

A Brighter Solution

AMP DISPLAY INC.

SPECIFICATIONS

CUSTOMER	
CUSTOMER DRAWING NO.	
AMPIRE PART NO.	AD-162D3YIQY-00H
APPROVED BY	
DATE	

- Approved For Specifications
- Approved For Specifications & Sample

AMP DISPLAY INC

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APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Contents
2002/4/9	New Release
2002/5/27	Modify Dot & Character size of LCD.
2002/11/1	Change T162-39-2 to AD-162D3YIQY-00H

1 FEATURES

- (1) Display format : 16 characters × 2 line
- (2) LCD : STN yellow-green mode, Transflective, 6 o'clock, positive.
- (3) LED back-light : Yellow-green, edge type
- (4) Controller : KS0066U (Compatible to HD66710)
- (5) 3.0V single power input. Built-in DC/DC converter for LCD driving.
- (6) Extended temperature type.

2 MECHANICAL DATA

Parameter	Standard Value	Unit
Dot size	0.46(W) × 0.56(H)	mm
Character size	2.5(W) × 4.83(H)	mm
Viewing area	64.0(W) × 17.2(H)	mm
Module size	79.0(W) × 44.0(H) × 10.6 max (T)	mm

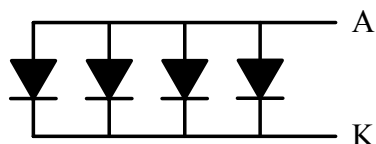
3 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Logic Circuit Supply Voltage	VDD-VSS	-0.3	7.0	V
LCD Driving Voltage	VDD-VO	-0.3	10.0	V
Input Voltage	VI	-0.3	VDD+0.3	V
Operating Temp.	TOP	-20	70	°C
Storage Temp.	TSTG	-33	80	°C

4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.7	3.0	4.5	V	
LCD Driving Voltage	VDD-VO	-20 °C	4.75	5.0	5.25	V	
		0 °C	4.75	5.0	5.25		
		25 °C	4.75	5.0	5.25		
		50 °C	4.75	5.0	5.25		
		70 °C	4.75	5.0	5.25		
Input Voltage	VIH	--	0.7 VDD	--	VDD	V	
	VIL	--	VSS	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	--	0.5	mA	
----- Optical Characteristics -----							
Contrast	CR	25°C	--	5	--		Note 1
Rise Time	tr	-20°C	--	900	1350	ms	Note 2
		0°C		180	270		
		25°C		80	120		
Fall Time	tf	-20°C	--	3400	5100	ms	Note 2
		0°C		600	900		
		25°C		150	225		
Viewing Angle Range	θf	25°C & CR \geq 2	--	40	--	Deg.	Note 3
	θb		--	35	--		
	θl		--	35	--		
	θr		--	35	--		
Frame Frequency	fF	25°C	--	64	--	Hz	
----- LED Back-light Characteristics -----							
Forward Voltage	VF	--	--	2.02	2.2	V	Supply Voltage between A&K
Forward Current	IF	VF=2.02V	--	30	--	mA	
LCM Luminous intensity		VF=2.02V	--	3	--	cd/m ²	

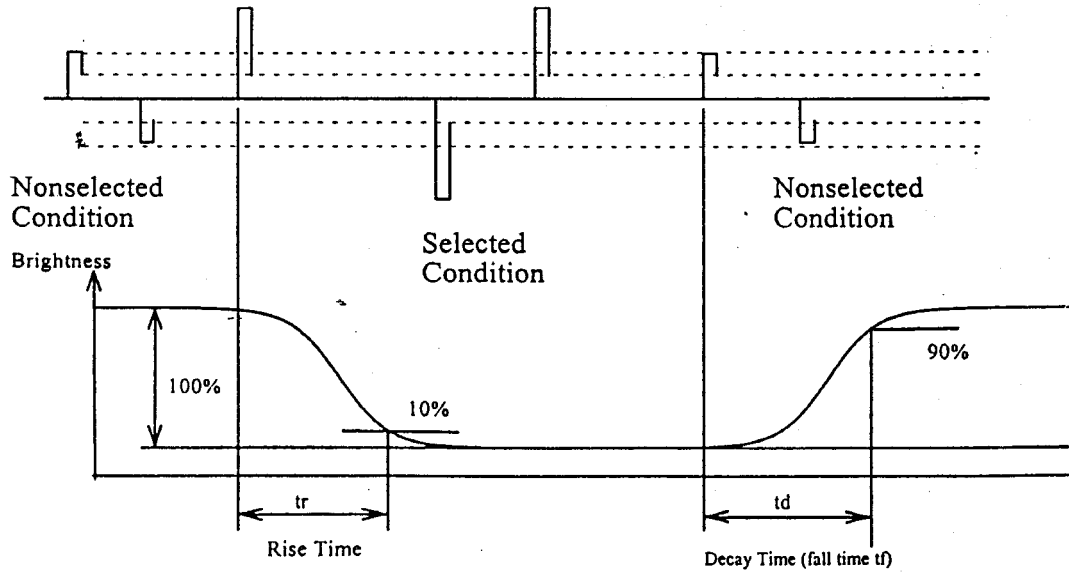
* LED Dice number = 4



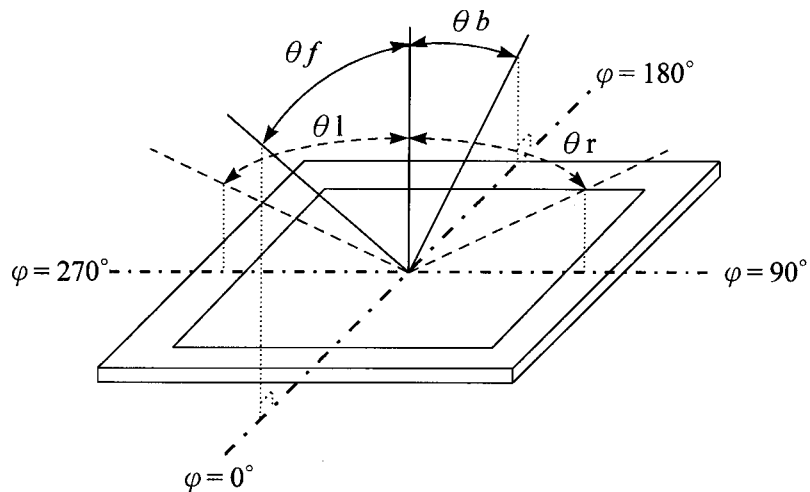
(NOTE 1) Contrast ratio :

$$CR = (\text{Brightness in OFF state}) / (\text{Brightness in ON state})$$

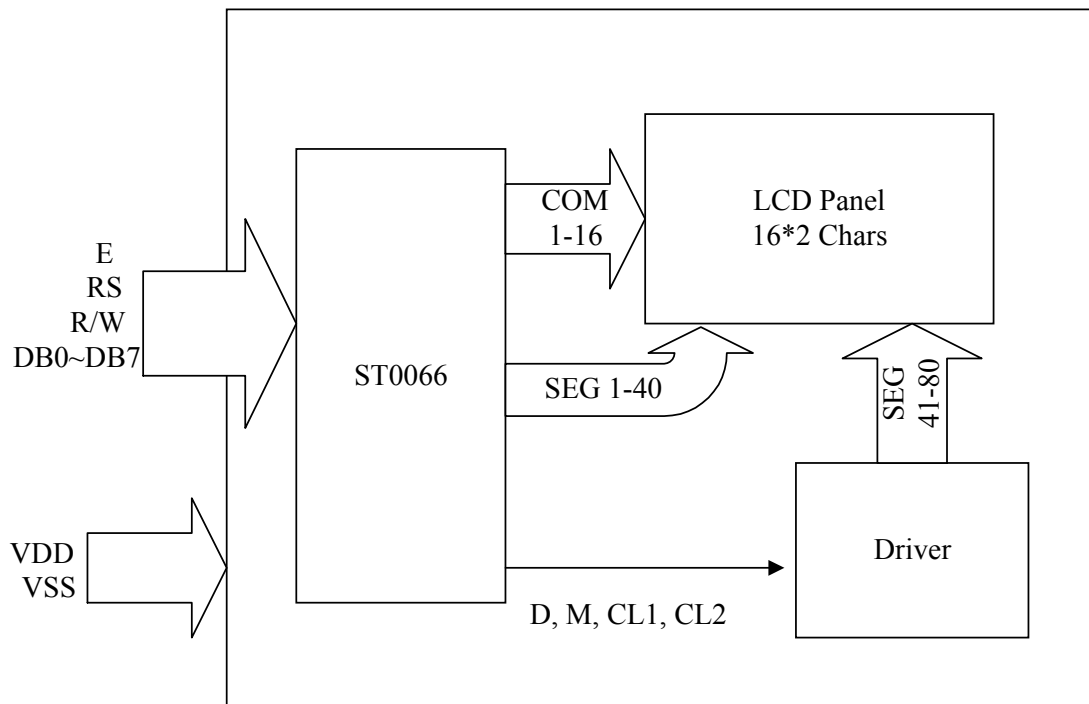
(NOTE 2) Response time :



(NOTE 3) Viewing angle



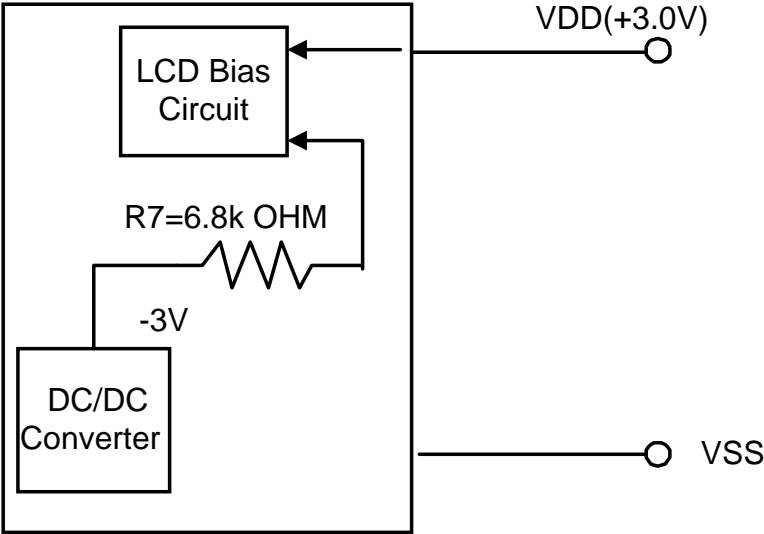
5 BLOCK DIAGRAM & INTERFACE



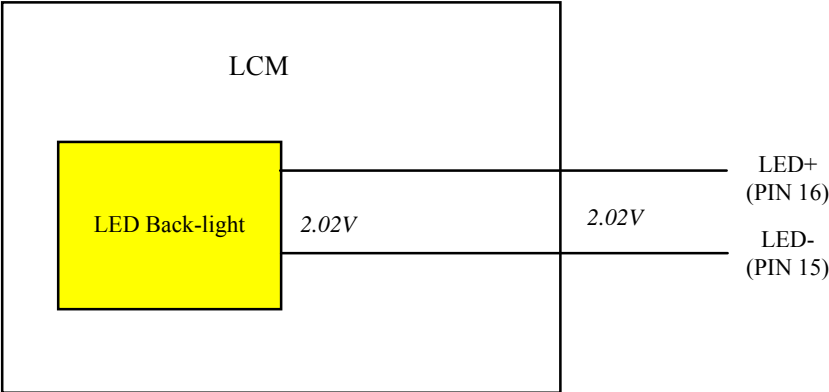
PIN NO.	SYMBOL	LEVEL	FUNCTION
1.	VSS	-	Ground
2.	VDD	-	Power supply for logic
3.	NC	-	No Connection
4.	RS	H/L	H: Data input L: Instruction data input
5.	R/W	H/L	H: Data read (CPU←LCM) L: Data write (CPU→LCM)
6.	E	H.H L	Enable (Operating start signal for data read / write)
7.	DB0	H/L	Data bus line(8 Bit)
8.	DB1	H/L	
9.	DB2	H/L	
10.	DB3	H/L	
11.	DB4	H/L	
12.	DB5	H/L	
13.	DB6	H/L	
14.	DB7	H/L	
15.	LED-	-	Cathode of LED Backlight(-) (switch ground)
16.	LED+	-	Anode of LED Backlight(+) (logic supply)
17.	NC	-	No Connection!
18.	NC	-	

6 POWER SUPPLY

LCD Module



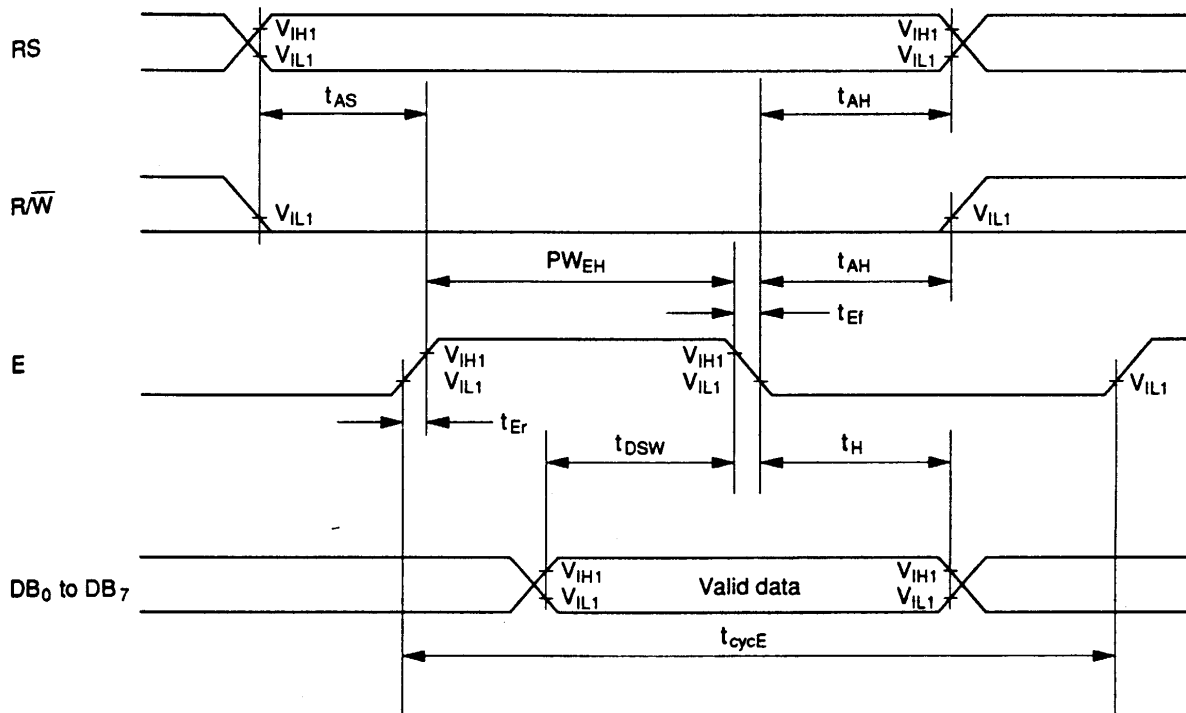
LCM



* Current Limit resistor = 0 ohm

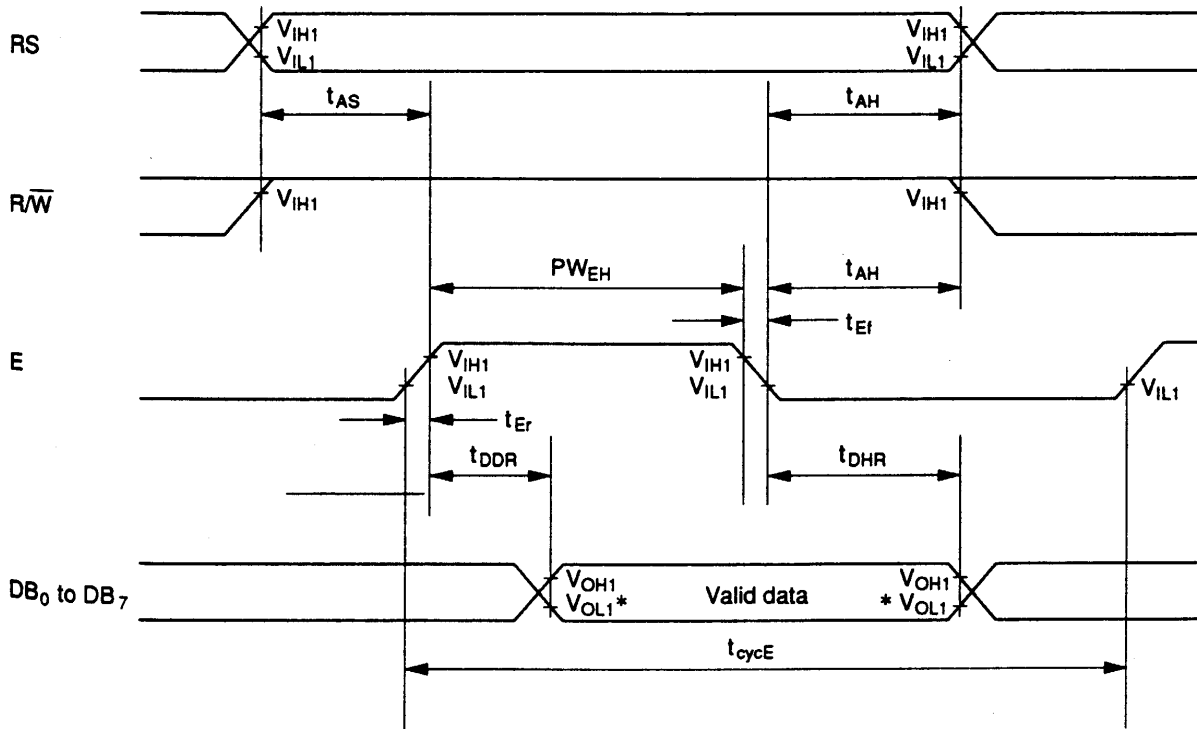
7 TIMING CHARACTERISTICS

Write Operation



Item	Symbol	Min	Max	Unit
Enable cycle time	t_{cycE}	1000	--	ns
Enable pulse width	PW_{EH}	450	--	
Enable rise/fall time	t_{Er}, t_{Ef}	--	25	
Address set-up time (RS, R/W to E)	t_{AS}	60	--	
Address hold time	t_{AH}	20	--	
Data set-up time	t_{DSW}	195	--	
Data hold time	t_H	10	--	

Read Operation



Item	Symbol	Min	Max	Unit
Enable cycle time	t_{cycE}	1000	--	ns
Enable pulse width	$PWEH$	450	--	
Enable rise/fall time	t_{Er}, t_{Ef}	--	25	
Address set-up time (RS, R/W to E)	t_{AS}	60	--	
Address hold time	t_{AH}	20	--	
Data delay time	t_{DDR}	--	360	
Data hold time	t_{DHR}	5	--	

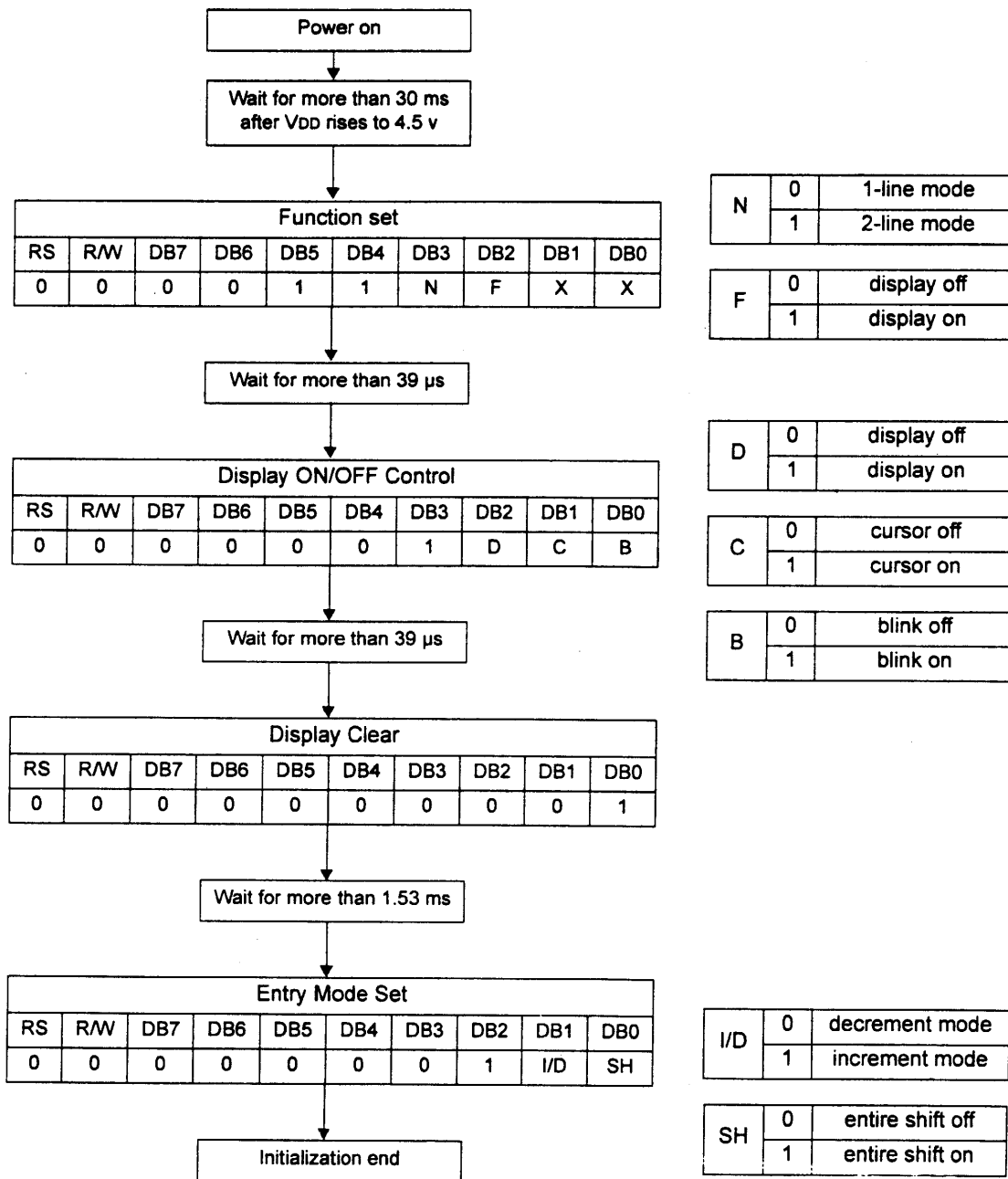
8 INSTRUCTION SET

Instruction	Code										Description
	RS	R/W	D7	D6	D5	D4	D3	D2	D1	D0	
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM and set DDRAM address to "00H" from AC
Return Home	0	0	0	0	0	0	0	0	1	--	Sets DD RAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.
Entry Mode SET	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display.
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display (D), cursor (C), and blink of cursor (B) on/off control bit.
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	--	--	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.
Function Set	0	0	0	0	1	DL	N	F	--	--	Sets interface data length (DL:8-bit/4-bit), number of display lines (N:2-line/1-line) and , display font type (F:5x11dots/5x8 dost).
Set CG RAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Sets CG RAM address in address counter.
Set DD RAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Sets DD RAM address in address counter.
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Writes data into internal RAM (DD RAM /CG RAM).
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Reads data from internal RAM (DD RAM /CG RAM).

* "--" : don't care

Note : When an MPU program with checking the Busy Flag(DB7) is made, it must be necessary $1/2F_{osc}$ is necessary for executing the next instruction by the falling edge of the 'E' signal after the Busy Flag(DB7) goes to "LOW".

9 INITIALIZATION SEQUENCE



10 DD RAM ADDRESS

DIGIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 LINE	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
2 LINE	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

DD RAM Address

11 Font Table

Upper 4bit Lower 4bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HLLL	HHLH	HHLL	HHHL	HHHH
	LLLL	CG RAM (1)															
LLLH	(2)																
LLHL	(3)																
LLHH	(4)																
LHLL	(5)																
LHLH	(6)																
LHHL	(7)																
LHHH	(8)																
HLLL	(1)																
HLLH	(2)																
HLHL	(3)																
HLHH	(4)																
HHLL	(5)																
HHLH	(6)																
HHHL	(7)																
HHHH	(8)																

12 QUALITY AND RELIABILITY

12.1 TESTING

- (1) Ampire will verify operation by powering each unit verifying that each pixel can be enabled and disabled.
- (2) Tests should be conducted under the following conditions :
Ambient temperature : $25 \pm 5^{\circ}\text{C}$
Humidity : $60 \pm 25\% \text{ RH}$.

12.2 SAMPLING PLAN

Sampling method shall be in accordance with MIL-STD-105E, inspection level II, normal inspection, and single sampling plan tables for normal, tightened, and reduced inspection. The zero defect AQL level of the major defect will be decided by the production lot size.

12.3 ACCEPTABLE QUALITY LEVEL

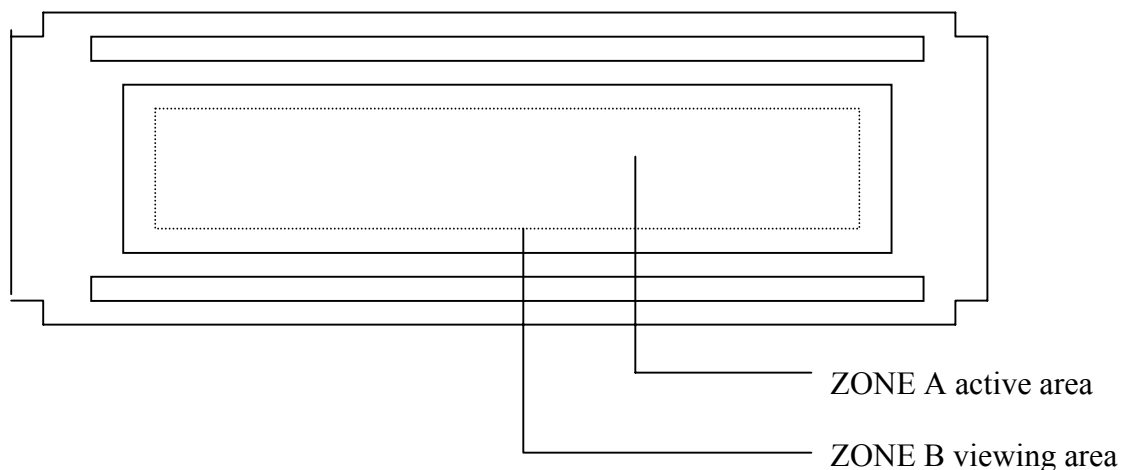
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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

12.4 APPEARANCE

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

12.5 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
	$D \leq 0.2$	Disregard			
	$0.2 < D \leq 0.3$	3	4		
	$0.3 < D \leq 0.4$	2	3		
	$0.4 < D$	0	1		
Black lines	Width W, Length L	A	B	Minor	2.5
	$W \leq 0.03$	disregard			
	$0.03 < W \leq 0.05$	3	4		
	$0.05 < W \leq 0.07, L \leq 3.0$	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 (Page 5)			Minor	2.5
Response time	See note 2 (Page 5)			Minor	2.5
Viewing angle	See note 3 (Page 5)			Minor	2.5



12.6 RELIABILITY

Test Item	Test Conditions	Note
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	25 °C ~ -20 °C ~ 25 °C ~ 70 °C ~ 25 °C 30 5 30 5 30 5 30 5 30 (min) / 5 cycles	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
ESD Test	Cp=200pF, R=100Ω Air-discharge ±10KV Shot times : every step 10 times total 60 times.	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.

13 HANDLING PRECAUTIONS

- (1) An 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 colour.
- (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.

14 SPECIAL REQUIREMENT

14.1 Comformal Coating

Using DOW CORNING 1-2577 Conformal Coating , type SR (Silicone resin), which is on QPL (Qualified Products List) for MIL-1-46058C.

14.2 Date Code

All Ampire modules are labeled with a Lot date code.

Label should include Ampire P/N AD162D3YIQY00H and CDS P/N 57039-148260-1.

14.3 ESD Lable

The assembly shall be marked with an ESD Susceptibility Symbol, in accordance with EIA Standard RS-471. This symbol is silk-screened on the PWB.

14.4 Packaging

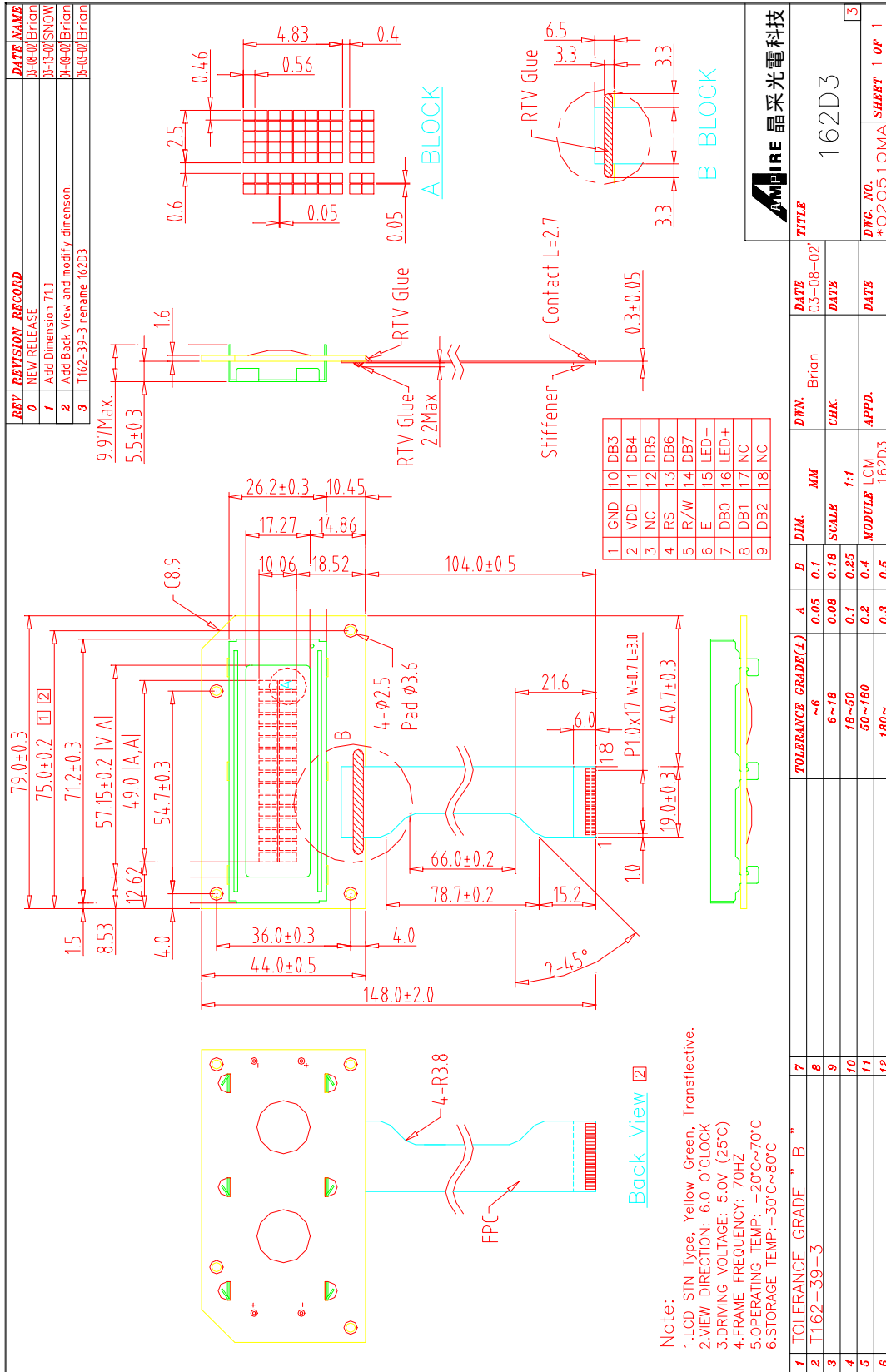
Each complete display module shall be protected against mechanical and electrostatic damage. Package marking shall include ESD symbol identifier. Packing shall be in accordance with best commercial practice.

14.5 Marking

The tape marking will be used:

- (1) Manufacture's name / cage code or symbol
- (2) Purchase part number
- (3) Lot date code

15 OUTLINE DIMENSION



AMPiRE 晶采光電科技

TITLE: 162D3

DWG. NO: *O2.05.10MA

SHEET 1 OF 1