QJ205-JX-LV Model

Thermal Printer Mechanism Specification

1. Brief introduction

1.1 Thermal printer mechanism

It is a small size, wide operating voltage, high efficiency thermal printer mechanism. The unique easy loading makes it become an ultra compact, reliable and cost-effective printer mechanism.

1.2 Characteristics

◆ Easy loading paper
◆ Small size, light weight
◆ Metal frame, metal gear shaft, stable, reliable, high life, excellent thermal properties
◆ Print speed（max）: 85 mm / s （at 9.5 V voltage of motor）
◆ Wide operating voltage (3.5 V-9.5V)
◆ High accuracy (8 dots / mm)
◆ Wear life: more than 50 km
◆ Don’t need to maintenance
◆ Low noise: brushless magnetic incentive step motor; high wear resistance, composed of resistant to high / low temperature special engineering plastics gears, makes it has very low noise.
◆ Compatible with APS SS205-V3-HS thermal printer

Apply to: ■ Portable printer/terminal
■ EFT
■ Cash register
■ POS
■ Weight machines
■ Medical equipment

1.3 Description

The manual describes electrical characteristics and mechanical properties of JX-2R-01K. That is operation principle, basic parameters, the scope of application, peripheral interface definitions and structure size. The contents of this document are subject to change without notice. Please contact us for the latest information.

QIJI Technology will not bear any responsibility for any damage or injuries arising from use of this product that is not in accordance with the specifications and the notes provided below.

2. General Specification

Item	Specification
Print Method	Thermal dot line printing
Print width（mm）	48
Precision（dots/mm）	8
Dots per line	384dots/line
Paper width（mm）	58
Dot pitch （mm）	0.125
Dot sizes	0.125mmx0.12mm
Max print speed	85mm/s(motor driving voltage is 9.5 V.)
Feeding accuracy	0.0625mm(2-2 phase excitation motor)
Head temperature detection	Via Thermistor
The Thermal Head in Place/Paper out Detection	Via photo interrupter
Head driving voltage(DCV)	3.13~9.5
Head logic voltage(DCV)	2.7～5.25
Motor driving voltage(DCV)	3.5~9.5
Operation temperature	+0℃~50℃（No condensation）
Operation humidity	20%~85%RH（No condensation）
Storage temperature	-20℃~60℃（No condensation）
Storage humidity	5%~95%RH（No condensation）
Noise	Less than 60dB(A-weighted RMS)
Platen open life	More than 5000 times(Roller left the reset time plus)
Traction to the thermal paper	≥50gf
Grip braking force to the thermal paper	≥80gf
Life Span(at 25°C and rated energy)	100 million print pulses or more More than 50km printing life
Weight(g)	21
Dimensions(L*W*H)	67.6±0.5mm*23.2±0.5mm*25.5±0.5mm

3. Print head specification

3.1 Rated parameters

Dots per line	384
Dot pitch	0.125mm
Dot size	0.125mm*0.12mm
Print width	48 mm
Paper width	54 mm
Average resistance	165 Ω±4%
Operation voltage	3.13~9.5 DC V
Pulse life	100 million pulses
Mechanical wear life	50km
conditions	25℃
Heat time ratio less than	12.5%.

3.2 Maximum conditions at 25℃

Item	symbol	Maximum Reference	Condition
Loop printing	S.L.T	1.25	Tsub=25℃
Heating Power		0.2 mJ/dot	
Heating Voltage	VH	9.5v	Rated voltage is 7.2V
Logic Voltage	Vdd	7V	Including max voltage
Logic input Voltage	Vin	-0.5V~Vdd+0.5V	
Substrate Temperature	Ta	65℃	Thermistor temperature
Print dots simultaneously		64 dots	

3.3 Condition for electrical actions

Table 4

Item		symbol	Electrical parameters	conditions
Consumed Power		P。	0.27W/dot	Rav=165Ω, Vdd=5V, concurrent applied dot number with 64 dots.
Supply voltage		VH	7.2V	
Loop printing		S.L.T	1.25ms/line	
Supply Energy	5℃	E。(Ton)	0.16mJ/dot(0.65ms)	64dots Pulsed simultaneously
	25℃		0.13mJ/dot(0.58ms)	
	45℃		0.11mJ/dot(0.50ms)	
Supply Current		I。	2.6A	

3.4 Calculation formula

Heating energy is calculated by equation below:

$$P_0 = I_0^{\,2} \times Rav = \frac{VH^2 \times Rav}{(Rcom \times N + Rav + Ric + Rlead)^2}$$

$$\because Ton = \frac{E_0}{P_0}$$

$$\therefore P_0 = \frac{E_0}{Ton}$$

$$VH = \sqrt{p_0 \div Rav} \times (Rcom \times N + Rav + Ric + Rlead)$$

where： Rav: average resistance value 165Ω

N: dots pulsed simultaneously 64dot

Rcom: common terminal resistance value 0.05Ω

Ric: On resistance value of driver IC 9Ω

Rlead: Wire resistance 10Ω

3.5 Thermistor characteristics

Calculation formula：

$$R_X = R25 \times EXP[B \times (\frac{1}{T_X} - \frac{1}{T25})]$$

T：Absolute temperature

Where： B： Constant Value 3550 kelvin ± 3%

R25： Resistance Value (At 25℃) 10KΩ±5%(At 25℃)

Tx： Operation Temperature 273 oK +（-20℃～+80℃）

T25： Working Temperature 25℃+273

Correlation between thermistor and temperature：see figure

Characteristics：1）Working temperature：-20℃～+80℃

2）keep time：Less than 30 seconds (In the air)

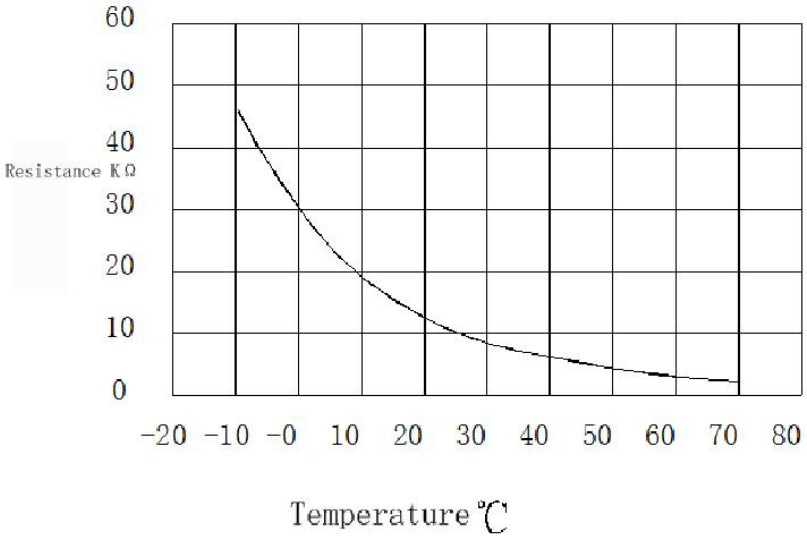


Table 5

Temp. (℃)	Resistance value (KΩ)	Temp. (℃)	Resistance value (KΩ)	Temp. (℃)	Resistance value (KΩ)	Temp. (℃)	Resistance value (KΩ)
-20	83.2	15	15.1	50	3.97		
-15	63	20	12.25	55	3.37		
-10	48.8	25	10	60	2.86		
-5	37.9	30	8.2	65	2.46		
0	29.8	35	6.79	70	2.1		
5	23.56	40	5.65	75	1.81		
10	18.8	45	4.7				

3.6 Electrical parameter (25±10℃) Table 6

Item	Symbol	MIN	TYP	MAX	Unit	Condition
Head Voltage	VH	3.13	7．2	9.5	V	
Logic Voltage	Vdd	2.7	5.0	5.25	V	*1
Logic Current	Idd	--	--	36	mA	fDI=fclk/2
Input Voltage(High level)	VIH	0.8Vdd	--	Vdd	V	STB, DI, LAT, CLK
Input Voltage(Low level)	VIL	0	--	0.2Vdd	V	
Latch input current(high level)	IIH	--	--	1.5	µÀ	VIH=5V VIL=0V
Heat input current(high level)		--	--	0.5		
Clock input current(high level)		--	--	1.5		
Data input current(high level)		--	--	0.5		
Latch input current(low level)	IIL	--	--	1.5	µÀ	
Heat input current(low level)		--	--	0.5		
Clock input current(low level)		--	--	1.5		
Data input current(low level)		--	--	0.5		
Data output voltage(high level)	VDOH	4.45	--	--	V	Open state, Vdd=4.5V
Data output voltage(low level)	VDOL	--	--	0.05	V	
Output Voltage	VOL	--	(1.0)	--	V	Drive the output section, the reference value

3.7 Timing characteristics (25±10℃) Table 7

Item	Symbol	Speed			Unit	Condition
		MIN	TYP	MAX		
Clock Frequency	fCLK	--	5	8	MHz	3≦Vdd≦5.525
		--	3	5	MHz	2.7≦Vdd<3
Clock pulse width	twCLK	95(155)	--	--	ns	See timing chart
Data setup time	Testup DI	100(140)	--	--	ns	
Data hold time	Thold DI	85	--	--	ns	
Data delay time	Td DO	--	50	--	ns	3≦Vdd≦5.525
		--	90	--	ns	2.7≦Vdd<3
Latch pulse width	Tw LAT	150	--	--	ns	
Latch setup time	Testup LAT	200	--	--	ns	
Latch delay time	Thold LAT	50	--	--	ns	
Heating setup time	Testup STB	300	--	--	ns	
Output delay time	Tdo	--	--	10	µs	Vdd=5V
		--	--	30	µs	Vdd=2.5V

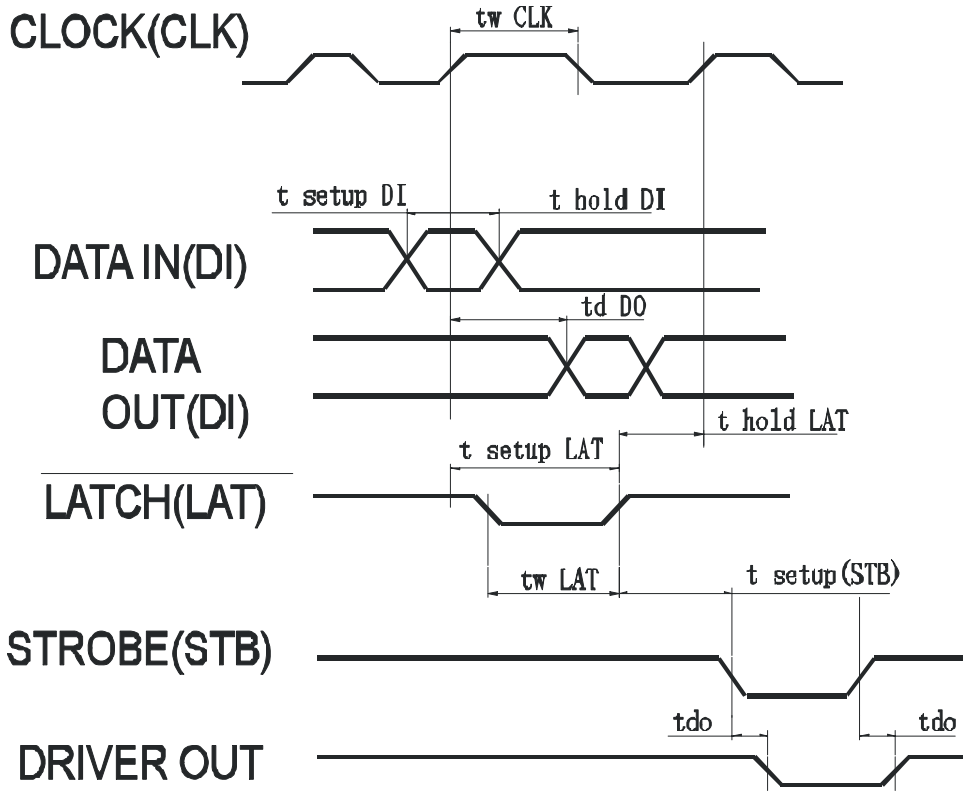


Fig.2 Circuit Diagram

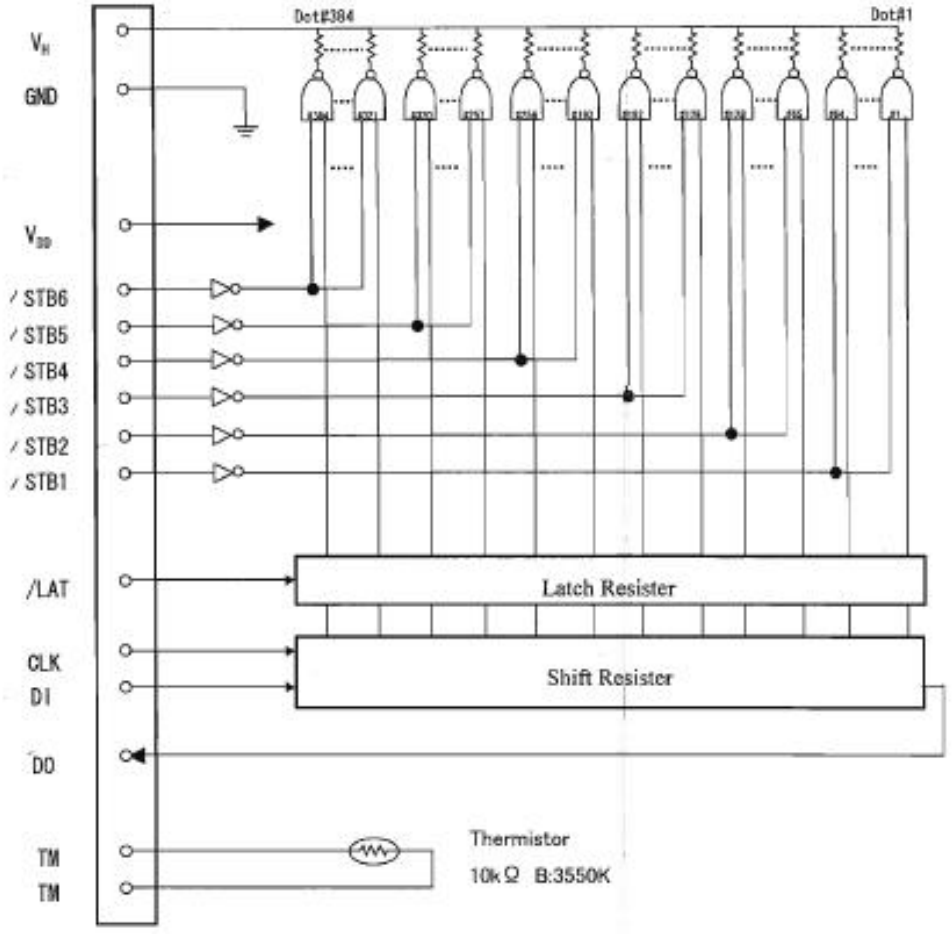
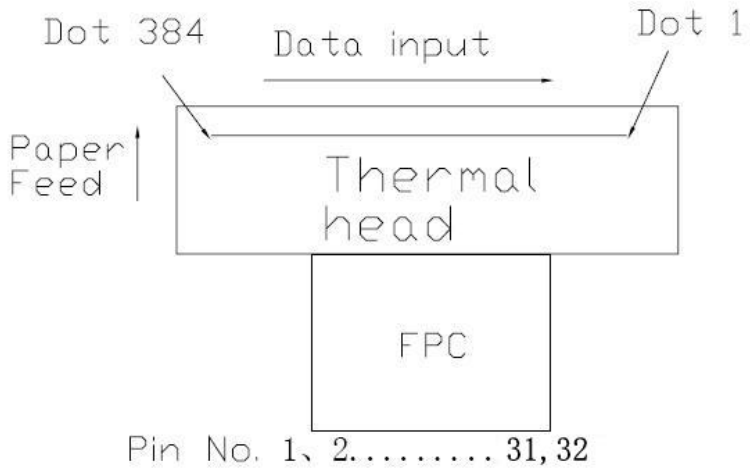


Figure 2

Table 8

Strobe No.	Dot NO.	Dots / Pins
1	1～128	128
2	129～192	64
3	193～320	128
4	321～384	64



(Note：The figure is face to the thermal head heat line.)

3.8 Attentions

(a) Thermal printer head driving voltage On/Off sequence:

On sequence: First supply logic voltage (VDD), and then supply thermal head driving voltage (VH).

Off sequence: First close thermal head driving voltage (VH), and then close logic voltage (VDD).

(b) When the printer mechanism is not on printing state, please cut off thermal head voltage (VH).

(c) During thermal head driving voltage on/off or no-operation, please keep strobe heat signal(STB) is on no-operation state.

(d) After printing, please cut down thermal head voltage decreasing to the ground level (0V), and then keep on next print state.

(e) Heating control signal requirements: please make sure that heating control signal is off when printer mechanism voltage is on/off; and power supplier VH, logic VDD voltage should not more than rated value, especially when the STB of thermal head is changing or is on/off state; please make sure the voltage as follow:

VH	0V～+9.5V
Vdd	0V～+7V
Other signal	GND-0.5V～ Vdd+0.5V

(f) The driver ICs of thermal head shall be anti-electrostatic in order to prevent electrostatic destruction. Do not touch thermal head connector and FPC by naked hands.

(g) Please pay more attention to thermal head. Do not clean or wipe the head face with rigid material, and prevent mechanical shock, because abrasion-resistant coating of heat elements is brittle in property.

(h) Even if lower printing quality, the numbers of dots pulsed simultaneously is also not exceed 192 dots. General speaking, if the numbers of dots pulsed simultaneously is larger than 64 dots, the current of thermal head will be increasing that causes printing unequal, and the current shall be less than 4 ampere.

4. Step Motor

When step motor performs a feed, paper advances 0.0625mm.

4.1 Step Motor characteristics

Item	Reference	Condition
Rated voltage	4.2~9.5 DCV	
Phase	2 phase	
Step angle	18º（2-2Phase excitation）	
Step distance	0.0625mm	
Resistance of Phase	20 Ω±10%	20℃
Current of Phase	300mA	
Driving Method	Bipolar，2-2phase excitation	

4.2 Step Motor Phase Position

The step motor of QJ205-JX-LV mechanism adopts 2-2 phase excitation, and there are 4 positions as follow:

Table 10

Position	STEP1	STEP2	STEP3	STEP4
A	+	+	-	-
B	-	+	+	-
$\overline{A}$	-	-	+	+
$\overline{B}$	+	-	-	+

Motor Excitation Sequence（2-2Phase）

Rotation direction: CCW（facing to the gear side）

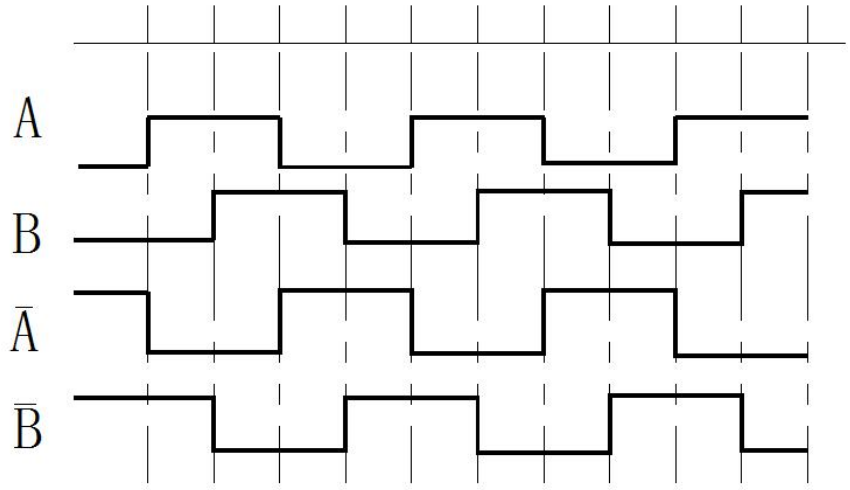


Figure 4

4.3 Step Motor Driving

It is recommended that motor is droved by PWM method, such as L3967, LB1836 as driver IC.

Different motor speed is correlated with different driving current, which can reduce effectively the radiation of motor and noise during printing?

The Maximum driving speed (at 25℃) corresponding with the phase voltage of step motor is showed as below.

Drive voltage	Frequency	Print ratio (%)
3．5 V DC	400 PPS	90
3．6 V DC	420 PPS	90
3．7 V DC	480 PPS	90
3．8 V DC	520 PPS	90
3． 9 V DC	550 PPS	89
4．0 V DC	800 PPS	88
4．1 V DC	840PPS	87
4．2 V DC	880PPS	86
4．3 V DC	900PPS	85
4．4 V DC	950PPS	84
4．5 V DC	1000PPS	83
4．6 V DC	1050PPS	82
4．7 V DC	1100PPS	81
4． 8 V DC	1150PPS	80
4． 9 V DC	1200PPS	79
5．0 V DC	1250PPS	78
5．1 V DC	1300PPS	77
5．2 V DC	1330PPS	76
5．5 V DC	1360PPS	75
6． 2 V DC	1380PPS	60
6． 5 V DC	1400PPS	55
6． 7 V DC	1420PPS	52
7． 0 V DC	1450PPS	50
7． 5 V DC	1480PPS	48
7． 8 V DC	1500PPS	46
8． 0 V DC	1520PPS	44
8． 3 V DC	1540PPS	42
8． 5 V DC	1560PPS	40
9． 0 V DC	1580PPS	38
9． 5 V DC	1600PPS	35

The drive current of step motor and print ratio can’t be more than the required value; otherwise it will be caused the motor overheating. In general, the temperature of motor face shall be not exceeding

90℃, if exceeding, it will affect operation stability of winding coil and rotor core of step motor.

Printing speed settings: It will be caused motor driving pulse deviation if applying too low printing speed, which will be taken more attention in the whole mechanism designation. It is recommended that it applies to low printing speed during starting motor for smoothly transition and preventing motor vibration, particularly in the case of low driving voltage and high printing speed.

During the printing, platen position will go backward a little that will cause low printing quality such as break line, dislocation, and so on, because of the elasticity effect of rubber body of platen without aidant force. Thus it will be supplied 120mA current to step motor for keeping platen's position no moving.

It is recommended that adopt the print ratio lower than the value listed in the table 11 above in order to prevent overheating of motor. The maximum allowed charged time is 30 sec.

5. The Thermal Head in Place/Paper our Detection

5.1 Paper-out Detection

QJ205-JX-LV printer mechanism adopts a reflection-type photoelectric detection sensor which are used to:

A: paper out detection

B: position the paper through the mark on it.

As the figure showed below, when out of paper, the light which is emitted by photoelectric detection can't be reflected. When there is paper inserting and covering the photoelectric detection sensor, the light can be reflected and received by receiving tube, output low level.

The driving circuit of photoelectric detection sensor is as the figure below. When out of paper, don't start the printer heating or motor, otherwise it will damage or reduce the using life of print head and motor. Please reduce to the appropriate speed if you want to load paper.

Maximum characteristics

Item		Symbol	Reference	Unit
Input	Forward current	IF	50	mA
	Reverse voltage	VR	5	V
	Min power	P	70	mW
Output	Voltage collector to emitter	VCEO	20	V
	Voltage emitter to collector	ECO	5	V
	Collector current	IC	20	mA
	Min power of emitter	PC	70	mW

Photoelectric characteristics(25℃):

Item		Symbol	Condition	Value			Unit
Input	Forward voltage	VF	IF=10mA	1.0	1.2	1.6	V
	Reverse current	IR	VR=5V			10	μÀ

Output	Collector to emitter breakdown voltage	BVCEO	IC=0.5mA	20			V
	Emission extreme collector	BVECO	IE=0.1mA	5			V
	Collector dark current	ICEO	VCE=10V IF=0mA			200	nA
Coupling characteristics	Saturation voltage collector to emitter	VCE(SAT)	IC=2mA Ee=1Mw/cm ²			0.4	V
	Sensor current	Ic	VCE=5V IF=10mA	150		600	uÀ
	Leakage current	ILEAK	IF=10mA VCE=5V No reflector			1	μÀ
	Fall/Down time	Tr/Tf	VCE=5V IC=10mA RL=100 Ω		5/5		μs

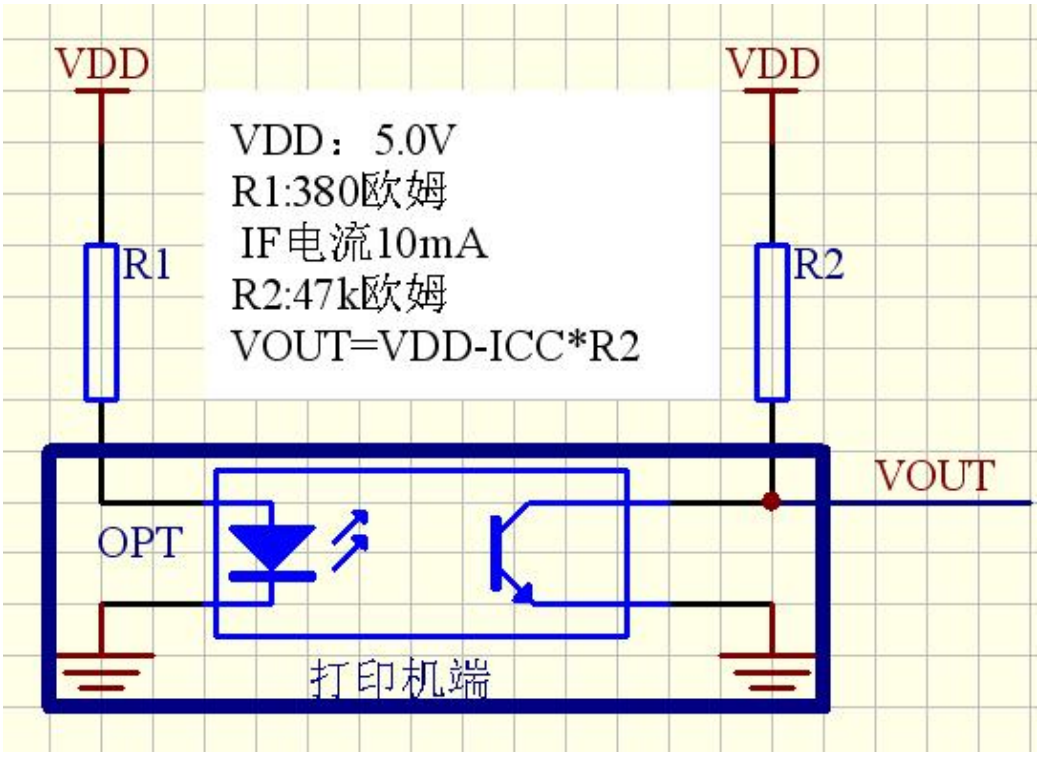


Figure 5

6. Interface Definition

6.1 Thermal Head Control Interface Definition

Table 14

No.	Symbol	Note	No.	Symbol	Note
1	VH	Printer driver power	17	GND	GND
2	VH	Printer driver power	18	GND	GND
3	VH	Printer driver power	19	VF	Phototube anode
4	VH	Printer driver power	20	TM	Thermistor end
5	DATA_OUT	Data out	21	STB1	Strobe 1
6	VDD	Logic Supply	22	VDD	Logic Voltage
7	STB5-6	Strobe 5-6	23	CLK	Clock
8	GND	GND	24	LATCH	Data Latch Control
9	GND	GND	25	DATA_IN	Data in
10	GND	GND	26	VH	Printer driver power
11	STB4	Strobe 4	27	VH	Printer driver power

12	CLK	Clock	28	VH	Printer driver power
13	STB2-3	Strobe 2-3	29	$\overline{A}$	Step motor phase $\overline{A}$
14	GND	GND	30	B	Step motor phase B
15	GND	GND	31	A	Step motor phase A
16	CO	Photoelectric tube collector	32	$\overline{B}$	Step motor phase $\overline{B}$

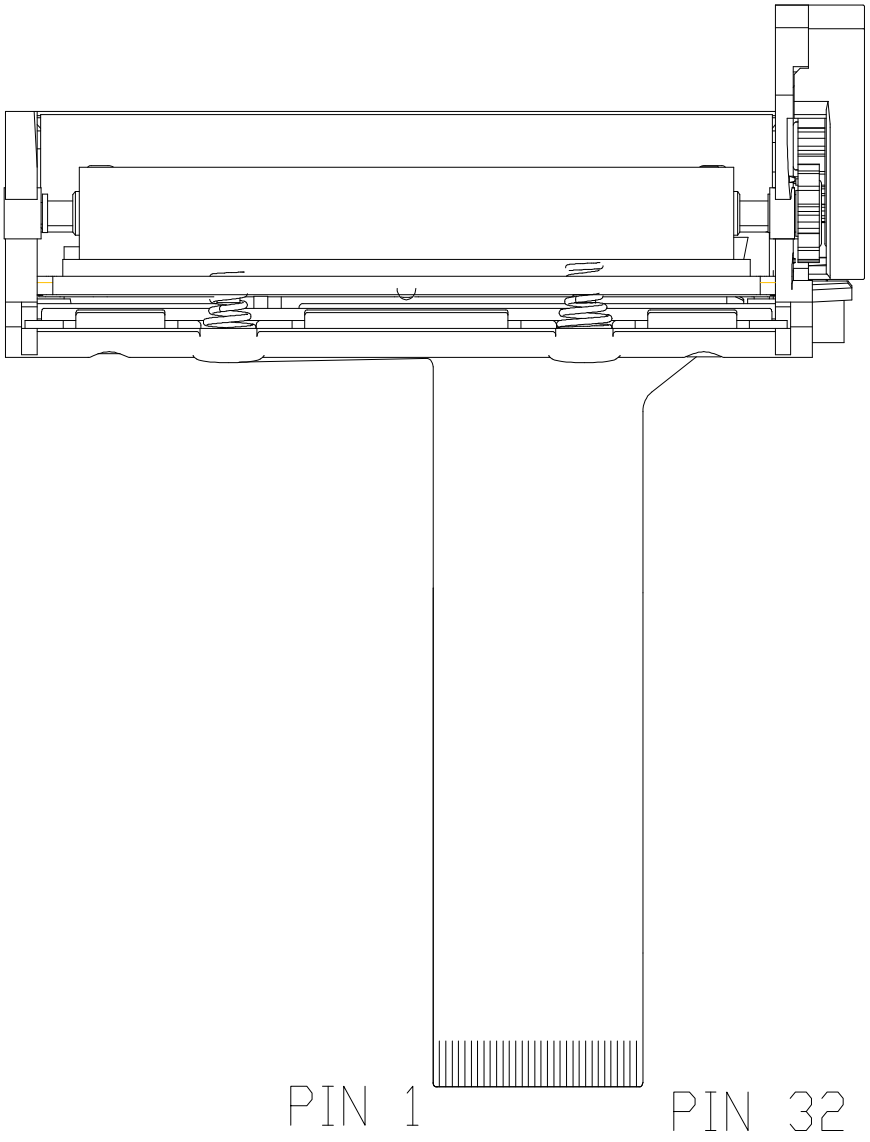
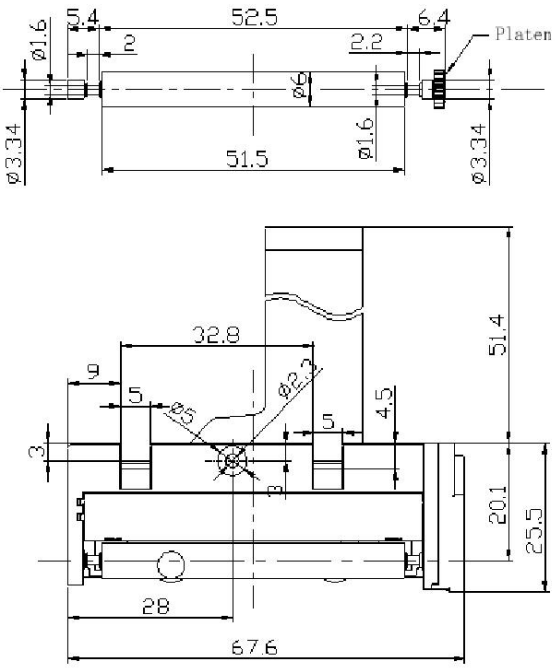


Figure 6

7. Printer Mechanism Size



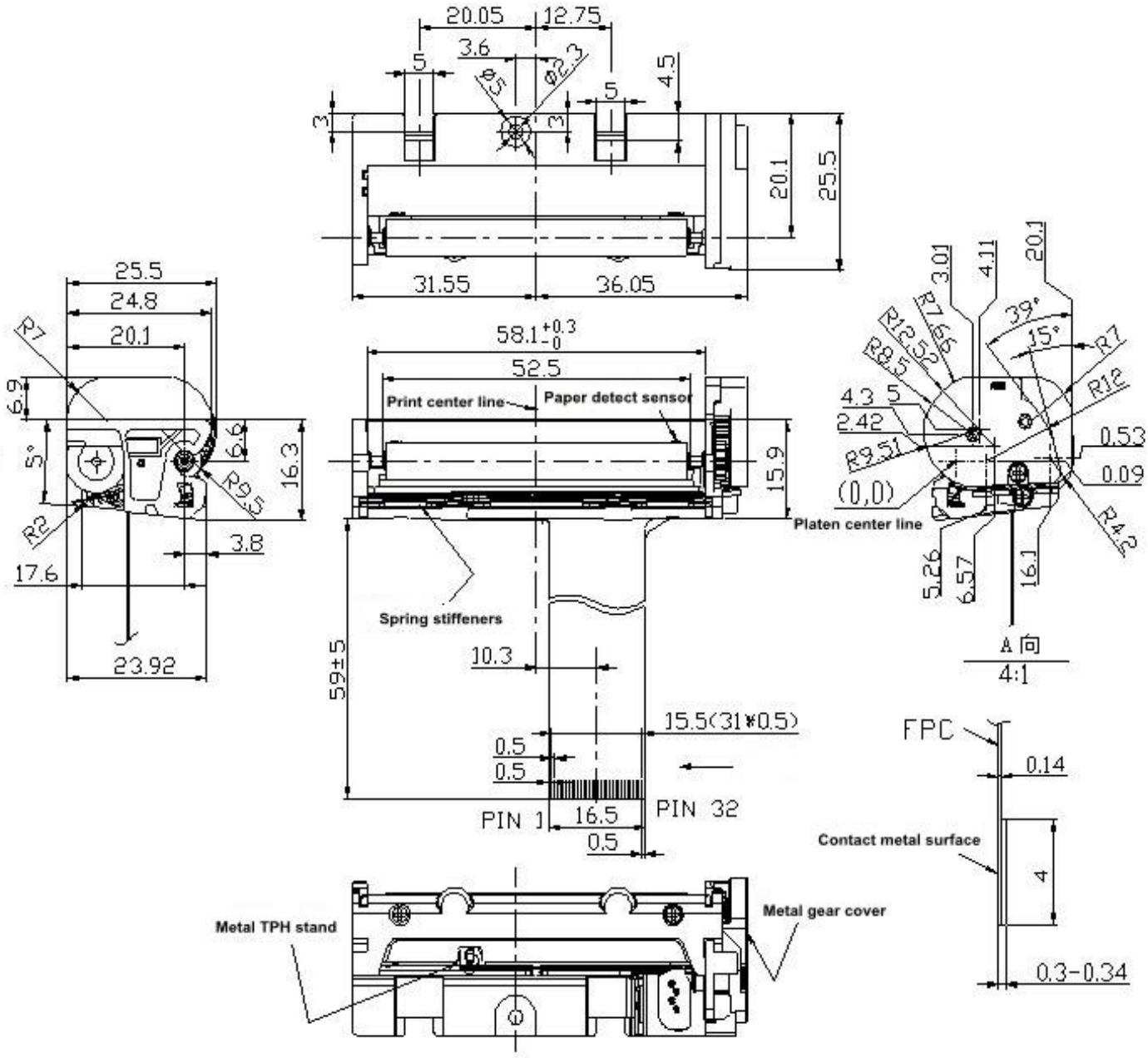

20.05
12.75
3.6
5
Φ2.3
Φ5
4.5
3
20.1
25.5
31.55
36.05
25.5
24.8
20.1
R7
6.9
5°
6.6
16.3
R9.5
R2
3.8
17.6
23.92
58.1 +0.3 -0
52.5
Print center line
Paper detect sensor
15.9
Platen center line
Spring stiffeners
59±5
10.3
15.5(31*0.5)
0.5
0.5
PIN 1
16.5
PIN 32
0.5
Metal TPH stand
Metal gear cover
3.01
4.11
20.1
R12.5
R9.5
39°
15°
R7
R12
4.3
5
2.42
R9.51
0.53
0.09
(0,0)
R4.2
5.26
6.57
16.1
A
4:1
FPC
0.14
Contact metal surface
4
0.3-0.34

Figure 7

8. Printer Mechanism Application Attentions

8.1 The specific structure of the printer mechanism refer to the formal samples from Suzhou Qiji Electric co; Ltd.

8.2 Before test, it is necessary to confirm that the printer mechanism type and specification is corresponding with required and identified former.

8.3 Please pay more attention during inspection, repairing and assembling of the printer mechanism. Anti-electrostatic measures shall be adopted in working platform, assembly line, turnover box and operator etc.

8.4 The printer mechanism connecting Pin of FPC can't be touched by hands directly. when connect with controller board, it will be kept relax status, preventing extra tension force. Before pull out and insert into FPC, make sure that the controller board is off state. The numbers of pull out and insert must be less than 10 times. Don't pull out and insert into the port on the mechanism which connects to FPC.

8.5 For the storage of printer mechanism, please pay more attention to water-proof, moisture-proof, sun-proof and corrosive chemical gases proof etc. In case of condensation, please cut off the power of printer mechanism first, and use the printer mechanism after blow-dry.

8.6 Don't print without paper. Printing without paper will cause printer roller and rubber rubbing the fever print working face directly, which will affect and reduce the using life of thermal print head.

8.7 Other operation attentions please refer to the operation precaution of thermal line printer drafted by Suzhou Qiji science and technology Co., LTD

8.8 It is recommended that customers use higher quality thermal paper for printing. Low quality thermal paper will cause low print quality and increase the wear of thermal print head, even the using life of thermal print head extremely.

9. Quality Assurances and Service

Our company guarantees that this printer mechanism is with superior performance in the normal using

and maintenance. And we provide one year warranty period for this printer mechanism.

9.1 Service

9.1.1 Maintenance must be made by professional maintainer.
9.1.2 During maintenance, please don't change the printer mechanism internal parts unauthorizedly.The problems caused by customers' improper repairs and changing the parts are not covered by this warranty range.

9.2 Guarantee

Warranty period：The printer mechanism is guaranteed one year warranty period from the shipping date. Within the warranty period， the cases below are not covered and the repairing fee is paid by customers:
A. Damage caused by customers' misuse.
B. Damage caused by customers' repairing and transforming itself.
C. Damage caused by the improper using conditions.
D. Damage caused by force majeure.