

# LC240240R1

## TFT display module with special shape

### 1. Application :

TFT LCD color module with octagonal outline and round viewing area. suitable for measurement equipment, GPS and other indoor and outdoor applications.

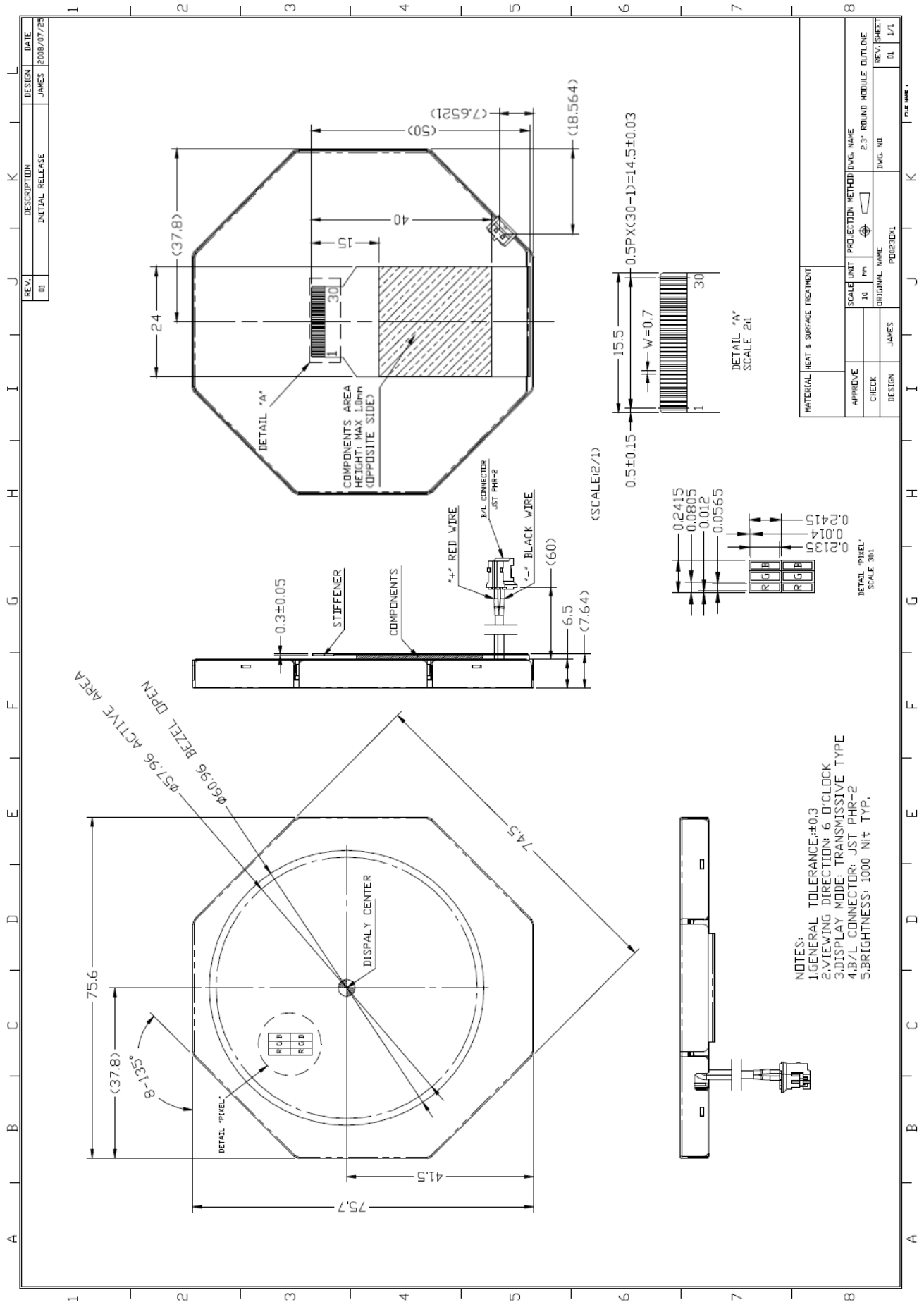
### 2. Features :

- . Pixel in stripe configuration
- . Slim and compact
- . Wide viewing angle
- . High Brightness
- . Octagonal LCD
- . Driver IC : ILI9341

### 3. Mechanical Specifications :

Parameter	Specifications	Unit
Screen Size	2.28" TFT LCD	inch
Display Format	240x(R, G, B)x240	dot
Display Colors	65.536	
Active Area	D = 57,96 (Circular)	mm
Pixel Pitch	0.2415x0.2415	mm
Pixel Configuration	Stripe	
Outline Dimension	75,60(W)x75,70(H)x7,64(D)	mm
Weight	46 ± 5	g
Surface treatment	Anti-glare and wide-view film	
Backlight	2-LED in series, 150mA	
Display mode	Normally white	
Gray scale inversion direction	6 [Refer to Note 12-1]	o' clock

4. Mechanical Drawing of TFT-LCD Module :



REV.	DESCRIPTION	DESIGN	DATE
01	INITIAL RELEASE	JAMES	2008/07/25

MATERIAL		HEAT & SURFACE TREATMENT	
APPROVE	SCALE	UNIT	PROJECTION METHOD
CHECK	1:1	mm	1st ANGLE
DESIGN	JAMES	ORIGINAL NAME	2.3" ROUND MODULE OUTLINE
FILE NAME	POD320K1	DWG. NO.	REV. SHEET
			01 1/1

## 5. Input / Output Terminals :

LCD module connection: FPC, 30 Pins, pitch 0,5mm, for ZIF connectors

Pin No.	Signal	Pin Function	Remark
1	V <sub>SS</sub>	Ground	
2	V <sub>SS</sub>	Ground	
3	RESx	Reset	
4	Dummy	n.c.	
5	D15	Parallel data bus (R4)	
6	D14	Parallel data bus (R3)	
7	D13	Parallel data bus (R2)	
8	D12	Parallel data bus (R1)	
9	D11	Parallel data bus (R0)	
10	D10	Parallel data bus (G5)	
11	D9	Parallel data bus (G4)	
12	D8	Parallel data bus (G3)	
13	D7	Parallel data bus (G2)	
14	D6	Parallel data bus (G1)	
15	D5	Parallel data bus (G0)	
16	D4	Parallel data bus (B4)	
17	D3	Parallel data bus (B3)	
18	D2	Parallel data bus (B2)	
19	D1	Parallel data bus (B1)	
20	D0	Parallel data bus (B0)	
21	Dummy	n.c.	
22	RDx	Read	
23	WRx_	Write	
24	DCx	Register Index or Register Command select	
25	CSx	Chip select	
26	Dummy	n.c.	
27	V <sub>Cl</sub>	Power supply, typ. 3,0V	
28	V <sub>Cl</sub>	Power supply, typ. 3,0V	
29	V <sub>SS</sub>	Ground	
30	V <sub>SS</sub>	Ground	

Backlight connection: Connector JST PHR-2, 2 contacts, pitch 2,00mm

Pin No.	Signal	Pin Function	Remark
1	LED A (red)	Power supply for backlight Anode	
2	LED C (black)	Power supply for backlight Cathode	

## 6. Absolute Maximum Ratings :

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

$$V_{SS}=GND=0V, T_a = 25^{\circ}C$$

Item	Symbol	Value	Unit	Remark
Power supply voltage (1)	$V_{CI}$ *	-0.3 to +4.6	V	
Supply voltage (logic)	$V_{DDI}$	-0.3 to +4.6	V	
Supply voltage (digital)	$V_{CORE}$	-0.3 to +2.0	V	
Driver Supply Voltage	$V_{GH}-V_{GL}$	-0.3 to +32	V	
Input Voltage Range	$V_{IN}$	-0.3 to $V_{DDI}+0.3$	V	
Output Voltage Range	$V_O$	-0.3 to $V_{DDI}+0.3$	V	

\* only  $V_{CI}$  is available from outside, all other voltages are defined on the module

## 7. Electrical Characteristics :

### 7-1 Operation condition :

$$V_{SS}=GND=0V, T_a = 25^{\circ}C$$

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage	$V_{CI}-V_{SS}$ *	2.5	3.0	3.3	V	Note 7-1
Supply voltage (logic)	$V_{DDI}-V_{SS}$	1.65		3.3	V	
Supply voltage (digital)	$V_{Core}-V_{SS}$		1.5		V	
Driver supply voltage	$V_{GH}-V_{GL}$			32	V	
Gate driver high voltage	$V_{GH}-V_{SS}$	12.0		21.0	V	
Gate driver low voltage	$V_{SS}-V_{GL}$	-12.5		-7.0	V	

\* only  $V_{CI}$  is available from outside, all other voltages are defined on the module

7-2 Power consumption :

Parameter	Symbol	min	typ	max	Unit	Remark
Supply voltage of LED backlight	$V_{LED}$	-	-	(7,6V)	V	Note 7-4
Supply current of LED backlight	$I_{LED}$	-	150	-	mA	Note 7-5
Backlight Power Consumption	$P_{LED}$	-	-	1140	mW	Note 7-6

Note 7-4 : The  $I_{LED}=150$  mA (Constant current)

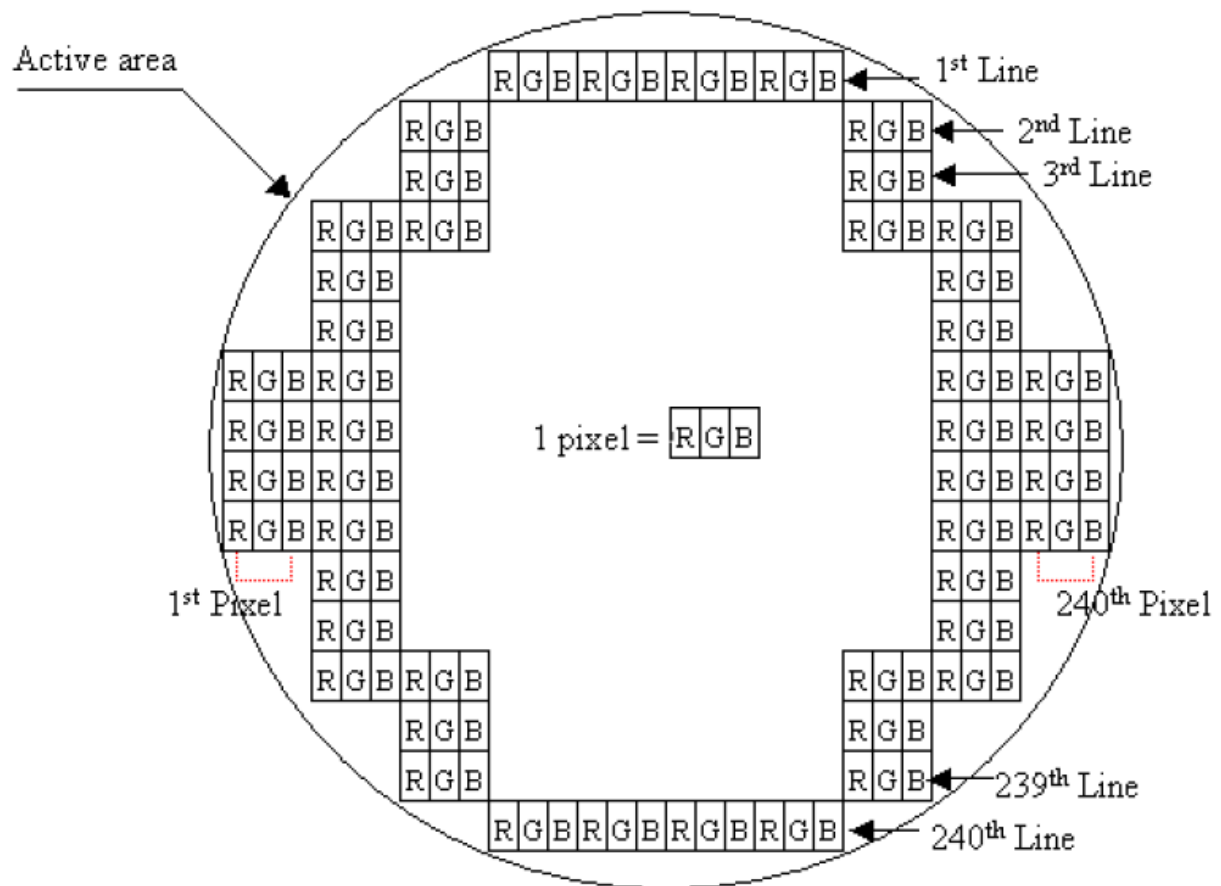
Note 7-5: LED B/L applied information

Note 7-6:  $P_{LED} = V_{LED} * I_{LED}$ .

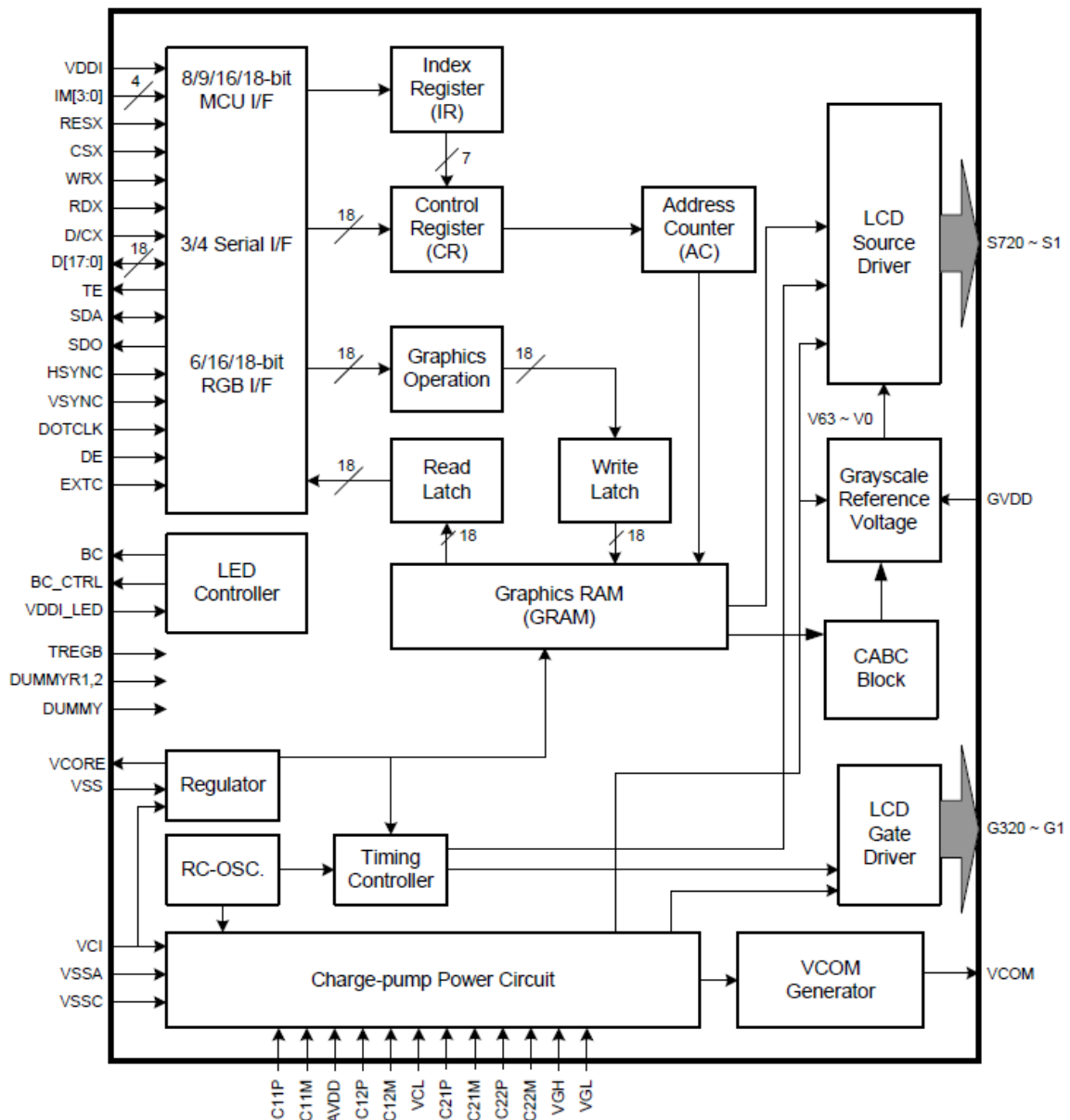


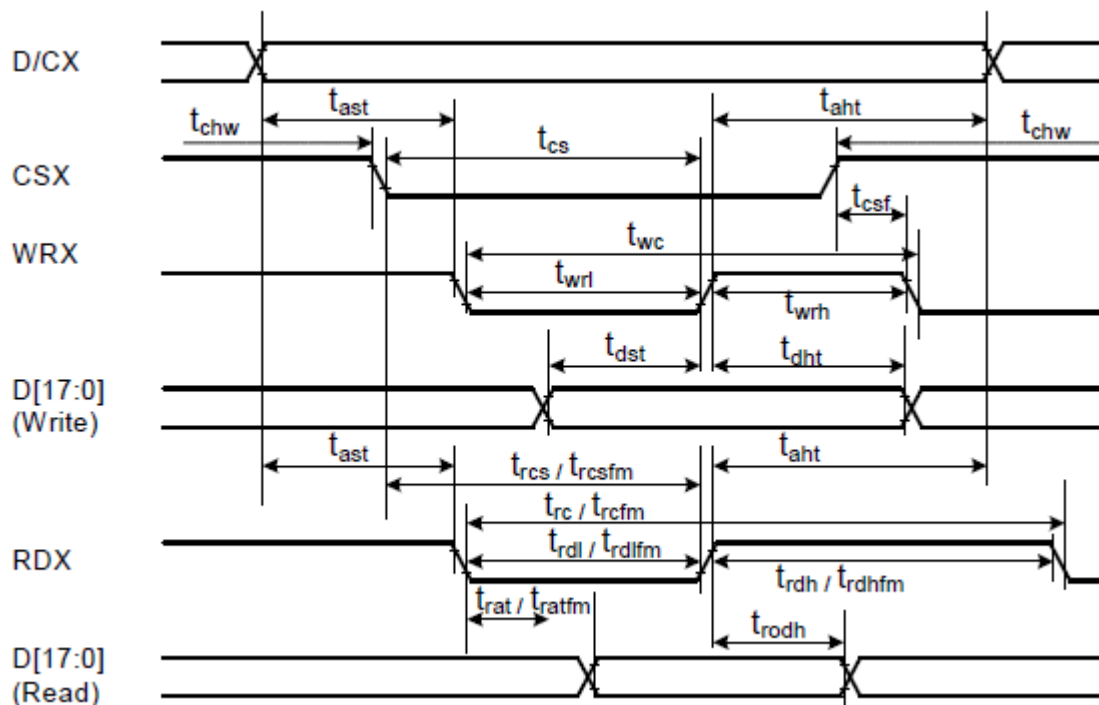
Parameter	Symbol	Conditions	typ.	max.	Unit	Remark
Supply current for source driver and gate driver	$I_{CI}$	$V_{CI} = 3,0V$	11,7	17,6	mA	
Backlight Power Consumption	$P_{LED}$	-	-	1140	mW	
Total power consumption	-	-	-	1192,8	mW	

8. Pixel Arrangement :



9. Block Diagram :



**10. Timing specification :****10-1. 80-system Bus Operation :****10-2. AC Characteristics :****10-2.1 80-system Bus Interface Timing Characteristics :**

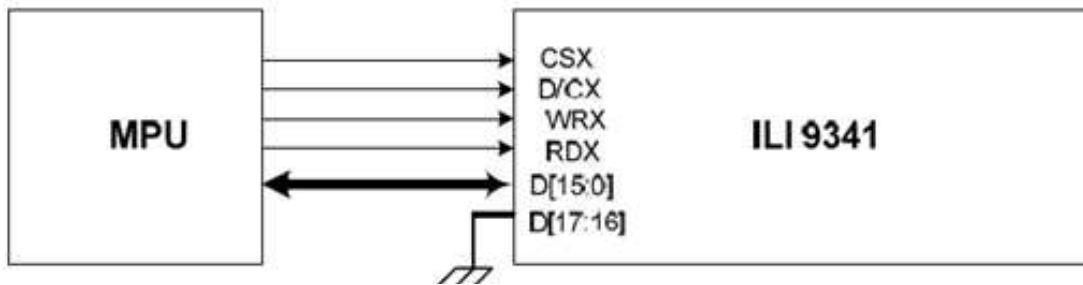
Signal	Symbol	Parameter	Min	Max	Unit	Description
DCX	Tast	Address setup time	0	-	ns	
	That	Address hold time(write/Read)	0	-	ns	
CSX	Tchwh	CSX "H" pulse width	0	-	ns	
	Tc $\dagger$ s	Chip select setup time(Write)	15	-	ns	
	Trcs	Chip select setup time(Read ID)	45	-	ns	
	Tresfm	Chip select setup time(Read FM)	355	-	ns	
	Tcsf	Chip select wait time(Write/Read)	10	-	ns	
WRX	Twc	Write cycle	66	-	ns	
	Twrh	Write control pulse H duration	15	-	ns	
	Twrl	Write control pulse L duration	15	-	ns	
RDX(FM)	Trefm	Read cycle(FM)	450	-	ns	
	Trdhfm	Read control pulse H duration(FM)	90	-	ns	
	Trdlfm	Read control pulse L duration(FM)	355	-	ns	
RDX(ID)	Trc	Read cycle(ID)	160	-	ns	
	Trdh	Read control pulse H duration	90	-	ns	
	Trdl	Read control pulse L duration	45	-	ns	
D[17:0] D[15:0] D[8:0] D[7:0]	Tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	Tdht	Write data hold time	10	-	ns	
	Trat	Read access time	-	40	ns	
	Tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	



## 11. Interface specification :

### 11-1. 16-bit bus interface :

The 80-system 16-bit bus parallel data transfer can be used by setting IM[3:0] pins to “0001” .



### display data format

-65K-Colors,RGB,5,6,5 –bits input data.

One pixel (3sub-pixels)display data is sent by 1 transfer when DBI[2:0]bits of 3Ah register are set to “101”

Count	0	1	2	3	...	238	239	240
D/CX	0	1	1	1	...	1	1	1
D15		0R4	1R4	2R4	...	237R4	238R4	239R4
D14		0R3	1R3	2R3	...	237R3	238R3	239R3
D13		0R2	1R2	2R2	...	237R2	238R2	239R2
D12		0R1	1R1	2R1	...	237R1	238R1	239R1
D11		0R0	1R0	2R0	...	237R0	238R0	239R0
D10		0G5	1G5	2G5	...	237G5	238G5	239G5
D9		0G4	1G4	2G4	...	237G4	238G4	239G4
D8		0G3	1G3	2G3	...	237G3	238G3	239G3
D7	C7	0G2	1G2	2G2	...	237G2	238G2	239G2
D6	C6	0G1	1G1	2G1	...	237G1	238G1	239G1
D5	C5	0G0	1G0	2G0	...	237G0	238G0	239G0
D4	C4	0B4	1B4	2B4	...	237B4	238B4	239B4
D3	C3	0B3	1B3	2B3	...	237B3	238B3	239B3
D2	C2	0B2	1B2	2B2	...	237B2	238B2	239B2
D1	C1	0B1	1B1	2B1	...	237B1	238B1	239B1
D0	C0	0B0	1B0	2B0	...	237B0	238B0	239B0

11-2. Display on Flow :

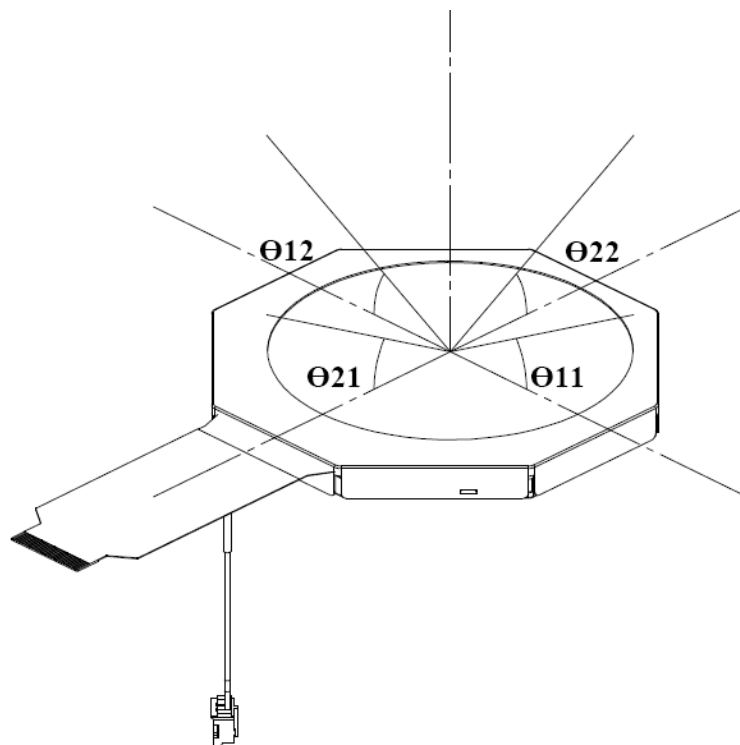
tbd

## 12. Optical Characteristics :

Ta=25°C

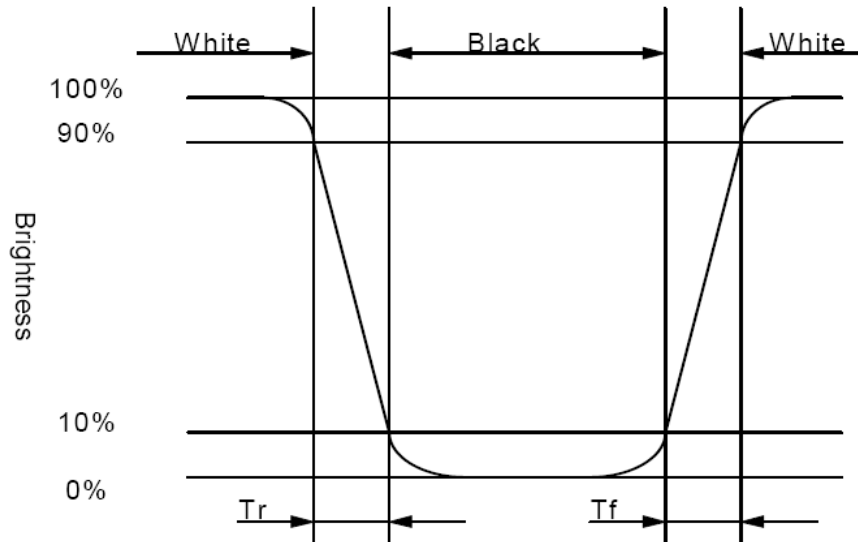
Parameter		Symbol	Condition	min.	typ.	max	Unit	Remarks
Viewing Angle	Horizontal	$\Theta_{11}, \Theta_{12}$	CR $\geq$ 10	70	75	-	deg	Note 12-1
	Vertical	$\Theta_{21}$		45	50	-	deg	
		$\Theta_{22}$		65	70	-	deg	
Contrast Ratio		CR	At optimized view angle	20	400	-	-	Note 12-2
Brightness		L	$\theta = 0^\circ$	800	1.000		cd/ m <sup>2</sup>	Note 12-4
Uniformity		U%	$\theta = 0^\circ$	70	75	-	%	Note 12-5
Response	Rise	Tr	$\theta = 0^\circ$	-	15	20	ms	Note 2-3
	Fall	Tf		-	20	30	ms	
White Chromaticity		x	$\theta = 0^\circ$	0.29	0.33	0.37	-	
		y		0.31	0.35	0.39	-	
LED Life Time		-	+25°C	20.000	30.000	-	hrs	Note12-6

Note 12-1: The definitions of viewing angles are as follow

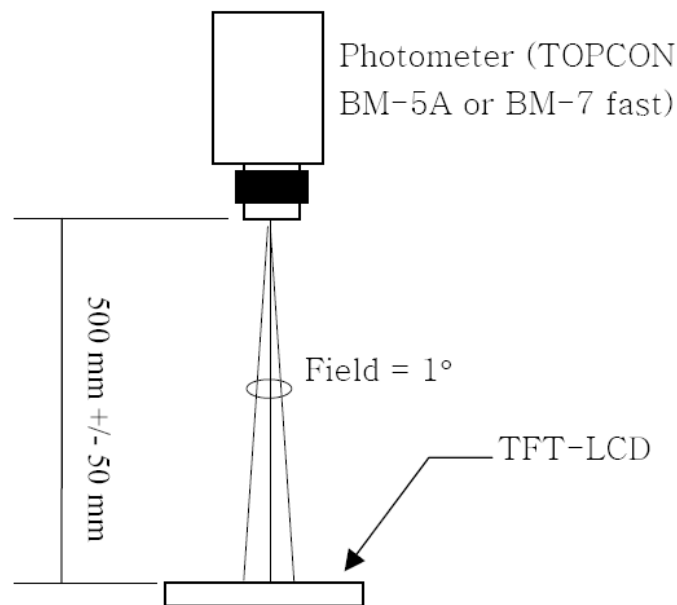


Note 12-2: The definition of contrast ratio :  $CR = \frac{\text{Luminance at White Pattern}}{\text{Luminance at Black Pattern}}$

Note 12-3: Definition of Response Time  $T_r$  and  $T_f$  :



Note 12-4: All optical measurements shall be performed after backlight being turned-on for 30 mins. The optical characteristics shall be measured in dark room (ambient illumination on panel surface less than 1 Lux). The measuring configuration shows as following figure.

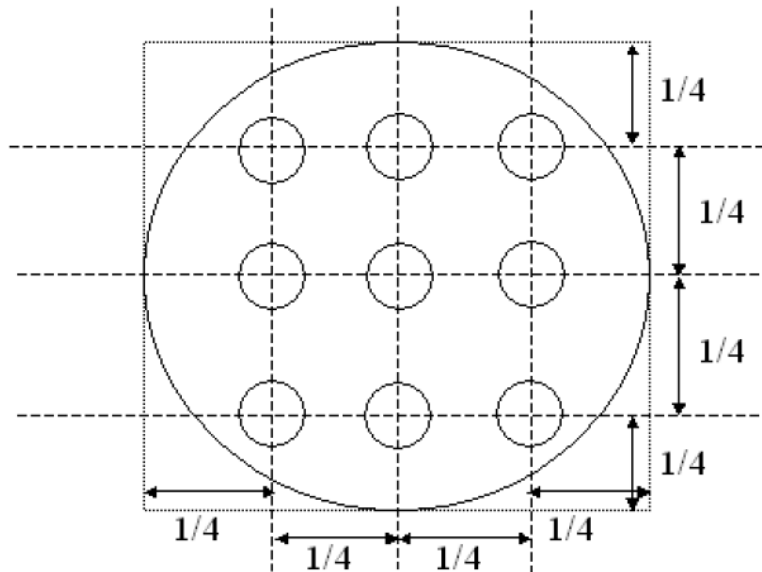


Optical characteristics measuring configuration

Note 12-5 : The uniformity of LCD is defined as

$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}}$$

Luminance meter : BM-5A or BM-7 fast (TOPCON)  
 Measurement distance : 500 mm +/- 50 mm  
 Ambient illumination : < 1 Lux  
 Measuring direction : Perpendicular to the surface of module  
 The test pattern is white



Note 12-6 : The “ LED Life time “ is defined as the module brightness decrease to 50% of original brightness. The ambient temperature is 25°C and ILED = 150mA.

### 13. Handling Cautions :

#### 13-1) Mounting of module :

- a) Please power off the module when you connect the input/output connector.
- b) Polarizer, which is made of soft material and susceptible to flaw, must be handled carefully.
- c) Protective film (Laminator) is applied on surface to protect it against scratches and dirt.
- d) Please following the tear off direction as figure 13-1 to remove the protective film as slowly as possible, so that electrostatic charge can be minimized.

#### 13-2) Precautions in mounting :

- a) When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth.
- b) Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.
- c) TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
- d) Since CMOS LSI is used in the module. So take care of static electricity and earth yourself when handling.

#### 13-3) Adjusting module

- a) Adjusting volumes on the rear face of the module have been set optimally before shipment.
- b) Therefore, do not change any adjusted values. If adjusted values are changed, the specifications described may not be satisfied.

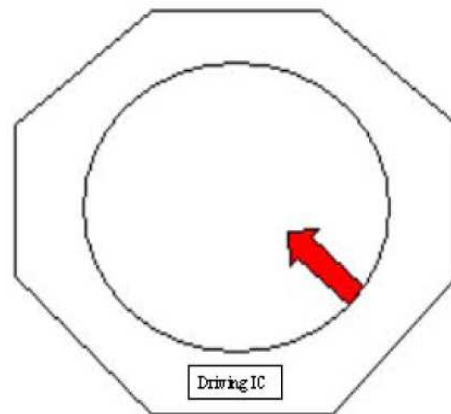
#### 13-4) Others :

- a) Do not expose the module to direct sunlight or intensive ultraviolet rays for many hours.
- b) Store the module at a room temperature place.  
After opening of the packing, assemble within 3 month.
- c) If LCD panel breaks, it is possibly that the liquid crystal escapes from the panel. Avoid putting it into eyes or mouth. When liquid crystal sticks on hands, clothes or feet. wash it out immediately with soap.
- d) Observe all other precautionary requirements in handling general electronic components.

#### 13-5) Polarizer mark :

The polarizer mark describes the direction of wide view angle film to match up with the rubbing direction.

Figure 13-1 the way to peel off protective film



#### 14. Reliability Test :

No.	Test item	Test condition	Remark
1	High Temperature Storage Test	Ta = 85°C, 240 hrs	
2	Low Temperature Storage Test	Ta = -40°C, 240 hrs	
3	High Temperature Operation Test	Ta = 80°C, 240 hrs	
4	Low Temperature Operation Test	Ta = -30°C, 240 hrs	
5	High Temperature & High Humidity Operation Test	Ta = 60°C, 95%RH, 240 hrs (No Condensation)	
6	Thermal Cycling Test (non-operating)	-30°C <--> +80°C, 200 Cycles 30 mins, 30 mins	
7	Vibration Test (non-operating)	Frequency : 10 ~ 55 Hz Amplitude : 1 mm Sweep time : 11 mins Test Period : 6 Cycles for each direction of X, Y, Z	
8	Shock Test (non-operating)	100G , 6ms Direction : ±X , ±Y , ±Z Cycle : 3 times	
9	Electrostatic Discharge Test (non-operating)	200pF , 0Ω ±200V 1 time / each terminal	

Ta : ambient temperature

#### [Criteria]

In the standard conditions, there is not display function, NG issue occurred.  
(including : line defect ,no image) All the cosmetic specification is judged before the reliability stress.