



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

HKT043ATA-1C

LCD Module User Manual

Prepared by: HeHongLiang Date: 2017-10-25	Checked by: Date:	Approved by: Date:
--	----------------------------------	-----------------------------------

Rev.	Descriptions	Release Date
0.1	- Preliminary Draft release	2017-07-05
0.2	- Assemble Precaution	2017-10-25

Table of Content

1	Basic Specification	3
1.1	General Specification	3
1.2	Block Diagram	3
1.3	Terminal Function	4
1.3.1	UART Interface Terminal (K1)	4
1.3.2	USB Interface Terminal (K3)	4
2	Absolute Maximum Ratings	5
3	Electrical Characteristics	5
3.1	DC Characteristics	5
3.2	AC Characteristic	5
4	Function Specifications	6
4.1	Basic Operation Function Descriptions	6
4.2	Quick Start Guide	7
4.3	Command Descriptions	7
5	Optical Characteristics	8
6	Precautions of using LCD Modules	10
7	Assemble Precaution	10

1 Basic Specification

TOPWAY HKT043ATA-1C is a Smart TFT Module with 32bit MCU on board. Its graphics engine provides numbers of outstanding features. It supports TOPWAY TML 3.0(Editor 2017) for preload and pre-design display interface that simplify the host operation and development time. Suitable for industry control, instrumentation, medical electronics, power electric equipment applications.

1.1 General Specification

Screen Size(Diagonal) :	4.3"
Resolution :	480(RGB) x 272
Color Depth :	65k color (16bit)
Pixel Configuration :	RGB Stripe
Display Mode :	Transmissive / Normal White
Viewing Direction :	12H (*1) (gray-scale inverse) 6H (*2)
Outline Dimension :	139 x 97 x 26.9 (mm) (see attached drawing for details)
Active Area :	95.04 x 53.86(mm)
Backlight :	LED
Surface Treatment :	Anti-Glare Treatment
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

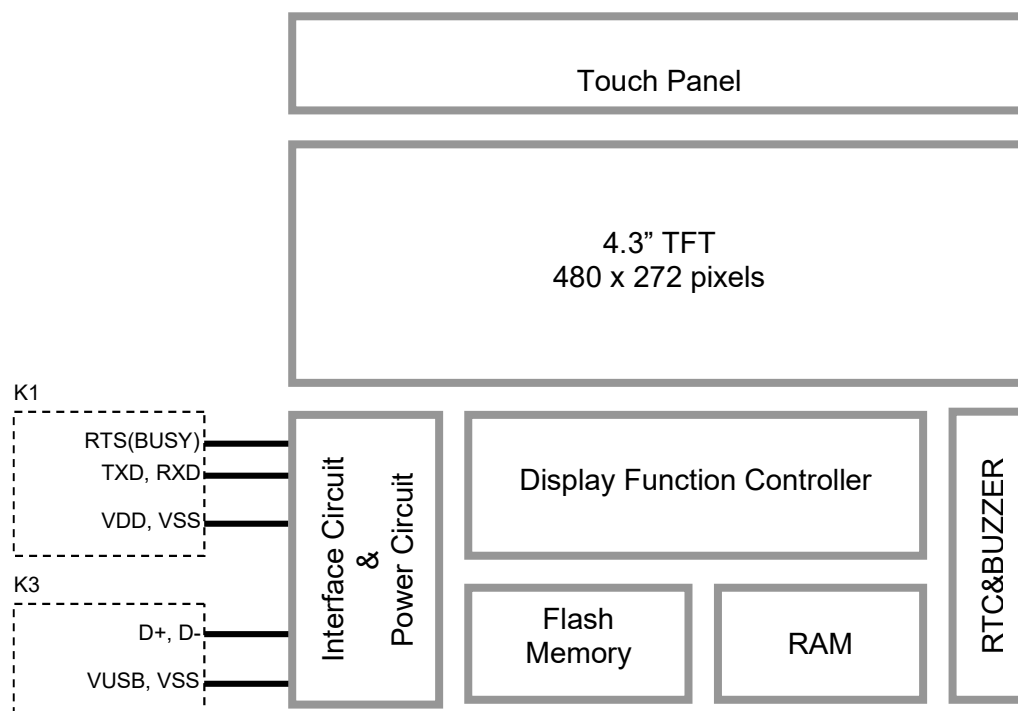
Note:

*1. For saturated color display content (eg. pure-red, pure-green, pure-blue, or pure-colors-combinations).

*2. For "color scales" display content.

*3. Color tone may slightly change by Temperature and Driving Condition.

1.2 Block Diagram



1.3 Terminal Function

1.3.1 UART Interface Terminal (K1)

Pin No.	Pin Name	I/O	Descriptions
1	VDD	P	Power supply
2	RXD	I	Data Input
3	TXD	O	Data output
4	RTS	O	Request To Send (function as busy BUSY signal) 1: Busy; 0: No busy
5	NC	--	NO Connect, leave open
6	VSS	P	Ground, (0V)

Note.

*1. User data and commands transfer through this terminal

*2. HW hand shake is suggested

1.3.2 USB Interface Terminal (K3)

Pin No.	Pin Name	I/O	Descriptions
1	VUSB	P	Power output
2	D-	I/O	USB DATA negative signal
3	D+	I/O	USB DATA positive signal
4	NC	--	No connection, leave open
5	VSS	P	Ground, (0V)

Note.

*1. TML files and image files preload through this terminal

2 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Power Supply voltage	V _{DD}	-0.3	28	V	
Operating Temperature	T _{OP}	-20	70	°C	No Condensation
Storage Temperature	T _{ST}	-30	80	°C	No Condensation

Note:

- *1. This rating applies to all parts of the module and should not be exceeded.
- *2. The operating temperature only guarantees operation of the circuit. The contrast, response speed, and the other specification related to electro-optical display quality is determined at the room temperature, T_{OP}=25°C
- *3. Ambient temperature when the backlight is lit (reference value)
- *4. Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

3 Electrical Characteristics

3.1 DC Characteristics

VDD=12V, VSS=0V, T_{OP} =25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage	V _{DD}	6	12.0	26	V	VDD
RxD Input MARK(1)	V _{RxDM}	-3.0	-	-15.0	V	Rx
RxD Input SPACE(0)	V _{RXDS}	+3.0	-	+15.0	V	Rx
TxD Output MARK(1)	V _{TXDM}	-3.0	-	-15.0	V	Tx
TxD Output SPACE(0)	V _{TXDS}	+3.0	-	+15.0	V	Tx
RTS Output High	V _{TXDH}	-3.0	-	-15.0	V	RTS(BUSY)
RTS Output Low	V _{TXDL}	+3.0	-	+15.0	V	RTS(BUSY)
Operating Current	I _{DD}	-	175	-	mA	VDD (*1)
Battery Supply Current	I _{BAT}	-	0.6	-	uA	

Note.

- *1. Normal display condition and no usb connect.

3.2 AC Characteristic

Items	JP6,JP8=close, JP5,JP7=open (factory default)	JP6,JP7=close, JP5,JP8=open	JP6,JP7= open, JP5,JP8= close	JP6,JP8= open, JP5,JP7= close
Start bit	1	1	1	1
Data bit	8	8	8	8
Parity bit	None	None	Even	Odd
Stop bit	1	1	1	1
Baud Rate(*1)	115200 bps	9600 bps	115200 bps	115200 bps

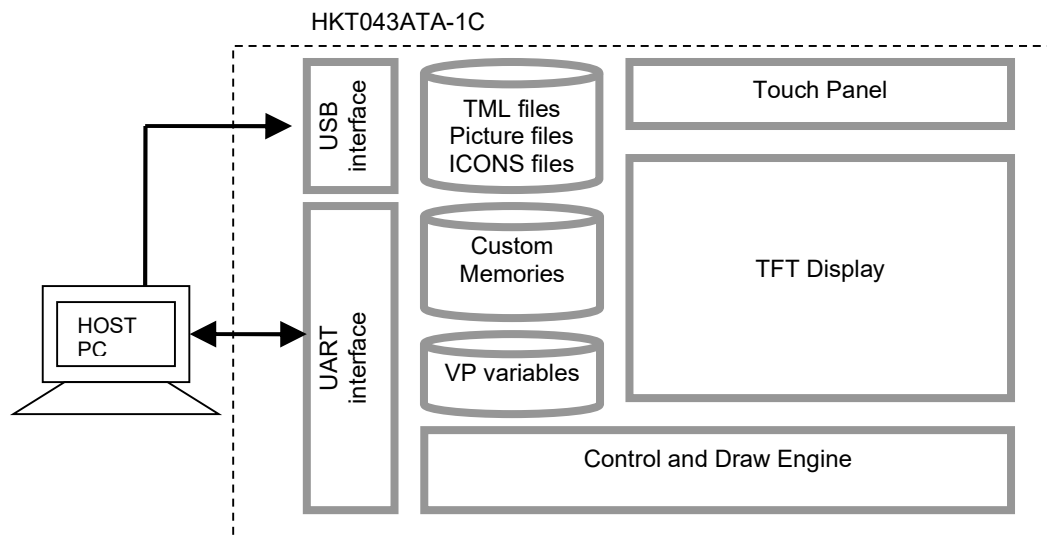
Items	JP10=close, JP9=open (factory default)	JP10= open, JP9=close
Serial Data Flow Control	busy	Xon/Xoff

Note.

- *1.Baud Rate (1200bps~115200bps) could be adjusted by software.

4 Function Specifications

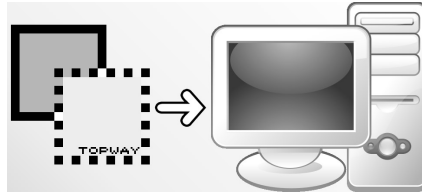
4.1 Basic Operation Function Descriptions



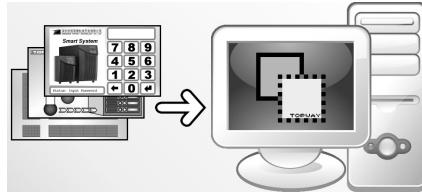
- TML files, Picture files, ICON files are stored inside FLASH memory area. They are preloaded to HKT043ATA-1C for stand alone interface use.
- Those files are preloaded via USB interface as an USB drive.
- All the interface flow and the touch response are based on the preloaded TML files
- VP variables memory is inside RAM area, it provides real time access via UART by the HOST or display onto the TFT by TML file.
- Custom Memories are inside FLASH memory area. It can be accessed via UART interface by the HOST.
- Control and Draw Engine executes HOST commands and response respectively
- It also reports the real time Touch Key number to the HOST

4.2 Quick Start Guide

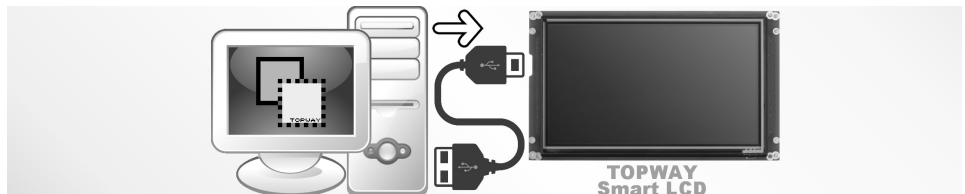
1. Install TOPWAY Graphics Editor



2. Import pictures design UI flow



3. Download to Smart LCD



4. power on & display



5. Connect to host Show real time data



4.3 Command Descriptions

Please refer to "SMART LCD Command Manual".

5 Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≧ 10	70	80	-	Degree	Note2,3
		θB		50	60	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ =0°	700	900	-		Note 3
Response Time		T _{ON}	25℃	-	20	30	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.255	0.305	0.355		Note 1,5
		y		0.277	0.327	0.377		
	Red	x		0.534	0.584	0.634		Note 1,5
		y		0.300	0.350	0.400		
	Green	x		0.290	0.340	0.390		Note 1,5
		y		0.543	0.593	0.643		
	Blue	x		0.102	0.152	0.202		Note 1,5
		y		0.040	0.090	0.140		
Uniformity		U		75	80	-	%	Note 6
NTSC				45	50	-	%	Note 5
Luminance		L		-	280	-	cd/m²	Note 7

1. IF = 40 mA, and the ambient temperature is 25°C.

2. The test systems refer to Note 1 and Note 2.

Note 1:

The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment SR-3A (1°)

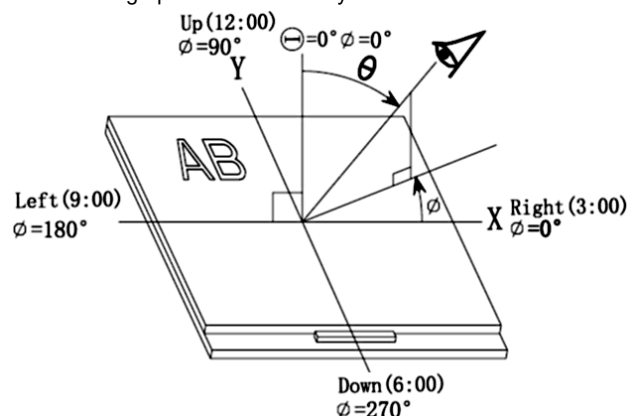
Measuring condition:

- Measuring surroundings: Dark room
- Measuring temperature: $T_a=25^{\circ}\text{C}$.
- Adjust operating voltage to get optimum contrast at the center of the display.

Note 2:

The definition of viewing angle:

Refer to the graph below marked by θ and ϕ



Note 3:

The definition of contrast ratio (Test LCM using SR-3A (1°)):

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

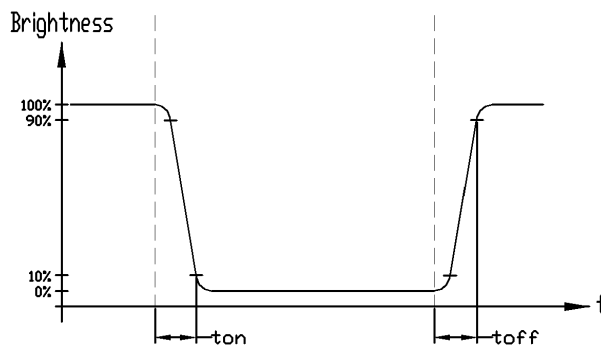
(Contrast Ratio is measured in optimum common electrode voltage)

Note 4:

Definition of Response time. (Test LCD using BM-7A(2°)):

The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

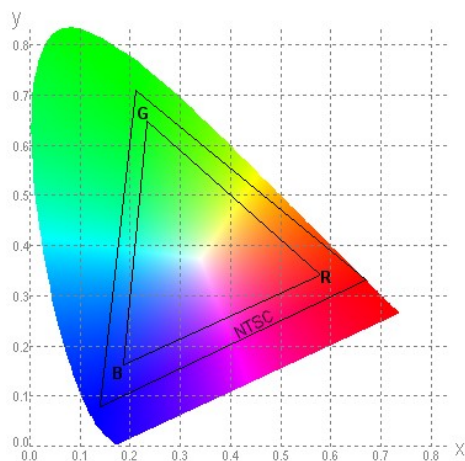


Note 5:

Definition of Color of CIE1931 Coordinate and NTSC Ratio.

Color gamut:

$$S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$



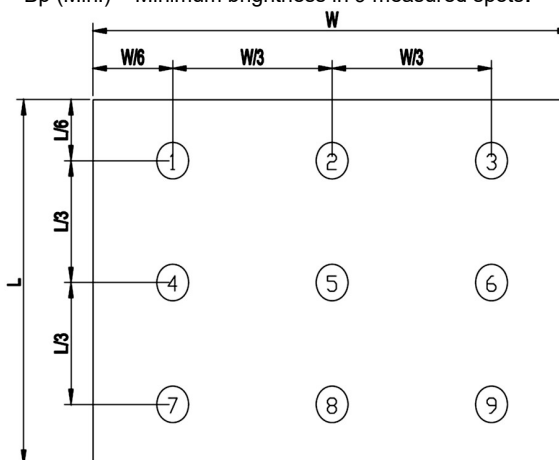
Note 6:

The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp (\text{Min.}) / Bp (\text{Max.}) \times 100 (\%)$$

$Bp (\text{Max.})$ = Maximum brightness in 9 measured spots

$Bp (\text{Min.})$ = Minimum brightness in 9 measured spots.



Note 7:

Measured the luminance of white state at center point

6 Precautions of using LCD Modules

Please refer to "LCD-Module-Design-Handling-Precaution.pdf".

7 . Assemble Precaution

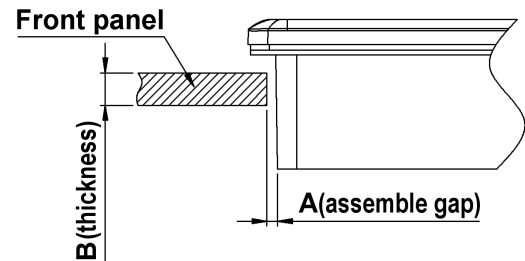
安装注意事项

1. Customer front panel opening and thickness for TOPWAY display module should be fit for its assembling and sealing.

- The suggested assemble gap(A) should be about 0.3~0.5mm on each side.
- The suggested front panel thickness(B) should be about 1.5~4.0mm.

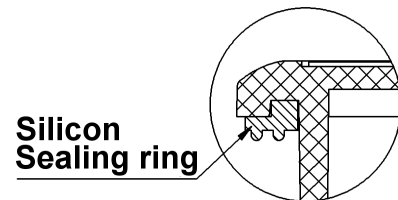
客户面板开窗及厚度应适合 TOPWAY 显示模块的安装及密封。

- 建议每边安装间隙(A)约为 0.3 ~0.5mm.
- 建议面板厚度(B) 约为 1.5~4.0mm.



2. A silicon sealing ring ships with TOPWAY display module. It should be in place before assembling to the front panel.

TOPWAY 显示模块上的硅胶密封圈在安装时确保嵌入到位。



3. It should fix the TOPWAY display module into the front panel with two steps.

- Pre-fixing: Slightly tighten the screws on beam clamp in sequence as picture on the right side.
- Final-fixing: Tighten the fixing screws on beam clamp in sequence as well with twist torque about 4~6kg.cm (*1) . and put the beam clamp straight.

Note:

*1. Over tightening might damage the shell and cause bad

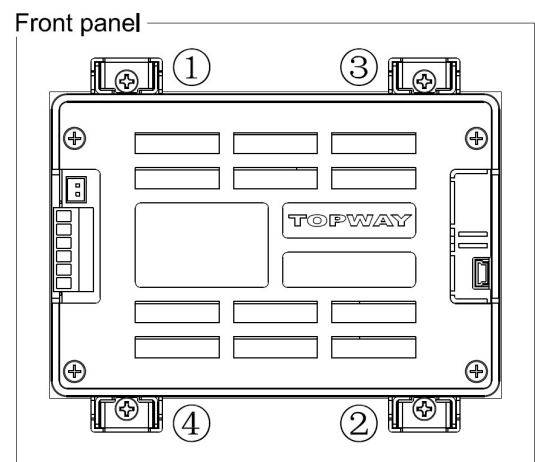
sealing result.

应分两步将 TOPWAY 显示模块固定在面板上。

- 预紧: 将卡扣螺钉按右图所示顺序稍加预紧.
- 紧定: 再次按顺序用 **4~6kg.cm** 扭力拧紧卡扣螺钉(* 1),并注意卡扣置正无歪斜.

注:

*1. 过度拧紧可能会损坏外壳和影响密封效果.

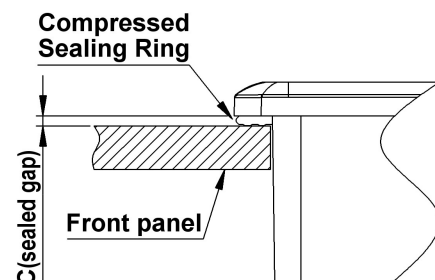


4. It is strongly suggested to check the seal balancing of the four-side of the TOPWAY display module.

- The suggested after assemble sealed gap(C) should be about 0.8~1.2mm.

需注意检查 TOPWAY 显示模块四周在安装后保证平衡密封。

- 建议组装后的密封间隙(C)约为 0.8 ~1.2 mm.



5. Others:

- Never hot plug the device! Power off the device before connect or disconnect the display module.
- Don't forget to remove the cover protective film for normal operation.

其它:

- 视频线禁止带电插拔！ 在连接或断开显示模块之前先关闭设备电源.
- 使用前请揭去保护膜.

