



## CUSTOMER APPROVAL SHEET

<b>Company Name</b>	
<b>MODEL</b>	<b>A090VW01 V0</b>
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- ☐ APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver.\_\_\_\_)
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# **Product Specification**

## **9.0" COLOR TFT-LCD MODULE**

**MODEL NAME: A090VW01 V0**

< ☐ > Preliminary Specification

< ☐ > Final Specification

Note: The content of this specification is subject to change.

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## Record of Revision

Version	Revise Date	Page	Content
0.0	2008/09/03		First Draft
0.1	2008/09/08	8	Update the drawing to define direction of panel
		11	Update the definition in life time
		20	Modify the RA spec in low temp. storage
0.2	2008/09/17	28 ~ 30	Add application circuit

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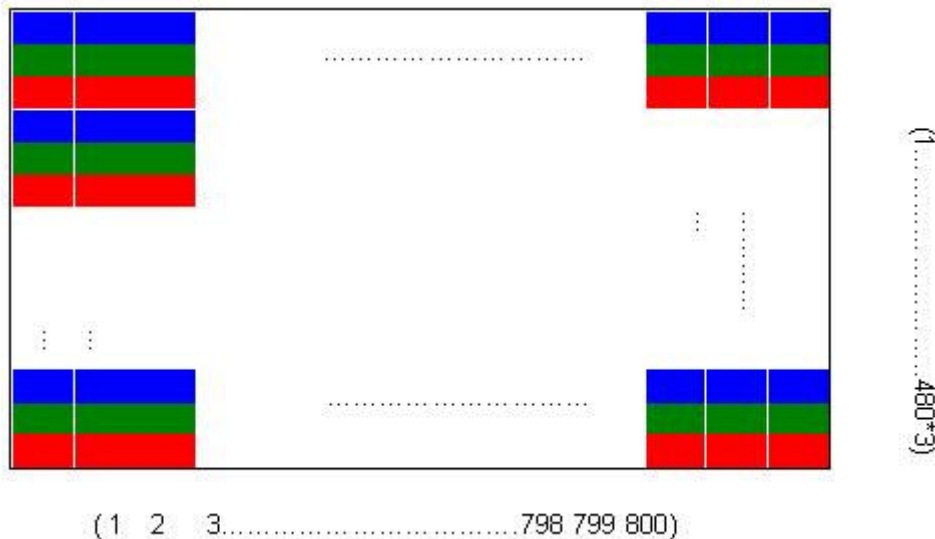
## A. General Information

This product is for portable DVD and digital photo frame application.

NO.	Item	Unit	Specification	Remark
1	Screen Size	inch	9.0(Diagonal)	
2	Display Resolution	dot	800×480RGB(V)	
3	Overall Dimension	mm	211.7(H) × 125(V) × 4.6(T)	Note 1
4	Active Area	mm	199.2(H)×110.16(V)	
5	Pixel Pitch	mm	0.249(H)×0.2295(V)	
6	Color Configuration	--	R. G. B. Stripe	Note 2
7	Color Depth	--	16.7M Colors	Note 3
8	NTSC Ratio	%	48%	
9	Display Mode	--	Normally White	
10	Panel surface Treatment	--	Anti-Glare, 3H	
11	Weight	g	220	
12	LCD Module Power Consumption	W	2.1W	
	Viewing direction		6 o'clock (gray inversion)	

Note 1: Not include backlight cable and FPC. Refer next page to get further information.

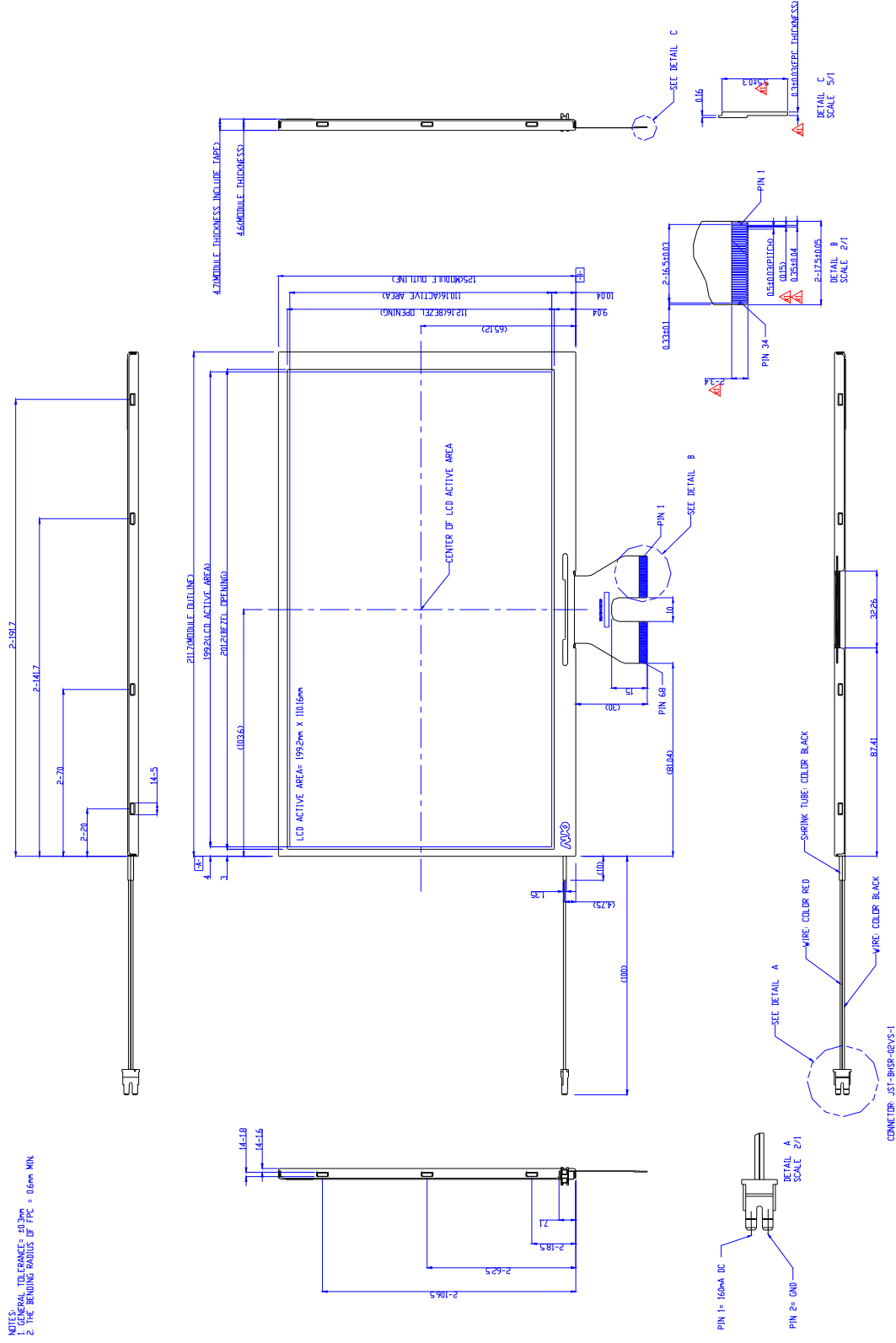
Note 2: Below figure shows dot stripe arrangement.



Note 3: The full color display depends on 24-bit data signal (pin 44~67).

## B. Outline Dimension

## 1. TFT-LCD Module – Front View

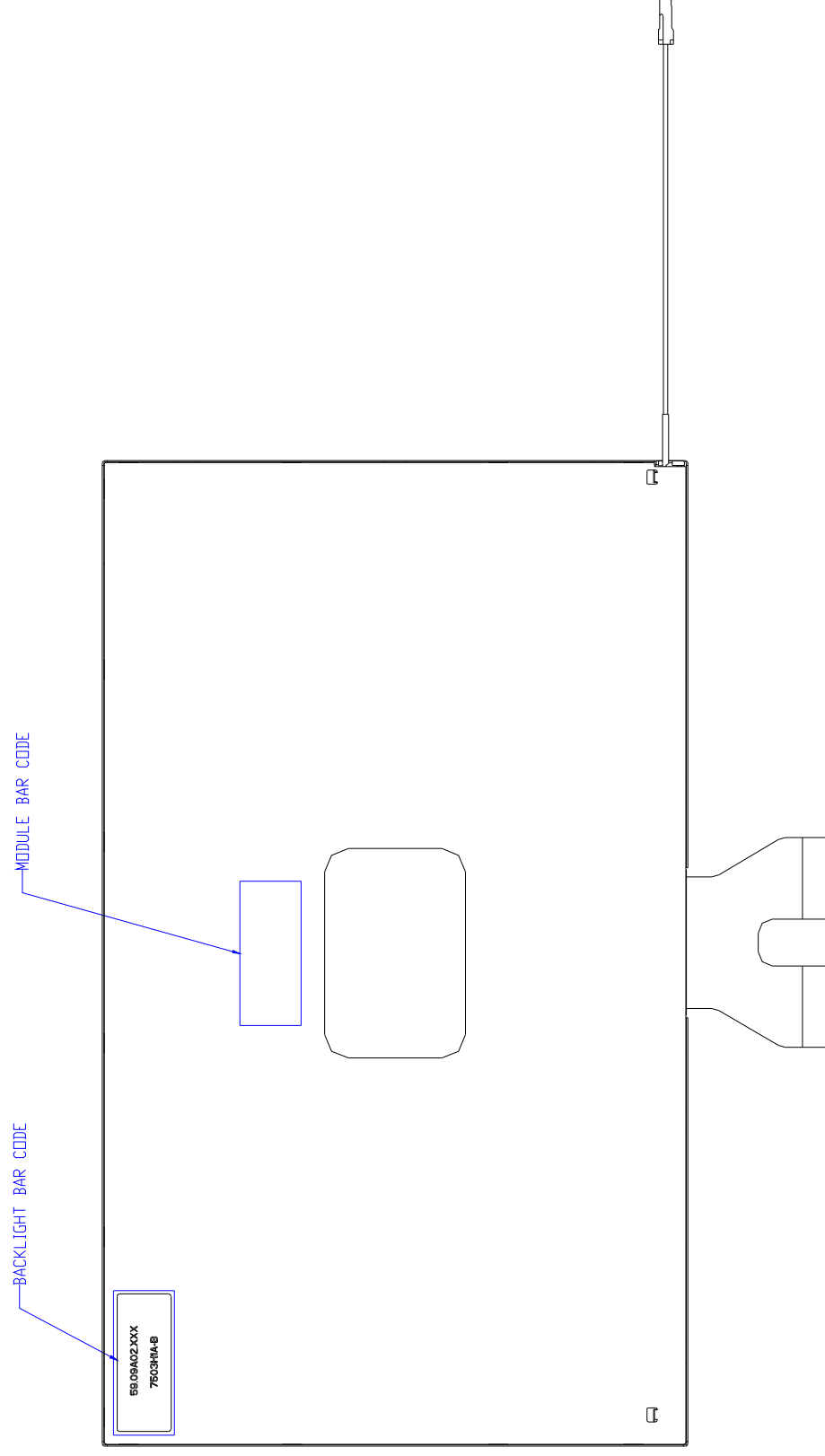


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## 2. TFT-LCD Module – Rear View

NOTES:

1. GENERAL TOLERANCE=  $\pm 0.3\text{mm}$
2. THE BENDING RADIUS OF FPC =  $0.6\text{mm}$  MIN.



## C. Electrical Specifications

### 1. TFT LCD Panel Pin Assignment

Recommended connector : JST 34FLZX-RSM1-A-TB

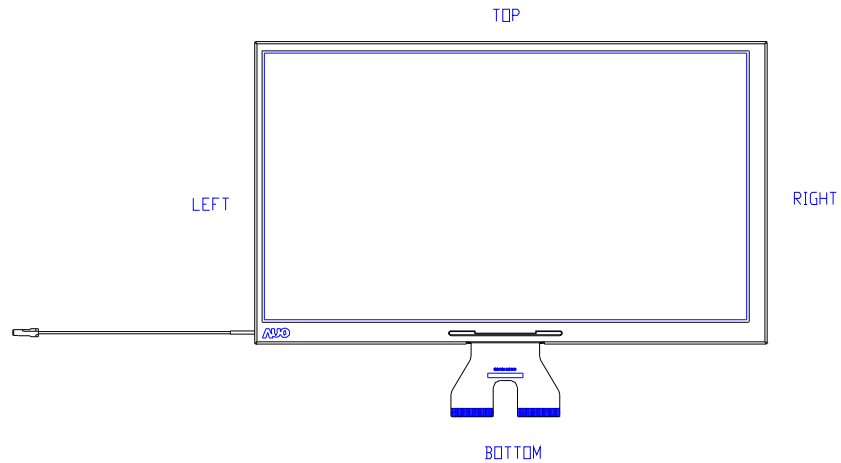
Pin no	Symbol	I/O	Description
1	VCOM	I	Common electrode driving voltage
2	VGL	P	Negative power supply voltage for Gate driver
3	VGH	P	Positive power supply voltage for Gate driver
4	VDPA	P	3.5V~5.5V(DCDC)
5	AGND	P	ground for analog circuit
6	VDNA	P	-3.5V ~ -5.5V(DCDC)
7	GND	P	Ground for digital circuit
8	VCC	P	supply voltage for digital circuit
9	DRV_BLU	O	LED driver dimming signal
10	CABC_EN	I	CABC function enable
11	CHUD	I	Vertical shift direction setting When CHUD = "L", display from up to down. When CHUD = "H", display from down to up.
12	CHLR	I	Horizontal shift direction setting When CHLR = "L", display from left to right. When CHLR = "H", display from right to left.
13	EXT_GAMMA	I	Enable external voltage correction voltage V1~V14 When EN_EXT_GAMMA="L", Disable external gamma voltage. When EN_EXT_GAMMA="H", Enable external gamma voltage.
14	GRB	I	global reset pin (active low) When GRB = "L", The controller is reset. When GRB = "H", Normal operation. Default setting.
15	NAVDD	C	Pins to connect capacitance for power circuitry Power supply for negative analog circuit.
16	V14	I	gamma reference voltage
17	V13	I	gamma reference voltage
18	V12	I	gamma reference voltage
19	V11	I	gamma reference voltage
20	V10	I	gamma reference voltage
21	V9	I	gamma reference voltage
22	V8	I	gamma reference voltage
23	V7	I	gamma reference voltage
24	V6	I	gamma reference voltage
25	V5	I	gamma reference voltage
26	V4	I	gamma reference voltage
27	V3	I	gamma reference voltage



28	V2	I	gamma reference voltage
29	V1	I	gamma reference voltage
30	PAVDD	C	Pins to connect capacitance for power circuitry Power supply for positive analog circuit.
31	NVDD	C	Pins to connect capacitance for power circuitry
32	VCC	P	supply voltage for digital circuit
33	VDDD	C	Pins to connect capacitance for power circuitry IC internal logic power.
34	GND	P	Ground for digital circuit
35	SC	I	Chip select (Low active) of SPI
36	SDA	I/O	Data input/output of SPI
37	SCL	I	Clock input of SPI
38	HSYNC	I	Horizontal sync input
39	VSYNC	I	Vertical sync input
40	GND	P	Ground for digital circuit
41	DCLK	I	Data clock Input
42	GND	P	Ground for digital circuit
43	DE	I	Data enable Input (Low active)
44	DB7	I	Blue data input
45	DB6	I	Blue data input
46	DB5	I	Blue data input
47	DB4	I	Blue data input
48	DB3	I	Blue data input
49	DB2	I	Blue data input
50	DB1	I	Blue data input
51	DB0	I	Blue data input
52	DG7	I	Green data input
53	DG6	I	Green data input
54	DG5	I	Green data input
55	DG4	I	Green data input
56	DG3	I	Green data input
57	DG2	I	Green data input
58	DG1	I	Green data input
59	DG0	I	Green data input
60	DR7	I	Red data input
61	DR6	I	Red data input
62	DR5	I	Red data input

63	DR4	I	Red data input
64	DR3	I	Red data input
65	DR2	I	Red data input
66	DR1	I	Red data input
67	DR0	I	Red data input
68	VCOM	I	Common electrode driving voltage

I: Input pin; P: Power pin; G: Ground pin; C: capacitor pin



## 2. Backlight Pin Assignment

Recommended connector : JST-BHSR-02VS-1

Pin no	Symbol	I/O	Description	Remark
1	VLED	P	LED power supply	
2	GNDLED	P	LED ground	

## 3. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VCC	GND=0	-0.5	5	V	Digital power
	PAVDD	GND=0	-0.5	5.5		Postive Analog power
	NAVDD	GND=0	-5.5	+0.5	V	Analog Negative power
	VGH - VGL	GND=0	-0.3	40	V	Gate driver supply voltage
Input signal voltage	Data	GND=0	-0.3	VCC+0.3	V	Digital Signals

Note 1: Functional operation should be restricted under ambient temperature (25°C).

**Note2:** Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics chapter.

### 3. Electrical DC Characteristics

#### a. Typical Operation Condition (AGND =GND = 0V)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power Voltage		VCC	3.0	3.3	3.6	V	Digital power
		PAVDD	3.0	5	5.5	V	Charge Pump Power
		NAVDD	-5.5	-5	-3.0	V	Analog Power
		VGH	13	14	15	V	Positive power supply for gate driver
		VGL	-11	-12	-13	V	Negative power supply for gate driver
Output Signal Voltage	H Level	VOH	VCCx0.8	--	VCC	V	IOH=400uA, IOL=400uA
	L Level	VOL	GND	--	GNDx0.2	V	
Input Signal Voltage	H Level	VIH	0.7xVCC	--	VCC	V	
	L Level	VIL	GND	--	0.3xVCC	V	
Gamma reference voltage		VCOM	-1.7	-1.85	-2	V	Detail Gamma voltage please refer to page 27.
		V1		4.56		V	
		V2		4.42			
		V3		2.59			
		V4		2.15			
		V5		1.87			
		V6		1.48			
		V7		0.4			
		V8		0			
		V9		-1.27			
		V10		-1.99			
		V11		-2.43			
		V12		-2.98			
		V13		-4.78			
		V14		-5			

### b. Current Consumption (AGND=GND=0V)

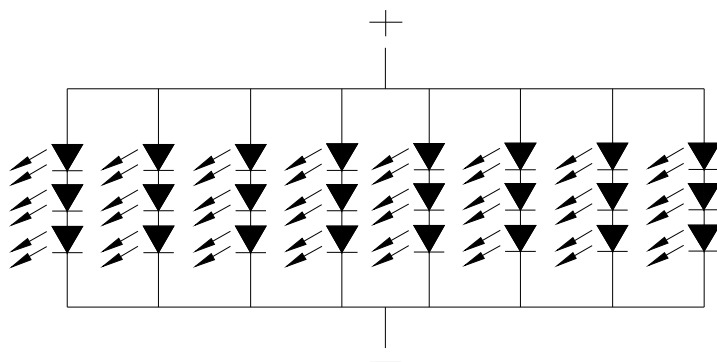
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Input current for VCC	$I_{VDD}$	VCC=3.3V	-	3.7		mA	
Input current for VDPA	$I_{VDPA}$	VDPA=5.5V	-	29		mA	
Input current for VDNA	$I_{VDNA}$	VDNA=-5.5	-	9.2		mA	
Input current for VGH	$I_{VGH}$	VGH=14V	-	5		mA	
Input current for VGL	$I_{VGL}$	VGL= -12V		8.5		mA	
Input current for VCOM	$I_{VCOM}$	VCOM= -1.85V		0.55		mA	

### c. Backlight Driving Conditions

The backlight (LED module, Note 1) is suggested to drive by constant current with typical value.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED light bar Current	$V_L$	--	--	160	mA	
BL Power Consumption	$P_{BL}$	1.360	1.512	1.663	W	Note 1
LED Life Time	$L_L$	10,000	--	--	Hr	Note 2, 3

Note 1: The LED driving condition is defined for LED module (24 LED). The voltage range will be 8.505 to 10.395V based on suggested driving current set as 160mA.



Note 2: Define “LED Lifetime”: brightness is decreased to 50% of the initial value. LED Lifetime is restricted under normal condition, ambient temperature = 25°C and LED lightbar **current = 160mA**.

Note 3: If it uses larger LED lightbar voltage more than 12V, it maybe decreases the LED lifetime.

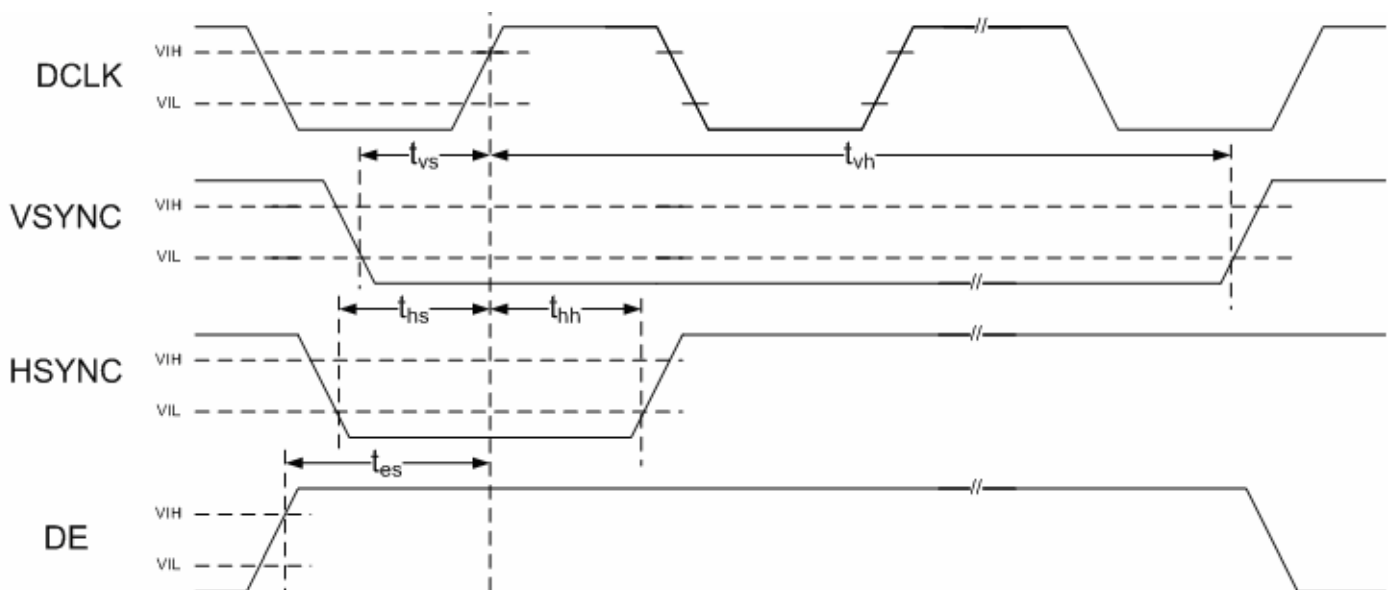
## 4. Electrical AC Characteristics

### a. Signal AC Characteristics

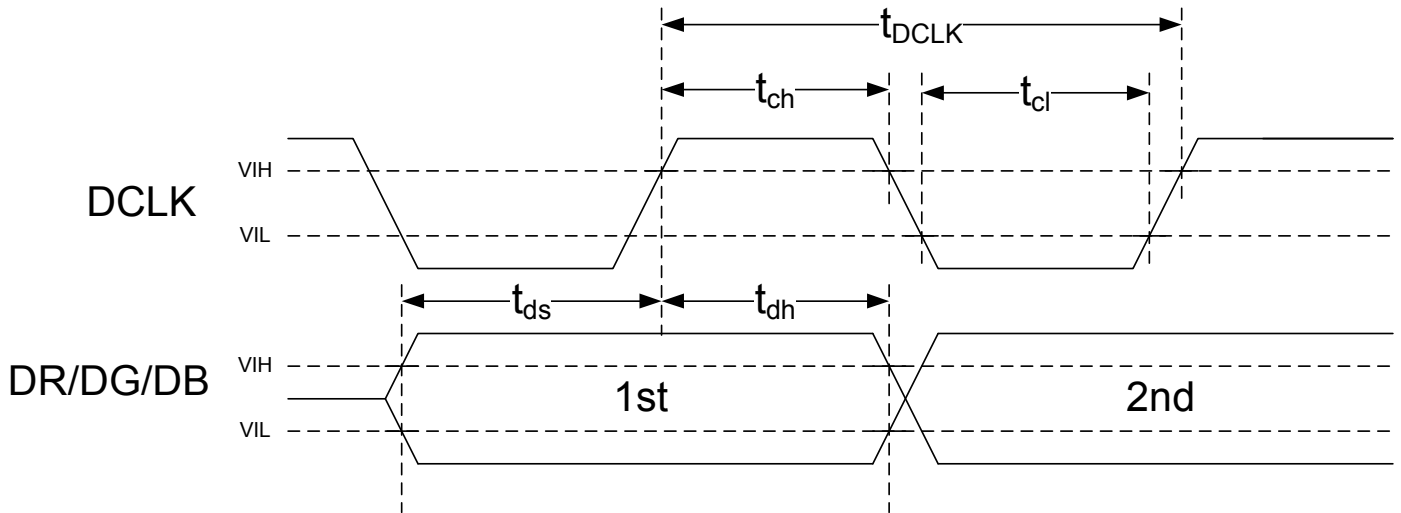
$t_H$ : HSYNC period /  $t_{DCLK}$ : DCLK period /  $t_{CW}$ : the width of DCLK high

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
INPUT Signals						
Clock High time	$T_{ch}$		8	-	-	ns
Clock Low time	$T_{cl}$		8	-	-	ns
Hsync setup time	$T_{hs}$		5			ns
Hsync hold time	$T_{hh}$		10			ns
Data setup time	$T_{ds}$		5			ns
Data hold time	$T_{dh}$		10			ns
Data enable set-up time	$T_{es}$		4			ns
SERIAL Communication						
Serial clock	$T_{sck}$		320			ns
SCL pulse duty	$T_{scw}$		40%	50%	60%	$T_{sck}$
Serial data setup time	$T_{ist}$		120			ns
Serial data hold time	$T_{ihd}$		120			ns
Serial clock high/low	$T_{ssw}$		120			ns
CS setup time	$T_{cst}$		120			ns
CS hold time	$T_{chd}$		120			ns
Chip select distinguish	$T_{cd}$		1			us
Delay from CS to Vsync	$T_{cv}$		1			us
Serial data output delay	$T_{id}$	CL=20pF	-	-	60	ns

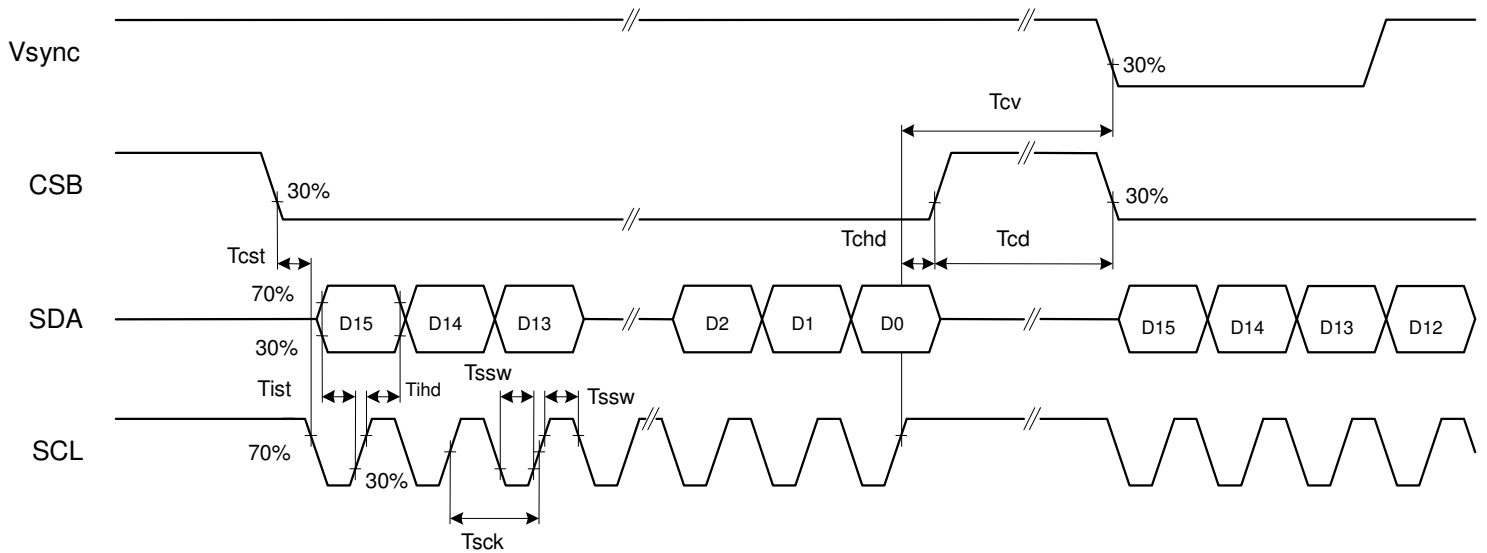
Figure : Input timing details



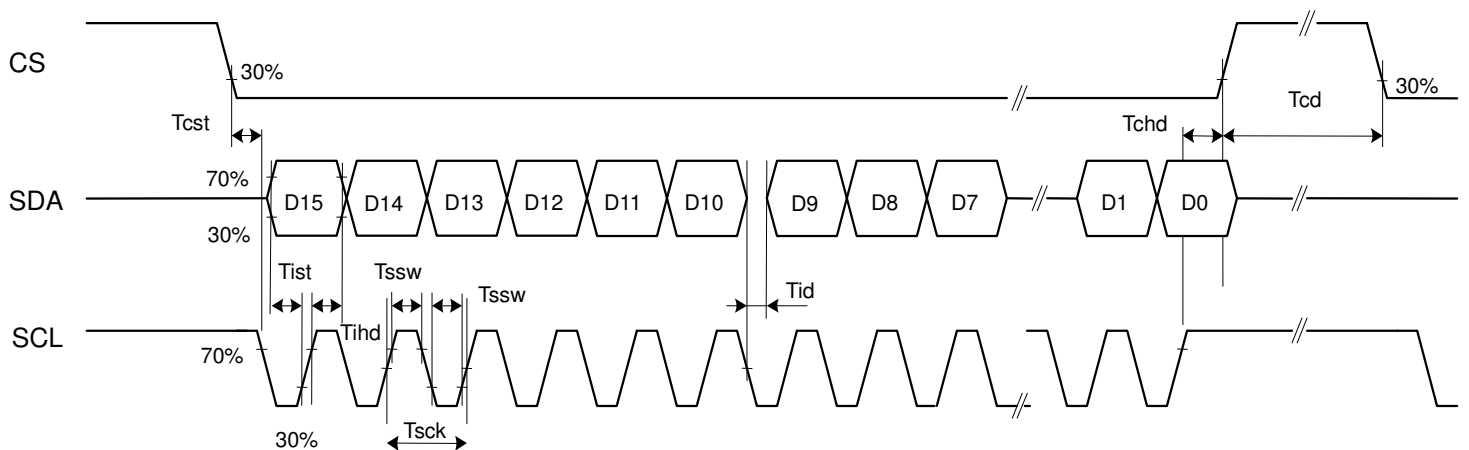
**Figure : Input timing details**



**Figure : AC serial interface write mode timings**



**Figure : AC serial interface read mode timings**



### c. Input Timing Setting

DE Mode:

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
DCLK frequency	$F_{DCLK}$		30.3	33.26	37.8	MHz
Horizontal blanking (= Thf+ The)	Thbl		186	256	383	$T_{DCLK}$
Vertical blanking (=Tvf + Tve)	Tvbl		37	45	52	Th

HV Mode:

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
DCLK frequency	$F_{DCLK}$		30.3	33.26	37.8	MHz
DCLK period	$T_{DCLK}$		26.5	30.06	33.0	ns
Hsync Period (= Thd + Thbl)	Th		986	1056	1183	$T_{DCLK}$
Active Area	Thd		-	800	-	$T_{DCLK}$
Horizontal blanking (=Thf + The)	Thbl		186	256	383	$T_{DCLK}$
Hsync front porch	Thf			40	-	$T_{DCLK}$
Delay from Hsync to 1 <sup>st</sup> data input (= Thw + Thb)	The	Function of HDL[7:0] settings	146	216	343	$T_{DCLK}$
Hsync pulse width	Thw		1	128	136	$T_{DCLK}$
Hsync back porch	Thb		10	88	342	$T_{DCLK}$
Vsync period (= Tvd + Tvbl)	Tv		517	525	532	Th
Active lines	Tvd		-	480	-	Th
Vertical blanking (=Tvf + Tve)	Tvbl		37	45	52	Th
Vsync front porch	Tvf		-	13	-	Th
GD start pulse delay	Tve	Function of VDL[3:0] settings	24	32	39	Th
Vsync pulse width	Tvw		1	3	-	Th



## 5. Serial Interface Characteristics

### a. Serial Control Interface AC Characteristic

A totally 16-bit register including 7-bit address D[15:9], 1-bit R/W bit D[8] and 8-bit data D[7:0] can be set via 3-wire serial peripheral interface. Below figure is for a detail description of the parameters.

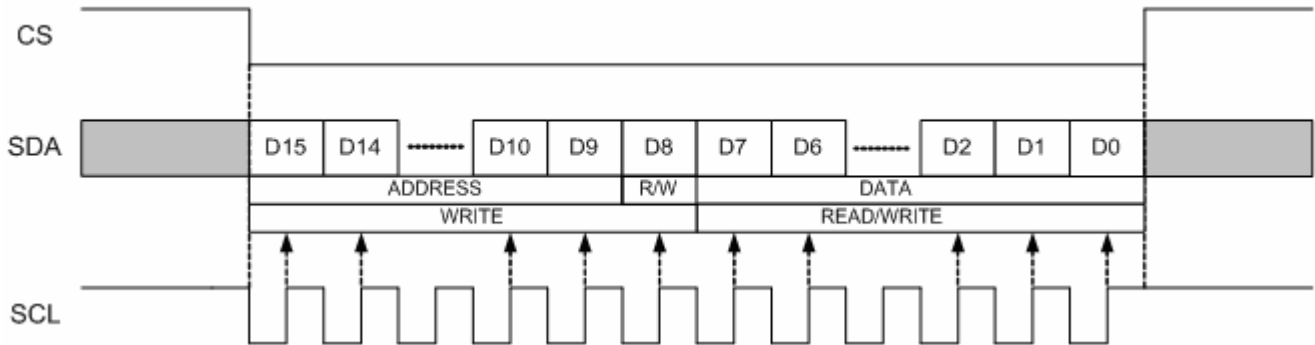


Figure: Serial interface write/read sequence

- ◆ Each serial command consists of 16 bits of data which is loaded one bit a time at the rising edge of serial clock SCL.
- ◆ Command loading operation starts from the falling edge of CS and is completed at the next rising edge of CS.
- ◆ The serial control block is operational after power on reset, but commands are established by the following Vsync(HV mode) or the following rising edge of the End Frame(DE mode). If command is transferred multiple times for the same register, the last command before the following Vsync(HV mode) or the following rising edge of the End Frame(DE mode) is valid, except for some special registers (ex. GRB, etc.).
- ◆ If less than 16 bits of SCL are input while CS is low, the transferred data is ignored.
  - The write operation is cancelled.
  - The read operation is interrupt.
- ◆ If 16 bits or more of SCL are input while CS is low, the first 16 bits of transferred data in the duration of CS="L" are valid data.
- ◆ Serial block operates with the SCL clock.
- ◆ Serial data can be accepted in the standby (power save) mode.
- ◆ Register R/W setting: D8 = "L" → write mode; D8 = "H" → read mode.
- ◆ It is suggested that Vsync, Hsync, DCLK(for HV mode) or DE,DCLK(for DE mode) always exists in the same time. But if Hsync, DE, DCLK stops, only Vsync operating, the register setting is still valid.

## b Serial Interface Setting Table.

### R0 settings

Address	Bit	Description	Default
0000000	4	NA	Not used in this model
	3	NA	Not used in this model
	2	NA	Not used in this model
	1	STB	Standby mode setting
	0	GRB	S/W global reset

Bit 1	STB
0	Normal operation. <b>(default)</b>
1	Standby mode. Register data are kept. DAC and DC/DC are off.

S/W STB	H/W STB	Operation mode
0	0	Normal operation
0	1	Standby mode
1	0	Standby mode
1	1	Standby mode

Bit 0	GRB
0	S/W global reset. Reset all registers to default value.
1	Normal operation. <b>(default)</b>

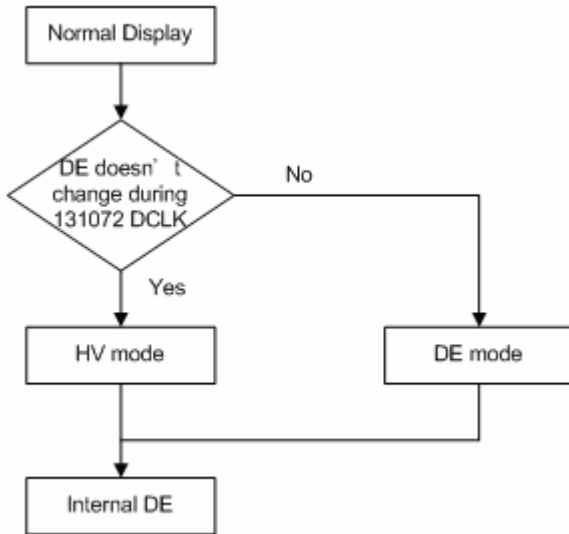
S/W GRB	H/W GRB	Operation mode
0	0	H/W reset
0	1	Execute S/W reset procedure
1	0	H/W reset
1	1	Normal operation

### R4 settings

Address	Bit	Description	Default
0000100	7-6	DEM	DE/HV mode setting
	3-0	VDL	Vertical start pulse adjustment function

Bit 7-6	DEM
0x	Auto detection. <b>(default)</b>
10	HV mode.
11	DE mode. If DE mode is set, it should be executed immediately.

Figure: DE auto detection flow chart



### R13 settings

Address	Bit	Description		Default
0001101	1	NA	NA	0
	0	EN_EXT_GAMMA	Enable gamma external voltage input (V1~V14)	0

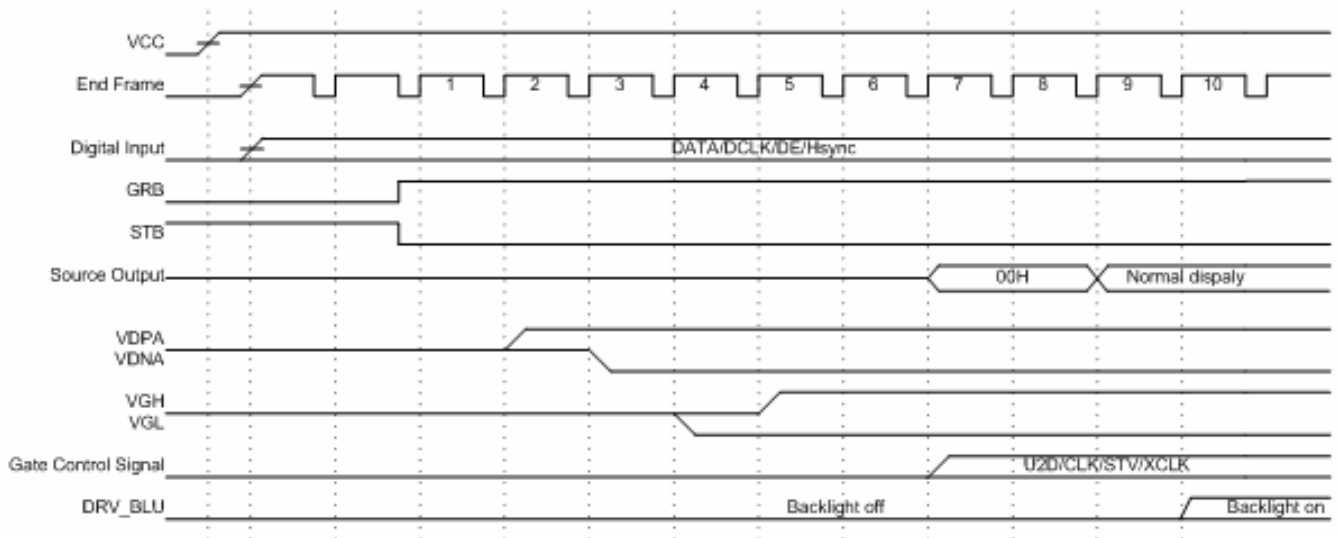
Bit 0	EN_EXT_GAMMA
0	Disable gamma external voltage input (V1~V14). (default)
1	Enable gamma external voltage input (V1~V14).

S/W EN_EXT_GAMMA	H/W EN_EXT_GAMMA	External gamma correction voltage V1~V14
0	0	Disable external V1~V14
0	1	Enable external V1~V14
1	0	Enable external V1~V14
1	1	Enable external V1~V14

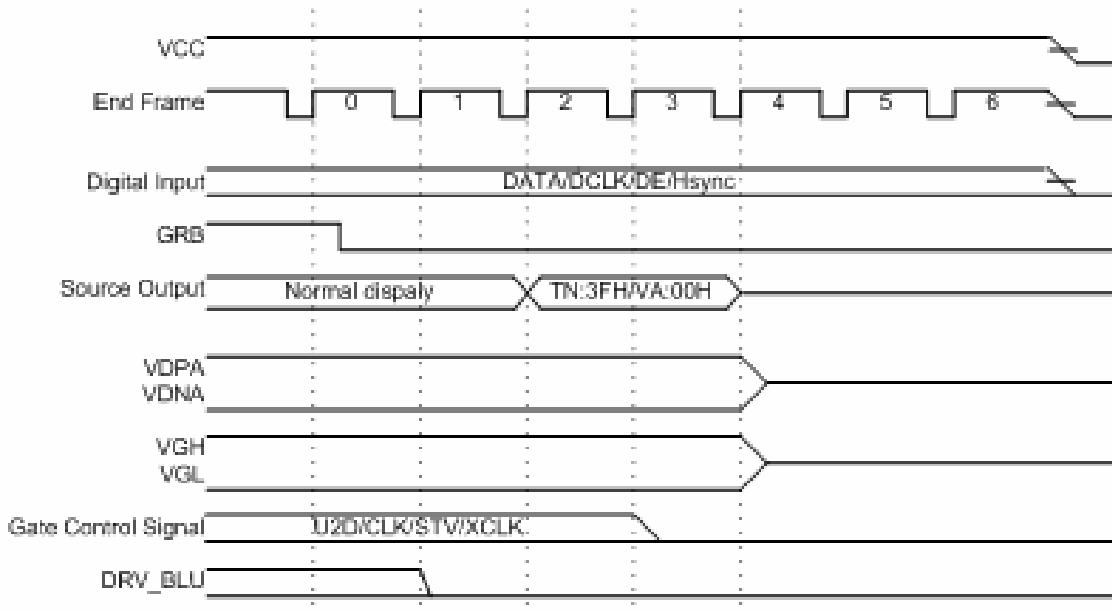
## 6. Power On/Off Characteristics

This IC may be damaged by a large current flow when an incorrect power sequence is applied. The recommended power-on sequence is to first connect the logical power (VCC&GND), then the analog and driver powers (PAVDD&NAVDD&AGND) and finally the references V1~14. When shutting off the power, the inverse sequence should be applied or all power should be turned off simultaneously.

### a. Recommended Power On Register Setting



### b. Recommended Power Off Sequence



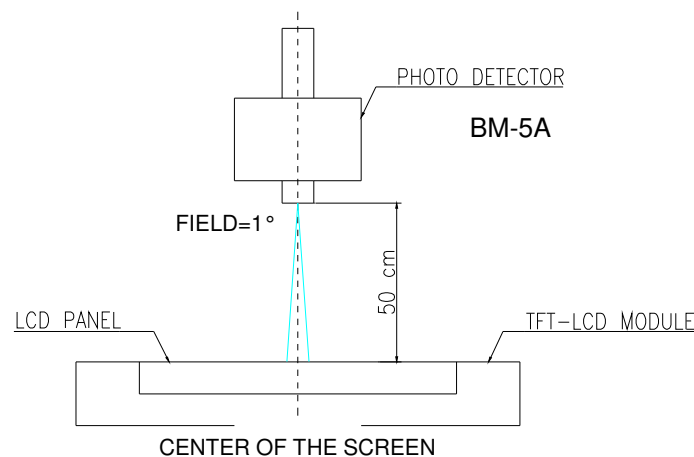
## D. Optical Specification

All optical specification is measured under typical condition (Note 1, 2)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time							
Rise	Tr	$\theta=0^\circ$	--	6	TBD	ms	Note 3
Fall	Tf		--	10	TBD	ms	
Contrast ratio	CR	At optimized viewing angle	300	400	--		Note 4
Viewing Angle							
Top			40	55	--		
Bottom		CR $\geq$ 10	55	70	--	deg.	Note 5
Left			55	70	--		
Right			55	70	--		
Brightness	$Y_L$	$\theta=0^\circ$	200	250	--	cd/m <sup>2</sup>	Note 6
Chromaticity							
White	X	$\theta=0^\circ$	0.26	0.31	0.36		
	Y	$\theta=0^\circ$	0.28	0.33	0.38		
Uniformity	$\Delta Y_L$	%	70	75	--	%	Note 7

Note 1: Ambient temperature =25℃, and LED lightbar current  $I_L = 160$  mA. To be measured in the dark room.

Note 2: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5A, after 15 minutes operation.

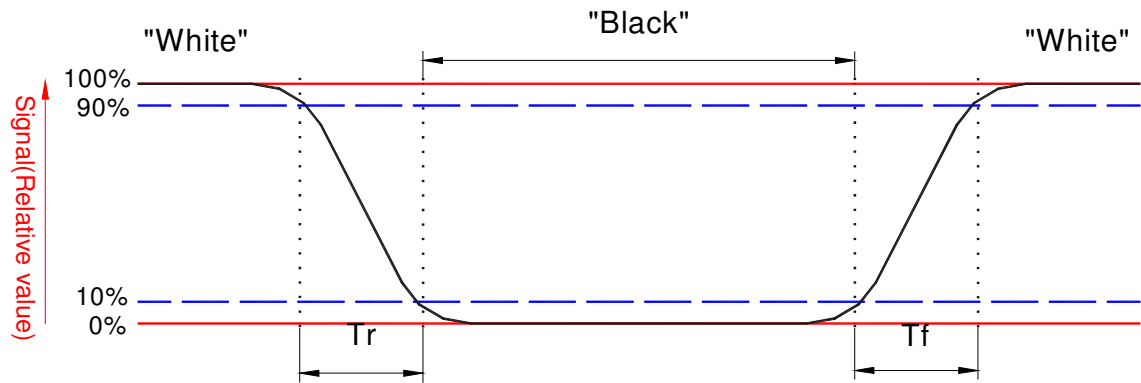


Note 3: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes.

Refer to figure as below.

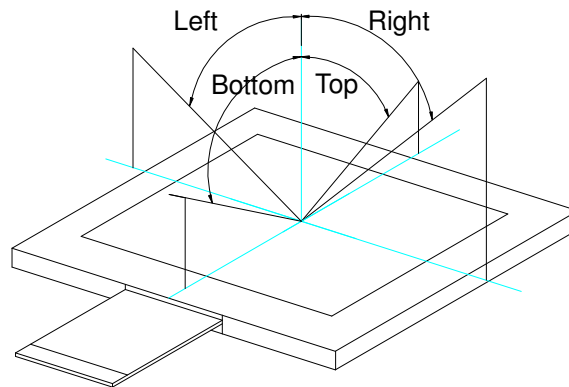


Note 4. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

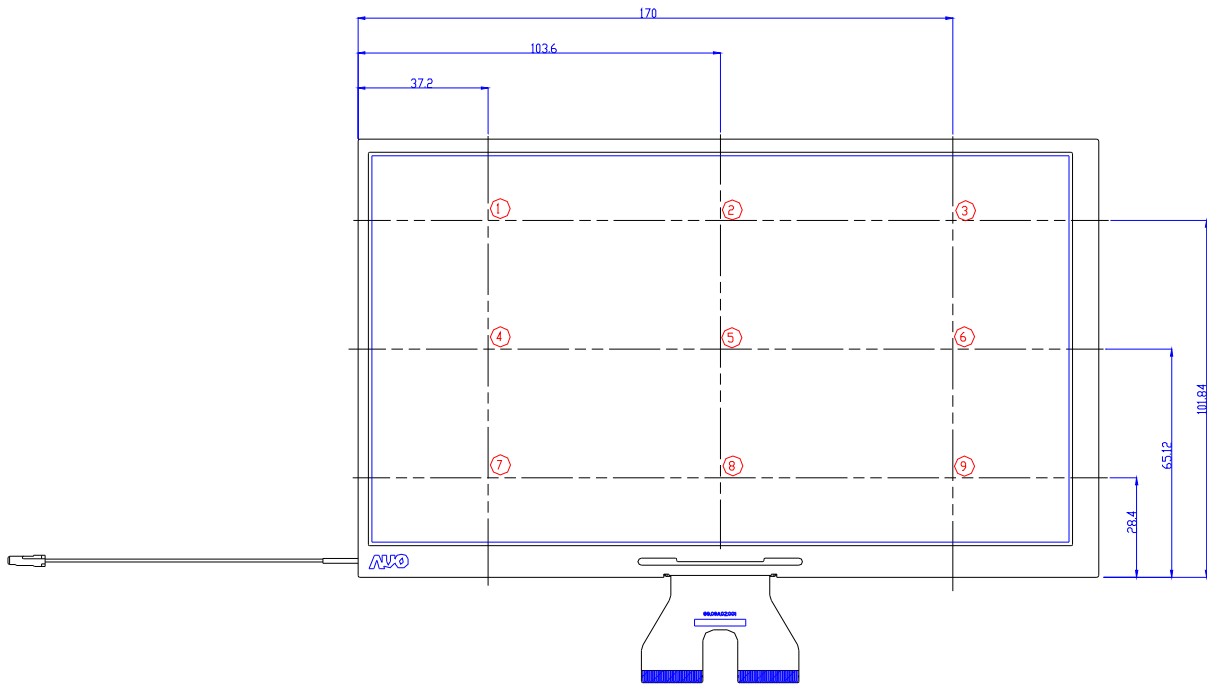
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" status}}{\text{Photo detector output when LCD is at "Black" status}}$$

Note 5. Definition of viewing angle,  $\theta$ , Refer to figure as below.



Note 6. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 7: Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

## E. Reliability Test Items

No.	Test items	Conditions	Remark
1	High Temperature Storage	Ta= 70□ 240Hrs	
2	Low Temperature Storage	Ta= -20□ 240Hrs	
3	High Ttemperature Operation	Tp= 60□ 240Hrs	
4	Low Temperature Operation	Ta= -10□ 240Hrs	
5	High Temperature & High Humidity	Tp= 50□. 80% RH 240Hrs	Operation
6	Heat Shock	-30℃/0.5hr~70℃/0.5hr, 50 cycle	Non-operation
7	Electrostatic Discharge	Contact = ± 4 kV, class B Air = ± 8 kV, class B	Note 4
8	Image Sticking	25□, 24hrs	Note 5
9	Vibration	Frequency range : 10~55Hz Stoke : 1.5mm Sweep : 10 Hz ~55 Hz 2 hours for each direction of X,Y,Z 4 hours for Y direction	Non-operation JIS C7021, A-10 condition A : 15 minutes
10	Mechanical Shock	100G . 6ms, ±X,±Y,±Z 3 times for each direction	Non-operation JIS C7021, A-7 condition C
11	Vibration (With Carton)	Random vibration: 0.015G <sup>2</sup> /Hz from 5~200Hz -6dB/Octave from 200~500Hz	IEC 68-34
12	Drop (With Carton)	Height: 100cm 1 corner, 3 edges, 6 surfaces	
13	Pressure	5kg, 5sec	Note 6


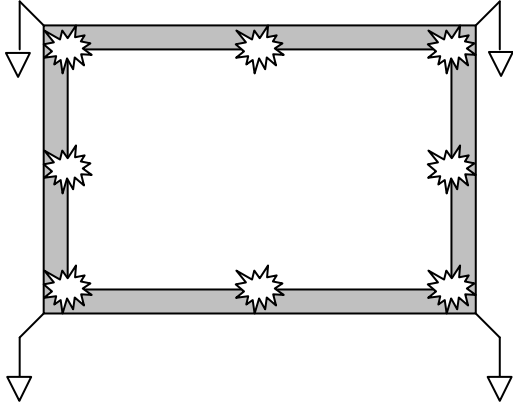
Note 1: Ta: Ambient Temperature. Tp: Panel Surface Temperature

Note 2: In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

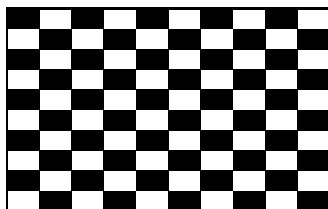
Note 3: All the cosmetic specification is judged before the reliability stress.

Note 4 : All test techniques follow IEC6100-4-2 standard.

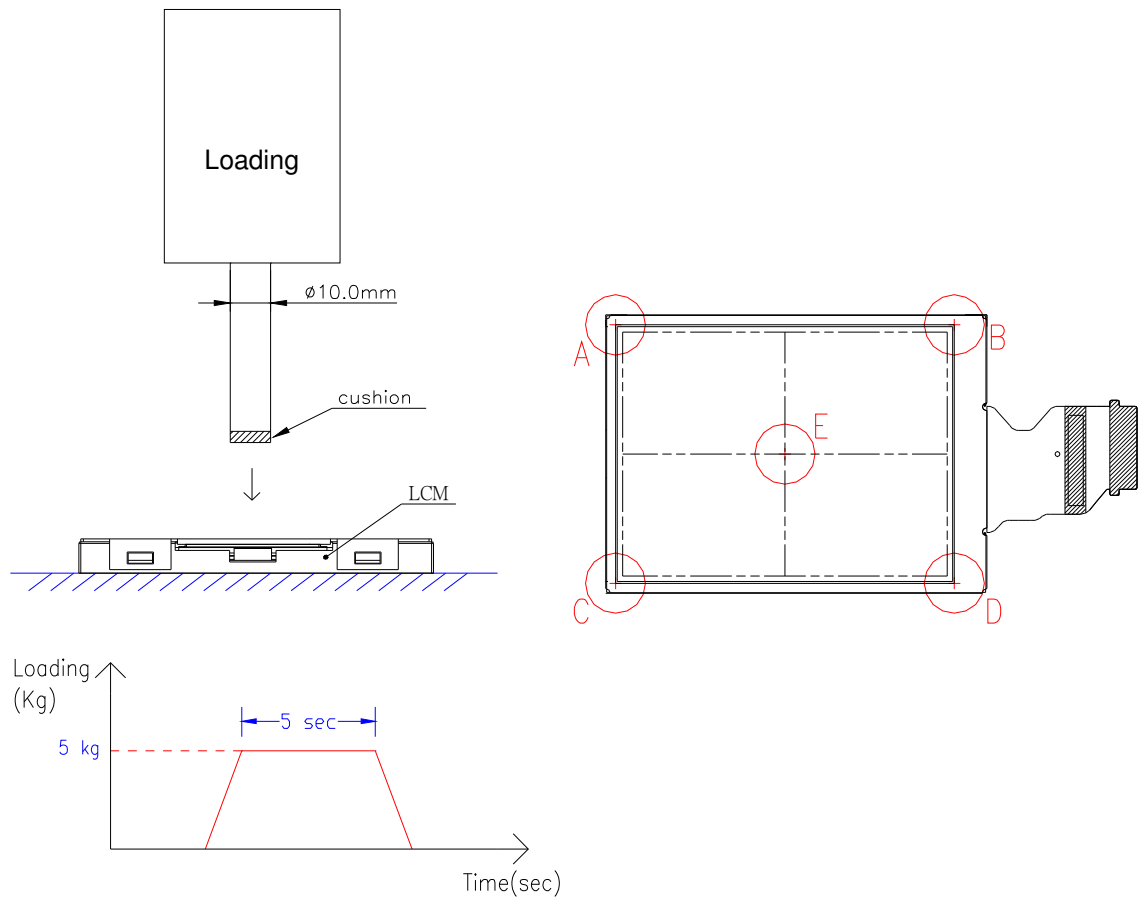


Test Condition		Note
Pattern		
Procedure And Set-up	<p>Contact Discharge : 330Ω, 150pF, 1sec, 8 point, 25times/point Air Discharge : 330Ω, 150pF, 1sec, 8 point, 25times/point</p> 	
Criteria	B – Some performance degradation allowed. No data lost. Self-recoverable hardware failure.	
Others	1. Gun to Panel Distance 2. No SPI command, keep default register settings.	

Note 5: Operate with chess board pattern as figure and lasting time and temperature as the conditions.  
Then judge with 50% gray level, the mura is less than JND 2.5

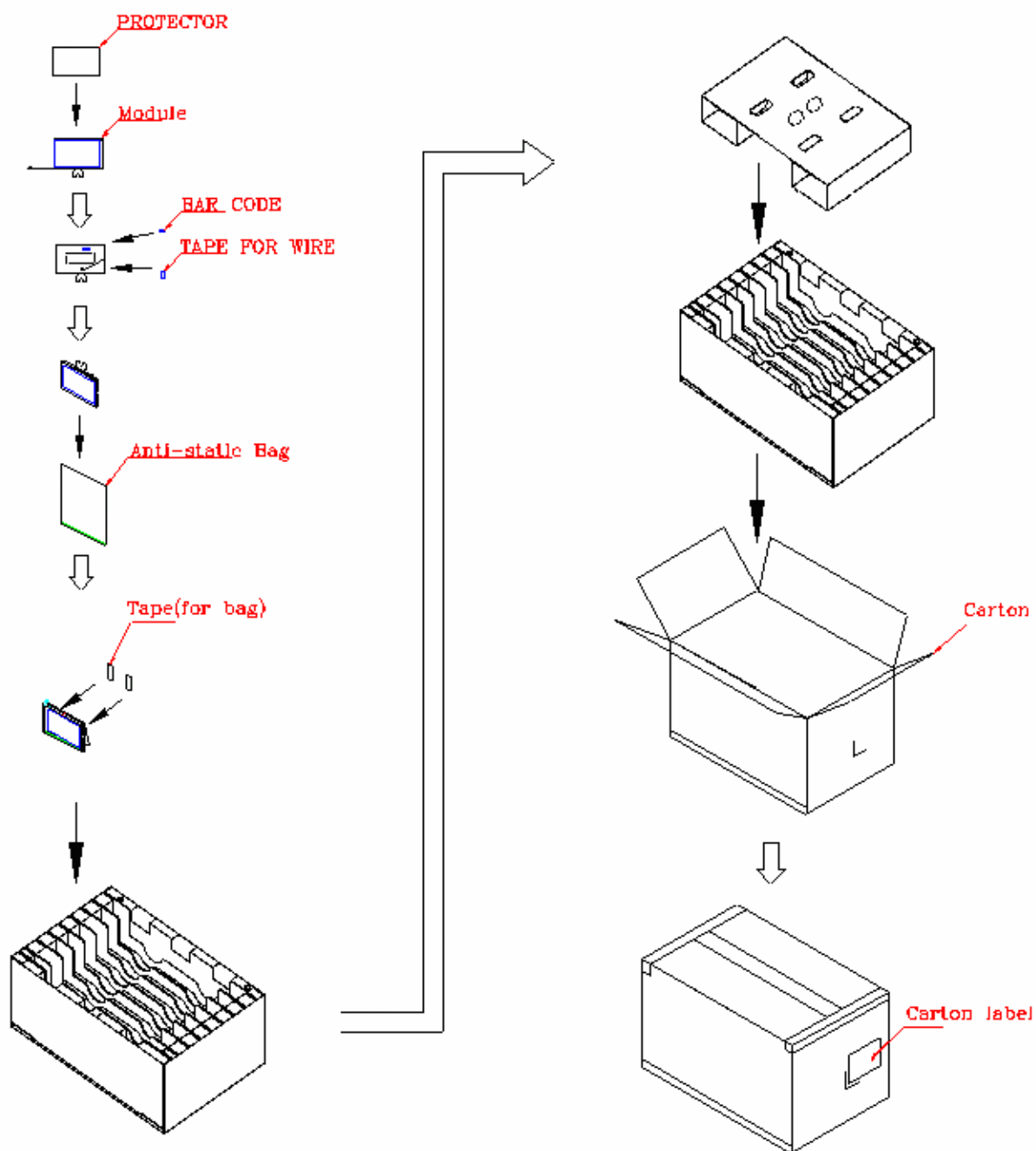


Note 6: The panel is tested as figure. The jig is  $\phi$  10 mm made by Cu with rubber and the loading speed is 3mm/min on position A~E. After the condition, no glass crack will be found and panel function check is OK.( no guarantee LC mura 、LC bubble)



## F. Packing and Marking

### 1. Packing Form



Max. Capacity: 30 Pcs Modules  
 Max. Weight: 90 Kg  
 Carton outline.: 520mm\*340mm\*250mm

## 2. Module/Panel Label Information

The module/panel (collectively called as the "Product") will be attached with a label of Shipping Number which represents the identification of the Product at a specific location. Refer to the Product outline drawing for detailed location and size of the label. The label is composed of a 22-digit serial number and printed with code 128 with the following definition:

ABCDEFGHIJKLMNOPQRSTUV

- For internal system usage and production serial numbers.
- AUO Module or Panel factory code, represents the final production factory to complete the Product
- Product version code, ranging from 0~9 or A~Z (for Version after 9)
- Week Code, the production week when the product is finished at its production process

Example:

501M06ZL06123456781Z05:

Product Manufacturing Week Code: WK50

Product Version: Version 1

Product Manufacturing Factory: M06

## 3. Carton Label Information

The packing carton will be attached with a carton label where packing Q'ty, AUO Model Name, AUO Part Number, Customer Part Number (Optional) and a series of Carton Number in 13 or 14 digits are printed. The Carton Number is appearing in the following format:

ABC-DEFG-HIJK-LMN

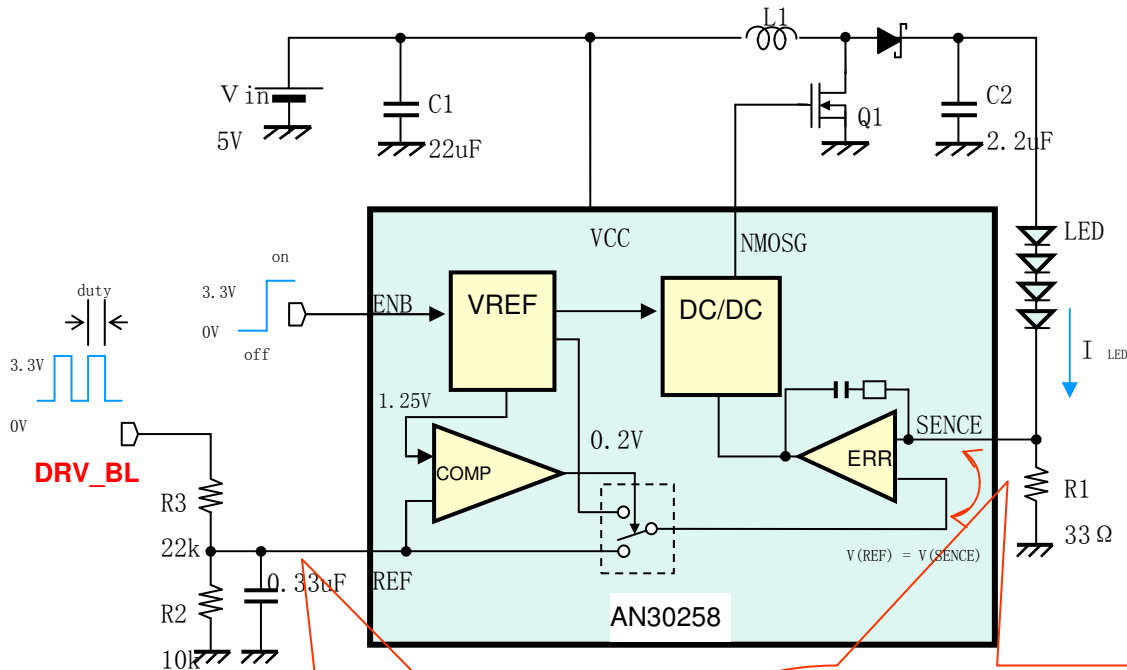
- DEFG appear after first "-" represents the packing date of the carton
- Date from 01 to 31
- Month, ranging from 1~9, A~C. A for Oct, B for Nov and C for Dec.
- A.D. year, ranging from 1~9 and 0. The single digit code represents the last number of the year

Refer to the drawing of packing format for the location and size of the carton label.

## G. Application Note

### 1. Content-based Automatic Backlight Control (CABC) reference circuit

It is used in a step-up DCDC converter that drives an external NMOS power transistor using a constant frequency PWM architecture. With 2 current modes (Dimmi Mode / Normal Mode) selectable.



Adjust  $V(\text{REF}) = 0\text{V} \sim 1\text{V}$  to change LED current.  
If you supply over 1.25V at this pin, COMP selects inner 0.2V mode.

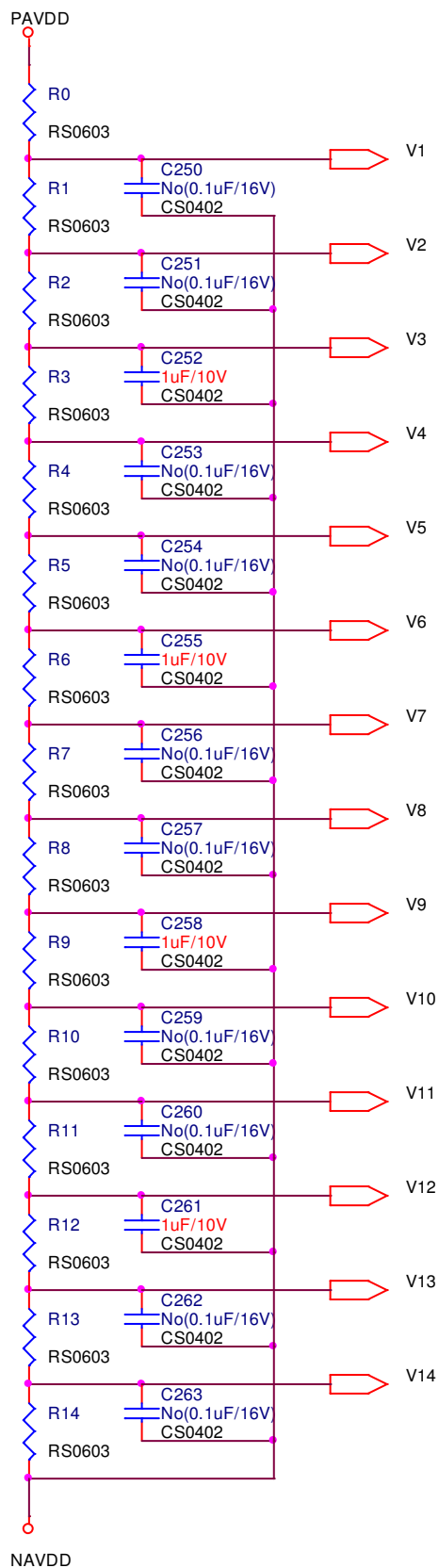
LED current ( $I_{\text{LED}}$ ) is decided by  $V(\text{SENSE})$  and  $R1$ ,  
 $I_{\text{LED}} = V(\text{SENSE}) / R1$   
And  $V(\text{SENSE}) \approx V(\text{REF})$   
So, LED current can be adjusted by  $V(\text{REF})$  that supplies by PWM signal.

## 2. Recommended Gamma Voltage

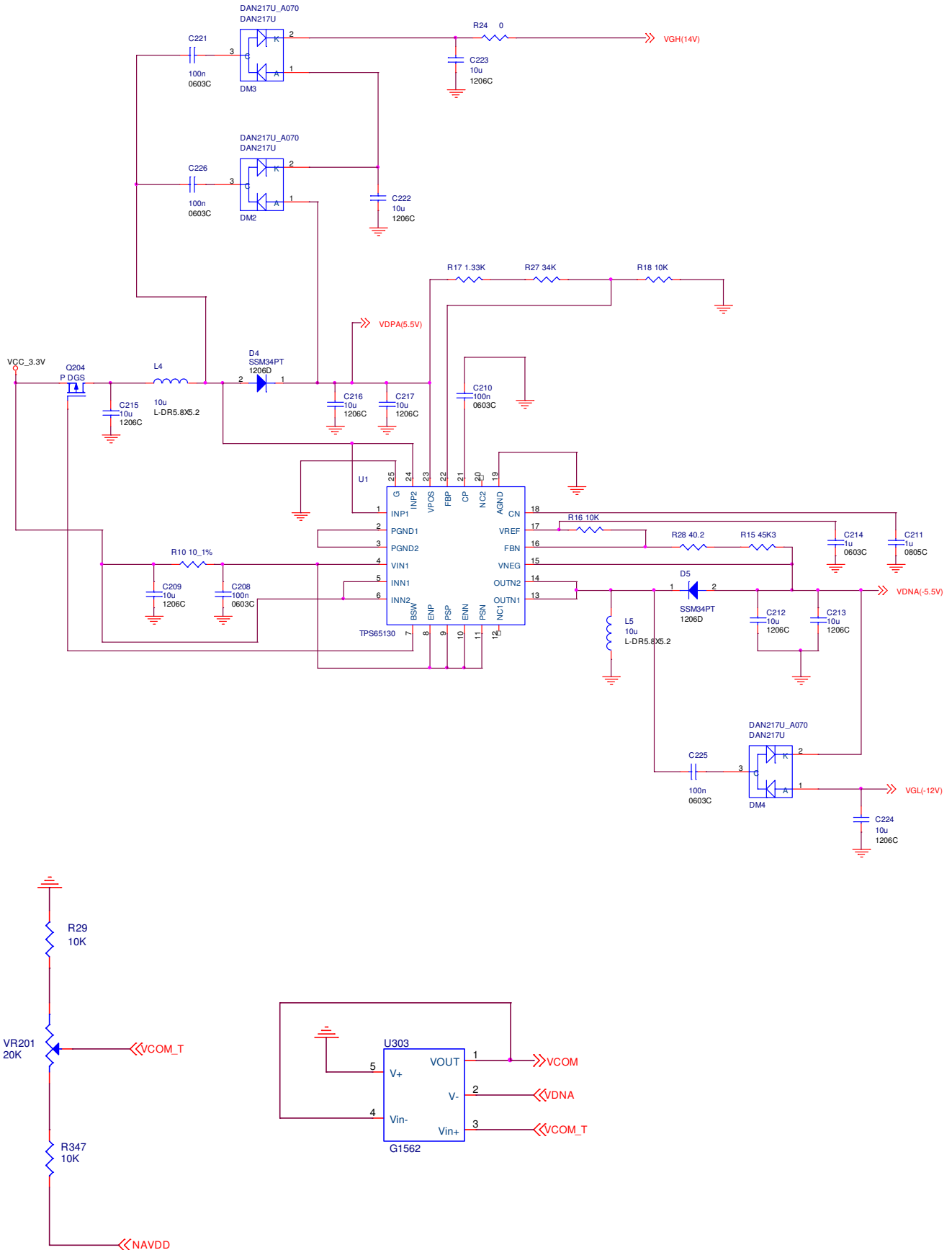
Symbol	Value (V)
V1	4.56
V2	4.44
V3	2.59
V4	2.15
V5	1.87
V6	1.48
V7	0.4
V8	0
V9	-1.27
V10	-1.99
V11	-2.43
V12	-2.98
V13	-4.78
V14	-5
PAVDD	5.173
NAVDD	-5.202
VCOM	-1.85

### Recommend resister value:

Symbol	Value (Ohm)
R0	2150
R1	412
R2	6490
R3	1540
R4	976
R5	1370
R6	3740
R7	1370
R8	4420
R9	2490
R10	1540
R11	1910
R12	6340
R13	768
R14	698



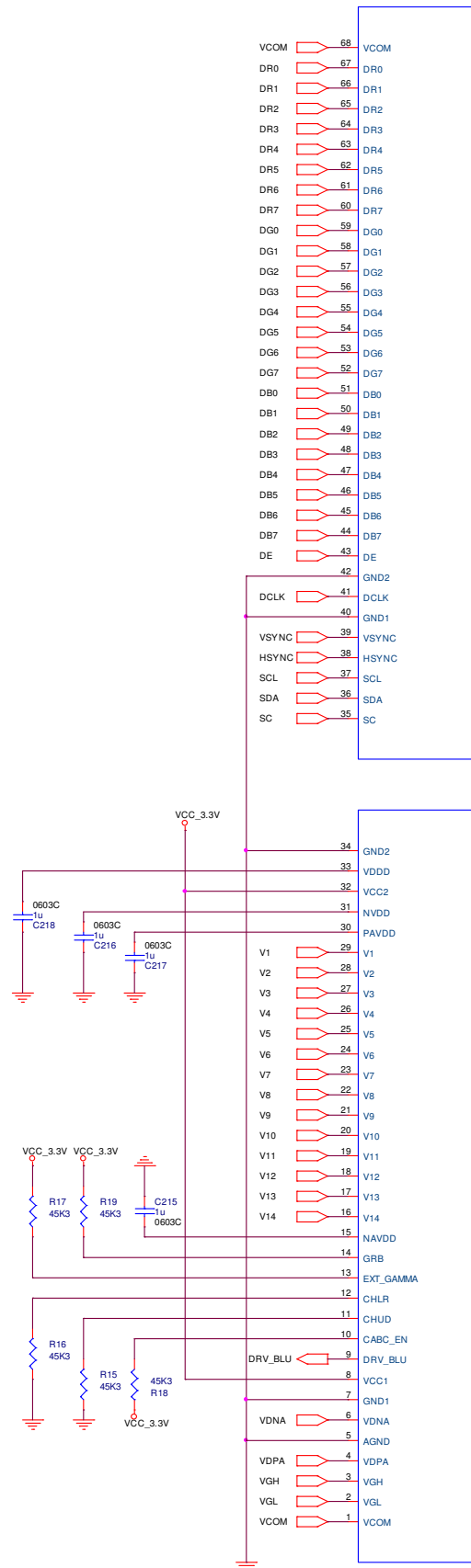
### 3. Application Circuit



**Default Setting:**

CABC_EN	<= "H"
CHUD	<= "L"
CHLR	<= "L"
EXT_GAMMA	<= "H"
GRB	<= "H"

**Note.**  
FCABC\_EN is "H", DRV\_BLU should be connected to LED Driver dimming control pin.





## H. Precautions

1. Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.
2. Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.
3. Avoid dust or oil mist during assembly.
4. Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.
5. Less EMI: it will be more safety and less noise.
6. Please operate module in suitable temperature. The response time & brightness will drift by different temperature.
7. Avoid to display the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.
8. Be sure to turn off the power when connecting or disconnecting the circuit.
9. Polarizer scratches easily, please handle it carefully.
10. Display surface never likes dirt or stains.
11. A dewdrop may lead to destruction. Please wipe off any moisture before using module.
12. Sudden temperature changes cause condensation, and it will cause polarizer damaged.
13. High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.
14. Acetic acid or chlorine compounds are not friends with TFT display module.
15. Static electricity will damage the module, please do not touch the module without any grounded device.
16. Do not disassemble and reassemble the module by self.
17. Be careful do not touch the rear side directly.
18. No strong vibration or shock. It will cause module broken.
19. Storage the modules in suitable environment with regular packing.
20. Be careful of injury from a broken display module.
21. Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the display non-uniformity or other function issue.