

DISPLAYTRONIC

A DIVISION OF ZE XIAMEN CO., LTD.

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

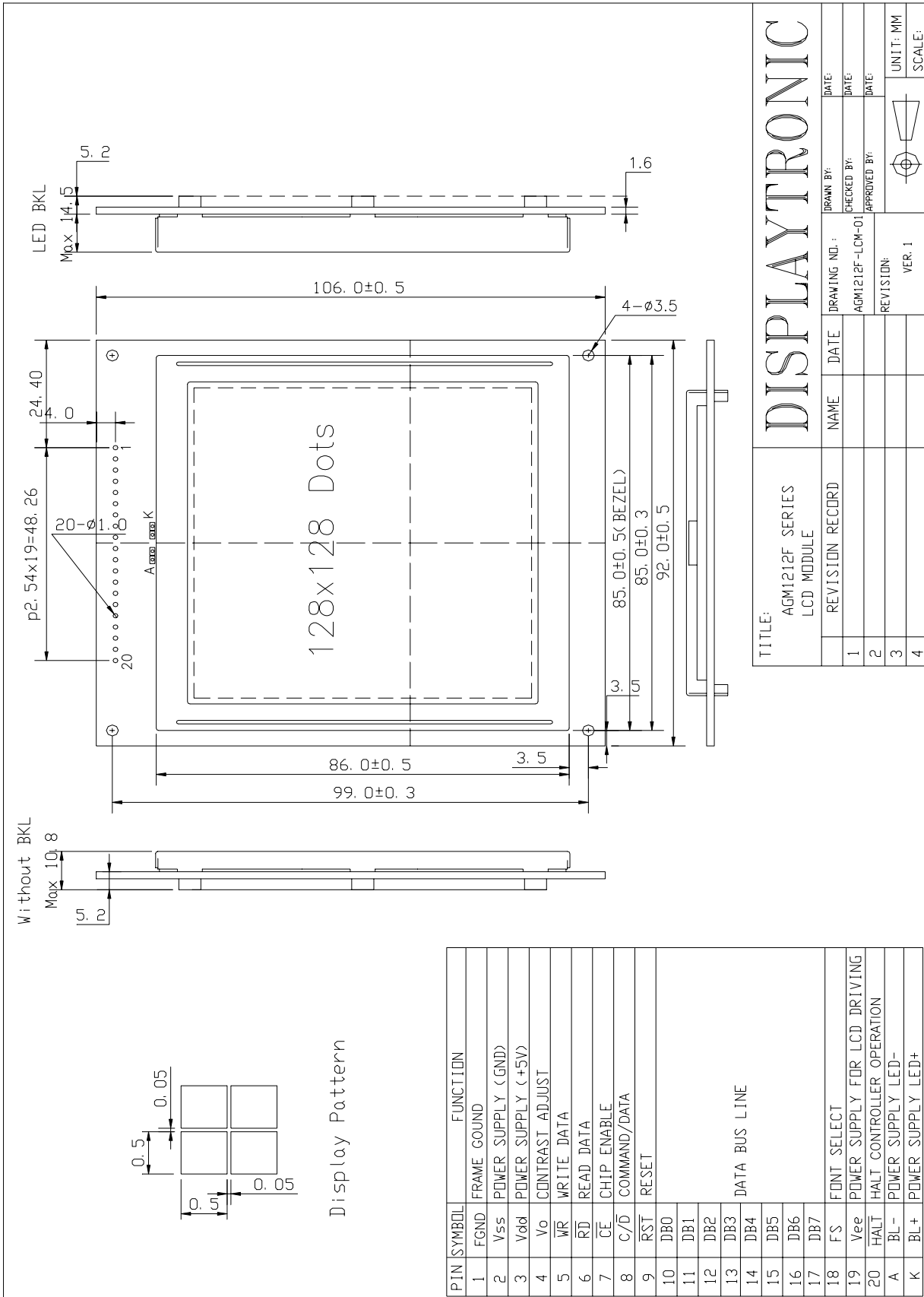
PART NUMBER:

AGM 1212F SERIES

DATE:

Sep.14, 2000

1.0 MECHANICAL DIAGRAM



2.0 MECHANICAL SPECS

1. Overall Module Size	92.0mm(W) x 106.0mm(H) x max 14.5mm(D) for LED backlight version 92.0mm(W) x 106.0mm(H) x max 10.8mm(D) for reflective version
1. Dot Size	0.50mm(W) x 0.50mm(H)
2. Dot Pitch	0.55mm(W) x 0.55mm(H)
3. Duty	1/128
4. On-Board Controller	T6963C
5. LC Fluid Options	STN, FSTN
6. Polarizer Options	Reflective, Transflective, Transmissive
7. Backlight Options	LED
8. Temperature Range Options	Standard (0°C ~ 50°C), Wide (-20°C ~ 70°C)

3.0 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Typ	Max	Unit
Operating temperature (Standard)	Top	0	-	50	°C
Storage temperature (Standard)	Tst	-10	-	60	°C
Operating temperature (Wide temperature)	Top	-20	-	70	°C
Storage temperature (Wide temperature)	Tst	-30	-	80	°C
Input voltage	Vin	-0.3	-	Vdd+0.3	V
Supply voltage for logic	Vdd- Vss	-0.3	-	7.0	V
Supply voltage for LCD drive	Vdd-V0		17.2		V

4.0 ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Input voltage (high)	Vih	H level	0.8Vdd	-	Vdd	V
Input voltage (low)	Vil	L level	0	-	0.2Vdd	V
Recommended LC Driving Voltage (Standard Temp)	Vdd - Vo	0°C	-			V
		25°C	-	17.2	-	
		50°C			-	
Power Supply Current	Idd	Vdd=5.0V	-	15	20	mA
LED Power Supply Voltage	Vfled	R=6.8Ω	-	4.6	5.0	V
LED Power Supply Current	Ifled	R=6.8Ω	-	166	180	mA

5.0 OPTICAL CHARACTERISTICS

Item		Cr (Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN	TYP.	MIN	TYP.
R	A	3.3	3.6	80°	85°	-	35°
	B	7.8	8.5	80°	85°	-	35°
	C	-	-	-	-	-	-
S	A	3.1	3.4	80°	85°	-	35°
	B	7.4	8.1	80°	85°	-	35°
	C	-	-	-	-	-	-

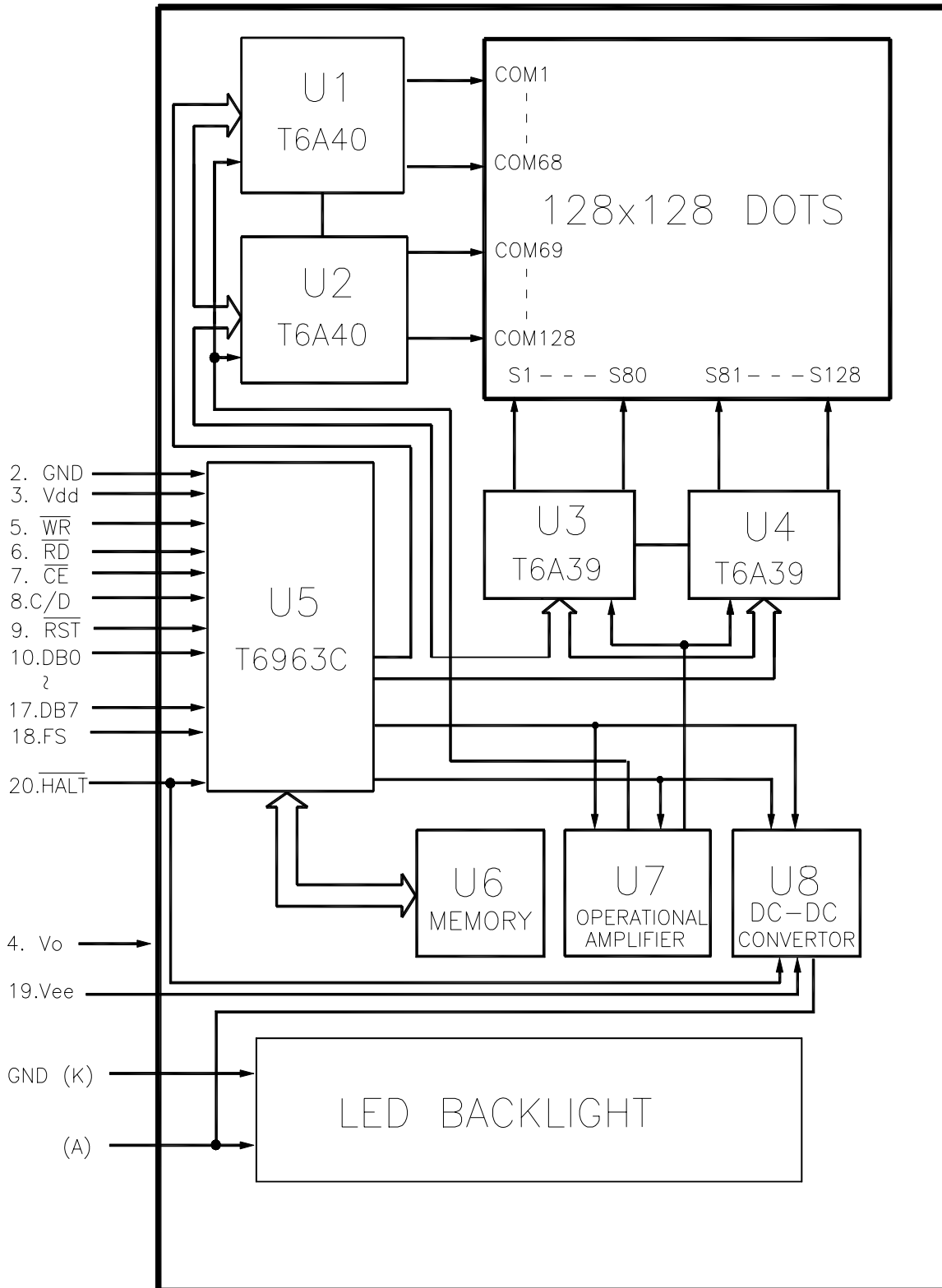
Note:

- R: Reflective
- S: Transflective
- A: STN Gray
- B: STN Yellow
- C: FSTN

At: $\phi = 0^\circ, \theta = 0^\circ$

Item	Symbol	Condition	Min	Typ	Max	Unit
Response time (rise)	Tr	25 °C	-	160		ms
Response time (fall)	Tf	25°C	-	200		ms

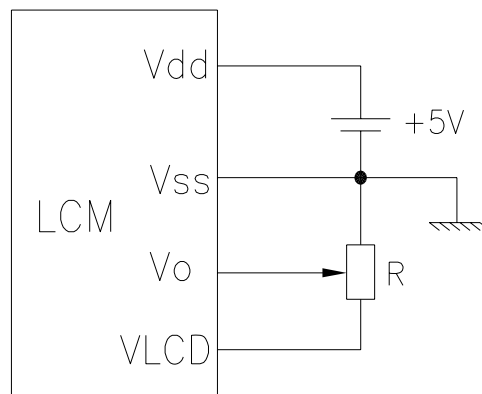
6.0 BLOCK DIAGRAM



7.0 PIN ASSIGNMENT

Pin No.	Symbol	atio	Level
1	FGND	Frame Ground	-
2	GND	Ground	-
3	Vdd	+5V	-
4	V0	LCD contrast adjust	-
5	WR	Write Data	H/L
6	RD	Read Data	H/L
7	CE	Chip Enable	H, H→L
8	C/D	Command/Data	H/L
9	RST	Reset	L
10	DB0	Data bit 0	H/L
11	DB1	Data bit 1	H/L
12	DB2	Data bit 2	H/L
13	DB3	Data bit 3	H/L
14	DB4	Data bit 4	H/L
15	DB5	Data bit 5	H/L
16	DB6	Data bit 6	H/L
17	DB7	Data bit 7	H/L
18	FS	Font select	H/L
19	VLCD	Power supply for LCD driving	-
20	HALT	Halt controller Operation	H/L
K	BL-	Power Supply for BL+	-
A	BL+	Power Supply for BL-	-

8.0 POWER SUPPLY



$R=10K\sim 20K\Omega$

9.0 TIMING CHARACTERISTICS

Item	Symbol	Test Condition	Min.	Tvp.	Max.	Unit
C/D Set-up Time	t_{CDS}	Fig.a	100	-	-	ns
C/D Hold Time	t_{CDH}	Fig.a	10	-	-	ns
CE,RD,WR Pulse Width	t_{CE}, t_{RD}, t_{WR}	Fig.a	80	-	-	ns
Data Set-up Time	t_{DS}	Fig.a	80	-	-	ns
Data Hold time	t_{DH}	Fig.a	40	-	-	ns
Access Time	t_{ACC}	Fig.a	-	-	150	ns
Output Hold Time	t_{OH}	Fig.a	10	-	50	ns

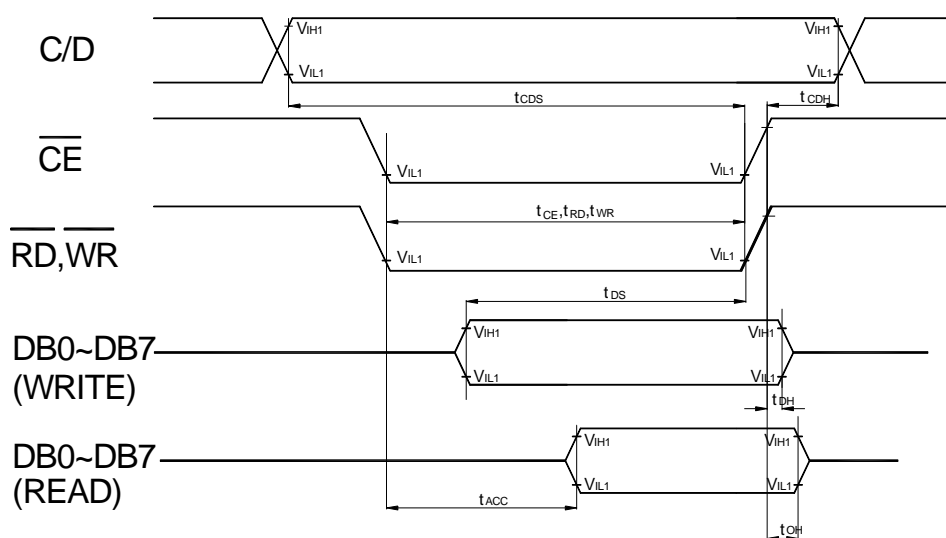


Fig. a Interface timing (data write/read)

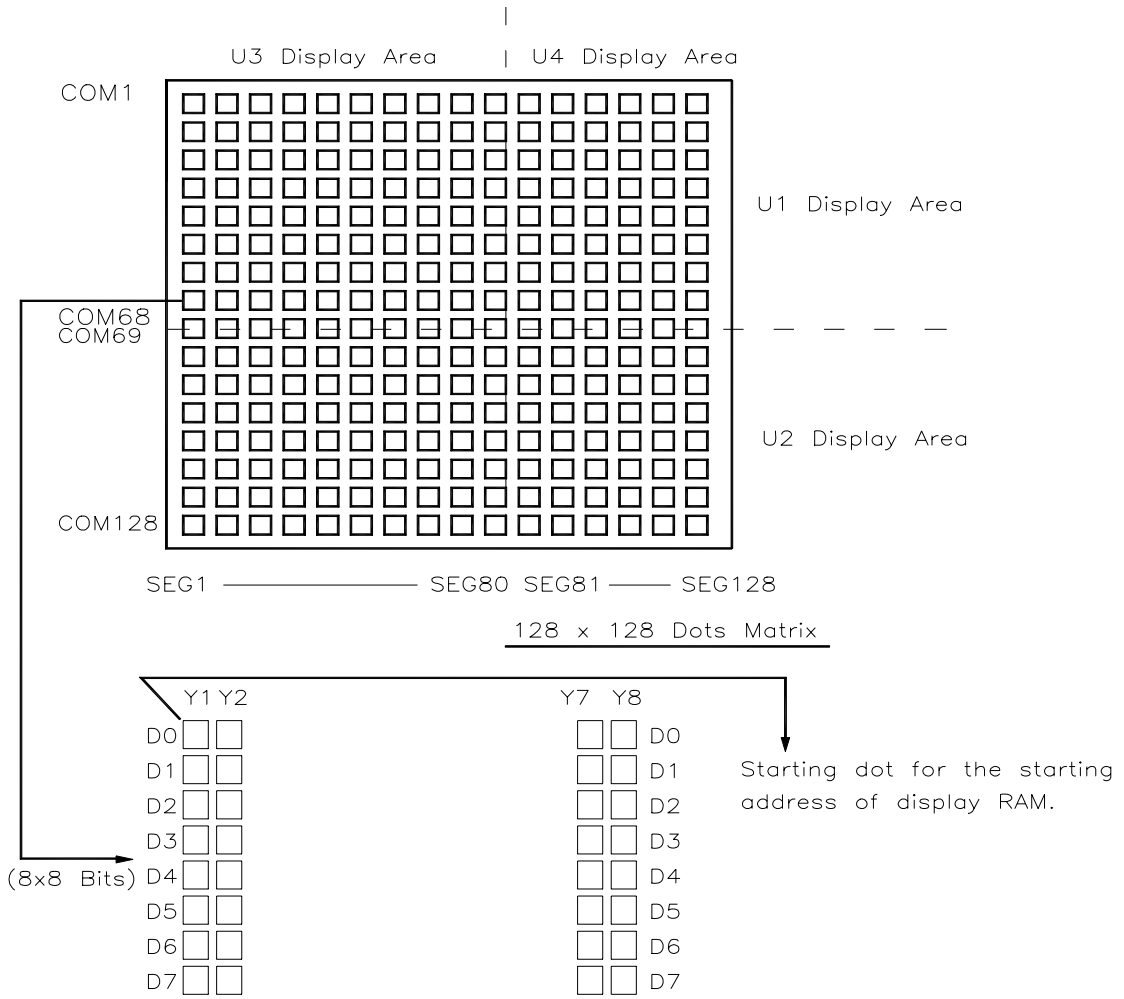
10.0 RELIABILITY TEST

Storage Condition	Content	Evaluations and Assessment*			
		Current Consumption	Oozing	Contrast	Other Appearances
Operation at high temperature and humidity	40°C,90% RH,240hrs	Twice initial value or less	None	More than 80% of initial value	No abnormality
High temperature storage	60°C, 240hrs	Twice initial value or less	None	More than 80% of initial value	No abnormality
Low temperature storage	-20°C, 240hrs	Twice initial value or less		More than 80% of initial value	No abnormality

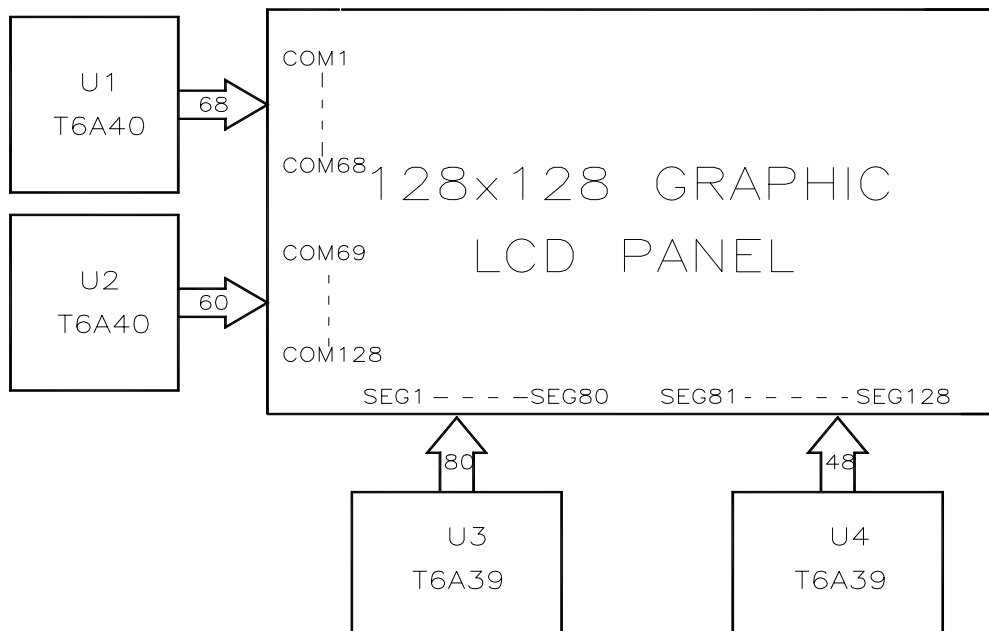
*Evaluations and assessment to be made two hours after returning to room temperature (25°C±5°C).

*The LCDs subjected to the test must not have dew condensation

11.0 RELATION BETWEEN DISPLAY PATTERN AND DRIVERS



D0~D7 are 8 bits transmitted data, where D0 is LSB and D7 is MSB.



12.0 DISPLAY CONTROL INSTRUCTION

The display control instructions control the internal state of the T6963C. Instructions are received from MPU to T6963C for the display control.

INSTRUCTION	C/D	$\overline{\text{RD}}$	$\overline{\text{WR}}$	D7	D6	D5	D4	D3	D2	D1	D0	DESCRIPTION	
Status Read	1	0	1	S7	S6	S5	S4 Not used	S3	S2	S1	S0	S1~S5 0: In operation 1: Ready S6 0:No Error 1:Error S7 0:Display Off 1:Normal Display	
Register Set	1	1	0	0	0	1	0	0	0	0	1	Set Cursor Pointer Set Offset Register Set Address Pointer	
Control Word Set	1	1	0	0	1	0	0	0	0	0	0	Set Text Home Address Set Text Area Set Graphic Home Address Set graphic Area	
Mode Set	1	1	0	1	0	0	0	X X X X 0 1	0 0 0 1 X X	0 0 1 0 X X	0 1 1 0 X X	OR mode EXOR mode AND mode Text Attribute mode Internal CG ROM mode External CG RAM mode	
Display Mode	1	1	0	1	0	0	1	0 X X 0 1 1	0 X X 1 0 1	0 1 1 X X X	0 0 1 X X X	Display Off Cursor on,blink off Cursor on,blink on Text on,graphic off Text off,graphic on Text on,graphic on	
Cursor Pattern Select	1	1	0	1	1	0	0	0	N2	N1	N0	Cursor Set	
Data Auto Read /Write	1	1	0	1	0	1	1	0	0	0	0	Set Data Auto Write Set Data Auto Read Auto Reset	
Data Read Write	1	1	0	1	1	0	0	0	N2	N1	N0	Data Read/Write And ADP Increment/Decrement It should executed after setting Address using Set Address Pointer command.	
Screen Peek	1	1	0	1	1	1	0	0	0	0	0	Screen Peek	
Screen Copy	1	1	0	1	1	1	0	1	0	0	0	Screen Copy	
Bit Set Reset	1	1	0	1	1	1	1	N3	N2	1	N0	Bit Set	
Data Write	0	1	0	Write Data									Writes data DB0~DB7 from MPU to external display RAM.
Data Read	0	0	1	Read Data									Reads data DB0~DB7 from external display RAM to MPU.

X : invalid