S6C0678

6 BIT 420 CHANNEL TFT-LCD SOURCE DRIVER

November. 1999.

Ver. 0.2

Prepared by: Si-Wang, Sung

mail to : iamturbo@samsung.co.kr

S6C0678 Specification Revision History		
Version	**Content**	**Date**
0.0	Original	Aug.1999
0.1	The content of page 17 has been modified	Aug.1999
0.2	The content of page 18 has been modified	Nov.1999

CONTENTS

INTRODUCTION

The S6C0678 is a 420 channel output, TFT-LCD source driver for 64 gray scale displays. Data input is based on digital input consisting of 6 bits by 6 dots, which can realize a full-color display of 260,000 colors by output of 64 values gamma-corrected.

This device has an internal D/A (Digital-to-Analog) converter for each output and 10 (5-by-2) external power supplies. Because the output dynamic range is as large as 4.8 - 7.8 Vp-p, it is unnecessary to operate level inversion of the LCD's common electrode. Besides, to be able to deal with dot-line inversion when mounted on a single-side, output gray scale voltages with different polarity can be output to the odd number output pins and the even output pins.

S6C0678 can be adopted to larger panel, and SHL (shift direction selection) pin makes use of the LCD panel connection conveniently. Maximum operation clock frequency is 45 MHz at a 2.7 V logic operation. it can be applied to the TFT-LCD panel of SXGA+(1400 * RGB) standards.

FEATURES

- TFT active matrix LCD source driver LSI
- 64 Gary-scale is possible through 10 (5 by 2) external power supply and D/A converter
- Both dot inversion display and N-line inversion display are possible
- CMOS level input
- Compatible with gamma-correction
- Input data inversion function (DATPOL1, 2)
- Logic supply voltage: 2.7 - 3.6 V
- LCD driver supply voltage: 5.0 - 8.0 V
- Output dynamic range: 4.8 - 7.8 Vp-p
- Maximum operating frequency: fMAX = 45 MHz (internal data transmission rate at 2.7 V operation)
- Output: 420 outputs
- TCP available

BLOCK DIAGRAM

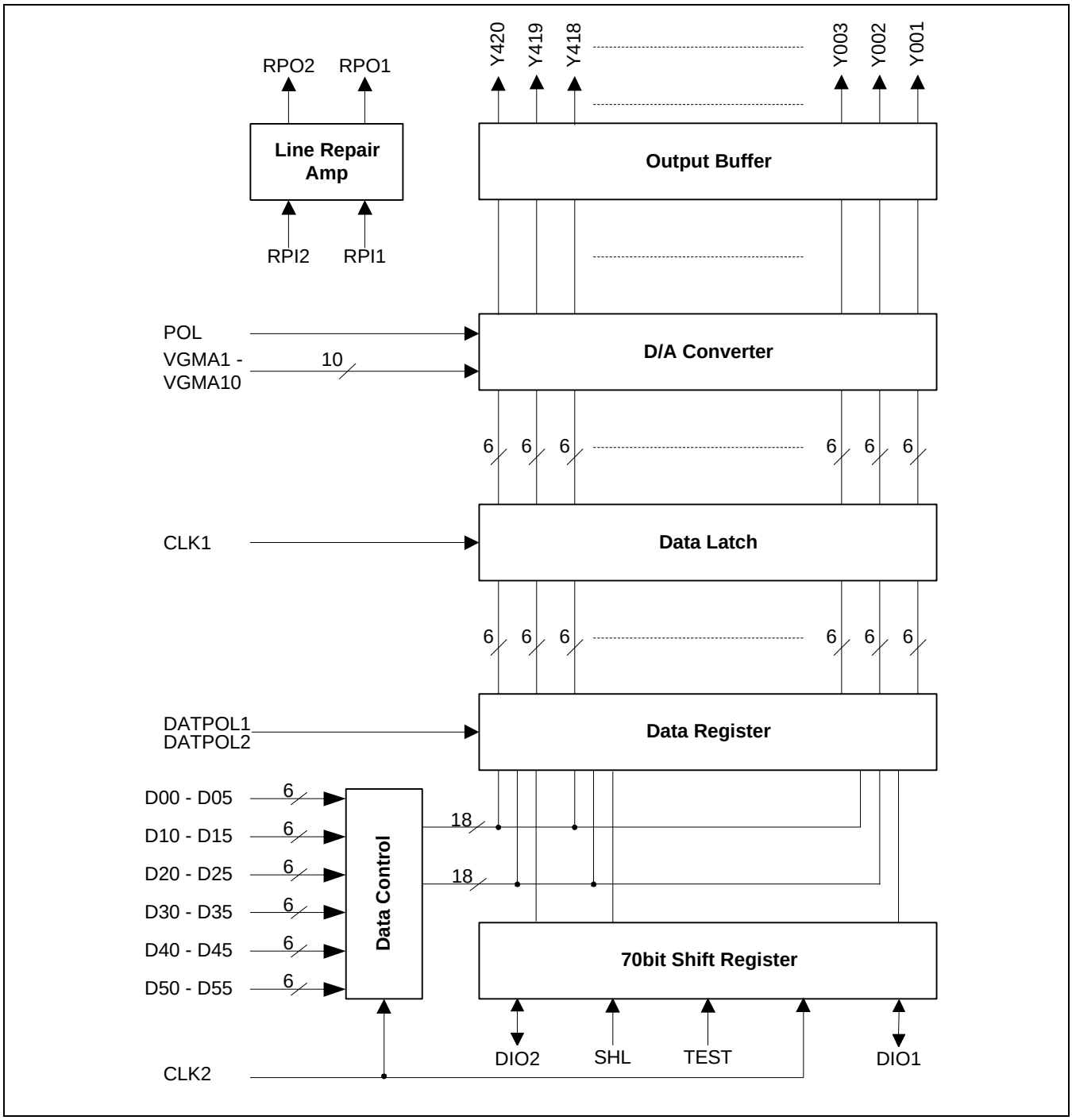

Figure 1. S6C0678 Block Diagram

PIN ASSIGNMENTS

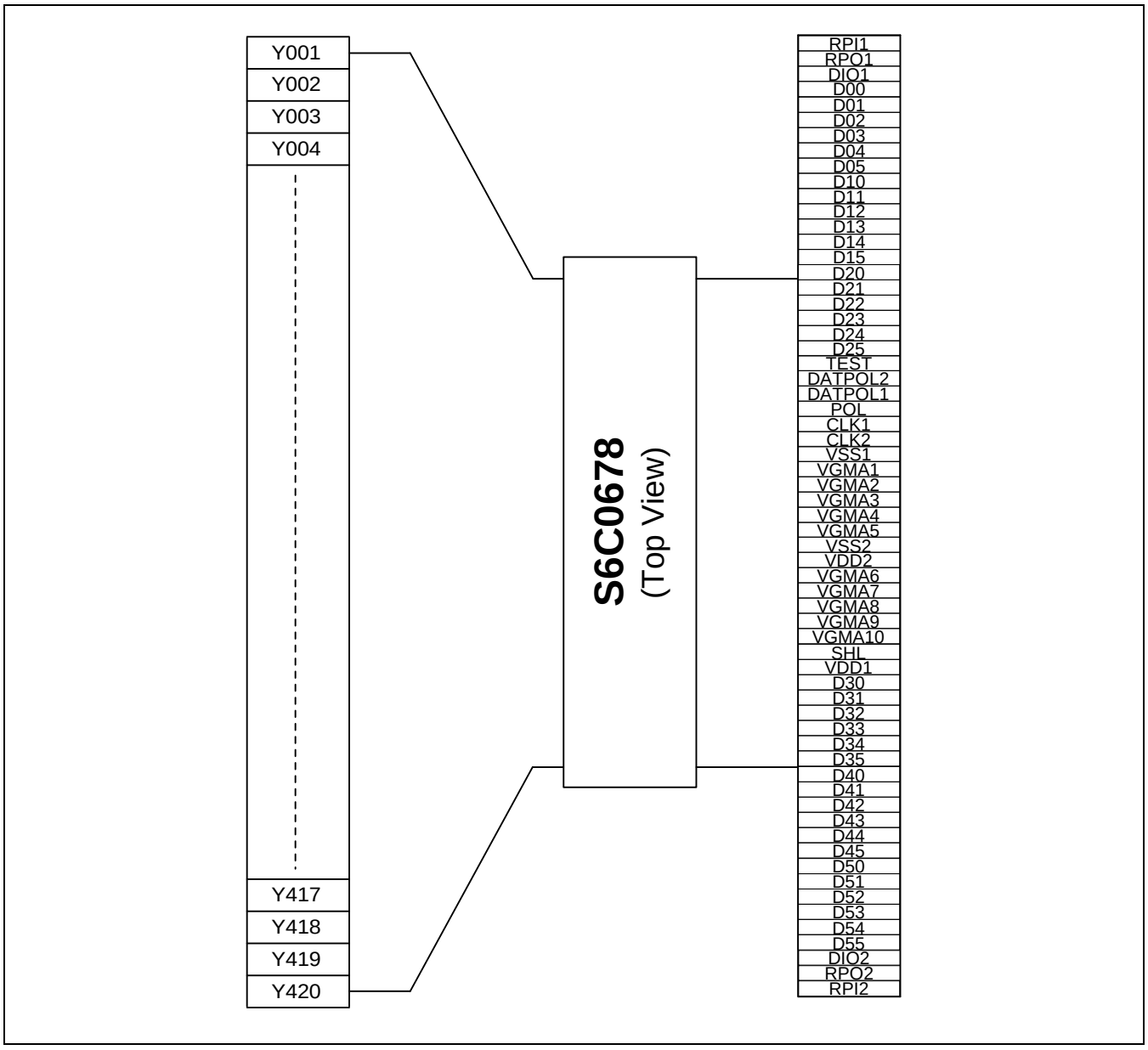

Figure 2. S6C0678 Pin Assignments

PIN DESCRIPTIONS

Symbol	Pin Name	Description
VDD1	Logic power supply	2.7 - 3.6 V
VDD2	Driver power supply	5.0 - 8.0 V
VSS1	Logic ground	Ground (0 V)
VSS2	Driver ground	Ground (0 V)
Y1 to Y420	Driver outputs	The D/A converted 64 gray-scale analog voltage is output.
D0<0:5> - D5<0:5>	Display data input	The display data is input with a width of 36 bits, gray-scale data (6 bits) by 6 dots (R,G,B) DX0: LSB, DX5: MSB
SHL	Shift direction control input	This pin controls the direction of shift register in cascade connection. The shift direction of the shift registers is as follows. SHL = H: DIO1 input, Y1 → Y420, DIO2 output SHL = L: DIO2 input, Y420 → Y1, DIO1 output
DIO1	Start pulse input / output	SHL = H: Used as the start pulse input pin. SHL = L: Used as the start pulse output pin.
DIO2	Start pulse input / output	SHL = H: Used as the start pulse output pin. SHL = L: Used as the start pulse input pin.
DATPOL1 DATPOL2	Data inversion input	DATPOL1, 2 = L: Display data is not inverted DATPOL1 = H: Display data of D0<0:5> - D2<0:5> is inverted DATPOL2 = H: Display data of D3<0:5> - D5<0:5> is inverted
POL	Polarity input	POL = H: The reference voltage for odd number outputs are VGMA1 – VGMA5 and those for even number outputs are VGMA6 – VGMA10. POL = L: The reference voltage for odd number outputs are VGMA6 – VGMA10 and those for even number outputs are VGMA1 – VGMA5.
CLK2	Shift clock input	Refer to the shift register's shift clock input. The display data is loaded to the data register at the rising edge of CLK2.
CLK1	Latch input	Latches the contents of the data register at rising edge and transfers them to the D/A converter. Also, after CLK1 input, clears the internal shift register contents. After 1 pulse input on start, operates normally. CLK1 input timing refers to the "Relationships between CLK1 start pulse (DIO1, DIO2) and blanking period" of the switching characteristic waveform. Outputs the G/S data at falling edge.
VGMA1 – VGMA10	Gamma corrected power supplies	Input the gamma corrected power supplies from external source. VDD2 > VGMA1 > VGMA2 > …… > VGMA9 > VGMA10 > VSS2 Keep gray-scale power supply unchanged during the gray-scale voltage output.
RPI1, RPO1 RPI2, RPO2	Line-repair AMP input / output	The Structure of the line-repair amp is the same as that of the analog output. RPI1 (RPI2) → impedance changed → RPO1 (RPO2)
TEST	Test input	TEST = L: Normal operation mode TEST = H: Test mode (OP AMP CUT-OFF, Rpd = 15kΩ)

OPERATION DESCRIPTION

DISPLAY DATA TRANSFER

When DIO1 (or DIO2) pulse is loaded into internal latch on the rising edge of CLK2, DIO1 (or DIO2) pulse enables the operation of data transfer, so display data is valid on the next rising edge of CLK2. Once all the data of 420 channels are loaded into internal latch, it goes into stand-by state automatically, and any new data is not accepted even though CLK2 is provided until next DIO1 (or DIO2) input. When next DIO1 (or DIO2) is provided, new display data is valid on the 2nd rising edge of CLK2 after the rising edge of DIO1 (or DIO2).

EXTENSION OF OUTPUT

Output pin can be adjusted to an extended screen by cascade connection.

(1) SHL = "L"
Connect DIO1 pin of previous stage to the DIO2 pin of next stage and all the input pins except DIO1 and DIO2 are connected together in each device.

(2) SHL = "H"
Connect DIO2 pin of previous stage to the DIO1 pin of next stage and all the input pins except DIO2 and DIO1 are connected together in each device.

RELATIONSHIP BETWEEN INPUT DATA VALUE AND OUTPUT VOLTAGE

The LCD drive output voltages are determined by the input data and 10 (5 by 2) gamma corrected power supplies (VGMA1 - VGMA10). Besides, to be able to deal with dot line inversion when mounted on a single-side, gradation voltages with different polarity can be output to the odd number output pins and the even number output pins. Among 5-by-2 gamma corrected voltages, input gray-scale voltages of the same polarity with respect to the common voltage, for the respective 5 gamma corrected voltages of VGMA1 - VGMA5 and VGMA6 - VGMA10.

SHL = H

OUTPUT	Y1	Y2	Y3	.....	Y418	Y419	Y420
-	First			→	Last		
DATA	D00 - D05	D10 - D15	D20 - D25	.....	D30 - D35	D40 - D45	D50 - D55

SHL = L

OUTPUT	Y1	Y2	Y3	.....	Y418	Y419	Y420
-	Last			←	First		
DATA	D00 - D05	D10 - D15	D20 - D25	.....	D30 - D35	D40 - D45	D50 - D55

Figure 3. Relationship between Shift Direction and Output Data

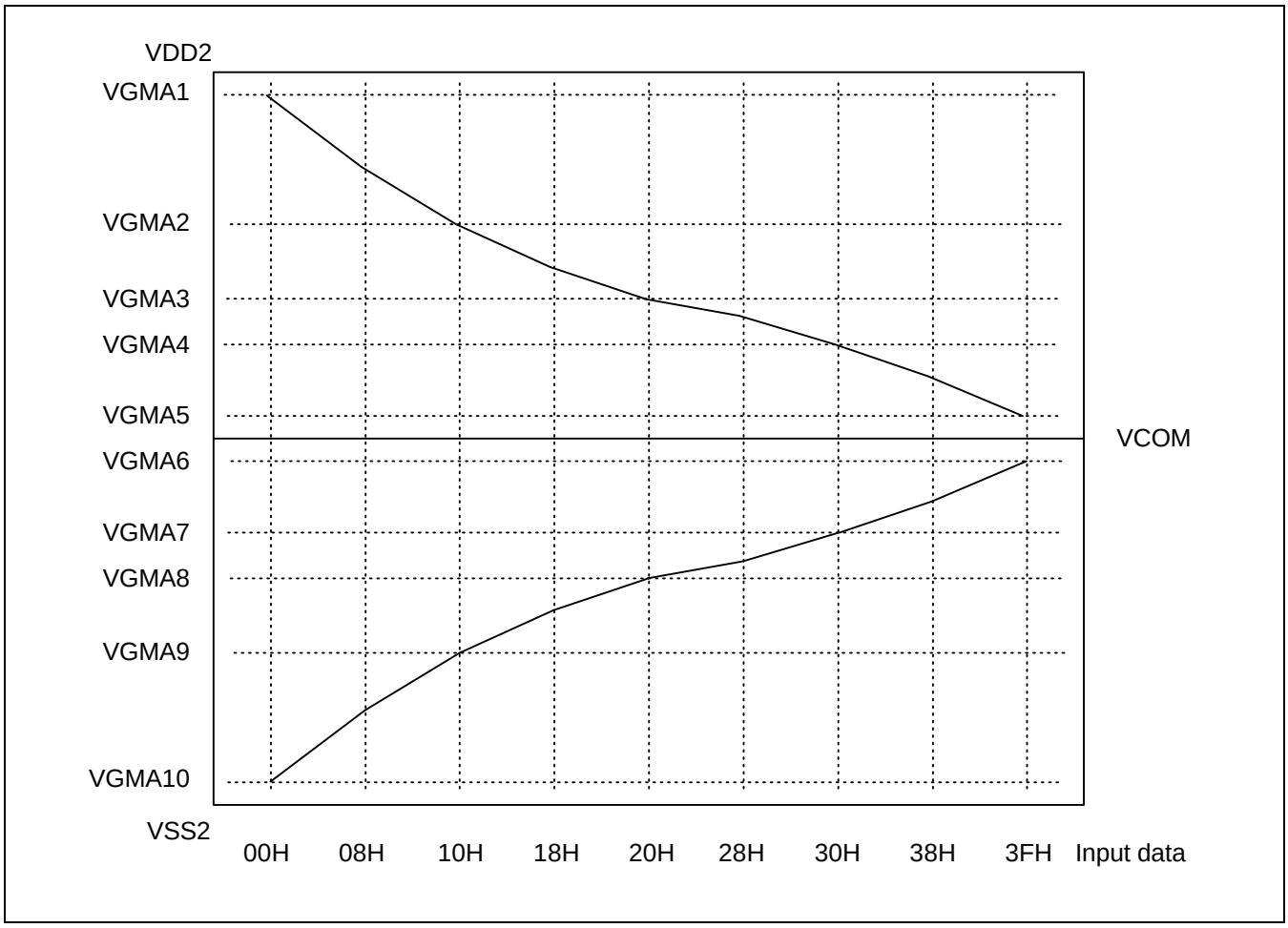

Figure 4. Gamma Correction Curve

Table 1. Resistor Strings (R0 - R62, unit: Ω)

Name	Value	Name	Value	Name	Value	Name	Value
R0	500	R16	330	R32	175	R48	210
R1	500	R17	330	R33	175	R49	220
R2	500	R18	330	R34	170	R50	230
R3	500	R19	320	R35	170	R51	240
R4	500	R20	300	R36	165	R52	250
R5	500	R21	280	R37	165	R53	260
R6	500	R22	270	R38	165	R54	270
R7	500	R23	260	R39	165	R55	290
R8	500	R24	250	R40	170	R56	300
R9	500	R25	240	R41	170	R57	310
R10	500	R26	230	R42	170	R58	320
R11	500	R27	220	R43	175	R59	340
R12	450	R28	210	R44	175	R60	340
R13	450	R29	200	R45	175	R61	340
R14	400	R30	190	R46	180	R62	340
R15	370	R31	180	R47	200		

Table 2. Relationship between Input Data and Output Voltage Value

Input data	DX5	DX4	DX3	DX2	DX1	DX0	G/S	Output voltage
00H	0	0	0	0	0	0	VH0	VGMA1
01H	0	0	0	0	0	1	VH1	VGMA1 + (VGMA2 - VGMA1) × 500 / 7670
02H	0	0	0	0	1	0	VH2	VGMA1 + (VGMA2 - VGMA1) × 1000 / 7670
03H	0	0	0	0	1	1	VH3	VGMA1 + (VGMA2 - VGMA1) × 1500 / 7670
04H	0	0	0	1	0	0	VH4	VGMA1 + (VGMA2 - VGMA1) × 2000 / 7670
05H	0	0	0	1	0	1	VH5	VGMA1 + (VGMA2 - VGMA1) × 2500 / 7670
06H	0	0	0	1	1	0	VH6	VGMA1 + (VGMA2 - VGMA1) × 3000 / 7670
07H	0	0	0	1	1	1	VH7	VGMA1 + (VGMA2 - VGMA1) × 3500 / 7670
08H	0	0	1	0	0	0	VH8	VGMA1 + (VGMA2 - VGMA1) × 4000 / 7670
09H	0	0	1	0	0	1	VH9	VGMA1 + (VGMA2 - VGMA1) × 4500 / 7670
0AH	0	0	1	0	1	0	VH10	VGMA1 + (VGMA2 - VGMA1) × 5000 / 7670
0BH	0	0	1	0	1	1	VH11	VGMA1 + (VGMA2 - VGMA1) × 5500 / 7670
0CH	0	0	1	1	0	0	VH12	VGMA1 + (VGMA2 - VGMA1) × 6000 / 7670
0DH	0	0	1	1	0	1	VH13	VGMA1 + (VGMA2 - VGMA1) × 6450 / 7670
0EH	0	0	1	1	1	0	VH14	VGMA1 + (VGMA2 - VGMA1) × 6900 / 7670
0FH	0	0	1	1	1	1	VH15	VGMA1 + (VGMA2 - VGMA1) × 7300 / 7670
10H	0	1	0	0	0	0	VH16	VGMA2
11H	0	1	0	0	0	1	VH17	VGMA2 + (VGMA3 - VGMA2) × 330 / 4140
12H	0	1	0	0	1	0	VH18	VGMA2 + (VGMA3 - VGMA2) × 660 / 4140
13H	0	1	0	0	1	1	VH19	VGMA2 + (VGMA3 - VGMA2) × 990 / 4140
14H	0	1	0	1	0	0	VH20	VGMA2 + (VGMA3 - VGMA2) × 1310 / 4140
15H	0	1	0	1	0	1	VH21	VGMA2 + (VGMA3 - VGMA2) × 1610 / 4140
16H	0	1	0	1	1	0	VH22	VGMA2 + (VGMA3 - VGMA2) × 1890 / 4140
17H	0	1	0	1	1	1	VH23	VGMA2 + (VGMA3 - VGMA2) × 2160 / 4140
18H	0	1	1	0	0	0	VH24	VGMA2 + (VGMA3 - VGMA2) × 2420 / 4140
19H	0	1	1	0	0	1	VH25	VGMA2 + (VGMA3 - VGMA2) × 2670 / 4140
1AH	0	1	1	0	1	0	VH26	VGMA2 + (VGMA3 - VGMA2) × 2910 / 4140
1BH	0	1	1	0	1	1	VH27	VGMA2 + (VGMA3 - VGMA2) × 3140 / 4140
1CH	0	1	1	1	0	0	VH28	VGMA2 + (VGMA3 - VGMA2) × 3360 / 4140
1DH	0	1	1	1	0	1	VH29	VGMA2 + (VGMA3 - VGMA2) × 3570 / 4140
1EH	0	1	1	1	1	0	VH30	VGMA2 + (VGMA3 - VGMA2) × 3770 / 4140
1FH	0	1	1	1	1	1	VH31	VGMA2 + (VGMA3 - VGMA2) × 3960 / 4140

NOTE: VDD2 > VGMA1 > VGMA2 > VGMA3 > VGMA4 > VGMA5

Table 2. Relationship between Input Data and Output Voltage Value (Continued)

Input data	DX5	DX4	DX3	DX2	DX1	DX0	G/S	Output voltage
20H	1	0	0	0	0	0	VH32	VGMA3
21H	1	0	0	0	0	1	VH33	VGMA3 + (VGMA4 - VGMA3) × 175 / 2765
22H	1	0	0	0	1	0	VH34	VGMA3 + (VGMA4 - VGMA3) × 350 / 2765
23H	1	0	0	0	1	1	VH35	VGMA3 + (VGMA4 - VGMA3) × 520 / 2765
24H	1	0	0	1	0	0	VH36	VGMA3 + (VGMA4 - VGMA3) × 690 / 2765
25H	1	0	0	1	0	1	VH37	VGMA3 + (VGMA4 - VGMA3) × 855 / 2765
26H	1	0	0	1	1	0	VH38	VGMA3 + (VGMA4 - VGMA3) × 020 / 2765
27H	1	0	0	1	1	1	VH39	VGMA3 + (VGMA4 - VGMA3) × 1185 / 2765
28H	1	0	1	0	0	0	VH40	VGMA3 + (VGMA4 - VGMA3) × 1350 / 2765
29H	1	0	1	0	0	1	VH41	VGMA3 + (VGMA4 - VGMA3) × 1520 / 2765
2AH	1	0	1	0	1	0	VH42	VGMA3 + (VGMA4 - VGMA3) × 1690 / 2765
2BH	1	0	1	0	1	1	VH43	VGMA3 + (VGMA4 - VGMA3) × 1860 / 2765
2CH	1	0	1	1	0	0	VH44	VGMA3 + (VGMA4 - VGMA3) × 2035 / 2765
2DH	1	0	1	1	0	1	VH45	VGMA3 + (VGMA4 - VGMA3) × 2210 / 2765
2EH	1	0	1	1	1	0	VH46	VGMA3 + (VGMA4 - VGMA3) × 2385 / 2765
2FH	1	0	1	1	1	1	VH47	VGMA3 + (VGMA4 - VGMA3) × 2565 / 2765
30H	1	1	0	0	0	0	VH48	VGMA4
31H	1	1	0	0	0	1	VH49	VGMA4 + (VGMA5 - VGMA4) × 210 / 4260
32H	1	1	0	0	1	0	VH50	VGMA4 + (VGMA5 - VGMA4) × 430 / 4260
33H	1	1	0	0	1	1	VH51	VGMA4 + (VGMA5 - VGMA4) × 660 / 4260
34H	1	1	0	1	0	0	VH52	VGMA4 + (VGMA5 - VGMA4) × 900 / 4260
35H	1	1	0	1	0	1	VH53	VGMA4 + (VGMA5 - VGMA4) × 1150 / 4260
36H	1	1	0	1	1	0	VH54	VGMA4 + (VGMA5 - VGMA4) × 1410 / 4260
37H	1	1	0	1	1	1	VH55	VGMA4 + (VGMA5 - VGMA4) × 1680 / 4260
38H	1	1	1	0	0	0	VH56	VGMA4 + (VGMA5 - VGMA4) × 1970 / 4260
39H	1	1	1	0	0	1	VH57	VGMA4 + (VGMA5 - VGMA4) × 2270 / 4260
3AH	1	1	1	0	1	0	VH58	VGMA4 + (VGMA5 - VGMA4) × 2580 / 4260
3BH	1	1	1	0	1	1	VH59	VGMA4 + (VGMA5 - VGMA4) × 2900 / 4260
3CH	1	1	1	1	0	0	VH60	VGMA4 + (VGMA5 - VGMA4) × 3240 / 4260
3DH	1	1	1	1	0	1	VH61	VGMA4 + (VGMA5 - VGMA4) × 3580 / 4260
3EH	1	1	1	1	1	0	VH62	VGMA4 + (VGMA5 - VGMA4) × 3920 / 4260
3FH	1	1	1	1	1	1	VH63	VGMA5

Table 2. Relationship between Input Data and Output Voltage Value (Continued)

Input data	DX5	DX4	DX3	DX2	DX1	DX0	G/S	Output voltage
00H	0	0	0	0	0	0	VL0	VGMA10
01H	0	0	0	0	0	1	VL1	VGMA10 + (VGMA9 - VGMA10) × 500 / 7670
02H	0	0	0	0	1	0	VL2	VGMA10 + (VGMA9 - VGMA10) × 1000 / 7670
03H	0	0	0	0	1	1	VL3	VGMA10 + (VGMA9 - VGMA10) × 1500 / 7670
04H	0	0	0	1	0	0	VL4	VGMA10 + (VGMA9 - VGMA10) × 2000 / 7670
05H	0	0	0	1	0	1	VL5	VGMA10 + (VGMA9 - VGMA10) × 2500 / 7670
06H	0	0	0	1	1	0	VL6	VGMA10 + (VGMA9 - VGMA10) × 3000 / 7670
07H	0	0	0	1	1	1	VL7	VGMA10 + (VGMA9 - VGMA10) × 3500 / 7670
08H	0	0	1	0	0	0	VL8	VGMA10 + (VGMA9 - VGMA10) × 4000 / 7670
09H	0	0	1	0	0	1	VL9	VGMA10 + (VGMA9 - VGMA10) × 4500 / 7670
0AH	0	0	1	0	1	0	VL10	VGMA10 + (VGMA9 - VGMA10) × 5000 / 7670
0BH	0	0	1	0	1	1	VL11	VGMA10 + (VGMA9 - VGMA10) × 5500 / 7670
0CH	0	0	1	1	0	0	VL12	VGMA10 + (VGMA9 - VGMA10) × 6000 / 7670
0DH	0	0	1	1	0	1	VL13	VGMA10 + (VGMA9 - VGMA10) × 6450 / 7670
0EH	0	0	1	1	1	0	VL14	VGMA10 + (VGMA9 - VGMA10) × 6900 / 7670
0FH	0	0	1	1	1	1	VL15	VGMA10 + (VGMA9 - VGMA10) × 7300 / 7670
10H	0	1	0	0	0	0	VL16	VGMA9
11H	0	1	0	0	0	1	VL17	VGMA9 + (VGMA8 - VGMA9) × 330 / 4140
12H	0	1	0	0	1	0	VL18	VGMA9 + (VGMA8 - VGMA9) × 660 / 4140
13H	0	1	0	0	1	1	VL19	VGMA9 + (VGMA8 - VGMA9) × 990 / 4140
14H	0	1	0	1	0	0	VL20	VGMA9 + (VGMA8 - VGMA9) × 1310 / 4140
15H	0	1	0	1	0	1	VL21	VGMA9 + (VGMA8 - VGMA9) × 1610 / 4140
16H	0	1	0	1	1	0	VL22	VGMA9 + (VGMA8 - VGMA9) × 1890 / 4140
17H	0	1	0	1	1	1	VL23	VGMA9 + (VGMA8 - VGMA9) × 2160 / 4140
18H	0	1	1	0	0	0	VL24	VGMA9 + (VGMA8 - VGMA9) × 2420 / 4140
19H	0	1	1	0	0	1	VL25	VGMA9 + (VGMA8 - VGMA9) × 2670 / 4140
1AH	0	1	1	0	1	0	VL26	VGMA9 + (VGMA8 - VGMA9) × 2910 / 4140
1BH	0	1	1	0	1	1	VL27	VGMA9 + (VGMA8 - VGMA9) × 3140 / 4140
1CH	0	1	1	1	0	0	VL28	VGMA9 + (VGMA8 - VGMA9) × 3360 / 4140
1DH	0	1	1	1	0	1	VL29	VGMA9 + (VGMA8 - VGMA9) × 3570 / 4140
1EH	0	1	1	1	1	0	VL30	VGMA9 + (VGMA8 - VGMA9) × 3770 / 4140
1FH	0	1	1	1	1	1	VL31	VGMA9 + (VGMA8 - VGMA9) × 3960 / 4140

NOTE: VGMA6 > VGMA7 > VGMA8 > VGMA9 > VGMA10 > VSS2

Table 2. Relationship between Input Data and Output Voltage Value (Continued)

Input data	DX5	DX4	DX3	DX2	DX1	DX0	G/S	Output voltage
20H	1	0	0	0	0	0	VL32	VGMA8
21H	1	0	0	0	0	1	VL33	VGMA8 + (VGMA7 - VGMA8) × 175 / 2765
22H	1	0	0	0	1	0	VL34	VGMA8 + (VGMA7 - VGMA8) × 350 / 2765
23H	1	0	0	0	1	1	VL35	VGMA8 + (VGMA7 - VGMA8) × 520 / 2765
24H	1	0	0	1	0	0	VL36	VGMA8 + (VGMA7 - VGMA8) × 690 / 2765
25H	1	0	0	1	0	1	VL37	VGMA8 + (VGMA7 - VGMA8) × 855 / 2765
26H	1	0	0	1	1	0	VL38	VGMA8 + (VGMA7 - VGMA8) × 1020 / 2765
27H	1	0	0	1	1	1	VL39	VGMA8 + (VGMA7 - VGMA8) × 1185 / 2765
28H	1	0	1	0	0	0	VL40	VGMA8 + (VGMA7 - VGMA8) × 1350 / 2765
29H	1	0	1	0	0	1	VL41	VGMA8 + (VGMA7 - VGMA8) × 1520 / 2765
2AH	1	0	1	0	1	0	VL42	VGMA8 + (VGMA7 - VGMA8) × 1690 / 2765
2BH	1	0	1	0	1	1	VL43	VGMA8 + (VGMA7 - VGMA8) × 1860 / 2765
2CH	1	0	1	1	0	0	VL44	VGMA8 + (VGMA7 - VGMA8) × 2035 / 2765
2DH	1	0	1	1	0	1	VL45	VGMA8 + (VGMA7 - VGMA8) × 2210 / 2765
2EH	1	0	1	1	1	0	VL46	VGMA8 + (VGMA7 - VGMA8) × 2385 / 2765
2FH	1	0	1	1	1	1	VL47	VGMA8 + (VGMA7 - VGMA8) × 2565 / 2765
30H	1	1	0	0	0	0	VL48	VGMA7
31H	1	1	0	0	0	1	VL49	VGMA7 + (VGMA6 - VGMA7) × 210 / 4260
32H	1	1	0	0	1	0	VL50	VGMA7 + (VGMA6 - VGMA7) × 430 / 4260
33H	1	1	0	0	1	1	VL51	VGMA7 + (VGMA6 - VGMA7) × 660 / 4260
34H	1	1	0	1	0	0	VL52	VGMA7 + (VGMA6 - VGMA7) × 900 / 4260
35H	1	1	0	1	0	1	VL53	VGMA7 + (VGMA6 - VGMA7) × 1150 / 4260
36H	1	1	0	1	1	0	VL54	VGMA7 + (VGMA6 - VGMA7) × 1410 / 4260
37H	1	1	0	1	1	1	VL55	VGMA7 + (VGMA6 - VGMA7) × 1680 / 4260
38H	1	1	1	0	0	0	VL56	VGMA7 + (VGMA6 - VGMA7) × 1970 / 4260
39H	1	1	1	0	0	1	VL57	VGMA7 + (VGMA6 - VGMA7) × 2270 / 4260
3AH	1	1	1	0	1	0	VL58	VGMA7 + (VGMA6 - VGMA7) × 2580 / 4260
3BH	1	1	1	0	1	1	VL59	VGMA7 + (VGMA6 - VGMA7) × 2900 / 4260
3CH	1	1	1	1	0	0	VL60	VGMA7 + (VGMA6 - VGMA7) × 3240 / 4260
3DH	1	1	1	1	0	1	VL61	VGMA7 + (VGMA6 - VGMA7) × 3580 / 4260
3EH	1	1	1	1	1	0	VL62	VGMA7 + (VGMA6 - VGMA7) × 3920 / 4260
3FH	1	1	1	1	1	1	VL63	VGMA6

ABSOLUTE MAXIMUM RATINGS

Table 3. Absolute Maximum Ratings (VSS1 = VSS2 = 0 V)

Parameter	Symbol	Ratings	Unit
Logic supply voltage	VDD1	-0.3 to 5.5	V
Driver supply voltage	VDD2	-0.3 to 9.0	V
Input voltage	VGMA1 - 10	-0.3 to VDD2 + 0.3	V
	RPI1, RPI2	-0.3 to VDD2 + 0.3	
	Others	-0.3 to VDD1 + 0.3	
Output voltage	DIO1, 2	-0.3 to VDD1 + 0.3	V
	Y1 to Y420	-0.3 to VDD2 + 0.3	
	RPO1, RPO2	-0.3 to VDD2 + 0.3	
Operating power dissipation	Pd	150	mW
Operation temperature	Top	-20 to 75	°C
Storage temperature	Tstg	-55 to 125	°C

CAUTIONS:

If LSIs are stressed beyond those listed above “absolute maximum ratings”, they may be permanently destroyed. These are stress ratings only, and functional operation of the device at these or any other condition beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

Turn on power order: VDD1 → control signal input → VDD2 → VGMA1 - VGMA10
or VDD1 & VDD2 → control signal input & VGMA1 - VGMA10

Turn off power order: VGMA1 - VGMA10 → VDD2 → control signal input → VDD1

RECOMMENDED OPERATION CONDITIONS

Table 4. Recommended Operation Conditions (Ta = -20 to 75 °C, VSS1 = VSS2 = 0 V)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Logic supply voltage	VDD1	2.7	3.0	3.6	V
Driver supply voltage	VDD2	5.0	7.0	8.0	V
Gamma corrected voltage	VGMA1 - VGMA5	0.5 VDD2	-	VDD2 - 0.1	V
	VGMA6 - VGMA10	VSS2 + 0.1	-	0.5 VDD2	V
Driver part output voltage	Vyo	VSS2 + 0.1	-	VDD2 - 0.1	V
Maximum clock frequency	fmax	VDD1 = 2.7 V		45	MHz
Output load capacitance	CL	-	-	150	pF/PIN

DC CHARACTERISTICS

Table 5. DC Characteristics (Ta = -20 to 75 °C, VDD1 = 2.7 to 3.6 V, VDD2 = 5.0 to 8.0 V, VSS1 = VSS2 = 0 V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
High level input voltage	VIH	SHL, CLK2, D00 - D55, CLK1, POL, DATPOL1, DATPOL2, DIO1 (DIO2)	0.7VDD1	-	VDD1	V
Low level input voltage	VIL		0	-	0.3VDD1	
Input leakage current	IL		-1	-	1	μA
Input Capacitance	Cin		-	5	10	pF
High level output voltage	VOH	DIO1 (DIO2), IO = -1.0 mA	VDD1-0.5	-	-	V
Low level output voltage	VOL	DIO1 (DIO2), IO = +1.0 mA	-	-	0.5	
Resistor	R0 - R62	Refer to Table 1. Resistor Strings	Rn × 0.7	-	Rn × 1.3	Ω
Driver output current	IVOH1	VDD2 = 8.0 V, Vx = 2.5 V, Vyo = 7.5 V(1)	-	-1.0	-0.5	mA
	IVOL1	VDD2 = 8.0 V, Vx = 5.5 V, Vyo = 0.5 V(1)	0.5	1.0	-	mA
Line-repair Driver output current	IVOH2	VDD2 = 8.0 V, Vx = 2.5 V, Vyo = 7.5 V(1)	-	-3.0	-1.5	mA
	IVOL2	VDD2 = 8.0 V, Vx = 5.5 V, Vyo = 0.5 V(1)	1.5	3.0	-	mA
Output voltage deviation	ΔVO	Input data : 00H to 3FH	-	±10	±20	mV
Output RMS voltage deviation	dVrms(2)	Input data : 00H to 3FH	-	±5	±15	
Output voltage range	Vyo	Input data : 00H to 3FH	VSS2 + 0.1	-	VDD2 - 0.1	V
Logic part dynamic current	IDD1	VDD1 = 3.0 V (3)	-	4.0	5.5	mA
Driver part dynamic current	IDD2	VDD1 = 3.0 V, VDD2 = 8.0 V, VGMA1 = 7.5 V, VGMA5 = 4.5 V, VGMA6 = 3.5 V, VGMA10 = 0.5 V (3) (4) (5)	-	4.0	7.0	

NOTES:

1. Vyo is the output voltage of analog output pins Y1 to Y420. Vx is the voltage applied to analog output pins Y1 to Y420.
2. dVrms is a maximum deviation value from ideal difference between high output and low output at the same gray scale.
3. CLK1 period is defined to be 15 μs at fCLK2 = 30.5 MHz, data pattern = 101010 (checkerboard pattern), Ta = 25 °C
4. The current consumption per driver when SXGA+ single-sided mounting (10 drivers) is connected in cascade
5. No load

AC CHARACTERISTICS

Table 6. AC Characteristics (Ta = -20 to 75 °C, VDD1 = 2.7 to 3.6 V, VDD2 = 5.0 to 8.0 V, VSS1 = VSS2 = 0 V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Clock pulse width	PWCLK	-	22	-	-	ns
Clock pulse low period	PWCLK(L)	-	6	-	-	
Clock pulse high period	PWCLK(H)	-	6	-	-	
Data setup time	tSETUP1	Refer to NOTE1	2	-	-	
Data hold time	tHOLD1	Refer to NOTE1	2	-	-	
Start pulse setup time	tSETUP2	Refer to NOTE1	2	-	-	
Start pulse hold time	tHOLD2	Refer to NOTE1	2	-	-	
DATPOL-CLK2 setup time	tSETUP4	Refer to NOTE1	2	-	-	
DATPOL-CLK2 hold time	tHOLD4	Refer to NOTE1	2	-	-	
Start pulse delay time	tPLH1	CL = 20pF	-	-	12	
CLK1 setup time	tSETUP3	-	1	-	-	CLK2 period
Driver output delay time1	tPHL1	Refer to NOTE2, 4	-	-	4	µs
Driver output delay time2	tPHL2	Refer to NOTE3, 4	-	-	8	
CLK1 pulse high period	PWCLK1	-	0.2	-	-	
Data invalid period	tINV	DIO1 (2) ↑ → CLK2 ↑	1			CLK2 period
Last data timing	tLDT	-	1	-	-	
CLK1-CLK2 time	tCLK1 - CLK2	CLK1 ↑ → CLK2 ↑	8	-	-	ns
POL-CLK1 time	tPOL - CLK1	POL ↑or ↓ → CLK1 ↑	6	-	-	ns

NOTES:

1. Input condition (VIH = 0.7 VDD1, VIL = 0.3 VDD1)
2. The value is specified when the drive voltage value reaches the target output voltage level of 90%
3. The value is specified when the drive voltage value reaches the target output voltage level of 6-bit accuracy.
4. Yout Load Condition

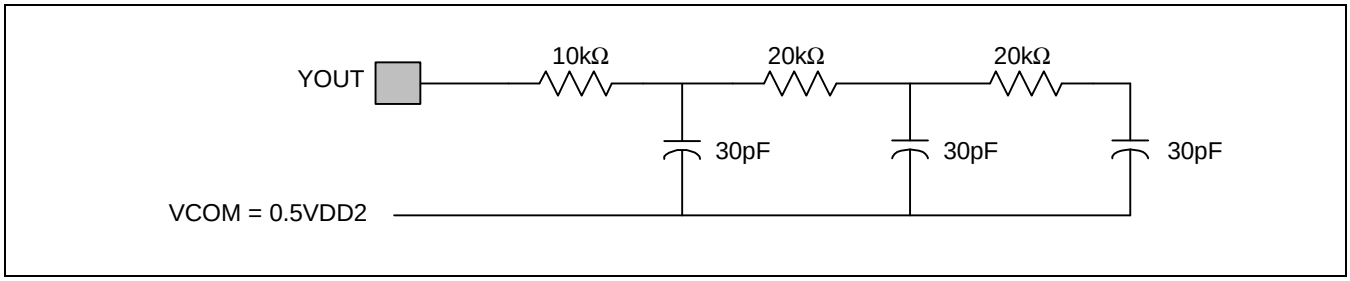

Figure 5. Yout Load Condition

WAVEFORMS (VIH = 0.7 VDD1, VIL = 0.3 VDD1)

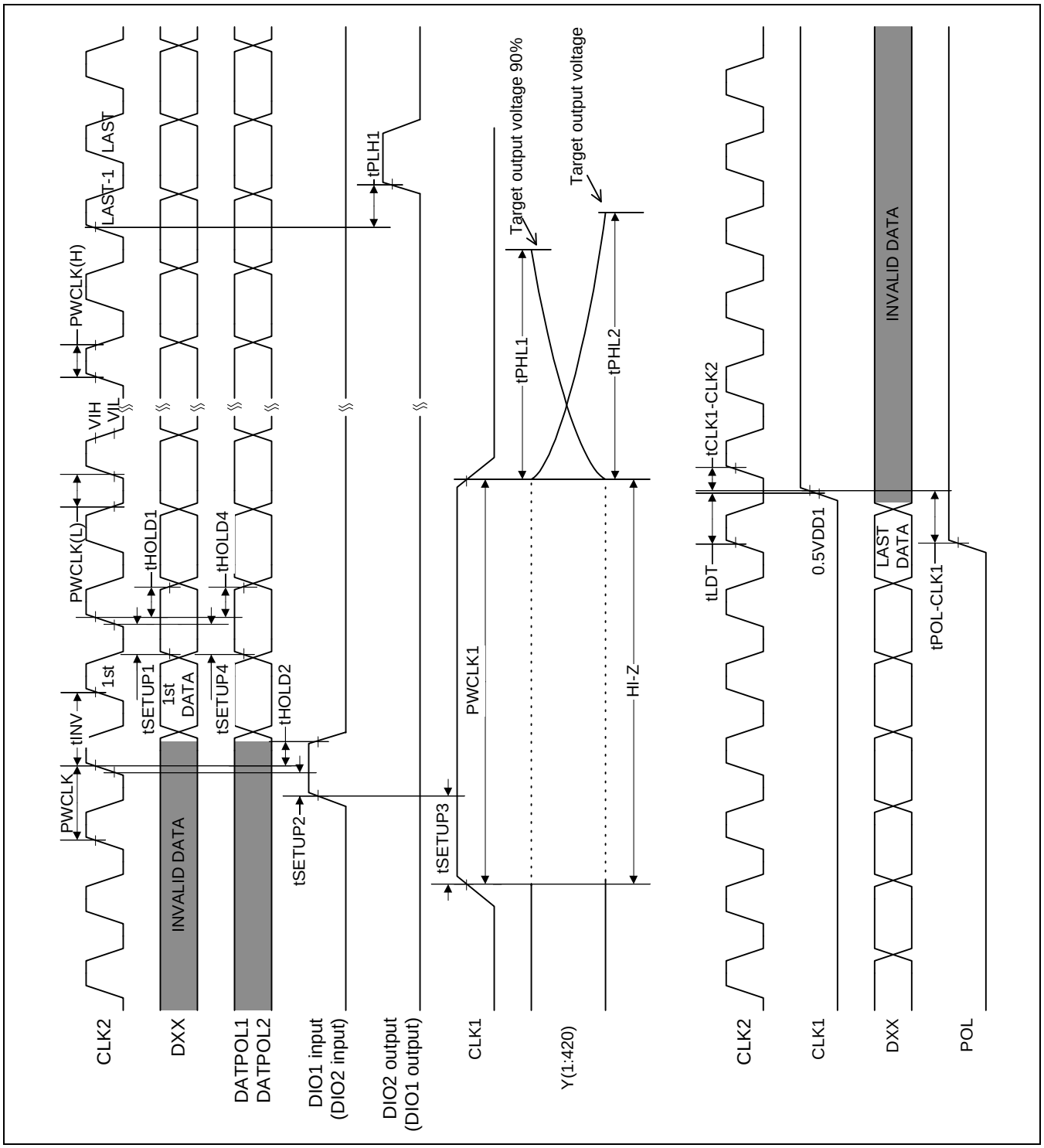

Figure 6. Waveforms

SAMSUNG ELECTRONICS

RELATIONSHIPS BETWEEN CLK1, START PULSE (DIO1, DIO2) AND BLANKING PERIOD

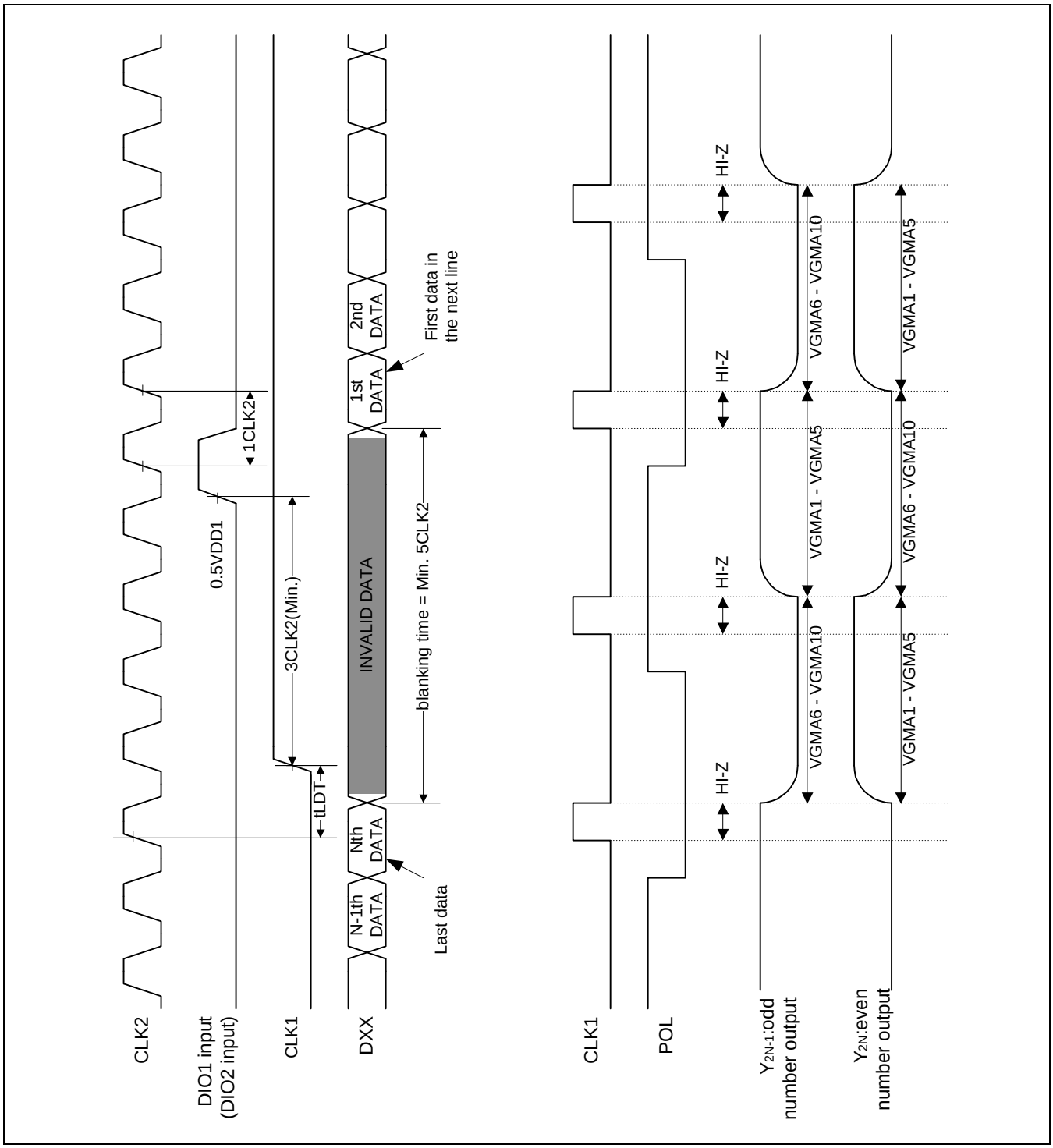

Figure 7. Waveforms