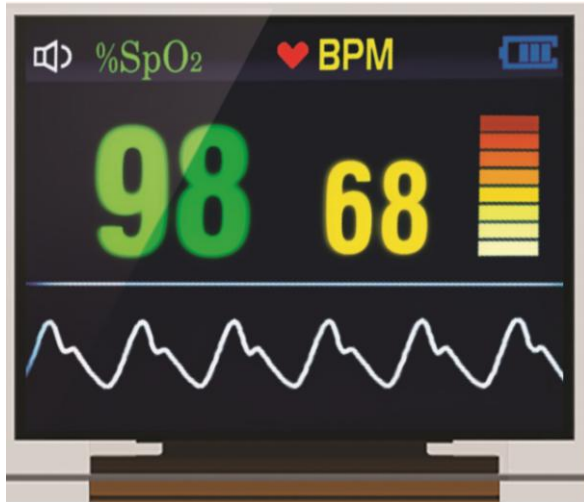# 4DOLED-602817 OLED Display

The 4DOLED-602817 is a 1.7" 160x128 pixel resolution 262K colour Passive Matrix OLED display. This OLED is the same display used in the uOLED-160G2 intelligent display module. It allows for a very cost effective means of adding a full colour small display to any product or your next microcontroller project.

- 160 x 128 1.5" 262K true to life colours
- SEPS525 Driver IC (Data Sheet available)
- 35 pins on LCD FPC, 0.5mm pitch
- Dimensions: 39.9mm x 34mm x 1.8mm
- 2.4 to 3.6 Volts supply, nominal 3.3 Volts
- No backlighting

Display Specifications

1) Display Mode : Passive Matrix
2) Display Color : 262,144 Colors (Maximum)
3) Drive Duty : 1/48 Duty

Mechanical Specifications

1) Outline Drawing : According to the annexed outline drawing
2) Number of Pixels : 160 (RGB) ´ 128
3) Module size : 39.90 ´ 48.50 ´ 1.60 (mm)
4) Panel Size : 39.9 0´ 34.00 ´ 1.60 (mm) including "Glare Polarizer"
5) Active Area : 33.575´ 26.864 (mm)
6) Pixel Pitch : 0.07 ´ 0.21 (mm)
7) Pixel Size : 0.045 ´ 0.194 (mm)

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage for Operation	V_{DD}	-0.3	4	V
Supply Voltage for I/O Pins	V_{DDIO}	-0.3	4	V
Supply Voltage for Display	V_{DDH}	-0.3	16	V
Operating Temperature	T_{OP}	-40	70	°C
Storage Temperature	T_{STG}	-40	85	°C
Life Time (90 cd/m2)		10,000	-	hour
Life Time (70 cd/m2)		15,000	-	hour
Life Time (50 cd/m2)		20,000	-	hour

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. lso, for normal operations, it is desirable to use this module under the conditions according to Section 3. "Optics & Electrical Characteristics". If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

Note 3: The defined temperature ranges do not include the polarizer. The maximum withstood temperature of the polarizer should be 80°C.

Note 4: VDDH = 14.0V, Ta = 25°C, 50% Checkerboard. Software configuration follows Section 4.4 Initialization. End of lifetime is specified as 50% of initial brightness reached. The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.

Optics Characteristics

Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
Brightness	Lbr	Note 5	60	75	-	cd/m^2
C.I.E. (White)	(x)	C.I.E. 1931	0.26	0.30	0.34	
	(y)		0.29	0.33	0.37	
C.I.E. (Red)	(x)	C.I.E. 1931	0.60	0.64	0.68	
	(y)		0.30	0.34	0.38	
C.I.E. (Green)	(x)	C.I.E. 1931	0.27	0.31	0.35	
	(y)		0.58	0.62	0.66	
C.I.E. (Blue)	(x)	C.I.E. 1931	0.10	0.14	0.18	
	(y)		0.12	0.16	0.20	
Dark Room Contrast	CR		-	>10,000:1	-	
Viewing Angle			-	Free	-	degree

* Optical measurement taken at VDD = 2.8V, VDDH = 14.0V.

DC Characteristics

Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage for Operation	V_{DD}		2.6	2.8	3.3	V
Supply Voltage for I/O Pins	V_{DDIO}		1.6	2.8	V_{DD}	V
Supply Voltage for Display	V_{DDH}	Note 5	13.5	14.0	14.5	V
High Level Input	V_{IH}		0.8´V_{DDIO}	-	V_{DDIO}	V
Low Level Input	V_{IL}		0	-	0.4	V
High Level Output	V_{OH1}	I_{OH} = -0.4mA	V_{DDIO}-0.4	-		V
	V_{OH2}	I_{OH} = -0.4mA				V
Low Level Output	V_{OL1}	I_{OL} = -0.1mA		-	0.4	V
	V_{OL2}	I_{OL} = -0.1mA				V
Operating Current for V_{DD}	I_{DD}		-	2.5	3.5	mA
Operating Current for V_{DDH}	I_{DDH}	Note 6	-	10.5	13.2	mA
		Note 7	-	14.9	18.6	mA
		Note 8	-	26.2	32.8	mA
Sleep Mode Current for V_{DD}	$I_{DD, SLEEP}$		-	3	5	µA
Sleep Mode Current for V_{DDH}	$I_{DDH, SLEEP}$		-	1	5	µA

Note 5: Brightness (Lbr) and Supply Voltage for Display (V_{DDH}) are subject to the change of the panel characteristics and the customer's request.

Note 6: V_{DD} = 2.8V, V_{DDH} = 14.0V, 30% Display Area Turn on.

Note 7: V_{DD} = 2.8V, V_{DDH} = 14.0V, 50% Display Area Turn on.

Note 8: V_{DD} = 2.8V, V_{DDH} = 14.0V, 100% Display Area Turn on.

AC Characteristics

Symbol	Description		Min	Max	Unit
tAH6	Address Setup Timing	Read	10	-	ns
		Write	5	-	ns
tAS6	Address Hold Timing	Read	10	-	ns
		Write	5	-	ns
tCYC6	System Cycle Timing	Read	200	-	ns
		Write	100		
tELR6	Read "L" Pulse Width		90	-	ns
tEHR6	Read "H" Pulse Width		90	-	ns
tELW6	Write "L" Pulse Width		45	-	ns
tEHW6	Write "H" Pulse Width		45	-	ns
tRDD6	Read Data Output Delay Time (CL = 15pF)		0	70	ns
tRDH6	Data Hold Timing (CL = 15pF)		0	70	ns
tDS6	Write Data Setup Timing		40	-	ns
tDH6	Write Data Hold Timing		10	-	ns

* All the timing reference is 10% and 90% of VDDIO.

Functional Specification

Commands

Refer to the Technical Manual for the SEPS525

Power down and Power up Sequence

To protect OEL 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. It gives the OEL panel enough time to complete the action of charge and discharge before/after the operation.

Power up Sequence

1. Power up VDD & VDDIO
2. Send Display off command
3. Initialization
4. Clear Screen
5. Power up VDDH
6. Delay 100ms (When VDDH is stable)
7. Send Display on command

Power down Sequence

1. Send Display off command
2. Power down VDDH
3. Delay 100ms (When VDDH is reach 0 and panel is completely discharges)
4. Power down VDD & VDDIO

Note 9

1) Since an ESD protection circuit is connected between VDD, VDDIO and VDDH inside the driver IC, VDDH becomes lower than VDD & VDDIO whenever VDD & VDDIO is ON and VDDH is OFF.
2) VDDH should be kept float (disable) when it is OFF.
3) Power Pins (VDD, VDDIO, VDDH) can never be pulled to ground under any circumstance.
4) VDD & VDDIO should not be power down before VDDH power down.

Reset Circuit

When RESETB input is low, the chip is initialized with the following status:
1. Frame Frequency: 90Hz
2. Oscillation: Internal Oscillator On
3. DDRAM Write Horizontal Address: MX1 = 0x00, MX2 = 0x9F
4. DDRAM Write Vertical Address: MY1 = 0x00, MY2 = 0x7F
5. Display Data RAM Write: HC = 1, VC = 1, HV = 0
6. RGB Data Swap: Off
7. Row Scan Shift Direction: G0, G1, … , G126, G127
8. Column Data Shift Direction: S0, S1, … , S478, S479
9. Display On/Off: Off
10. Panel Display Size: FX1 = 0x00, FX2 = 0x9F, FY1 = 0x00, FY1 = 0x7F
11. Display Data RAM Read Column/Row Address: FAC = 0x00, FAR = 0x00
12. Precharge Time (R/G/B): 0 Clock
13. Precharge Current (R/G/B): 0mA
14. Driving Current (R/G/B): 0mA