SPECIFICATIONS   FOR
LCD   MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	**13232ASWQW-02** (preliminary spec)
APPROVED BY	
DATE	

☑**Approved For Specifications**
☐Approved For Specifications & Sample

APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2007/4/4	-	New Release	Lorry

1 FEATURES

(1) Display format : 132×32 dots, 1/49duty, 1/7 bias.

(2) Construction : LCD panel , COG, IC, Metal Pin and White LED Back-Light.

(3) Display type : STN LCD, Transmissive, Negative, Blue mode, Antiglare, 4:30 o'clock view

(4) Controller : ST7588T

(5) Extended temperature type.

(6) ROHS compliant.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.67(W) × 0.56(H)	mm
Dot pitch	0.71(W) × 0.6(H)	mm
Active area	93.68(W) ×19.16 (H)	mm
Viewing area	98.0 (W) ×23.0 (H)	mm
Module size Without Metal PIN	113.0(W) × 34.24(H) × 15.0 (T)	mm

3 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Logic Circuit Supply Voltage	VDD-VSS	-0.5	+3.6	V
LCD Driving Voltage	VLCD	-0.5	+13.5	V
Input Voltage	VI	-0.5	VDD+0.5	V
Operating Temp.	TOP	-20	70	°C
Storage Temp.	TSTG	-30	80	°C

4   ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.4	--	3.3	V	
LCD Driving Voltage	VLCD	25 °C	8.5	9.0	9.5	V	
Input Voltage	VIH	--	0.7VDD	--	VDD	V	
	VIL	--	-0	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD=3.0V	--	0.2	0.4	mA	
----- Optical Characteristics (FSTN) -----							
Contrast	CR	25°C	--	(6)	--		Note 1
Rise Time	tr	25°C	--	(200)	--	ms	Note 2
Fall Time	tf	25°C	--	(200)	--	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	(40)	--	Deg.	Note 3
	θ b		--	(35)	--		
	θ l		--	(40)	--		
	θ r		--	(40)	--		
Frame Frequency	fF	25°C	--	70	--	Hz	

( ) : For Reference only. These data should be measured and defined according real LCD.

(NOTE 1) Contrast ratio :

CR = (Brightness in OFF state) / (Brightness in ON state)

(NOTE 2) Response time :
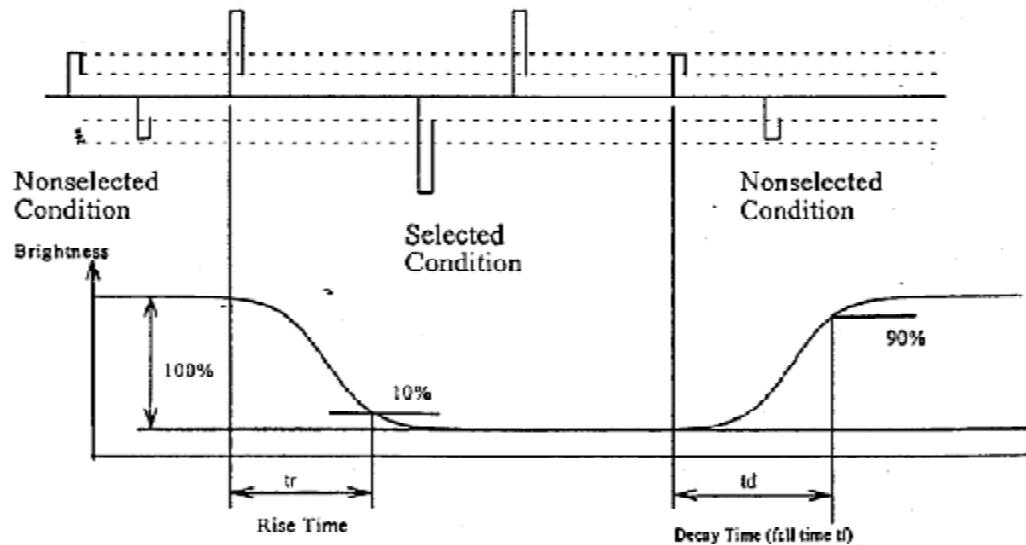
(NOTE 3) Viewing angle
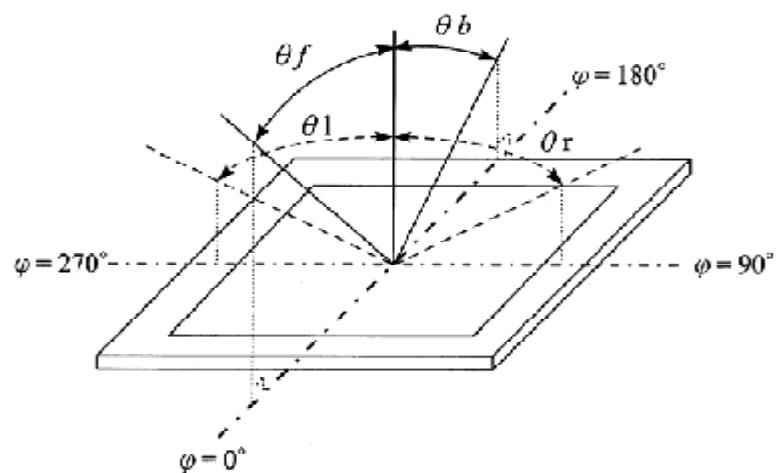
4.1 LED Back-light Electrical Specification

| ----- White LED Back-light Characteristics -----							
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Unit**	**Note**
Forward Current	IF	--	--	30x2	40x2	mA	Note 4
LCM Luminous intensity (Full White pattern)	IF=30mAx2 Total		--	T.B.D	--	cd/m^2	Note 4
Forward Voltage	VF	IF=30mA each side	3.0	3.2	3.5	V	Note 5
LED C.I.E	X	IF=30mAx2 Total	0.28	0.31	0.34		Note 6
	Y	IF=30mAx2 Total	0.29	0.32	0.35		

Note 4: Luminous intensity is decided by forward current of White LED.

Note 5: White LEDs are with voltage tolerance.

Note 6: White LEDs are with color tolerance.
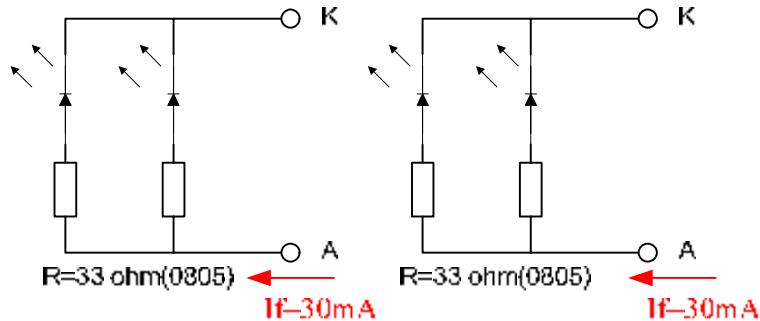
5   BLOCK DIAGRAM & POWER SUPPLY
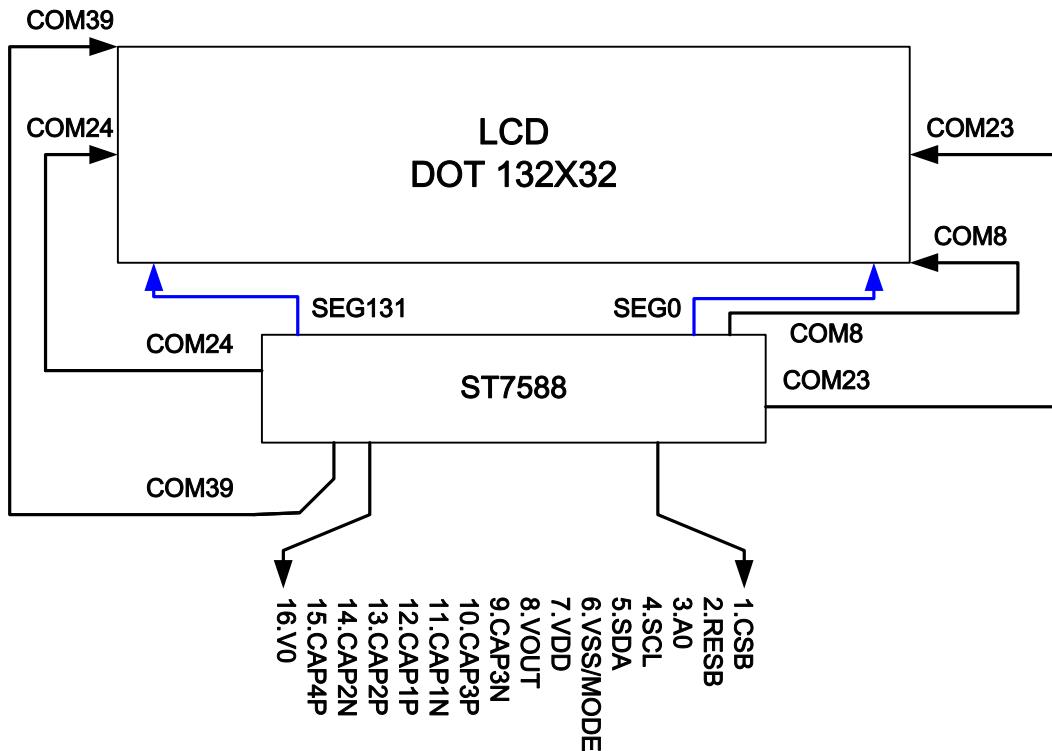
Internal Setting: D0=SCL , D1=D2=D3=SDA , D4~D7=VDD ,T5~T0= OPEN, MS=VDD, Mode1=Mode0=VSS, PS[2:0]=010, VOUT connect to CAP5P

6 INTERFACE

No.	Symbol	Function
1	/CSB	Chip select terminal.
2	RESB	Reset terminal.
3	A0(RS)	Connector to the address bus of MPU.
4	SCL	Serial clock input
5	SDA	Serial data input
6	VSS/MODE	Ground (0V)
7	VDD	Power supply for logic (VDD)
8	VOUT	Internal Booster circuit.
9	CAP3N	
10	CAP3P	
11	CAP1N	
12	CAP1P	
13	CAP2P	
14	CAP2N	
15	CAP4P	
16	V0	

When VDD=2.4~2.7V, 5x booster connection.

7.VDD
8.VOUT
9.CAP3N
10.CAP3P
11.CAP1N
12.CAP1P
13.CAP2P
14.CAP2N
15.CAP4P
16.V0

C=1.0uF~4.7uF

When VDD=2.7~3.3V, 4x booster connection.

7.VDD
8.VOUT
9.CAP3N
10.CAP3P
11.CAP1N
12.CAP1P
13.CAP2P
14.CAP2N
15.CAP4P
16.V0

C=1.0uF~4.7uF

7 TIMING CHARACTERISTICS

SERIAL INTERFACE (4-Line Interface)
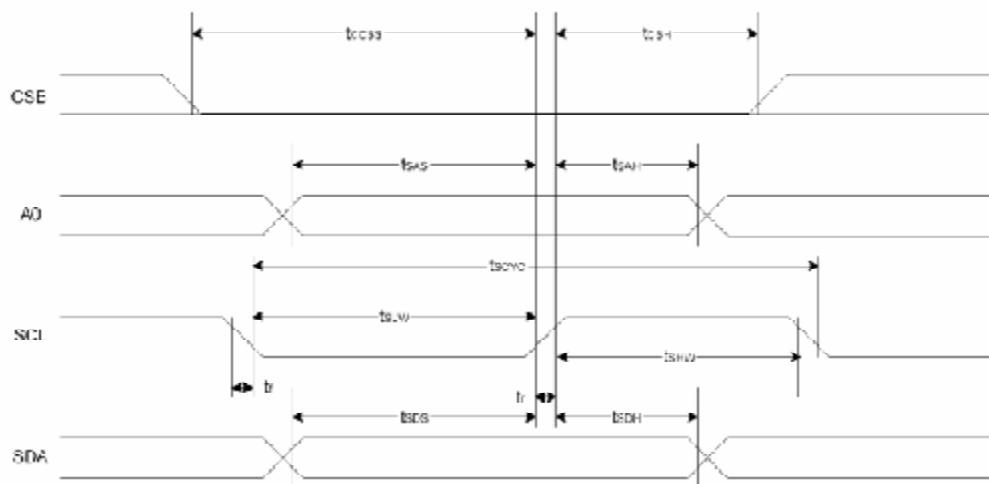
Figure 29

$(V_{DD} = 3.3V, Ta = -30 \text{ to } 85 \text{ °C})$

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	t_{SCYC}		100	--	ns
SCL "H" pulse width		t_{SHW}		60	--	
SCL "L" pulse width		t_{SLW}		60	--	
Address setup time	A0	t_{SAS}		20	--	
Address hold time		t_{SAH}		80	--	
Data setup time	SDA	t_{SDS}		20	--	
Data hold time		t_{SDH}		20	--	
CS-SCL time	CSB	t_{CSS}		30	--	
CS-SCL time		t_{CSH}		120	--	

$(V_{DD} = 2.7V, Ta = -30 \text{ to } 85 \text{ °C})$

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	t_{SCYC}		120	--	ns
SCL "H" pulse width		t_{SHW}		70	--	
SCL "L" pulse width		t_{SLW}		70	--	
Address setup time	A0	t_{SAS}		20	--	
Address hold time		t_{SAH}		100	--	
Data setup time	SDA	t_{SDS}		20	--	
Data hold time		t_{SDH}		20	--	
CS-SCL time	CSB	t_{CSS}		30	--	
CS-SCL time		t_{CSH}		150	--	

■ RESET TIMING
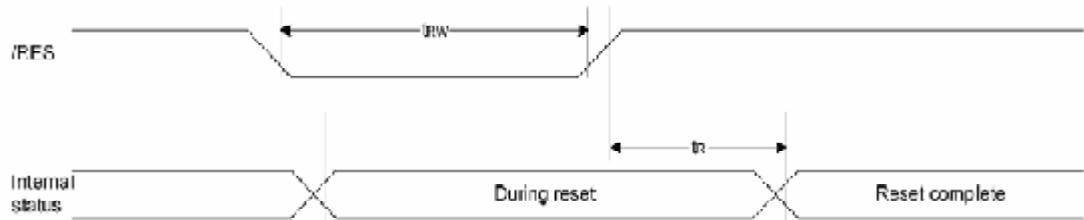
Figure 31

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		t_R		–	–	400	ns
Reset "L" pulse width	/RES	t_{RW}		1200	–	–	

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		t_R		–	–	350	ns
Reset "L" pulse width	/RES	t_{RW}		1600	–	–	

8   QUALITY AND RELIABILITY

8.1   TEST CONDITIONS

Tests should be conducted under the following conditions :
Ambient temperature   : $25 \pm 5°C$
Humidity   : $60 + 25\%$ RH.

8.2   SAMPLING PLAN

Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

8.3   ACCEPTABLE QUALITY LEVEL

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

8.4   APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under flourescent light. The inspection area of LCD panel shall be within the range of following limits.

8.5 INSPECTION QUALITY CRITERIA

Item	Description of defects			Class of Defects	Acceptable level (%)
Function	Short circuit or Pattern cut			Major	0.65
Dimension	Deviation from drawings			Major	1.5
Black spots	Ave . dia . D	area A	area B	Minor	2.5
	$D \leqslant 0.2$	Disregard			
	$0.2<D \leqslant 0.3$	3	4		
	$0.3<D \leqslant 0.4$	2	3		
	$0.4<D$	0	1		
Black lines	Width W, Length L	A	B	Minor	2.5
	$W \leqslant 0.03$	disregard			
	$0.03<W \leq 0.05$	3	4		
	$0.05<W \leq 0.07 , L \leqslant 3.0$	1	1		
	See line criteria				
Bubbles in polarizer	Average diameter D $0.2 < D < 0.5$ mm for $N = 4$, $D > 0.5$ for $N = 1$			Minor	2.5
Color uniformity	Rainbow color or newton ring.			Minor	2.5
Glass Scratches	Obvious visible damage.			Minor	2.5
Contrast ratio	See note 1			Minor	2.5
Response time	See note 2			Minor	2.5
Viewing angle	See note 3			Minor	2.5

ZONE A active area

ZONE B viewing area
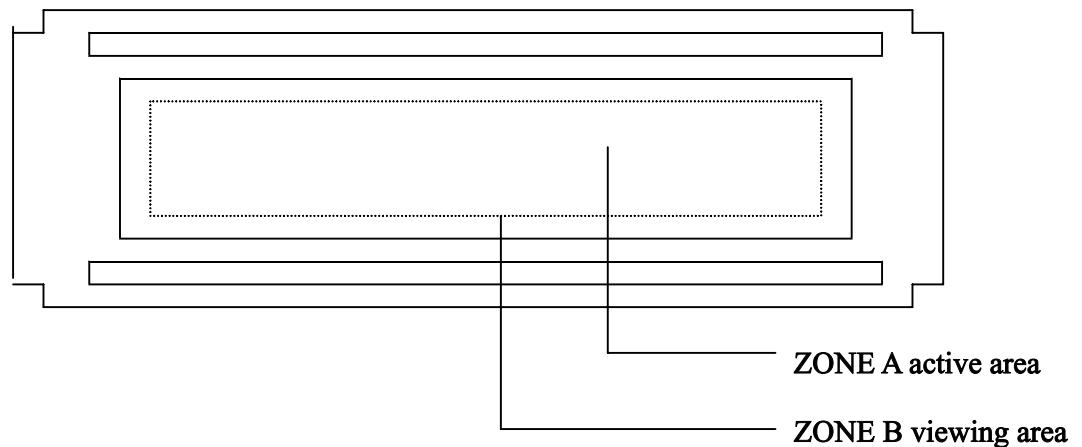
8.6 RELIABILITY

Test Item	Test Conditions	Note
	Extend Temp. type	
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-20+3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-30+3°C , t=96 hrs	1,2
Thermal Shock Test	-30°C ~ 25°C ~ 80°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions
(15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

9 HANDLING PRECAUTIONS

(1) A LCD module is a fragile item and should not be subjected to strong mechanical shocks.

(2) Avoid applying pressure to the module surface. This will distort the glass and cause a change in color.

(3) Under no circumstances should the position of the bezel tabs or their shape be modified.

(4) Do not modify the display PCB in either shape or positioning of components.

(5) Do not modify or move location of the zebra or heat seal connectors.

(6) The device should only be soldered to during interfacing. Modification to other areas of the board should not be carried out.

(7) In the event of LCD breakage and resultant leakage of fluid do not inhale, ingest or make contact with the skin. If contact is made rinse immediately.

(8) When cleaning the module use a soft damp cloth with a mild solvent, such as Isopropyl or Ethyl alcohol. The use of water, ketone or aromatic is not permitted.

(9) Prior to initial power up input signals should not be applied.

(10) Protect the module against static electricity and observe appropriate anti-static precautions.

10 OUTLINE DIMENSION