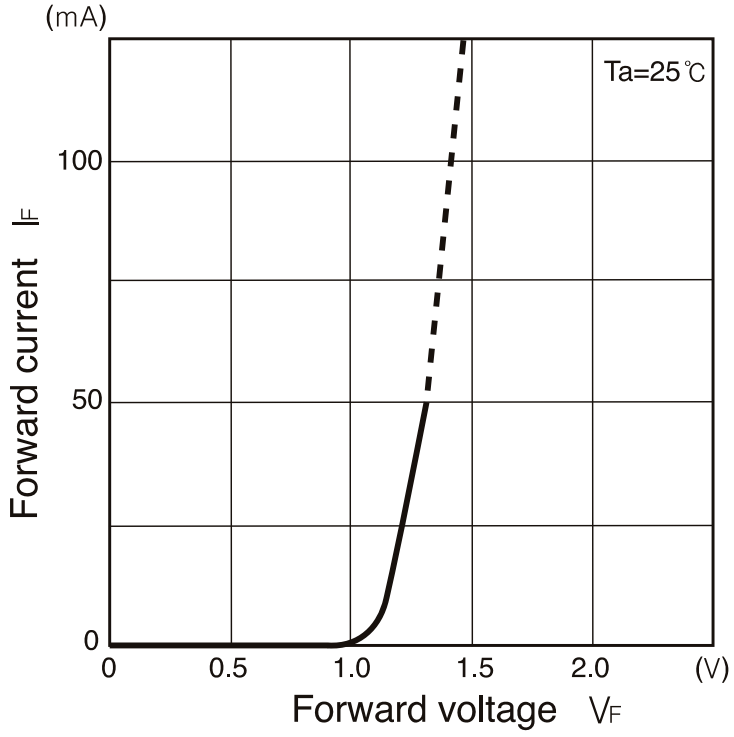
PARAMETER		SYMBOL	CONDITIONS	MIN.	TYP.	MAX	UNIT
Input	Forward voltage	V_F	I_F = 10 mA	-	-	1.3	V
	Reverse current	I_R	V_R = 5 V	-	-	10	μA
	Peak emission wavelength	λ_P	I_F = 10 mA	-	940	-	nm
Output	Collector dark current	I_{CEO}	V_{CE} = 10 V	-	-	0.2	μA
	Peak sensibility wavelength	λ_P		-	900	-	nm
Light current		I_L	V_{CE} = 5 V, I_F = 10 mA	90	-	-	μA
Leakage current		I_{LEAK}	V_{CE} = 5 V, IF = 10 mA	-	-	0.2	μA
Switching speeds	Rise time	t_r	V_{CC} = 2 V, I_C = 0.1 mA R_L = 1 KΩ	-	30	-	μs
	Fall time	t_f		-	25	-	μs

6.1 Graphics of typical characteristics

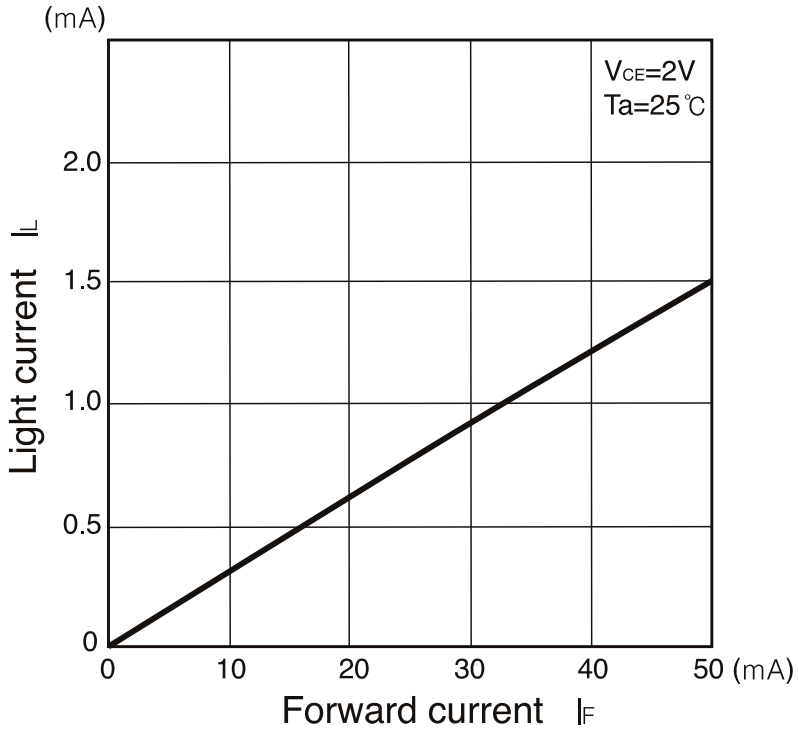
Collector Power dissipation vs. Ambient Temperature



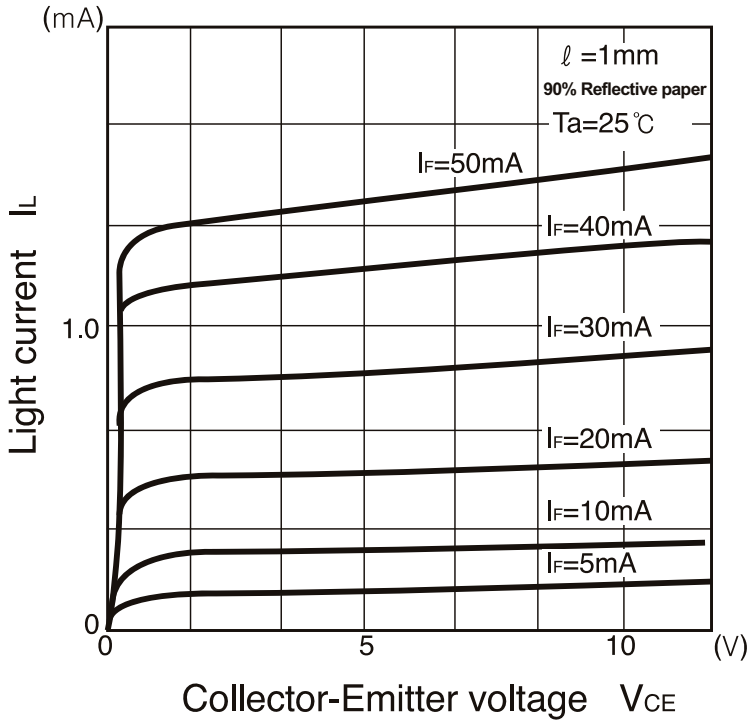
Forward Current vs. Forward Voltage



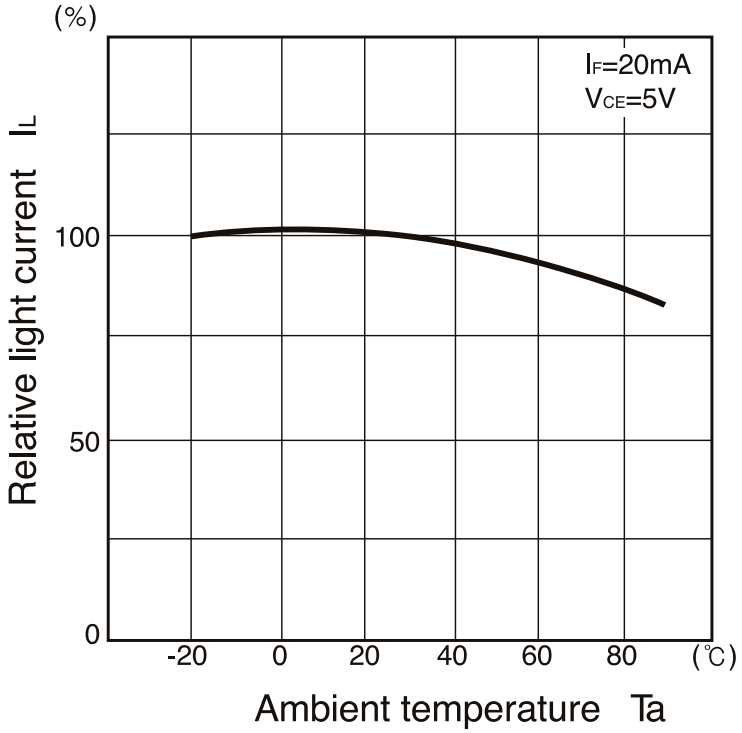
Light Current vs. Forward Current



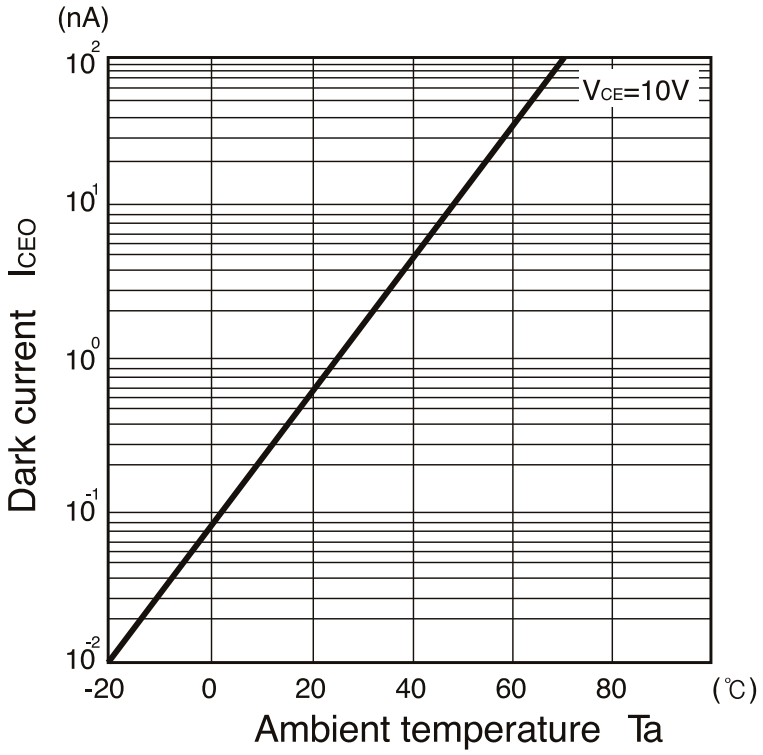
Light Current vs. Collector-Emitter Voltage



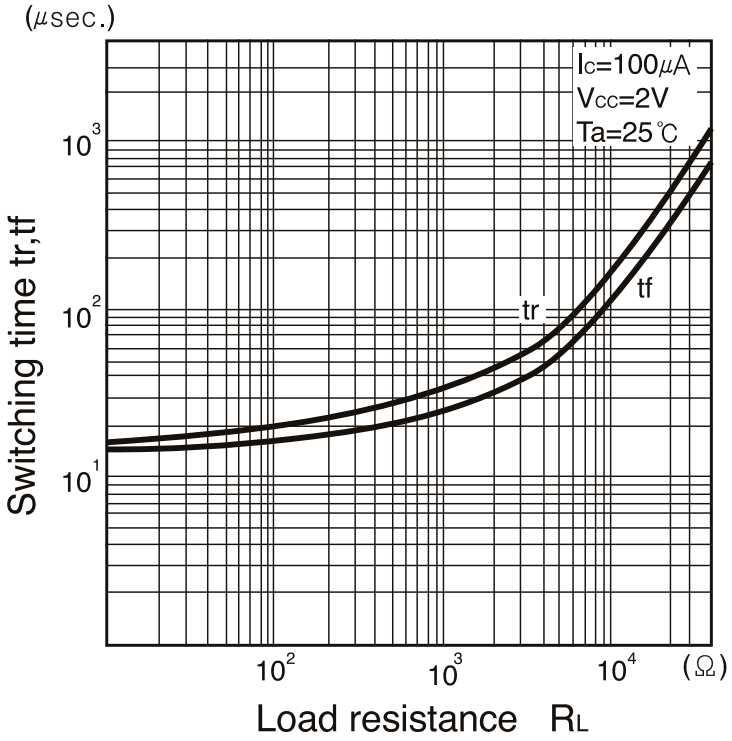
Relative light current vs Ambient temperature



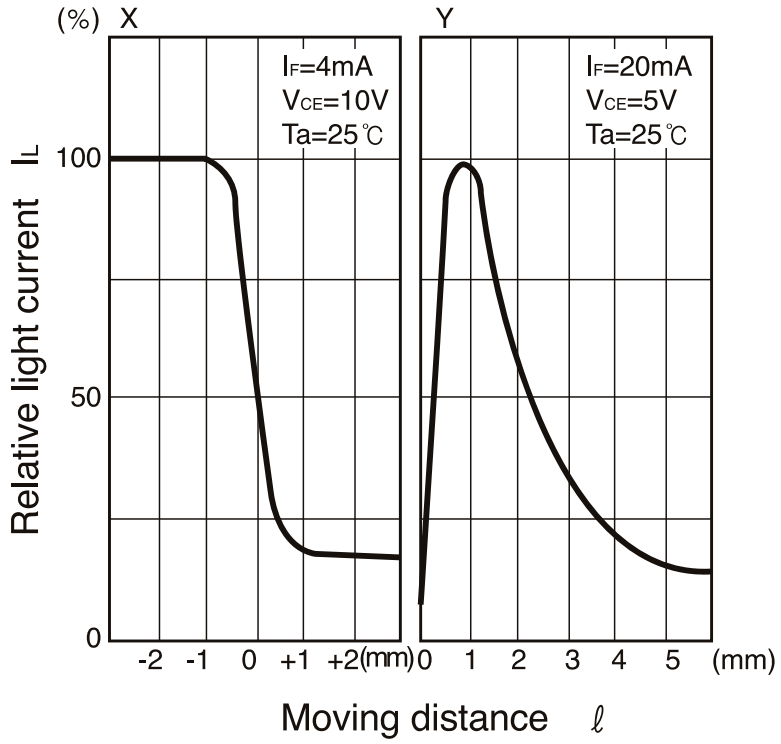
Dark current vs Ambient temperature



Switching time vs Load resistance



Relative light current vs Moving distance

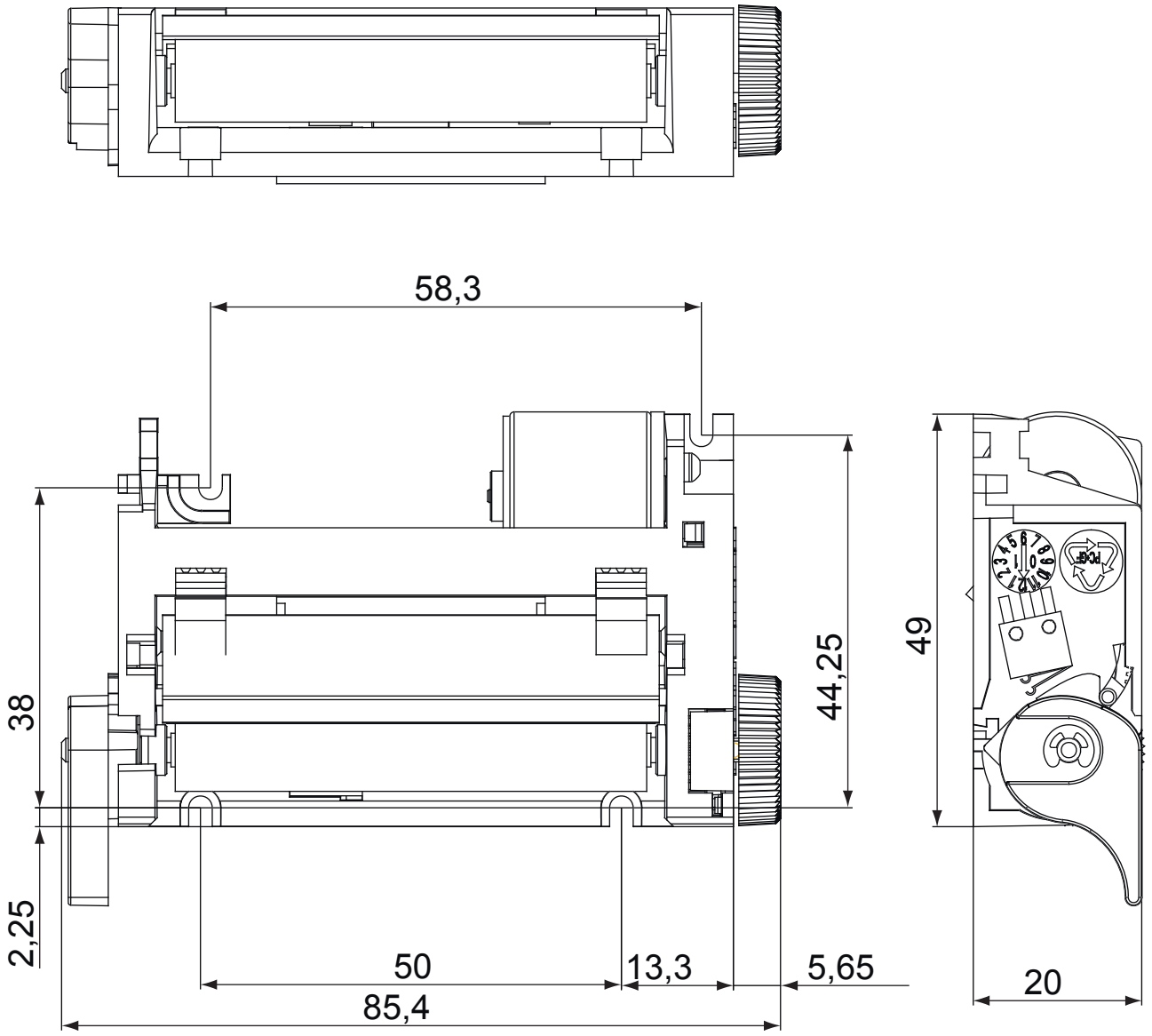


7 DIMENSIONS

7.1 DIMENSIONS

The figure illustrates the overall dimensions for the MT2460 thermal printing mechanism.

(Dimensions in mm)



Part Number : DOME-MT2460 Rev. 1.50

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Research Scientifi
T e c h n o l o g
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