

To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

DESCRIPTION

The M35080FP is a bitmap pattern display control IC can display on the screen. Display frequency can operate in 3.3MHz to 20MHz, and is equipped with the analog RGB output (512 colors / 260k colors) and the digital RGB output (512 colors) function. Moreover, 2 pages (horizontal 128 dot X vertical 96 dots/page) display can be simultaneously performed on 1 screen. It uses a silicon gate CMOS process and it housed in a 24-pin shrink SOP package.

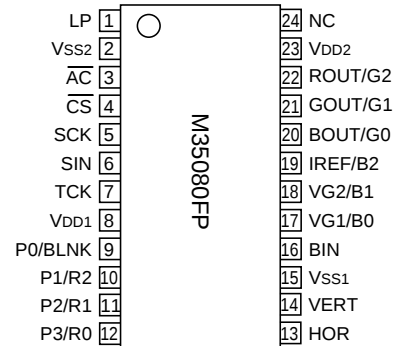
FEATURES

- Pixel composition Eight kinds (Can be chosen from the following)
 - horizontal 128 dots X vertical 96 dots X 2 pages
 - horizontal 192 dots X vertical 64 dots X 2 pages
 - horizontal 256 dots X vertical 48 dots X 2 pages
 - horizontal 384 dots X vertical 32 dots X 2 pages
 - horizontal 32 dots X vertical 384 dots X 2 pages
 - horizontal 48 dots X vertical 256 dots X 2 pages
 - horizontal 64 dots X vertical 192 dots X 2 pages
 - horizontal 96 dots X vertical 128 dots X 2 pages
- RGB output
 - Analog RGB output ROUT, GOUT, BOUT
 - Number of colors displayed
 - double-screen display (3 bits each of RGB) : 512 colors
 - one-screen display (6 bits each of RGB) : 260 K colors
 - Digital RGB output R0 to R2, G0 to G2, B0 to B2,
 - Number of colors displayed
 - one and double-screen display (3 bits each of RGB) : 512 colors
- Bit map RAM 1000h to 3AFFh
 - 128 X 96 X 9 plans (R, G, B every 3 bit) X 2
 - 221184 bit (27 Kbyte)
- Display input frequency range
 - external input Fosc = 3.3 MHz to 20 MHz
- Horizontal synchronous input frequency
 - H.sync = 10 kHz to 20 kHz
- Output ports (Combination port output)
 - 4 ports (Switches with R0, R1, R2 and BLNK output)
- DAC 6 bits X 3 (R, G, B)
- Operating voltage 2.7 V to 3.3 V

APPLICATION

Liquid crystal display, Plasma display, Multi-scan monitor

PIN CONFIGURATION (TOP VIEW)



Outline 24P2Q-A

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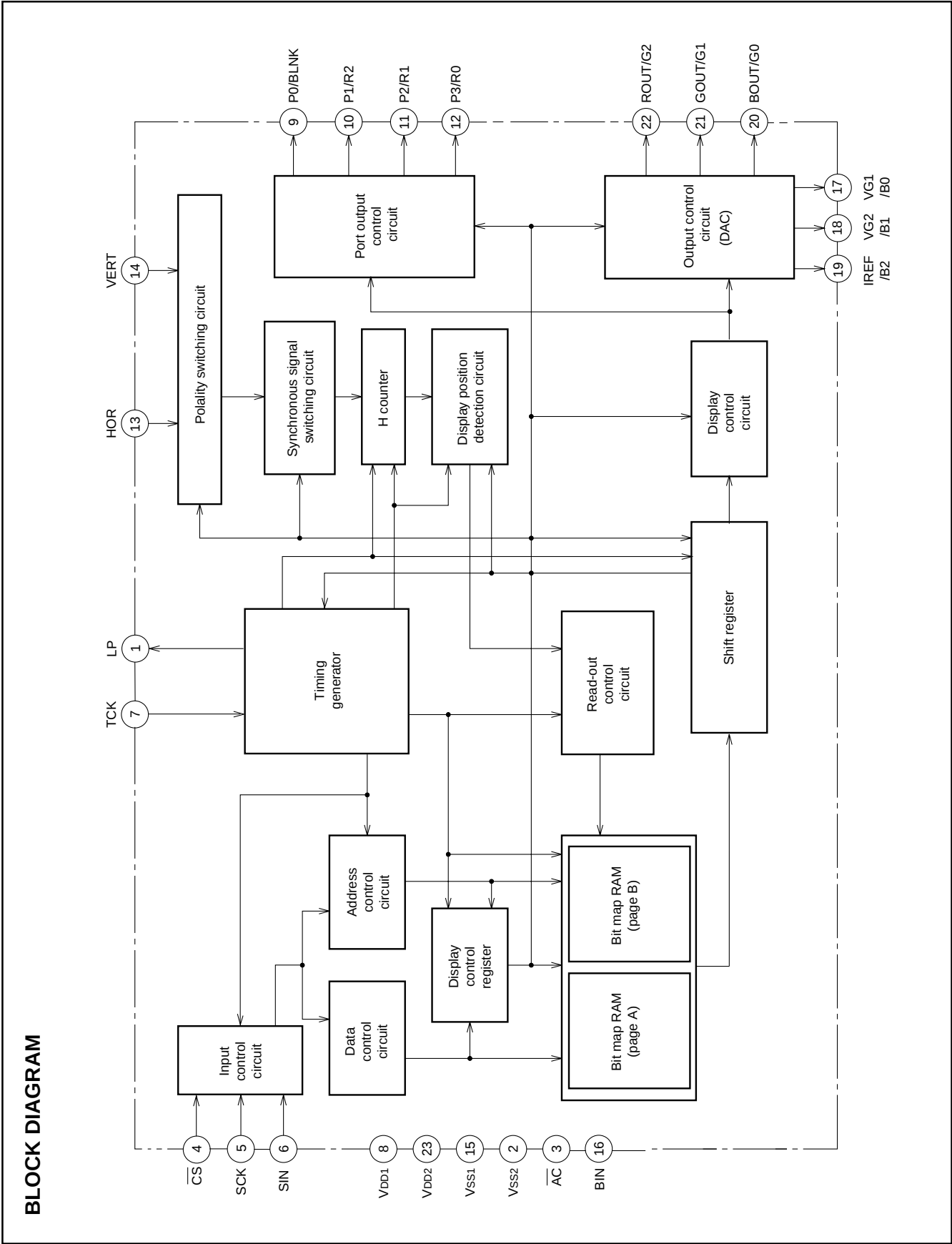
SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

PIN DESCRIPTION

Symbol	Pin name	Input/ Output	Function
LP	Test output	Output	Test pin. Open this pin.
Vss2	Earthing pin	–	Connect to GND.
$\overline{\text{AC}}$	Auto-clear input	Input	When "L", this pin resets the internal IC circuit. Hysteresis input. Built-in pull-up resistor.
$\overline{\text{CS}}$	Chip select input	Input	This is the pin for chip select input. Set "L" level at serial data transmission. Hysteresis input.
SCK	Serial clock input	Input	At $\overline{\text{CS}}$ pin is "L" level, SDA pin serial data is taken in when SCL rises. Hysteresis input. Built-in pull-up resistor.
SIN	Serial data input	Input	This is the pin for serial input of display control register and display RAM data. Also, this pin output acknowledge signal. Hysteresis input. Nch open-drain output.
TCK	External clock	Input	This is the pin for external clock input.
VDD1	Power pin	–	Digital power supply. Connect to +3V with the power pin.
P0/BLNK	Port P0 output BLNK	Output	This is a general purpose port output at analog RGB output. Outputs port output or BLNK signal. Outputs BCLK signal at digital RGB output.
P1/R2	Port P1 output R2	Output	This is the output port output at analog RGB output. Outputs R2 signal at digital RGB output.
P2/R1	Port P2 output R1	Output	This is the output port output at analog RGB output. Outputs R1 signal at digital RGB output.
P3/R0	Port P3 output R0	Output	This is the output port output at analog RGB output. Outputs R0 signal at digital RGB output.
HOR	Horizontal synchronous signal input	Input	Input horizontal synchronous signal. (Hysteresis input.)
VERT	Vertical synchronous signal input	Input	Input vertical synchronous signal. (Hysteresis input.)
Vss1	Earthing pin	–	Connect to GND.
BIN	Test pin	–	Test pin. Connect to GND.
VG1/B0	Reference voltage output 1 B0	Output	Use reference voltage output 1 of DAC for analog RGB output at analog RGB output. Connect to capacitor. Output B0 signal at digital RGB output.
VG2/B1	Reference voltage output 1 B1	Output	Use reference voltage output 2 of DAC for analog RGB output at analog RGB output. Connect to capacitor. Output B1 signal at digital RGB output.
IREF/B2	Reference voltage output 2 B2	Output	The pin connects resistors which convert voltage current at analog RGB output. Output B2 signal at digital RGB output.
BOU/G0	Analog B signal output G0	Output	Output analog B signal at analog RGB output(Current output). Connect to load resistance. Output G0 signal at digital RGB output.
GOU/G1	Analog G signal output G1	Output	Output analog G signal at analog RGB output(Current output). Connect to load resistance. Output G1 signal at digital RGB output.
ROU/G2	Analog R signal output G2	Output	Output analog R signal at analog RGB output(Current output). Connect to load resistance. Output G2 signal at digital RGB output.
VDD2	Power pin	–	Digital power supply. Connect to +3V with the power pin.
NC	NC	–	NC pin. Open.

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS



MEMORY CONSTITUTION

Address 0000₁₆ to 0007₁₆ are assigned to the display RAM, address 1000₁₆ to 3AFF₁₆ are assigned to bitmap RAM. The internal circuit is reset and all display control registers (address 0000₁₆ to 0007₁₆) are set to "0" when the AC pin level is "L". And then, bit map RAM is not erased and be undefined. This memory has 2-page composition (an address is Page A and page B community)

of the memory for page A, and the memory for page B. Registers PAGEONA and PAGEONB perform page control at the time of writing in data. For detail, refer to "DATA INPUT EXAMPLE". Memory constitution is shown in Figure 1 to 10.

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0
0000 ₁₆	—	—	—	—	—	—	—	—	—	—	—	—	—	—	PAGEONB	PAGEONA
0001 ₁₆	—	—	—	—	—	YM2	YM1	YM0	BLANK1	BLANK0	ALLON	DSPON	—	WIDTH2	WIDTH1	WIDTH0
0002 ₁₆	—	VSIZE1	VSIZE0	—	—	—	VP9	VP8	VP7	VP6	VP5	VP4	VP3	VP2	VP1	VP0
0003 ₁₆	—	—	—	—	—	—	HP9	HP8	HP7	HP6	HP5	HP4	HP3	HP2	HP1	HP0
0004 ₁₆	—	ANADIG2	ANADIG1	ANADIG0	SYNCCK	TEST	—	—	—	—	—	POLV	POLH	MODE2	MODE1	MODE0
0005 ₁₆	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0006 ₁₆	—	DACON	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0007 ₁₆	—	—	—	—	—	—	—	—	SBLANK3	SBLANK2	SBLANK1	SBLANK0	PTD3	PTD2	PTD1	PTD0

Fig.1 Memory constitution (Display Control register)

Note : Address 0000₁₆ and 0004₁₆ to 0007₁₆ are Page A and B common registers. The writing of data is made regardless of registers PAGEONA and PAGEONB. As for addresses 0001₁₆ to 0003₁₆, register of Page A and Page B exists for every page (common to an address.)
When write data in the memory for page A, and write data in the memory for page B, set it as register PAGEONA = "1" at register PAGEONB = "1."
When both of PAGEONA and PAGEONB are set to "1", data can be simultaneously written in both the memory for page A, and the memory for page B.
Address 0XXX₁₆ other than addresses 0000₁₆ to 0007₁₆ are write-protected.

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots X 96 dots
1000 ₁₆	Bit map RAM (R0) data																Dot 1 to 16 of line 1
1001 ₁₆																	Dot 17 to 32 of line 1
1002 ₁₆																	Dot 33 to 48 of line 1
1003 ₁₆																	Dot 49 to 64 of line 1
1004 ₁₆																	Dot 65 to 80 of line 1
1005 ₁₆																	Dot 81 to 96 of line 1
1006 ₁₆																	Dot 97 to 112 of line 1
1007 ₁₆																	Dot 113 to 128 of line 1
1008 ₁₆																	Dot 1 to 16 of line 2
1009 ₁₆																	Dot 17 to 32 of line 2
100A ₁₆																	Dot 33 to 48 of line 2
⋮																	⋮
1206 ₁₆																	Dot 81 to 96 of line 95
1207 ₁₆																	Dot 97 to 112 of line 95
1208 ₁₆																	Dot 113 to 128 of line 95
12F9 ₁₆																	Dot 1 to 16 of line 96
12FA ₁₆																	Dot 17 to 32 of line 96
12FB ₁₆																	Dot 33 to 48 of line 96
12FC ₁₆																	Dot 49 to 64 of line 96
12FD ₁₆																	Dot 65 to 80 of line 96
12FE ₁₆																	Dot 81 to 96 of line 96
12FF ₁₆																	Dot 97 to 112 of line 96
1300 ₁₆	unused area																—
⋮																	
13FF ₁₆																	

Fig.2 Memory constitution (Bit map RAM (R0))

Notes : Bit map RAM (Addresses 1000₁₆ to 3AFF₁₆) has 2-page composition of the memory for page A, and the memory for page B.

When write data in the memory for page A, and write data in the memory for page B, set it as register PAGEONA = "1" at register PAGEONB = "1."

When both of PAGEONA and PAGEONB are set to "1", data can be simultaneously written in both the memory for page A, and the memory for page B.

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots X 96 dots
1400 ₁₆	Bit map RAM (R1) data																Dot 1 to 16 of line 1
1401 ₁₆																	Dot 17 to 32 of line 1
⋮																	⋮
16FE ₁₆																	Dot 81 to 96 of line 96
16FF ₁₆																	Dot 97 to 112 of line 96
1700 ₁₆	unused area																—
⋮																	
17FF ₁₆																	

Fig.3 Memory constitution (Bit map RAM (R1))

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots X 96 dots
1800 ₁₆	Bit map RAM (R2) data																Dot 1 to 16 of line 1
1801 ₁₆																	Dot 17 to 32 of line 1
⋮																	⋮
1AFE ₁₆																	Dot 81 to 96 of line 96
1AFF ₁₆																	Dot 97 to 112 of line 96
1B00 ₁₆	unused area																—
⋮																	
1FFF ₁₆																	

Fig.4 Memory constitution (Bit map RAM (R2))

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots × 96 dots
2000 ₁₆	Bit map RAM (G0) data																Dot 1 to 16 of line 1
2001 ₁₆																	Dot 17 to 32 of line 1
⋮																	⋮
22FE ₁₆																	Dot 81 to 96 of line 96
22FF ₁₆																	Dot 97 to 112 of line 96
2300 ₁₆ ⋮ 23FF ₁₆	unused area																—

Fig.5 Memory constitution (Bit map RAM (G0))

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots X 96 dots
2400 ₁₆	Bit map RAM (G1) data																Dot 1 to 16 of line 1
2401 ₁₆																	Dot 17 to 32 of line 1
⋮																	⋮
26FE ₁₆																	Dot 81 to 96 of line 96
26FF ₁₆																	Dot 97 to 112 of line 96
2700 ₁₆ ⋮ 27FF ₁₆	unused area																—

Fig.6 Memory constitution (Bit map RAM (G1))

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots X 96 dots
2800 ₁₆	Bit map RAM (G2) data																Dot 1 to 16 of line 1
2801 ₁₆																	Dot 17 to 32 of line 1
⋮																	⋮
2AFE ₁₆																	Dot 81 to 96 of line 96
2AFF ₁₆																	Dot 97 to 112 of line 96
2B00 ₁₆	unused area																
⋮																	
2FFF ₁₆																	

Fig.7 Memory constitution (Bit map RAM (G2))

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots × 96 dots
3000 ₁₆	Bit map RAM (B0) data																Dot 1 to 16 of line 1
3001 ₁₆																	Dot 17 to 32 of line 1
⋮																	⋮
32FE ₁₆																	Dot 81 to 96 of line 96
32FF ₁₆																	Dot 97 to 112 of line 96
3300 ₁₆ ⋮ 33FF ₁₆	unused area																—

Fig.8 Memory constitution (Bit map RAM (B0))

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots × 96 dots
3400 ₁₆	Bit map RAM (B1) data																Dot 1 to 16 of line 1
3401 ₁₆																	Dot 17 to 32 of line 1
⋮																	⋮
36FE ₁₆																	Dot 81 to 96 of line 96
36FF ₁₆																	Dot 97 to 112 of line 96
3700 ₁₆ ⋮ 37FF ₁₆	unused area																—

Fig.9 Memory constitution (Bit map RAM (B1))

Address	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Dot composition (DAF to DA0) at 128 dots × 96 dots
3800 ₁₆	Bit map RAM (B2) data																Dot 1 to 16 of line 1
3801 ₁₆																	Dot 17 to 32 of line 1
⋮																	⋮
3AFE ₁₆																	Dot 81 to 96 of line 96
3AFF ₁₆																	Dot 97 to 112 of line 96
3B00 ₁₆	unused area																—
⋮																	
3FFF ₁₆																	

Fig.10 Memory constitution (Bit map RAM (B2))

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Pixel composition

Each bit of a bit map display consists of nine bit map RAM (R0 to R2, G0 to G2, and B0 to B2.) Color setup can be specified out of 512 kinds per dot. The bit map RAM address corresponding to dot composition in case pixel composition is 128 dot x 96 dot is shown

in Fig. 11. And, the bit map RAM address corresponding to dot composition in case pixel composition is 64 dot x192 dot is shown in Fig. 12. In other pixel composition, the bit map RAM is similarly assigned in an order from the dots 1 to 16 of line 1.

Dots Lines	1 to 16	17 to 32	33 to 48	49 to 64	65 to 80	81 to 96	97 to 112	113 to 128
1	000 ₁₆	001 ₁₆	002 ₁₆	003 ₁₆	004 ₁₆	005 ₁₆	006 ₁₆	007 ₁₆
2	008 ₁₆	009 ₁₆	00A ₁₆	00B ₁₆	00C ₁₆	00D ₁₆	00E ₁₆	00F ₁₆
3	010 ₁₆	011 ₁₆	012 ₁₆	013 ₁₆	014 ₁₆	015 ₁₆	016 ₁₆	017 ₁₆
4	018 ₁₆	019 ₁₆	01A ₁₆	01B ₁₆	01C ₁₆	01D ₁₆	01E ₁₆	01F ₁₆
5	020 ₁₆	021 ₁₆	022 ₁₆	023 ₁₆	024 ₁₆	025 ₁₆	026 ₁₆	027 ₁₆
6	028 ₁₆	029 ₁₆	02A ₁₆	02B ₁₆	02C ₁₆	02D ₁₆	02E ₁₆	02F ₁₆
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
91	2D0 ₁₆	2D1 ₁₆	2D2 ₁₆	2D3 ₁₆	2D4 ₁₆	2D5 ₁₆	2D6 ₁₆	2D7 ₁₆
92	2D8 ₁₆	2D9 ₁₆	2DA ₁₆	2DB ₁₆	2DC ₁₆	2DD ₁₆	2DE ₁₆	2DF ₁₆
93	2E0 ₁₆	2E2 ₁₆	2E2 ₁₆	2E3 ₁₆	2E4 ₁₆	2E5 ₁₆	2E6 ₁₆	2E7 ₁₆
94	2E8 ₁₆	2E9 ₁₆	2EA ₁₆	2EB ₁₆	2EC ₁₆	2ED ₁₆	2EE ₁₆	2EF ₁₆
95	2F0 ₁₆	2F1 ₁₆	2F2 ₁₆	2F3 ₁₆	2F4 ₁₆	2F5 ₁₆	2F6 ₁₆	2F7 ₁₆
96	2F8 ₁₆	2F9 ₁₆	2FA ₁₆	2FB ₁₆	2FC ₁₆	2FD ₁₆	2FE ₁₆	2FF ₁₆

* The numerical value in a thick frame corresponds to lower 10-bits of bit map RAM (R0 to R2, G0 to G2, B0 to B2) address. (n RAM character number : 0 to 7)
Dot composition in 1 address (16 bits) is MSB.....LSB

Fig.11 Pixel composition (at 128 dots × 96 dots)

Dots Lines	1 to 16	17 to 32	33 to 48	49 to 64
1	000 ₁₆	001 ₁₆	002 ₁₆	003 ₁₆
2	004 ₁₆	005 ₁₆	006 ₁₆	007 ₁₆
3	008 ₁₆	009 ₁₆	00A ₁₆	00B ₁₆
4	00C ₁₆	00D ₁₆	00E ₁₆	00F ₁₆
5	010 ₁₆	011 ₁₆	012 ₁₆	013 ₁₆
6	014 ₁₆	015 ₁₆	016 ₁₆	017 ₁₆
⋮	⋮	⋮	⋮	⋮
187	2E8 ₁₆	2E9 ₁₆	2EA ₁₆	2EB ₁₆
188	2EC ₁₆	2ED ₁₆	2EE ₁₆	2EF ₁₆
189	2F0 ₁₆	2F1 ₁₆	2F2 ₁₆	2F3 ₁₆
190	2F4 ₁₆	2F5 ₁₆	2F6 ₁₆	2F7 ₁₆
191	2F8 ₁₆	2F9 ₁₆	2FA ₁₆	2FB ₁₆
192	2FC ₁₆	2FD ₁₆	2FE ₁₆	2FF ₁₆

* The numerical value in a thick frame corresponds to lower 10-bits of bit map RAM (R0 to R2, G0 to G2, B0 to B2) address. (n RAM character number : 0 to 7)
Dot composition in 1 address (16 bits) is MSB.....LSB

Fig.12 Pixel composition (at 64 dots × 192 dots)

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Register

Address 000016

DA	Register	Contents		Remarks
		Status	Function	
0	PAGEONA	①	Writing to the memory(display control registers and Bit map RAM) for page A is disapproval.	Memory writing control for page A.
		1	Writing to the memory(display control registers and Bit map RAM) for page A is permission.	
1	PAGEONB	①	Writing to the memory(display control registers and Bit map RAM) for page B is disapproval.	Memory writing control for page B.
		1	Writing to the memory(display control registers and Bit map RAM) for page B is permission.	
2	—	①	Set "0" to this bit.	
		1	Can not be used.	
3	—	①	Set "0" to this bit.	
		1	Can not be used.	
4	—	①	Set "0" to this bit.	
		1	Can not be used.	
5	—	①	Set "0" to this bit.	
		1	Can not be used.	
6	—	①	Set "0" to this bit.	
		1	Can not be used.	
7	—	①	Set "0" to this bit.	
		1	Can not be used.	
8	—	①	Set "0" to this bit.	
		1	Can not be used.	
9	—	①	Set "0" to this bit.	
		1	Can not be used.	
A	—	①	Set "0" to this bit.	
		1	Can not be used.	
B	—	①	Set "0" to this bit.	
		1	Can not be used.	
C	—	①	Set "0" to this bit.	
		1	Can not be used.	
D	—	①	Set "0" to this bit.	
		1	Can not be used.	
E	—	①	Set "0" to this bit.	
		1	Can not be used.	
F	—	①	Set "0" to this bit.	
		1	Can not be used.	

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address 000116

DA	Register	Contents					Remarks															
		Status	Function																			
0	WIDTH0	①	<table><tr><th>WIDTH2</th><th>WIDTH1</th><th>WIDTH0</th><th>Pixel (Horizontal X Vertical)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>128 X 96 dots</td></tr><tr><td>0</td><td>0</td><td>1</td><td>192 X 64 dots</td></tr></table>				WIDTH2	WIDTH1	WIDTH0	Pixel (Horizontal X Vertical)	0	0	0	128 X 96 dots	0	0	1	192 X 64 dots	Set the pixel composition. The BLNK signal of the range set up by this register is outputted at the time of BLANK1, 0 = 0, and 0 (normal) setup.			
		WIDTH2					WIDTH1	WIDTH0	Pixel (Horizontal X Vertical)													
0	0	0	128 X 96 dots																			
0	0	1	192 X 64 dots																			
1																						
1	WIDTH1	①	<table><tr><td>0</td><td>1</td><td>0</td><td>256 X 48 dots</td></tr><tr><td>0</td><td>1</td><td>1</td><td>384 X 32 dots</td></tr><tr><td>1</td><td>0</td><td>0</td><td>32 X 384 dots</td></tr><tr><td>1</td><td>0</td><td>1</td><td>48 X 256 dots</td></tr></table>	0	1	0	256 X 48 dots	0	1	1	384 X 32 dots	1	0	0	32 X 384 dots	1	0	1		48 X 256 dots		
		0	1	0	256 X 48 dots																	
0	1	1	384 X 32 dots																			
1	0	0	32 X 384 dots																			
1	0	1	48 X 256 dots																			
1																						
2	WIDTH2	①	<table><tr><td>1</td><td>1</td><td>0</td><td>64 X 192 dots</td></tr><tr><td>1</td><td>1</td><td>1</td><td>96 X 128 dots</td></tr></table>	1	1	0	64 X 192 dots	1	1	1	96 X 128 dots											
		1	1	0	64 X 192 dots																	
1	1	1	96 X 128 dots																			
1																						
3	—	①	Set "0" to this bit.																			
		1	Can not be used.																			
4	DSPON	①	Display OFF																			
		1	Display ON																			
5	—	①	Set "0" to this bit.				The measure against a character bend (test bit)															
		1	Can not be used.																			
6	BLANK0	①	<table><tr><th>BLANK1</th><th>BLANK0</th><th>Blank signal</th></tr><tr><td>0</td><td>0</td><td>Normal(Control by register WIDTH 0 to 2)</td></tr><tr><td>0</td><td>1</td><td>Control by Bit map RAM(R0)</td></tr><tr><td>1</td><td>0</td><td>Control by Bit map RAM(G0)</td></tr><tr><td>1</td><td>1</td><td>Control by Bit map RAM(B0)</td></tr></table>				BLANK1	BLANK0	Blank signal	0	0	Normal(Control by register WIDTH 0 to 2)	0	1	Control by Bit map RAM(R0)	1	0	Control by Bit map RAM(G0)	1	1	Control by Bit map RAM(B0)	Control of blank signal. (a blank setup in a bit unit is possible). Note 2
		BLANK1					BLANK0	Blank signal														
0	0	Normal(Control by register WIDTH 0 to 2)																				
0	1	Control by Bit map RAM(R0)																				
1	0	Control by Bit map RAM(G0)																				
1	1	Control by Bit map RAM(B0)																				
1																						
7	BLANK1	①																				
		1																				
8	YM0	①	$R = \sum_{n=0}^2 2^n R_n - \sum_{n=0}^2 2^n Y M_n$ when set to R < 0, R = 0. Same as G output and B output.				Control of R, G and B output luminosity															
		1																				
9	YM1	①																				
		1																				
A	YM2	①																				
		1																				
B	—	①	Set "0" to this bit.																			
		1	Can not be used.																			
C	—	①	Set "0" to this bit.																			
		1	Can not be used.																			
D	—	①	Set "0" to this bit.																			
		1	Can not be used.																			
E	—	①	Set "0" to this bit.																			
		1	Can not be used.																			
F	—	①	Set "0" to this bit.																			
		1	Can not be used.																			

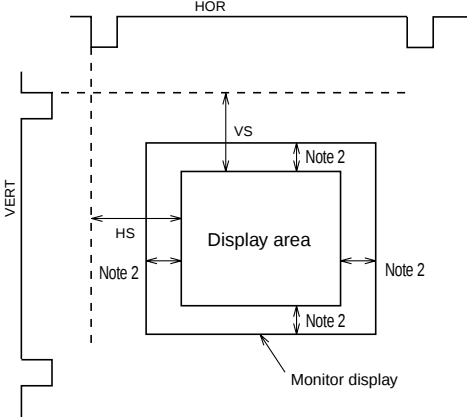
Notes 1 : This register is consisted of 2 pages (address community) of the register for page A, and the register for page B.

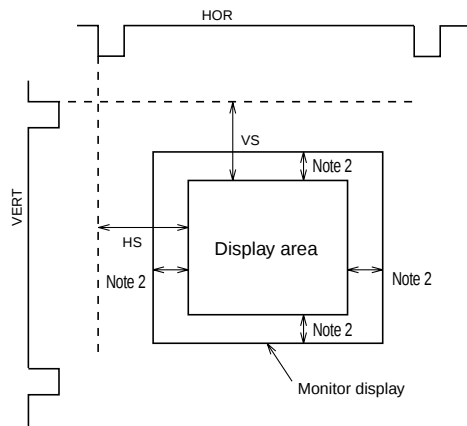
Writing control to each page is performed by registers PAGEONA and PAGEONB (address 000016).

2 : The bit map RAM used for blank signal control is not applicable to color setup.

SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address 0002₁₆

DA	Register	Contents		Remarks															
		Status	Function																
0	VP0	①	If VS is the vertical display start location, $VS = H \times \sum_{n=0}^9 2^n VP_n$ H: Cycle with the horizontal synchronizing pulse 	Setting vertical start location															
		1																	
1	VP1	①																	
		1																	
2	VP2	①																	
		1																	
3	VP3	①																	
		1																	
4	VP4	①																	
		1																	
5	VP5	①																	
		1																	
6	VP6	①																	
		1																	
7	VP7	①																	
		1																	
8	VP8	①																	
		1																	
9	VP9	①																	
		1																	
A	—	①	It should be fixed to "0".																
		1	Can not be used.																
B	—	①	It should be fixed to "0".																
		1	Can not be used.																
C	VSIZE0	①	<table><tr><th>VSIZE1</th><th>VSIZE0</th><th>Vertical direction size</th></tr><tr><td>0</td><td>0</td><td>1H/dot</td></tr><tr><td>0</td><td>1</td><td>2H/dot</td></tr><tr><td>1</td><td>0</td><td>3H/dot</td></tr><tr><td>1</td><td>1</td><td>4H/dot</td></tr></table>	VSIZE1	VSIZE0	Vertical direction size	0	0	1H/dot	0	1	2H/dot	1	0	3H/dot	1	1	4H/dot	Setting vertical direction dot size
VSIZE1		VSIZE0	Vertical direction size																
0	0	1H/dot																	
0	1	2H/dot																	
1	0	3H/dot																	
1	1	4H/dot																	
D	VSIZE1	①	H : Synchronous of horizontal direction pulse																
		1																	
E	—	①	It should be fixed to "0".																
		1	Can not be used.																
F	—	①	It should be fixed to "0".																
		1	Can not be used.																



Notes 1 : This register is consisted of 2 pages (address community) of the register for page A, and the register for page B. Writing control to each page is performed by registers PAGEONA and PAGEONB (address 0000₁₆).

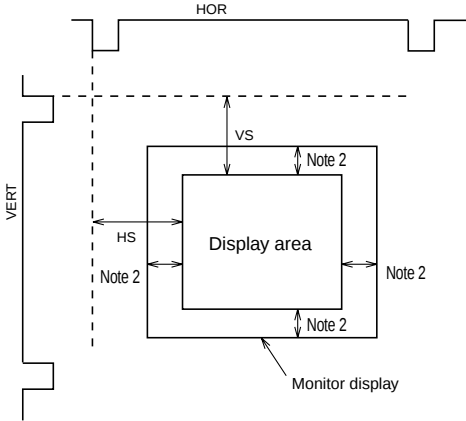
2 : Set up the horizontal and vertical display start location so that display range may not exceed it.

Set the character code "1FF₁₆" (blank without background) for the display RAM of the part which the display range exceeds.

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address 000316

DA	Register	Status	Contents	Remarks
			Function	
0	HP0	①	If HS is the horizontal display start location, $HS = T \times \sum_{n=0}^9 2^n HP_n$ T: Display clock 	Setting horizontal start location
1	HP1	①		
2	HP2	①		
3	HP3	①		
4	HP4	①		
5	HP5	①		
6	HP6	①		
7	HP7	①		
8	HP8	①		
9	HP9	①		
A	—	①	It should be fixed to "0".	
		1	Can not be used.	
B	—	①	It should be fixed to "0".	
		1	Can not be used.	
C	—	①	It should be fixed to "0".	
		1	Can not be used.	
D	—	①	It should be fixed to "0".	
		1	Can not be used.	
E	—	①	It should be fixed to "0".	
		1	Can not be used.	
F	—	①	It should be fixed to "0".	
		1	Can not be used.	

Notes 1 : This register is consisted of 2 pages (address community) of the register for page A, and the register for page B. Writing control to each page is performed by registers PAGEONA and PAGEONB (address 000016).

2 : Set up the horizontal and vertical display start location so that display range may not exceed it.

Set the character code "1FF16" (blank without background) for the display RAM of the part which the display range exceeds.

SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address 000416

DA	Register	Contents			Remarks															
		Status	Function																	
0	MODE0	①	<table><tr><th>MODE1</th><th>MODE0</th><th>Display mode</th></tr><tr><td>0</td><td>0</td><td>Priority is given to Page A</td></tr><tr><td>0</td><td>1</td><td>Priority is given to Page B</td></tr><tr><td>1</td><td>0</td><td>260 K colors display</td></tr><tr><td>1</td><td>1</td><td>The average of Page A and Page B</td></tr></table>		MODE1	MODE0	Display mode	0	0	Priority is given to Page A	0	1	Priority is given to Page B	1	0	260 K colors display	1	1	The average of Page A and Page B	
		MODE1			MODE0	Display mode														
0	0	Priority is given to Page A																		
0	1	Priority is given to Page B																		
1	0	260 K colors display																		
1	1	The average of Page A and Page B																		
1																				
1	MODE1	①																		
		1																		
2	-	①	Set "0" to this bit.																	
		1	Can not be used.																	
3	POLH	①	HOR pin is negative polarity	Polarity of HOR pin																
		1	HOR pin is positive polarity																	
4	POLV	①	VERT pin is negative polarity	Polarity of VERT pin																
		1	VERT pin is positive polarity																	
5	-	①	Set "0" to this bit.																	
		1	Can not be used.																	
6	-	①	Set "0" to this bit.																	
		1	Can not be used.																	
7	-	①	Set "0" to this bit.																	
		1	Can not be used.																	
8	-	①	Set "0" to this bit.																	
		1	Can not be used.																	
9	-	①	Set "0" to this bit.																	
		1	Can not be used.																	
A	TEST	①	Set "0" to this bit.	Test bit																
		1	Can not be used.																	
B	SBLANK0	①	It synchronizes with a display CK rising and is port output (at the time of digital output setup).	BLNK signal output timing control (BLNK signal). Effective at the time of SBLANK1, 2 = 1, and 1 (BLNK output) setup.																
		1	It synchronizes with a display CK falling and is port output (at the time of analog output setup).																	
C	SBLANK1	0	<table><tr><th>SBLANK1</th><th>SBLANK2</th><th>P0/BLNK pin output</th></tr><tr><td>0</td><td>0</td><td>Port P0 output</td></tr><tr><td>0</td><td>1</td><td>Can not be used</td></tr><tr><td>1</td><td>0</td><td>Can not be used</td></tr><tr><td>1</td><td>1</td><td>BLNK output</td></tr></table>	SBLANK1	SBLANK2	P0/BLNK pin output	0	0	Port P0 output	0	1	Can not be used	1	0	Can not be used	1	1	BLNK output	P0/BLNK pin output control. SBLANK2 : address 000716	
		SBLANK1		SBLANK2	P0/BLNK pin output															
0	0	Port P0 output																		
0	1	Can not be used																		
1	0	Can not be used																		
1	1	BLNK output																		
①																				
D	PTC13	0	Port P1 to P3 output (at the time of analog RGB output setup "L" fixation)	P1 to P3 output control																
		①	R0 to R2 output (at the time of digital RGB output setup "H" fixation)																	
E	-	0	Set "0" to this bit.																	
		①	Can not be used.																	
F	-	0	Set "0" to this bit.																	
		①	Can not be used.																	

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address 000516

DA	Register	Contents		Remarks
		Status	Function	
0	—	①	Set "0" to this bit.	
		1	Can not be used.	
1	—	①	Set "0" to this bit.	
		1	Can not be used.	
2	—	①	Set "0" to this bit.	
		1	Can not be used.	
3	—	①	Set "0" to this bit.	
		1	Can not be used.	
4	—	①	Set "0" to this bit.	
		1	Can not be used.	
5	—	①	Set "0" to this bit.	
		1	Can not be used.	
6	—	①	Set "0" to this bit.	
		1	Can not be used.	
7	—	①	Set "0" to this bit.	
		1	Can not be used.	
8	—	①	Set "0" to this bit.	
		1	Can not be used.	
9	—	①	Set "0" to this bit.	
		1	Can not be used.	
A	—	①	Set "0" to this bit.	
		1	Can not be used.	
B	—	①	Set "0" to this bit.	
		1	Can not be used.	
C	—	①	Set "0" to this bit.	
		1	Can not be used.	
D	—	①	Set "0" to this bit.	
		1	Can not be used.	
E	—	①	Set "0" to this bit.	
		1	Can not be used.	
F	—	①	Set "0" to this bit.	
		1	Can not be used.	

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address 000616

DA	Register	Contents		Remarks
		Status	Function	
0	—	①	Set "0" to this bit.	
		1	Can not be used.	
1	—	①	Set "0" to this bit.	
		1	Can not be used.	
2	—	①	Set "0" to this bit.	
		1	Can not be used.	
3	—	①	Set "0" to this bit.	
		1	Can not be used.	
4	—	①	Set "0" to this bit.	
		1	Can not be used.	
5	—	①	Set "0" to this bit.	
		1	Can not be used.	
6	—	①	Set "0" to this bit.	
		1	Can not be used.	
7	—	①	Set "0" to this bit.	
		1	Can not be used.	
8	—	①	Set "0" to this bit.	
		1	Can not be used.	
9	—	①	Set "0" to this bit.	
		1	Can not be used.	
A	—	①	Set "0" to this bit.	
		1	Can not be used.	
B	—	①	Set "0" to this bit.	
		1	Can not be used.	
C	—	①	Set "0" to this bit.	
		1	Can not be used.	
D	—	①	Set "0" to this bit.	
		1	Can not be used.	
E	DACON	①	DAC OFF (at the time of digital RGB output setup "L" fixation) Digital RGB output mode (G0 to G2, B0 to B2 signal output)	DAC ON/OFF, and digital RGB/analog RGB output change
		1	DAC ON (at the time of analog RGB output setup "H" fixation). Analog RGB output mode (VG1, VG2, IREF, ROUT, GOUT, and BOUT signal output)	
F	—	①	Set "0" to this bit.	
		1	Can not be used.	

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

Address 000716

DA	Register	Contents		Remarks
		Status	Function	
0	PTD0	①	"L" fixation at port output, negative polarity at BLNK output.	Data control of P0 pin
		1	"H" fixation at port output, positive polarity at BLNK output.	
1	PTD1	①	"L" fixation at port output.	Data control of P1 pin
		1	"H" fixation at port output.	
2	PTD2	①	"L" fixation at port output.	Data control of P2 pin
		1	"H" fixation at port output.	
3	PTD3	①	"L" fixation at port output.	Data control of P3 pin
		1	"H" fixation at port output.	
4	SBLANK2	①	Refer to SBLANK1(000416).	Output control of P0/BLNK pin
		1		
5	—	①	Set "0" to this bit.	
		1	Can not be used.	
6	—	①	Set "0" to this bit.	
		1	Can not be used.	
7	—	①	Set "0" to this bit.	
		1	Can not be used.	
8	—	①	Set "0" to this bit.	
		1	Can not be used.	
9	—	①	Set "0" to this bit.	
		1	Can not be used.	
A	—	①	Set "0" to this bit.	
		1	Can not be used.	
B	—	①	Set "0" to this bit.	
		1	Can not be used.	
C	—	①	Set "0" to this bit.	
		1	Can not be used.	
D	—	①	Set "0" to this bit.	
		1	Can not be used.	
E	—	①	Set "0" to this bit.	
		1	Can not be used.	
F	—	①	Set "0" to this bit.	
		1	Can not be used.	

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

DISPLAY FORM

M35080FP can display two pages, Page A and Page B, simultaneously, as shown in Figure 13.
And, 1 page of 260K color display can be displayed by piling up two pages completely.

(Page A: register PAGEONA (address 0000₁₆) Set up by = "1."
Page B: register PAGEONB (address 0000₁₆) Set up by = "1.")

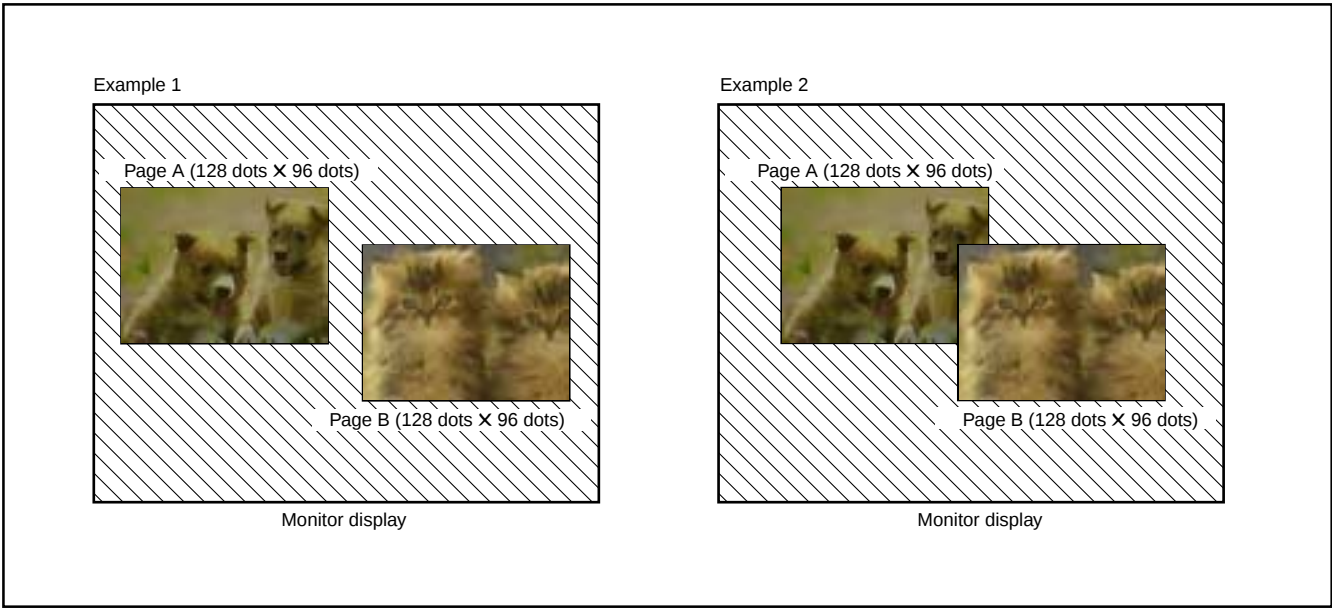


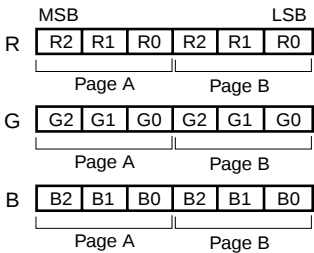
Fig. 13 The example of a display at the time of a 2-page display

- Notes 1: Setup of display position, display size, etc. can be freely performed for every page. Two pages can be displayed side by side vertically and horizontally.
2: when the display area of two pages overlaps on the monitoring screen, registers MODE0 and MODE1 (address 0004₁₆) can perform four displays as follows.

MODE1	MODE0	Display mode	Display number of pages
0	0	Priority is given to Page A	2 pages
0	1	Priority is given to Page B	2 pages
1	0	260 K colors display(Note 1)	1 page
1	1	The average of Page A and Page B	2 pages

- (1) Priority is given to Page A The overlaped part gives priority to Page A, and Page B is not displayed.
(2) Priority is given to Page B The overlaped part gives priority to Page B, and Page A is not displayed.
(3) 260 K colors display By overlapping two pages completely, 1 page of 260K color is displayed.
RGB output is 6-bit(Note 2)each setup.
(4) The average of Page A and Page B ... The overlaped part averages and outputs the RGB output of two pages.

- Notes 1. It becomes 512 color displays at the time of digital RGB output setup.
2. Assignment of 6 bits each of RGB is as follows.



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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

DATA INPUT EXAMPLE

Data of Bit map RAM and display control registers can be set by the 16-bit serial input function. Example of data setting is shown in Figure 14.

Address/Data	DAF	DAE	DAD	DAC	DAB	DAA	DA9	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0	Remarks	
Address 0000 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Address setting	
Data 0000 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	Page A and B writing setting (Note 1)	
Data 0001 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Page A and B display OFF	
Address 0000 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Address setting	
Data 0000 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Page A writing setting	
Data 0002 ₁₆	0	VSIZE1	VSIZE0	0	0	0	VP9	VP8	VP7	VP6	VP5	VP4	VP3	VP2	VP1	VP0	Page A	Vertical display location setting
Data 0003 ₁₆	0	0	0	0	0	0	HP9	HP8	HP7	HP6	HP5	HP4	HP3	HP2	HP1	HP0		Horizontal display location setting
Data 0004 ₁₆	0	0	0	0	0	0	0	0	0	0	0	POLV	POLH	MODE2	MODE1	MODE0	Display form setting	
Data 0005 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—	
Data 0006 ₁₆	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	DAC setting	
Data 0007 ₁₆	0	0	0	0	0	0	0	0	SBLANK	3	SBLANK	2	SBLANK	1	SBLANK	0	PTD3	Port output setting
Address 1000 ₁₆	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Address setting	
Data 1000 ₁₆	Bit map RAM (Page A) (R0,R1,R2,G0,G1,G2,B0,B1,B2)																Page A	Bit map setting
Data 1001 ₁₆																		
.....																		
Data 3AFE ₁₆																		
Data 3AFF ₁₆																		
Address 0000 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Address setting	
Data 0000 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Page B writing setting	
Data 0002 ₁₆	0	VSIZE1	VSIZE0	0	0	0	VP9	VP8	VP7	VP6	VP5	VP4	VP3	VP2	VP1	VP0	Page B	Vertical display location setting
Data 0003 ₁₆	0	0	0	0	0	0	HP9	HP8	HP7	HP6	HP5	HP4	HP3	HP2	HP1	HP0		Horizontal display location setting
Address 1000 ₁₆	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Address setting	
Data 1000 ₁₆	Bit map RAM (PageB) (R0,R1,R2,G0,G1,G2,B0,B1,B2)																Page B	Bit map setting
Data 1001 ₁₆																		
.....																		
Data 3AFF ₁₆																		
Data 3AFF ₁₆																		
Address 0000 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Address setting	
Data 0000 ₁₆	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	Page A and B writing setting	
Data 0001 ₁₆	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	Display ON	

Notes 1. Registers PAGEONA and PAGEONB perform writing control of data.

2. Input the clock with which the cycle was fixed and continued from the TCK pin. Moreover, input horizontal synchronized signal into HOR pin, and input vertical synchronized signal into VERT pin.

Fig. 14 Example of data setting

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

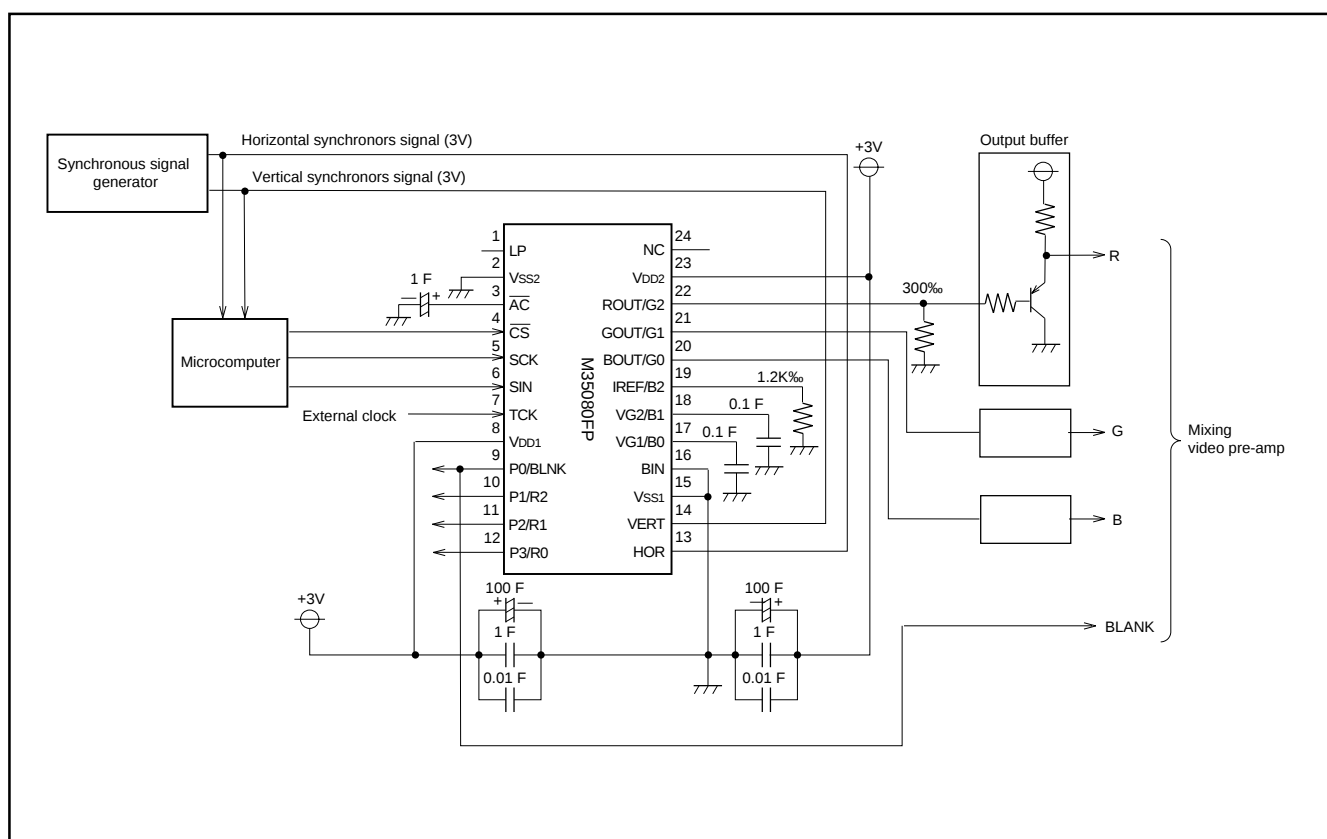


Fig.15 Example of the M35080FP peripheral circuit (at analog RGB output setting)

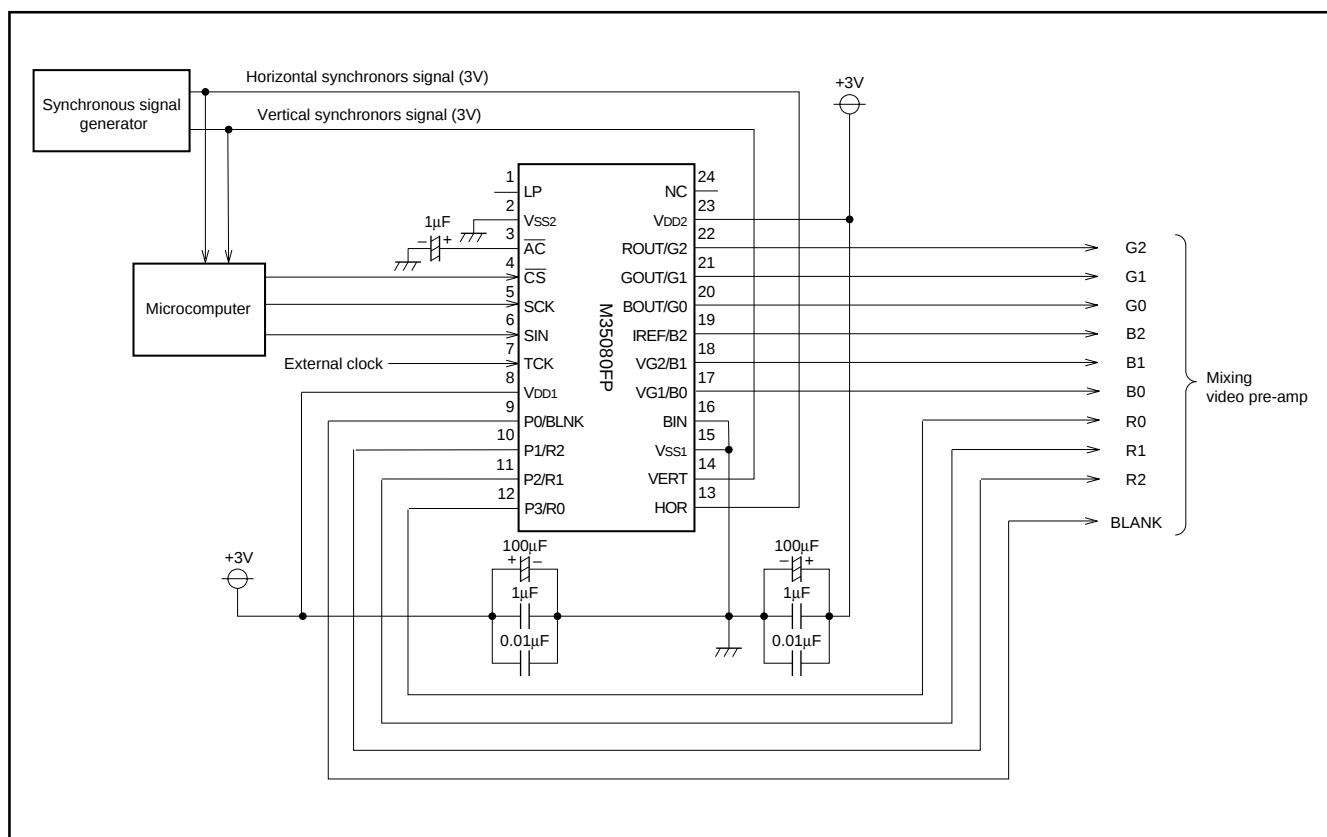


Fig.16 Example of the M35080FP peripheral circuit (at digital RGB output setting)

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

DATA INPUT

SERIAL DATA INPUT TIMING

- (1) Serial data should be input with the LSB first.
- (2) The address consists of 16 bits.
- (3) The data consists of 16 bits.
- (4) The 16 bits in the SCK after the $\overline{CS}$ signal has fallen are the address, and for succeeding input data, the address is incremented every 16 bits. Therefore, it is not necessary to input the address from the second data.

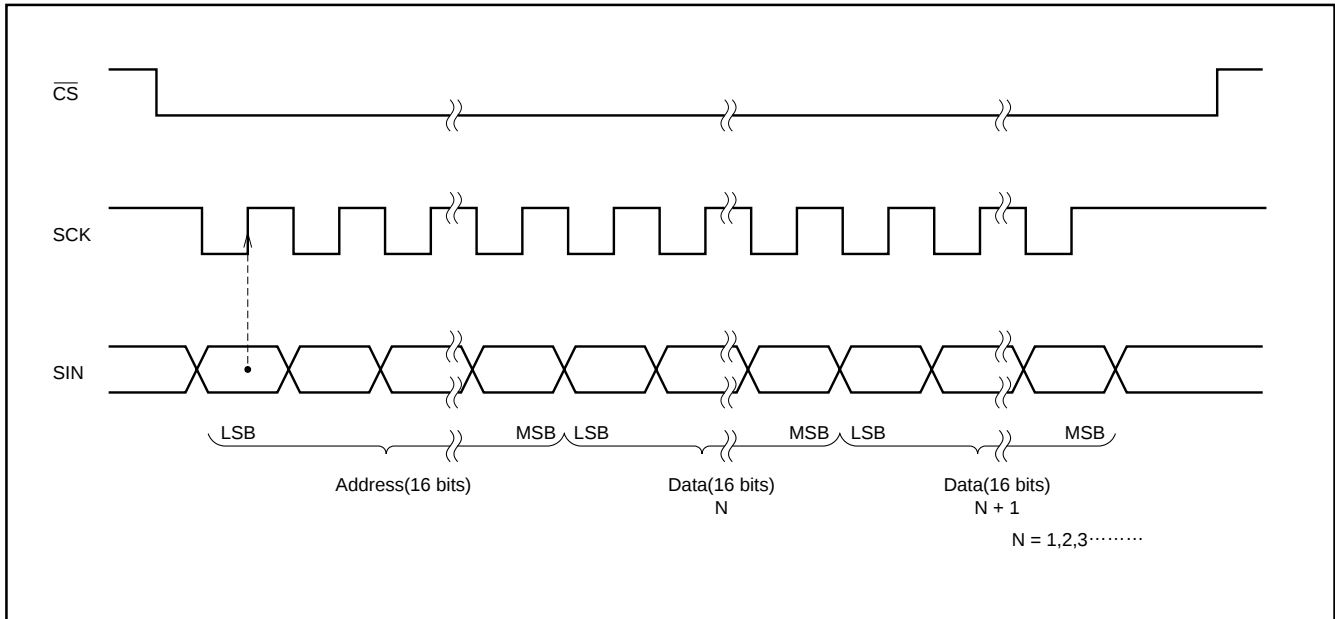


Fig.17 Serial input timing

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

TIMING REQUIREMENTS ($V_{DD} = 3 \pm 0.30 \text{ V}$, $T_a = -20 \text{ to } +85^\circ\text{C}$, unless otherwise noted)

Serial data input

Symbol	Parameter	Limits			Unit	Remarks
		Max.	Typ.	Max.		
$t_w(\text{SCK})$	SCK width	200	—	—	ns	Refer to fig 18
$t_{su}(\overline{\text{CS}})$	$\overline{\text{CS}}$ setup time	200	—	—	ns	
$t_h(\overline{\text{CS}})$	$\overline{\text{CS}}$ hold time	2	—	—	μs	
$t_{su}(\text{SIN})$	SIN setup time	200	—	—	ns	
$t_h(\text{SIN})$	SIN hold time	200	—	—	ns	
t_{word}	1 word write time	10	—	—	μs	

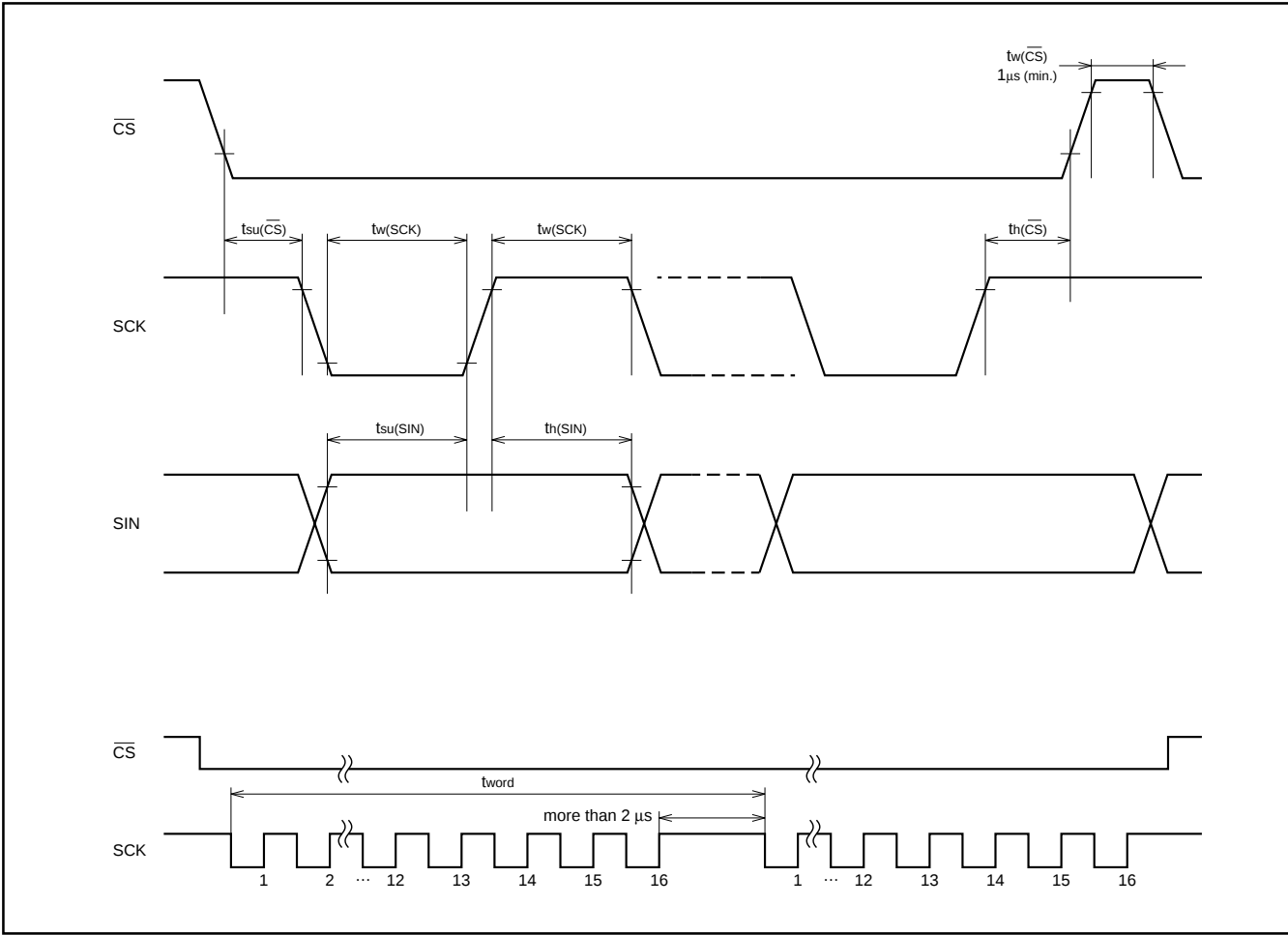


Fig.18 Serial input timing

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SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS
ABSOLUTE MAXIMUM RATINGS ($V_{DD} = 3.00V$, $T_a = -20$ to $+85^{\circ}C$, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{DD}	Supply voltage	With respect to V_{SS} .	-0.3 to $+4.2$	V
V_I	Input voltage		$V_{SS} - 0.3 \leq V_I \leq V_{DD} + 0.3$	V
V_O	Output voltage		$V_{SS} \leq V_O \leq V_{DD}$	V
P_d	Power dissipation	$T_a = +25^{\circ}C$	$+70$	mW
T_{opr}	Operating temperature		-20 to $+85$	$^{\circ}C$
T_{stg}	Storage temperature		-40 to $+125$	$^{\circ}C$

RECOMMENDED OPERATING CONDITIONS ($V_{DD} = 3.00V$, $T_a = -20$ to $+85^{\circ}C$, unless otherwise noted)

Symbol	Parameter		Limits			Unit
			Min.	Typ.	Max.	
V_{DD}	Supply voltage		2.7	3.00	3.3	V
V_{IH}	"H" level input voltage	SIN, SCK, $\overline{CS}$, $\overline{AC}$, HOR, VERT	$0.8 \times V_{DD}$	V_{DD}	V_{DD}	V
V_{IL}	"L" level input voltage	SIN, SCK, $\overline{CS}$, $\overline{AC}$, HOR, VERT	0	0	$0.2 \times V_{DD}$	V
FOSC	Oscillating frequency for display		10.0	—	20.0	MHz
H.sync	Horizontal synchronous signal input frequency		10.0	—	20.0	kHz

ELECTRICAL CHARACTERISTICS ($V_{DD} = 3.00V$, $T_a = 25^{\circ}C$, unless otherwise noted)

Symbol	Parameter		Test conditions	Limits			Unit
				Min.	Typ.	Max.	
V_{DD}	Supply voltage		$T_a = -20$ to $+70^{\circ}C$	2.70	3.00	3.30	V
I_{DD}	Supply current (at analog output)		$V_{DD} = 3.00V$	—	15	25	mA
V_{OH}	"H" level output voltage	P0 to P7, R0 to R2 G0 to G2, B0 to B2	$V_{DD} = 2.70V$, $I_{OH} = -1mA$	2.2	—	—	V
V_{OL}	"L" level output voltage	P0 to P7, R0 to R2 G0 to G2, B0 to B2	$V_{DD} = 2.70V$, $I_{OL} = 1mA$	—	—	0.5	V
R_i	Pull-up resistance $\overline{AC}$		$V_{DD} = 3.00V$	10	—	100	k Ω
V_{TCK}	External clock input width			$0.7 \times V_{DD}$	—	V_{DD}	V
V_{DAO}	Full scale width	ROUT, GOUT, BOUT	$R_{REF} = 1.2k\Omega$, $R_L = 300\Omega$	—	1.0	—	Vp-p
NL	Nonlinear nature error	ROUT, GOUT, BOUT	$R_{REF} = 1.2k\Omega$, $R_L = 300\Omega$	—	—	± 2.0	LSB

NOTE FOR SUPPLYING POWER

(1) Timing of power supplying to $\overline{AC}$ pin

The internal circuit of M35080FP is reset when the level of the auto clear input pin $\overline{AC}$ is "L". This pin is hysteresis input with the pull-up resistor.

The timing about power supplying of $\overline{AC}$ pin is shown in Figure below.

After supplying the power (V_{DD} and V_{SS}) to M35080FP and the supply voltage becomes more than $0.8 \times V_{DD}$, it needs to keep V_{IL} time; t_w of the $\overline{AC}$ pin for more than 1ms.

Start inputting from microcomputer after $\overline{AC}$ pin supply voltage becomes more than $0.8 \times V_{DD}$ and keeping 200ms wait time.

(2) Timing of power supplying to V_{DD1} and V_{DD2} .

Supply power to V_{DD1} and V_{DD2} at the same time.

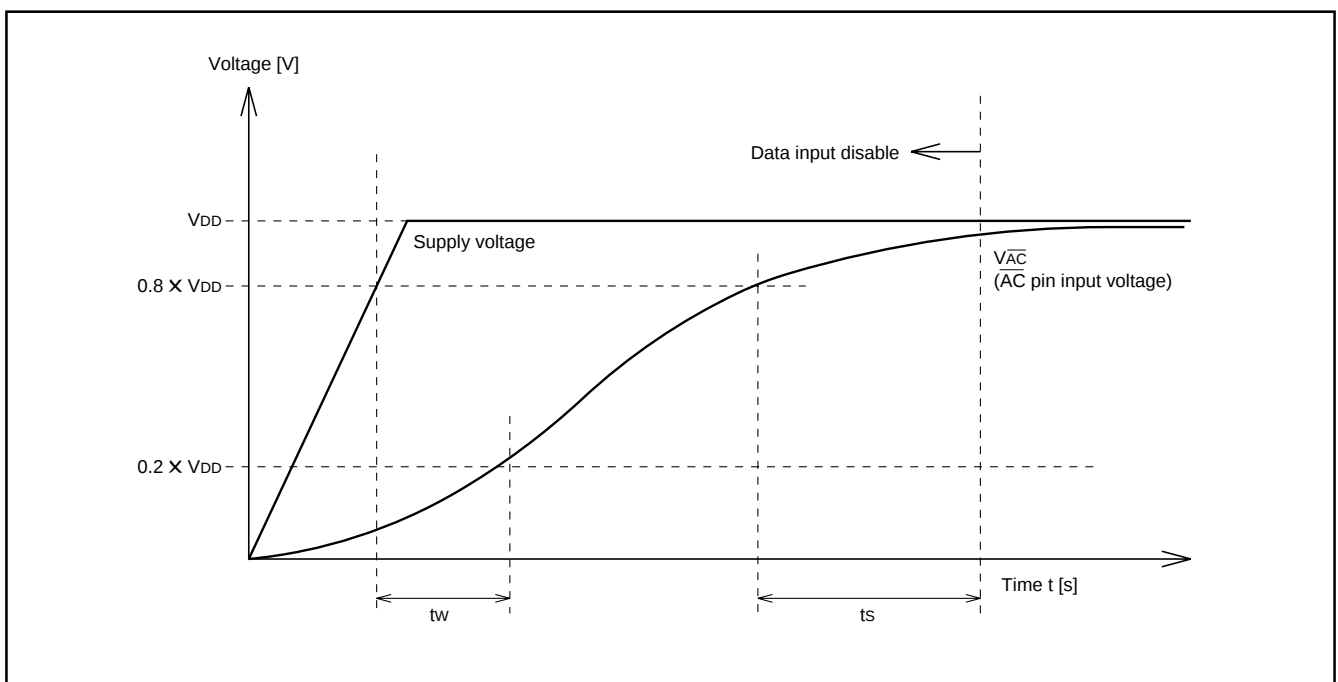


Fig.19 Timing of power supplying to $\overline{AC}$ pin

PRECAUTION FOR USE

Notes on noise and latch-up

In order to avoid noise and latch-up, connect a bypass capacitor ($\approx 0.1\mu\text{F}$) directly between the V_{DD1} pin and V_{SS1} pin, and the V_{DD2} pin and V_{SS2} pin using a heavy wire.

Notes on the time of external clock input to TCK pin

Input the continuous external clock which cycle is fixed and synchronized with horizontal synchronized signal from TCK pin. And, input continuous horizontal synchronized signal which cycle is fixed from HOR pin. Do not stop clock input absolutely during display.

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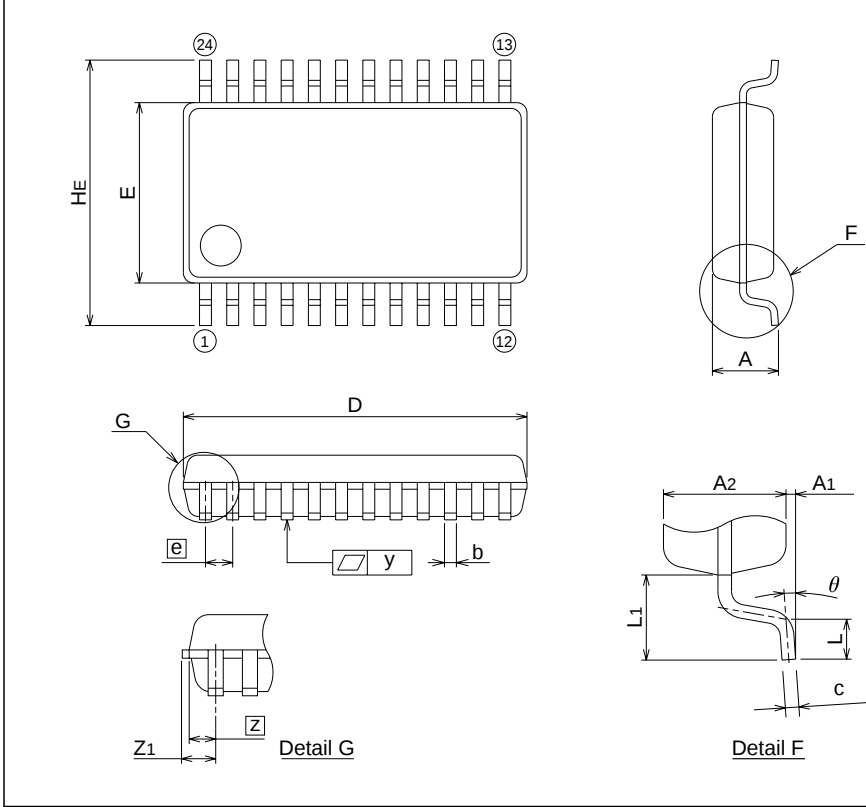
SCREEN CHARACTER and PATTERN DISPLAY CONTROLLERS

PACKAGE OUTLINE

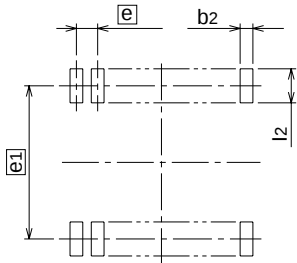
24P2Q-A

(MMP)

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SSOP24-P-300-0.80	—	0.2	Cu Alloy



Plastic 24pin 300mil SSOP



Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	2.1
A1	0	0.1	0.2
A2	—	1.8	—
b	0.3	0.35	0.45
c	0.18	0.2	0.25
D	10.0	10.1	10.2
E	5.2	5.3	5.4
HE	7.5	7.8	8.1
L	0.4	0.6	0.8
L1	—	1.25	—
Z	—	0.65	—
Z1	—	—	0.8
y	—	—	0.1
theta	0°	—	8°
b2	—	0.5	—
e1	—	7.62	—
l2	1.27	—	—

Renesas Technology Corp.

Nippon Bldg.,6-2,Otemachi 2-chome,Chiyoda-ku,Tokyo,100-0004 Japan

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