



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

HMT050ATA-2C

LCD Module User Manual

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Rev.	Descriptions	Release Date
0.1	- Preliminary Draft release	2018-12-27
	-Update Section 1.3 , Section 3.1 and Section 5	2019-01-22

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1 Basic Specification

TOPWAY HMT050ATA-2C is a Smart TFT Module with 32bit MCU on board. Its graphics engine provides numbers of outstanding features. It supports TOPWAY TML 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) :	5.0"
Resolution :	800(RGB) x 480
Color Depth :	65k color (16bit)
Pixel Configuration :	RGB Stripe
Display Mode :	Transmissive / Normal White
Viewing Direction :	6H (*1) (gray-scale inverse) 12H (*2)
Outline Dimension :	143.5 x 80.9 x 13.7 (max) (mm) (see attached drawing for details)
Active Area :	108.0 x 64.8 (mm)
Backlight :	LED
Command I/F:	RS-232C
Project Download:	by PC or by U-Drive (with OTG cable)
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

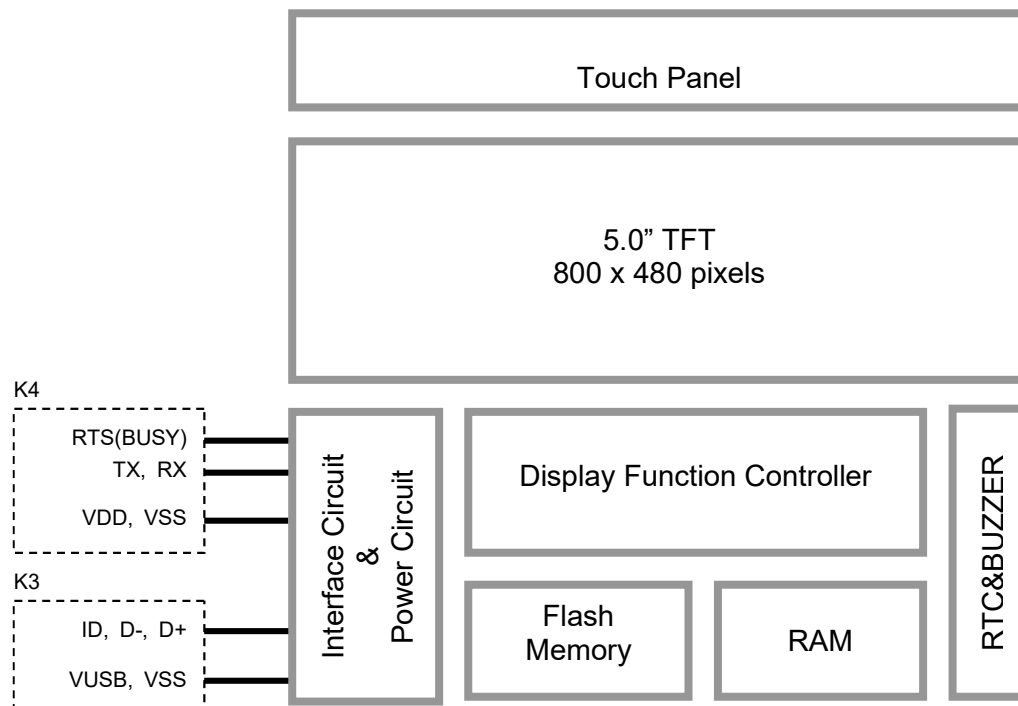
Note:

*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

RS232 Interface Terminal (K4)

Pin No.	Pin Name	I/O	Descriptions
1,2,3	VDD	P	Power supply (5.0~26.0 V)
4	NC	--	No connection, leave open
5	RX	I	Data Input (eg. to PC's RS-232C pin3 <9pin D-connector>)
6	TX	O	Data output (eg. to PC's RS-232C pin2 <9pin D-connector>)
7	RTS(BUSY)	O	Request To Send (could function as busy BUSY signal) (eg. to PC's RS232C pin8 <9pin D-connector>)
8,9,10	VSS	P	Ground, (0V)

Note.

*1. User data and commands transfer through this terminal

*2. HW hand shake is suggested

USB Interface Terminal (K3)

Pin No.	Pin Name	I/O	Descriptions
1	VUSB	P	Power supply(5.0V)
2	D-	I/O	USB DATA negative signal
3	D+	I/O	USB DATA positive signal
4	ID	I	USB_ID, 1:Client, 0:HOST
5	VSS	P	Ground, (0V)

Note.

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

*2. Standard "USB-drive" functions provided

*3. During the files transfer, all others display functions will be suspended

2 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Power Supply voltage	V_{dd}	-0.3	26.0	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, $T_{OP}=25^{\circ}\text{C}$

*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

VSS=0V, VDD=12V, T_{OP} =25°C

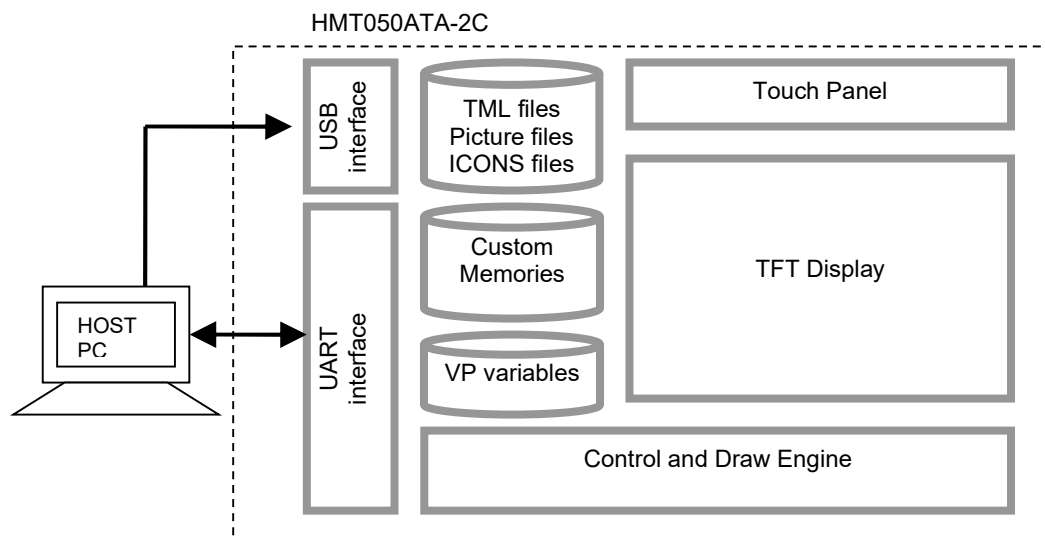
Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin/FUNC
Operating Voltage	V _{dd}	5.0	12.0	26.0	V	VDD
RxD Input MARK(1)	V _{RxDM}	-3.0	-	-15.0	V	Rx
RxD Input SPACE(0)	V _{RXDS}	+3.0	-	+15.0	V	Rx
TxD Output MARK(1)	V _{TXDM}	-3.0	-	-15.0	V	Tx
TxD Output SPACE(0)	V _{TXDS}	+3.0	-	+15.0	V	Tx
RTS Output High	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}	-	180	-	mA	VDD (*1)
Operating Current (USB)	I _{VUSB}	-	175	-	mA	VUSB
Battery Supply Current	I _{BAT}	-	0.6	-	uA	

Note.

*1. Normal display condition

4 Function Specifications

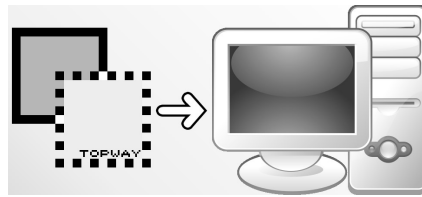
4.1 Basic Operation Function Descriptions



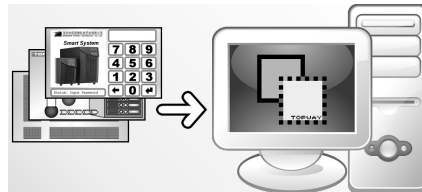
- TML files, Picture files, ICON files are stored inside FLASH memory area. They are preloaded to HMT050ATA-2C for stand alone interface use.
- Those files are preloaded via USB interface as an USB drive.
- All the interface flow and the touch response are based on the preloaded TML files
- VP variables 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

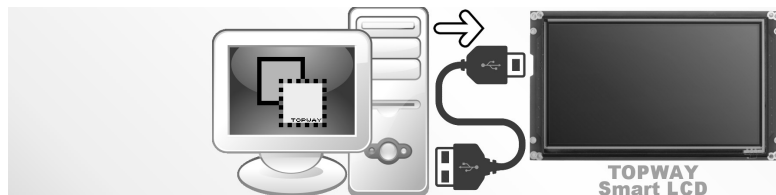
1. Install TOPWAY Graphics Editor



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	Note.
Viewing angle (CR $\geq$ 10)	θ_L	9 o'clock	60	70	-	degree	*2
	θ_R	3 o'clock	60	70	-		
	θ_T	12 o'clock	40	50	-		
	θ_B	6 o'clock	60	70	-		
Response Time	T_f	Normal $\theta=0^\circ$	-	10	20	msec	*3
	T_r		-	15	30	msec	
Contrast ratio	CR		400	500	-	-	*1
Color chromaticity	W_X		0.26	0.31	0.36	-	
	W_Y		0.28	0.33	0.38	-	
Luminance	L		-	200	-	cd/m ²	*4
Luminance uniformity	Y_U		70	75	-	%	*4

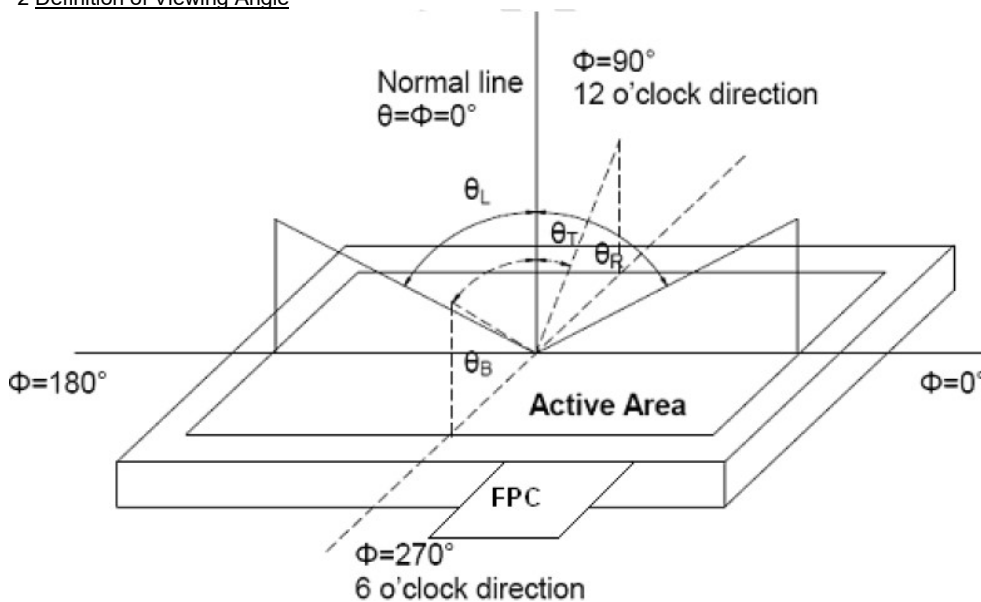
Note:

*1. Definition of Contrast Ratio

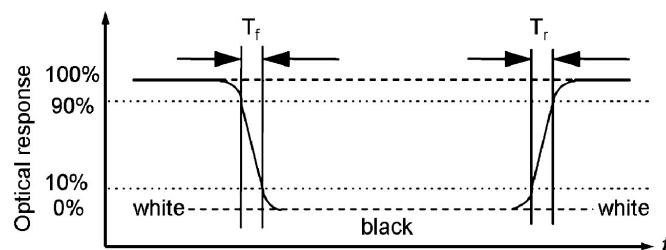
The contrast ratio could be calculate by the following expression:

Contrast Ratio (CR) = Luminance with all pixels white / Luminance with all pixels black

*2 Definition of Viewing Angle



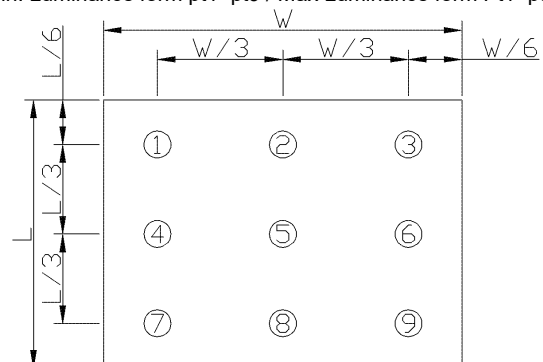
*3 Definition of response time



*4 Definition of Luminance Uniformity

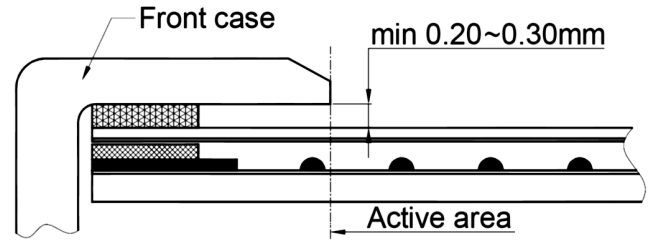
Luminance uniformity (Lu)=

Min. Luminance form pt1~pt9 / Max Luminance form Pt1~pt9

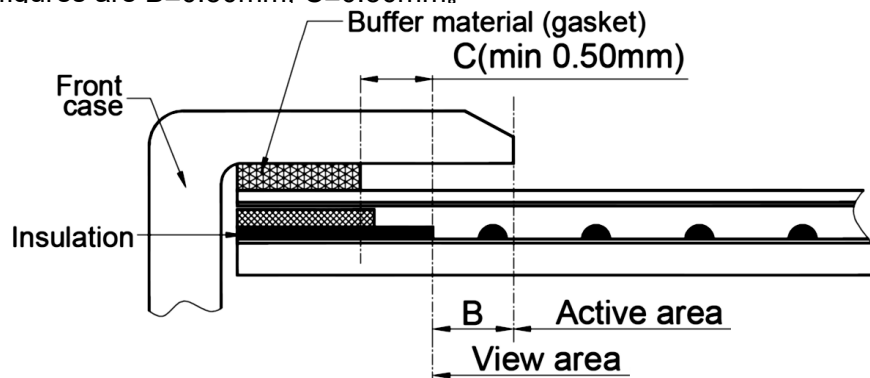


6 Touch panel Design Precautions

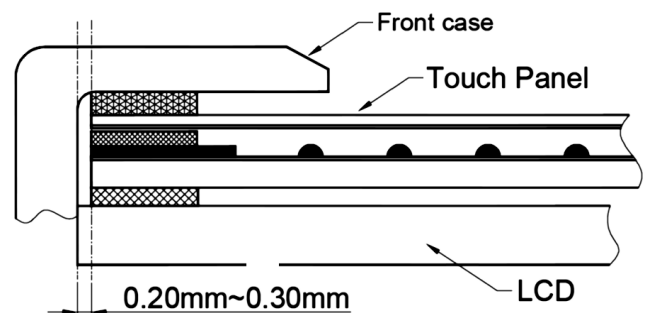
1. It should prevent front case touching the touch panel Active Area (A.A.) to prevent abnormal touch.
It should left gab (e.g. 0.2~0.3mm) in between.



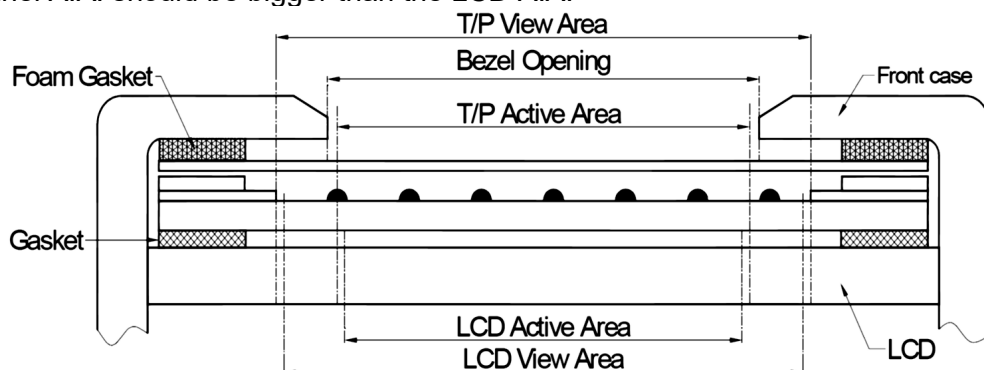
2. Outer case design should take care about the area outside the A.A.
Those areas contain circuit wires which is having different thickness. Touching those areas could deform the ITO film. As a result case the ITO cold be damaged and shorten its lifetime.
It is suggested to protect those areas with gasket (between the front case and the touch panel).
The suggested figures are $B \geq 0.50\text{mm}$; $C \geq 0.50\text{mm}$.



3. The front case side wall should keep space (e.g. 0.2 ~ 0.3mm) from the touch panel.

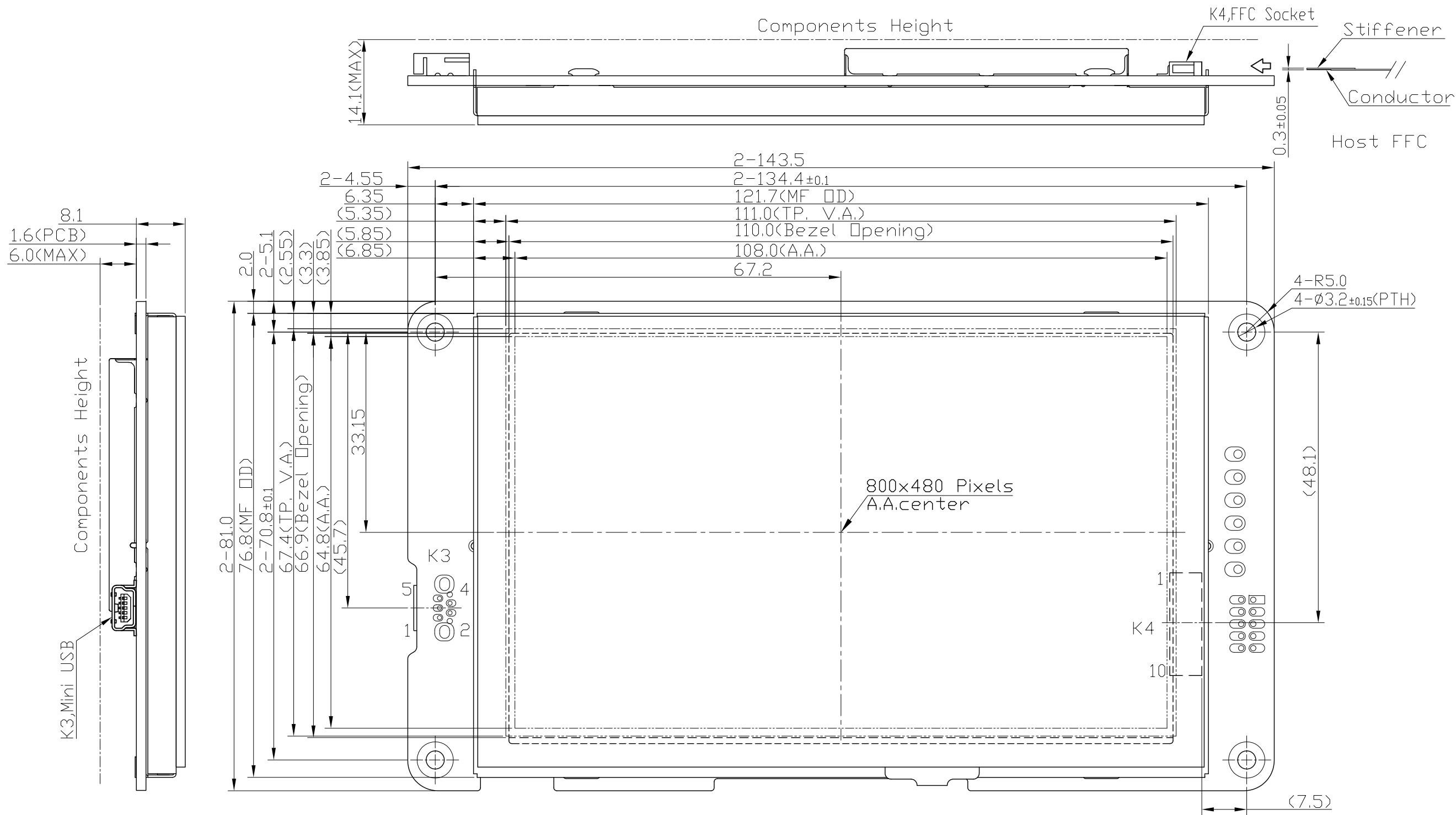


4. In general design,
touch panel V.A. should be bigger than the LCD V.A.
and touch panel A.A. should be bigger than the LCD A.A.



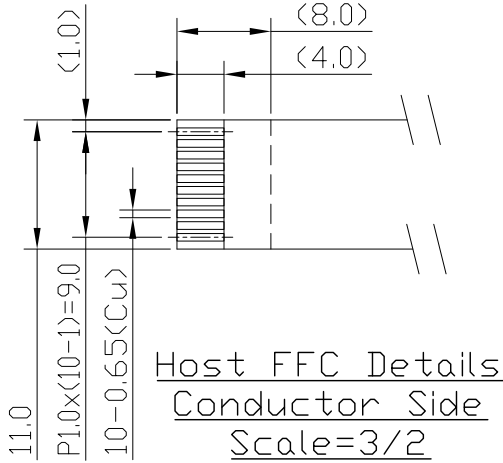
7 Precautions of using LCD Modules

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



K4 Terminal	
No	Pin Name
1	VDD
2	VDD
3	VDD
4	NC
5	RX
6	TX
7	RTS(BUSY)
8	VSS
9	VSS
10	VSS

- Note:
- *1. LCD Display Type: TFT, Transmissive
 - *2. Pixel Arrangement: RGB-STRIPE
 - *3. Operating Voltage: 5.0~26.0V
 - *4. Color Depth: 65k Color
 - *5. Backlight: White LED
 - *6. Touch Panel Type: Resistive Touch Panel
 - *7. User Interface: RS-232C
 - *8. Terminal:
 - K3: Mini USB
 - K4: 10Pin P1.0 FFC Socket Or Equivalent
 - *9. Operating Temperature: -20°C~70°C
 - *10. Storage Temperature: -30°C~80°C
 - *11. Foam Gasket must be assemble outside TP VA by 0.5mm
 - *12. Unmarked Tolerance: ≤150, ±0.3; >150, ±0.5



C		
B		
A		
Rev	Note	Date
Dwg	Title	
	HMT050ATA-2C Outline Dwg	
Dwg No.	MK-006533-1-1	Date
		2018-12-26
Scale	Tol.	Unit
3/2		mm
Approved	Checked	Paper Size
		A3
		Drawn
		HeHongLiang
TOPWAY		