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S1D13705 Embedded Memory LCD Controller

Power Consumption

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SEIKO EPSON CORPORATION

Rev. 2.1

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1 S1D13705 Power Consumption

S1D13705 power consumption is affected by many system design variables.

- Input clock frequency (CLKI): the CLKI frequency and the internal clock divide register determine the operating clock (CLK) frequency of the S1D13705. The higher CLK is, the higher the frame fate, performance, and power consumption.
- CPU interface: the S1D13705 current consumption depends on the BUSCLK frequency, data width, number of toggling pins, and other factors – the higher the BUSCLK, the higher the CPU performance and power consumption.
- V_{DD} voltage levels (Core and IO): the voltage level of the Core and IO sections in the S1D13705 affects power consumption – the higher the voltage, the higher the consumption.
- Display mode: the resolution, panel type, and color depth affect power consumption. The higher the resolution/color depth and number of LCD panel signals, the higher the power consumption.

Note

If the High Performance option is turned on, the power consumption increases to that of 8 bit-per-pixel mode for all color depths.

There are two power save modes in the S1D13705: Software and Hardware Power Save. The power consumption of these modes is affected by various system design variables.

- CPU bus state during Power Save: the state of the CPU bus signals during Power Save has a substantial effect on power consumption. An inactive bus (e.g. BUSCLK = low, Addr = low etc.) reduces overall system power consumption.
- CLKI state during Power Save: disabling the CLKI during Power Save has substantial power savings.

1.1 Conditions

Table 1-1: "S1D13705 Total Power Consumption" below gives an example of a specific environment and its effects on power consumption.

Table 1-1: S1D13705 Total Power Consumption

	Test Condition *Core V_{DD} = 3.3V, IO V_{DD} = 3.3V* BUSCLK = 8.33MHz	Gray Shades / Colors	Power Consumption				
			Active			Power Save Mode	
			Core	IO	Total	Software	Hardware
1	Input Clock = 6MHz LCD Panel = 320x240 4-bit Single Monochrome	Black-and-White 4 Gray Shades 16 Gray Shades	4.29mW 4.99mW 6.13mW	0.52mW 0.76mW 0.75mW	4.81mW 5.75mW 6.88mW	1.44mW[1]	1.21mW[2]
2	Input Clock = 6MHz LCD Panel = 320x240 4-bit Single Color	2 Colors 4 Colors 16 Colors 256 Colors	4.64mW 5.30mW 6.58mW 8.65mW	0.73mW 1.51mW 1.57mW 1.52mW	5.37mW 6.81mW 8.15mW 10.16mW	1.44mW[1]	1.22mW[2]
3	Input Clock = 25MHz LCD Panel = 640x480 8-bit Single Monochrome	Black-and-White 4 Gray Shades	13.97mW 16.75mW	1.10mW 2.08mW	15.07mW 18.83mW	2.53mW[1]	2.32mW[2]
4	Input Clock = 25MHz LCD Panel = 640x480 8-bit Single Color	2 Colors 4 Colors	15.53mW 18.30mW	2.64mW 7.16mW	18.17mW 25.47mW	2.53mW[1]	2.32mW[2]
5	Input Clock = 25MHz LCD Panel = 640x480 8-bit Dual Monochrome	Black-and-White 4 Grey Shades	13.84mW 20.38mW	1.08mW 2.07mW	14.93mW 22.45mW	2.53mW[1]	2.32mW[2]
6	Input Clock = 25MHz LCD Panel = 640x480 8-bit Dual Color	2 Colors 4 Colors	15.82mW 23.31mW	2.62mW 7.01mW	18.44mW 30.32mW	2.53mW[1]	2.32mW[2]
7	Input Clock = 25MHz LCD Panel = 640x480 9-bit TFT	2 Colors 4 Colors	11.42mW 19.74mW	7.40mW 20.96mW	18.82mW 40.70mW	2.53mW[1]	2.32mW[2]

Note

1. Conditions for Software Power Save:
   - CPU interface active (signals toggling)
   - CLKI active

2. Conditions for Hardware Power Save:
   - CPU interface inactive (high impedance)
   - CLKI active

2 Summary

The system design variables in Section 1, “S1D13705 Power Consumption” and in Table 1-1: “S1D13705 Total Power Consumption” show that S1D13705 power consumption depends on the specific implementation. Active Mode power consumption depends on the desired CPU performance and LCD frame-rate, whereas Power Save Mode consumption depends on the CPU Interface and Input Clock state.

In a typical design environment, the S1D13705 can be configured to be an extremely power-efficient LCD Controller with high performance and flexibility.

3 Change Record

X27A-G-006-02 Revision 2.1 - Issued: April 9, 2018

- updated Sales and Technical Support Section
- updated some formatting

4 Sales and Technical Support

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