



Specification for LCD Glass Panel

JAZZ-BC-W

Revision 2.0



JAZZ	1.0'' COG Type Graphic LCD
BC	Serial BC, Dimension 28.50 x 20.00 x 1.80 mm
W	FSTN Positive
/	Resolution 128 x 64
/	Transflective
/	6 o'clock Viewing Direction
/	Top: -20~+70°C; Tstr: -30~+80°C
/	RoHS Compliant
/	FPC Connection
/	Controller ST7565R
/	Pair with Backlight JAZZ-BE



RECORDS OF REVISION

Date	Rev.	Description	Section NO	Note	Page
2009.7.16	1.0	New sample			
2011.12.3	2.0	Updata temperature of page 11			

JAZZ-BC-W LCD MODULE

1. FEATURES

- Display Type: FSTN
- Display Mode: Positive, Transflective
- Display Format: 128X 64 Dots
- Driving Mode: 1/65 Duty, 1/9 Bias
- Operating Voltage: 3.3V
- Viewing Direction: 6 O' clock

2. MAXIMUM ABSOLUTE RATING

Item	Symbol	Min.	Max.	Unit
Power Supply Voltage	VDD-VSS	0	+3.6	V
Operating Temperature	T _{opr}	-20	+70	°C
Storage Temperature	T _{stg}	-30	+80	°C

3. MECHANICAL PARAMETERS

Item	Description	Unit
LCM Outline Dimension	28.5X 20.0 X 1.7	mm
Viewing Area	26.5X 14.0	mm
Weight	---	g

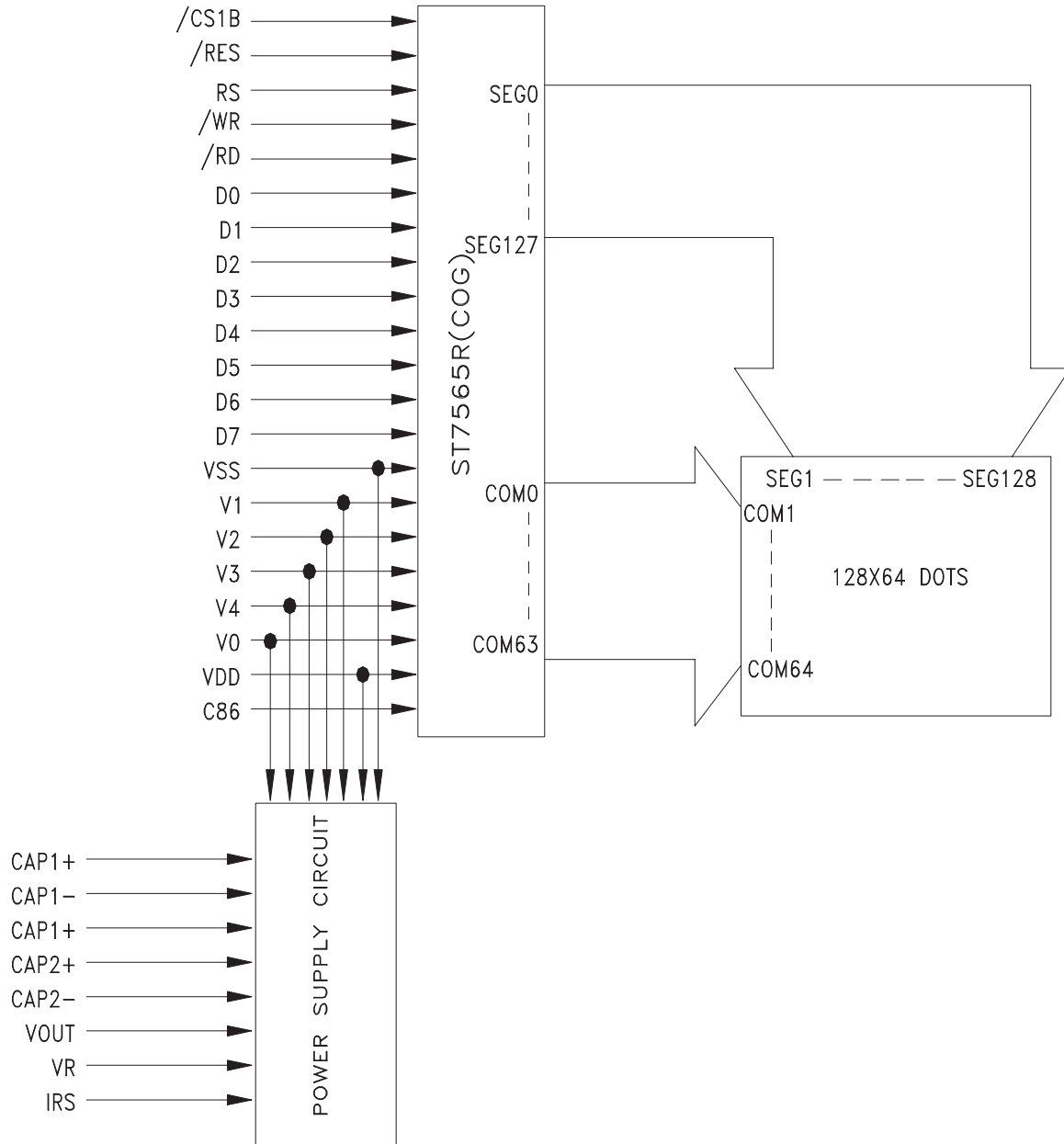
4、DC Characteristics (VSS=0V, VDD=2.4to3.6V:TOPR=25°C)

Item		Symbol	Condition		Min.	Typ.	Max.	Unit
Operating voltage		VDD			-	3.3	-	V
Operating voltage for LCD		V0			-	9.8	-	V
Input voltage	High	VIH			0.8VDD	-	VDD	V
	Low	VIL			VSS	-	0.2VDD	
Output voltage	High	VOH	IOH=-0.5mA		0.8VDD	-	VDD	V
	Low	VOL	IOL=0.5mA		VSS	-	0.2VDD	
Input leakage current		IIL	VDD=3.0V VIN=VDD or VSS		-1.0	-	+1.0	uA
Output leakage current		IOZ	VIN=VDD or VSS		-3.0	-	+3.0uA	uA
LCD driver ON resistance		RON	Ta=25°C, V0=8V		-	2.0	3.0	KΩ
Oscillator frequency	Internal	FOSC	VDD=3.0V Ta=25°C Duty ratio=1/65		32.7	43.6	54.5	KHz
	External	fCL			4.09	5.45	6.81	
Voltage converter input voltage		VCI	X 2		2.4	-	5.5	V
			X 3		2.4	-	5.0	
			X 4		2.4	-	3.75	
			X 5		2.4	-	3.0	
Voltage converter output voltage		VOUT	X 2/X 3/X 4/X 5 voltage conversion (no-load)		95	99	-	%
Voltage regulator operating voltage		VOUT			6.0	-	16.0	V
Voltage follower operating voltage		V0			4.5	-	15.0	V
Reference voltage		VREF	VDD=3.0V Ta=25°C	-0.05% / °C	2.04	2.1	2.16	V

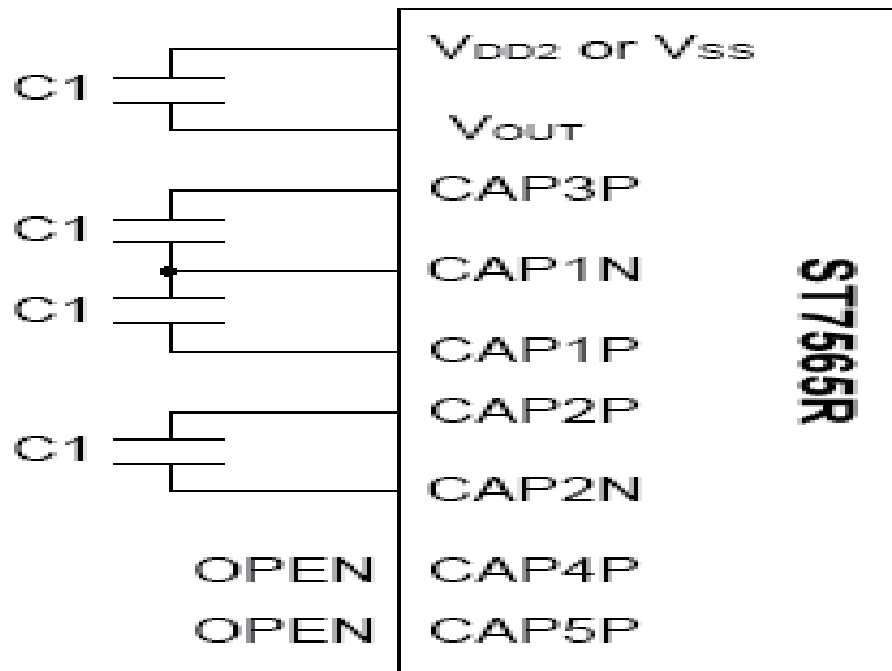
5. INTERFACE PIN ASSIGNMENT

Pin No.	Symbol	L evel	Description
1	VDD	H/L	Power supply
2	C86	H/L	T his is the MPU interace selection pin
3	VSS	H/L	Ground
4	V0	H/L	T he voltage settings are selected using the LCD bias set
5	V1	H/L	
6	V2	H/L	
7	V3	H/L	
8	V4	H/L	
9	CAP2-	H/L	DC/DC voltage converter Connect capacitor between this terminal and the pin
10	CAP2+	H/L	
11	CAP1-	H/L	
12	CAP1+	H/L	
13	CAP3+	H/L	
14	VOUT	H/L	
15	VSS	H/L	Gronud
16	D7	H/L	Data bit7
17	D6	H/L	Data bit6
18	D5	H/L	Data bit5
19	D4	H/L	Data bit4
20	D3	H/L	Data bit3
21	D2	H/L	Data bit2
22	D1	H/L	Data bit1
23	D0	H/L	Data bit0
24	RD	H/L	Read date
25	WR	H/L	Write series signal
26	A0	H/L	Data type selection
27	REST	H/L	Reset pin
28	/CS1	H/L	C hip select input, L: chip selected

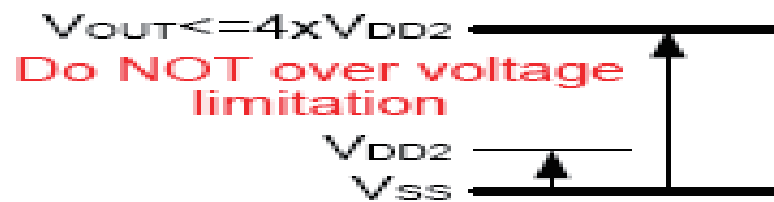
6. SYSTEM BLOCK DIAGRAM



Power Supply Circuit For Driving LCD panel



4x voltage booster circuit



4x boost voltage relationship

7. AC CHARACTERISTICS (V_{DD}=3.0V, T_a= -20~+70°C)

System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)

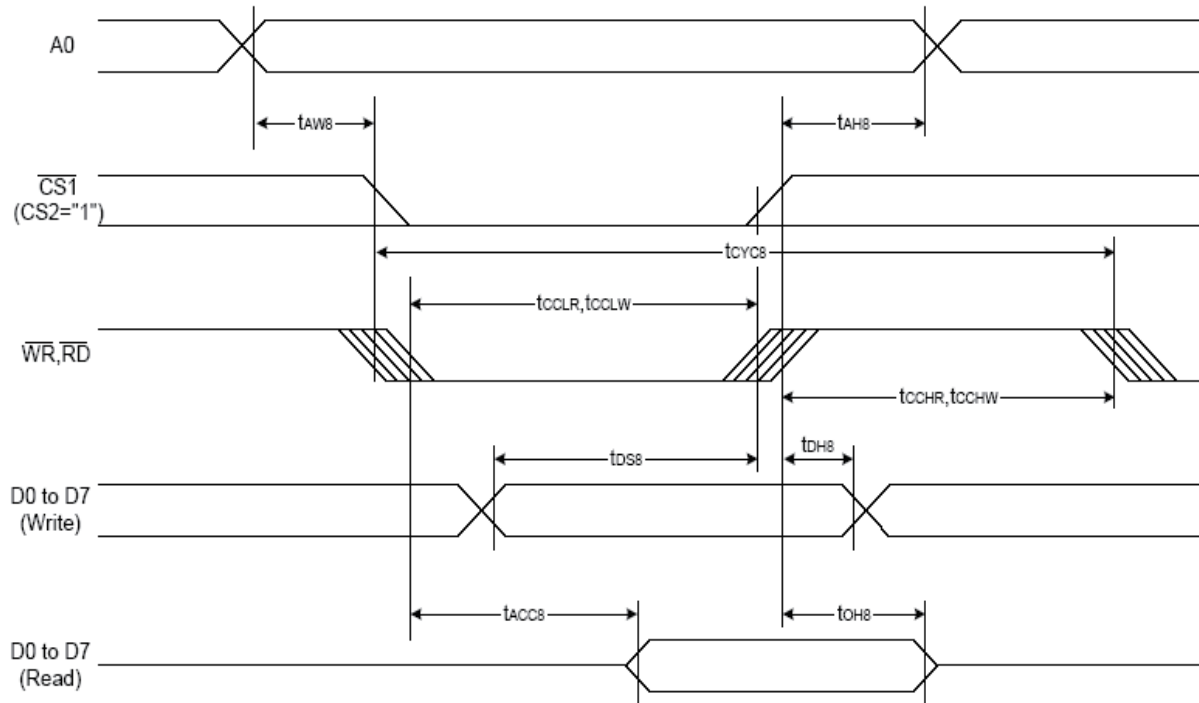


Figure 37

Table 24

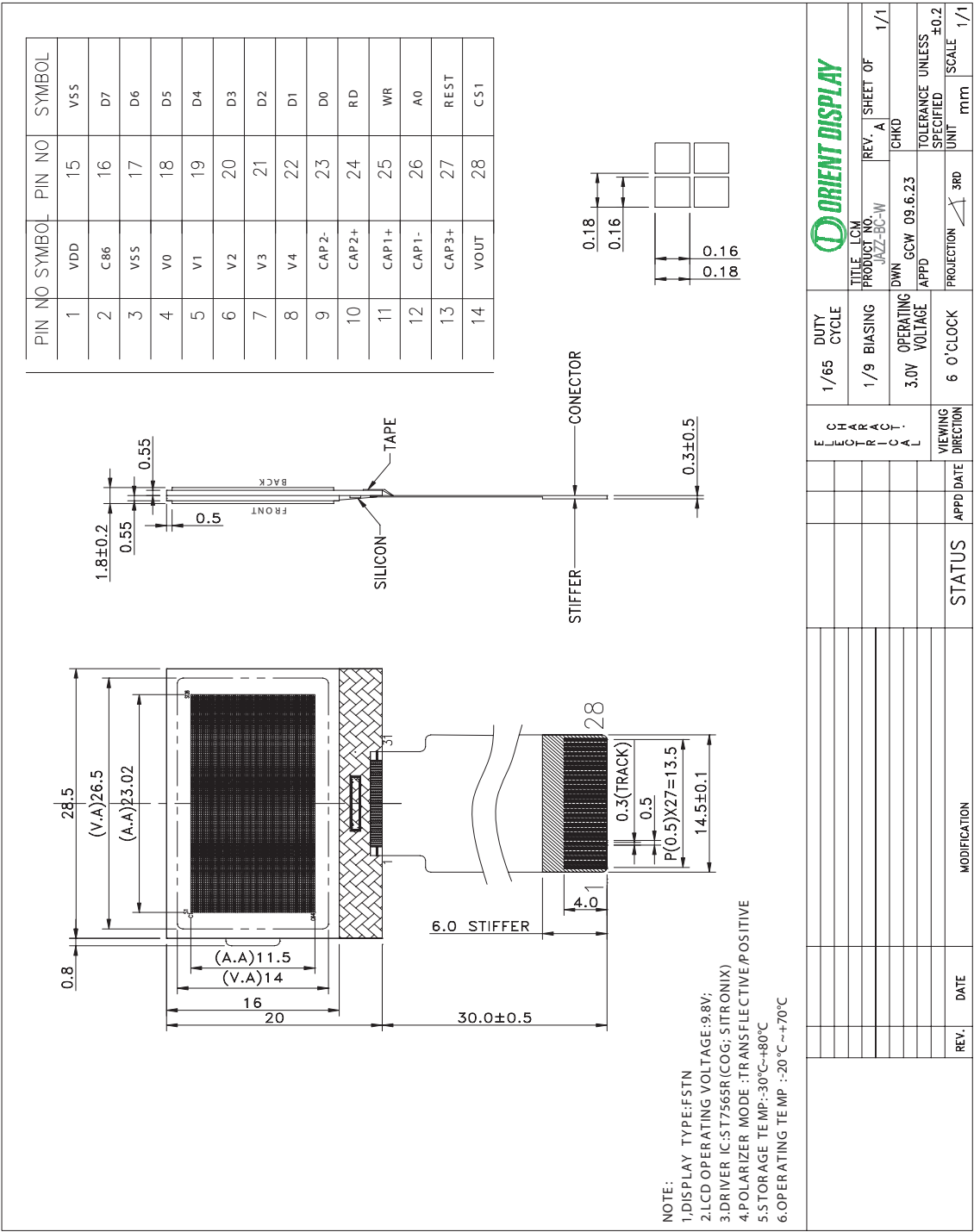
(V_{DD} = 3.3V, T_a = -30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH8		0	—	Ns
Address setup time		tAW8		0	—	
System cycle time		tCYC8		240	—	
Enable L pulse width (WRITE)	WR	tCCLW		80	—	
Enable H pulse width (WRITE)		tCCHW		80	—	
Enable L pulse width (READ)	RD	tCCLR		140	—	
Enable H pulse width (READ)		tCCHR		80	—	
WRITE Data setup time	D0 to D7	tDS8		40	—	
WRITE Address hold time		tDH8		0	—	
READ access time		tACC8	CL = 100 pF	—	70	
READ Output disable time		tOH8	CL = 100 pF	5	50	

8. CONTROL AND DISPLAY COMMAND

Command	Command Code										Function	
	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1		D0
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address					Sets the display RAM display start line address	
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit Column address set lower bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
				0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.
(5) Status read	0	0	1	Status				0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data							Writes to the display RAM	
(7) Display data read	1	0	1	Read data							Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	Sets the LCD display normal/ reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565R)
(12) Read-modify-write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode
(17) V ₀ voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode
(18) Electronic volume mode set Electronic volume register set	0	1	0	1	0	0	0	0	0	0	1	Set the V ₀ output voltage electronic volume register
(19) Static indicator ON/OFF Static indicator register set	0	1	0	1	0	1	0	1	1	0	0	0: OFF, 1: ON
				0	0	0	0	0	0	0	Mode	Set the flashing mode
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power save	0	1	0								Display OFF and display all points ON compound command	
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

9. ASSEMBLY DIAGRAM



10.OPTICAL CHARACTERISTICS

($V_0 = 9.4V$, $T_a = 25^\circ C$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	$\theta_2 - \theta_1$	$\phi = 0^\circ$ $C_0 \geq 2.0$	60	—	—	dgr.	Note 1.
	θ_1	$\theta_1 < \theta_2$ $C_0 = 2.0$	—	—	-25	dgr.	Note 1.
	θ_2		25	—	—	dgr.	Note 1.
	$\theta_2 - \theta_1$	$\phi = 45^\circ$ $C_0 \geq 2.0$	60	—	—	dgr.	Note 1.
	θ_1	315° $C_0 = 2.0$ $\theta_1 < \theta_2$	—	—	-25	dgr.	Note 1.
	θ_2		25	—	—	dgr.	Note 1.
Contrast ratio	C_0	$\theta = 15^\circ$	4	6	—		Note 2.
Response Time	Rise	$\theta = 15^\circ$	—	150	300	ms	Note 3.
	Decay	$\theta = 15^\circ$	—	200	400	ms	Note 3.
Backlight brightness (measured through LCD)	-	LED current=80ma	-	25		Cd/m ²	

Note 1) The viewing angle range is defined as shown below:

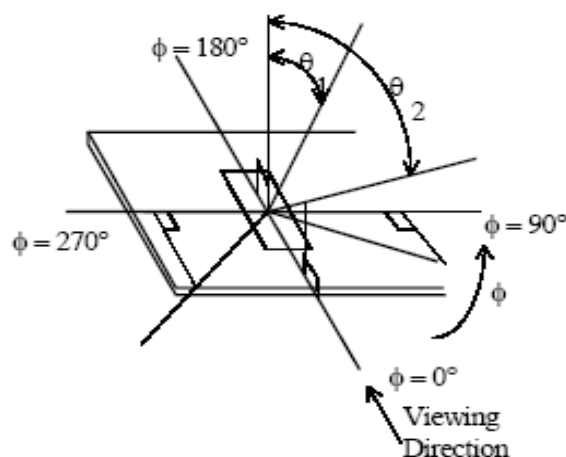


Fig. 4.1.1: Definition of viewing angle

* Angles θ_1 , θ_2 and ϕ shall fall within the range over which the displayed character can be read.

- Note 2) Contrast ratio is defined as follows:
When input signal is applied to the unit to select (turn on), the LCD dots (pixels) to be measured in the optical characteristics test method as defined in Fig. 3:
- $$\text{Contrast ratio} = \frac{\text{Photodetector output voltage with non-select waveform being applied}}{\text{Photodetector output voltage with select waveform being applied}}$$
- Note 3) When input signal for selecting or non-selecting the dots to be measured are applied using the optical characteristics test method shown in Fig. 3. The response characteristics of the photo-detector output are measured as shown in Fig. 4.
- Note 4) This optical data is specified on condition that the LCD temperature is 25°C. When designing, be sure to check the rating of V_0 in table 3.
- Note 5) The response characteristics of photo-detector output are measured as shown in Fig. 4, assuming that input signals are applied so as to select and deselect the dots to be measured, in the optical characteristics test method shown in Fig. 3.
- Note 6) Table 6 shows the optical characteristics detected when the LCD applied voltage waveforms are in the highest frequency *.

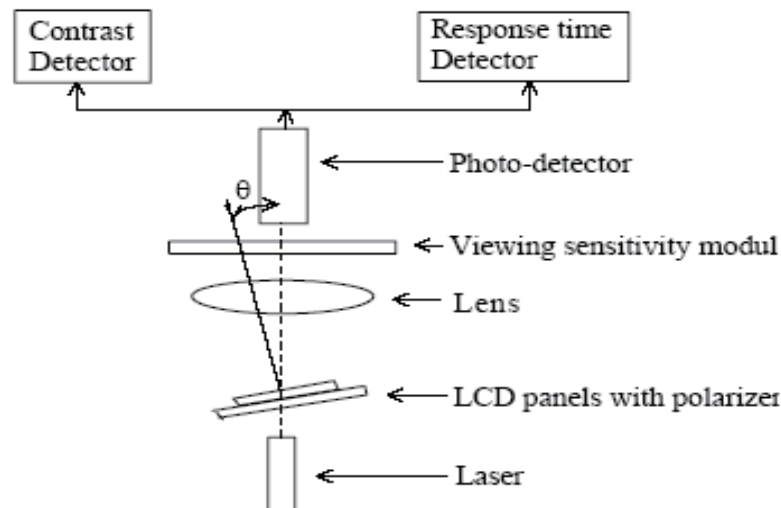


Fig. 4.1.2 Optical Characteristics Test Method