Confidential Document

DATA IMAGE CORPORATION

TFT Module Specification

ITEM NO.: FG120140DSCWBG01

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2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	18/DCE/08			Release Rev: A for production.

3. GENERAL DESCRIPTION

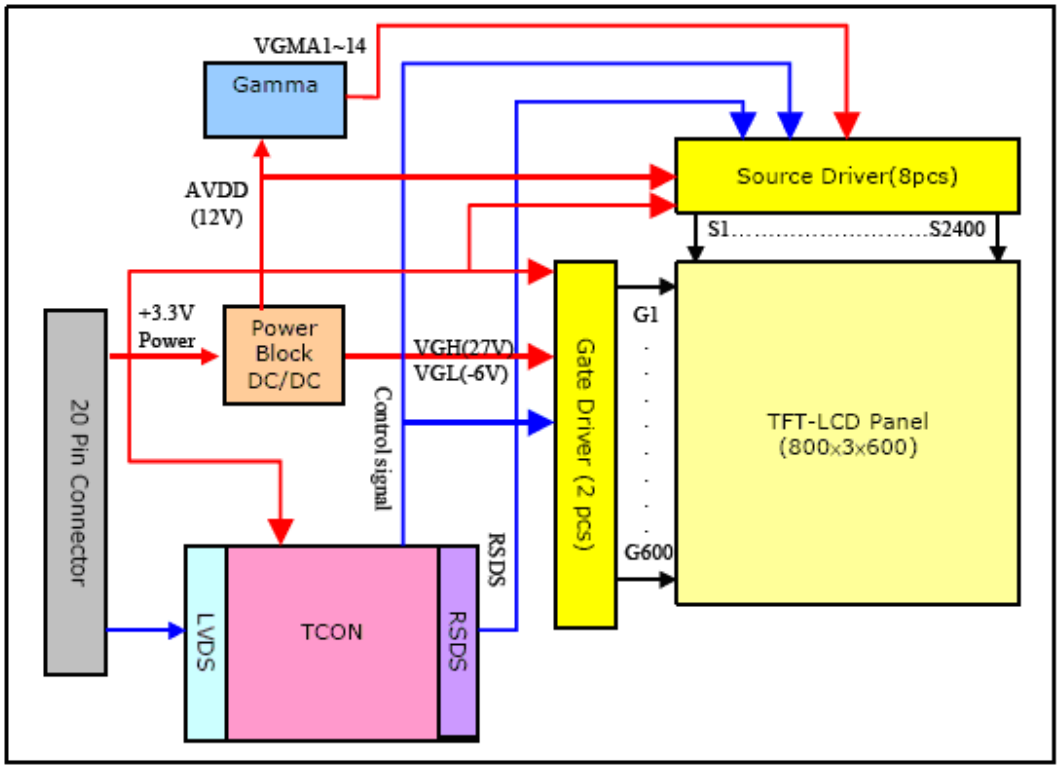
This module is designed for display units of Industrial Applications. The screen format is intended to support the SVGA (800(H) x 600(V)) screen and 262k (RGB 6-bits) or 16.2M color (RGB 8-bit data driver).
All input signals are LVDS interface compatible.

3.1 Display Characteristics

The following items are characteristics summary on the table under 25°C condition：

Items	Unit	Specifications
Screen Diagonal	[inch]	(12.1")
Active Area	[mm]	246.0(H) x 184.5(V)
Pixel H x V		800x3(RGB) x 600
Pixel Pitch	[mm]	0.3075(H) x 0.3075(V)
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN mode, Normally White
Weight	[Grams]	660g (typ)
Physical Size	[mm]	279.0(W) x 209.0(H) x 11(D)
Electrical Interface		LVDS (1 channel)
Surface treatment		Anti-glare (AG)
Temperature Range Operating Storage(Shipping)	[°C] [°C]	-30 to + 85 -30 to + 85
RoHS Compliance		RoHS Compliance

3.2 Functional Block Diagram

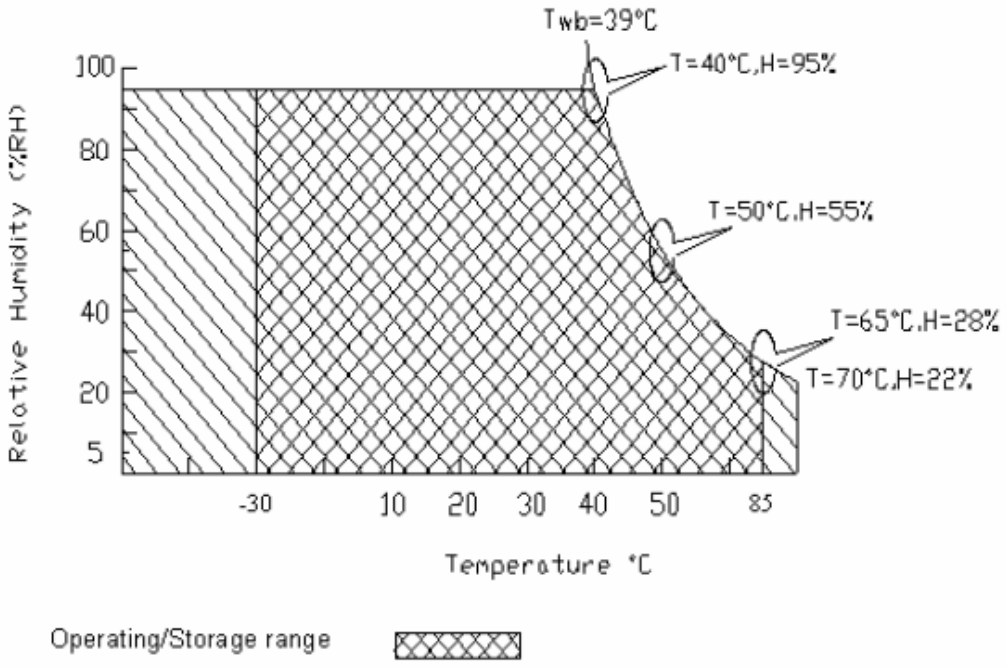


4. ABSOLUTE MAXIMUM RATINGS

Absolute maximum ratings of the module is as follows：

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+3.6	[Volt]	
Input Voltage of Signal	Vin	-0.3	VDD+0.3	[Volt]	
Operating Temperature	TOP	-30	+85	[°C]	Note1
Operating Humidity	HOP	8	95	[%RH]	Note1
Storage Temperature	TST	-30	+85	[°C]	Note1
Storage Humidity	HST	5	95	[%RH]	Note1

Note1： Maximum Wet-Bulb should be 39°C and no condensation.

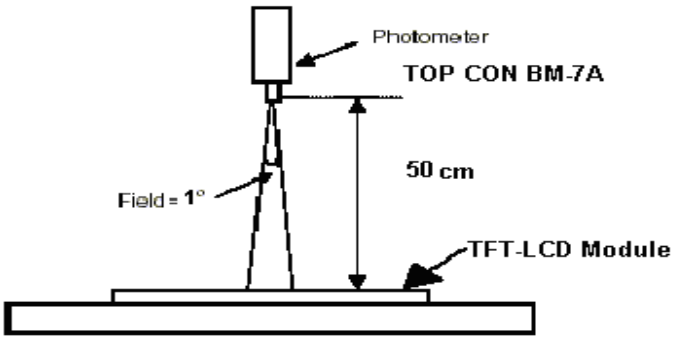


5. OPTICAL CHARACTERISTICS

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ_x+	Center CR≥10	70	80	--	deg	Note 1,4
		θ_x-		70	80	--		
	Vertical	θ_Y+		45	50	--		
		θ_Y-		55	60	--		
Contrast Ratio		CR	at optimized viewing angle	500	600			Note 1,3
Response time	Rise	Tr	Center θx=θy =0°	-	10	20	ms	Note 1,6
	Fall	Tf		-	25	30	ms	
Uniformity		B-uni	θx=θy =0°	70	80	--	%	Note1,5
Brightness		L	θx=θy =0°	320	400	--	cd/m²	Note 1,2
Chromaticity		x_W	Center θx=θy =0°	0.283	0.313	0.343		Note 1,7
		y_W		0.299	0.329	0.359		
		x_R		0.576	0.606	0.636		
		y_R		0.320	0.350	0.380		
		x_G		0.274	0.304	0.334		
		y_G		0.547	0.577	0.607		
		x_B		0.119	0.149	0.179		
		y_B		0.097	0.127	0.157		
Image sticking		tis	2 hours			2	Sec	Note 8

The following optical specifications shall be measured in a darkroom or equivalent state(ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C and IRCFL current 6.0mA.
The measurement method is shown in Note1.

Note1: The method of optical measurement:

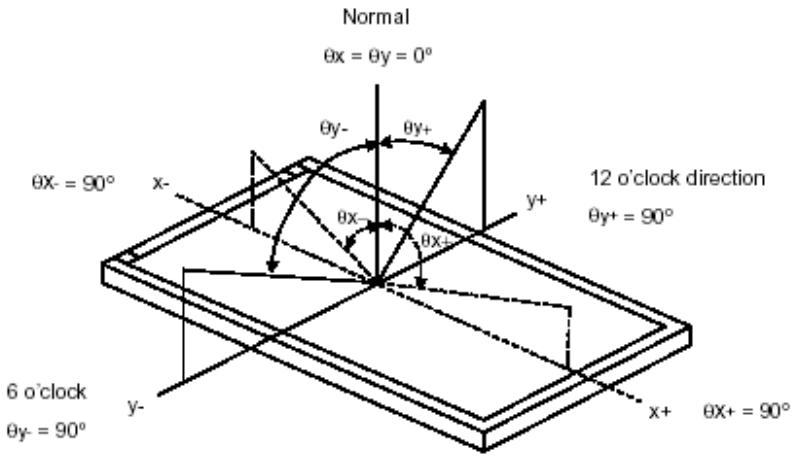


Note2: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°

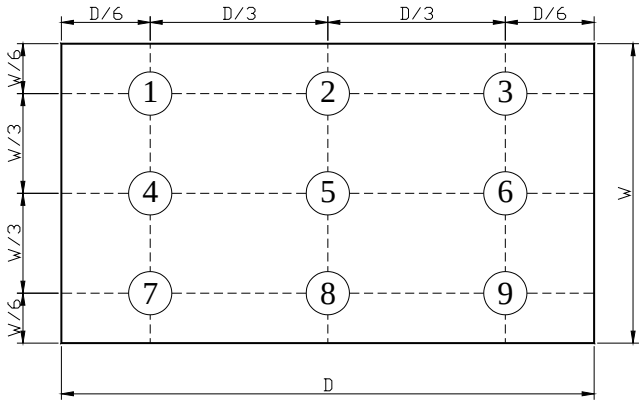
Note3: Definition of Contrast Ratio (CR):

$$CR = \frac{\text{Luminance with all pixels in white state}}{\text{Luminance with all pixels in Black state}}$$

Note4: Definition of Viewing Angle



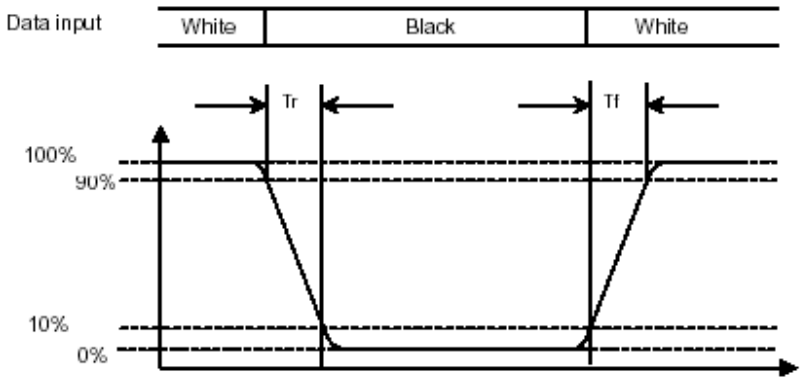
Note 5: Definition of Brightness Uniformity (B-uni):



$$\text{B-uni} = \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9points}} \quad \text{(Note 5).}$$

Note6: Definition of Response Time:

The Response Time is set initially by defining the “Rising Time (Tr)” and the “Falling Time (Tf)” respectively. Tr and Tf are defined as following figure.



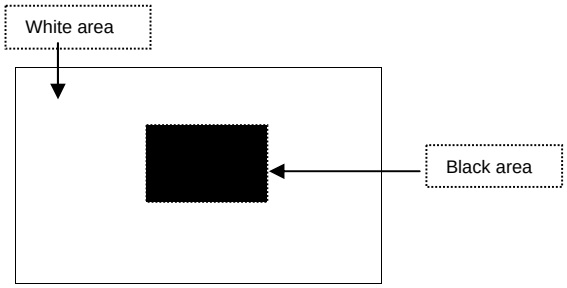
Note 7: Definition of Chromaticity:

The color coordinates (x_W,y_W),(x_R,y_R),(x_G,y_G),and (x_B,y_B) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

Note 8: Definition of Image sticking (tis):

Continuously display the test pattern shown in the figure below for 2 hours. Then display a completely white screen. The previous image shall not persist more than 2 sec at 25 °C

Image sticking pattern



6. SIGNAL INTERFACE

6.1 Connectors

Connector Name / Designation	For Signal Connector
Manufacturer	STM
Type / Part Number	MSB240420-E or compatible
Mating Connector / Part Number	P240420 or Compatible

Connector Name / Designation	Lamp Connector
Manufacturer	JST
Type / Part Number	JST BHR-03VS-1 or compatible
Mating Connector / Part Number	JST SM03(4.0)B-BHS-1-TB or compatible

6.2.1 Signal Pin for module

Pin No.	Signal Name	Pin No.	Signal Name
1	VDD	2	VDD
3	GND	4	6-8 Bit SEL
5	RIN0-	6	RIN0+
7	GND	8	RIN1-
9	RIN1+	10	GND
11	RIN2-	12	RIN2+
13	GND	14	CLKIN-
15	CLKIN+	16	GND
17	RIN3-	18	RIN3+
19 (Note1)	REVERSE	20(Note2)	NC/GND

Note1: Pin19 can be used for enabling “reverse scan” function. Refer to section 6.7 for scanning direction.
Note2: Do not set this pin to High

6.2.2 Signal for Backlight Connector

Note: CN2 and CN3 lamp connector (backlight): JST BHR-03VS-1
Mating connector: JST SM03(4.0)B-BHS-1-TB

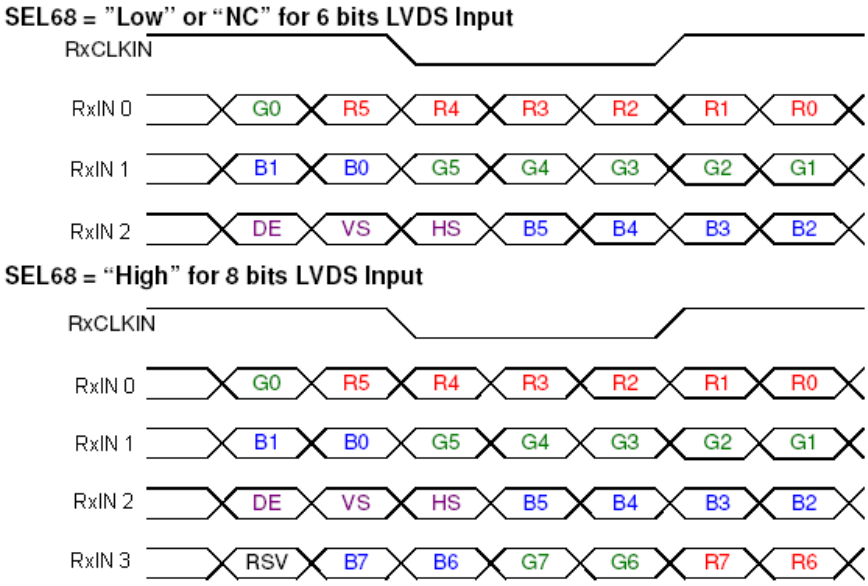
Pin no.	Symbol	Function	Remark
1	H	CCFL power supply (H.V.)	Cable color: Pink
2	NC	No connection	
3	L	CCFL power supply (GND)	Cable color: White

6.3 Signal Description

The module uses a LVDS receiver. LVDS is a differential signal technology for LCD interface and a high-speed data transfer device. Transmitter shall be THC63LVDM83A or compatible.

Note : Input signals shall be low or Hi-Z state when VDD is off.

Signal Name	Description
RIN0-, RIN0+	LVDS differential data input (Red0-Red5, Green0)
RIN1-, RIN1+	LVDS differential data input (Green1-Green5, Blue0-Blue1)
RIN2-, RIN2+	LVDS differential data input (Blue2-Blue5, Hsync, Vsync, DE)
CLKIN-, CLKIN+	LVDS differential clock input
VDD	+3.3V Power Supply
GND	Ground
NC	No Connection
RIN3-, RIN3+	LVDS differential data input. Must be tied to Ground in 6 bit input mode.
6-8 bit SEL (SEL68)	LVDS 6/8 bit select function control. Low or NC->6 bit Input Mode. High->8 bit input Mode. Note 1.
REVERSE	Display Reversed Function (VDD: Display Reverse; GND/NC: Normal Display).



Note1: Please follow PSWG.

Note2: R/G/B data 7: MSB, R/G/B data 0:LSB

Signal Name	Description	
+RED5 +RED4 +RED3 +RED2 +RED1 +RED0	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
+GREEN5 +GREEN4 +GREEN3 +GREEN2 +GREEN1 +GREEN0	Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
+BLUE5 +BLUE4 +BLUE3 +BLUE2 +BLUE1 +BLUE0	Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data.
CLK	Data Clock	The typical frequency is 40MHz. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of CLK. When the signal is high, the pixel data shall be valid to be displayed.
VSYNC	Vertical Sync	The signal is synchronized to CLK.
HSYNC	Horizontal Sync	The signal is synchronized to CLK.

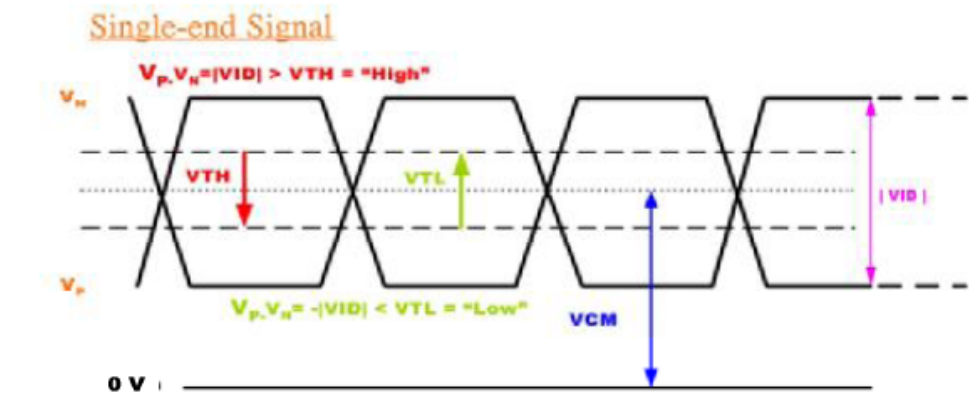
Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

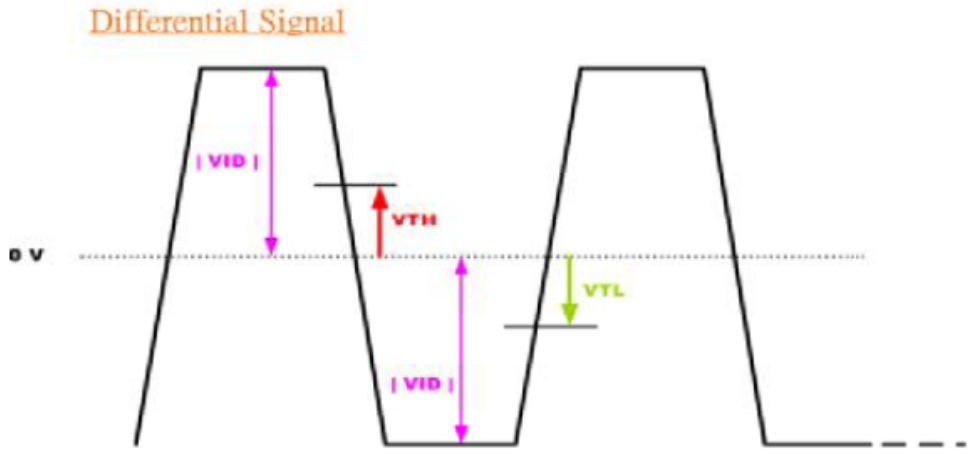
6.4 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.
Signal electrical characteristics are as follows:

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
| VID |	Input Differential Voltage	250	350	450	[mV]	
VICM	Differential Input Common Mode Voltage	1.0	1.25	2.0	[V]	
VTH	Differential Input High Threshold	-	-	100	[mV]	VCM=1.25V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM=1.25V
CLK	Clock frequency	30	40	50	MHz	

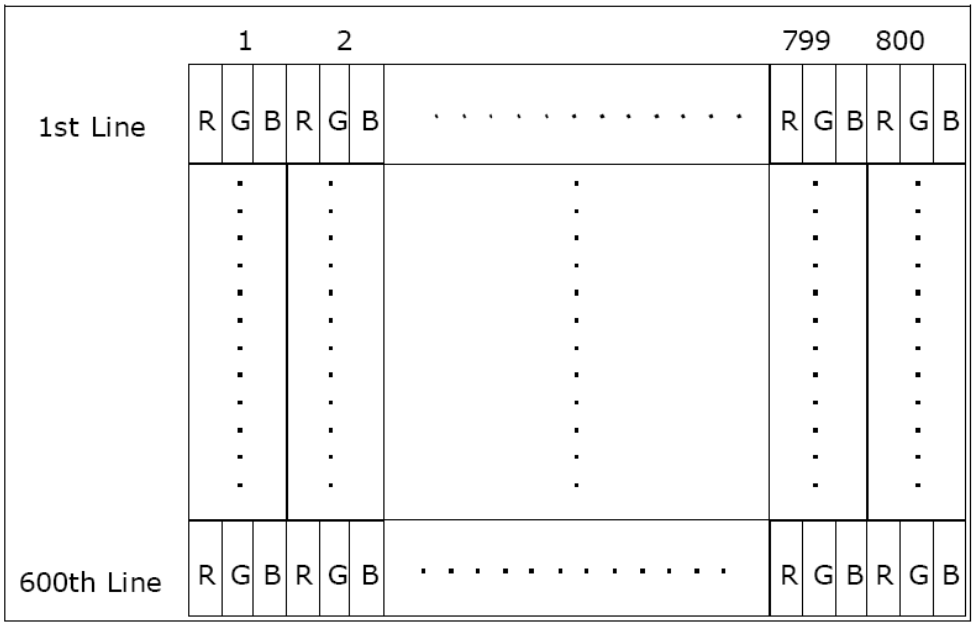
Note: LVDS Signal Waveform.





6.6 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format:



6.7 Scanning Direction

Following picture figures shows the image seen from the front view. The arrow indicate the direction of scan.

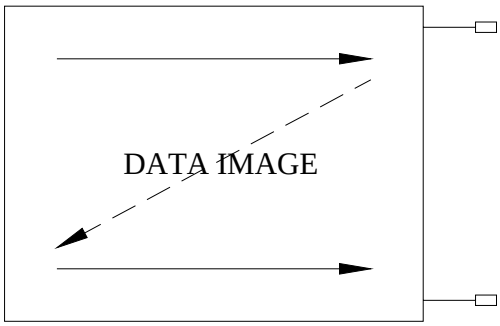


Fig. 1 Normal scan (Pin19= GND/NC)

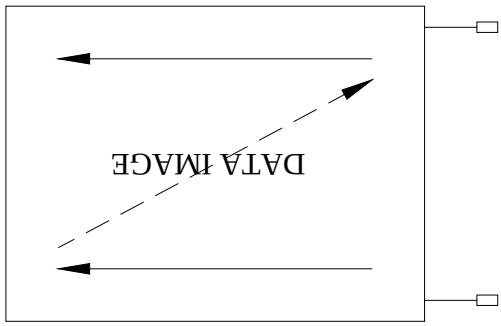


Fig. 2 Reverse scan (Pin19= High)

7. INTERFACE TIMINGS

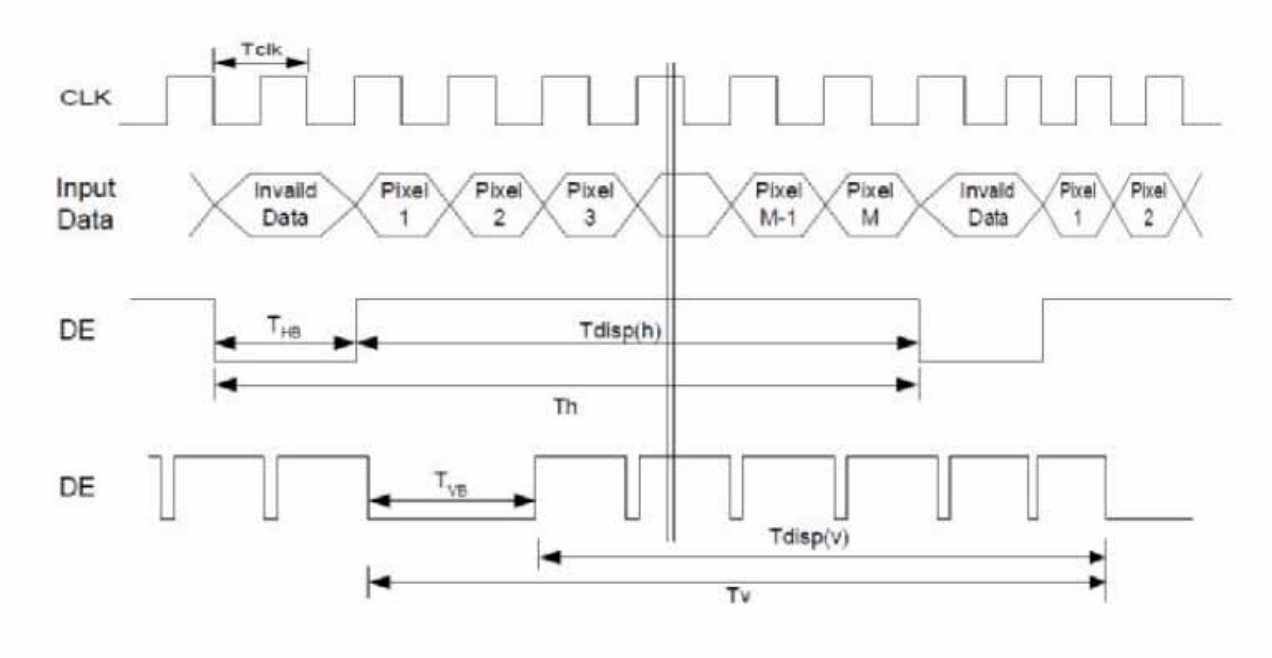
7.1 Timing Characteristics

DE only mode

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency		1/ T clock	33.6	39.8	48.3	MHz	
Vertical Section	Period	Tv	608	628	650	TLine	
	Active	TVD	600	600	600		
	Blanking	TVB	8	28	50		
Horizontal Section	Period	TH	920	1056	1240	Tclock	
	Active	THD	800	800	800		
	Blanking	THB	120	256	440		

Note 1: Frame rate is 60 Hz.
Note 2: Typical value refer to VESA Standard

7.2 Input Timing Diagram



8. ELECTRICAL CHARACTERISTICS

8.1 TFT-LCD Driving Conditions

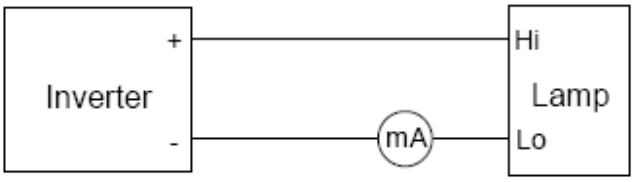
Symbol	Parameter	Min	Typ	Max	Units	Condition
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	V	Load Capacitance 20uF
PDD	VDD Power	-	0.66	0.73	W	VDD=3.3V All Black Pattern
IDD	IDD Current	-	200	220	mA	VDD=3.3V All Black pattern
VRP	Power Ripple Voltage	-	-	100	mVp-p	
I RUSH	Inrush Current	-	-	1.5	A	VDD=3.3V, with Black Pattern, Rising time= 500us.

8.2 Backlight driving conditions

Following characteristics are measured under a stable condition using an inverter at 25℃ (Room Temperature):

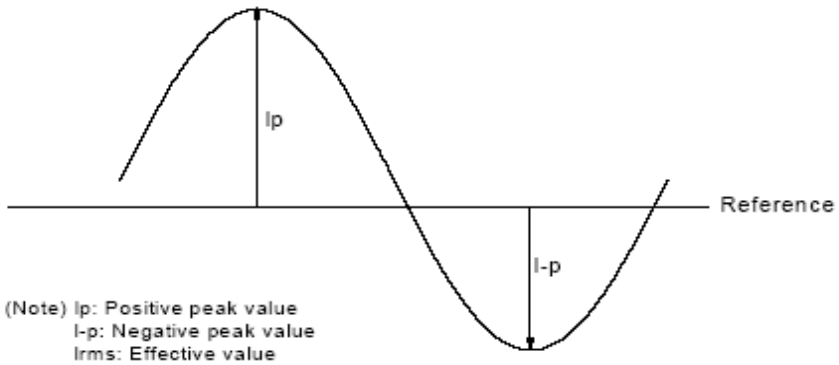
Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
IRCFL	CCFL operation range	3	6	6.5	[mA] rms	(Ta=25℃) Note 1,2
FCFL	CCFL Frequency	40	55	60	[KHz]	(Ta=25℃) Note 3
ViCFL 0℃ (reference)	CCFL Ignition Voltage	-	930	1120	[volt] rms	(Ta=0℃)
ViCFL 25℃ (reference)	CCFL Ignition Voltage	-	770	930	[Volt] rms	(Ta=25℃)
VCFL	CCFL Discharge Voltage		510		[Volt] rms	(Ta=25℃) IRCFL=6.0Ma
PCFL	CCFL Power consumption (inverter excluded)	3.8	6.7	7.7	[Watt]	(Ta=25℃) Note 4
Lamp Life		50000		-	Hrs	(Ta=25℃) Note 2 IRCFL=6mA

Note 1: IRCFL is defined as the return current of an inverter. (In Figure 1)



(Figure 1: Measurement of return current)

A stable IRCFL is a current without flicker or biasing waveform provided by inverter that ensures the backlight perform to its specification. The ideal sine waveform should be symmetric in positive and negative polarities and the asymmetry rate of the inverter waveform should be below 10%.



Dc Bias=(| Ip-I-p| / Irms) X 100% < 10%
Crest Factor = Ip or (I-p) / Irms should have the range within 1.414±10%

It is recommended to use the inverter with detection circuit (ie: balance and protection circuit) to avoid overvoltage, over current, or mismatching waveform.

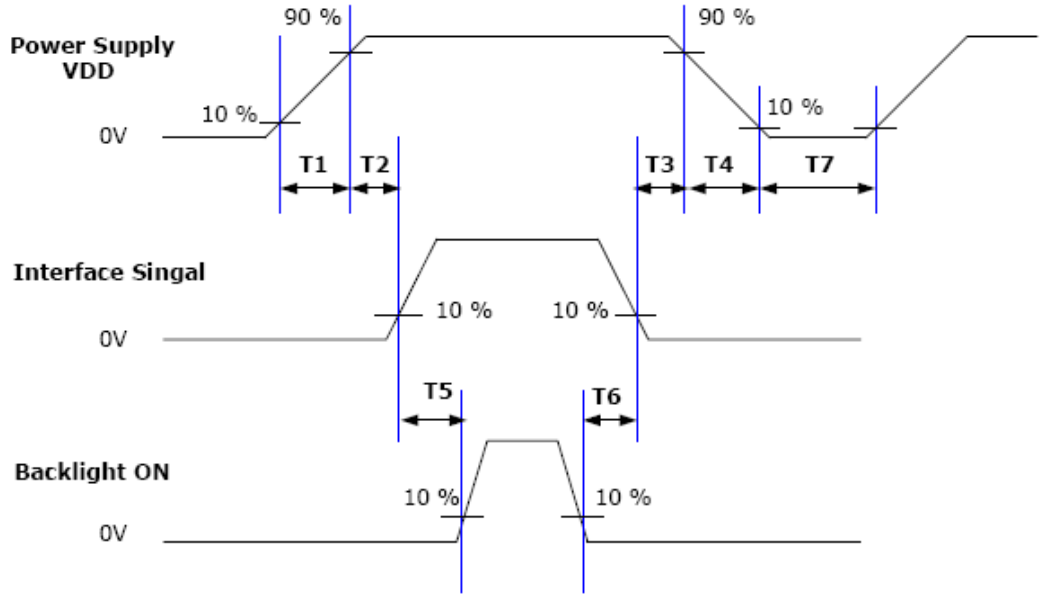
Note 2: The definition of lamp life means when any of following conditions happen:
a) Luminance falls to 50% or less of the initial value.
b) Normal lighting is no more available (flickering, pink lighting, no lighting, etc.)
c) Lamp voltage or lighting start voltage exceeds the specified value.

Lamp life time shortens according to
a) Placing methodology: mercury is unevenly distributed in portrait mounting.
b) Environmental condition: low temperature reduces the presence of mercury vapor, which results in approximately lamp life of 1000 hours.
c) CCFL surface temperature: Presence of gradient in lamp surface temperature causes uneven mercury migration.
d) Inverter design: its resonance capacitor should be fine-tuned with the impedance of CCFL
e) Over driving current (>6.5 mA) shortens lamp life time dramatically.

Note 3: CCFL frequency should be carefully determined to avoid interference between inverter and TFT LCD. Higher frequency will induce higher leakage current and further impact lamp life.
Note 4: Calculator value for reference (IRCFLxVCFLx2=PCFL).
Note 5: The display is with dual lamp design, and the CCFL current in above table refers to each lamp.

9. POWER ON/OFF SEQUENCE

VDD Power and lamp on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when DVV is off.



Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	0	-	10	ms
T5	200	-		ms
T6	200	-		ms
T7	500	-	-	Ms

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

10. QUALITY ASSURANCE

10.1 Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C
Humidity : 65 ± 5%

10.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

10.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

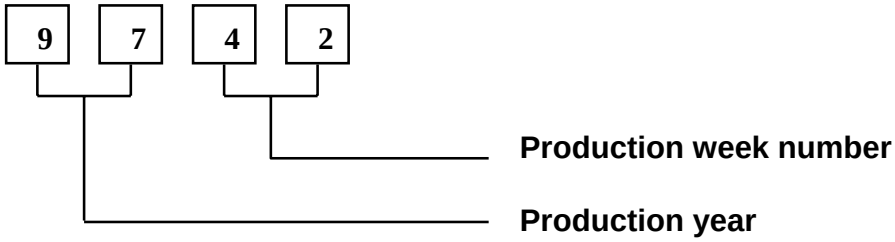
10.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

10.1.5 Test Method

Reliability Test Item & Level		Test Level
No.	Test Item	
1	High Temperature Storage Test	T=85°C,240hrs
2	Low Temperature Storage Test	T=-30°C,240hrs
3	High Temperature Operation Test	T=85°C,240hrs
4	Low Temperature Operation Test	T=-30°C,240hrs
5	High Temperature and High Humidity Operation Test	T=50°C,90%RH,240hrs
6	Thermal Cycling Test (No operation)	-20°C → +25°C → +60°C ,100 Cycles 30 min 5 min 30 min
7	Vibration Test (No operation)	1.5G, random 10Hz~200Hz~10Hz 30 minutes for each Axis (X, Y,Z), 15min / sweep
8	Shock Test (No operation)	50G, 11ms Direction：± X,± Y,± Z Cycle：1 times

11. LOT NUMBERING SYSTEM



12. LCM NUMBERING SYSTEM

FG 120140 D S C W B G 01

VERSION :01

RoHS

View direction & Temp. Range

A – Bottom view 6H & Normal temp.

B – Bottom view 6H & Wide temp.

C–Top View & Normal temp

D–Top View & Wide temp.

Backlight Color

W –White Y – Yellow Green

G - green

Backlight

C–CCFL B/L

S–LED B/L

LCD Polarize type

N–Negative W –Super wide view micro reflector

M–transmissive S – Super wide view or Excellent. W. V.

LCD type

A –TFT analog

D –TFT digital

Series code

120140–, 12.1 inch

Model type

FG–Standard TFT Module

FX–Custom TFT Module

13. PRECAUTION IN USE LCM

1. LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The following precautions should be taken when handing,

(1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.

(2). Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface, wipe gently with cotton, chamois or other soft material soaked in petroleum benzin.

(3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.

(4). Glass can be easily chipped or cracked from rough handling, especially at corners and edges.

(5). Do not drive LCD with DC voltage.

2. Liquid Crystal Display Modules

2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

(1). Do not tamper in any way with the tabs on the metal frame.

(2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.

(3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).

(4). When mounting a LCM make sure that the PCB is not under any stress such as bending or twisting . Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

(5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

2.2. Static Electricity

LCM contains CMOS LSI’s and the same precaution for such devices should apply, namely

(1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.

(2). The modules should be kept in antistatic bags or other containers resistant to static for storage.

(3). Only properly grounded soldering irons should be used.

(4). If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

(5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

(6). Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

2.3 Soldering

(1). Solder only to the I/O terminals.

(2). Use only soldering irons with proper grounding and no leakage.

(3). Soldering temperature : 280°C ± 10°C

(4). Soldering time: 3 to 4 sec.

(5). Use eutectic solder with resin flux fill.

(6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

2.4 Operation

(1). Driving voltage should be kept within specified range; excess voltage shortens display life.

(2). Response time increases with decrease in temperature.

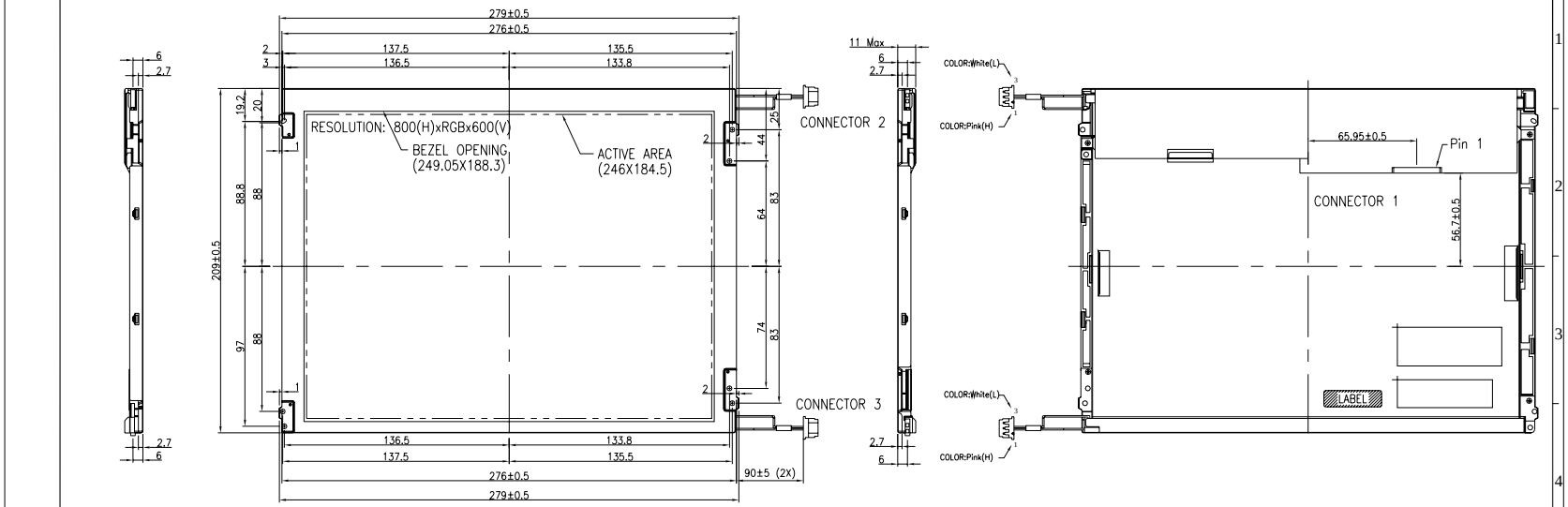
(3). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear “fractured”.

(4). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear “fractured”.

2.5 Storage

If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

14. OUTLINE DRAWING



NOTE:

1. For RoHS.
2. System hole to be ø3.3 mm.
3. Brightness: 320 cd/m^2 (Min).
4. Connector 1 : STM MSB240420-E.
   Mating connector : STM P240420 or equivalent.
5. CCFL Connector 2&3 : JST BHR-03VS-1 or equivalent.
   Mating connector : JST SM03B-BHS-1-TB or equivalent.
6. Unspecified tolerance to be ±0.3 mm.

PIN FUNCTION

1 VDD	6 RIN0+	11 RIN2-	16 GND
2 VDD	7 GND	12 RIN2+	17 RIN3-
3 GND	8 RIN1-	13 GND	18 RIN3+
4 6-8Bit SEL	9 RIN1+	14 CLKIN-	19 REVERSE
5 RIN0-	10 GND	15 CLKIN+	20 NC/GND

AUTH	DESCRIPTION	DATE	APPROVED
	Change FG120140C-G01 from rev: 1 to rev : A.	12/22/08'	

REVISIONS

DATE: 12/15/08'
DRAWN:
CHECK:
APPROVE:

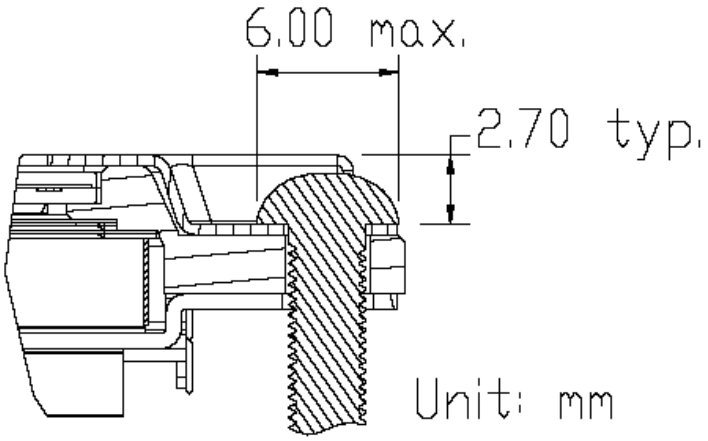
TITLE: LCM OUTLINE DIMENSION

DWG. NO. FG120140C-G01
UNITS M M
REV. A
SCALE 1 / 1
SHEET 1 OF 1

DATA IMAGE

14.1 Screw Hole Depth and Center Position

Screw type: M3 screw
Screw hole minimum depth, from side surface=2.7mm (See drawing)
The Max. Diameter of the mounting screw head is 6.0mm
Screw Torque: Maximum 6.0 kgf-cm



15. PACKAGE SPECIFICATION

1. Max. Capacity: 20pcs LCD Modules / per carton
2. Max. Weight: 17 kg / per carton
3. The outside dimension of carton is 576(L)mm x 326(L)mm X 420(H)mm