HY-LINE®
COMPUTER COMPONENTS

TFT-Display Datenblatt

Modell FG040320DWSWBG04

Kurzdaten

Hersteller	DataImage
Diagonale	4,3” / 10,9cm
Format	16:9
Auflösung	480x272
Backlight	LED/450cd/m²
Temperatur	-20...+70°C (Betrieb)

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DATA IMAGE

Confidential Document

DATA IMAGE CORPORATION

TFT Module Specification

ITEM NO.: FG040320DWSWBG04

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	JACK	ERIC	PAUL	HELEN
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	B	2009/10/22		17

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2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	11/SEP/09'			Initial preliminary
A	25/SEP/09'			Release Rev A for production
B	22/OCT/09'	9 14	11 16	1.Modify: OPTICAL CHARACTERISTIC 2.Change OUTLINE DRAWING from Rev: A to Rev: B

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3. FEATURE

- 64 gray level with 2 bit dithering function to realize 16M colors
- This module is sunlight readable type.

4. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Display resolution	480X R.G.B x 272	dot
Active area	95.04(W) x 53.856(H)	mm
Screen size	4.3(Diagonal)	inch
Dot pitch	0.066 (W) x 0.198(H)	mm
Color configuration	R.G.B. Stripe	
Overall dimension	105.5 (W) x 67.2(H) x 3.1(D)	mm
Weight	50	g
Surface treatment	Glare	
View Angle direction	6 o'clock	
Our components and processes are compliant to RoHS standard		

5. ELECTRICAL CHARACTERISTICS

GND=0V,Ta=25°C

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	V_{CC}	3.0	3.3	3.6	V	Note1
Power Supply Current	I_{CC}		17	20	mA	V_{CC} =3.3V
Ripple Voltage	V_{RPVCC}			100	mVp-p	
"H" level logical input voltage	V_{IH}	0.8Vcc	--	VCC	V	
"L" level logical input voltage	V_{IL}	0	--	0.2Vcc	V	
Operating temperature	Topa	-20	--	70	°C	Ambient temperature
Storage temperature	Tstg	-30	--	80	°C	Ambient temperature

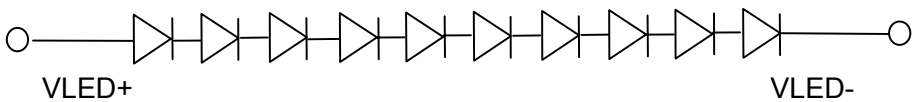
Note1: VCC Absolute Maximum Ratings -0.3V~+6V

5.1 Backlight driving for power conditions

Ta= 25 °C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I_L	--	20	--	mA	
VLED voltage	V_L	--	33	--	V	$I_{L=20}$ mA
LED Dice Life Time		30000	--	--	Hours	Note 1

Note1: The "LED dice life time" is defined as the brightness decrease to 50% original brightness that the ambient temperature is 18℃~28℃ and LED dice current=20mA.



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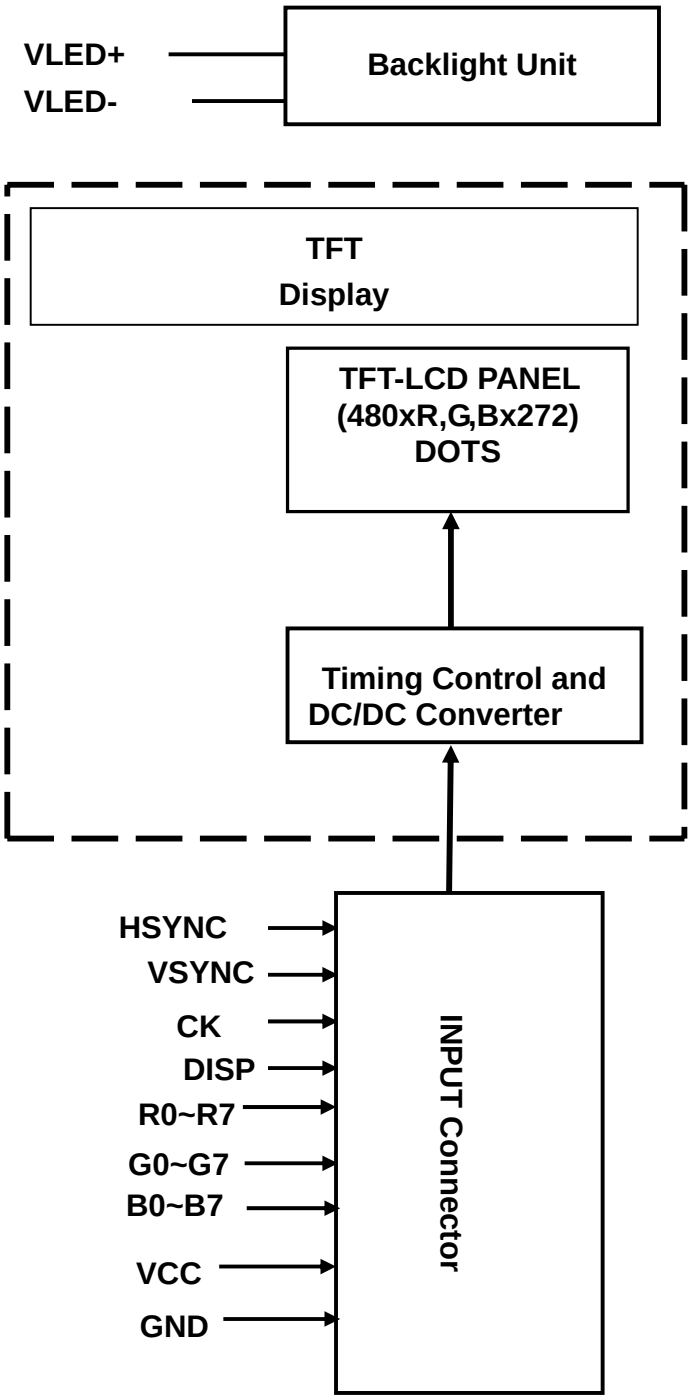
6. BLOCK DIAGRAM



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7. PIN CONNECTIONS

7.1 Input Pins Connection

Pin No	Symbol	Function	Remark
1	GND	Ground	
2	GND	Ground	
3	Vcc	Power Supply : +3.3V	
4	Vcc	Power Supply : +3.3V	
5	R0	Digital data input. R0 is LSB and R7 is MSB	
6	R1		
7	R2		
8	R3		
9	R4		
10	R5		
11	R6		
12	R7		
13	G0	Digital data input. G0 is LSB and G7 is MSB	
14	G1		
15	G2		
16	G3		
17	G4		
18	G5		
19	G6		
20	G7		
21	B0	Digital data input. B0 is LSB and B7 is MSB	
22	B1		
23	B2		
24	B3		
25	B4		
26	B5		
27	B6		
28	B7		
29	GND	Ground	
30	CK	clock signal to sample each data	
31	DISP	Display ON/OFF Control ON=H(VCC), OFF=L(GND)	
32	HSYNC	Horizontal synchronous signal	
33	VSYNC	Vertical synchronous signal	
34	NC	No Connection	
35	NC	No Connection	
36	NC	No Connection	
37	NC/TP(X-)	No Connection	
38	NC/TP(Y-)	No Connection	
39	NC/TP(X+)	No Connection	
40	NC/TP(Y+)	No Connection	

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7.2 Backlight Pins Connection

No.	Signal	Function
1	VLED-	LED Power Source input terminal (Cathode side)
2	NC	No Connection
3	NC	No Connection
4	VLED+	LED Power Source input terminal (Anode side)

8. AC CHARACTERISTICS

8.1 Input Timing Requirement

(480RGBx272, Ta =25ºC, VCC=3.3V GND= 0V)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Clock cycle	$f_{CLK(1)}$	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	$thp_{(2)}$	2	41	41	CLK
Horizontal back porch	$thb_{(2)}$	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	511	$H_{(1)}$
Vertical display period	tvd	272	272	272	$H_{(1)}$
Vertical front porch	tvf	1	2	227	$H_{(1)}$
Vertical pulse width	$tvp_{(2)}$	1	10	11	$H_{(1)}$
Vertical back porch	$tvb_{(2)}$	1	2	11	$H_{(1)}$

Note: (1) Unit: CLK=1/ f_{CLK} , H=th,
(2)It is necessary to keep tvp+tvb=12 and thp+thb=43 in sync mode.

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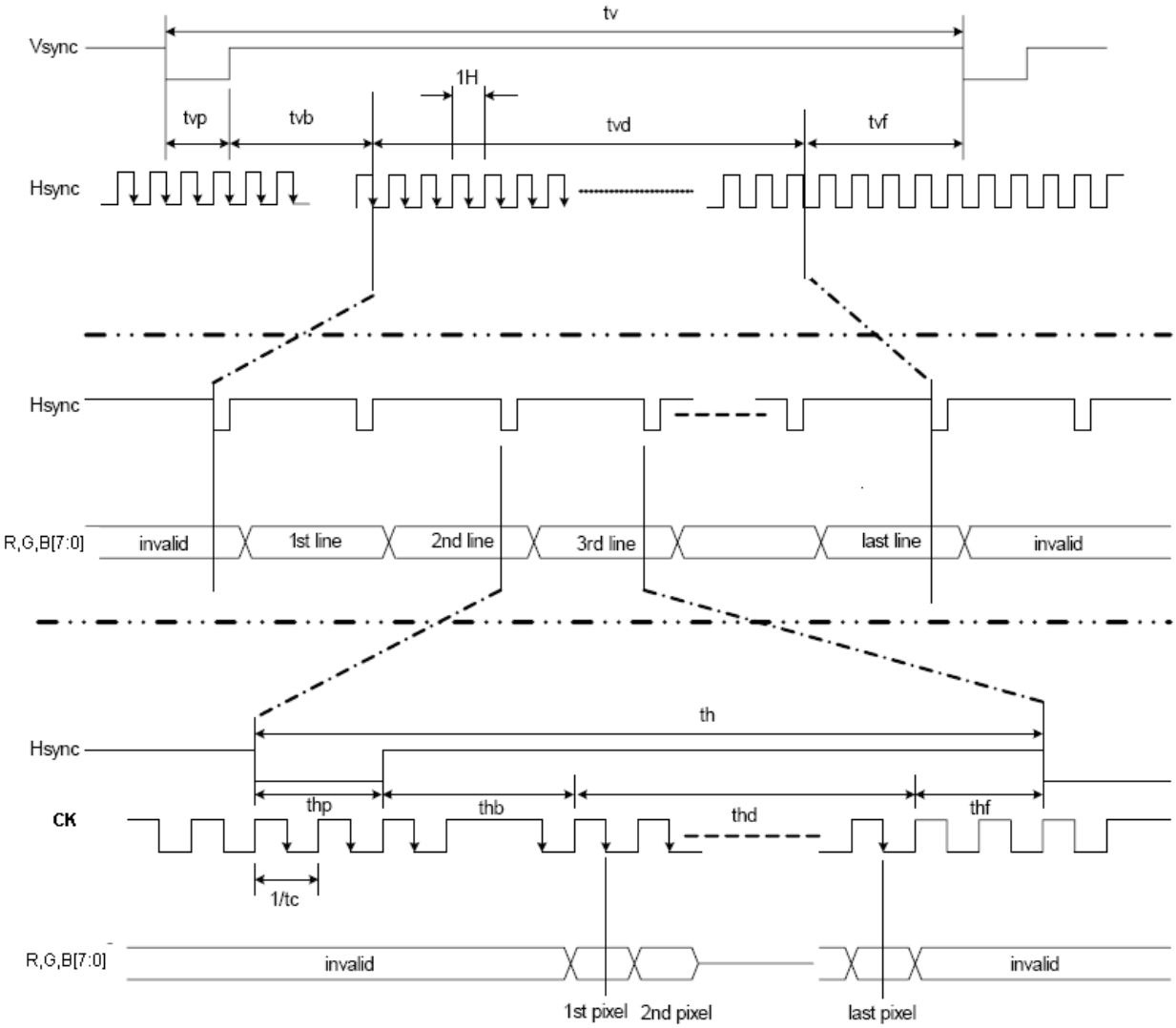

Fig 1. Parallel RGB input timing

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8.2 Input Setup Timing Requirement

(Ta =25ºC, VCC=3.3V ,GND= 0V, tr (1)=tf (1)=2ns)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
DISP setup time	t_{diss}	10	-	-	ns
DISP hold time	t_{dish}	10	-	-	ns
Clock period	$PW_{CLK(2)}$	66.7	-	-	ns
Clock pulse high period	$PWH_{(2)}$	26.7	-	-	ns
Clock pulse low period	$PWL_{(2)}$	26.7	-	-	ns
Hsync setup time	t_{hs}	10	-	-	ns
Hsync hold time	t_{hh}	10	-	-	ns
Data setup time	t_{ds}	10	-	-	ns
Data hold time	t_{dh}	10	-	-	ns
Vsync setup time	t_{vhs}	10	-	-	ns
Vsync hold time	t_{vhh}	10	-	-	ns

Note:

(1) tr, tf is defined 10% to 90% of signal amplitude.

(2) For parallel interface, maximum clock frequency is 15MHz.

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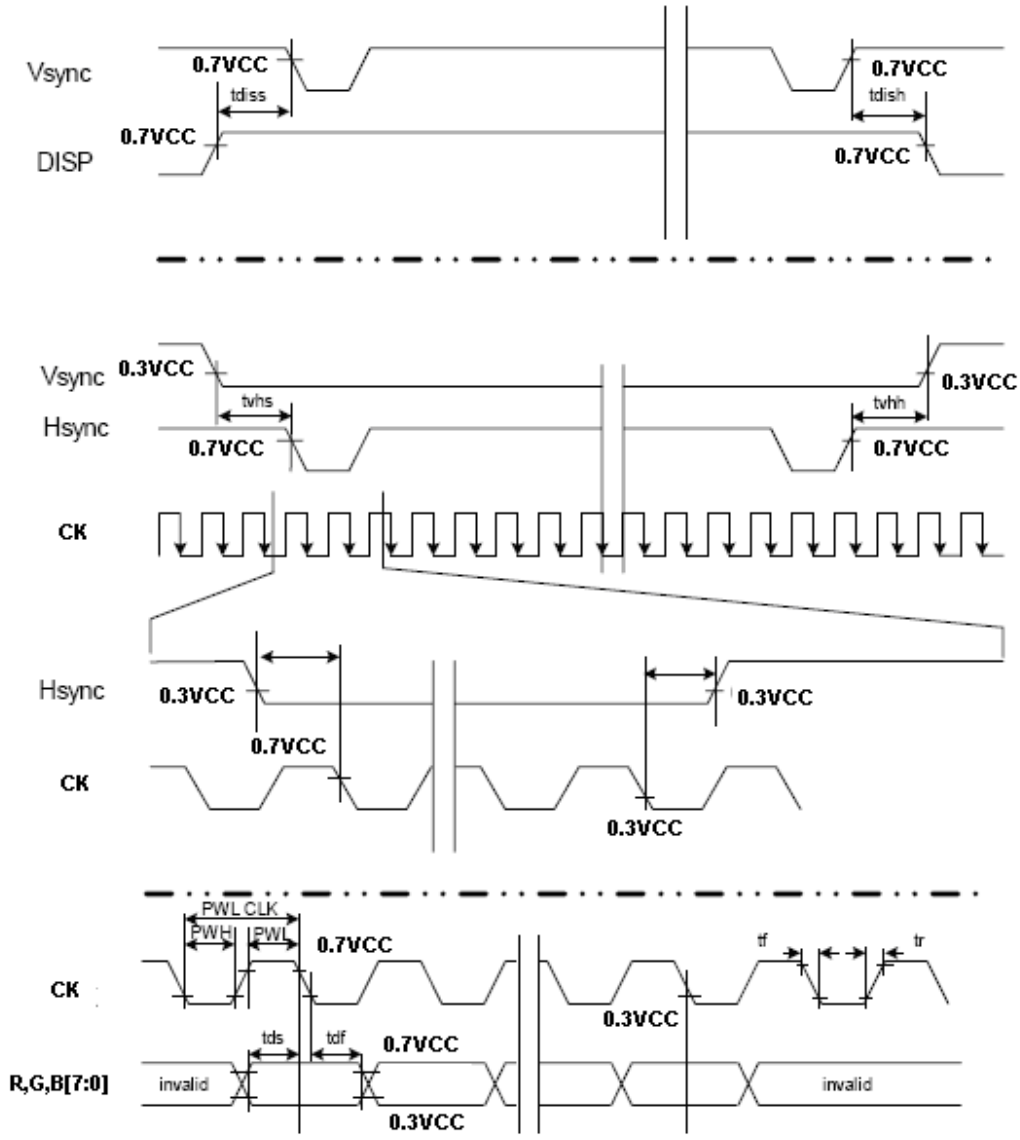

Fig 1.Input setup timing requirement

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8.3 TCON Power ON/OFF Control

The TCON IC has a power ON/OFF sequence control function. When DISP pin is pulled “H”, blank data is outputted for 10-frames first, from the falling edge of the following VSYNC signal. Similarly, when DISP is pulled “L”, 10-frames of blank data will be outputted from the falling edge of the following VSYNC, too.

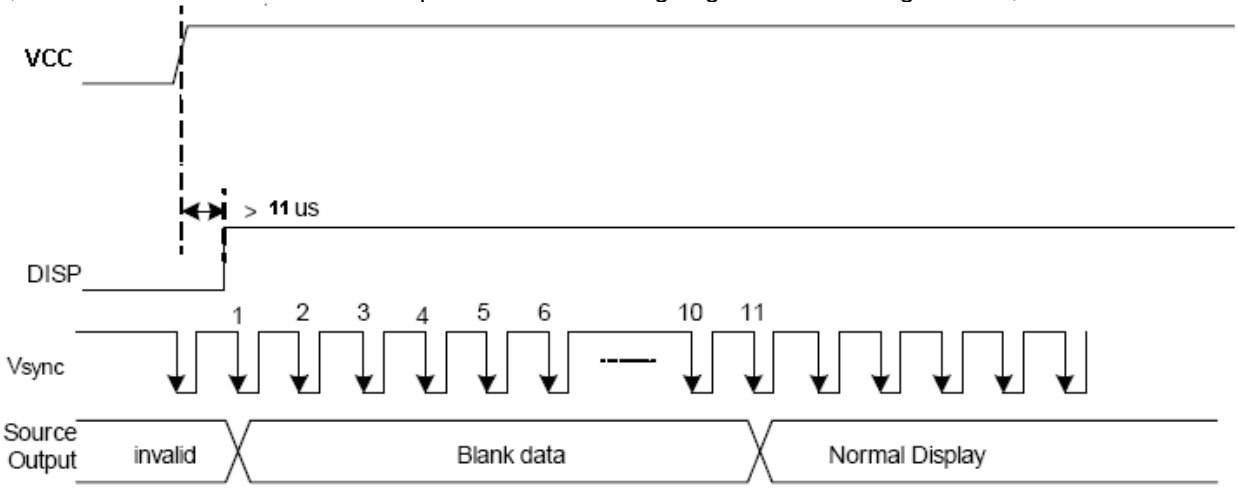

Fig 2.Power On Sequence

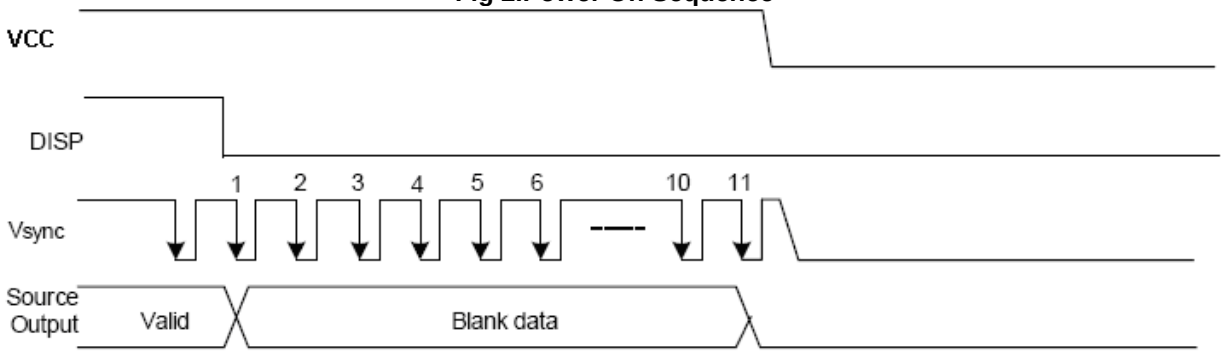

Fig 3.Power Off Sequence

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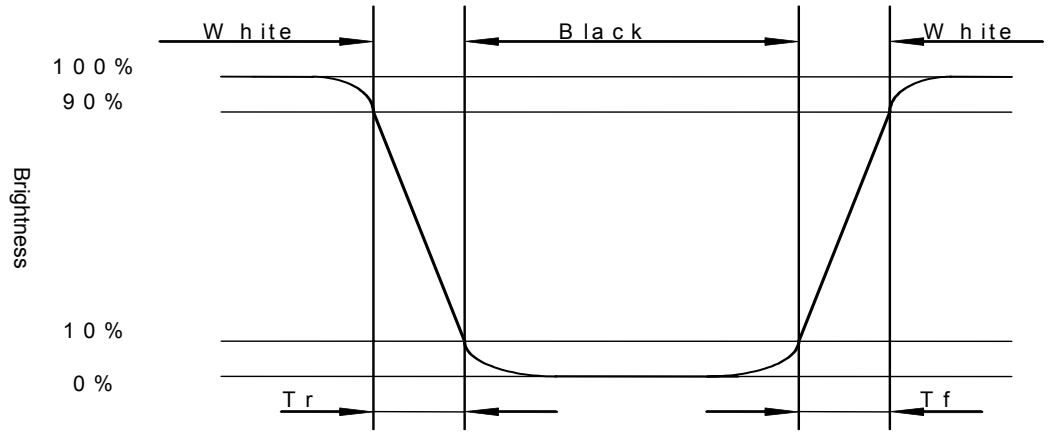
9. Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	Tr	θ=0°	-	5	8	ms	Note 4
	Fall	Tf		-	15	20	ms	
Contrast ratio		CR	At optimized viewing angle	100	400			Note 5
Viewing angle	Top		CR≥10	40	50	-	Deg.	Note 6
	Bottom			60	70	-		
	Left			60	70	-		
	Right			60	70	-		
Luminance of white			θ=0°	450	--	--	cd/m^2	Note 7
Uniformity				70	--		%	
White chromaticity		X	θ=0°	0.27	0.32	0.37		Note 7
		y		0.28	0.33	0.38		

Note 1: Ambient temperature =25°C. LED current I_L= 20 mA.
Note 2: To be measured in the dark room.
Note 3: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7A, after 2 minutes operation.
Note 4: Definition of response time:
The output signals of photo-detector are measured when the input signals are changed from “white” to “black” (rising time) and from “black” to “white”(falling time),respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as shown below.



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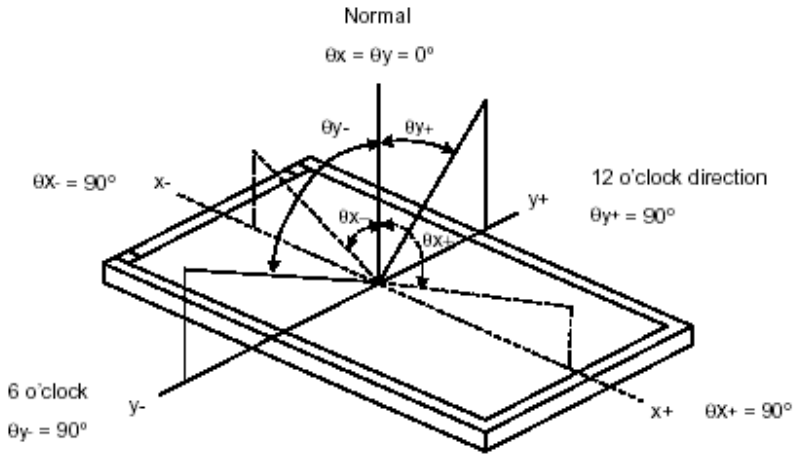
Note5: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo-detector output when LCD is at “White” state}}{\text{Photo-detector output when LCD is at “Black” state}}$$

Note 6: Definition of viewing angle:

Refer to figure as below.



Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

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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

No.	Reliability Test Item & Level	Test Level
1	High Temperature Storage Test	T=80°C,240hrs
2	Low Temperature Storage Test	T=-30°C,240hrs
3	High Temperature Operation Test	T=70°C,240hrs
4	Low Temperature Operation Test	T=-20°C,240hrs
5	High Temperature and High Humidity Operation Test	T=60°C, 90% RH,240hrs
6	Thermal Cycling Test (No operation)	-30°C → +25°C → +80°C,200 Cycles 30 min 5min 30 min
7	Vibration Test (No operation)	Frequency:0 ~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z
8	Electrostatic Discharge Test (No operation)	150pF,330Ω Air:± 15KV;Contact: ± 8KV 10 times/point;4 points/panel face

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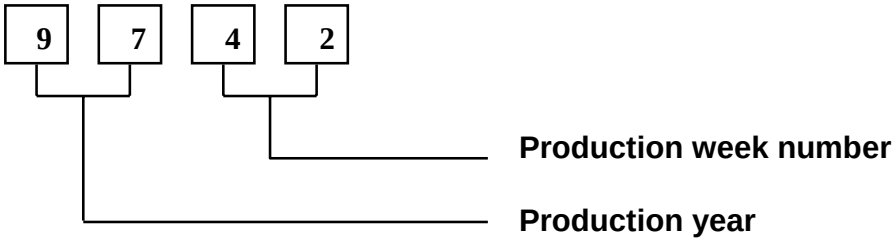
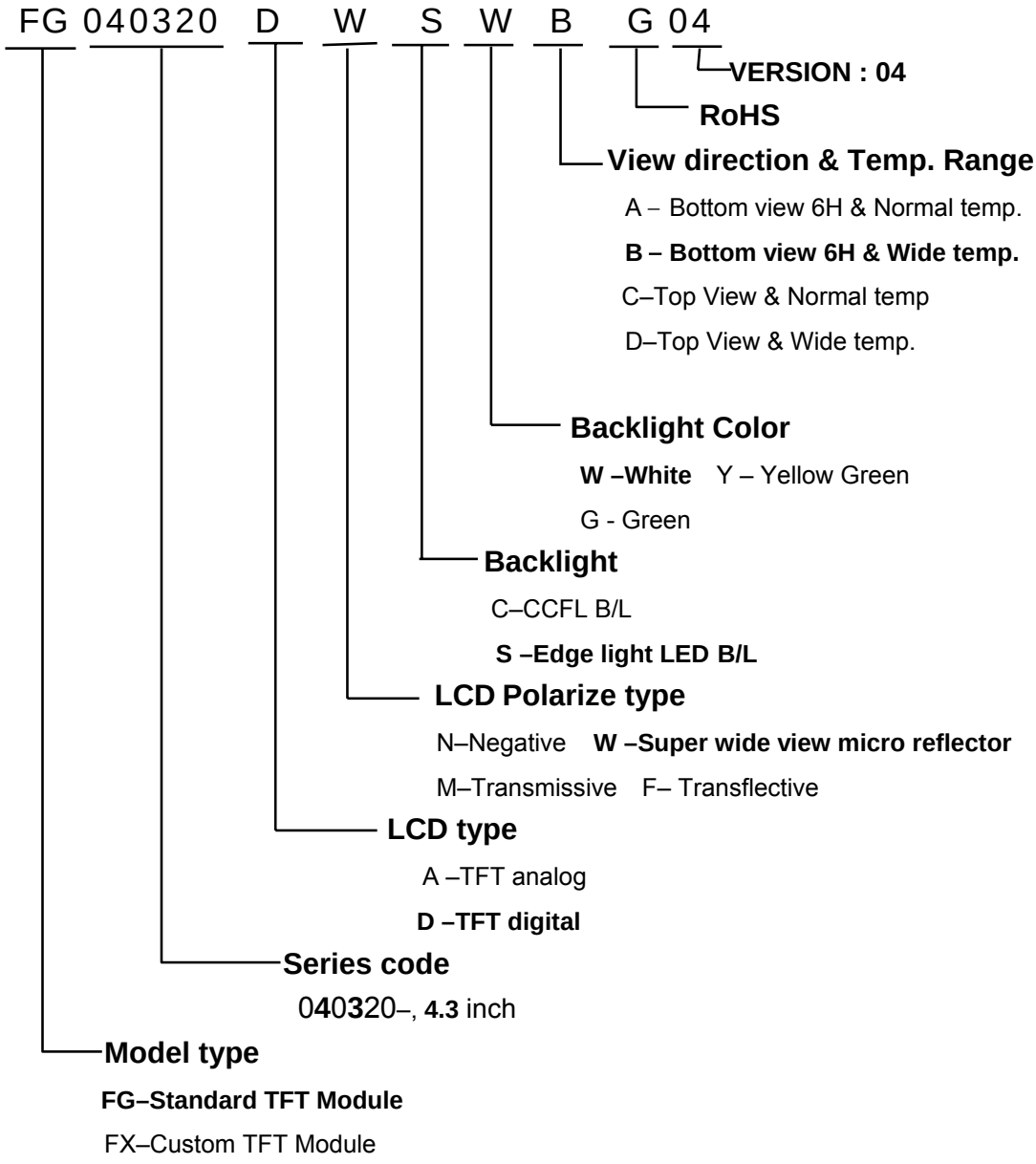
11. LOT NUMBERING SYSTEM



12. LCM NUMBERING SYSTEM



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13. PRECAUTIONS 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 degredation, 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). The viewing angle can be adjusted by varying the LCD driving voltage V0.

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

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

(4). 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".

(5). 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.

2.6 Limited Warranty

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.

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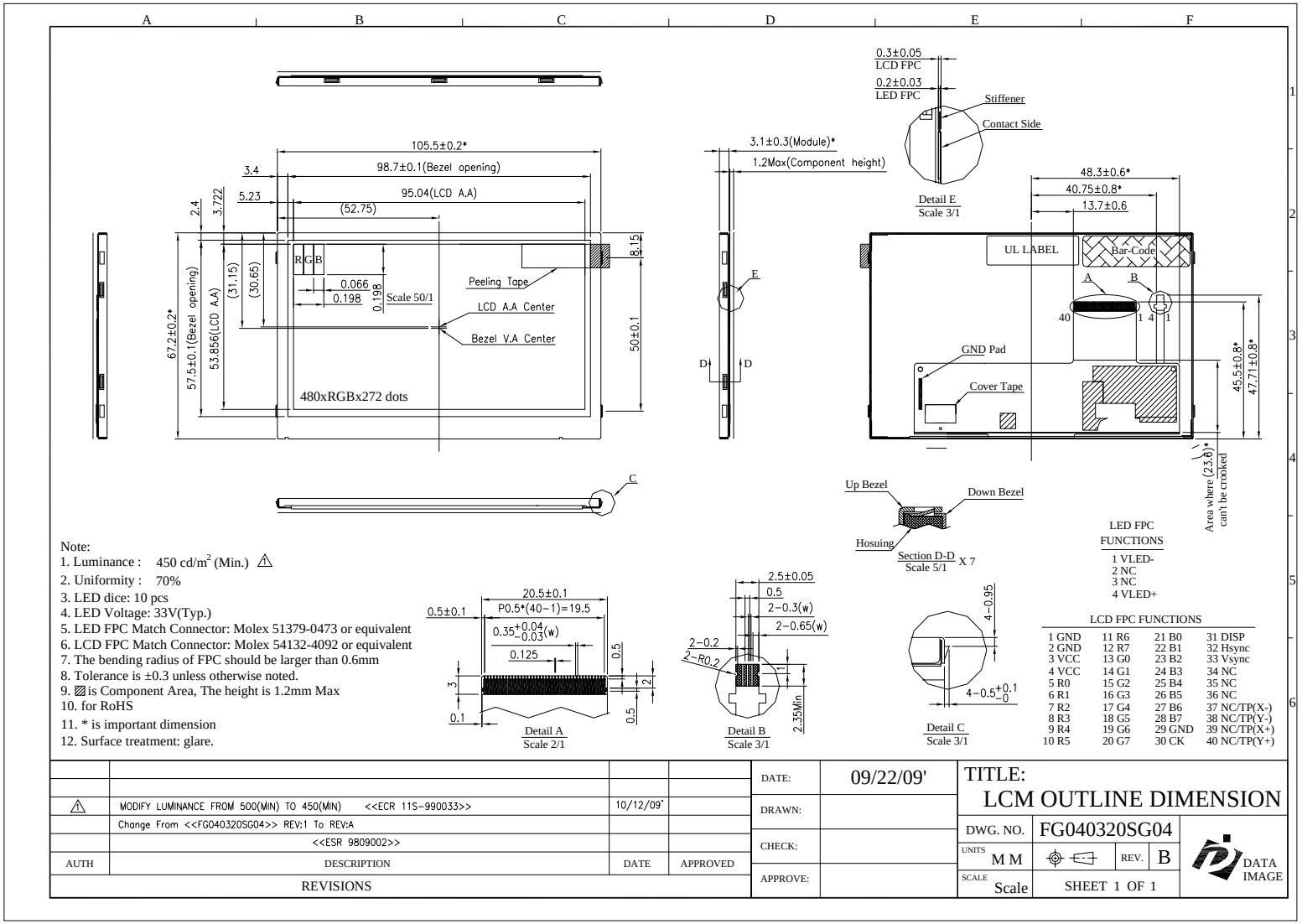
14. OUTLINE DRAWING



Note:
1. Luminance : 450 cd/m^2 (Min.) ⚠
2. Uniformity : 70%
3. LED dice: 10 pcs
4. LED Voltage: 33V(Typ.)
5. LED FPC Match Connector: Molex 51379-0473 or equivalent
6. LCD FPC Match Connector: Molex 54132-4092 or equivalent
7. The bending radius of FPC should be larger than 0.6mm
8. Tolerance is ±0.3 unless otherwise noted.
9. ▨ is Component Area, The height is 1.2mm Max
10. for RoHS
11. * is important dimension
12. Surface treatment: glare.

LED FPC FUNCTIONS

1 VLED-
2 NC
3 NC
4 VLED+

LCD FPC FUNCTIONS

1 GND	11 R6	21 B0	31 DISP
2 GND	12 R7	22 B1	32 Hsync
3 VCC	13 G0	23 B2	33 Vsync
4 VCC	14 G1	24 B3	34 NC
5 R0	15 G2	25 B4	35 NC
6 R1	16 G3	26 B5	36 NC
7 R2	17 G4	27 B6	37 NC/TP(X-)
8 R3	18 G5	28 B7	38 NC/TP(Y-)
9 R4	19 G6	29 GND	39 NC/TP(X+)
10 R5	20 G7	30 CK	40 NC/TP(Y+)

⚠	MODIFY LUMINANCE FROM 500(MIN) TO 450(MIN) <<ECR 11S-990033>>	10/12/09'	
	Change From <<FG040320SG04>> REV:1 To REV:A		
	<<ESR 9809002>>		
AUTH	DESCRIPTION	DATE	APPROVED
REVISIONS			

DATE:	09/22/09'
DRAWN:	
CHECK:	
APPROVE:	

TITLE: LCM OUTLINE DIMENSION

DWG. NO.	FG040320SG04		
UNITS M M		REV.	B
SCALE Scale	SHEET 1 OF 1		

DATA IMAGE

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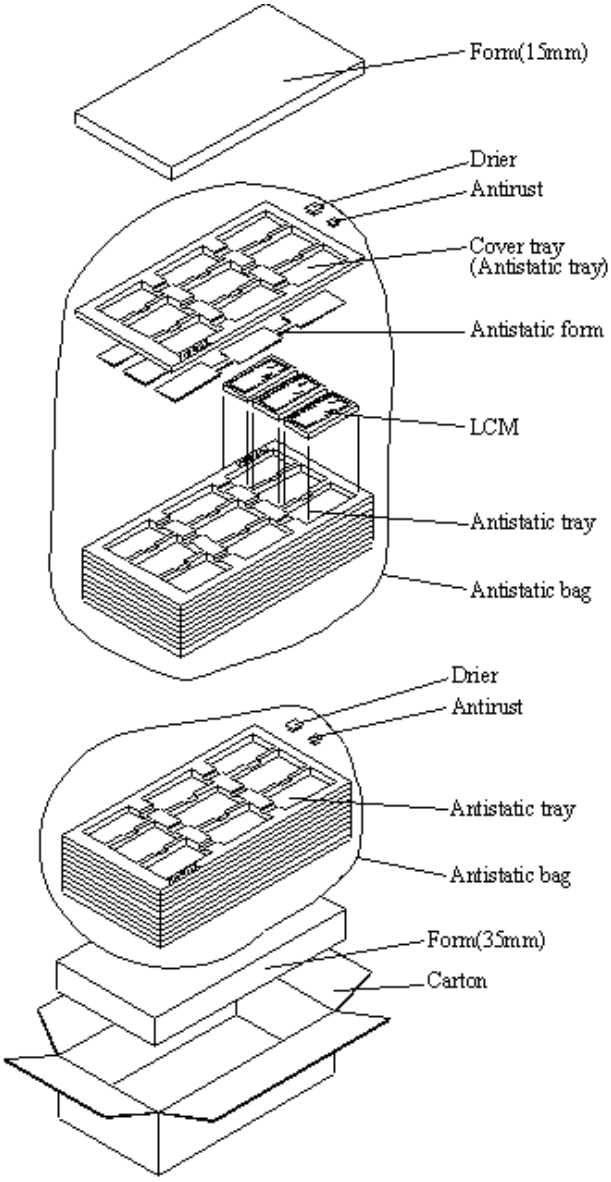
15. PACKAGE INFORMATION



Material

1 Carton + 1 Form (15mm) + 2 Anti-static bag + 20 Anti-static tray + 2 Drier + 2 Antirust + 1 Form (35mm)

Total pcs

1 Antistatic tray = 9 pcs (modules)

1 Anti-static bag = 9 Anti-static tray + cover tray = 9*9 + 1*0 =81 pcs

1 Carton = 2 Anti-static bag = 2*81 = 162 pcs

1 Carton = 162 pcs

Carton size : 465L x 380W x 395H (mm)

Total Weight = 9.6 kgw

FG040320 TFT LCM PACKING

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