OLED DISPLAY MODULE

Product Specification

CUSTOMER	Standard
PRODUCT NUMBER	DD-25664GE-1A

INTERNAL APPROVALS		
Product Mgr	Doc. Control	Electr. Eng
Bazile Peter	**Elijah Ebo**	**Rekha Mani**
Date: 07/09/09	Date: 07/09/09	Date: 07/09/09

☐ **Approval for Specification only**

☐ **Approval for Specification and Sample**

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REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECR no.
A	07/09/09	--	--	Initial Release	
B	16/09/2009	12	3.4	Error on the Block diagram Changed from 3.12" to 5.5"	
C	02/10/2009	5	1	Error on the colour.	

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1 MAIN FEATURES

ITEM	CONTENTS
Display Format	256 x 64 Dots
Colour	Green Monochrome
Overall Dimensions	146.00 (W) × 45 (H) × 2.00 (D) mm
Viewing Area	137.65 (W) x 35.89 (H) mm
Screen Size	5.5"
Mode	Passive Matrix
Duty ratio	1/64
Driver IC	SSD1322
Operating temperature	-30°C ~ +70°C
Storage temperature	-40°C ~ +80°C

2 MECHANICAL SPECIFICATION

2.1 MECHANICAL CHARACTERISTICS

ITEM	CHARACTERISTIC	UNIT
Display Format	256 x 64	Dots
Overall Dimensions	146.00 (W) × 45 (H) × 2.00 (D) mm	mm
Viewing Area	137.65 (W) x 35.89 (H) mm	mm
Active Area	135.65 (W) x 33.89 (H)	mm
Dot Size	0.50 (W) 0.50(H)	mm
Dot Pitch	0.53 (W) 0.53 (H)	mm
Weight	27.1	g
IC Controller/Driver	SSD1322	

2.2 MECHANICAL DRAWING
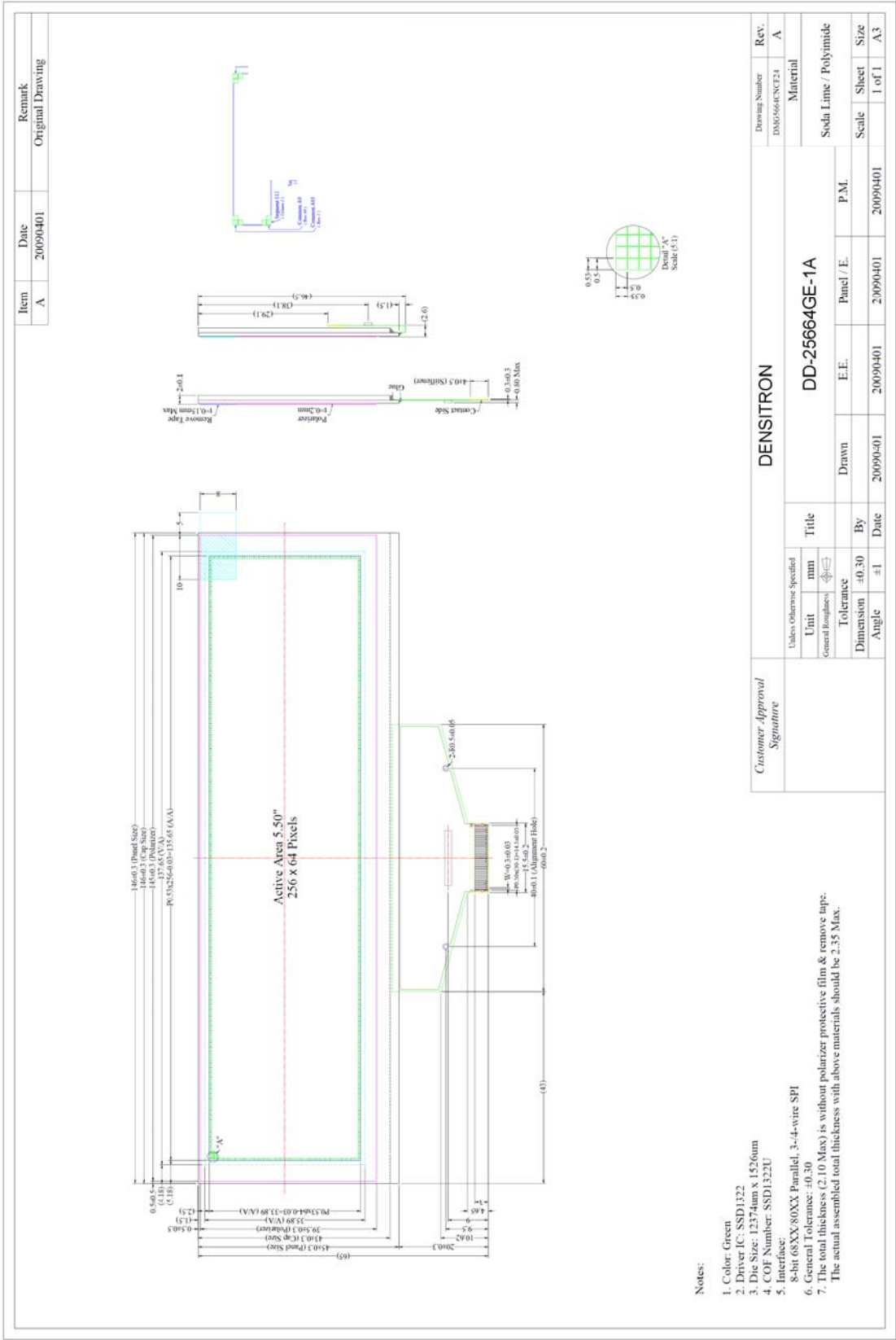
3 ELECTRICAL SPECIFICATION

3.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Max	Unit	Note
Supply Voltage for Operation	V_{CI}	-0.3	4	V	1, 2
Supply Voltage for Logic	V_{DD}	-0.5	2.75	V	1, 2
Supply Voltage for I/O pins	V_{DDIO}	-0.5	V_{CI}	V	1, 2
Supply Voltage for Display	V_{CC}	-0.5	16	V	1, 2
Operating Current for V_{CC}	I_{CC}	-	80	mA	1,2
Operating Temperature	Top	-30	+70	°C	
Storage Temperature	Tst	-40	+80	°C	
Static Electricity	Be sure that you are grounded when handling displays.				

Note 1: All the above voltages are on the basis of "VSS = 0V".

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to Section 3.2 "Electrical Characteristics". If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

3.2 ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Operation	V_{CI}		2.4	2.8	3.5	V
Supply Voltage for Logic	V_{DD}		2.4	2.5	2.6	V
Supply Voltage for I/O Pins	V_{DDIO}		1.65	1.8	V_{CI}	V
Supply Voltage for Display	V_{CC}		14.5	15	15.5	V
High Level Input	V_{IH}		$0.8 \times V_{DDIO}$	--	V_{DDIO}	V
Low Level Input	V_{IL}		0	--	$0.2 \times V_{DDIO}$	V
High Level Output	V_{OH}	$I_{OUT}=100\mu A$, 3.3MHz	$0.9 \times V_{DDIO}$	--	V_{DDIO}	V
Low Level Output	V_{OL}	$I_{OUT}=100\mu A$, 3.3MHz	0	--	$0.1 \times V_{DDIO}$	V
Operating Current for V_{CI}	I_{CI}	Note 4	-	1.8	2.25	mA
		Note 5	-	1.8	2.25	mA
Operating Current for V_{CC}	I_{CC}	Note 4	-	39.8	49.8	mA
		Note 5	-	64.0	80.0	mA
Sleep Mode Current for V_{CI}	$I_{CI,SLEEP}$		-	1	5	μA
Sleep Mode Current for V_{CC}	$I_{CC,SLEEP}$		-	1	5	μA

Note 3: Brightness (L_{br}) and Supply Voltage for Display (V_{CC}) are subject to the change of panel characteristics and the customers request.

Note 4: V_{CI} = 2.8V, V_{CC} = 15V, 50% Display Area Turn on.

Note 5: V_{CI} = 2.8V, V_{CC} = 15V, 100% Display Area Turn on.

3.3 INTERFACE PIN ASSIGNMENT

No.	Symbol	I/O	Function
1	N.C. (GND)	--	*Reserved Pin (Supporting Pin).* The supporting pins can reduce the influences from stresses on the function pins. This pin must be connected to external ground.
2	VSS	P	*Ground of Logic Circuit* This is a ground pin. It also acts as a reference for the logic pins. It must be connected to external ground
3	VCC	P	*Power Supply for OEL Panel* This is the most positive supply pin of the chip. They must be connected to external source.
4	VCOMH	P	*Voltage Output High Level for COM Signal* This pin is the input pin for the voltage output high level for COM signals. A tantalum capacitor should be connected between this pin and VSS.
5	VLSS	P	*Ground of Analog Circuit* This is analog ground pin. IT should be connected to VSS externally
6~13	D7~D0	I/O	*Host Data Input/Output Bus* These pins are 8-bit bi-directional data bus to be connected to the microprocessors data bus. When serial mode is selected, D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK. Unused pins must be connected to VSS except for D2 in serial mode.
14	E/RD#	I	*Read/Write Enable or Read* This pin is MCU interface input. When interfacing to a 68XX-sseries microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled high and the CS# is pulled low. When connecting to an 80XX-microprocessor, this pin receives the Read (RD#) signal. Data read operation is initiated when this pin is low and CS# is pulled low. When serial mode is selected, this pin must be connected to VSS.
15	R/W#	I	*Read/Write Select or Write* This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Pull this pin to "High" for read mode and pull it "Low" for write mode. When 80XX interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled low and the CS# is pulled low. When serial mode is selected, this pin must be connected to VSS.
16 17	BS0 BS1	I	*Communicating Protocol Select* These pins are MCU interface selection input. See the following table: <table><tr><td></td><td>BS0</td><td>BS1</td></tr><tr><td>3-wire SPI</td><td>1</td><td>0</td></tr><tr><td>4-wire SPI</td><td>0</td><td>0</td></tr><tr><td>8-bit 68XX Parallel</td><td>1</td><td>1</td></tr><tr><td>8-bit 80XX Parallel</td><td>0</td><td>1</td></tr></table>

| 18	D/C#	I	**Data/Command Control** This pin is Data/Command control pin. When the pin is pulled high, the input at D7~D0 is treated as display data. When the pin is pulled low, the input at D7~D0 will be transferred to the command register. For detailed relationship to MCU interface signals, please refer to the Timing Characteristics Diagrams
19	CS#	I	**Chip Select** This pin is the chip select input. When the pin is enabled for MCU communication only when CS# is pulled low..
20	RES#	I	**Power Reset for Controller and Driver** This pin is reset signal input. When the pin is low, initialization of the chip is executed.
21	FR	O	**Cascade Application Connection Pin** This pin is No Connection pins. Nothing should be connected to this pin. It should be left open individually.
22	IREF	I	**Current Reference for Brightness Adjustment** This pin is segment current reference pin. A resistor should be connected between this pin and VSS. Set the current lower than $10\mu A$
23	N.C.	-	**Reserved Pin** The N.C. pin between function pins are reserved for compatible and flexible design.
24	VDDIO	P	**Power Supply for I/O Pin** This pin is a power supply pin of I/O buffer. It should be connected to VDD or external source. All I/O signals should have VIH reference to VDDIO. When I/O signal pins (BS0~BS1, D0~D7, control signals…) pull high, they should be connected to VDDIO.
25	VDD	P	**Power Supply for Core Logic Circuit** This is a voltage supply pin. It can be supplied externally (within the range of 2.4~2.6V) or regulated internally from VCI. A capacitor should be connected between this pin & VSS under all circumstances.
26	VCI	P	**Power Supply for Operation** This is a voltage supply pin. It must be connected to external source & always be equal or higher than VDD & VDDIO.
27	VSL	P	**Voltage Output Low Level for SEG Signal** This is segment voltage reference pin. When external VSL is not used, this pin should be left open. When external VSL is used, this pin should connect with resistor and diode to ground.
28	VLSS	P	**Ground of Analog Circuit** This is the analog ground pin. It should be connected to VSS externally
29	VCC	I	**Power Supply for OEL Panel** This is the most positive supply pin of the chip. They should be connected to external source.
30	N.C. (GND)	-	**Reserved Pin (Supporting Pin).** The supporting pins can reduce the influences from stresses on the function pins. This pin must be connected to external ground.

3.4 BLOCK DIAGRAM

MCU Interface Selection: BS0 and BS1
Pins connected to MCU interface: D7~D0, E/RD#, R/W#, D/C#, CS#, and RES#

C1, C3, C5: 0.1μF
C2, C4: 4.7μF
C6: 20μF
C7: 1μF
C8: 4.7uF / 25V Tantalum Capacitor R1: 680kΩ,
R1 = 910kΩ, R1=(Voltage at IREF – VSS) / IREF
R2: 50Ω, 1/4W
D1: ≤1.4V, 0.5W

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3.5 TIMING CHARACTERISTICS

3.5.1 68XX-Series MPU Parallel Interface Timing Characteristics:

Symbol	Description	Min	Max	Unit
t_{cycle}	Clock Cycle Time	300	-	ns
t_{AS}	Address Setup Time	10	-	ns
t_{AH}	Address Hold Time	0	-	ns
t_{DSW}	Write Data Setup Time	40	-	ns
t_{DHW}	Write Data Hold Time	7	-	ns
t_{DHR}	Read Data Hold Time	20	-	ns
t_{OH}	Output Disable Time	-	70	ns
t_{ACC}	Access Time	-	140	ns
PW_{CSL}	Chip Select Low Pulse Width (Read) Chip Select Low Pulse Width (Write)	120 60	-	ns
PW_{CSH}	Chip Select High Pulse Width (Read) Chip Select High Pulse Width (Write)	60 60	-	ns
t_R	Rise Time	-	15	ns
t_F	Fall Time	-	15	ns

$(V_{DD}-V_{SS} = 2.4V$ to $2.6V$, $V_{DDIO} = 1.6V$, $V_{CI} = 2.8V$, $T_a = 25°C$)
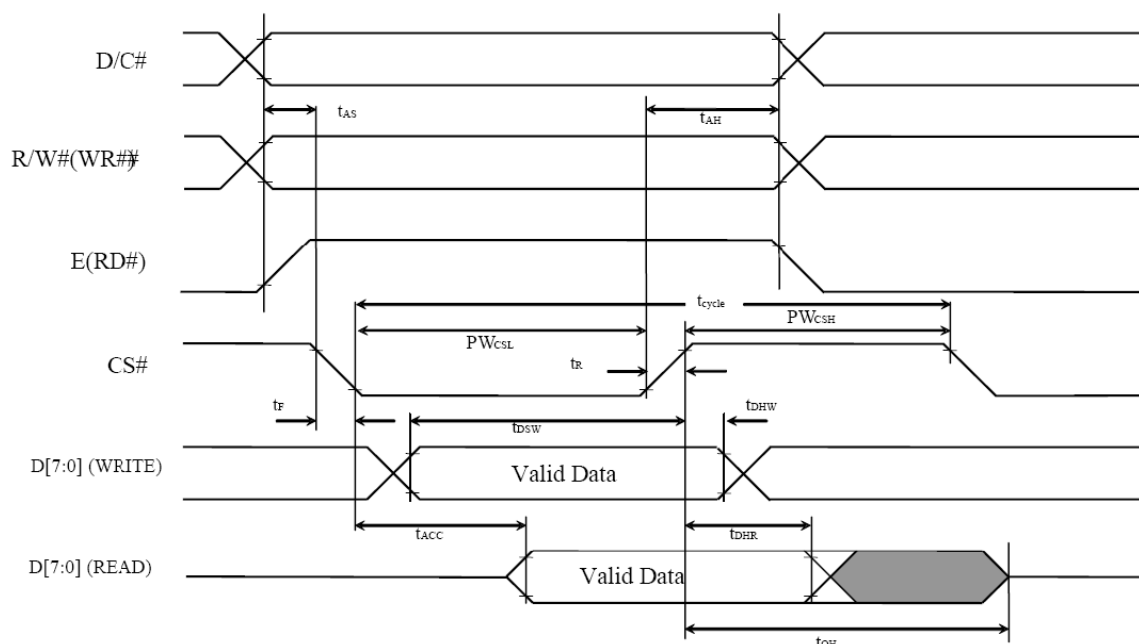
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3.5.2 80XX-Series MPU Parallel Interface Timing Characteristics:

Symbol	Description	Min	Max	Unit
t_{cycle}	Clock Cycle Time	300	-	ns
t_{AS}	Address Setup Time	10	-	ns
t_{AH}	Address Hold Time	0	-	ns
t_{DSW}	Write Data Setup Time	40	-	ns
t_{DHW}	Write Data Hold Time	7	-	ns
t_{DHR}	Read Data Hold Time	20	-	ns
t_{OH}	Output Disable Time	-	70	ns
t_{ACC}	Access Time	-	140	ns
t_{PWLR}	Read Low Time	150	-	ns
t_{PWLW}	Write Low Time	60	-	ns
t_{PWHR}	Read High Time	60	-	ns
t_{PWHW}	Write High Time	60	-	ns
t_{CS}	Chip Select Setup Time	0	-	ns
t_{CSH}	Chip Select Hold Time to Read Signal	0	-	ns
t_{CSF}	Chip Select Hold Time	20	-	ns
t_R	Rise Time	-	15	ns
t_F	Fall Time	-	15	ns

(V_{DD}-V_{SS} = 2.4V to 2.6V, V_{DDIO} = 1.6V, V_{CI} = 2.8V, T_a = 25°C)
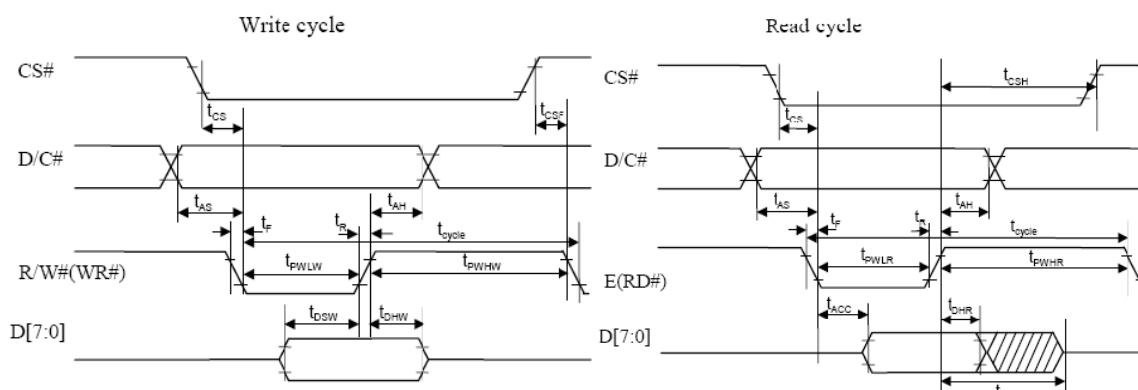
3.5.3 Serial Interface Timing Characteristics: (4-wire SPI)

Symbol	Description	Min	Max	Unit
t_{cycle}	Clock Cycle Time	100	-	ns
t_{AS}	Address Setup Time	15	-	ns
t_{AH}	Address Hold Time	15	-	ns
t_{CSS}	Chip Select Setup Time	20	-	ns
t_{CSH}	Chip Select Hold Time	10	-	ns
t_{DSW}	Write Data Setup Time	15	-	ns
t_{DHW}	Write Data Hold Time	15	-	ns
t_{CLKL}	Clock Low Time	20	-	ns
t_{CLKH}	Clock High Time	20	-	ns
t_R	Rise Time	-	15	ns
t_F	Fall Time	-	15	ns

$(V_{DD}-V_{SS} = 2.4V$ to $2.6V$, $V_{DDIO} = 1.6V$, $V_{CI} = 2.8V$, $T_a = 25°C$)

3.5.4 Serial Interface Timing Characteristics: (3-wire SPI)

Symbol	Description	Min	Max	Unit
t_{cycle}	Clock Cycle Time	100	-	ns
t_{AS}	Address Setup Time	15	-	ns
t_{AH}	Address Hold Time	15	-	ns
t_{CSS}	Chip Select Setup Time	20	-	ns
t_{CSH}	Chip Select Hold Time	10	-	ns
t_{DSW}	Write Data Setup Time	15	-	ns
t_{DHW}	Write Data Hold Time	15	-	ns
$t_{CLK}L$	Clock Low Time	20	-	ns
t_{CLKH}	Clock High Time	20	-	ns
t_R	Rise Time	-	15	ns
t_F	Fall Time	-	15	ns

$(V_{DD}-V_{SS} = 2.4V$ to $2.6V$, $V_{DDIO} = 1.6V$, $V_{CI} = 2.8V$, $T_a = 25°C$)

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4 OPTICAL SPECIFICATION

4.1 OPTICAL CHARACTERISTICS

Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
Brightness	L_{br}	With Polarizer (Note 3)	60	80	-	cd/m^2
C.I.E. (Green)	(x) (y)	Without Polarizer	0.27 0.58	0.31 0.62	0.35 066	
Dark Room Contrast	CR		-	>2000:1	-	
View Angle			>160	-	-	degree

Note 3: Optical measurement taken at V_{CI} = 2.8V, V_{CC} = 15V
　　　　Software configuration follows Section 4.4 Initialization

5 FUNCTIONAL SPECIFICATION

5.1 COMMANDS

Refer to the Technical Manual for the SSD1322

5.2 POWER DOWN AND UP SEQUENCE

To protect the panel and extend the panel life time, the driver IC power up/down routine should include a delay period between high voltage and low voltage power sources during turn on/off. Such that panel has enough time to charge and discharge before/after operation.

5.2.1 Power up Sequence:

1. Power up V_{CI} & V_{DDIO}
2. Send Display off command
3. Initialization
4. Clear Screen
5. Power up V_{CC}
6. Delay 100ms (when V_{CC} is stable)
7. Send Display on command
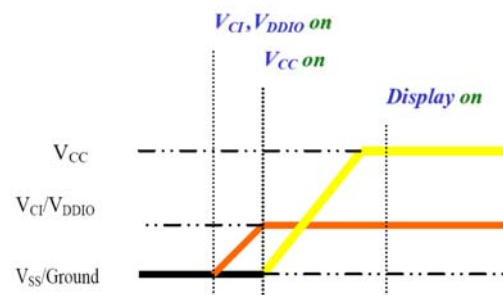
5.2.2 Power down Sequence:

1. Send Display off command
2. Power down V_{CC}
3. Delay 100ms (when V_{CC} is reach 0 and panel is completely discharges)
4. Power down V_{CI} & V_{DDIO}
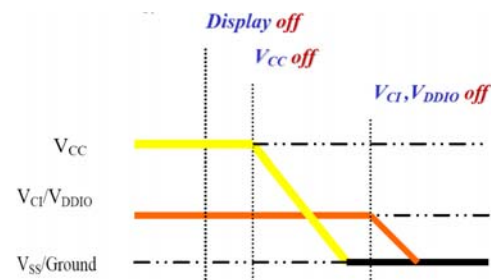
5.3 RESET CIRCUIT

When RES# input is low, the chip initialized with the following status:
1. Display is OFF
2. 480x128 Display Mode
3. Normal segment and display data column and row address mapping (SEG0 mapped to column address 00h and COM0 mapped to row address 00h)
4. Display start line is set at display RAM address 0
5. Column address counter is set at 0
6. Normal scan direction of the COM outputs
7. Contrast control registers is set at 7Fh

5.4 ACTUAL APPLICATION EXAMPLE

Command usage and explanation of an actual example

<Initialization>

Command Lock 0xFD, 0x12	Function Selection 0xAB, 0x01	Enhance Driving Scheme Capability 0xD1, 0x82, 0x20
Sleep In 0xAE	Enable External VSL 0xB4, 0xA0, 0xFD	Set Pre-Charge Voltage 0xBB, 0x1F
Set Display Clock Divide Ratio/Oscillator Frequency 0xB3, 0x91	Set Contrast Current 0xC1, 0xDF	Set Second Pre-Charge Period 0xB6, 0x08
Set Multiplex Ratio 0xCA, 0x3F	Master Contrast Current Control 0xC7, 0x0F	Set VCOMH Deselect Level 0xBE, 0x07
Set Display Offset 0xA2, 0x00	Select Gray Scale Table 0xB8, 0x00, 0x01, 0x03, 0x06, 0x0A, 0x10, 0x1A, 0x28, 0x37, 0x47, 0x58, 0x6A, 0x7F, 0x96, 0xB4	Set Display Mode 0xA6
Set Display Start Line 0xA1, 0x00		*Clear Screen*
Set Re-Map & Dual COM Line Mode 0xA0, 0x14, 0x11	Enable Gray Scale Table 0x00	Sleep Out 0xAF
Set GPIO 0xB5, 0x00	Set Phase Length 0xB1, 0xE8	

If the noise is accidentally occurred at the displaying window during the operation, please reset the display in order to recover the display function.

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6 SUPPORTED ACCESSORIES

6.1 DUO KIT

Densitron has developed an easy to use yet powerful development and demonstration tool for driving its range of Active matrix OLED displays from the USB port of a PC.
DUO (Densitron USB OLED) kit is hot pluggable and does not require extra cables or power supply to run, allowing users to be up and running in minutes.

The kit consists of an OLED display with transition Board, USB controller card, mini USB cable and a CD with software application and drivers.

Part number: PDK-N-25664GE-1A

6.2 TRANSITION BOARD CARD

A Transition board card is like a daughterboard which is meant to be a circuit board for connections between the baseboards (DUO).
It has connector pins for interfacing between the display and the baseboards.
Part number: PDK-N-25664GE-1A

6.3 CONNECTOR BOARD CARD

A Connector board card is also a daughterboard which is a circuit board for connection between a microprocessor or microcontroller (customer's system).
It has built in DC/DC converter, and is for 8 bit 8080 system interfacing.
Part number: EVK-CONECT-21

6.4 CONNECTORS

Driver IC S6E63D6 (Samsung)
Type: ZIF connector.
No. of connections:
Pitch: 0.5mm.

Part number: XF2M-3015-1A
Manufacturer: OMRON
Supplier:
> Farnell/1112560
> Digikey/ OR723CT-ND

7 OTHER DOCUMENTATIONS

Application notes, software and driver IC specs are available on demand.

8 PACKAGING
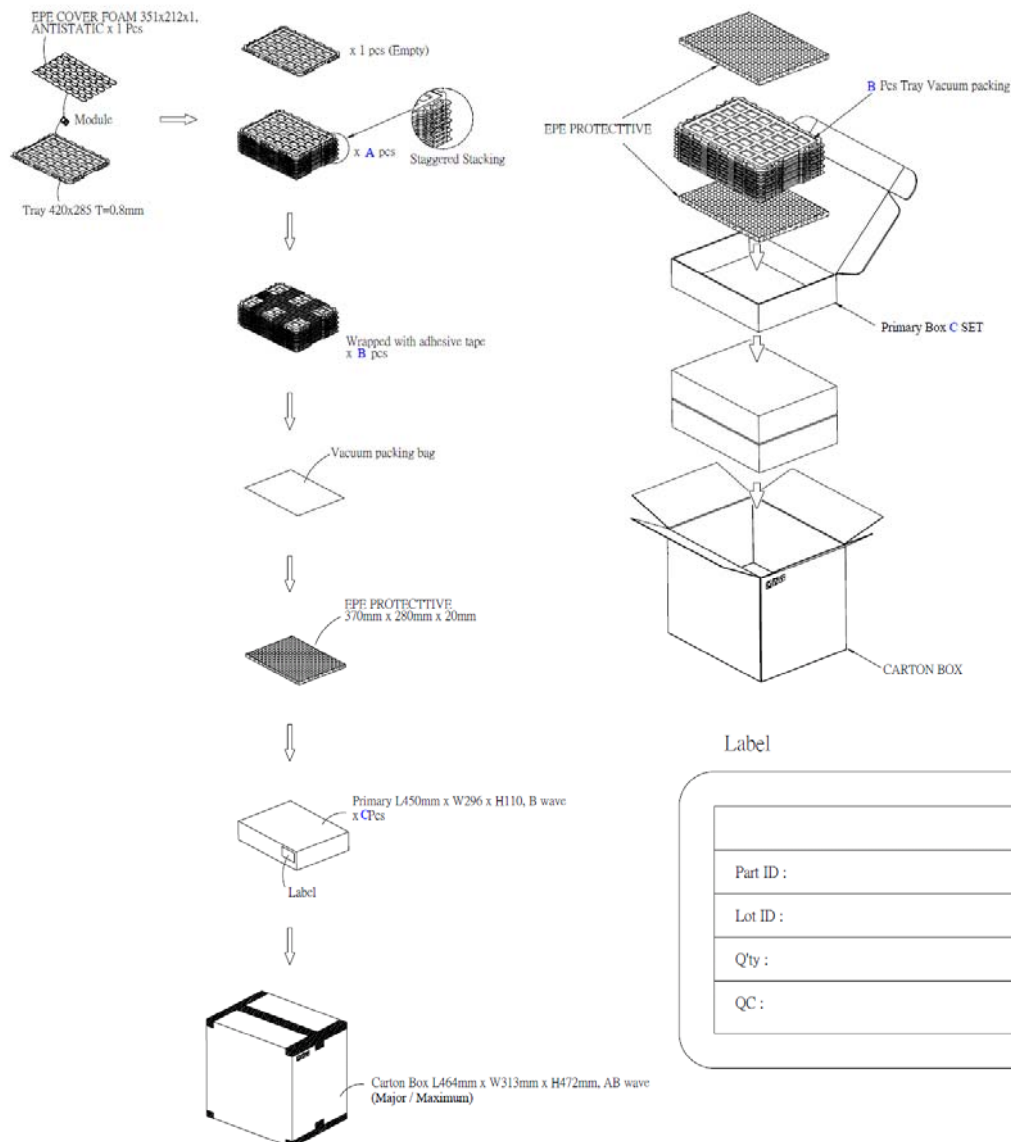
8.1 LABELLING AND MARKING

DENSITRON
DD-25664GE-1A
TW   YYMM

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9 QUALITY ASSURANCE SPECIFICATION

9.1 CONFORMITY

The performance, function and reliability of the shipped products conform to the Product Specification.

9.2 DELIVERY ASSURANCE

9.2.1 Delivery inspection standards

- IPC-AA610 rev. C, class 2 electronic assemblies standard

9.2.2 Zone definition

A   Viewing area

B   Outside viewing area
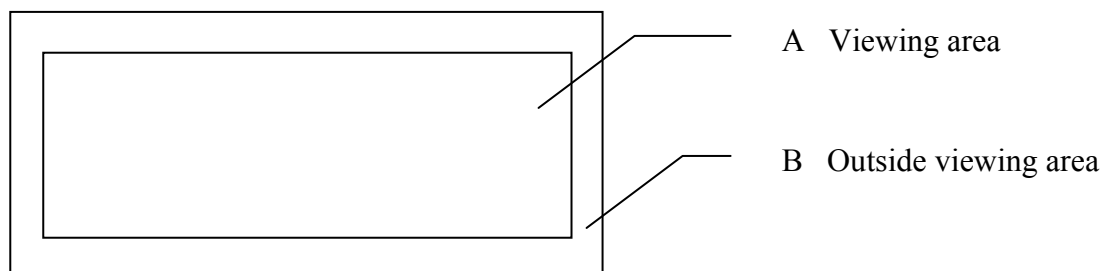
9.2.3 Visual inspection

- Inspect under 30W fluorescent lamp leaving 50 cm between the module and the lamp and 30 cm between the module and the eye (measuring position).
- Appearance is inspected at the best contrast voltage (best contrast is adjusted considering clearness and crosstalk on screen).
- Inspect the module at 45° right and left, top and bottom.
- Use the optimum viewing angle during the contrast inspection.

eye

45°   45°
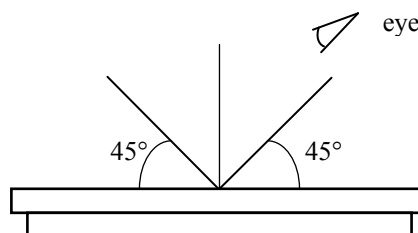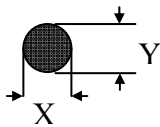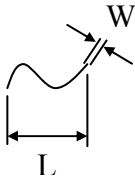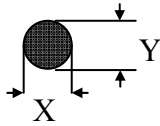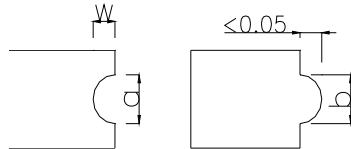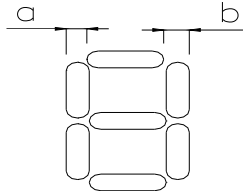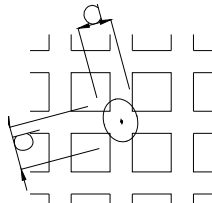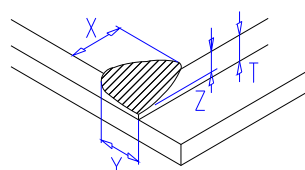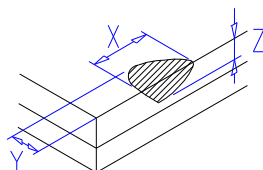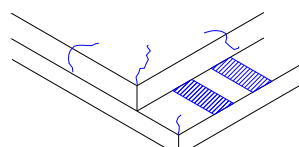
9.2.3.1 Standard of appearance inspection

Units: mm

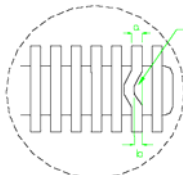| Class	Item	Criteria	
Minor	Packing & Label	Outside & inside package	Presence of product no., lot no., quantity
Critical		Product must not be mixed with others and quantity must not be different from that indicated on the label	
Major	Dimension	Product dimensions must be according to specification and drawing	
Major	Electrical	Product electrical characteristics must be according to specification	
Critical	LCD Display	Missing lines or wrong patterns on LCD display are not allowed	
Minor	Black spot, white spot, dust	Round type: as per following drawing $\varnothing = (X+Y)/2$ Acceptable quantity: 	Size	Zone A	Zone B
---	---	---
$\varnothing<0.1$	Any number	Any number
$0.1<\varnothing<0.2$	3	
$0.2<\varnothing<0.25$	1	
$0.25<\varnothing$	0	| Line type: as per following drawing Acceptable quantity: | Length	Width	Zone A	Zone B
- -	$W\leq0.05$	Any number	Any number
$L\leq2.0$	$W\leq0.1$	3	
$L>2.0$		0		 Total acceptable quantity: 3	
Minor	Polariser scratch	Scratch on protective film is permitted Scratch on polariser: same as No. 1	
Minor	Polariser bubble	$\varnothing = (X+Y)/2$ Acceptable quantity: 	Size	Zone A	Zone B
---	---	---
$\varnothing<0.5$	Any number	Any number
$\varnothing>0.5$	0	| Total acceptable quantity: 3	
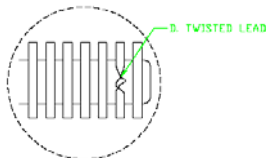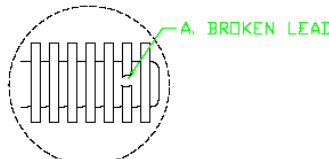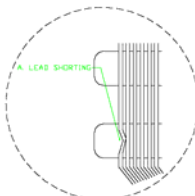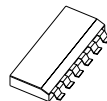
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Class	Item	Criteria
Minor	Segment deformation	1b. Pin hole on dot matrix display **Acceptable quantity** 	Size		 	a,b<0.1	Any number	 	(a+b)/2≤0.1	Any number	 	0.5<∅<1.0	3	 Total acceptable quantity: 7 2. Segments / dots with different width **Acceptable** 	a≥b	a/b≤4/3	 	a<b	a/b>4/3	 3. Alignment layer defect $\varnothing = (a+b)/2$ **Acceptable quantity** 	Size		 	∅≤0.4	Any number	 	0.4<∅≤1.0	5	 	1.0<∅≤1.5	3	 	1.5<∅≤2.0	2	 Total acceptable quantity: 7
Minor	Panel Chipping	$X \leq 1/6$ Panel length $Y \leq 1$ $Z \leq T$
Minor	Panel Cracking	Cracks not allowed
Minor	Cupper exposed (pin or film)	Not allowed if visible by eye inspection
Minor	Film or Trace Damage	Not allowed if affects electrical function

Class	Item	Criteria
Minor	Contact Lead Twist	Not allowed
Minor	Contact Lead Broken	Not allowed
Minor	Contact Lead Bent	Not allowed if bent lead causes short circuit
		Not allowed if bent lead extends horizontally more than 50% of its width
Minor	Colour uniformity	Level of sample for approval set as limit sample
Major	PCB	No unmelted solder paste should be present on PCB
Critical		Cold solder joints, missing solder connections, or oxidation are not allowed
Minor		No residue or solder balls on PCB are allowed
Critical		Short circuits on components are not allowed

Minor	Tray particles		Size	Quantity
		On tray	∅<0.2	Any number
			∅>0.25	4
		On display	∅≥0.25	2
			L = 3	1

9.3 DEALING WITH CUSTOMER COMPLAINTS

9.3.1 Non-conforming analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.
After accepting it, Densitron should complete the analysis in two weeks from receiving the sample.
If the analysis cannot be completed on time, Densitron must inform the purchaser.

9.3.2 Handling of non-conforming displays

If any non-conforming displays are found during customer acceptance inspection which Densitron is clearly responsible for, return them to Densitron.
Both Densitron and customer should analyse the reason and discuss the handling of non-conforming displays when the reason is not clear.
Equally, both sides should discuss and come to agreement for issues pertaining to modification of Densitron quality assurance standard.

10 RELIABILITY SPECIFICATION

10.1 RELIABILITY TESTS

Test Item	Test Condition	Evaluation and assessment
High Temperature Operation	70°C, 240 hrs	The brightness should be greater than 50% of the initial brightness. The operational functions work.
Low Temperature Operation	-30°C, 240 hrs	
High Temperature Storage	80°C, 240hrs	
Low Temperature Storage	-40°C, 240 hrs	
High Temperature & High Humidity Storage	60°C, 90% RH, 120 hrs	
Thermal Shock Storage	-40°C ↔85°C, 24 cycles 60 min. dwell	

- All operation tests are conducted in all display on pattern.
- The samples used for above tests do not include polarizer.
- No moisture condensation is observed during tests.

10.1.1   FAILURE CHECK STANDARD

After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure teat at 23±5 °C; 55±15% RH

10.2 LIFE TIME

Item	Description
1	Function, performance, appearance, etc. shall be free from remarkable deterioration within 40,000 hours under ordinary operating and storage conditions of room temperature (25±10 °C), normal humidity (45±20% RH), and in area not exposed to direct sunlight.
2	End of lifetime is specified as 50% of initial brightness.

11 PRECAUTIONS

11.1 Handling

Safety
If the panel breaks, be careful not to get the organic substance in your mouth or in your eyes.
If the organic substance touches your skin or clothes, wash it off immediately using soap and plenty of water.

Mounting and Design
Place a transparent plate (e.g. acrylic, polycarbonate or glass) on the display surface to protect the display from external pressure. Leave a small gap between the transparent plate and the display surface.
Design the system so that no input signal is given unless the power supply voltage is applied.

Caution during OLED cleaning
Lightly wipe the display surface with a soft cloth soaked with Isopropyl alcohol, Ethyl alcohol or Trichlorotriflorothane.
Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.
Do not use aromatic solvents (toluene and xylene), or ketonic solvents (ketone and acetone).

Caution against static charge
As the display uses C-MOS LSI drivers, connect any unused input terminal to V_{DD} or V_{SS}. Do not input any signals before power is turned on.
Also, ground your body, work/assembly table and assembly equipment to protect against static electricity.

Packaging
Displays use OLED elements, and must be treated as such. Avoid strong shock and drop from a height.
To prevent displays from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

Caution during operation
It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life.

Other Precautions
When a display module is operated for a long of time with fixed pattern may remain as an after image or slight contrast deviation may occur.
Nonetheless, if the operation is interrupted and left unused for a while, normal state can be restored. Also, there will be no problem in the reliability of the module.

Storage
Store the display in a dark place where the temperature is 25°C ± 10°C and the humidity below 50%RH.
Store the display in a clean environment, free from dust, organic solvents and corrosive gases.
Do not crash, shake or jolt the display (including accessories).

11.2 STORAGE

When storing OEL display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps, etc. and, also, avoiding high temperature and high humidity environments or low temperature (less than 0°C) environments. (We recommend you to store these modules in the packaged state when they were shipped from Factory.)
At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.

If electric current is applied when water drops are adhering to the surface of the OEL display module, when the OEL display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

11.3 DESIGNING

The absolute maximum ratings are the ratings which cannot be exceeded for
OEL display module, and if these values are exceeded, panel damage may be happen.

To prevent occurrence of malfunctioning by noise: pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.

We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VCI). (Recommend value: 0.5A)

Pay sufficient attention to avoid occurrence of mutual noise interference with the neighbouring devices.

As for EMI, take necessary measures on the equipment side basically.

When fastening the OEL display module, fasten the external plastic housing section.

If power supply to the OEL display module is forcibly shut down by such errors as taking out the main battery while the OEL display panel is in operation, we cannot guarantee the quality of this OEL display module.

The electric potential to be connected to the rear face of the IC chip should be as follows: SSD1351
* Connection (contact) to any other potential than the above may lead to rupture of the IC.

11.4 Disposing

Request the qualified companies to handle industrial wastes when disposing of the OEL display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.

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11.5 Other

When an OEL display module is operated for a long of time with fixed pattern may remain as an after image or slight contrast deviation may occur. Nonetheless, if the operation is interrupted and left unused for a while, normal state can be restored. Also, there will be no problem in the reliability of the module.

To protect OEL display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the OEL display modules.
* Pins and electrodes
* Pattern layouts such as the COF

With this OEL display module, the OEL driver is being exposed. Generally speaking, semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, if this OEL driver is exposed to light, malfunctioning may occur.
* Design the product and installation method so that the OEL driver may be shielded from light in actual usage.
* Design the product and installation method so that the OEL driver may be shielded from light during the inspection processes.

Although this OEL display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal status may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.

We recommend you to construct its software to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.