4” OLED Display Model 1 – Summary Specification

1.1 DISPLAY FEATURES

- 16.7M (24-bit) and 65k (16-bit) color modes
    - 16-bit color via internal 16-bit to 24-bit converter
- 20-pin board-to-board connector
    - FPC (2-layer in connector area, 4-layer in main area) with connector
- Automatic current limit function
- Low power mode for showing limited number of pixels in low refresh rate
- On-module oscillator, RAM, DC/DC converter and timing generator
    - Module can operate stand-alone in still image use case
- 8 discrete brightness steps
- Note: The display manufacturer is Samsung Mobile Display.

1.2 POWER SUPPLY

- Analog power supply range 2.9 – 4.8V
    - Direct connection to lithium-ion battery possible
- Digital power supply 1.65 – 1.95V (1.8V nominal)

1.3 ELECTRICAL INTERFACE

- OLED panel with COG OLED controller
- MIPI DSI Command mode 1 lane (1 data lane + 1 clock lane)
    - MIPI Dphy v0.9
    - MIPI DSI 1.01 r11
- On-module RAM 360x640x24 bits

1.4 GENERAL PARAMETERS

Table 1: Specification summary table

GENERAL		
Technology		AM OLED
Display format		360 • 640 • RGB
Pixel Density		186 ppi
Weight [g]		23.57 g
Image mode		Normally black
Functions		Automatic current limit, Low power mode, High brightness mode
DIMENSIONS		
Diagonal size [inch]		4.0”
Display module size		53.76 mm • 97.16 mm • 2.21 mm
Glass size (width x height x thickness)		52.76 mm • 94.36 mm • 0.61 mm
Active area size		49.14 mm • 87.36 mm
Pixel height to width ratio		1:1
Sub pixel pitch		0.0455 mm • 0.1365 mm
ELECTRICAL		
Interface		MIPI DSI 1 lane
Supply voltage	VPNL	3.7 V
	VDDI	1.8 V
I/O voltage, sideband signals		1.8 V
Display identification		Display supplier code ID and version codes readable via DSI.
OPTICAL		
Pixel arrangement		RGB stripe
Color gamut (NTSC ratio)		110 %
Polarizer absorption angle		N/A (Polarizer is not attached on display.)
Output luminance		640 cd/m^2
Refresh rate		60 Hz
Number of colours		16.7M (24-bit) 65k (16-bit)
ENVIRONMENTAL		
Operational temperature		−15 °C to +70 °C
Storage temperature		−40 °C to +85 °C

1.5 DISPLAY STRUCTURE

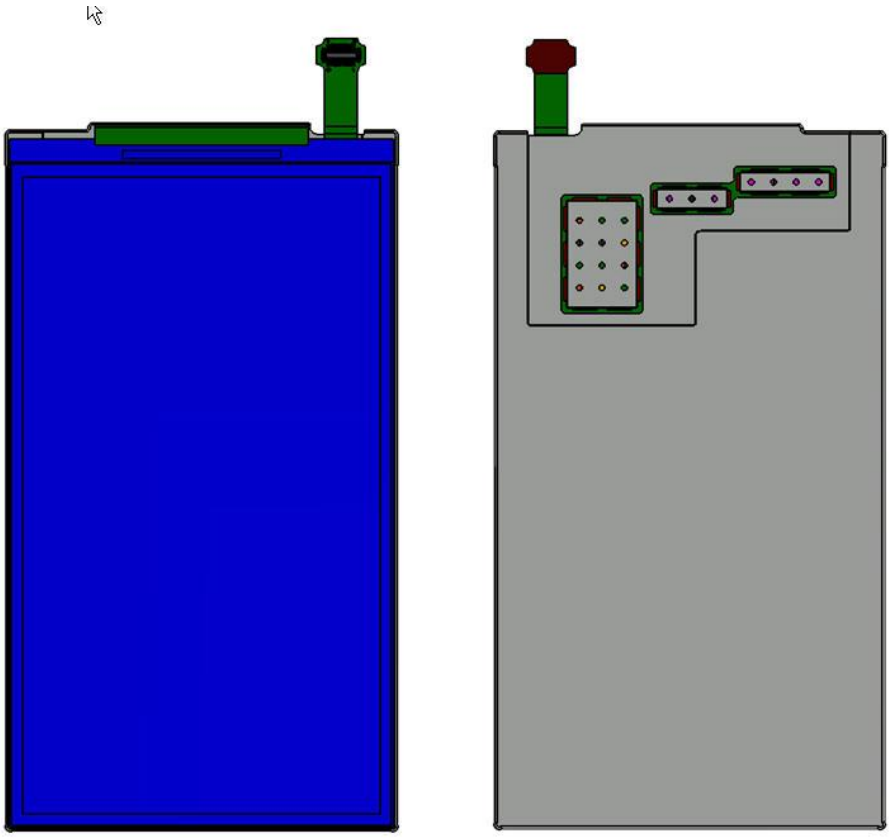

FIGURE 1 PICTHRE OF DISPLAY MODULE

1.6 DISPLAY CONNECTOR

The connector on display FPC is Hirose Electric BM10B(0.6)-20DP-0.4V(73). Pin layout is presented in the figures below.

GND	10	11	GND
GND	9	12	VSEL
GND	8	13	RES
D0-	7	14	VDDI
D0+	6	15	VPNL
GND	5	16	VPNL
CLK-	4	17	VPNL
CLK+	3	18	VPNL
GND	2	19	TE
GND	1	20	tGND

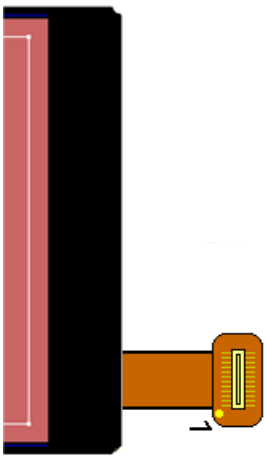

FIGURE 2. PIN LAYOUT & NUMBERING

1.7 DISPLAY POWER CONSUMPTION

MODE OF OPERATIONS	IMAGE	CURRENT CONSUMPTION							
		NOMINAL			MAXIMUM			PEAK	
		IDDI [mA]	IPNL [mA]	Power [mW]	IDDI [mA]	IPNL [mA]	Power [mW]	IDDI [mA]	IPNL [mA]
Normal mode	All pixels black	3	11	46	8	19	68	11	23
	All pixels white (1)	3	467	1735	8	875	2551	11	1050
	All pixels red	3	108	404	8	201	595	11	241
	All pixels green	3	174	650	8	325	956	11	390
	All pixels blue	3	199	743	8	372	1093	11	447
Low Power Mode (2)	White 6,000 pixels	0.5	4	16	-	-	-	-	-
Sleep In Mode (3)	N/A	0.06	0.06	0.33	0.2	0.2	0.91	0.28	0.28
Video data	16.7M colors (1) CPU access @ 30 fps	8	478	1785	20	893	2624	28	1072

NOTES

1. Worst case pattern is all pixels white.
2. Display luminance dimmed to 43 cd/m^2.
   Refresh rate reduced to 15 Hz.
   Number of colors reduced to 8 (3-bit).
3. CPU access is inactive.
   DSI interface in ULPS.

NOMINAL CONDITIONS:

T_A = 25 °C

VPNL = 3.7 V

VDDI = 1.8 V

MAXIMUM CONDITIONS:

T_A = -15 to 70 °C

VPNL = 2.90 V to 4.80 V

VDDI = 1.65 V to 1.95 V

Includes Process Variance

1.8 OPTICAL PARAMETERS

Nominal values in the following tables describe the performance at the temperature of 25 °C.

1.8.1 OUTPUT LUMINANCE

TABLE 3. OUTPUT LUMINANCE IN TEMPERATURES, DARK ROOM.

PARAMETER	TEMP [°C]	MIN	NOMINAL	MAX	DEFINITION AND SETUP
Luminance [cd/m^2]	+25	575	640	800	(3) C1 or equivalent θ_1 = 0° Φ = 270°
	-15...+70	384	640	N/A	

1.8.2 CONTRAST RATIO TEMPERATURES

TABLE 4. CONTRAST RATIO IN TEMPERATURES, DARK ROOM.

PARAMETER	TEMP [°C]	MIN	NOMINAL	DEFINITION AND SETUP
Contrast ratio	+25	800	> 1300	(1) C1 or equivalent θ_1 = 0° Φ = 270°
	-15...+70	800	> 1300	

TABLE 5. COLOR CHARACTERISTICS, DARK ROOM, @ + 25 °C

COLOR		MIN	NOMINAL	MAX	DEFINITION AND SETUP
White	u’	-	0.196	-	(5) C1 or equivalent θ_1 = 0°
	v’	-	0.454	-	
Red	u’	0.446	0.482	0.518	
	v’	0.511	0.526	0.536	
Green	u’	0.055	0.078	0.108	
	v’	0.560	0.580	0.590	
Blue	u’	0.134	0.172	0.200	
	v’	0.097	0.147	0.202	

1.8.3 TRC CHARACTERISTICS IN TEMPERATURES

TABLE 6. TRC IN TEMPERATURES, DARK ROOM.

PARAMETER	MIN	NOMINAL	MAX	DEFINITION AND SETUP
TRC, Gamma	2.0	2.2	2.4	(3) C1 or equivalent θ_1 = 0° Φ = 270°