



# SPECIFICATIONS

**CUSTOMER** : \_\_\_\_\_

**MODEL NO.** : **GFTO080AA8001280M**

**VERSION** : **A**

**DATE** : **2018.01.12**

**CERTIFICATION** : **ROHS**

**CUSTOMER SIGN** : \_\_\_\_\_

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# CONTENTS

1. SPECIFICATIONS	
1.1 Features	4
1.2 Absolute Maximum Ratings	5
1.3 Electrical Characteristics	6
1.4 Optical Characteristics	8
1.5 Backlight	11
2. MODULE STRUCTURE	12
2.1 Interface Pin Description	12
2.2 BLOCK DIAGRAM	13
2.3 INPUT SIGNAL	14
2.4 Color Data Reference	19
3. RELIABILITY TEST	20
4. LCM Drawing	21
5. WARRANTY	22



## 1. SPECIFICATIONS

GFTO080AA8001280M is 8" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, MIPI driver ICs, control circuit and backlight. By applying 8bits digital data, 800×RGB(2)×1280, 16.7M-color images are displayed on the 8" diagonal screen.

General specifications are summarized in the following table:

### 1.1 Features

ITEM	SPECIFICATION
Display Area	107.64(H)x172.224(V) (mm) (8-inch diagonal)
Number of Pixels	800 ×3(H)×1280 (V)
Pixel Pitch	0.13455 (H)×0.13455(V) (mm)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally Black
Number of Colors	16.7M(8bits)(MIPI)
Gamut	58%(Typ)
Optimum Viewing Angle	whole view
Response Time	30ms (Typ)
Surface Treatment	AG, Hardness : 3H
Viewing Angle(CR>10)	85°、85° / 85°、85°(Typ.)
Brightness	350 cd/m <sup>2</sup> (5P) (Typ)
Uniformity	9point : 80 %(Typ.)/ 13point : 80 %(Typ.)
IC	ILI6136S-00T00CA/ JD9366AB
Consumption of Power	Logic TBD (W Pattern)/ BL_ 1.26W
Module Size	114.8 (H)×184.7 (V)×4.56 (D) (Max.)(mm)
Module Weight	115g (Max.)

The LCD Products listed on this document are not suitable for use of aerospace equipment, submarine cable, and nuclear reactor control system and life support systems. If customers intend to use these LCD products for applications listed above or those not included in the "Standard" list as follows, please contact our sales in advance.

Standard : Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tool, Industrial robot, Audio and Visual equipment, Other consumer products.



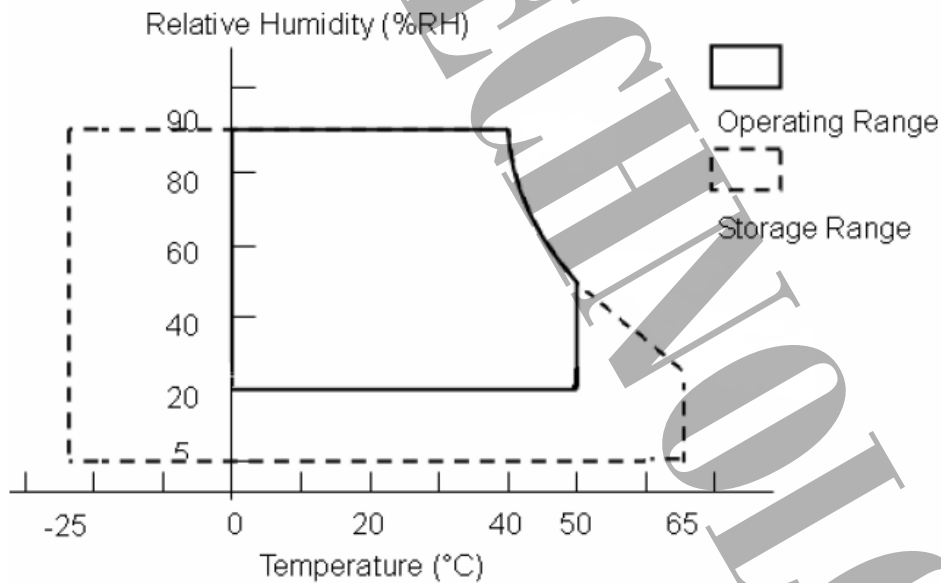
## 1.2 Absolute Maximum Ratings

The following are maximum value, which if exceeded, may cause faulty operation or damage to the unit.

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
LCD Power Voltage	VDDI	-0.3	4.0	V	
	VCCI	-0.3	2	V	
Operation Temperature	Top	0	50	°C	*1). 2). 3). 4)
Storage Temperature	Tstg	-20	60	°C	*1). 2). 3)

### 【Note】

- \*1) The relative temperature and humidity range are as below sketch, 90%RH Max. ( $T_a \leq 40^\circ\text{C}$ )
- \*2) The maximum wet bulb temperature  $\leq 39^\circ\text{C}$  ( $T_a > 40^\circ\text{C}$ ) and without dewing.
- \*3) If product in environment which over the definition of the relative temperature and humidity out of range too long, it will affect visual of LCD.
- \*4) If you operate LCD in normal temperature range, the center surface of panel should be under  $50^\circ\text{C}$ .





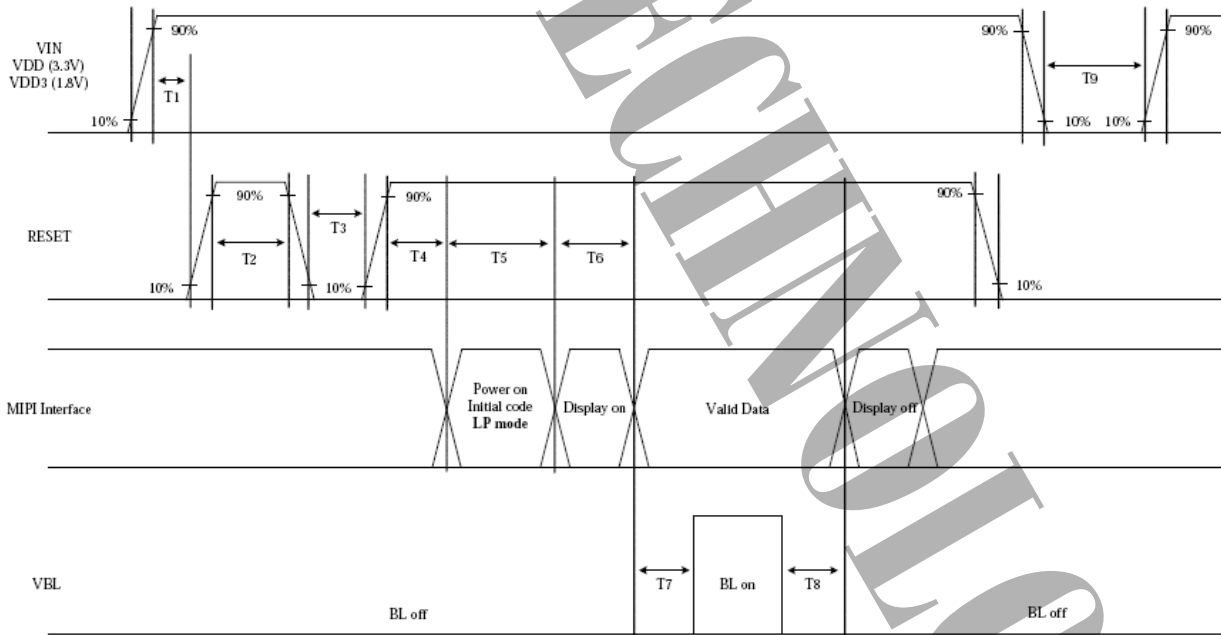
### 1.3 Electrical Characteristics

#### (A) TFT LCD

TEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Voltage	VDDI	3	3.3	3.6	V	*1)
	VCCI	1.7	1.8	1.9	V	
LCD Power Current Normal Mode	IDD	-	TBD	TBD	mA	*2)
	ICC	-	TBD	TBD	mA	
LCD Power Current Sleep in Mode	IDD	-	TBD	TBD	uA	*3)
	ICC	-	TBD	TBD	uA	

#### 【Note】

\*1) Power Sequence :



Parameter	Min.	Max.	Units
T1	(5)		ms
T2	(5)		
T3	(0.01)		
T4	(5)		
T5	(180)		
T6	(34)		
T7	(200)		
T8	(200)		
T9	(500)		

※Please refer to initial code

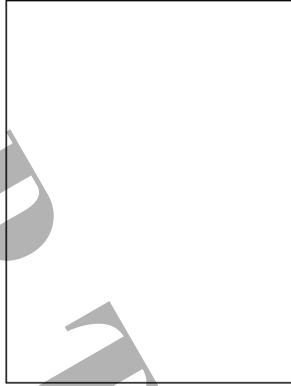


\*2) Normal Mode :

Typ. value is White Pattern : 1280 line mode ◦

Circuit condition (Max.) : VDDI=3.3 V , VCCI=1.8V ,  $f_V=60$  Hz ,  $f_H=77.76$  kHz ,  $f_{CLK}=68.43$  MHz

The current is root mean square value (RMS)



Max. value is R / G / B Pattern : 1280 line mode ◦

Circuit condition (Max.) : VDDI=3.3 V , VCCI=1.8V ,  $f_V=60$  Hz ,  $f_H=77.76$  kHz ,  $f_{CLK}=68.43$  MHz

The current is root mean square value (RMS)



\*3) Sleep in Mode :

Sleep in Condition: VDDI(3.3 V) / VCCI(1.8V) / LCD\_RST(1.8) always keep H

The current is root mean square value (RMS)

※ Please refer to initial code





## 1.4 Optical Characteristics

Ta=25°C , VDD=3.3V

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE	
Contrast Ratio	CR	$\theta = \psi = 0^\circ$	600	800	--	--	*1) 2)	
Luminance (Center)	L	$\theta = \psi = 0^\circ$	300	350	--	cd/m <sup>2</sup>	*1) 3)	
Uniformity(9P)	$\Delta L$	$\theta = \psi = 0^\circ$	70	80	--	%	*1) 3)	
Uniformity(13P)	$\Delta L$	$\theta = \psi = 0^\circ$	75	80	--	%	*1) 3)	
Response Time	Tr+Tf	$\theta = \psi = 0^\circ$	--	30	40	ms	*5)	
Cross talk	CT	$\theta = \psi = 0^\circ$	--	--	2	%	*6)	
View angle	Horizontal	$\psi$	CR $\geq 10$	80/-80	85/-85	--	°	View angle
	Vertical	$\theta$		80/-80	85/-85	--	°	
MDL Color Coordinate	W	X	$\theta = \psi = 0^\circ$	0.283	0.313	0.343	--	
		Y		0.299	0.329	0.359		
	R	X		0.592	0.622	0.652	--	
		Y		0.320	0.350	0.380		
	G	X		0.315	0.345	0.375	--	
		Y		0.557	0.587	0.617		
	B	X		0.121	0.151	0.181	--	
		Y		0.069	0.099	0.129		
Gamut		$\theta = \psi = 0^\circ$	55	58	--	--		
Gamma	$\gamma$	GL	2.0	2.2	2.4	--	*7)	

Color coordinate and color gamut are measured by SRUL1R, response time is measured by TRD-100, and all the other items are measured by BM-5A (TOPCON). All these items are measured under the dark room condition (no ambient light).

Measurement Condition: IL=18 mA(each LED)

Definition of these measurement items is as follows:

### \*1) Setup of Measurement Equipment

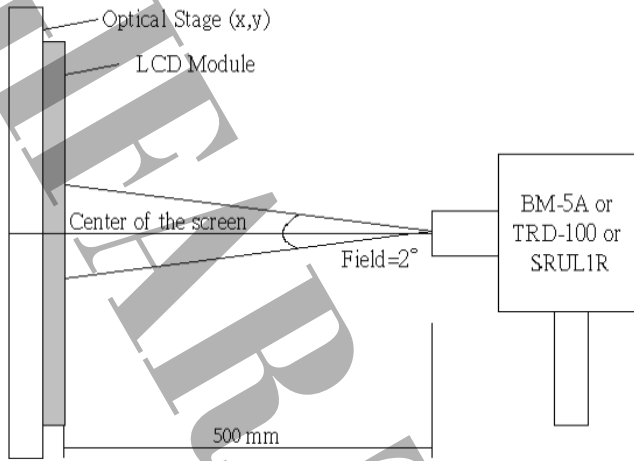
The LCD module should be turn-on to a stable luminance level to be reached. The measurement should be executed after lighting Backlight for 20 minutes and in a dark room.





**\*2) Definition of Contrast Ratio**

CR=ON (White) Luminance/OFF (Black) Luminance

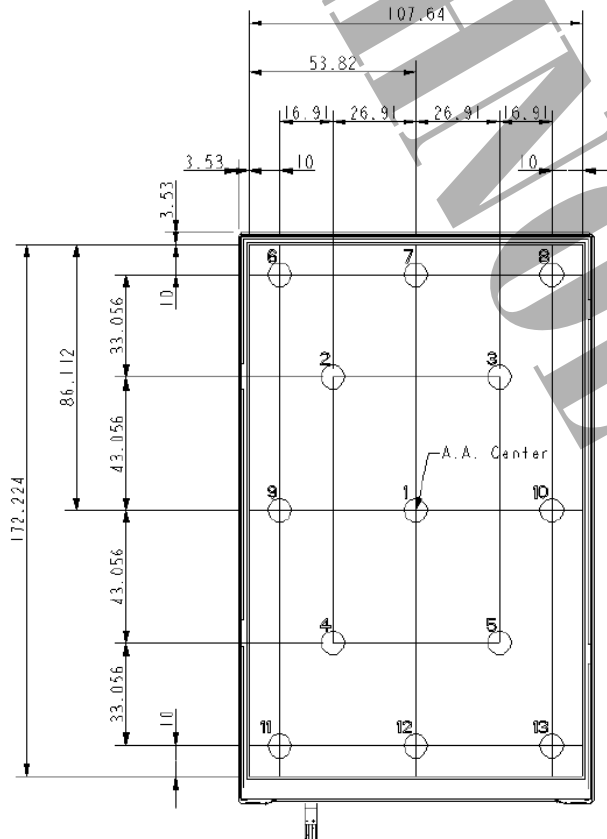


**\*3) Definition of Luminance and Luminance uniformity**

Central luminance: The white luminance is measured at the center position "1" on the screen, see Fig below.

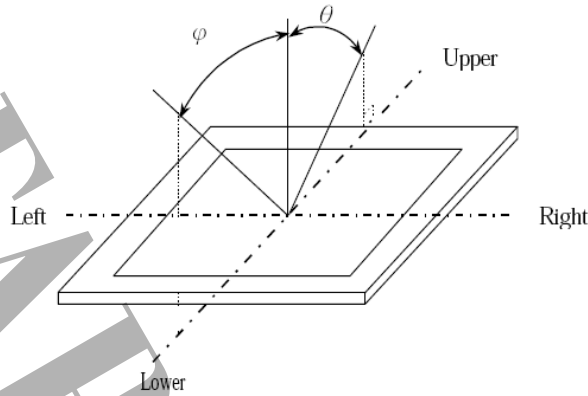
9P Uniformity:  $\Delta L = (L_{min} / L_{max}) \times 100\%$  at measuring points 1 & 6~13 see fig below.

13P Uniformity:  $\Delta L = (L_{min} / L_{max}) \times 100\%$  at measuring points 1 ~13 see fig below.

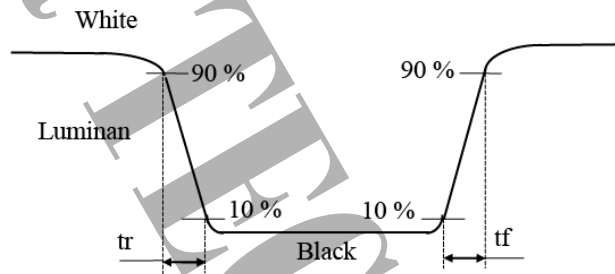




\*4). Definition of Viewing Angle ( $\theta, \varphi$ ):



\*5) Definition of Response Time:



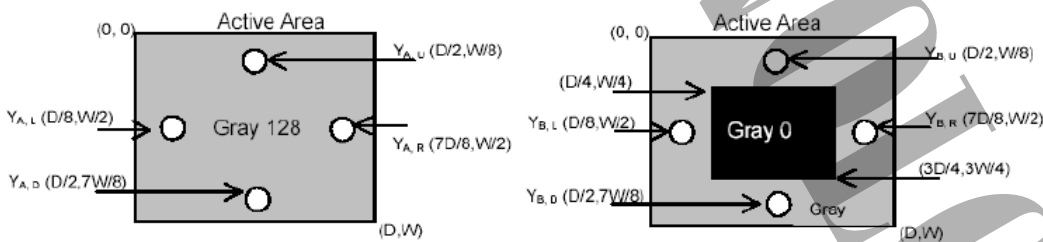
\*6) Crosstalk Modulation Ratio:

$$CT = \frac{|Y_B - Y_A|}{Y_A} \times 100\%$$

$Y_A$ 、 $Y_B$  measure position and definition

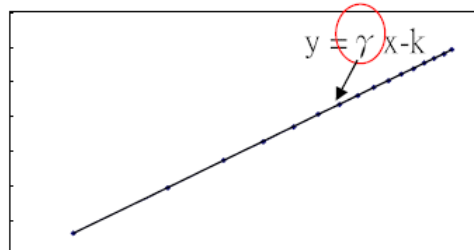
$Y_A$  means luminance at gray level 128(exclude gray level 0 pattern)

$Y_B$  means luminance at gray level 128(include gray level 0 pattern)



\*7) Definition Gamma (VESA)

Based on Customer Sample, take the average value as a standard center value and the variation range of gamma value caused by loop voltage error should be between  $\pm 0.2$ . the bellow figure shows how to obtain the gamma curve and  $\gamma$  (from gray level: 0、15、31----239、255).





## 1.5. Backlight

### (a) ELECTRICAL CHARACTERISTICS

Ta=25°C

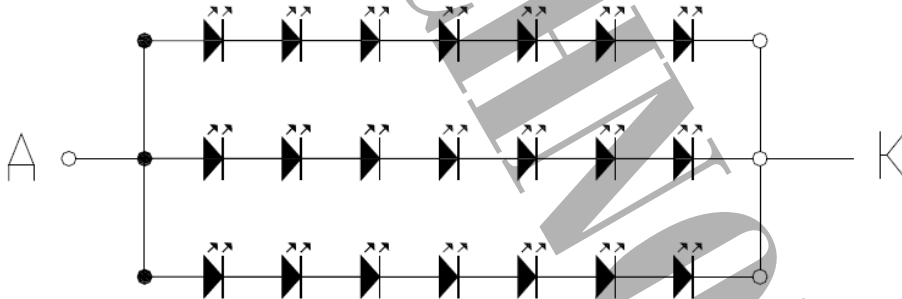
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Total Input Voltage	VBL+	-	19.95	21	V	
LED Total Input Current	IBL+	-	54	-	mA	
Forward Voltage per LED	VF	2.7	2.85	3	V	
Forward Current per LED	IF	-	18	-	mA	*1)
Power consumption	PLED	-	-	1.14	W	*3)

### (b) LED LIFE – TIME

ITEM	Condition	min	typ	max	UNIT	NOTE
LIFE TIME	IF=18mA、Ta=25°C	15000	x	x	hrs	*4)

#### 【Note】

\*1)LED Circuit Diagram :



\*2) A : Anode(+) , K : Cathode(-)

\*3) Calculator value for reference  $I_F \times V_F \times N = P_{LED}$

\*4) Life time means that estimated time to 50% degradation of initial luminous intensity.



## 2. MODULE STRUCTURE

### 2.1 Interface Pin Description

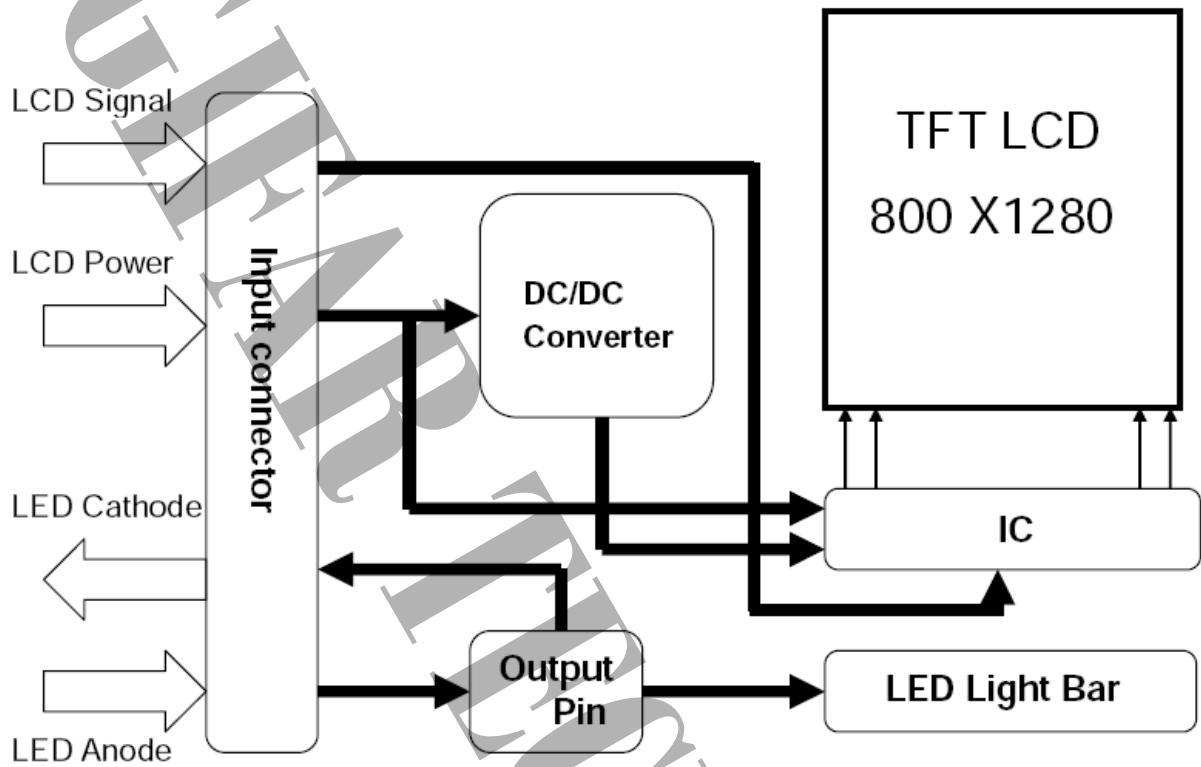
CN (Interface signal)

Outlet connector: FH35C-31S-03 (HIROSE)

Pin No.	Pin Name	Description
1	VCI	Power Supply, 3.3V(Typical)
2	VCI	Power Supply, 3.3V(Typical)
3	ID	ID PIN (CPT : NC)
4	VDDI	Power Supply, 1.8V(Typical)
5	VDDI	Power Supply, 1.8V(Typical)
6	RST	REST PIN ( H=1.8V L=0V)
7	VPP	No connection (Please let it floating for CPT test only)
8	NC	NC
9	D2P	MIPI Input Data Pair
10	NC	NC
11	D2N	MIPI Input Data Pair
12	GND	Ground
13	GND	Ground
14	D1P	MIPI Input Data Pair
15	CLKP	MIPI Input Clock Pair
16	D1N	MIPI Input Data Pair
17	CLKN	MIPI Input Clock Pair
18	GND	Ground
19	GND	Ground
20	D0P	MIPI Input Data Pair
21	D3P	MIPI Input Data Pair
22	D0N	MIPI Input Data Pair
23	D3N	MIPI Input Data Pair
24	GND	GND
25	NC	NC
26	FB1	LED Feedback
27	FB2	LED Feedback
28	FB3	LED Feedback
29	NC	NC
30	VLED	VLED
31	VLED	VLED



## 2.2 BLOCK DIAGRAM





## 2.3. INPUT SIGNAL

### (1) MIPI Interface Timing Sequence

(a) MIPI interface DC characteristic :

Item		Parameter	Min.	Typ.	Max.	Unit
LP_TX	Thevenin output high level	VOH	1.1	1.2	1.3	V
	Thevenin output low level	VOL	-50		50	mV
	Output impedance of LP transmitter	ZOLP	110	—	—	$\Omega$
HS_RX	Common-mode voltage HS receive mode	VCMRX(DC)	70	—	330	mV
	Differential input high threshold	VIDTH	—	—	70	mV
	Differential input low threshold	VIDTL	-70	—	—	mV
	Single-ended input high voltage	VIHHS	—	—	460	mV
	Single-ended input low voltage	VILHS	-40	—	—	mV
	Single-ended threshold for HS termination enable	VTERM-EN	—	—	450	mV
	Differential input impedance	ZID	80	100	125	$\Omega$
LP_RX	Logic 1 input voltage	VIH	880	—	—	mV
	Logic 0 input voltage. not in ULPState	VIL	—	—	550	mV
	Input hysteresis	VHYST	25	—	—	mV
LP_CD	Logic 1 contention threshold	VIHCD	450	—	—	mV
	Logic 1 contention threshold	VILCD	—	—	200	mV

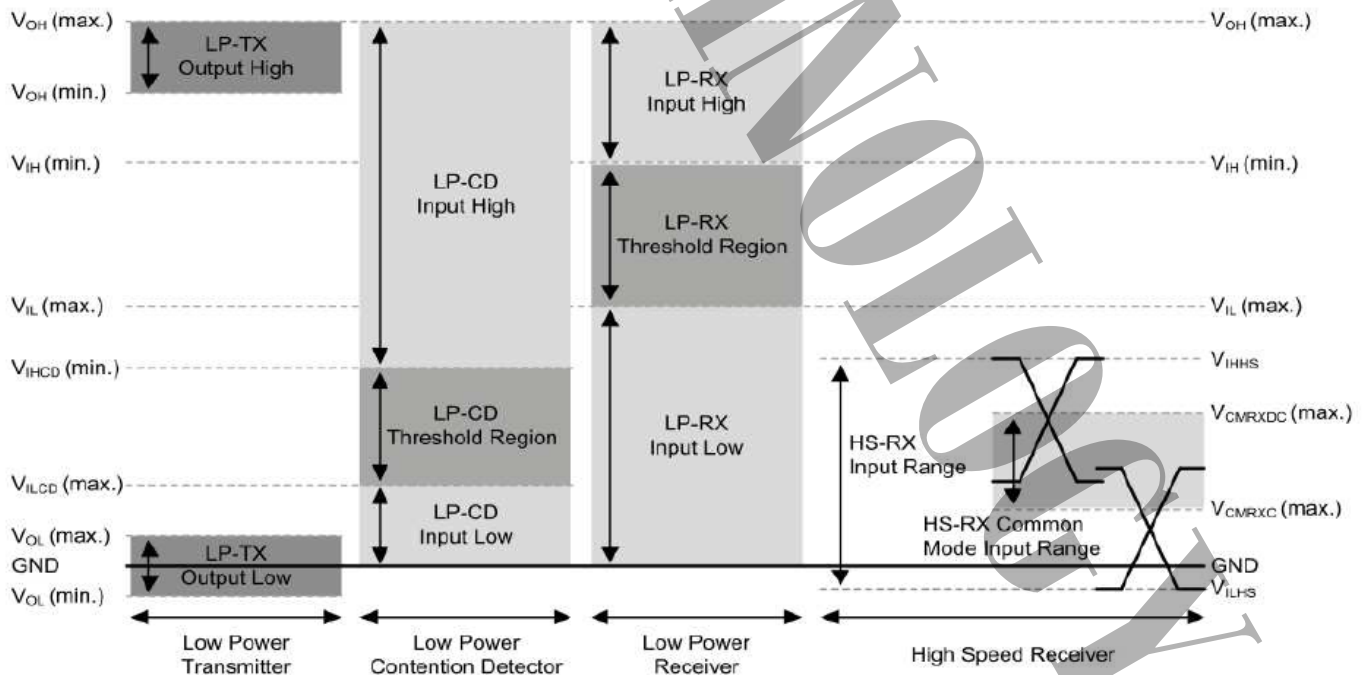


Figure1. MIPI DC Diagram



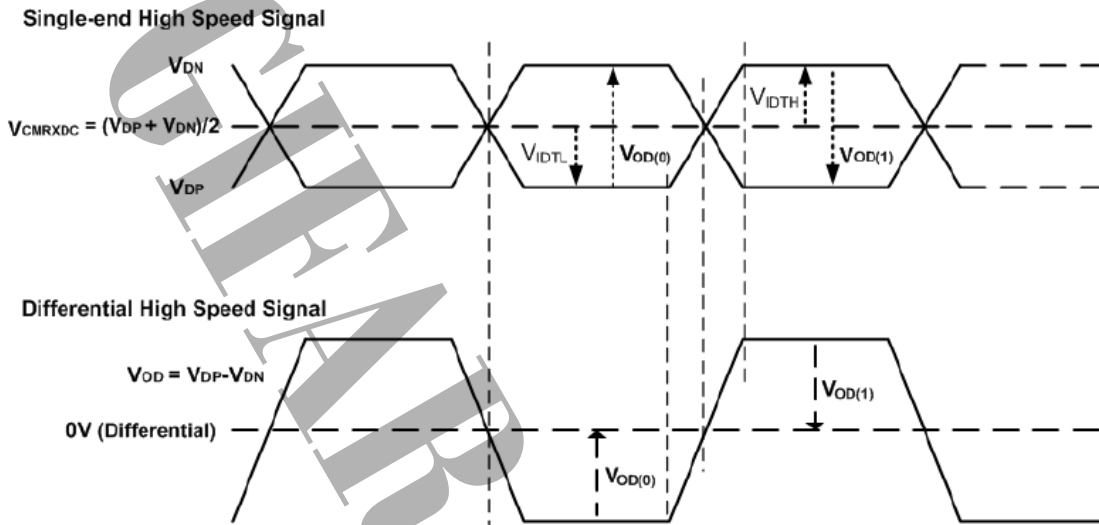


Figure 2. Signal-ended and Resulting Differential HS Signals Diagram

(b) MIPI data to clock timing definitions

Clock Parameter	Symbol	Min	Typ.	Max.	Unit
UI instantaneous	UI INST	2	—	5	ns
Data to Clock Setup Time[Receiver]	T SETUP[RX]	0.15	—	—	UI INST
Clock to Data Hold Time[Receiver]	T HOLD[RX]	0.15	—	—	UI INST
Data to Clock Skew (Measured at transmitter)	T SKEW[TX]	-0.15	—	0.15	—

【Note】

- \*1) This max value corresponds to a minimum 200 Mbps data rate
- \*2) The minimum UI shall not be violated for any single bit period, i.e., any DDR half cycle within a data burst.
- \*3) Total silicon and package delay budget of 0.3 UIINST
- \*4) Total setup and hold window for receiver of 0.3\* UIINST
- \*5) T SETUP[RX] and T HOLD[RX] are only for RX without FPCB and connector and guaranteed by design.

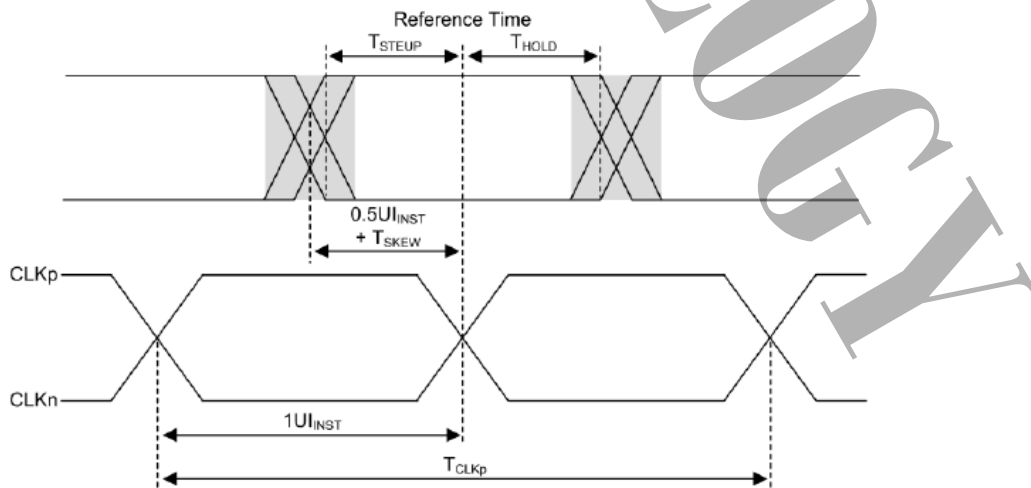


Figure 3. MIPI data to clock timing definitions

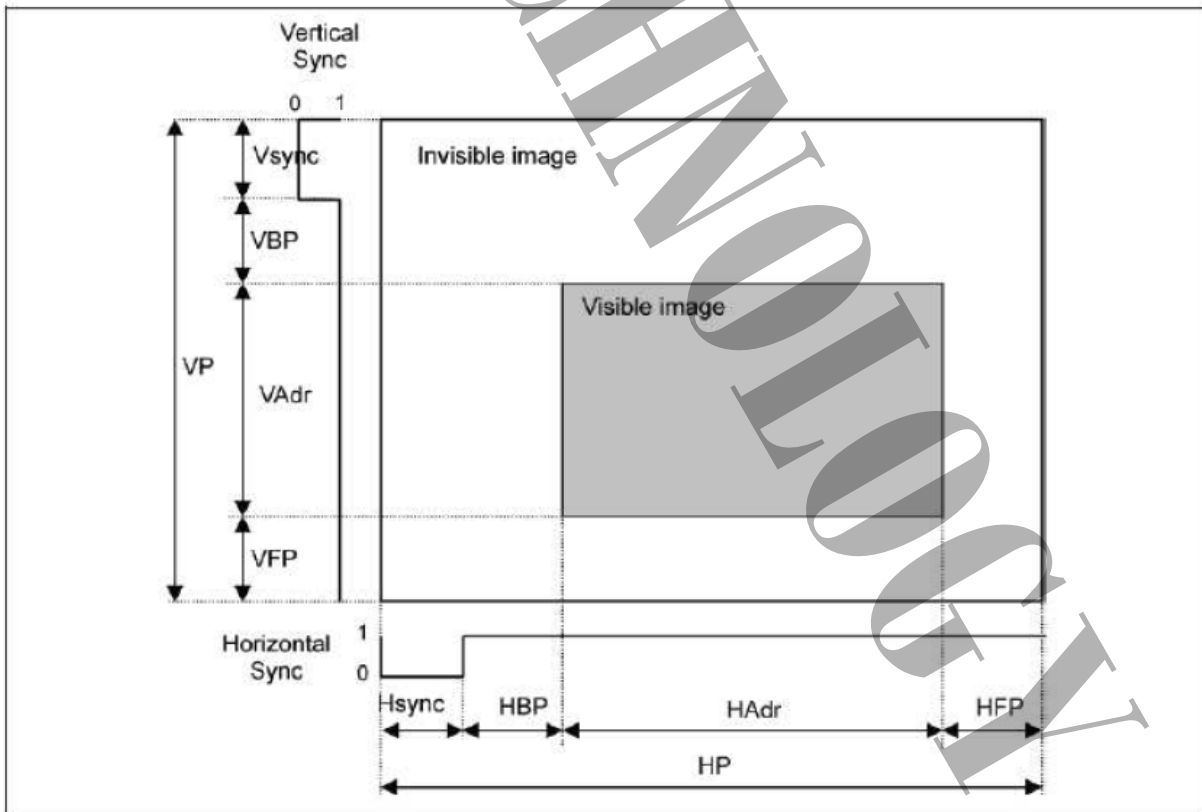


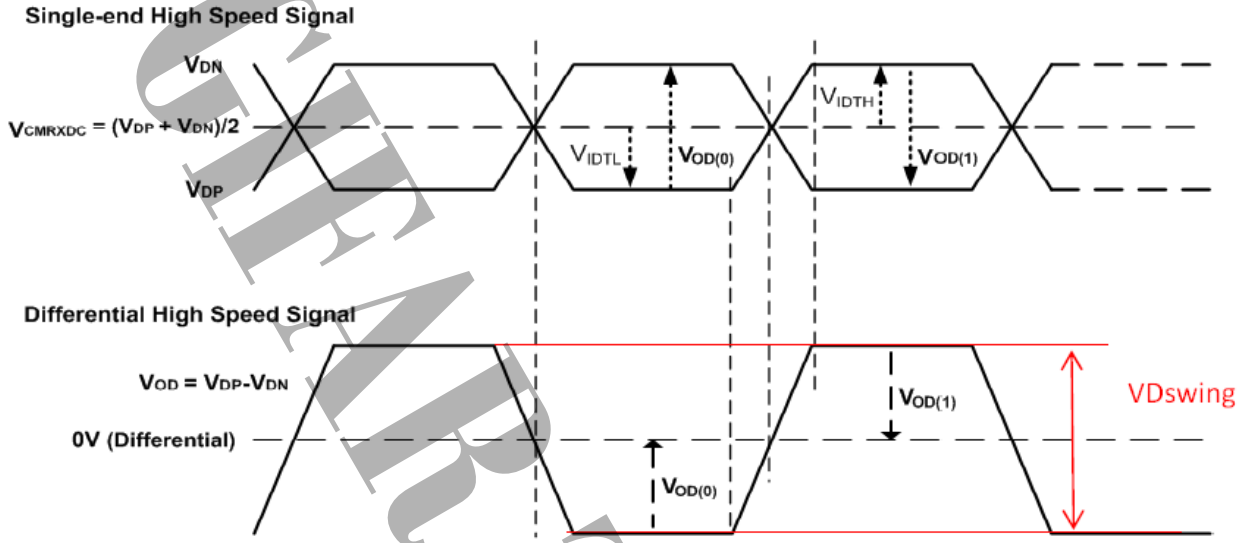


(2) Timing Chart

ITEM		SYMBOL	Timing	UNIT	
LCD	Frame Rate	-	60	Hz	
Timing	DCLK	Frequency	fCLK	68.43 MHz	
		Period	Tclk	14.61 ns	
	Horizontal	Horizontal total time	tHP	880	t <sub>CLK</sub>
		Horizontal Active time	tHadr	800	t <sub>CLK</sub>
		Horizontal Pulse Width	tHsync	5	t <sub>CLK</sub>
		Horizontal Back Porch	tHBP	59	t <sub>CLK</sub>
		Horizontal Front Porch	tHFP	16	t <sub>CLK</sub>
	Vertical	Vertical total time	tvp	1296	t <sub>H</sub>
		Vertical Active time	tVadr	1280	t <sub>H</sub>
		Vertical Pulse Width	tVsync	5	t <sub>H</sub>
		Vertical Back Porch	tVBP	3	t <sub>H</sub>
		Vertical Front Porch	tVFP	8	t <sub>H</sub>
	Differential Swing		VDswing	250	mV
	Bit Rate		TX SPD(MBPS)	450	Mbps
Pixel Fomat			888	Data bit/pixel	
Lane			4	Lane	

※Please refer to initial code





(3) Reset Input Timing

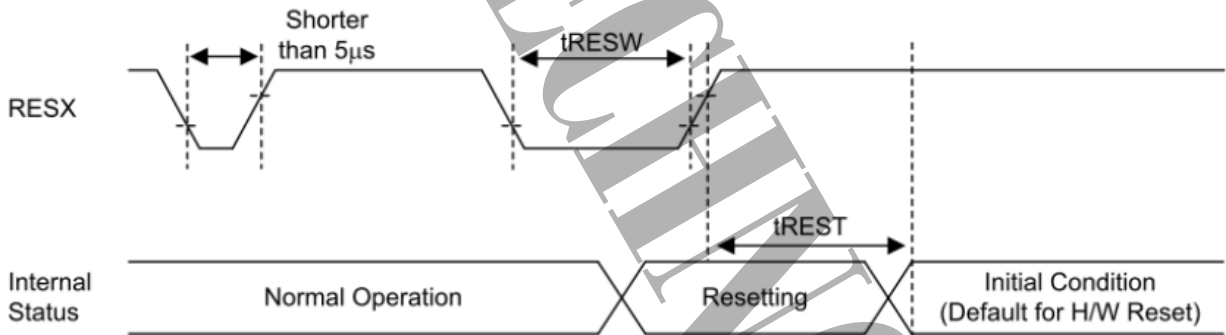


Figure4. Reset Input Timing

Symbol	Parameter	Pad	Min.	Typ.	Max.	Unit	Note
t <sub>RESW</sub>	Reset low pulse width	RESX	10			us	
t <sub>REST</sub>	Reset completion time	RESX			5	ms	Reset during Sleep In mode
		RESX			120 <sup>(5)</sup>		Reset during Sleep Out mode

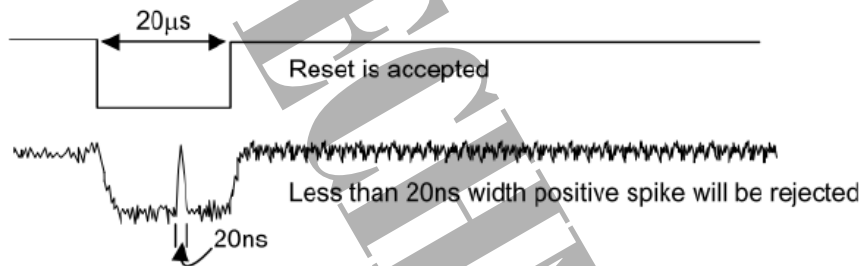


【Note】

- \*1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset Start

- \*2) During the reset period, the display will be blanked. (The display is entering blanking sequence, for which the maximum time is 120ms, when Reset starts is sleep out-mode. The display remains in the blank state is Sleep In-mode) and then return to default condition for H/W reset.
- \*3) During Reset Completion Time, ID bytes (or similar) value in MTP block will be latched to the internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of RESX.
- \*4) Spike Rejection also applies during a valid reset pulse as shown below:



- \*5) It is necessary to wait for 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.



## 2.4 Color Data Reference

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GREEN(1)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
GREEN(2)		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
GREEN(254)		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0		
GREEN(255)		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0		
BLUE		BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0		
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1		

【 Note 】

\*1) Gray level:

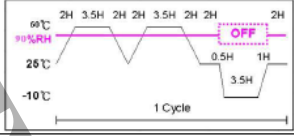
Color(n) : n is level order; higher n means brighter level.

\*2) DATA:

1: high , 0: low



### 3. RELIABILITY TEST

Test Items	Conditions
High Temp. Operating Test	60°C, 240 Hrs
High Temp. Storage Test	60°C, 240 Hrs
High Temp/ High Humidity Operating Test	60°C, 90% RH, 240Hrs
High Temp./High Humidity Storage Test	60°C, 90% RH, 240Hrs
Low Temp. Operating Test	-20°C, 240 Hrs
Low Temp. Storage Test	-20°C, 240 Hrs
Thermal Shock	-40°C (1Hr)~60°C (1Hr) · 50cycles
ALT	90%RH/60°C → 25°C → -10°C · 10Cycle 
ESD	Power off : 150pF, 330Ω, Air +/-8KV, contact +/-4KV, 25 times/point, 4 points/panel, No damage Power on : 150pF, 330Ω, Air +/-4KV, contact +/-2KV, 25 times/point, 4 points/panel, No damage
Image Sticking	25°C, 30min, 5*8 Chess board, 5min Disappear
	50°C, 30min, 5*8 Chess board, 5min Disappear

**【Note】**

\*1)The judgment of the above test should be made as follow:

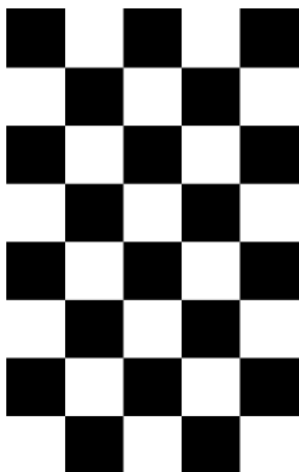
Pass : Normal display image with no obvious non-uniformity and no line defect.

Fail : No display image, obvious non-uniformity, or line defects.

\*2)Condition of image sticking test: 25°C、50°C

Operation with test pattern sustained for 30min, then change to gray pattern immediately.

After 5 min, the Mura must be disappeared completely.



(a)Test Pattern(Chess Board Pattern)



(b) 128<sup>th</sup> Gray Pattern

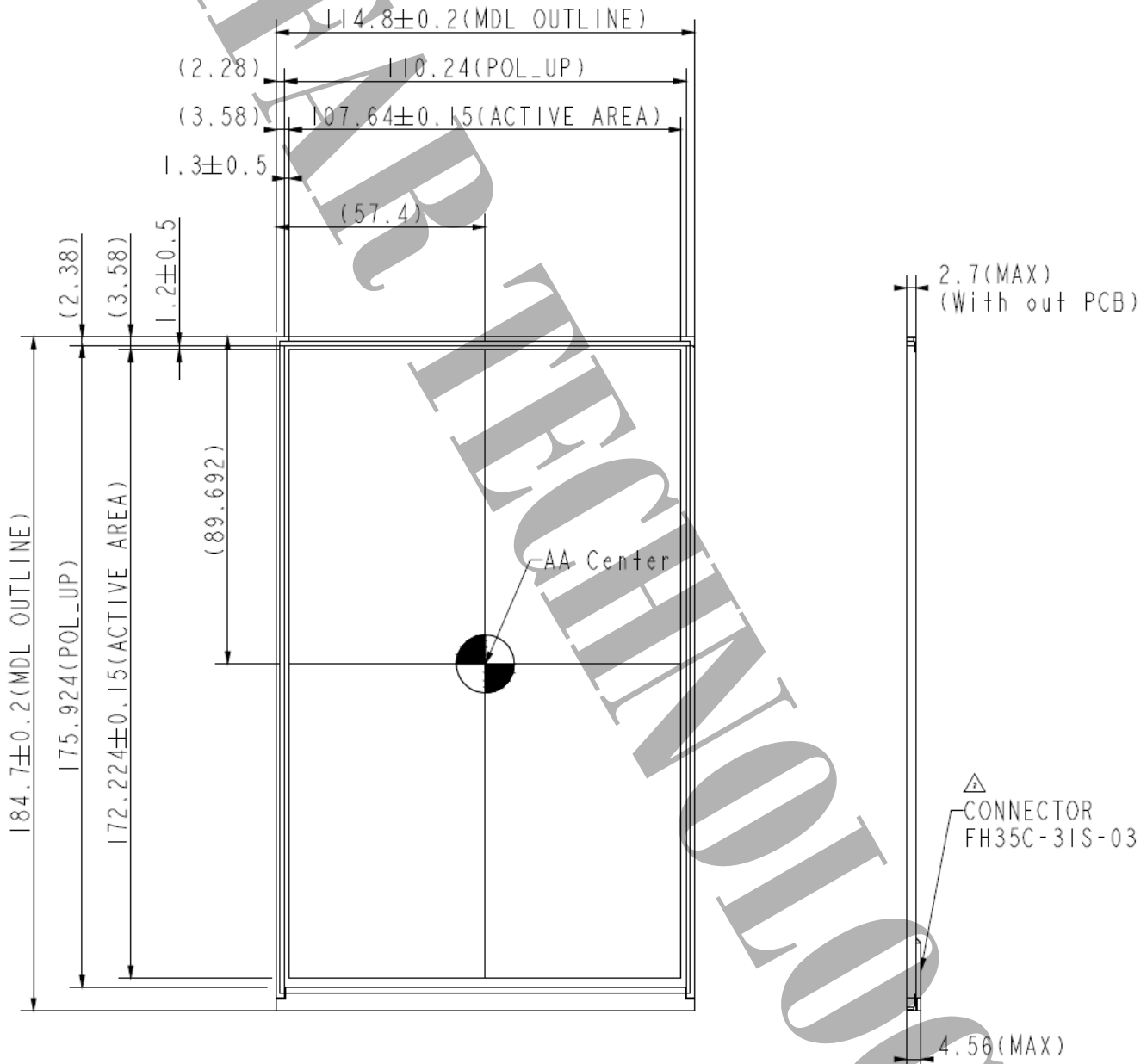


## 4. LCM Drawing

### 4.1 Front side

The tolerance, not show in the figure, is  $\pm 0.15\text{mm}$ .

[Unit : mm]



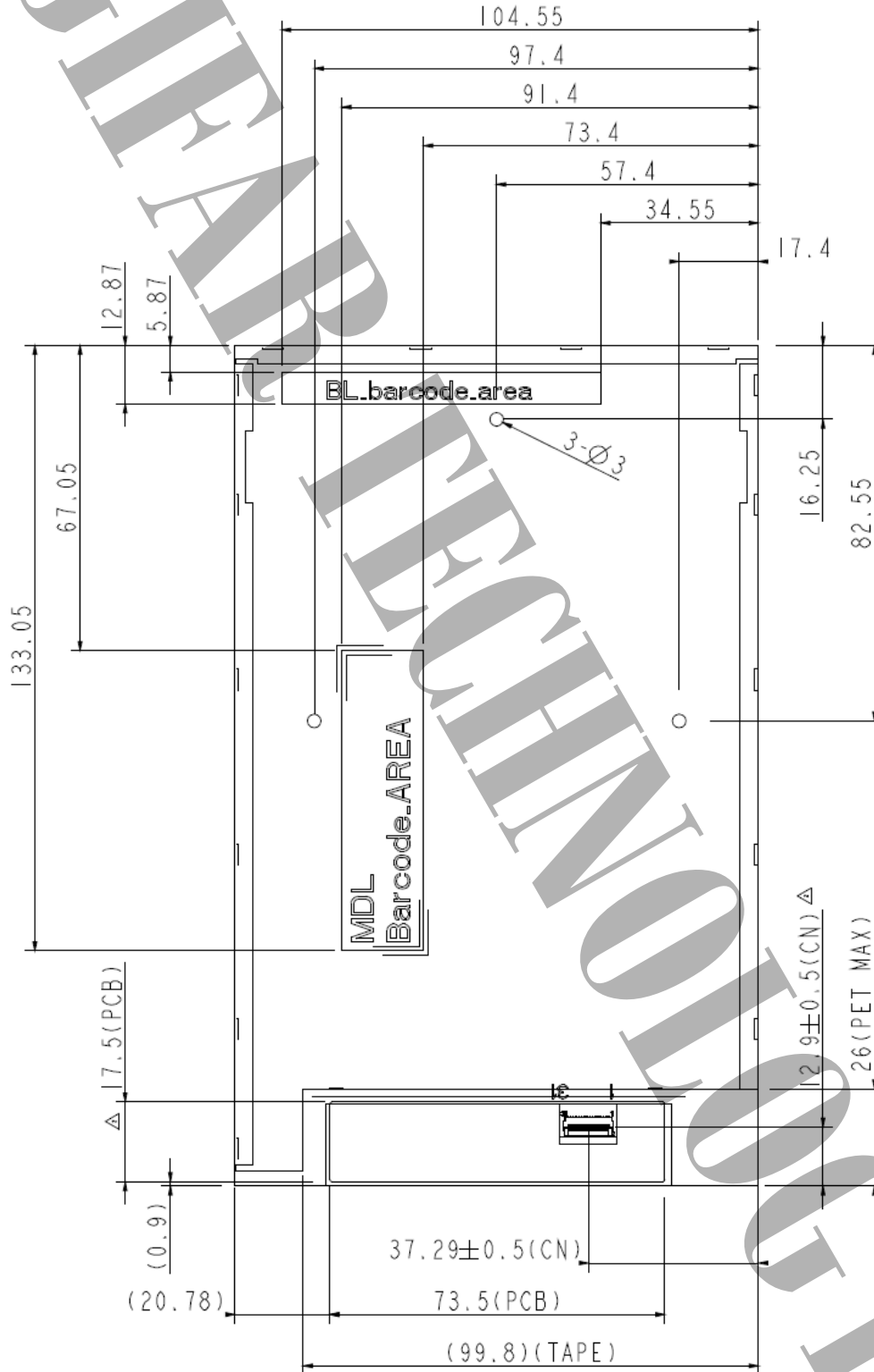




## 4.2 Rear Side

The tolerance, not show in the figure, is  $\pm 0.15\text{mm}$ .

[Unit : mm]



## 5. WARRANTY

5.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

5.2 The warranty will be avoided in case of defect induced by customer.