DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 128064M1 FGX-PW

Product Specification   *Version: 2*

09.03.2022

GENERAL SPECIFICATION

MODULE NO. :

DEM 128064M1 FGX-PW

VERSION NO.	CHANGE DESCRIPTION	DATE
0	Original Version	28.02.2022
1	Change the module/BL drawing.	02.03.2022
2	Change FPC length	09.03.2022

PREPARED BY: CC   DATE: 09.03.2022

APPROVED BY: WH   DATE: 09.03.2022

CONTENTS

1. FUNCTIONS & FEATURES

- DEM 128064M1 Series LCD Type :

| MODULE	LCD TYPE	REMARKS
DEM 128064M1 FGX-PW	FSTN Transflective Positive Mode	-

- Viewing Direction : 6 O'clock

- Driving Scheme : 1/65 Duty Cycle, 1/9 Bias

- Power Supply Voltage(Typ.) : 3.3 Volt (typ.)

- LCD Operation Voltage : 9.0 Volt (typ.)

- Display Contents : 128 x 64 Dots

- Backlight : LED, Lightguide, White

- Operating temperature : -30°C ~ +85°C

- Storage temperature : -30°C ~ +85°C

- RoHS Compliant

2. MECHANICAL SPECIFICATIONS

- Module Size: : 43.00(L) x 38.00(W) x 5.20(T)mm （without FPC）

- Viewing Area Size: : 37.00(W) x 28.00(H) mm

- Active Area Size : 36.08(W) x 23.02(H)mm

- Dot pitch: : 0.282(W) x 0.36(H)mm

- Dot Size: : 0.262(W) x 0.34(H) mm

3. EXTERNAL DIMENSIONS

Label Printed Sample:
DEM 128064M1 FGX-PW
WYW: W:Week Y:Year

DEM 128064M1 FGX-PW
WYW

BLACK TAPE

0.3±0.05
P0.5*(34-1)=16.5±0.1
17.5±0.1
0.5±0.1
3±0.5

5.2±0.3
0.7±0.1
0.7±0.1
2.05 MAX

silicone
black tape
stiffener
contact side
0.3±0.05
A-A

0.282
0.262
0.34
0.36
SCALE 10:1

3.0
3.46
BL/LCD 43.0±0.2
V,A 37.0
A,A 36.08
128X64 DOTS
silk screen
DEM 128064M1
UL:XXXXXX
XXXXXX
12.75
34
1
MAX 1
10.0 MAX
MIN 17
4.39
A,A 23.02
1.9
V,A 28
COMMON 32±0.2
BL/LCD 38±0.2
6±0.5
30±0.5
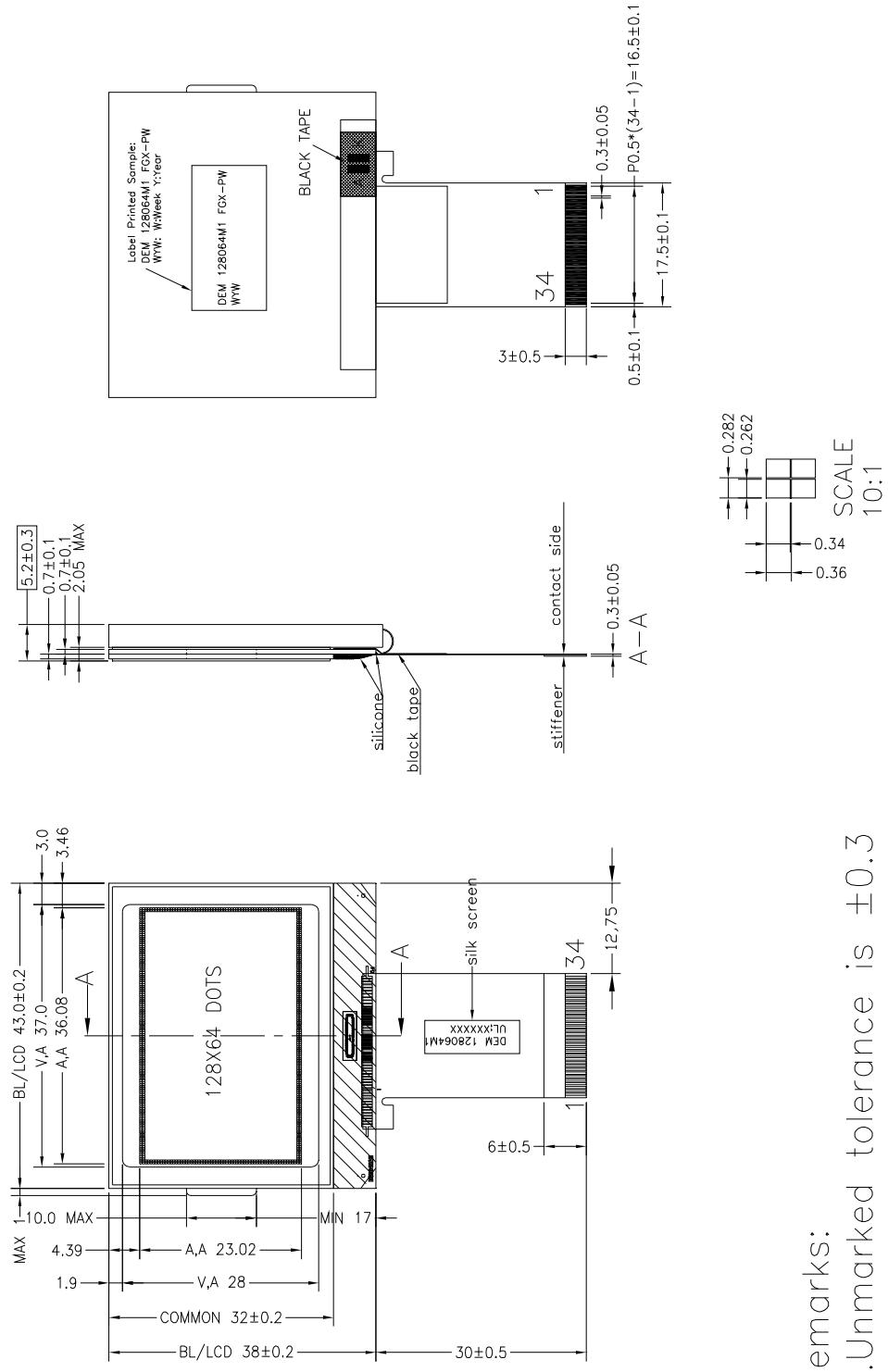
Remarks:
1.Unmarked tolerance is ±0.3
2.All materials comply with RoHs
3. ....critical dimension.

4. BLOCK DIAGRAM

A ───▶
K ───▶
IRSB ───▶
HPMB ───▶
PSB ───▶
C68 ───▶
VR ───▶
V0 ───▶
V1 ───▶
V2 ───▶
V3 ───▶
V4 ───▶
C4+ ───▶
C2− ───▶
C2+ ───▶
C1+ ───▶
C1− ───▶
C3+ ───▶
VOUT ───▶
VSS ───▶
VDD ───▶
DB7 ───▶
DB6 ───▶
DB5 ───▶
DB4 ───▶
DB3 ───▶
DB2 ───▶
DB1 ───▶
DB0 ───▶
E_RDB ───▶
RW_WRB ───▶
A0 ───▶
RESB ───▶
CS1B ───▶

IST3004-TX

COM32~COM63

SEG0~SEG127

LCD PANEL 128*64

COM0~COM31
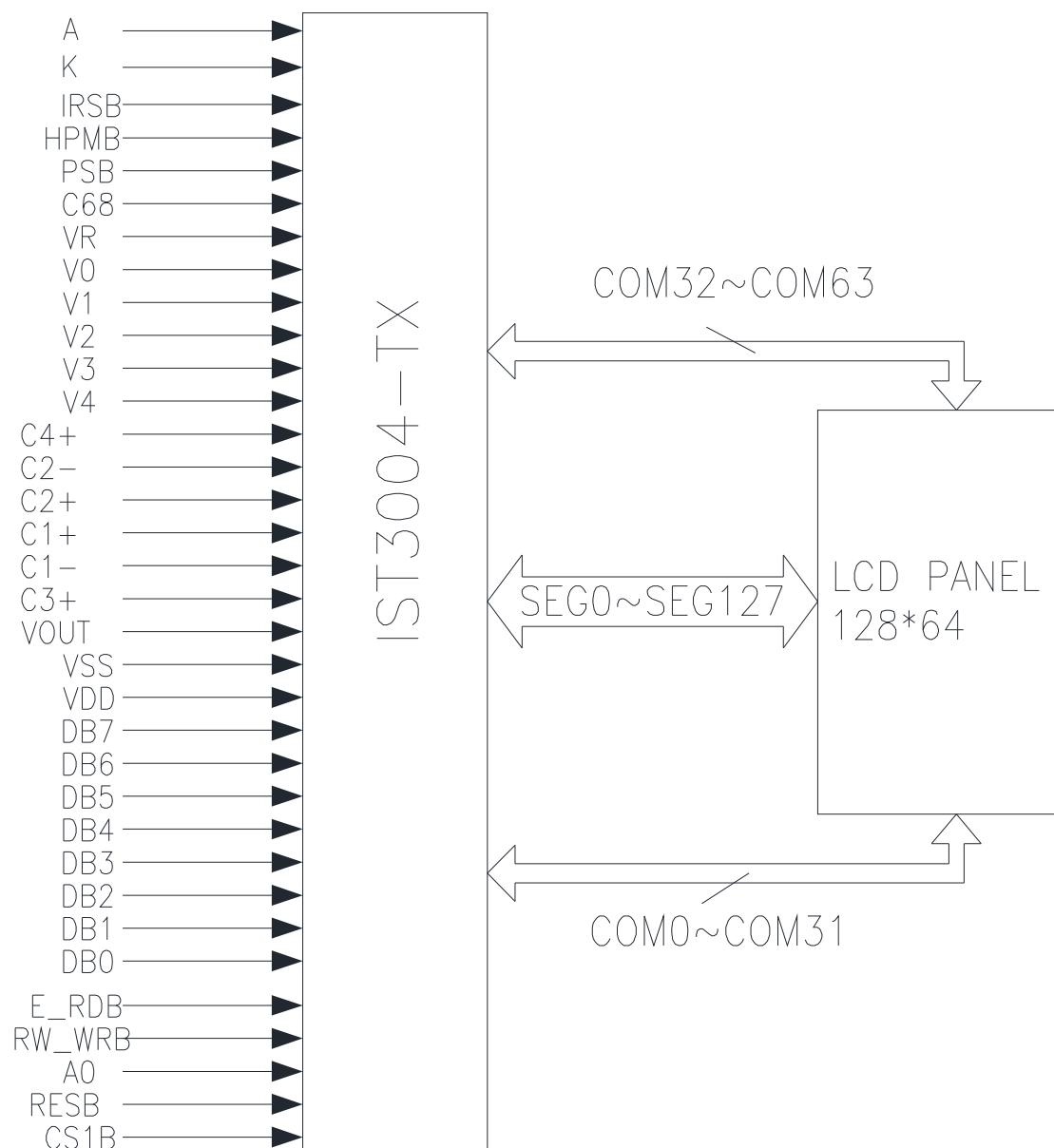
5. PIN DESCRIPTION

Pin No.	Name	Description
1	A	Supply voltage for backlight LED+
2	K	Supply voltage for backlight LED-
3	IRS	Voltage regulator internal/external resistor source select IRS = "L"→ Use external resistor source through VR terminal IRS = "H"→ Use internal resistor source
4	HPMB	Power circuit driving ability control - HPMB = "H" : Normal mode - HPMB = "L" : High power mode
5	PS	Parallel / Serial Data Input Select Input <table><tr><td>PS</td><td>Interface Mode</td><td>Chip Select</td><td>Data / instruction</td><td>Data</td><td>Read / Write</td><td>Serial clock</td></tr><tr><td>"H"</td><td>Parallel</td><td>CS1B</td><td>A0</td><td>DB0 to DB7</td><td>E_RDB RW_WRB</td><td>--</td></tr><tr><td>"L"</td><td>Serial</td><td>CS1B</td><td>A0</td><td>SDI (DB7)</td><td>Write only</td><td>SCL (DB6)</td></tr></table> <NOTE> In serial mode, it is impossible to read data from the on-chip RAM. And DB0 to DB5 and E_RDB and RW_WRB must be fixed to either "H" or "L".
6	C68	Microprocessor Interface Select input pin in parallel mode - C68 = "H" : 6800-series MPU interface - C68 = "L" : 8080-series MPU interface
7	VR	Voltage regulator terminal When IRS = "L", the Voltage Regulator resistor will be decided by the external resistors connected between V0/VR & VR/VSS
8	V0	
9	V1	
10	V2	LCD driver supplies voltages
11	V3	
12	V4	
13	C4+	
14	C2-	
15	C2+	
16	C1+	DC/DC voltage converter.
17	C1-	
18	C3+	
19	VOUT	
20	VSS	Ground
21	VDD	power supply
22	DB7	
23	DB6	8-bit bi-directional data bus that is connected to the standard 8-bit microprocessor data bus.
24	DB5	When the serial interface selected (PS = "L");
25	DB4	- DB0 to DB5 : high impedance
26	DB3	- DB6 : serial input clock (SCL)
27	DB2	- DB7 : serial input data (SDI)
28	DB1	When chip select is not active, DB0 to DB7 may be high impedance.
29	DB0	
30	E-RDB	Read / Write execution control pin <table><tr><td>C68</td><td>MPU Type</td><td>E_RDB</td><td>Description</td></tr><tr><td>H</td><td>6800-series</td><td>E</td><td>Read / Write control input pin - RW = "H" : When E is "H", DB0 to DB7 are in an output status. - RW = "L" : The data on DB0 to DB7 are latched at the falling edge the E signal.</td></tr><tr><td>L</td><td>8080-series</td><td>/RDB</td><td>Read enable clock input pin When / RDB is "L", DB0 to DB7 are in an output status.</td></tr></table>

31	RW_WRB	Read / Write execution control pin			
		C68	MPU Type	RW_WRB	Description
		H	6800-series	RW	Read / Write control input pin - RW = "H" : read - RW = "L" : write
		L	8080-series	/WRB	Write enable clock input pin The data on DB0 to DB7 are latched at the rising edge of the /WRB signal.
32	A0	Register select input pin - A0 = "H" : DB0 to DB7 are display data - A0 = "L" : DB0 to DB7 are control data			
33	RESB	Hardware Reset input pin When RESB is "L", initialization is executed.			
34	CS1B	Chip select input pins Data / instruction I/O is enabled only when CS1B is "L" and CS2 is "H". when chip select is non-active, DB0 to DB7 may be high impedance.			

6. BACKLIGHT CHARACTERISTICS

Item	Symbol	min.	typ.	max.	Unit	Condition
Forward Voltagt	Vf	2.8	3.1	3.3	V	
Power Dissipation	Pd	168	186	198	mW	
Luminous Uniformity	ΔLv	70			%	If= 60 mA
Luminance	Lv	420	500		cd/m ^{2}	
Color Coordinate	X	0.260		0.30		T=25° C
	Y	0.270		0.31		
Lifetime		50000h			Hours	
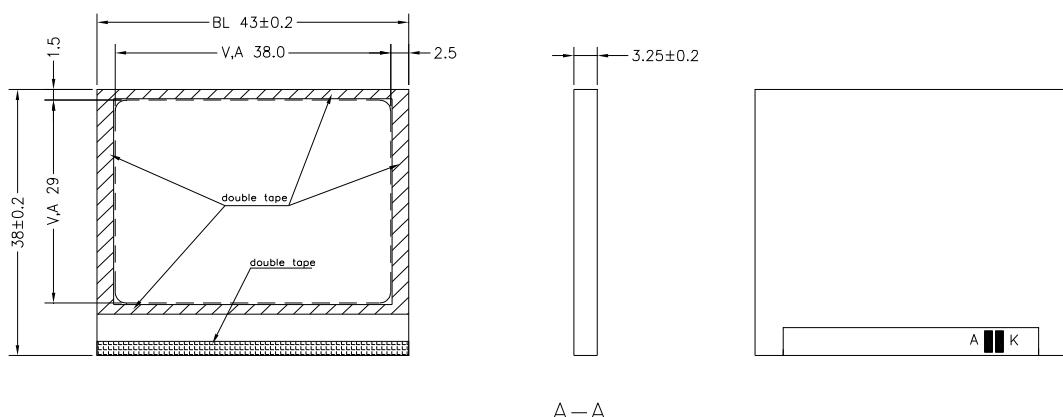
A—A

Circuit Diagram
COLOR:WHITE
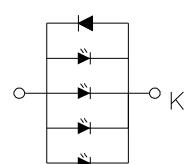
Remarks:
1. Unmarked tolerance is ±0.3
2. All materials comply with RoHs
3. [   ]...:critical dimension.

7. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Supply Voltage Range	VDD	-0.3 ~ 7.0	V
	V0,VOUT	-0.3 ~ 15.0	V
Supply Voltage Range	V1/V2/V3/V4	-0.3 ~ V0	V
Operating Temperature	Topr	-30~+85	°C
Storage Temperature	Tstg	-30~+85	°C

8. ELECTRICAL CHARACTERISTICS

8.1. DC CHARACTERISTICS

ITEM		symbol	Condition	STANDARD VALUE			UNIT
				MIN	TYP	MAX	
Supply Voltage For Logic		V_{DD}		3.0	3.3	3.6	V
Supply Voltage For LCD		V_{LCD}		8.7	9.0	9.3	
Current Consumption		I_{DD}			TBD		mA
Input Voltage	High	VIH		0.8xVDD	-	VDD	V
	Low	VIL		VSS	-	0.2xVDD	
Output Voltage	High	VOH	IOH= -0.5mA	0.8xVDD	-	VDD	
	Low	VOL	IOL = 0.5mA	VSS	-	0.2xVSS	

8.2. AC CHARACTERISTICS

System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)
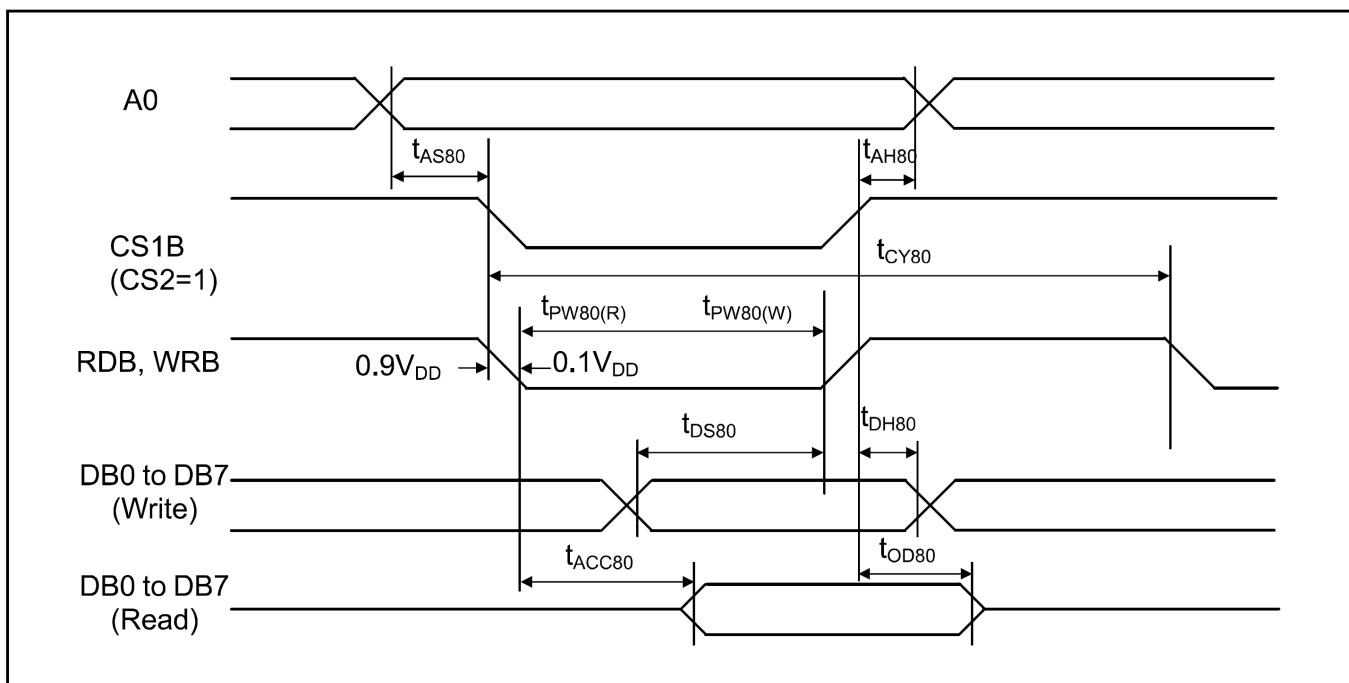
Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Address setup time Address hold time	A0	t_{AS80} t_{AH80}	0 0	-	-	ns	
System cycle time		t_{CY80}	300	-	-	ns	
Pulse width (WRB)	RW_WRB	$t_{PW80}(W)$	150	-	-	ns	
Pulse width (RDB)	E_RDB	$t_{PW80}(R)$	150	-	-	ns	
Data setup time Data hold time	DB7 to DB0	t_{DS80} t_{DH80}	60 0	-	-	ns	
Read access time Output disable time		t_{ACC80} t_{OD80}	140 -	-	- 10	ns	(No load)

Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Address setup time Address hold time	A0	t_{AS68} t_{AH68}	0 0	- -	- -	ns	
System cycle time		t_{CY68}	300	-	-	ns	
Pulse width (E)	RW_WRB	$t_{PW68}(W)$	150	-	-	ns	
Pulse width (E)	E_RDB	$t_{PW68}(R)$	150	-	-	ns	
Data setup time Data hold time	DB7 to DB0	t_{DS68} t_{DH68}	60 0	- -	- -	ns	
Read access time Output disable time		t_{ACC68} t_{OD68}	140 -	- -	- 10	ns	(No load)

Serial Interface
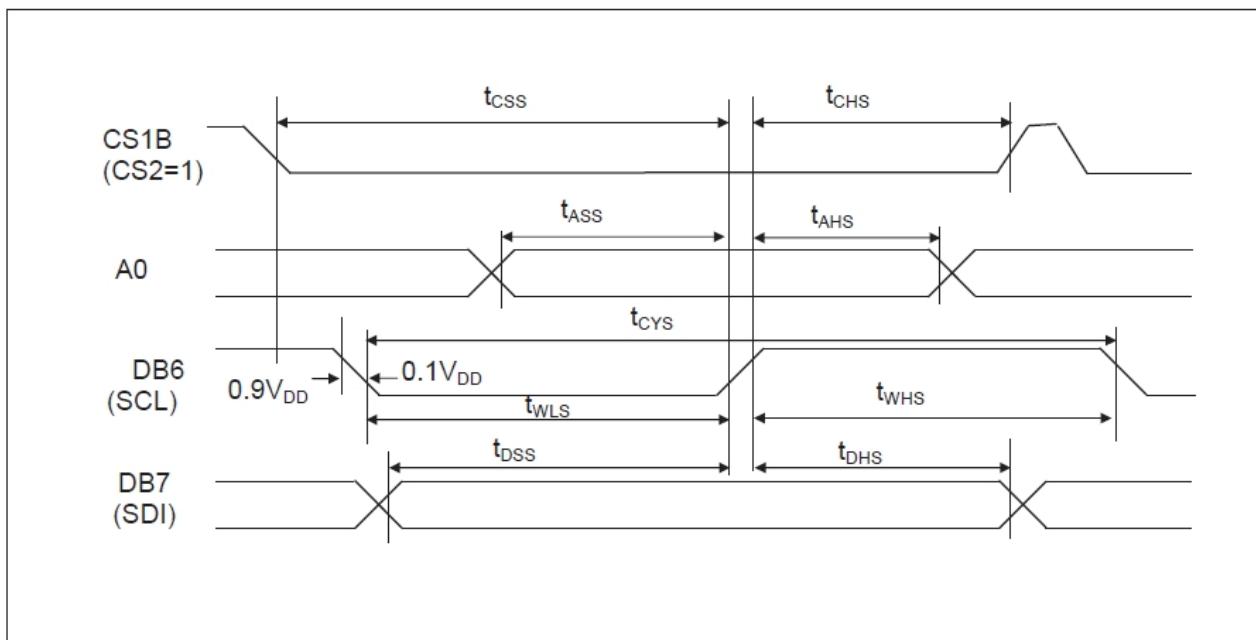
Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Serial clock cycle	DB6 (SCL)	tCYS	200	-	-	ns	
SCL high pulse width		tWHS	90	-	-		
SCL low pulse width		tWLS	90	-	-		
Address setup time	A0	tASS	45	-	-	ns	
Address hold time		tAHS	45	-	-		
Data setup time	DB7 (SDI)	tDSS	45	-	-	ns	
Data hold time		tDHS	45	-	-		
CS1B setup time	CS1B	tCSS	90	-	-	ns	
CS1B hold time		tCHS	90	-	-		

Reset Input Timing

| Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Reset low pulse width	RESB	tRW	2	-	-	us	*1
Reset time	-	tR	-	-	2	us	
Reset time	RESB	t	0	-	-	us	

NOTE

*1. t_R (reset time) represents the period from rising edge of reset input to end of internal circuit reset. The IST3004-TX can operate normally after t_R

9. COMMAND TABLE

× : Don't care

INSTRUCTION	A0	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Display ON / OFF	0	0	1	0	1	0	1	1	1	DON	LCD display On/Off control DON = 0 : display OFF DON = 1 : display On
Display starting line	0	0	0	1	ST5	ST4	ST3	ST2	ST1	ST0	Specify the line address for the first COM output
page address	0	0	1	0	1	1	P3	P2	P1	P0	Set page address
Set column address MSB	0	0	0	0	0	1	Y7	Y6	Y5	Y4	Set column address MSB
Set column address LSB	0	0	0	0	0	0	Y3	Y2	Y1	Y0	Set column address LSB
Read status	0	1	BUSY	ADC	ON/OFF	RESB	0	0	0	0	Read the internal status
Write display data	1	0	Write data								Write data into Display RAM
Read display data	1	1	Read data								Read data from Display RAM
ADC select	0	0	1	0	1	0	0	0	0	ADC	SEG output direction select ADC = 0 : SEG0 → SEG131 ADC = 1 : SEG131 → SEG0
Reverse display ON / OFF	0	0	1	0	1	0	0	1	1	REV	Normal / Reverse display select REV = 0 : Reverse display off REV = 1 : Reverse display on
Entire display ON / OFF	0	0	1	0	1	0	0	1	0	EON	Entire display On/Off control EON = 0 : Entire display off EON = 1 : Entire display on
LCD bias select	0	0	1	0	1	0	0	0	1	BS	Select LCD bias
Set Read-modify-write (RMW)	0	0	1	1	1	0	0	0	0	0	Set Read-modify-write mode
Clear RMW	0	0	1	1	1	0	1	1	1	0	Clear Read-modify-write mode
S/W Reset	0	0	1	1	1	0	0	0	1	0	S/W Reset
SHL select	0	0	1	1	0	0	SHL	×	×	×	COM output direction select SHL = 0 : COM0 → COM63 SHL = 1 : COM63 → COM0
Power control	0	0	0	0	1	0	1	VC	VR	VF	Control power circuit operation
Regulator resistor select	0	0	0	0	1	0	0	R2	R1	R0	Select internal resistance ratio of the regulator resistor
Set reference voltage mode	0	0	1	0	0	0	0	0	0	1	Set reference voltage mode (double byte command)
Set reference voltage register	0	0	×	×	SV5	SV4	SV3	SV2	SV1	SV0	Set reference voltage register
Set static indicator mode	0	0	1	0	1	0	1	1	0	SM	Set static indicator mode (double byte command)
Set static indicator register	0	0	×	×	×	×	×	×	S1	S0	Set static indicator register
Power save	-	-	-	-	-	-	-	-	-	-	Compound Instruction of display OFF and entire display ON
NOP	0	0	1	1	1	0	0	0	1	1	No operation (dummy command)
Set Booster Ratio select mode	0	0	1	1	1	1	1	0	0	0	Set Booster ration select mode (double byte command)
Set Booster Ratio register	0	0	x	x	x	x	x	x	BT1	BT0	Set Booster ration BT[1:0] = 00 : x2, x3, x4 BT[1:0] = 01 : x5 BT[1:0] = 11 : x6 BT[1:0] = 10 : (don't use)
Test Instruction	0	0	1	0	0	0	1	0	0	0	Test command (don't use)

10. LCD ARTWORK
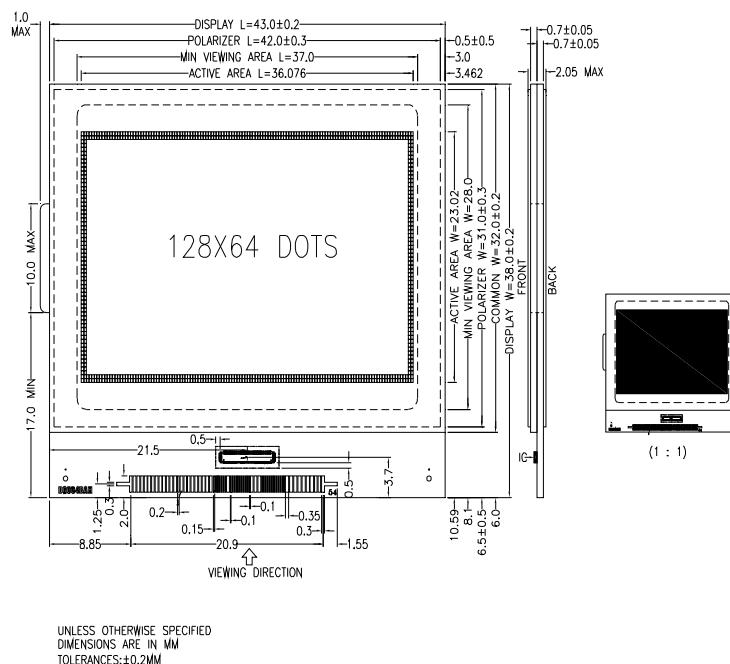
11. LABELLING

12. SEG &COM LAYOUT

SEG

COM
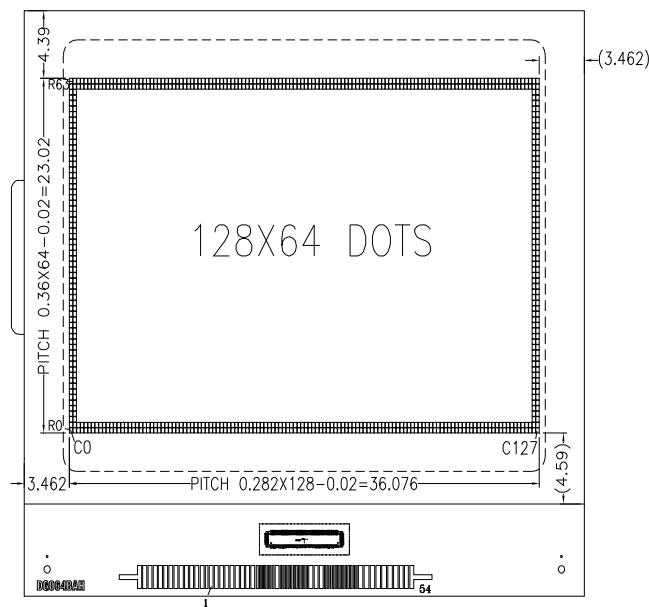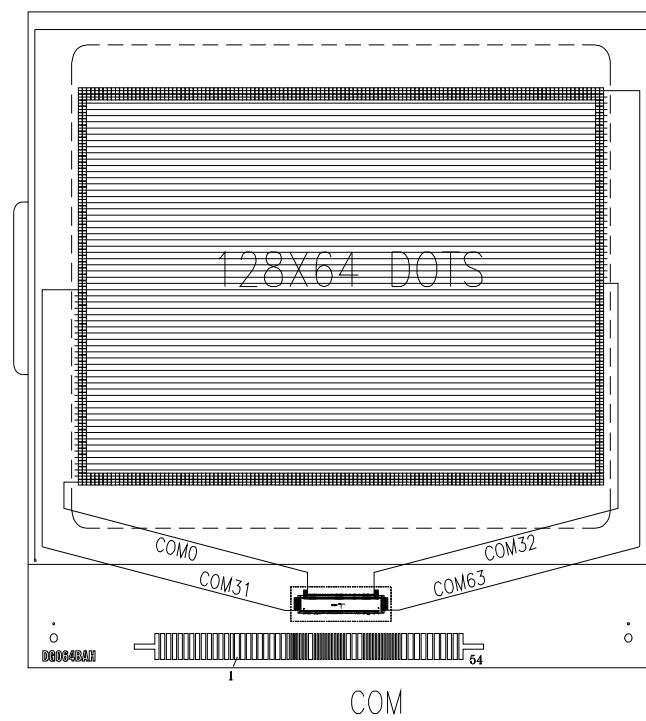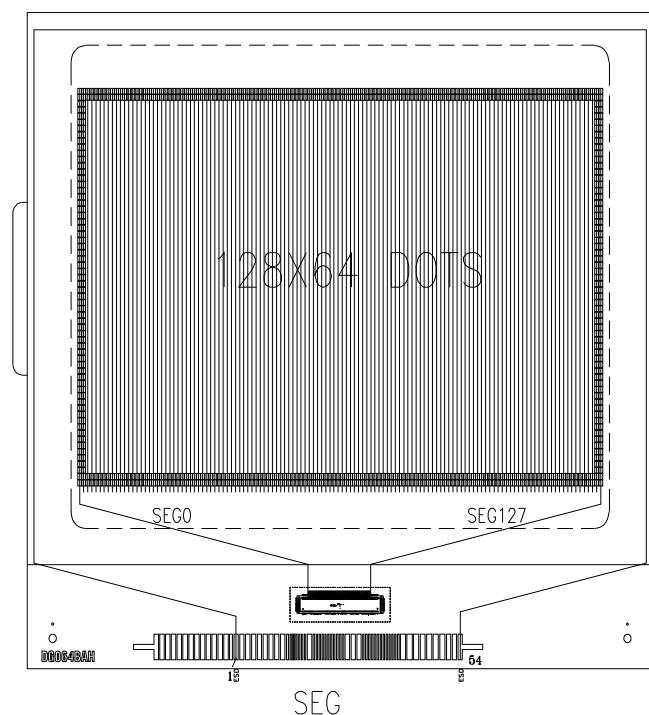
13. PAD & GRAPHIC DIMENSION IC NO. CONFIGURATION

IC NO.	CONFIGURATION
COM31	COM31[R31(C0-C127)]
COM30	COM30[R30(C0-C127)]
COM1	COM1[R1(C0-C127)]
COM0	COM0[R0(C0-C127)]
SEG0	SEG0[C0(R0-R63)]
SEG1	SEG1[C1(R0-R63)]
SEG126	SEG126[C126(R0-R63)]
SEG127	SEG127[C127(R0-R63)]
COM32	COM32[R32(C0-C127)]
COM33	COM33[R33(C0-C127)]
COM62	COM62[R62(C0-C127)]
COM63	COM63[R63(C0-C127)]

0.34
0.36
0.282
0.262
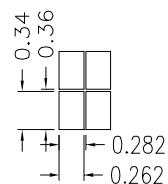
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MM
TOLERANCES:±0.1MM

IST3004   (0,0)
Y
X

1.0
5.9
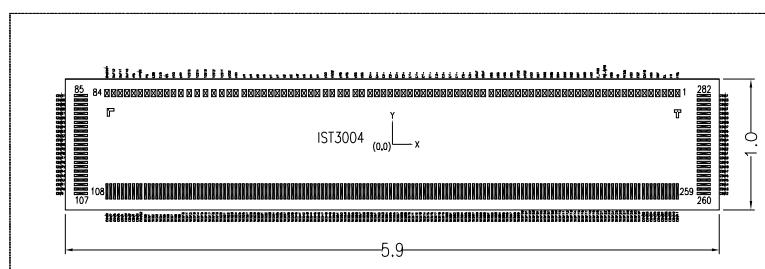
| PAD NO.	CONFIGURATION	PAD NO.	CONFIGURATION	PAD NO.	CONFIGURATION
1	ESD	26	C1+	41	RW_WRB
2~12	NC	27	C1-	42	A0
13	IRS	28	C3+	43	RESB
14	HPMB	29	VOUT	44	CS1B
15	PS	30	VSS	45~53	NC
16	C68	31	VDD(VDD,VDD2,CS2,MS,CLS)	54	ESD
17	VR	32	DB7		
18	V0	33	DB6		
19	V1	34	DB5		
20	V2	35	DB4		
21	V3	36	DB3		
22	V4	37	DB2		
23	C4+	38	DB1		
24	C2-	39	DB0		
25	C2+	40	E_RDB		

14. IC LAYOUT
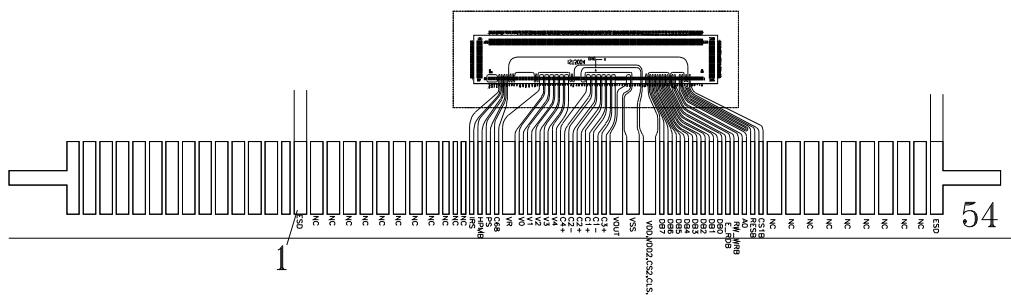
15. QUALITY DESCRIPTION

DEFECT SPECIFICATION:

Specific type-related items are covered in this sheet.

a: Table for Cosmetic defects

(Note: nc = not counted).

Sizes and number of defects

(Max. Qty)

Efffective visible dot/segment areas: Min 80%

Examples/ Shapes

b: Glass defects

b1:Glass defects at contact ledge

b2:Glass chipping in other areas shall not be in conflict

with the product's function.
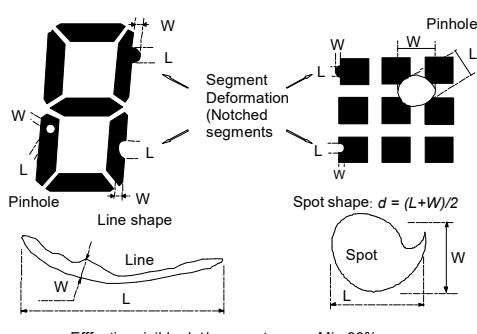
Defect Type	Max. defect size [μm] d or L	W	Max. Quantity.
Black or White Spots	$d \leq 150$		nc
	$150 < d \leq 300$		5
Black or White Lines	--	$W \leq 10$	nc
	$L \leq 5000$	$W \leq 30$	3
	$L \leq 2000$	$W \leq 50$	2
Pinhole	$d \leq 150$ $150 < d \leq 300$		nc 1/segment
(Total defects)			(5)
Segment Deformation	$W \leq 100$		nc
Bubble (e.g. under pola)	$d \leq 150$		nc
	$200 < d \leq 400$		3
	$400 < d \leq 600$		1

Glass defect, if Y > 1/3 L
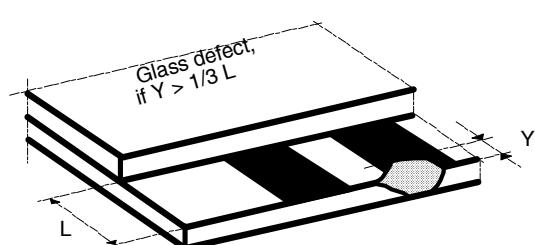
16. RELIABILITY TEST

Operating life time: Longer than 50000 hours (at room temperature without direct irradiation of sunlight)
Reliability characteristics shall meet following requirements.

TEMPERATURE TESTS	NORMAL GRADE
High temperature storage	+85°C * 96HR
Low temperature storage	-30°C * 96HR
High temperature operation	+85°C * 96HR
Low temperature operation	-30°C * 96HR
High temperature, High humidity	+60°C 90%RH 96HR
Thermal shock	-30°C * 30 min 10s 5Cycles +85°C * 30 min
Vibration test	Frequency * Swing * Time 40Hz * 4mm * 4hrs
Drop test	Drop height * Times 1.0m * 6 times

17. LCD MODULES HANDLING PRECAUTIONS

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

  -Be sure to ground the body when handling the LCD module.

  -Tools required for assembly, such as soldering irons, must be properly grounded.

  -To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

  -The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

- Storage precautions

  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

18. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:

  - Exposed area of the printed circuit board

  - Terminal electrode sections