LCM Specification

Revision History

Date	Rev.	Sheet (New)	Old	New	Reason

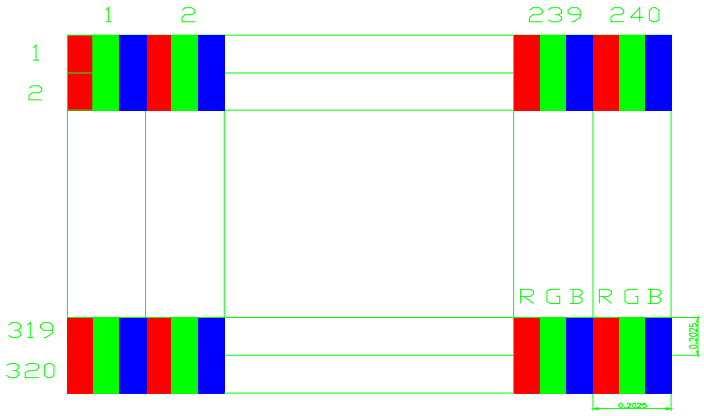
CONTENTS

1. General Description

2. General Features

Item	Display Panel	Remark
Display Mode	Normally White, Transmissive LCD	
Viewing Direction	9 O'CLOCK	
Input Signals	16Bits	
Outside Dimensions	57.45 mm(W)*78.95 mm(H)*4.5mm(T)	
Effective Area	-	
Active Area	64.8mm(H)×48.6mm(W)	
Number of Pixels	240×RGB×320Pixels	Note1)
Pixel Pitch	0.2025mm(H)×0.0675mm(W)	Note1)
Pixel Arrangement	RGB Vertical stripes	Note1)
Drive IC	SSD1298	

Note1)



3. Absolute Maximum Ratings

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

ITEM	Symbol	Min.	Typ.	Max.	Unit	Remark
Power for Circuit Driving	VDD	-0.3	-	3.3	V	
Power for Circuit Logic	VCI	-0.3	-	5.0	V	
LC Operating Voltage *1)	Vop		3.3		V	
LED Forward Voltage	V_f	3.0	-	3.6	V	per LED
LED Forward Current	Ir	-	-	20	mA	per LED
LED Luminance	B_P	-	3000	-	cd/m^2	
Storage Humidity	H_{ST}	10	-	90	%RH	At 25±5℃
Storage Temperature	T_{ST}	-40	-	85	℃	
Operating Ambient Humidity	H_{OP}	10	-	90	%RH	
Operating Ambient temperature	T_{OP}	-20	-	70	℃	

Note:

*1) Liquid Crystal driving voltage.
Due to the characteristics of LC Material, this voltage vary with environmental temperature.

*2) Temp.>60℃, Absolute humidity shall be less than 90%RH at 60℃

*3) Temp.≤60℃, 90%RH MAX.

4. Electrical Specification

Main Window Display

(Unless specified, the ambient temperature Ta=25℃)

Properties		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		VDD	1.65	1.8	3.3	V	Note
Power for Circuit Logic		VCI	2.7	2.8	3.0	V	Note
BLU Driving Logic		Vbat	-	9.6	-	V	
Logic Input Voltage	Low Voltage	VIL	0	-	0.2VDD	V	
	High Voltage	VIH	0.8VDD	-	VDD	V	
Logic Output Voltage	Low Voltage	VOL	0	-	0.1VDD	V	
	High Voltage	VOH	0.9VDD	-	VDD	V	
Power Consumption	White	P_w	T.B.D	T.B.D	T.B.D	mW	
	Black	P_b	T.B.D	T.B.D	T.B.D	mW	
	Vertical Stripe	P_v	T.B.D	T.B.D	T.B.D	mW	

Note:

The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.
Accordingly, please make sure that the module is used within this range. And these current values are measured under the condition that all devices are stopped, each component is stable and logic signal is input.

5. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 ℃. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.
Measurement condition:

*1):with Polarizer
*2):without Polarizer
*3):only color filter glass

Spec	Parameter	Sym.	Values			Unit	Note
			Min.	Typ.	Max.		
With Back light LED ON	*1)Contrast Ratio	C/R	150	200	-		Note
	*1)Threshold Voltage	Vsat	2.0	2.1	2.2	V	FIG.2
		Vth	1.0	1.1	1.2	V	
	*2)Transmittance	T%	-	6.2	-	%	FIG.1
	*1)Response Time	Tr+Tf	*3)	30	-	msec	FIG.4
	*1)Viewing Angle	θL	-	40	-	Degree	FIG.5
		θr	-	40	-		
		θu	-	60	-		
		θd	-	15	-		
	*3)CIE Color Coordinate	Wx	-	0.30	-		
		Wy	-	0.32	-		
		Rx	-	0.58	-		
		Ry	-	0.34	-		
		Gx	-	0.32	-		
		Gy	-	0.58	-		
		Bx	-	0.15	-		
		By	-	0.11	-		
Color Gamut		S(%)	-	61.5	-	%	FIG.3

u Measurement System

Notes:

1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.

3. Response time is the time required for the display to transition from white to black

(Rising Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 3.

4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 4.

FIG. 1 Optical Characteristic Measurement Equipment and Method

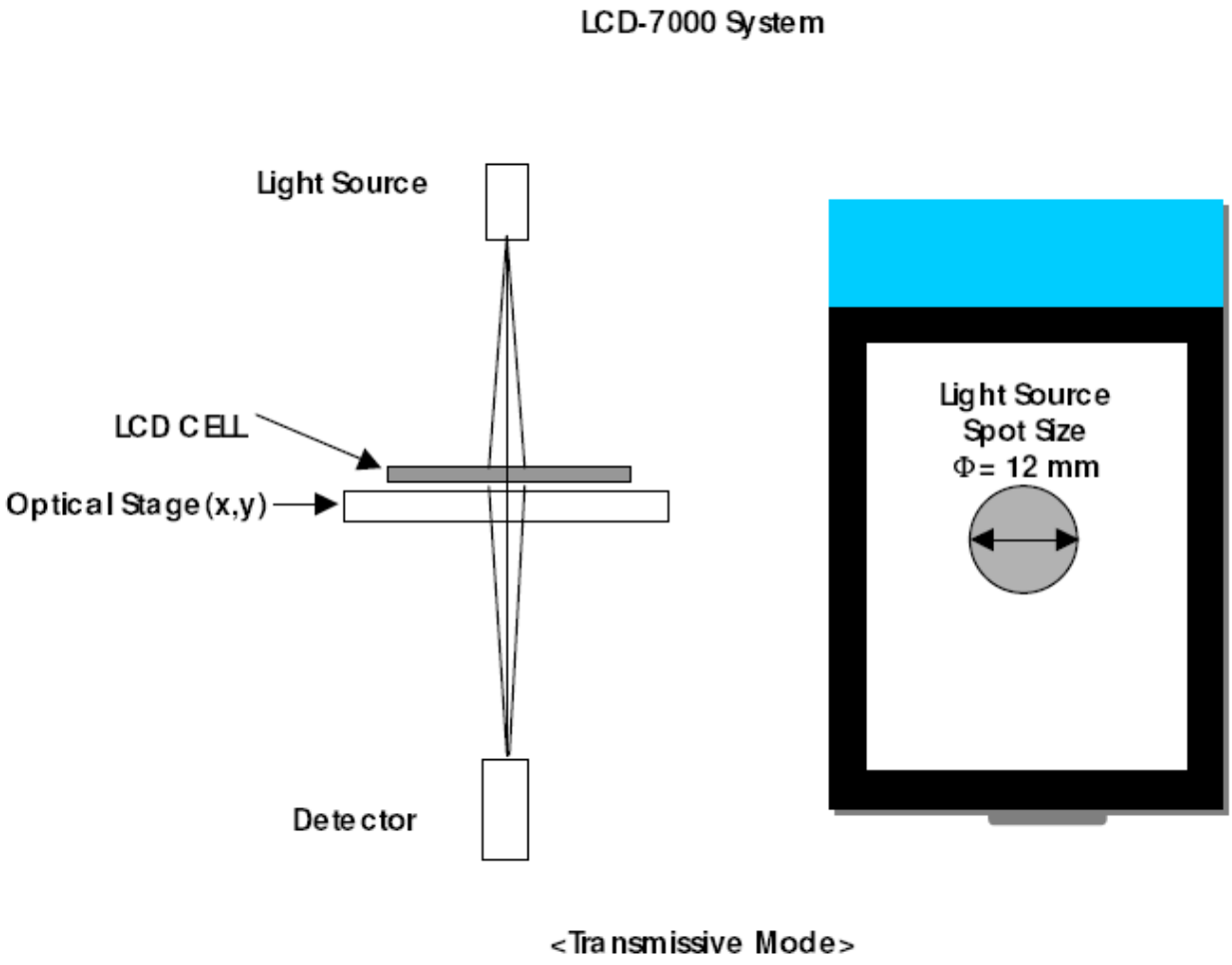


Fig. 2 The Definition of Vth and Vsat

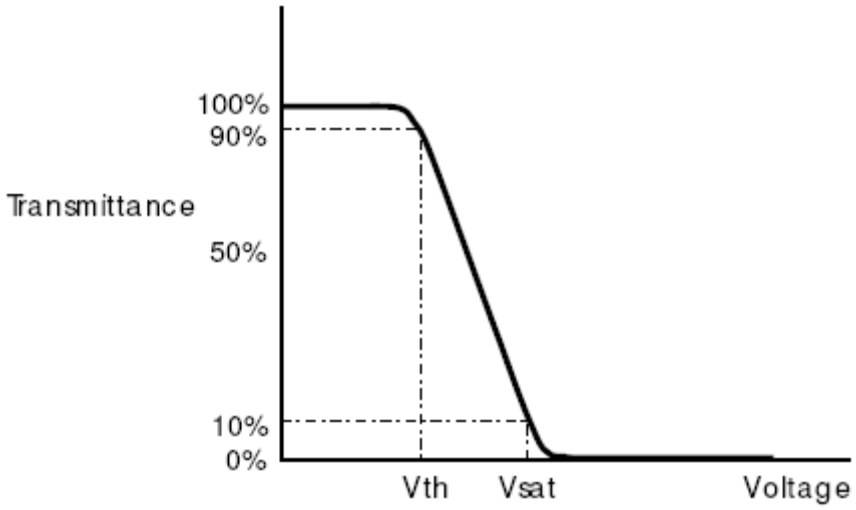


Fig. 3 The Definition of Color Gamut

Color Gamut : S(%)=(RGB Triangle Area/ NTSC Triangle Area) × 100

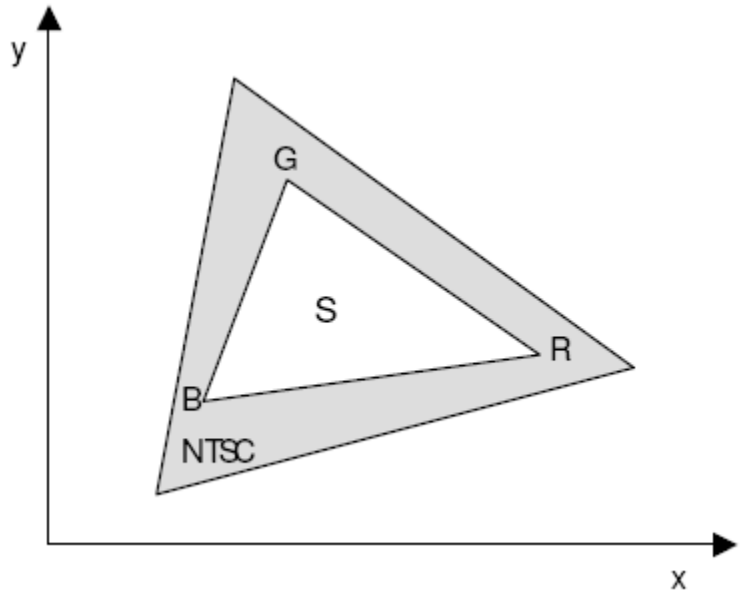


FIG. 4 The definition of Response Time

The response time is defined as the following figure and shall be measured by

switching the input signal for “black” and “white”.

Response Time = Rising Time(Tr) + Falling Time(Tf)

- Rising Time(Tr) : Full White 90% **à** Full White 10% Transmittance.
- Falling Time(Tf) : Full White 10% **à** Full White 90% Transmittance.

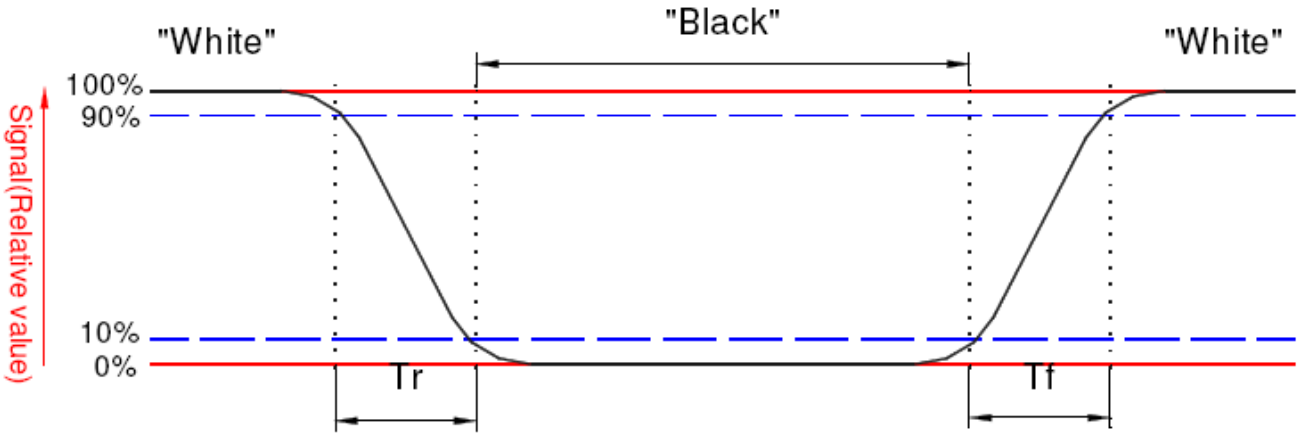
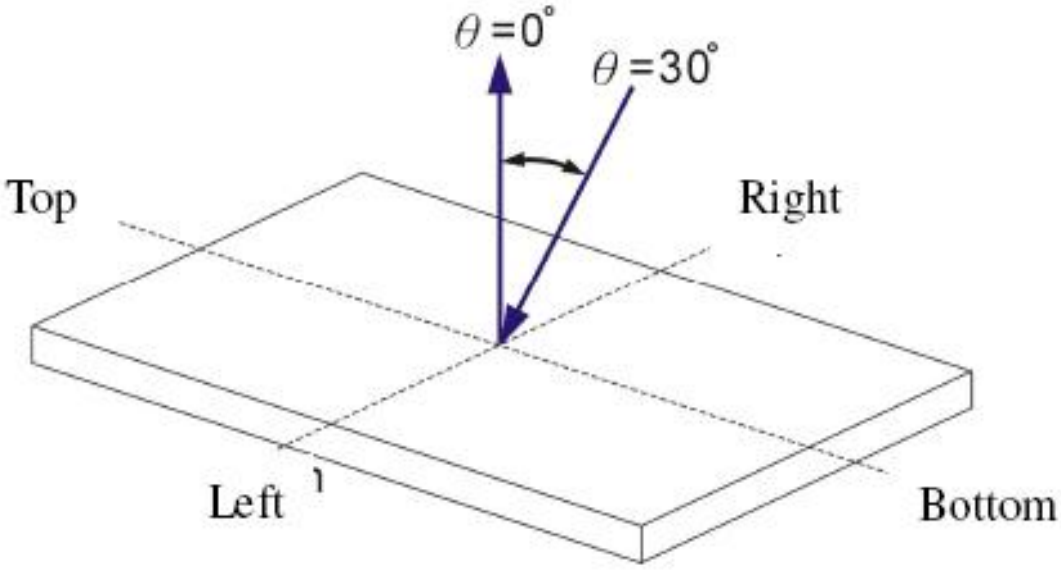
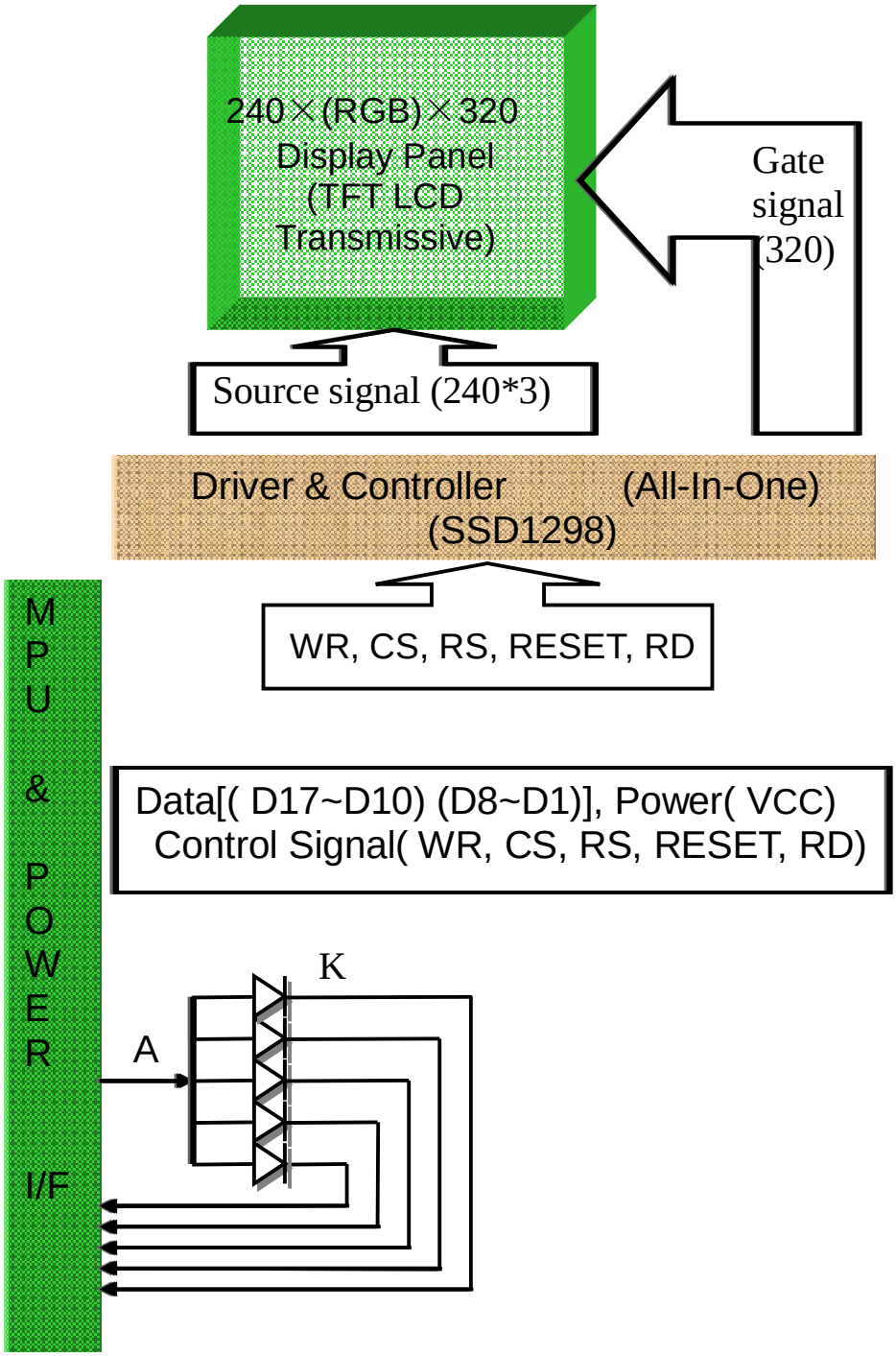


FIG. 5 The definition of Viewing Angle

Use Fig. 1(Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.



6. Block Diagram

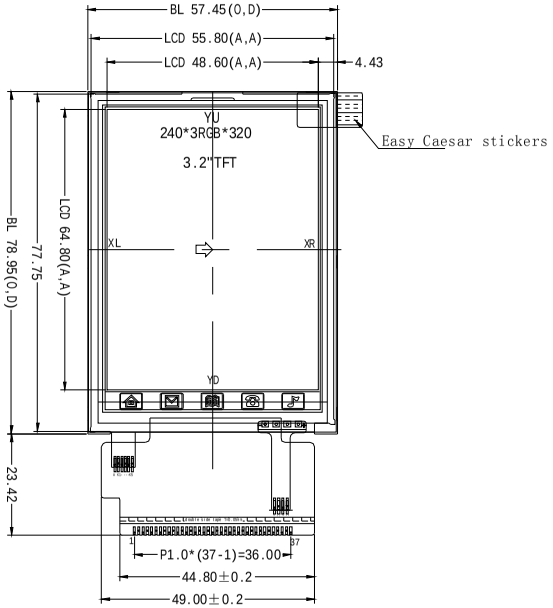

240×(RGB)×320
Display Panel
(TFT LCD
Transmissive)
Gate
signal
(320)
Source signal (240*3)
Driver & Controller (All-In-One)
(SSD1298)
WR, CS, RS, RESET, RD
MPU & POWER I/F
Data[(D17~D10) (D8~D1)], Power(VCC)
Control Signal(WR, CS, RS, RESET, RD)
K
A

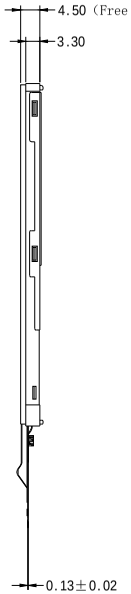
7. Pin Description

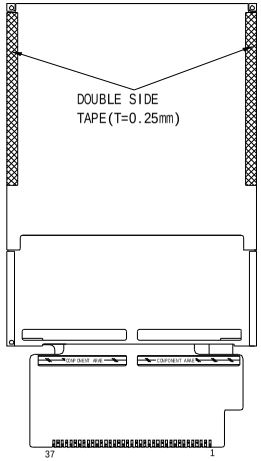
Input Signal and Power(35 Pins FPC PAD)

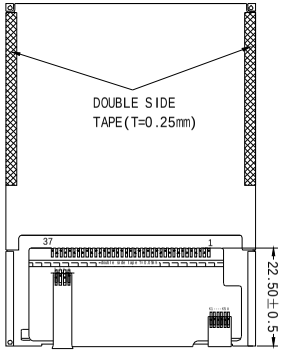
Pin NO.	Symbol	Description	Remark
1	GND	O	Ground
2	VDD	I	Power supply
3	VDD	I	Power supply
4	CS	I	Chip Select Pin
5	RS	I	Command/display data select pin
6	WR	I	Write enable clock input pin
7	RD	I	Read enable clock input pin
8	RESET	I	RESET set pin
9~24	DB0~DB15	I/O	Data Bus
25	GND	O	Ground
26	YD	I	Touch panel Down pin
27	XL	I	Touch panel Left pin
28	YU	I	Touch panel Up pin
29	XR	I	Touch panel Right pin
30	LEDK1	I	The led power supply(-)
31	LEDK2	I	The led power supply(-)
32	LEDK3	I	The led power supply(-)
33	LEDK4	I	The led power supply(-)
34	LEDK5	I	The led power supply(-)
35	A	I	The led power supply(+)
36	A	I	The led power supply(+)
37	GND	O	Ground

8. Outline Dimension







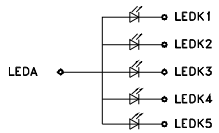


FPC bending schematic
Expand shipments

PIN ASSIGNMENT

1	GND
2	VDD
3	VDD
4	CS
5	RS
6	WR
7	RD
8	RESET
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6
16	DB7
17	DB8
18	DB9
19	DB10
20	DB11
21	DB12
22	DB13
23	DB14
24	DB15
25	GND
26	YD(Y-)
27	XL(X-)
28	YU(Y+)
29	XR(X+)
30	LED_K1
31	LED_K2
32	LED_K3
33	LED_K4
34	LED_K5
35	LED_A
36	LED_A
37	GND

Display Type	TFT
	NEGATIVE
	TRANSMISSIVE
Viewing Angle	9 O'CLOCK
	——
Operation Temperature	−20°C TO +70°C
Storage Temperature	−30°C TO +80°C
Interface	80 PARALLEL
Backlight Color	WHITE
Drive IC	SSD1298
All radii without dimension	
Unspecified tolerance is	±0.2
ROHS request	Yes



Backlit Circuit
(CIRCUIT DIAGRAM)

ITEM		ELECTRICAL & PHYSICAL DATA
LED		5pcs
Luminous		3000cd/m²(MIN .Avg)
Uniformity		80% MIN
C.I.E	X	0.260~0.290
	Y	0.260~0.290
Supply Current		60mA(fixed)
Supply Voltage		3.2V

			MODULE NO.	YXD FPC-Y80216			
			DESIGNED	CHECKED	VERIFIED	APPROVED	FILE NAME
UNIT	SIZE	SCALE					Count Drawing
mm	A4	FIT					

9. Timing Characteristics

9.1. 80-System bus interface operation

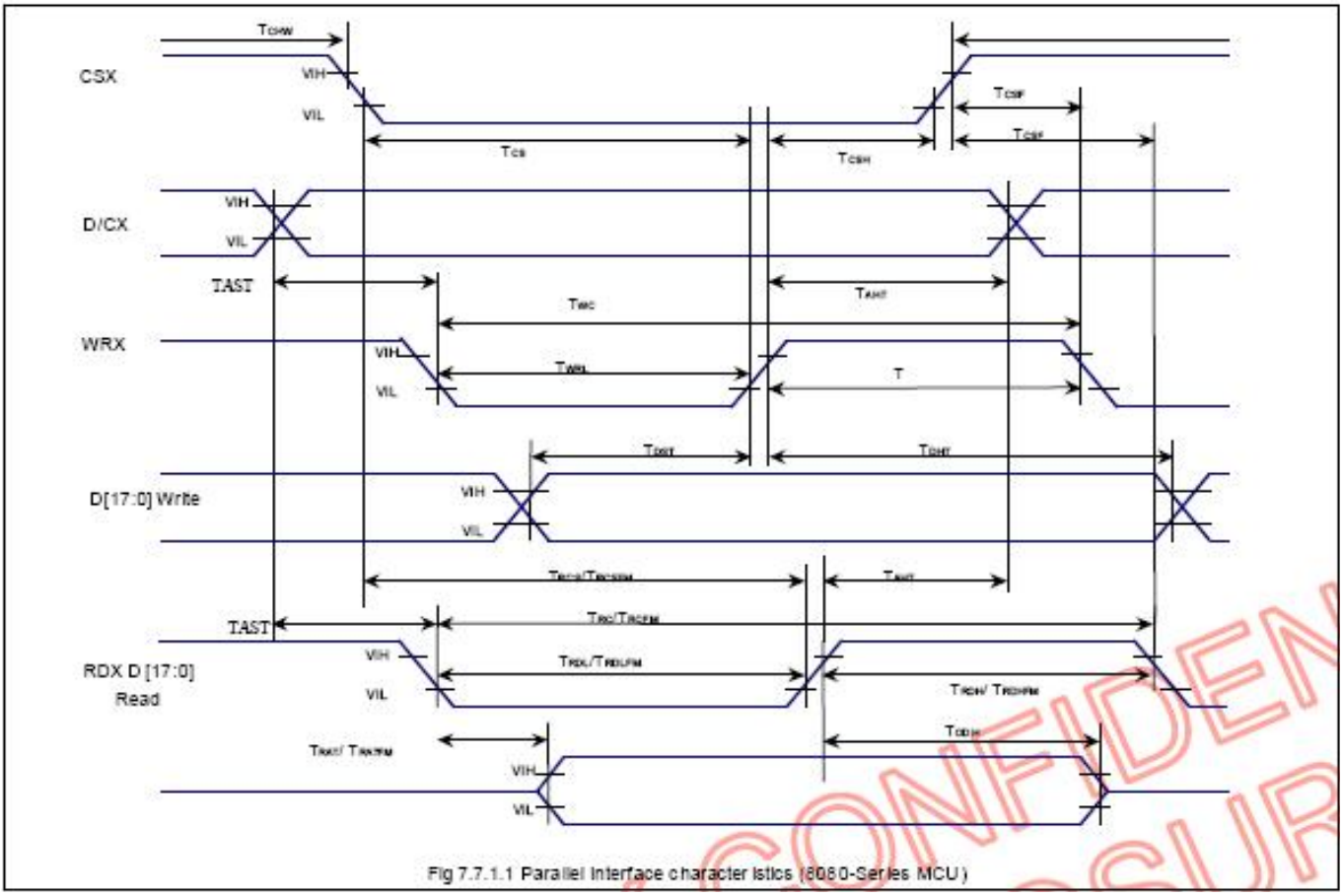


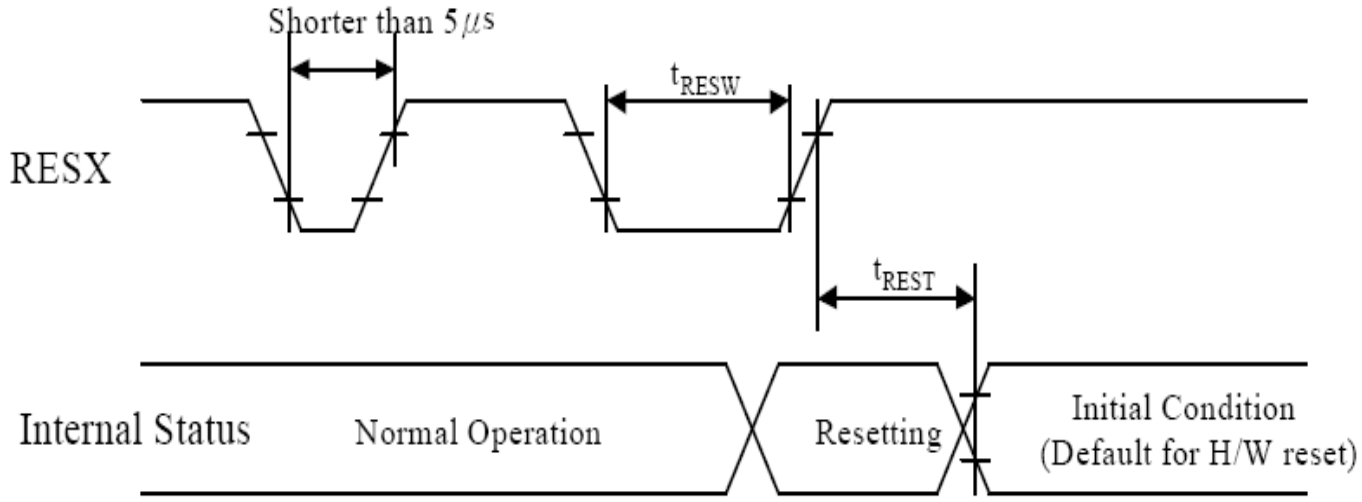
Fig 7.7.1.1 Parallel interface characteristics (8080-Series MCU)

9.2. Timing Characteristics

Normal Write Mode(HWM='0'), IOVcc=1.65V~3.6V,Vcc=2.5V~3.6V

Parameter	Symbol	Unit	Min.	Max.	Unit
Bus cycle time write	t_{CYCW}	ns	**100**	-	-
Bus cycle time read	t_{CYCR}	ns	**160**	-	-
Write low-level pulse width	PW_{LW}	ns	**35**	-	-
Read low-level pulse width	PW_{LR}	ns	**45**	-	-
Write high-level pulse width	PW_{HW}	ns	**35**	-	-
Read high-level pulse width	PW_{HR}	ns	**90**	-	-
Write/Read rise/fall time	$t_{WR,WRf}$	ns	-	-	**25**
Setup time Write	t_{AS}	ns	**0**	-	-
Setup time Read	t_{AS}	ns	**10**	-	-
Address hold time	t_{AH}	ns	**2**	-	-
Write data setup time	t_{DSW}	ns	**25**	-	-
Write data hold time	t_{H}	ns	**5**	-	-
Read data delay time	t_{DDR}	ns	-	-	**100**
Read data hold time	t_{DHR}	ns	**5**	-	-

9.3. Reset Operation



(VDD1=VDD=2.3~3.3 V, Ta= -40~ +85℃)

Parameter	Symbol	Unit	Min.	Typ.	Max.
Reset rise time	t_{rRES}	μs	-	-	10
Reset LOW-level width	t_{RES}	ms-	10	-	-

10. Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	70℃, 120Hr	Note
		Operation	60℃, 120Hr	Note
2	Low Temperature	Storage	-30℃, 120Hr	Note
		Operation	-20℃, 120Hr	
3	High Temperature and High Humidity		60℃, 90%RH, 120Hr	Note
4	Temperature Cycle	Storage	-10℃(1Hr) à 25℃(5min) à 60℃(1Hr) 32 Cycles	Note
		Operation	-20℃(1Hr) à 25℃(5min) à 60℃(1Hr) 25 Cycles	
5	Peeling Off (Storage)		≧500gf/cm	Note
6	FPC Bending Test		≧6,000 times, 2/sec	Note
7	Vibration Test(Storage)		50HZ, 30min, Amplitude: 2 cm, X/Y/Z directions	Note
8	Drop Test		60cm/ 3Corner/ 8Face, 1Cycle	Note

Note:

1) The test samples should be applied to only one test item.
2) Sample size for each test item is 5~10pcs.
3) For Damp Proof Test, pure water(Resistance>1MΩ) should be used.
4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
5) EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
6) After the reliability test, the test samples should be inspected after 2 hours at least.
7) Functional test is OK. Missing segment, shorts, unclear segment, non display, display abnormally, liquid crystal leak are not allowed.
8) After testing, the current Idd should be within initial value ±20%.
9) No low temperature bubbles ,end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

11. Inspection Criterion

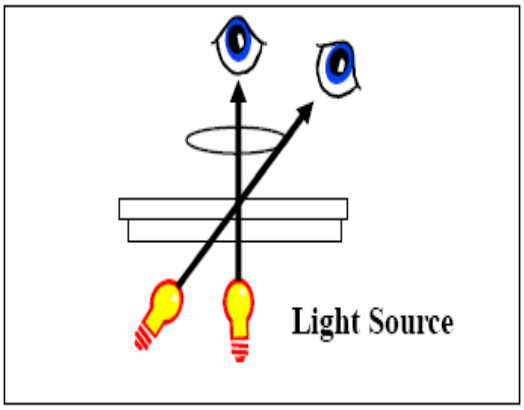
12.1. Sampling Method

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to the Customer's incoming inspection.

1) Lot size: Quantity per shipment lot
2) Sampling type: Normal inspection , single sampling
3) Inspection level: Ⅱ
4) Sampling table: MIL-STD-105D
5) Acceptable Quality Level(AQL): Major=0.65 Minor=1.5

12.2. Inspection Method

1) Ambient Condition:
   a. Temperature: Room temperature 25±5℃
   b. Illumination: Single fluorescent lamp non-directive(300 to 700 Lux)
2) Viewing distance
   The distance between the LCD and the inspector's eyes shall be at least 30-50cm.
3) Viewing Angle
   The inspection shall be conducted within normal viewing angle range.

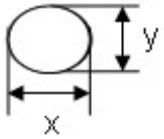


12.3. Inspection Criteria

12.3.1. Major defect

No.	Item	Inspection Standard	Classification of defects
1	All functional defects	1) No display 2) Display abnormally 3) Open or missing segment 4) Short circuit 5) Excess power consumption 6) Backlight no lighting, flickering and abnormal lighting	Major
2	Missing	Missing component	Major
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	Major

12.3.2. Cosmetic Defect

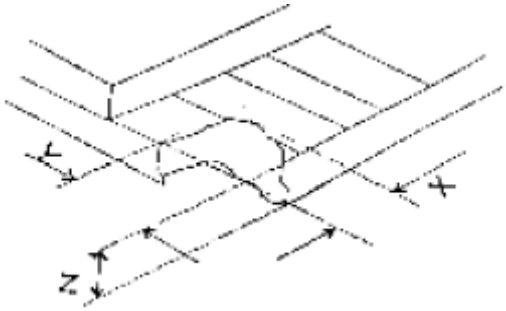
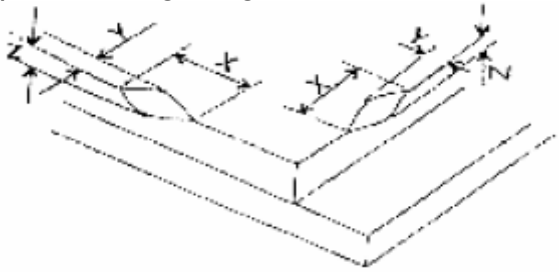
<table>
<tr><th>No.</th><th>Item</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td>1</td><td>(spot defect) Black and White spot pinhole</td><td>For dark/white spot, size Φ is defined as Φ=(x+y)/2
 

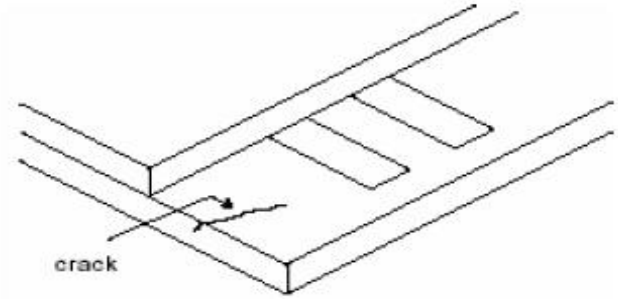
<table>
<tr><th>Size Φ (mm)</th><th>Acceptable Quantity</th></tr>
<tr><td>Φ≤0.1</td><td>Ignore</td></tr>
<tr><td>0.10≤Φ≤0.15</td><td>2</td></tr>
<tr><td>0.15≤Φ≤0.2</td><td>1</td></tr>
<tr><td>0.2<Φ</td><td>0</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>2</td><td>(line defect) Black and White line Polarizer scratch</td><td>Define:
 

<table>
<tr><th>Width(mm)</th><th>Length(mm);Acceptable Qty</th></tr>
<tr><td>Φ≤0.03</td><td>Ignore</td></tr>
<tr><td>0.03<W≤0.05</td><td>L≤3.0; N≤2</td></tr>
<tr><td>0.05<W≤0.1</td><td>L≤2.0; N≤2</td></tr>
<tr><td>0.1<W</td><td>Define as spot defect</td></tr>
</table></td><td>Minor</td></tr>
</table>

<table>
<tr>
<td>3</td>
<td>Polarizer defect</td>
<td>Dent or bubble(between the polarizer and glass)
<table>
<tr><th>Size Φ(mm)</th><th>Acceptable Qty</th></tr>
<tr><td>Φ≤0.10</td><td>Ignor</td></tr>
<tr><td>0.10<Φ≤0.20</td><td>2</td></tr>
<tr><td>0.20<Φ≤0.30</td><td>1</td></tr>
<tr><td>0.30<Φ</td><td>0</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
</table>

12.3.3. Cosmetic Defect

<table>
<tr><th>No.</th><th>Item</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr>
<td rowspan="2">1</td>
<td rowspan="2">Glass defect</td>
<td>1) Chip on the corner

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤3.0</td><td>≤S</td><td>≤T</td></tr>
</table>
Remark: S=contact pad length;
T=the thickness of glass
Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. Acceptable Quantity N≤2.</td>
<td>Minor</td>
</tr>
<tr>
<td>2) Chip on the edge of glass

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>Ignore</td><td>≤0.5</td><td>≤T</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
</table>

		Acceptable Quantity: N≤2	
		3) Creak Creaks tend to break are not allowed.  	Minor