



FORMIKE ELECTRONIC CO.,LTD

PRDUCT SPECIFICATON

TFT LCD MODULE

MODEL : KWHO24Q05-F02

Preliminary Specification

Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWD	PD REVIEWD	PREPARED BY
Wayne	Li tong	Zhengjinrong	Jully

Prepared By :

FORMIKE ELECTRONIC CO.,LTD

Address : A909, Huaying Building, 97 Nanshang Road, Nanshan District, Shenzhen, China. 518054

TEL: (86) 755 88306921, 88306931 FAX: (86) 755 88304615

Http://www.wandisplay.com

This specification is subject to change without notice. Please contact FORMIKE or its representative before designing your product based on this specification.

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REVISION RECORD

REV	REVISION ITEM	DATE
Preliminary	First release	2009-3-1
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		
L		
M		
N		

Formike Electronic Co., Ltd.



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1. Precautions in use of LCM

1.1 Use Modules

1. When modules switch on or off, after accessing positive supply power with 3 ± 0.5 voltage, then input signal levels, if signal levels input before supply power becomes stable or switches off, IC circuits off, modules will be damaged, as a result, modules will be damaged.
2. Dot matrix modules are high path-number LCDs, they are largely related to the contrast, view angle, driving voltage when displaying, so you should adjust it to get best contrast and view angle, if it is too high, not only displays are affected, but also let life shorted.
3. When using under regulated working temperature below, the display responsiveness is too slow, when using under regulated temperature above, whole display surface turns dark, this is not damaged, when the temperature returns normal, all displays become normal

1.2 Module storage

1. Storage temperature: $-20\sim +70^{\circ}\text{C}$
2. Place in dark sites to avoid strong lights
3. Don't place other thing on their surfaces
4. Packaged in polyester materials (with anti-static electricity layers) and sealed

1.3 Soldering

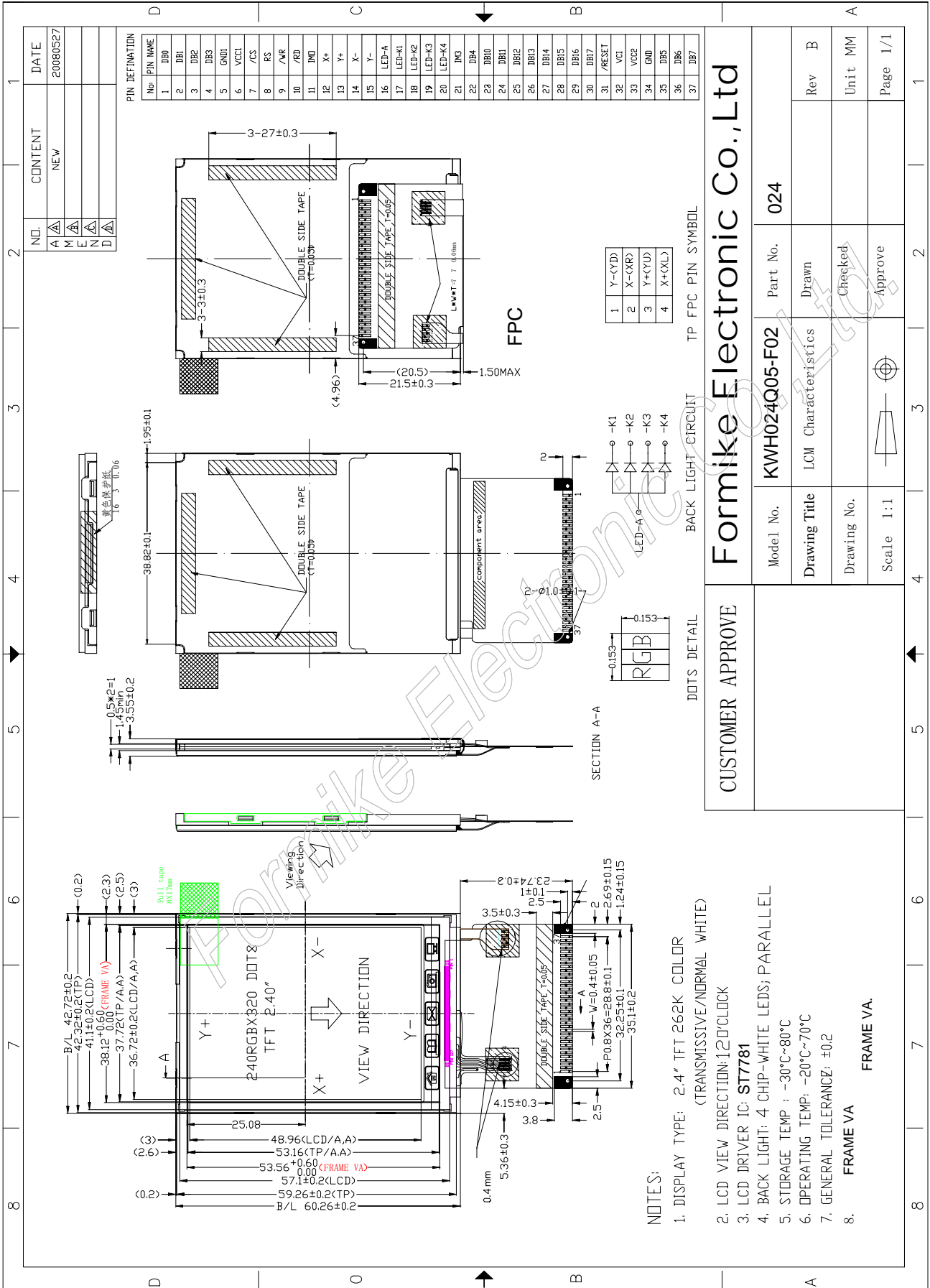
1. Iron head temperature: $340\pm 10^{\circ}\text{C}$
2. Soldering time: $< 3-4\text{S}$
3. Soldering material: eutectic nature, low melting point
4. Don't use acid solder
5. Soldering don't repeat above 3 times

**2. General Features & Mechanical Specifications**

Item	STANDARD Value	Unit
LCD type	262K a-Si TFT-LCD TRANSMISSVIE	
Dot arrangement	240(R.G.B)*320	Dot
Module size	42.72(W)*60.26(H)*3.6(T)	mm
Active area	36.72(W)*48.96(H)	mm
Pixel size	153(W)*153(H)	mm
Diagonal length	2.40	inch
Viewing direction	12 O'clock	-
Backlight	LED(white 4*LED)	-
Top & Tst	-20°C - +70°C & -30°C - +80°C	°C
Drive IC & Interface	ST7781	-
LCM: All of LCM of material and process measure up to ROHS Europe		



3. MODULE OUTLINE DRAWING





4. Absolute Maximum Ratings

The absolute maximum rating is listed on following table. When IST7781 is used out of the absolute maximum ratings, the ST7781 may be permanently damaged. To use the ST7781 within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the ST7781 will malfunction and cause poor reliability.

Item	Symbol	Unit	Value	Note
Power supply voltage (1)	VCC, IOVCC	V	-0.3 ~ + 4.6	1, 2
Power supply voltage (1)	VCI - GND	V	-0.3 ~ + 4.6	1, 4
Power supply voltage (1)	DDVDH - GND	V	-0.3 ~ + 6.0	1, 4
Power supply voltage (1)	GND -VCL	V	-0.3 ~ + 4.6	1
Power supply voltage (1)	DDVDH - VCL	V	-0.3 ~ + 9.0	1, 5
Power supply voltage (1)	VGH - GND	V	-0.3 ~ + 18.5	1, 5
Power supply voltage (1)	GND - VGL	V	-0.3 ~ + 18.5	1, 6
Input voltage	Vt	V	-0.3 ~ VCC+ 0.3	1
Operating temperature	Topr	°C	-40 ~ + 85	8, 9
Storage temperature	Tstg	°C	-55 ~ + 110	8, 9

Notes:

- VCC, DGND must be maintained
- (High) (VCC = VCC) ≥ DGND (Low), (High) IOVCC ≥ DGND (Low).
- Make sure (High) VCI ≥ DGND (Low).
- Make sure (High) DDVDH ≥ ASSD (Low).
- Make sure (High) DDVDH ≥ VCL (Low).
- Make sure (High) VGH ≥ ASSD (Low).
- Make sure (High) ASSD ≥ VGL (Low).
- For die and wafer products, specified up to 85°C.
- This temperature specifications apply to the TCP package



5. DC Electrical Characteristics

(VCC = 2.40 ~ 3.30V, IOVCC = 1.65 ~ 3.30V, Ta = -40 ~ 85 °C)

Item	Symbol	Unit	Test Condition	Min.	Typ.	Max.	Note
Input high voltage	V _{IH}	V	VCC= 1.8 ~ 3.3V	0.8*IOVCC	-	IOVCC	-
Input low voltage	V _{IL}	V	VCC= 1.8 ~ 3.3V	-0.3	-	0.2*IOVCC	-
Output high voltage(1) (DB0-17 Pins)	V _{OHI}	V	IOH = -0.1 mA	0.8*IOVCC	-	-	-
Output low voltage (DB0-17 Pins)	V _{OLI}	V	IOVCC=1.65~3.3V VCC= 2.4 ~ 3.3V IOL = 0.1mA	-	-	0.2*IOVCC	-
I/O leakage current	I _I	μA	Vin = 0 ~ VCC	-0.1	-	0.1	-
Current consumption during normal operation (V _{CC} - DGND)	I _{OP}	μA	VCC=2.8V, Ta=25°C, fOSC = 512KHz (Line) GRAM data = 0000h	-	100 (VCC)	-	-
Current consumption during standby mode (V _{CC} - DGND)	I _{ST}	μA	VCC=2.8V, Ta=25 °C	-	5	10	-
LCD Drive Power Supply Current (DDVDH-DGND)	ILCD	mA	VCC=2.8V, VREG1OUT=4.8V DDVDH=5.0V, fOSC = 512KHz (320 line), Ta=25 °C, GRAM data = 0000h, REV="0", SAP="001", ON4-0="0", OP4-0="0", MP52-00="0", MN52-00="0", CP12-00="0", CN12-00="0"	-	3.0	-	-
LCD Driving Voltage (DDVDH-DGND)	DDVDH	V	-	4.5	-	6	-
Output voltage deviation		mV	-	-	10	-	-
Dispersion of the Average Output Voltage	V	mV	-	-10	-	10	-

6. OPTICAL CHARACTERISTICS

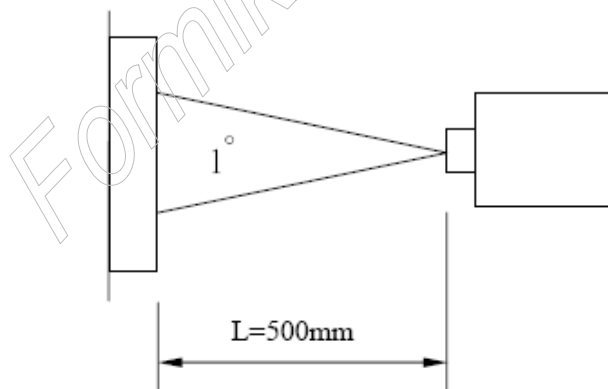
(Note1 · Note2)

(Using CPT LC+ EWV Polarizer+Corresponding Backlight, reference only)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Transmittance	T		4.5	5		%	
Contrast Ratio	CR	*1)		(300)	-	--	Note 3
Response Time	Tr+ Tf	*3)	-	(30)	(40)	ms	Note 4
Viewing Angle	Vertical	θ *2)	CR \geq 10	(45)	(60)	-	
				(35)	(50)	-	Note 5
	Horizontal	ϕ *2)		(50)	(65)	-	
				(50)	(65)	-	
Color Filter Chromacity	White	x y Y	$\theta = \phi = 0^\circ$	0.288	0.308	0.328	
				0.322	0.342	0.362	Note 6
				27.8	30.8	33.8	
	Red	x y Y	$\theta = \phi = 0^\circ$	0.633	0.653	0.673	
				0.311	0.331	0.351	
				15.4	18.4	21.4	
	Green	x y Y	$\theta = \phi = 0^\circ$	0.291	0.311	0.331	
				0.554	0.574	0.594	
				55.0	59.0	63.0	
	Blue	x y Y	$\theta = \phi = 0^\circ$	0.114	0.134	0.154	
				0.114	0.134	0.154	
				12.0	15.0	18.0	
NTSC			-	61	-	%	

Note 1.Ambient condition : 25°C ±2°C · 60±10%RH · under 10 Lux in the darkroom °

Note 2.Measure device : BM-5A (TOPCON) · viewing cone= 1° · I=20mA °



7.BACKLIGHT SPECIFICATION

COLOR : WHITE

Item	Symbol	Min.	Typ..	Max..	Unit.
Forward voltage	V _f	3.0	3.3	3.6	V
Backlight current	I _{led}	-	60	-	MA
Luminance	L _v	3000	3500	4000	cd/m ²
Backlight uniformity	No less than eighty percent				-
Number of LED	-	4			Piece
Connection mode	S/P	In parallel			

★1 Test condition is :

(a) Center point on active area

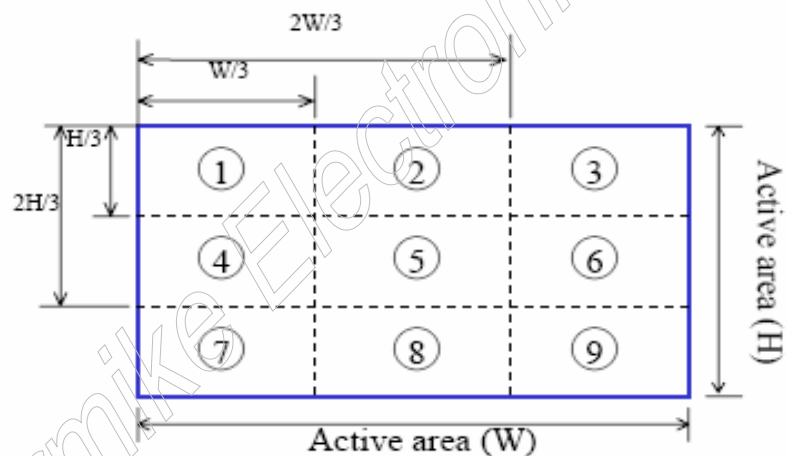
(b) Best Contrast

★2 Uniform measure condition :

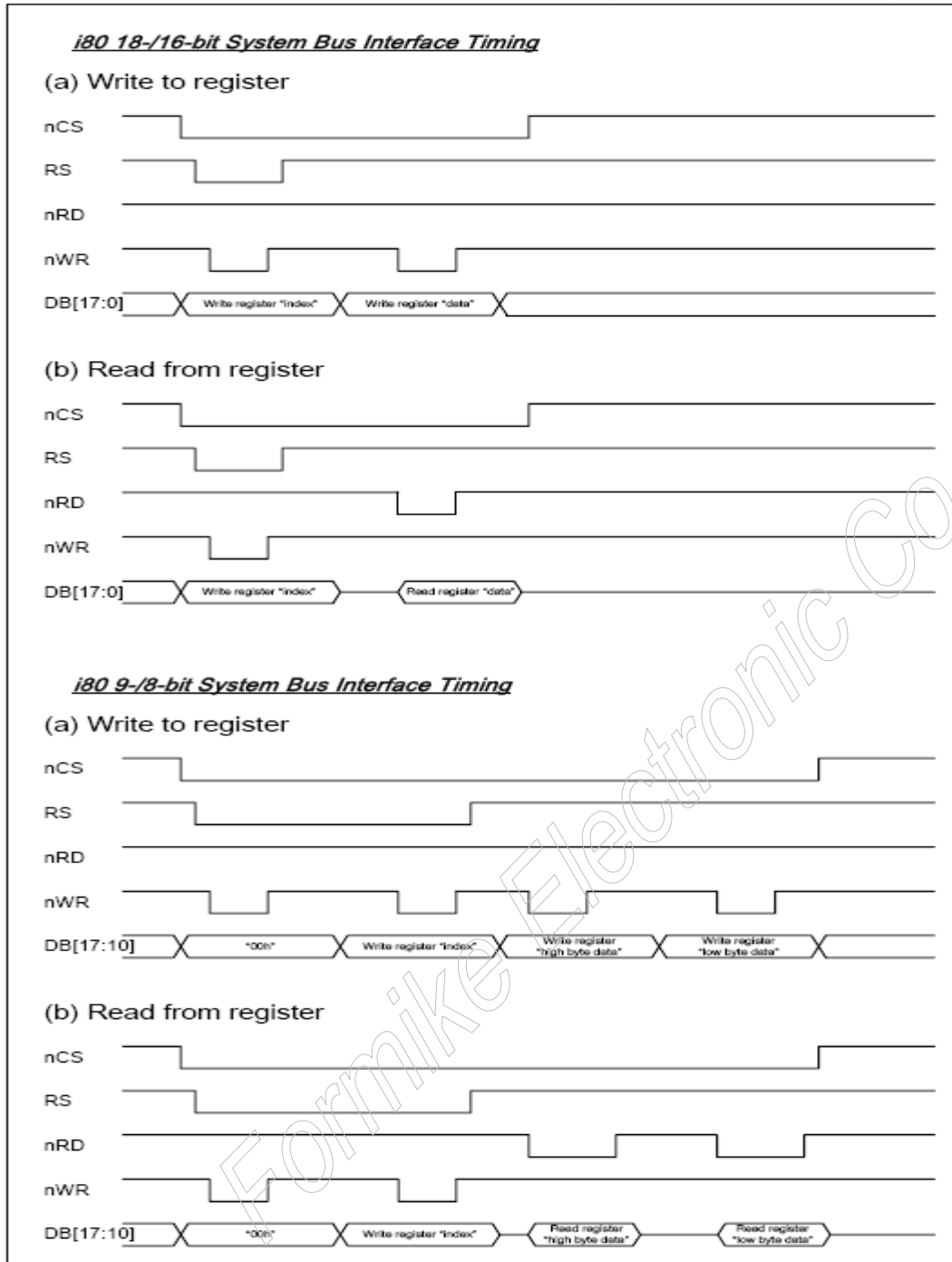
(1) Measure 9 point. Measure location is show below :

(2) Uniform = (Min. brightness / Max. brightness) × 100%

(3) Best Contrast.



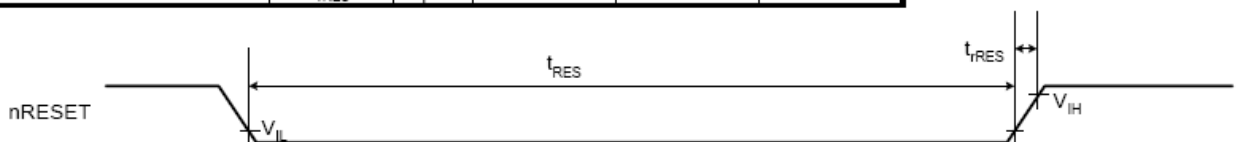
8. READ / WRITE CHARACTERISTICS(8080-SERIES MPU)



9. RESET INPUT TIMING

Reset Timing Characteristics (VCC = 1.8 ~ 3.3 V, IOVCC = 1.65 ~ 3.3 V)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	t_{RES}	ms	1	-	-
Reset rise time	t_{RES}	μ s	-	-	10



**10. INTERFACE DESCRIPTION**

Pin No	Symbol	Description
1	DB0	Data bus
2	DB1	Data bus
3	DB2	Data bus
4	DB3	Data bus
5	GND1	Ground
6	VCC1	Power supply voltage to the interface pins
7	CS	CHIP SELECT PIN
8	/RS	Data/Command control Pin
9	/WR	Write execution control Pin
10	/RD	Read execution control Pin
11	IMO	Interface select pin
12	X+(XR)	Touch panel X+
13	Y+(YU)	Touch panel Y+
14	X-(XL)	Touch panel X-
15	Y-(YD)	Touch panel Y-
16	LEDA	Backlight anode
17	LEDK1	Backlight cathode
18	LEDK2	Backlight cathode
19	LEDK3	Backlight cathode
20	LEDK4	Backlight cathode
21	IM3	Interface select pin
22	DB4	Data bus
23-30	DB10-DB17	Data bus
31	RESET	RESET Signal input
32	VCI	Power supply to the analog circuit.
33	VCC2	Power supply voltage to the interface pins
34	GND	Ground
35-37	DB5-DB7	Data bus

12. FINAL REMARKS

1. The above specifications are the binding criteria for FORMIKE Technology's outgoing quality inspection.
2. The customer is kindly requested to inform FORMIKE Technology as soon as possible on any questions, remarks, and disagreements regarding these specifications.
3. Formike is not responsible for damage to its products due to neglect of the precautions as described in the previous chapter.
4. About the limited warranty unless special agreement between Formike and customer, Formike will replace or repair any of its products that are found to be functionally defective when inspected in accordance with Formike acceptance standards for a period of one year from date of shipments.