	Specification No. LCP-03029
То:	
	Delivery Specification
	Name of Product CG Silicon – LCD Module
	Model Name 7.1 inch Module
	keceipt Stamp]

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1. Scope

This specification applies to the 7.1 inch color CGS – LCD module.

- ◎ This specification is the proprietary product and includes materials protected under copyright. Please handle with care and do not reproduce this specification in any form.
- \bigcirc The device listed in this specification was developed and manufactured for use in OA equipment.
- ◎ In case of using the device for applications such as transportation (aircraft, trains, automobiles, etc.), disaster-prevention & safety equipment, rescue and any security equipment which require higher reliability and safety, take into consideration that appropriate measures such as fail-safe functions and redundant system design should be taken.
- This device is not designed for equipment that requires an extreme level of reliability and safety such as aerospace applications, major communication device, nuclear power control equipment and medical or other equipment for life support. Do not use for the above.
- ◎ We assumes no responsibility for any damage resulting from the use of the device which does not comply with the instruction and the precautions specified in this specification.

2. General Description

This module is a color active matrix minim reflection LCD incorporating CGS-TFT (<u>C</u>ontinuous <u>G</u>rain <u>Silicon Thin Film T</u>ransistor). It is composed of a color CGS-LCD panel, driver ICs, control circuit, power supply circuit and a back light unit. With LVDS (<u>Low V</u>oltage <u>D</u>ifferential <u>Signaling</u>) for its interface, supplying +3.3 V DC for CGS-TFT panel driving and power source for back-light, it displays figures and letters with 262,144 colors on a 1024 x 3 x 768 dots panel.

Furthermore, with a color filter of high rendition and a minim reflection panel, it displays clear images in direct sunlight outdoors, which makes it a suitable module for multi-media purpose.

Its best view of direction is from 6 o'clock position.

DC/AC inverter for the lamp is not built in.

3. Specification

Item	Specification	Unit
Display Size	18 (7.1inch) width across corner	cm
Effective Display	144.38 (H) x 108.29 (V)	mm
Dival Format	1024 x 768	nival
Pixel Format	$(1 \text{ pixel} = \mathbf{R} + \mathbf{G} + \mathbf{B} \text{ dot})$	pixei
Pixel Pitch	0.141 (H) x 0.141 (V)	mm
Pixel Alignment	RGB stripe alignment	
Display Mode	Normally white	
Unit Outline Dimension *1	169.0(W) x 122.0 (H) x 7.5 (Max)(D)	mm
Mass	130 ± 10	g
Surface Treatment	Anti-glare, LR-coating and	
Surface Treatment	hard-coating 2H	

*1 Note: This is the dimension excluding back- light cables/connecter and any projection. Outline dimensions are shown in Fig. 1.

4. Input Terminals Pin Assignments

4-1 LCD Panel Driving Unit

CN1(LVDS interface signal and +3.3V power supply)

Connector used : SL00-26L2 (Kel Corporation)

Connector mating: SL20-26S, SL20-26L (Kel Corporation)

Pin No.	Symbol	Function	Remarks
1	Vcc	+3.3V power supply	
2	Vcc	+3.3V power supply	
3	Vcc	+3.3V power supply	
4	Vcc	+3.3V power supply	
5	GND		
6	GND		
7	RXCKIN+	CK receiver signal (+) for LVDS	LVDS
8	RXCKIN-	CK receiver signal (-) for LVDS	LVDS
9	GND		
10	RXIN2+	CH 2 receiver signal (+) for LVDS	LVDS
11	RXIN2-	CH 2 receiver signal (-) for LVDS	LVDS
12	GND		
13	RXIN1+	CH 1 receiver signal (+) for LVDS	LVDS
14	RXIN1-	CH 1 receiver signal (-) for LVDS	LVDS
15	GND		
16	RXIN0+	CH 0 receiver signal (+) for LVDS	LVDS
17	RXIN0-	CH 0 receiver signal (-) for LVDS	LVDS
18	GND		
19	GND		
20*	N.C.	This is open.	Reserved
21**	/RLINV	Horizontal scan control signal**	
22**	/USDW	Vertical scan control signal**	
23	GND		
24	GND		
25	GND		
26	GND		

* Not available: make sure this pin is opened.]

** When /RLINV is high, scans from LEFT to RIGHT; when low, scans from RIGHT to LEFT (It is pulled up internally, and when the pin is open, scans from LEFT to RIGHT.)
When /USDW is high, scans from TOP to BOTTOM; when low, BOTTOM to TOP. (It is pulled up internally, and when the pin is open, scans from TOP to BOTTOM.)
Note 1: Refer to 4-2 for RXINi (i = 0,1,2) and actual displayed data]



Receiver used : Control IC with function equivalent to THC63LVDF64A (THine)

Transmitter mating: DS90C363, DS90C383, DS90C383A(National semi-conductor), THC63LVDF63A, THC63LVDM63A(Thine)

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Ta=25°C

4-3 Back-light Unit

CN2 Connector used : BHSR-02VS-1 (JST Mfg. Co., Ltd.) Connector Mating: SM02B-BHSS-1-TB (JST Mfg. Co., Ltd)

Pin No.	Symbol	Function
1	V _{HIGH}	Lamp input terminal (high voltage side)
2	V LOW	Lamp input terminal (low voltage side)

5. Absolute Maximum Rating

Item	Symbol	Condition	Standard	Unit	Remarks
Input Voltage	V ₁	Ta=25°C	$-0.3 \sim \text{Vcc} + 0.3$	V	Note 1
3.3V power source Voltage	Vcc	Ta=25°C	$0 \sim +4.0$	v	
Storage Temp.	Tstg		$-25 \sim +60$	°C	
Operating Temp. (environment)	Тора		$0 \sim +50$	°C	Note 2
	•		•	•	•

Note 1 All the LVDS input signals

Note 2] Humidity: 95% RH Max. (when Ta $\leq 40^{\circ}$ C)

Maximum wet-bulb temperature $\leq 39^{\circ}$ C (when Ta > 40°C).

No condensation.

6. Electrical Characteristics

6-1 TFT LCD Module

	Item	Sym.	Min.	STD.	Max.	Unit	Remarks		
+ 3.3V	Input Voltage	Vcc	+ 3.0	+ 3.3	+ 3.6	V	Note 5		
Power Supply	Consumption Voltage	Icc		230	300	mA	Note 6		
Allowable Input Ripple Volt.		V _{RP}	-	-	100	mV p-p	Vcc = +3.3V		
Differential Input Threshold Voltage (High)		V _{TH}		Ι	+ 100	mV	$V_{CM} = + 1.2V$		
Differential Input Threshold Voltage (Low)		VTL	- 100	1	1	mV	Note 1		
Input Thres	hold Voltage (High)	V _{THC}		1.8	2.3	V	Note 2		
Input Three	shold Voltage (Low)	VTLC	0.5	0.9	-	V	Note 2		
Input Leak Current (High)		IHC			±10	μA	Note 3		
Input Leak Current (Low)		ILC	- 22	- 66	- 160	μA	Note 4		
Terminal resistance		RT	_	100		Ω	Inter-differential signals		

[Note 1] V_{CM} : common mode voltage of LVDS driver

Note 2] Applicable to /RLINV, /USDW terminal. To be CMOS 3.3 V level input

Note 3] Applicable to /RLINV, /USDW terminal. $V_{IN} = V_{CC}$

Note 4] Applicable to /RLINV, /USDW terminal. VIN= 0V



Display Time

Under the input condition stated above, time before LCD displays from power start-up (t1) is as follows: Display time (t) < 250 ms

instant-voltage-drop

1) When 2.5V \leq Vcc < 3.0 V, td \leq 10 ms

2) When Vcc < 2.5V, conditions for

instant-voltage-drop is in accordance with Input Voltage Sequence.



Note 6] Consumption Current

Standard Value : 16-gray-bar patterns

(Vcc = +3.3V, Gray scale: (4n) where "n"= $0 \sim 15$; see Chapt. 8 for RGB scale)



6-2 Back-light Unit

The back-light system is an edge-lighting type with 1 CCFT (Cold Cathode Fluorescent Tube). The characteristics of the lamp are shown below.

Item	Symbol	Min.	STD.	Max.	Unit	Rem	arks
Discharge Tube Current	I_L	2.0	6.0	6.5	mArms	Note 1	
Discharge Tube Voltage	V_L	—	390	_	Vrms		
Power Consumption	\mathbf{P}_{L}	—	2.3	_	W	Note 2	
Lighting Frequency	F_L	37	49	6.0	kHz	Note 3	
	Vs	_	910	1100		Ta=25°C	
Kick-Off Voltage		_	1010	1220	Vrms	Ta=0°C	Note 4]
Tube Life	L_L	10000	—	—	h	Note 5]	

Note 1] Current range for lighting a tube is shown below.

Rating for tube current is measured by a high frequency current measurement equipment connected to V_{LOW} at circuit shown below. (Keep enough kick-off voltage and steady voltage.) • Lighting frequency : 37 ~ 60 kHz

Ambient temperature : $0 \sim 50^{\circ}$ C



Before using in low-current area, please confirm the kick-off voltage and stability by actually mounting the module and inverter.

Note 2] Referential value by calculation is $I_L \times V_L$.

- Note 3] Lamp frequency may produce interference with horizontal synchronous frequency to cause beating on the display; to prevent this interference, keep lamp frequency as far as possible from the horizontal synchronous frequency and high harmonic frequency.
 - Note 4] Ballast condenser of DC/AC inverter when 22pF is used. Lighting voltage must be kept steady for at least 1 second; otherwise it may fail to light.

Note 5] When the tube is lit at $Ta = 25^{\circ}C$, $I_L = 6.0$ mArms, tube life is defined as:

- 1 when surface luminance becomes 50% of its original value
 - ② when kick-off voltage is 1220 Vrms at Ta = 0° C.
- (NOTE) Characteristics of DC/AC inverter affects the lighting performance and life of backlight. Please make sure to avoid poor lighting, such as flickering and miss-lighting, caused by mismatch of back-light and the inverter. When you confirm, the module should be operated on the same condition as it is actually installed in your instrument. Strong impact to LCD module may cause micro crack in CCFT; a device to detect excessive

voltage/current must be mounted on the inverter circuit to avoid overheating of electrode.



(Vertical)

Item (symbols)	Min.	STD.	Max.	Unit	Remarks
Varma Cruela (Trac)	_	16.667	-	ms	negative
v sync Cycle (1 VA)	803	806		line	(-)
Blanking Period (T _{VB})	35	38	1	line	
Sync. Range (T _{VC})	4	6	1	line	
Back Porch (T_{V_D})	0	29		line	
Sync. Range + Back Porch	35	35	35	line	
Effective Display Range (T _{VE})	768	768	768	line	
Front Porch (TvF)	0	3	_	line	

(Horizontal)

Item (symbols)	Min.	STD.	Max.	Unit	Remarks
Houng Cuolo (T)	19.4	20.667	_	μs	negative
Hisyne Cycle (THA)	1260	1344	1408	clock	(-)
Blanking Period (T _{HB})	236	320		clock	
Sync. Range (T _{HC})	8	136		clock	
Back Porch (T _{HP})	0	160	312	clock	
Sync. Range + Back Porch	1500-Тна	296	T _{HA-} 1024	clock	
Effective Display Range (T _{HE})	1024	1024	1024	clock	
Front Porch (T _{HF})	0	24	_	clock	

(Clock)

Item (symbol)	Min.	STD.	Max.	Unit	Remarks
Clock Frequency	59.5	65.0	65.0	MHz	Note

Note Low frequency may cause deterioration of display such as flickering.

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(H Vs Hs	(Horizontal-Vertical Synchronizing Signal Phase Difference)								
	Item (symbol)	Min.	STD.	Max.	Unit	Remark			
	Horizontal-Vertical Sync. Signal Phase Difference (T _{HV})	1	_	T _{HA} -T _{HC}	clock				

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(]	Horizontal-ENAB Signal Phase Diff	erence)					
EN	JAB						
Hs	sync $T_{HN} \rightarrow \leftarrow$						
						1	I
	Item (symbol)	Min.	STD.	Max.	Unit	Remark	
	Horizontal-ENAB Signal Phase Difference (T _{HN})	0	_	312	clock		

7-2 Display Positioning

Item	Standard Position	Starting Position	Ending Position	Unit	Remark
Harizantal	ENAB start-up	0	1024	clock	
Horizoiltai	Hsync start-up	296	1320	clock	Set ENAB to LOW
Vertical	Vsync start-up	35	803	line	

Note]

(Horizontal display position)

When ENAB is set at Low level, it counts 296 clock after Hsync start-up and displays one after that. If any other timing is desired, use ENAB signal.

(Vertical display position)

It counts 35 lines after Vsync start-up and displays one after that. Any other timing will cause displacement.

(Remarks)

ENAB cannot be used for vertical position adjustment.



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8	Input Signals.	Basic Display	Colors and Gray	v Scale of Each Color
·.	mpere orginally,	Dable Diopiaj	cororo and ora	

-	Color &	Input Data																		
	luminance	Scale	RO	R1	R2	R3	R4	R5	GO	G1	G2	G3	G4	G5	BO	B1	B2	B3	B4	B5
	Black	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	-	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
_	Green	-	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Basic	Cyan	-	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
ğ	Red	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
9	Magenda	-	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	-	1	1	1	1	1	1	1	1	1	1	1	1	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
	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Û	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Graj	Dark	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
/Sc	Û	\downarrow		\downarrow					\downarrow					\downarrow						
le of	Û	\downarrow			ţ	/						/					`	Ļ		
fRec	Bright	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Û	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Û	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
àray	Dark	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Scal	Û	\rightarrow			↓	,						/					`	Ļ		
e of (Û	\rightarrow			↓	/						/					`	Ļ		
Gree	Bright	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
2	Û	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Û	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Gray	Dark	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Sca	Û	\downarrow			↓	/			\downarrow						\downarrow					
e of	Û	\downarrow			Ţ	,			\downarrow					\downarrow						
Blue	Bright	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	Û	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0: Low level voltage 1: High level voltage

By inputting data signal 6 bit for each color display, 64 gray scale(gradation) for each color is displayed. 262,144 colors display is possible by having combination of total 18 bit data.

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9. Optical Characteristics

9-1 Back-light ON

Item		Symbol	Condition	Min.	STD.	Max.	Unit	Remarks	
Range of	Horizontal	<i>Θ</i> 21 <i>Θ</i> 22		30	40	_	o		
Visual	N 7 41 1	Θ11	CR > 10	40	45	-	o	N ote 1,4	
Aligie	vertical	Θ12		20	30	_	o		
Contras	st Ratio	CRn	$\Theta = 0^{\circ}$	100	150	—		Note 2,4	
Response	Rising	τr		_	30	45	ms	Klata 2 4	
Time	Time Falling		τd		50	75	ms	Note 5,4	
Wh	White			0.282	0.322	0.362		Note 4]	
Chrom	aticity	У	$\Theta = 0^{\circ}$	0.292	0.332	0.372			
Luminanc	e of White	YL		140	180	_	cd/m ²	IL=6.0mArms, FL=49kHz Note 5	
Lumi Distri	Luminance Distribution			_	-	1.45		Note 6	

Measuring will be done 30 minutes after lighting the lamp rating.
 Measurement of optical characteristics will be done in the following method in the dark room or equivalent. (standard: I_{L = 6.0 mArms})



9-2 Back-light OFF

					Ta	1 = 25 C, V	/cc = +3.3V	
Item	Symbol	Condition	Min.	STD.	Max.	Unit	Remarks	
Contrast Ratio	CR	$\partial - 0^{\circ}$	3	3.5	_		Note 2, 4]	
Reflectance	R	$\mathcal{O}=0$	2	2.6	—	%	Note 4	
Measuring device : CM-2002 (dispersion colorimeter by Minolta)								
	<u>R</u>	Reflected light	t intens	ity of th	e panel v	vhen volta	age is added	
Definition of reflec	tance =	R	eflectio	on intens	sity of wł	nite panel		

 $T_2 = 25^{\circ}$ C. Vcc = + 3.3V



576

pixel



$$\delta w = \frac{\text{Max.luminance of points A} - E}{\text{Min. luminance of points A} - E}$$

10. Visual Quality

Please refer to the attachment "Delivery Inspection Manual".

11. Handling Instruction

- a) Turn power OFF before connecting or disconnecting a cable to the module.
- b) Assemble the module firmly with the mounting holes on the same face; do not cause any stress such as twist or warp.
- c) Handle the polarized face of the panel surface with extreme care.
- d) Contact with water droplet for over 10 minutes may cause discoloration or stain. Wipe off promptly.
- e) When the surface of the panel is soiled, clean it with a cotton wool or a soft cloth.
- f) Handle the device with care as the surface is made of glass. It may crack or chip off if dropped or bumped on hard surface.
- g) Connecting / disconnecting must be done parallel to LCD module and be kept horizontal.
- h) LCD module is mounted with CMOS-LSI; take special measures toward static electricity.
- i) Handle other electronic parts with care.
- j) The circuit board is located on the back of the module; excessive stress during assembly may cause damage to the circuit.
- k) In handling or mounting of module, storing it in an environment where oxidizing gas or reducing medium may be present, or use of chemicals, solution, or resin that may cause the gases mentioned above, may cause corrosion or discoloration.
- LCD panel is composed of fluorescent tube, please comply with the local regulations in disposition.

12. Packing Form

- a) Maximum stack in a pile: 10
- b) Maximum packing quantity: 20 units.
- c) Carton size: 337 mm (W) x 313 mm (D) x 218 mm (H)
- d) Total mass with 20 units: 3300g

Fig. 2 shows the packing form.

13. Reliability Items

No.	Test item	Description
1	High temperature storage test	$Ta = 60^{\circ}C; 240 hr$
2	Low temperature storage test	$Ta = -25^{\circ}C; 240 hr$
3	High temperature operation	$Ta = 50^{\circ}C; 240 \text{ hr}$
		(panel temperature $<60^{\circ}$ C)
4	Low temperature operation	$Ta = 0^{\circ}C; 240 hr$
5	High temp./high humidity operation	$Ta = 40^{\circ}C, 95\%$ RH; 240 hr
	test	(no condensation)
6	Vibration test	Frequency: 5~57Hz/0.075mm
	(non-operating)	58~500Hz/9.8 m/s ²
		Sweep time: 10Hz~500Hz~10Hz/11.0min
		Test period: 6 hr (2 hr each for X,Y,Z direct.)
	Shock test	by the term A of JIS-C-0041
7	(non-operating)	Acceleration: 490 m/s ² , pulse width: 11ms
		Direction: $\pm X$, $\pm Y$, $\pm Z$

Évaluation Criteria] There should be no change in operation when actually operated in normal condition in accordance with "Delivery Inspection Manual".





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