

GRAPHIC TYPE LCD MODULE

SN016IVL01

PRODUCT SPECIFICATIONS

CAUTION

The product described by these specifications is designed to be used with ordinary electronic equipment or devices, such as audio/video equipment, office-automation equipment, communication devices, and other. Should you intend to use this product with equipment or devices that could endanger or affect human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers, and all other safety devices and equipment), please be sure to consult our sales representatives in advance.

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1.0 COMPOSITION

SUB:

Display type (Color): [96(R.G.B) × 64 Dots Matrix LCD Module]

Driving method (Color): [1/68 Duty, 1/9 Bias]

View Direction (Color): [6 O' clock]

Backlight (Color): [LED B/L White]

MAIN:

Display type (Color): [128(R.G.B) × 160 Dots Matrix LCD Module]

Driving method (Color): [1/160 Duty, 1/6Bias]

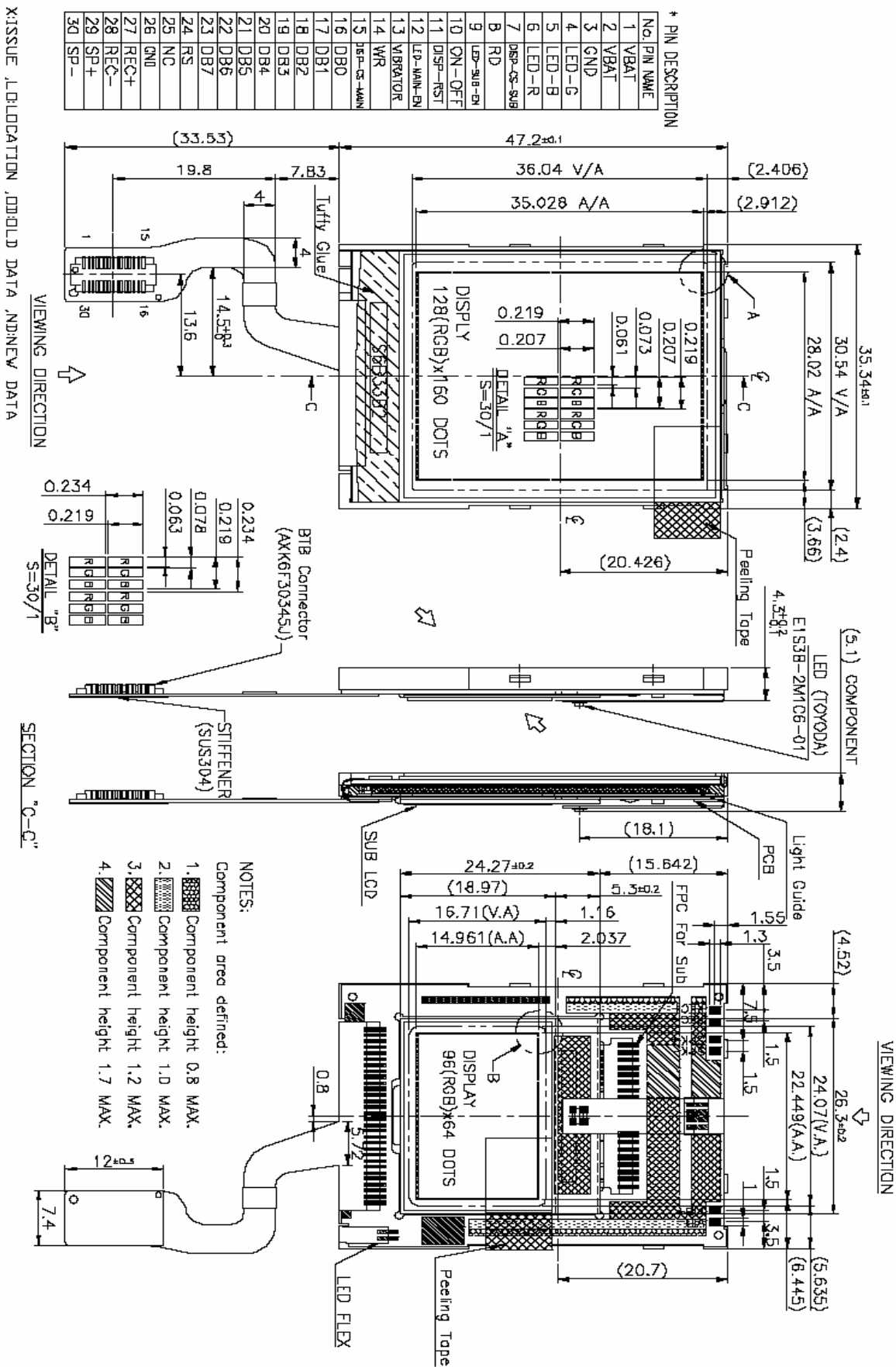
View Direction (Color): [6 O' clock]

Backlight (Color): [LED B/L White]

2.0 MECHANICAL SPECIFICATIONS

ITEM	STANDARD VALUES	UNITS
LCD type(Sub)	CSTN	
LCD type(Main)	CSTN	
Dot arrangement(Sub)	96(R.G.B) × 64	dots
Dot arrangement(Main)	128(R.G.B) × 160	dots
Module size	35.34 (W) × 80.73 (H) × 5.1 (D)	mm
View area(Sub)	24.07 (W) × 16.71(H)	mm
View area(Main)	30.54 (W) × 36.04 (H)	mm
Active area(Sub)	22.449 (W) × 14.961 (H)	mm
Active area(Main)	28.02 (W) × 35.028 (H)	mm
Dot size(Sub)	0.063 (W) × 0.219 (H)	mm
Dot size(Main)	0.061 (W) × 0.207 (H)	mm
Dot pitch(Sub)	0.078 (W) × 0.234 (H)	mm
Dot pitch(Main)	0.073 (W) × 0.219 (H)	mm
Viewing direction(Sub)	6 O' clock	
Viewing direction (Main)	6 O' clock	

3.0 DIMENSIONAL DIAGRAM



4.0 OPTICAL CHARACTERISTICS

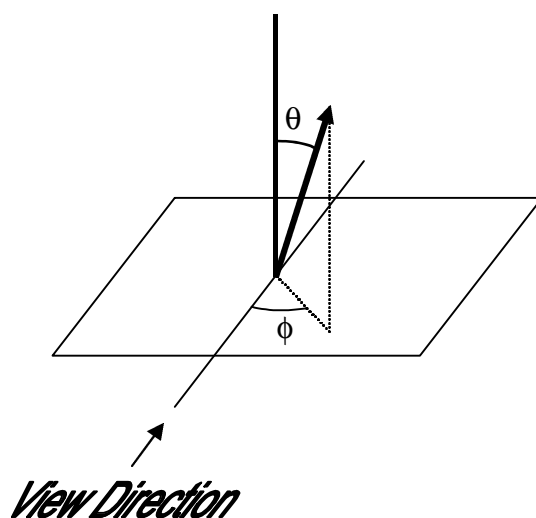
4.1 SUB LCD

ITEM	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
LCD operation voltage	Vop	T _a =25 °C		9.7	10	10.3	V
Viewing angle	θ	φ = 0°	T _a = 25 °C C _r ≥ 2.0	—	30	—	Deg
		φ = 180°		—	35	—	
		φ = 90°		—	40	—	
		φ = 270°		—	40	—	
Contrast Ratio	C _r (MAX)	T _a = 25 °C		20	30	—	
Response Time	T _R	T _a =25 °C		—	150	225	ms
	T _F			—	190	285	
Frame Frequency	F _{FLM}	—		—	80	—	Hz
Chromaticity of the color filter	White	x	θ = φ = 0°	—	0.299	—	
		y		—	0.326	—	
	Red	x	θ = φ = 0°	—	0.473	—	
		y		—	0.311	—	
	Green	x	θ = φ = 0°	—	0.314	—	
		y		—	0.489	—	
	Blue	x	θ = φ = 0°	—	0.180	—	
		y		—	0.180	—	
TRANSMITTANCE	T%			—	7.14	—	%

4.2 MAIN LCD

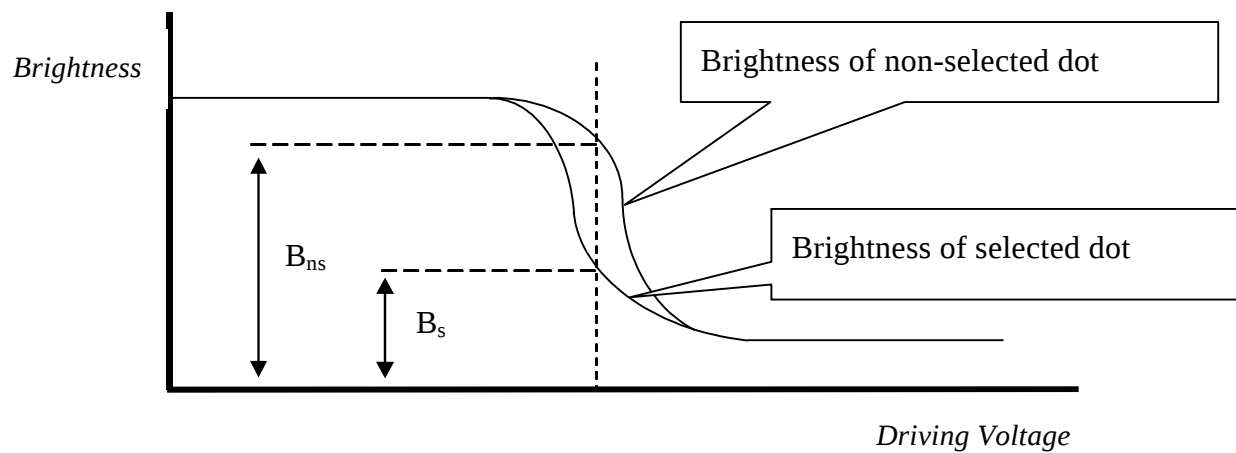
ITEM	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
LCD operation voltage	Vop	T _a =25 °C		9.7	10.0	10.3	V
Viewing angle	θ	φ = 0°	T _a = 25 °C C _r ≥ 2.0	—	40	—	Deg
		φ = 180°		—	30	—	
		φ = 90°		—	45	—	
		φ = 270°		—	50	—	
Contrast Ratio	C _r (MAX)	T _a = 25 °C		20	35	—	
Response Time	T _R	T _a =25 °C		—	90	135	ms
	T _F			—	110	165	
Frame Frequency	F _{FLM}	—		—	80	—	Hz
Chromaticity of the color filter	White	x	θ = φ = 0°	—	0.284	—	
		y		—	0.313	—	
	Red	x	θ = φ = 0°	—	0.473	—	
		y		—	0.299	—	
	Green	x	θ = φ = 0°	—	0.314	—	
		y		—	0.473	—	
	Blue	x	θ = φ = 0°	—	0.176	—	
		y		—	0.164	—	
TRANSMITTANCE	T%			—	5.91	—	%

4.3 θ and ϕ



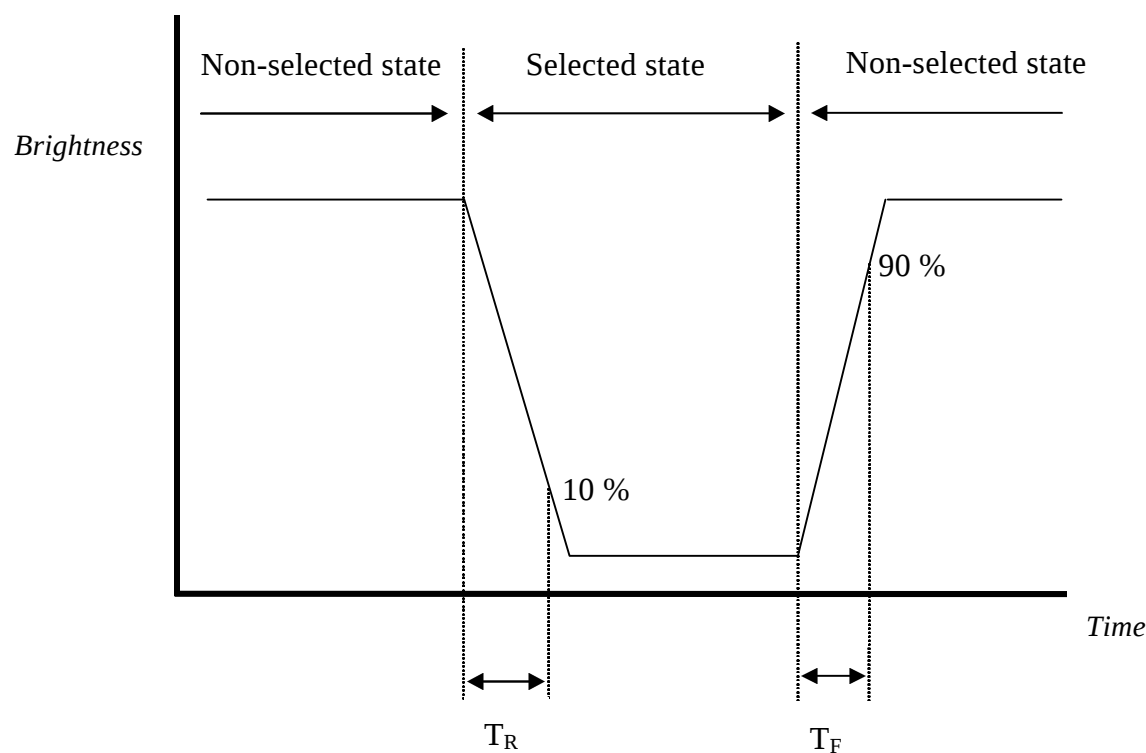
- The contrast of the display is optimal when viewed in the “View Direction” ($\phi = 0^\circ$).
- $0^\circ \leq \theta < 90^\circ$, $0^\circ \leq \phi < 360^\circ$

4.4 Contrast ratio Cr

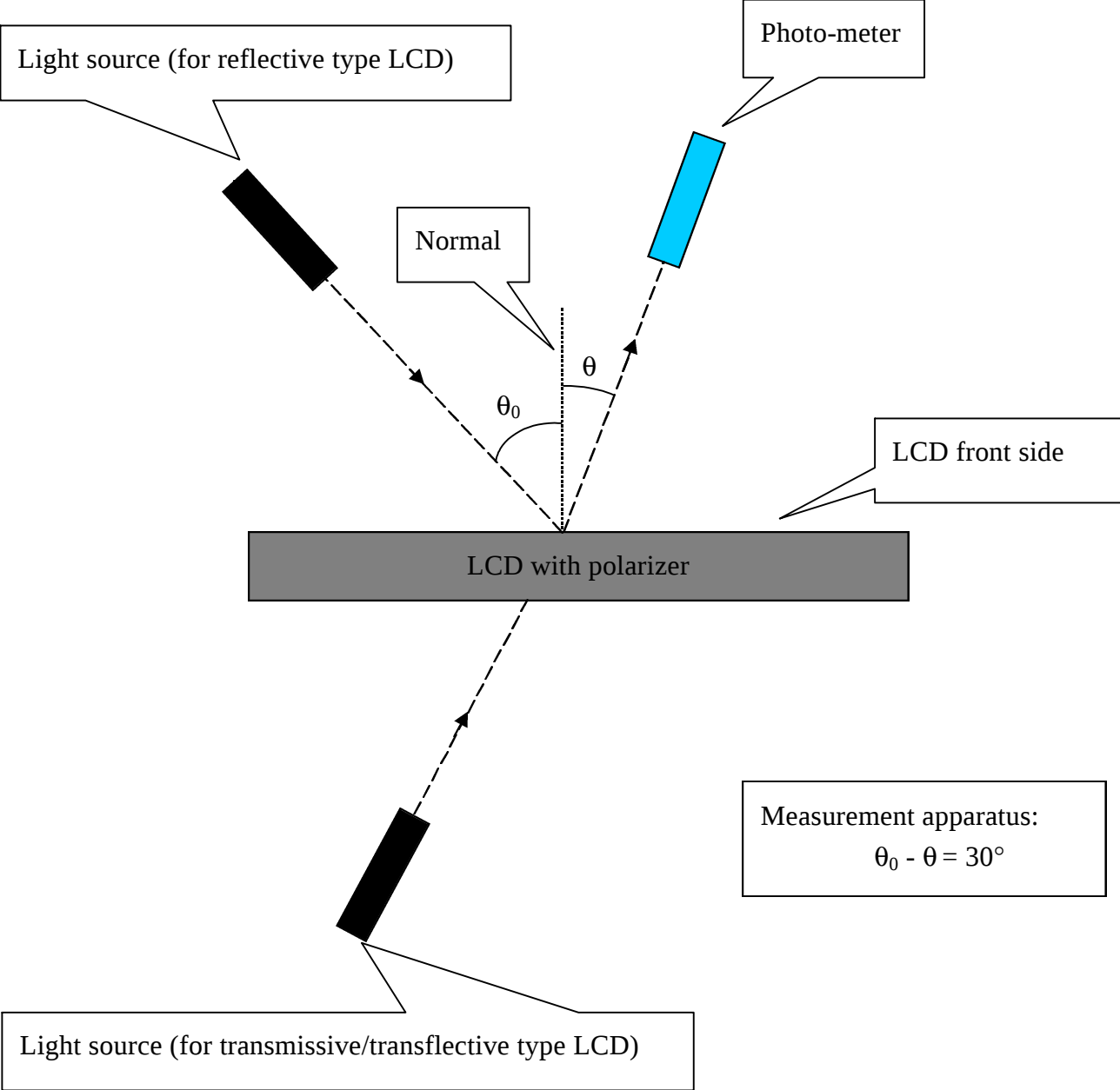


$$\text{Contrast Ratio: } C_r = B_{ns} / B_s$$

4.5 Response times T_R and T_F



4.6 Optical measurement system



5.0 ELECTRICAL Characteristics

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Power-supply voltage for LCD		Main V_{LCD}	$T_a = 25$	---	10	---	V
		Sub V_{LCD}		---	10	---	
		$V_{DD_}$		3.2	3.3	3.4	
Input voltage for LCD		V_{IH}	$V_{DD_P} = 3.3\text{ V}$	$0.8 \times V_{DD}$	—	V_{DD}	V
		V_{IL}		V_{SS}	—	$0.2 \times V_{DD}$	
Supply current for LCM		I_{BA}	$V_{BA_} = 3.3\text{V}$	—	100	200	mA
LCM	Center Surface Luminance	Pixel all on $T_a = 25\text{ }^{\circ}\text{C}$	MAIN	80	120	—	Cd/m^2
			SUB	80	100	—	

***The supply voltage for VLCD has to be adjusted by software**

6.0 B/L Characteristics

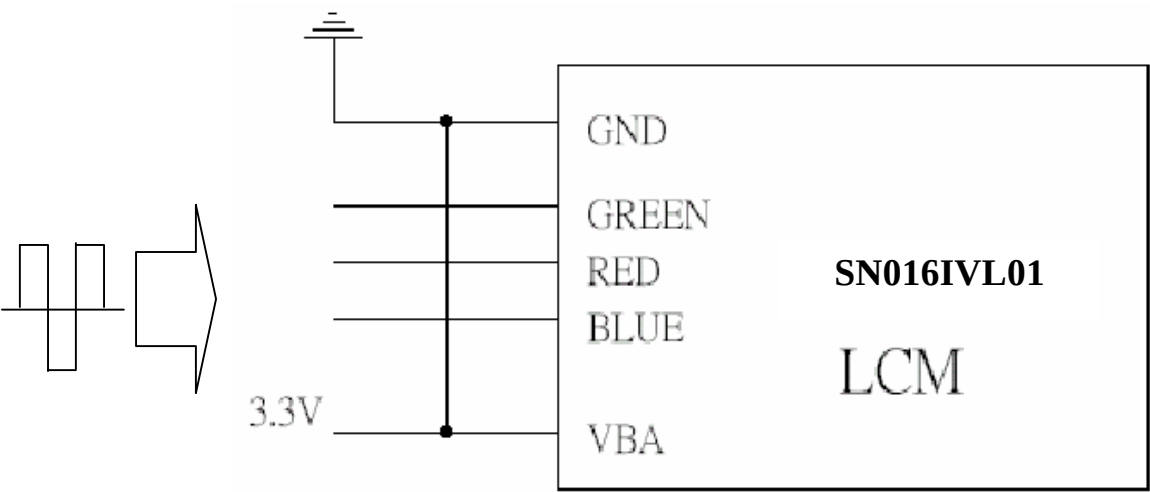
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	CONDITION
Lamp Voltage	V_L	-	3.5	-	V_{rms}	1 LED $T_a = 25\text{ }^{\circ}\text{C}$
Lamp Current	I_L	-	20	-	mA_{rms}	
Power consumption	P_L	-	70	-	mW	
LED Chromaticity coordinates	White ($x=0.305\pm0.06, y=0.320\pm0.05$)					

3 LEDs in series of B/L module.

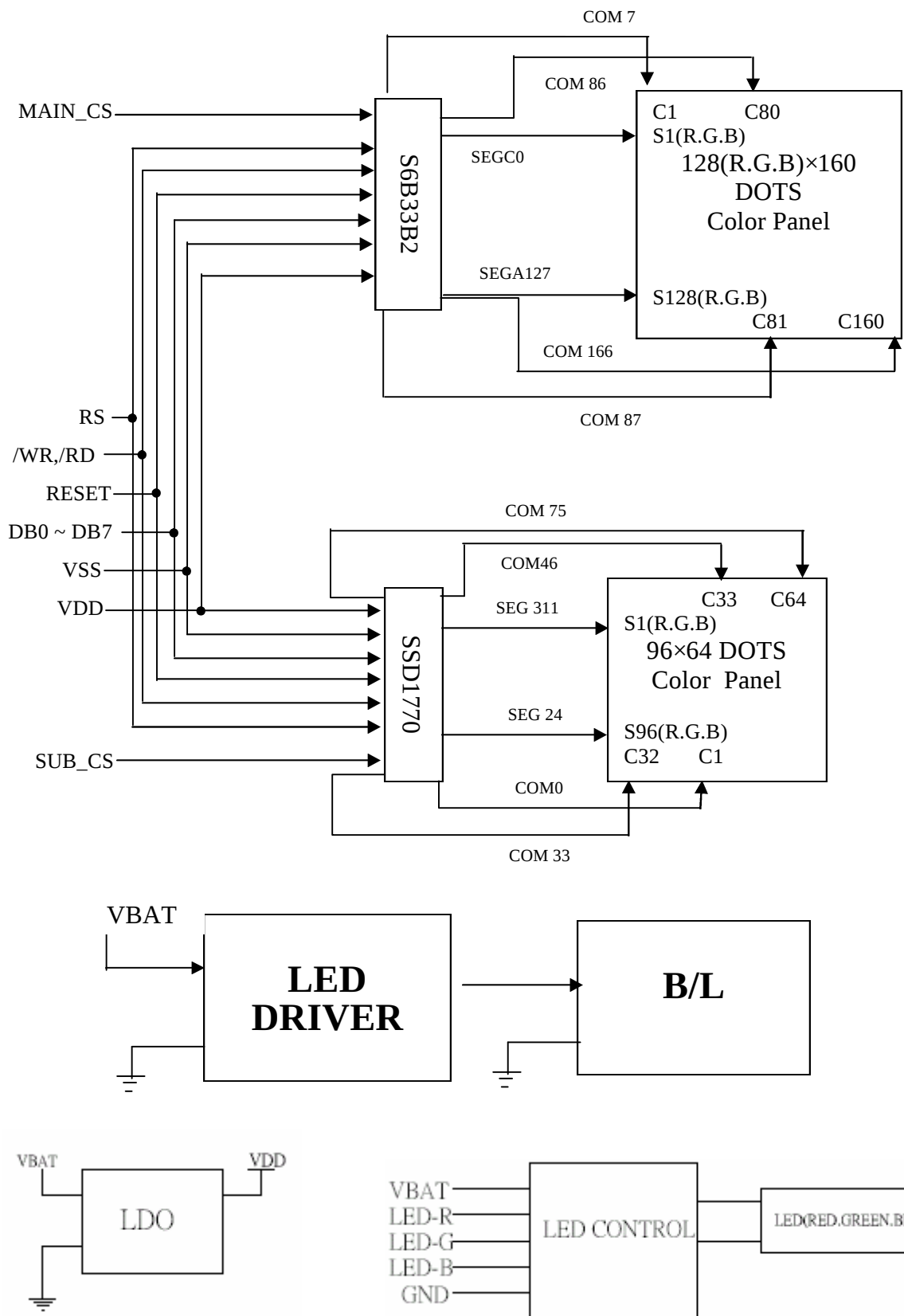
7.0 INTERFACE PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1-2	VBAT	Power supply pin
3	GND	Ground pin
4	LED-G	Indication LED (GREEN) ON
5	LED-B	Indication LED (BLUE) ON
6	LED-R	Indication LED (RED) ON
7	DISP-CS-SUB	SUB chip selection input pin: Active “L”.
8	RD	E is read enable clock input pin. When E=“L”, DB0~DB7 are in output status.
9	LED-SUB-EN	LED backlight enable pin. When “H” the LED back light is turned on.
10	ON_OFF	LDO ON/OFF
11	DISP-RST	Chip reset signal input pin: Active “L”
12	LED-MAIN-EN	LED backlight enable pin. When “H” the LED back light is turned on.
13	VIBRTOR	Motor control pin
14	WR	WR is write enable clock input pin. DB0~DB7 are latched at the rising edge of the RW signal
15	DISP-CS-MAIN	Main LCD chip selection input pin: Active “L”
16-23	DB0-DB7	8-bits Bi-directional data bus.
24	RS	Read enable clock input pin.
25	NC	Not used
26	GND	Ground pin.
27	REC+	Connect to REC.
28	REC-	Connect to REC.
29	SPK+	Connect to speaker.
30	SPK-	Connect to speaker.

8.0 POWER SUPPLY CIRCUIT DIAGRAM



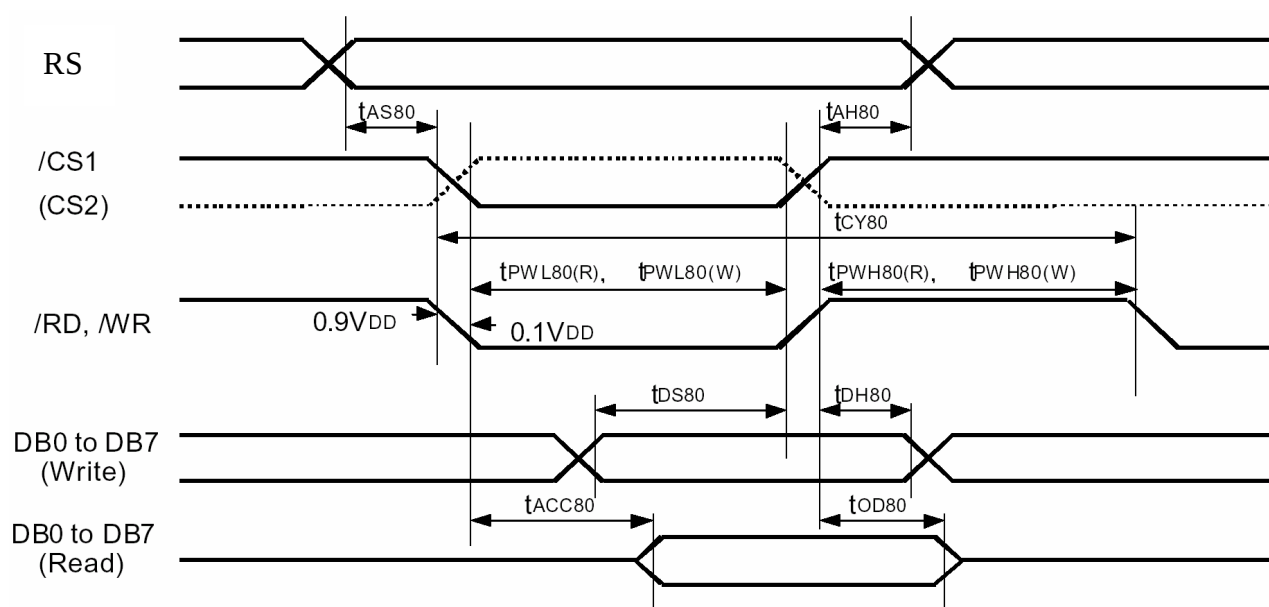
9.0 BLOCK DIAGRAM



10.0 AC CHARACTERISTICS

10.1 Read / Write Characteristics (8080-series MPU)

(1) Main LCD



** $t_{PWL80(W)}$ and $t_{PWL80(R)}$ is specified in the overlapped period when CS1B is low (CS2 is high) and $/WR(/RD)$ is low.

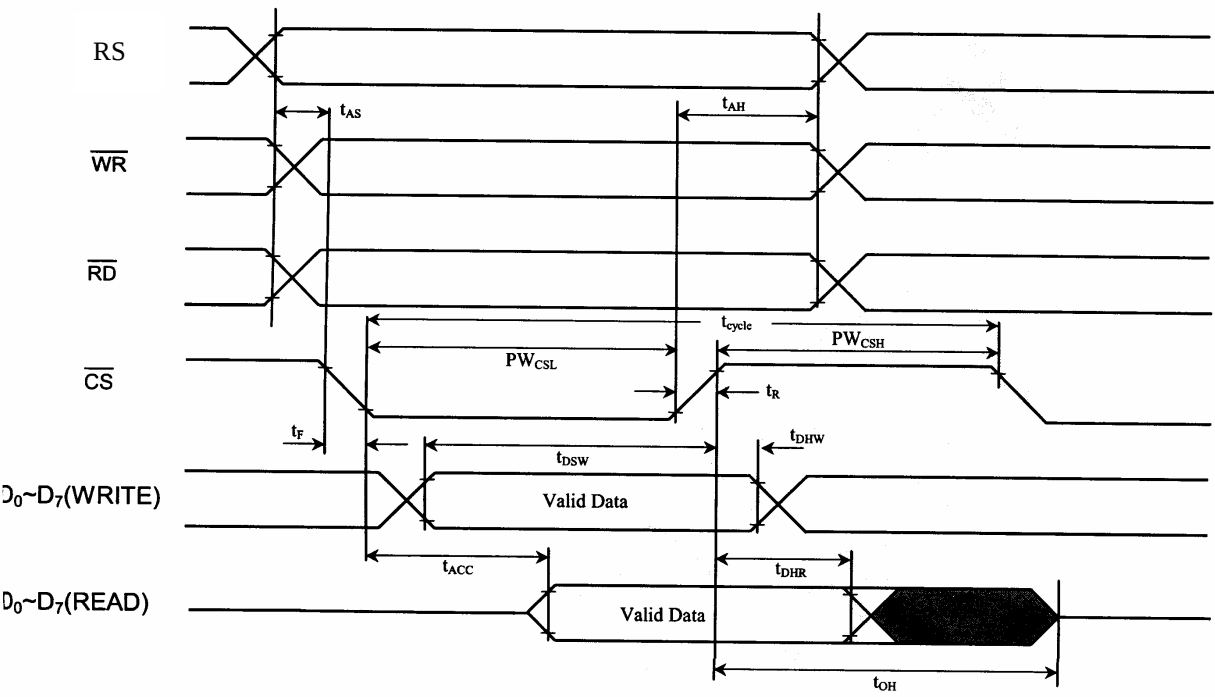
Item	Signal	Symbol	Condition	Min.		Max. (3.3V/1.8V)	Unit
				3.3V	1.8V		
Address setup time Address hold time	RS	t _{AS80} t _{AH80}		0 0	0 0	- -	ns
System cycle time			t _{CY80}		150	360	
Pulse width low for write Pulse width High for write	WRB (WRB)	t _{PWLW} t _{PWHW}		50 30	100 75	- -	ns
Pulse width low for read Pulse width high for read	RDB (RDB)	t _{PWLR} t _{PWHR}		50 30	100 75	- -	
Data setup time Data hold time	DB0 to DB15	t _{DS80} t _{DH80}		5 8	10 14	- -	ns
Read access time Output disable time		t _{ACC80} t _{OD80}	CL = 100 pF	-		60 / 120	
				t _{EWHR}			

NOTE: *1. The input signal rise time and fall time (t_r , t_f) is specified at 10 ns or less.

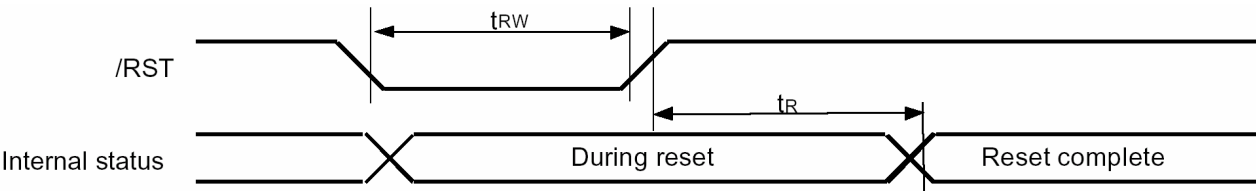
$(t_r + t_f) < (t_{CY80} - t_{PWLW} - t_{PWHW})$ for write, $(t_r + t_f) < (t_{CY80} - t_{PWL R} - t_{PWH R})$ for read

(2)SUB LCD

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	500	-	-	ns
t_{AS}	Address Setup Time	15	-	-	ns
t_{AH}	Address Hold Time	10	-	-	ns
t_{DSW}	Data Setup Time	10	-	-	ns
t_{DHW}	Data Hold Time	20	-	-	ns
t_{ACC}	Data Access Time	15	-	170	ns
t_{OH}	Output Hold time	20	-	60	ns



10.2 Reset Input Timing



Item	Signal	Symbol	Condition	Min.	Max.	Unit
Reset low pulse width	RSTB	t_{RW}		1000	-	ns
Reset time	-	t_R		-	1000	ns

11.0 MAXIMUM ABSOLUTE VALUES

ITEM	SYMBOL	MIN	MAX	UNITS
Operating temperature	T _{OP}	-20	+70	
Storage temperature	T _{ST}	-30	+80	
Supply voltage for logic	V _{DD}	-0.3	+4.0	V
For MAIN drive	V _{OUT}	-0.3	+15	V
For SUB drive	V _{OUT}	-0.3	+22	V
LCD input driving	V _I	-0.3	V _{DD} +0.3	V

12.0 RELIABILITY

ITEM	CONDITIONS	CRITERIA
High temperature operation	70 °C for 200 hours	◆ No defect in cosmetic and operational functions. ◆ Total current consumption below double of initial value.
Low temperature operation	-20 °C for 200 hours	
High humidity storage	40 °C, 90 % RH for 240 hours	
High temperature storage	80 °C for 200 hours	
Low temperature storage	-30 °C for 200 hours	
Temperature cycling	-30 °C (30 min) ↓↑ 25 °C (5 min) ↓↑ 80 °C (30 min) CYCLES: 10	
Vibration	Random Wave: 40~500 Hz Acceleration: 5g Each Direction (x, y, z): 50 sec	

13.0 COSMETIC CRITERIA

DEFECT	JUDGMENT CRITERION	
Spots	Size d(mm)	Acceptable quantity in active area
	d ≤ 0.1	Disregard
	0.1 < d ≤ 0.2	6
	0.2 < d ≤ 0.3	2
	d > 0.3	0
Note: d = (Length + Width)/2		
Polarizer Bubbles	Size d(mm)	Acceptable quantity in active area
	d ≤ 0.3	Disregard
	0.3 < d ≤ 1.0	3
	1.0 < d ≤ 1.5	1
	d > 1.5	0
Note: d = (Length + Width)/2		
Lines	Width W (mm) Length L (mm)	Acceptable quantity in active area
	W ≤ 0.02	Disregard
	0.02 < W ≤ 0.05	L ≤ 5.0
		L > 5.0
	0.05 < W ≤ 0.1	L ≤ 2.0
		L > 2.0
	W > 0.1	See criteria for Spots
Testing conditions: 20W fluorescent lamp at 30 cm distance at normal viewing angle		

14.0 PRECAUTIONS

14.1 Static charge

Since this LCD module contains CMOS LSIs that are sensitive to static charge, care must be taken when handling it.

14.2 Power on sequence

1. Input signals should not be applied to the LCD module before the logic system voltage has reached the specified voltage. If the above sequence is not kept the LCD module might be permanently damaged.
2. When connecting the power supply, connect the LCD bias voltage *after* connecting the logic system voltage.
3. When disconnecting the power supply, disconnect the logic system voltage *after* the LCD bias voltage.
4. It is recommended to connect a serial resistor or fuse to the LCD bias power supply of the system, as a current limiter. The value of the resistor depends on the kind of LCD used, but is typically 50 ~ 100 Ω .

14.3 Operation

1. It is essential to drive the LCD within the specified voltage limits, since a higher driving voltage than allowed causes a shorter LCD lifetime. Under these circumstances, electrochemical reactions will result in undesirable deterioration of the LCD.
2. The response time of the LC fluid is considerably longer at low temperatures than in the normal operating temperature range. On the other hand, the LCD will show a dark blue color at high temperatures. Those phenomena do not indicate a malfunction or defect of the LCD. Back at normal temperatures, the LCD will return to its original behavior.
3. If the display area is pressed hard during operation, some abnormal display patterns might appear. However, the display will resume normal operation after turning the module off and on.
4. Moisture on the terminals could cause an electrochemical reaction resulting in an open terminal connection. If the environmental temperature is higher than 40 °C, it is required that the relative humidity is 50% or less.

14.4 Packaging

1. Do not leave the product in a place of high humidity for a long period. For storage in a location where the temperature is 35 °C or higher, special care to protect the product from high humidity is required. A combination of high temperature and high humidity may cause polarization degradation and damage as well. Please keep the temperature and humidity within the specified range for storing.

2. Since LCD panels tend to be easily damaged, they should be handled with full care. Avoid any contact with materials that have a hardness of more than 2H.
3. Adhesives used for adhering upper/lower polarizers and aluminum plates are made of organic substances that will deteriorate by chemical reactions with for example chemicals such as acetone, toluene, ethanol, and isopropylalcohol. Please prevent the use of these chemicals and contact us when it is necessary for you to use other chemicals.
4. Immediately wipe off saliva or water drops from the display area with an absorbent cotton cloth, without scrubbing it. If adhered for a long period, such particles might cause deformation or faded color.
5. Moisture deposited on the display surface and contact terminals due to low temperatures will be a cause for polarizer damage, stains, and dirt. Before use, such panels should be slowly warmed up to a temperature that is higher than room temperature.
6. Touching the display area and contact terminals with bare hands is harmful to polarizer and may lead to poor insulation at the terminals.
7. The glass is fragile and can be cracked or chipped easily by handling, in particular on near its edge. Please prevent sudden shocks or exposing the glass to other sorts of stress.

14.5 Long-term storage

For long-term storage the following methods are highly recommended:

1. Store the product in a polyethylene bag with a sealed opening to prevent fresh air entering from the outside. Placing it with a desiccant is not necessary.
2. Store the product in a dark place, with the temperature in the range from 0 to 35 .
3. Keep the sensitive polarizer surface of the LCD panels clear of any contact. We recommend using the container that was used by Picvue to deliver the products.

14.6 Cleaning of the product

To clean the product make sure to use absorbent cotton cloth or other soft material like chamois. Make sure to rub it gently, and do not use chemicals when cleaning.

15.0 FINAL REMARKS

1. The above specifications are the binding criteria for Picvue's outgoing quality inspection.
2. The customer is kindly requested to inform Picvue as soon as possible on any questions, remarks, and disagreements regarding these specifications.
3. Picvue is not responsible for damage to its products due to neglect of the precautions as described in the previous chapter.

APPENDIX—

REVISION RECORD

REV	REVISION ITEM	DATE
NEW	—	JUN.25.2004
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		
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M		