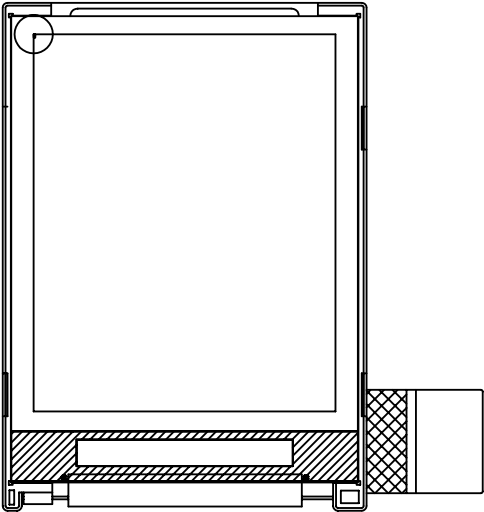




PRODUCT SPECIFICATION

HDA200

176 x 220 TFT COLOR GRAPHICS  
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV:	HDA200	SHEET 1 OF 15
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# 1. MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	HDA200	—
2	Module Size	38.18 (W) x 53.32 (H) x 4.2 Max. (D)	mm
3	Dot Size	0.05 (W) x 0.17 (H)	mm
4	Dot Pitch	0.06 (W) x 0.18 (H)	mm
5	Active Area	31.68 (W) x 39.6 (H)	Dot
6	Number of Dots	176 RGB (W) x 220 (H)	—
7	LCD Display Mode	TFT Module	—
8	Rear Polarizer	Color Transmissive Type	—
9	Viewing Direction	12	O'clock
10	Backlight	LED (White)	—
11	Controller	HCD667B89RBP (COG) or Compatible	—
12	Weight	10 (Approx.)	g

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**HDA200**

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## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

	SYMBOL	MIN.	MAX.	UNIT	COMMENT
Power Supply for Logic	VCC-GND	-0.3	4.6	V	
Input Voltage	VI	-0.3	VCC	V	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling LCM.

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	WIDE TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-40	80
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 2  $T_a \leq 70^\circ\text{C}$  : 75%RH max

Note 3 Please refer to item of reliability test

Note 4 Background color will change slightly depending on ambient temperature.  
That phenomenon is reversible.

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# 3. ELECTRICAL CHARACTERISTICS

## 3-1. ELECTRICAL CHARACTERISTICS OF LCM

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Power Supply Voltage	VCC	-	2.5	2.8	3.3	V	
	VCI	-	2.5	2.8	3.3		
Input Voltage	VIH	H level	0.7VCC	-	VCC	V	
	VIO	L level	-0.3	-	0.2VCC		
LC Driving Voltage	VGH *1)	-	12	-	20	V *3)	
	VGL *2)		-10	-	-4		
	Vcom		-2	-	4		
	ΔVpMax		0.2	-	1.0		
	ΔVpMin		0.2	-	1.0		
Power Supply Current	IDD	Normal Picture	-	7.0	10.5	mA	
		Partial Display (32 Duty)	-	5.0	8.0		
		Stand by	-	0.7	1.0		
		Moving Picture	-	11.0	17.0		
Surface Luminance	L	Pattern: (LED = 54mA max.) Dots All On(White)(Vak= 3.6V)	120	140	-	cd/m <sup>2</sup>	
		Pattern: (LED = 54mA max.) Dots All Off(Black)(Vak= 3.6V)	-	0.5	1.0		
Contrast Ratio(LCM)	LCD	Cr	$\frac{L(White)}{L(Black)}$	120	150	-	-
Uniformity	LCD	U	PATTERN: (Dots All On) (White)	75	-	-	%

Notes:

- \*1) VGH is TFT Gate on operating Voltage.
- \*2) VGL is TFT Gate off operating Voltage, VGL signal must be fluctuates with same phase as Vcom when Storage on Gate structure.
- \*3) Vcom must be adjusted to optimize display quality\_Crosstalk, Contrast Ratio and etc.
- \*4) Register Setting :

### Register Setting

1 00h	00h 01h	13 13h	15h 14h	25 37h	04h 04h
2 07h	00h 04h	14 10h	44h 44h	26 38h	04h 00h
3 12h	00h 00h	15 12h	00h 13h	27 39h	04h 00h
4 13h	00h 00h	16 10h	44h 40h	28 40h	00h 00h
5 01h	01h 1Bh	17 13h	35h 14h	29 41h	00h EFh
6 02h	07h 00h	18 30h	03h 03h	30 42h	DBh 00h
7 03h	70h 30h	19 31h	03h 03h	31 43h	DBh 00h
8 04h	00h 00h	20 32h	03h 03h	32 44h	AFh 00h
9 05h	00h 00h	21 33h	04h 04h	33 45h	DBh 00h
10 0Bh	40h 00h	22 34h	03h 03h	34 07h	01h 05h
11 11h	00h 00h	23 35h	03h 03h	35 07h	01h 27h
12 12h	00h 03h	24 36h	03h 03h	36 07h	01h 37h

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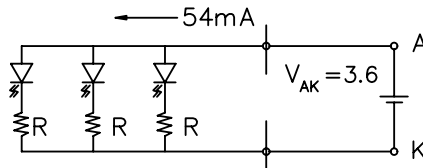
### 3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used LED Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	$I_P$	—	—	90	mA	—
Maximum reverse voltage	$V_R$	—	—	5	V	—
Applied forward current	$I_F$	—	—	54	mA	at $V_F = 3.6$ V
Applied forward voltage	$V_F$	—	3.6	4.0	V	at $I_F = 54$ mA
LED power consumption	$P_F$	—	—	0.2	W	—
AVG.X OF 1931 C.I.E.	X	0.28	0.31	0.34	—	—
AVG.Y OF 1931 C.I.E.	Y	0.28	0.31	0.34	—	—
Uniformity (*2)	U	80	—	—	%	—
LED life time	$L_L$	—	10000	—	hrs	at $I_F = 54$ mA (*1)

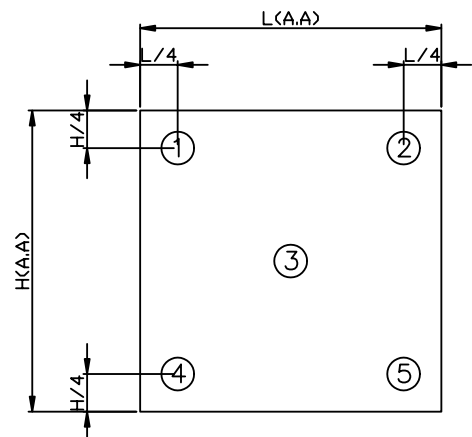
(\*1) LED life time is defined as follows : The final brightness is at 50% of original brightness .



Application condition

#### LED Data

1. Manufacturer : EVERLIGHT
2. Model : 99-115UWC



(\*2) Uniformity Inspect Method  
5 Points(Min./Max. X 100%)

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# 4. OPTICAL CHARACTERISTICS

## 4.1 Optical Char. of LCD Panel

Parameter	SYMBOL	Values			Unit	NOTE
		MIN.	TYP.	MAX.		
Response Time	Tr+Tf	–	40	–	ms	NOTE 2
Contrast Ratio	C/R	–	150	–		*1)
$\theta$ (Viewing Angle)		–	F: 15 R: 35	–		NOTE 5
$\phi$ (Viewing Angle)		–	L: 45 R: 45	–		
Degree of Saturation	NTSC	–	50	–	%	

\*1) Contrast Ratio(CR) is define mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

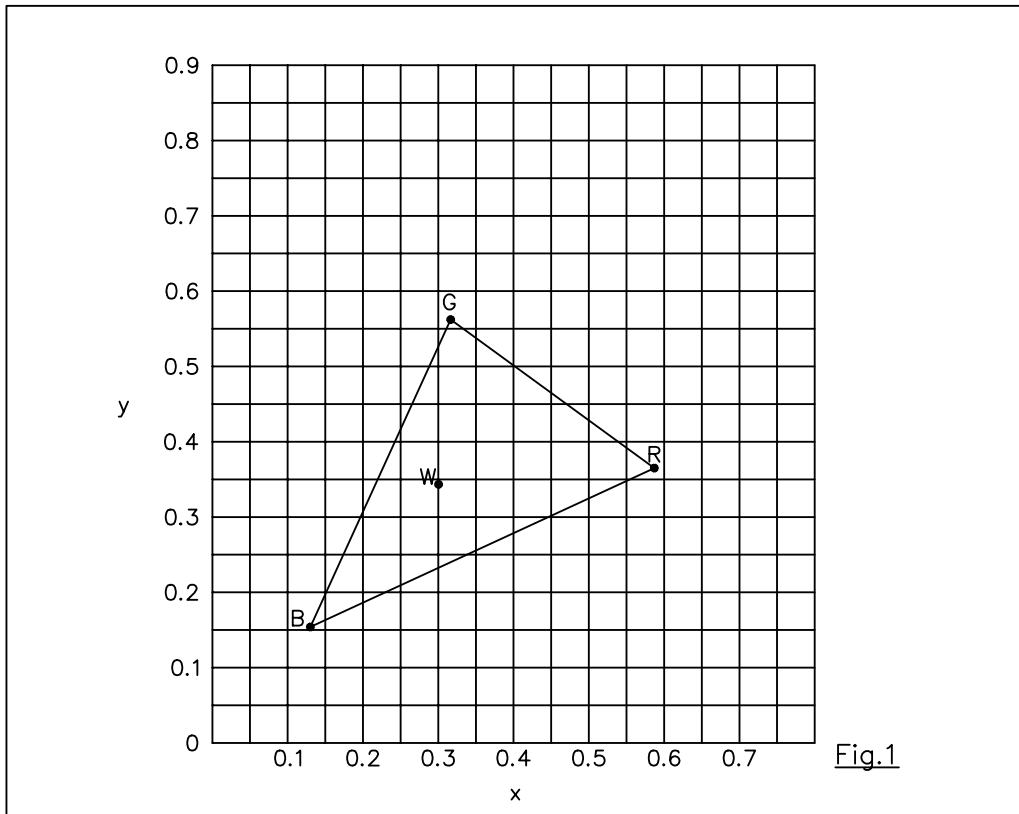
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## 4.2 Color of CIE Coordinate

Ta = 25°C Tolerance : ±0.05

ITEM		SYMBOL	CONDITION	VALUE	NOTE
Color of CIE Coordinate	Red	X	$\phi=0^\circ, \theta=0^\circ$	0.595	Note*
		y		0.341	
	Green	X		0.307	
		y		0.566	
	Blue	X		0.136	
		y		0.151	
	White	X		0.302	
		y		0.342	

Note\* Measuring at position 3 on Fig.1 CIE chromaticity diagram



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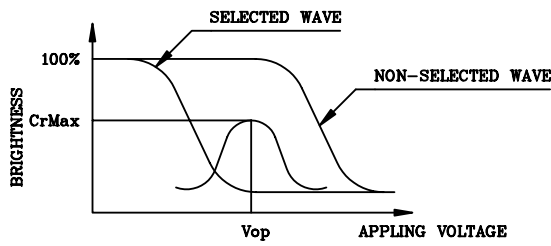
HDA200

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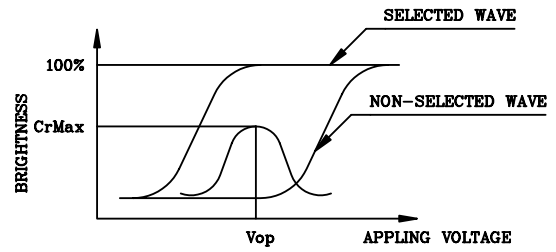
DATE:  
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(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



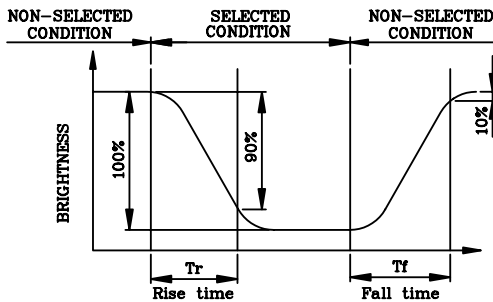
(negative type)

\*Conditions

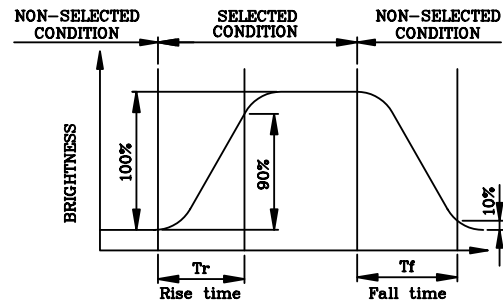
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



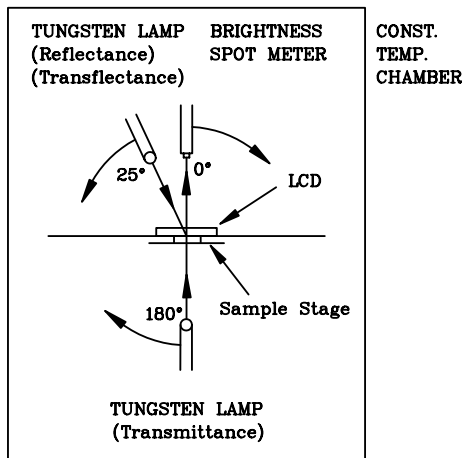
(negative type)

\*Conditions

Operating Voltage : Vop  
 Viewing Angle (θ,φ) : (0,0)  
 Frame Frequency : 70Hz  
 Applying Waveform : 1/N duty 1/a bias

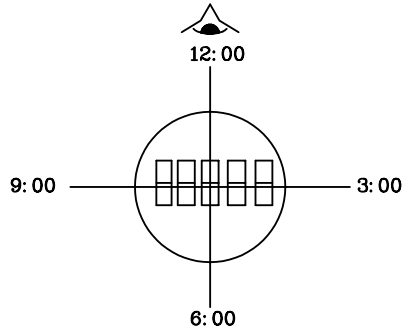
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



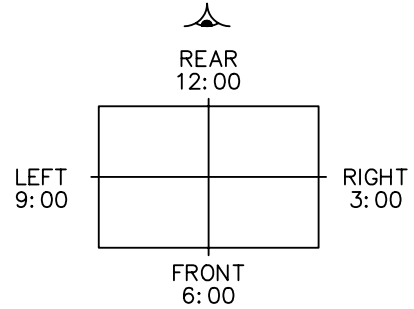
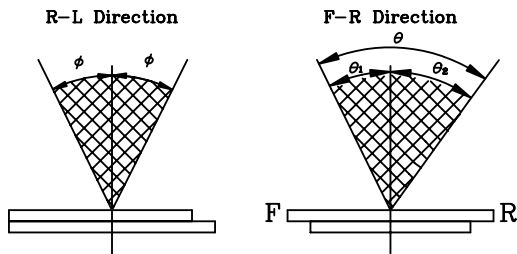
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



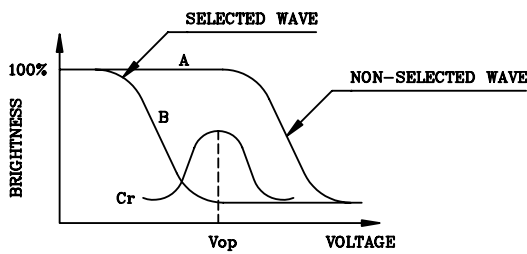
$$\theta = \theta_1 + \theta_2$$

\*Conditions

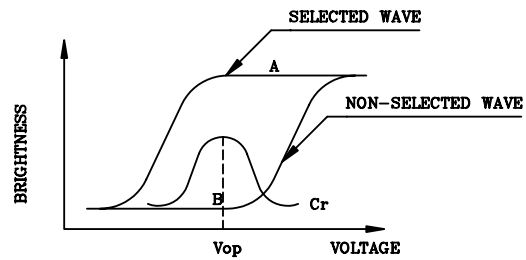
- Operating Voltage :  $V_{op}$
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

$$\text{Contrast Ratio : } Cr = A/B$$

\*Conditions

- Viewing Angle : 0
- Applying Waveform : 1/N duty 1/a bias

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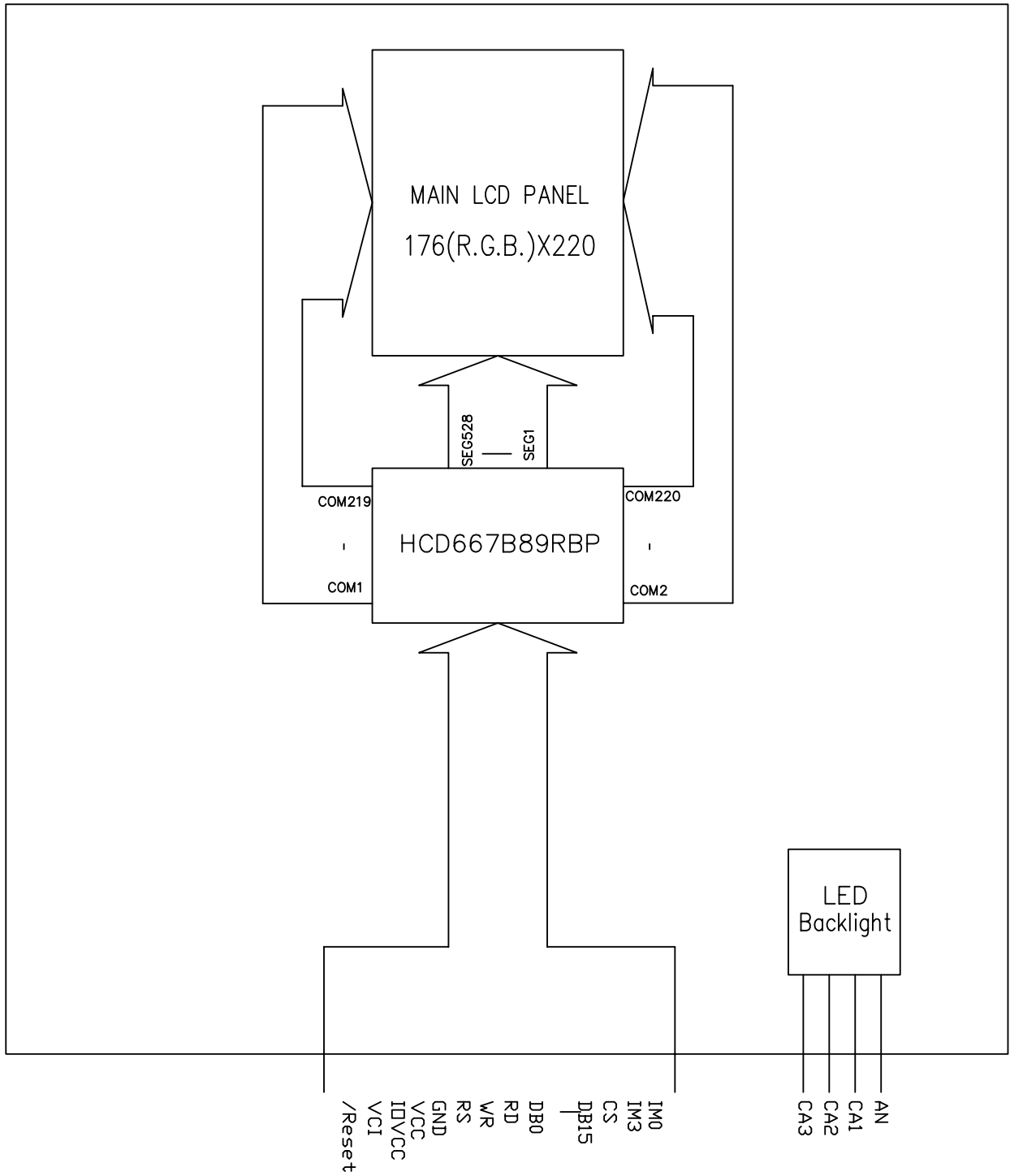
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# 5. BLOCK DIAGRAM



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## 6. INTERNAL PIN CONNECTION

### PIN FUNCTION

PIN NO.	SYMBOL	I/O	FUNCTION
1	GND	-	GND
2	IM0	-	Interface mode Select
3	IM3	-	Interface mode Select
4	RESET	-	Reset
5	DB17	-	Data Bus (Instruction & Display Data)
6	DB16	-	
7	DB15	I	
8	DB14	I	
9	DB13	I	
10	DB12	I/O	
11	DB11	I/O	
12	DB10	I/O	
13	DB9	I/O	
14	DB8	I/O	
15	DB7	I/O	
16	DB6	I/O	
17	DB5	I/O	
18	DB4	I/O	
19	DB3	I/O	
20	DB2	I/O	
21	DB1	I/O	
22	DB0	I/O	
23	RD	I/O	Read Strobe
24	WR	I/O	Write Strobe
25	RS	I/O	Resister Select
26	CS	I/O	Chip Select
27	VCC	I/O	Power Supply for Logic circuit
28	I/O VCC	I	Interface I/O Power
29	GND	I	GND
30	VCI	I	Power Supply for Analog circuit
31	GND	I	GND
32	NC	-	NC (No Connection)
33	NC	-	NC (No Connection)
34	NC	-	NC (No Connection)
35	NC	-	NC (No Connection)
36	AN	-	Power Supply for LED
37	CA1	-	GND for LED1
38	CA2	-	GND for LED2
39	CA3	-	GND for LED3
40	NC	-	NC (No Connection)

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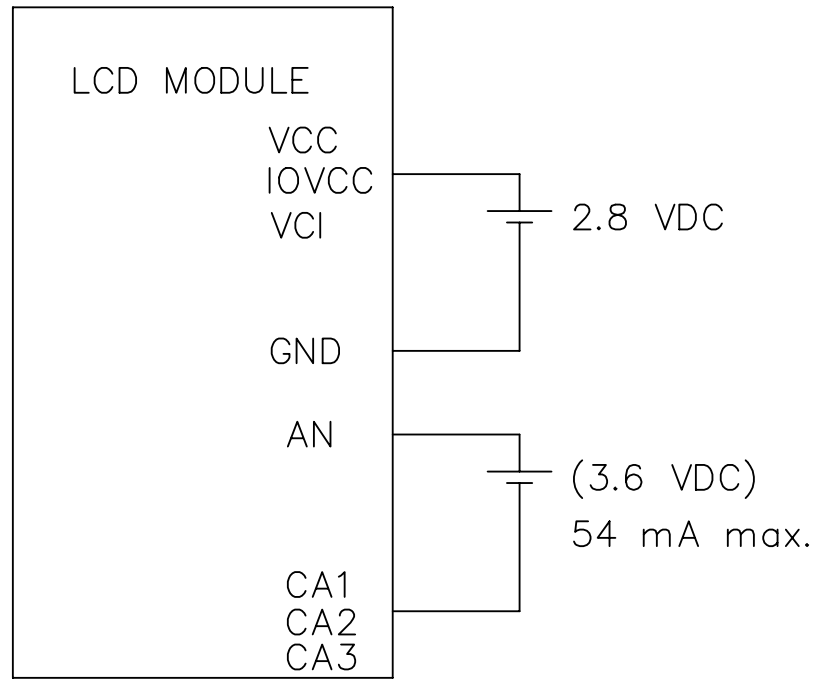
REV.:  
1.0

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## 7. POWER SUPPLY



# 8. TIMING CHARACTERISTICS

PLEASE REFER TO HITAICHI HCD667B89RBP SPEC.

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8-2. DISPLAY SEQUENCE

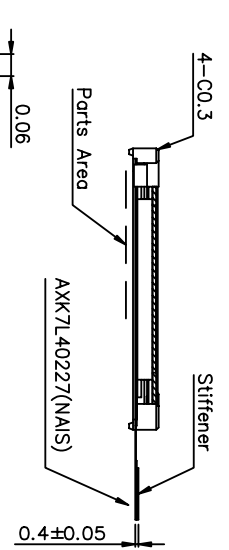
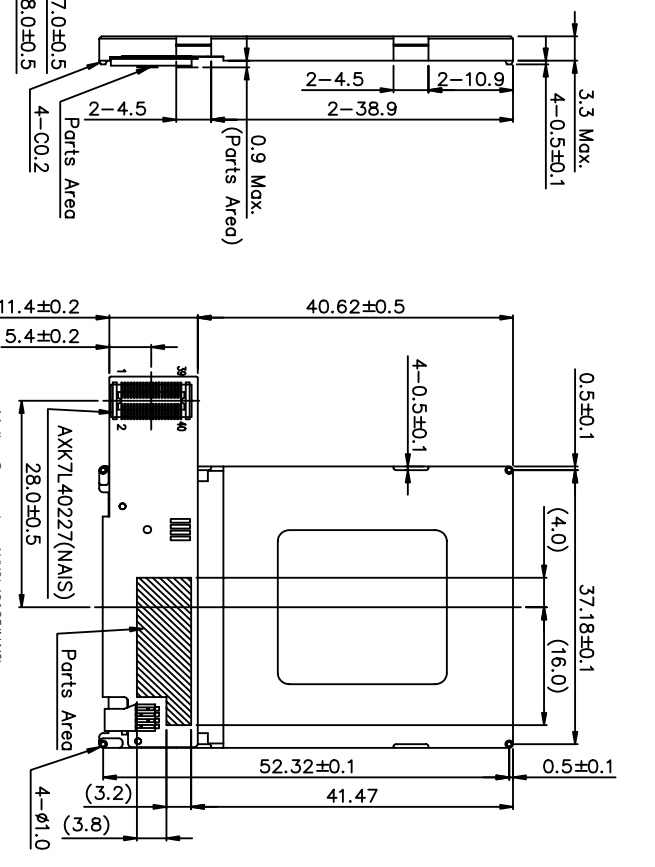
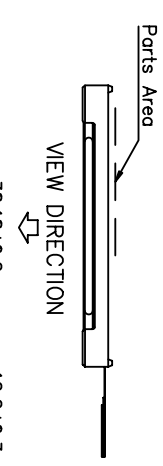
	COLUMN 1			COLUMN 2		
ROW1	R1	G1	B1	R2	G2	B2
ROW2	R1	G1	B1	R2	G2	B2

COLUMN 175			COLUMN 176		
R175	G175	B175	R176	G176	B176
R175	G175	B175	R176	G176	B176

ROW219	R1	G1	B1	R2	G2	B2
ROW220	R1	G1	B1	R2	G2	B2

R175	G175	B175	R176	G176	B176
R175	G175	B175	R176	G176	B176

PIN NO.	SYMBOL	I/O	FUNCTION
1	GND	-	GND
2	IM0	-	Interface mode Select
3	IM3	-	Interface mode Select
4	RESET	-	Reset
5	DB17	-	
6	DB16	-	
7	DB15	-	
8	DB14	-	
9	DB13	-	
10	DB12	-	
11	DB11	-	
12	DB10	-	
13	DB9	-	Data Bus
14	DB8	-	(Instruction & Display Data)
15	DB7	-	
16	DB6	-	
17	DB5	-	
18	DB4	-	
19	DB3	-	
20	DB2	-	
21	DB1	-	
22	DB0	-	
23	RD	-	Read Strobe
24	WR	-	Write Strobe
25	RS	-	Resister Select
26	CS	-	Chip Select
27	VCC	-	Power Supply for Logic circuit
28	I/O VCC	-	Interface I/O Power
29	GND	-	GND
30	VCI	-	Power Supply for Andlog circuit
31	GND	-	GND
32	NC	-	NC (No Connection)
33	NC	-	NC (No Connection)
34	NC	-	NC (No Connection)
35	NC	-	NC (No Connection)
36	AN	-	Power Supply for LED
37	CA1	-	GND for LED1
38	CA2	-	GND for LED2
39	CA3	-	GND for LED3
40	NC	-	NC (No Connection)



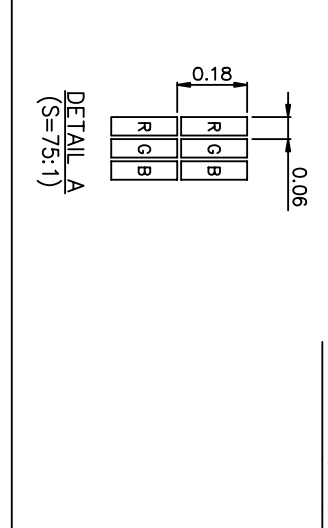
**GENERAL TOLERANCE LIST**

DIMENSION	TOLERANCE
L ≤ 6	±0.25 (mm)
6 < L ≤ 18	±0.3 (mm)
18 < L ≤ 50	±0.4 (mm)
50 < L ≤ 125	±0.5 (mm)
125 < L	±0.6 (mm)
ANGLE	±1° (DEG)

**Note:**  
1. Resolution : (176x3) x 220 Dots  
2. Driver IC : HCD667B89RBP (or Compatible)  
3. Backlight : LED (White)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE

NAME	DATE	THIRD ANGLE P.



REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE	DWG NO.