NEC

MOS INTEGRATED CIRCUIT
μPD16681A

LCD CONTROLLER/DRIVER FOR DOT MATRIX DISPLAY OF JIS LEVEL 1 AND JIS LEVEL 2 KANJI SETS

DESCRIPTION

The μPD16681A is a single-chip controller driver that can display Japanese text; including JIS Level 1 kanji, JIS Level 2 kanji, hiragana, and katakana. Each chip can display up to four lines containing up to eight full width characters (11 x 12 dots), or up to four lines containing up to 16 half width characters (5 x 12 dots), as well 96 pictographs.

FEATURES

- LCD controller/driver for dot matrix display of JIS Level 1 and JIS Level 2 kanji sets
- On-chip ROM for character generation
  - –JIS Level 1 + Level 2 kanji (11 x 12 dots) : 6,355 characters
  - –JIS non-kanji characters (11 x 12 dots) : 453 characters
  - –Other characters (symbols, etc.) (11 x 12 dots): 256 characters
  - –Half width alphanumeric characters (5 x 12 dots) : 192 characters
- On-chip RAM for character generation
  - –8 types (12 x 13 dots)
- On-chip boost circuit : switchable between 3x and 4x modes
- RAM for pictograph data displays : 96 bits
- Outputs : 96 segments, 52 commons
- Duty settings : 1/39 or 1/52
- Switchable data inputs : serial or 8-bit parallel
- On-chip divider resistor
- Selectable bias settings (1/8 bias, 1/7 bias, or 1/6 bias)
- On-chip oscillation circuit

ORDERING INFORMATION

Part number	Package	ROM code
μPD16681A-001	Wafer	Standard
μPD16681AP-001	Chip (COG compliant)	Standard

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The mark ★ shows major revised points.

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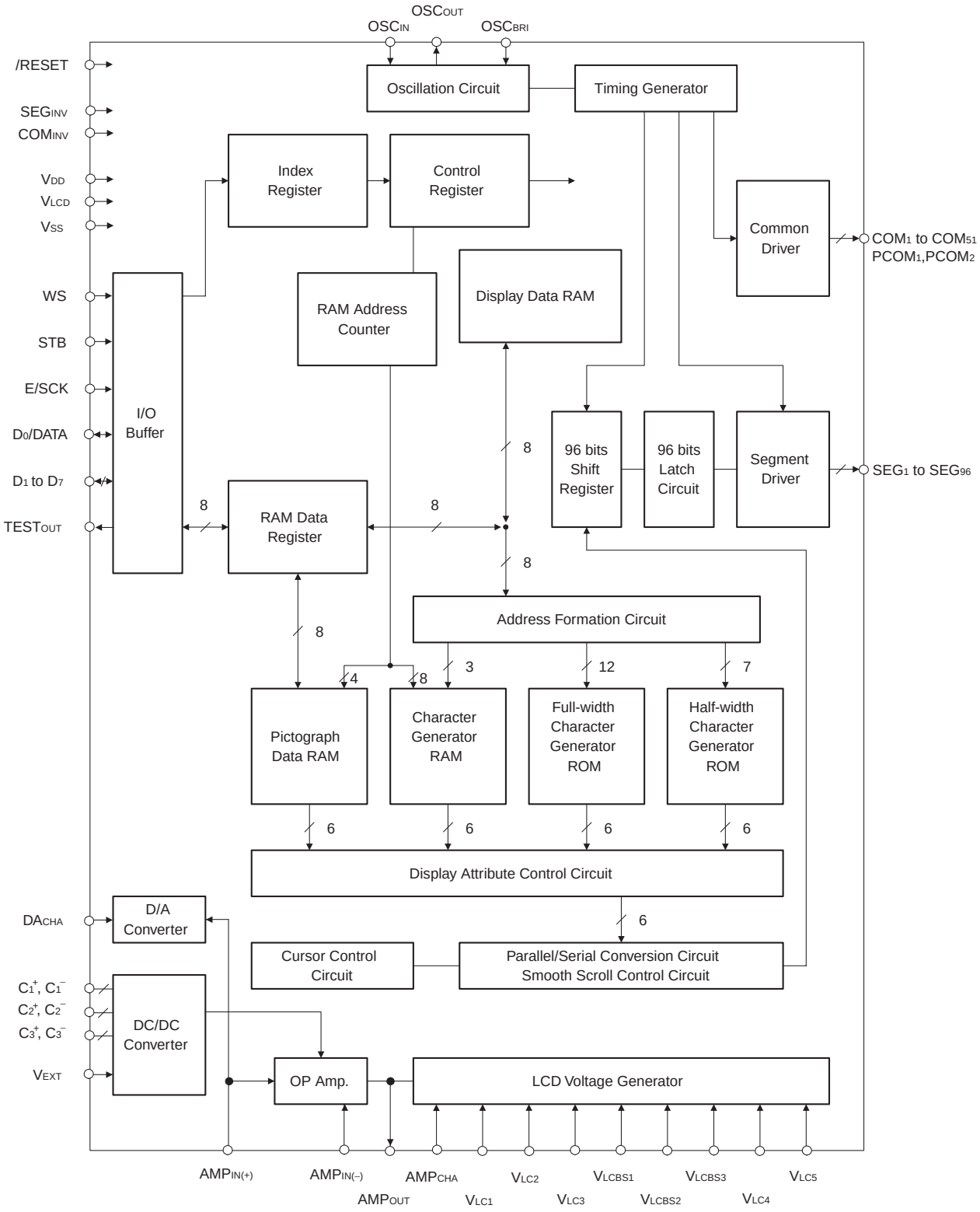
1. BLOCK DIAGRAM



Remark /xxx indicates active low signals.

2. PIN CONFIGURATION (Pad Layout)

Chip size : 2.80 x 10.48 mm^2

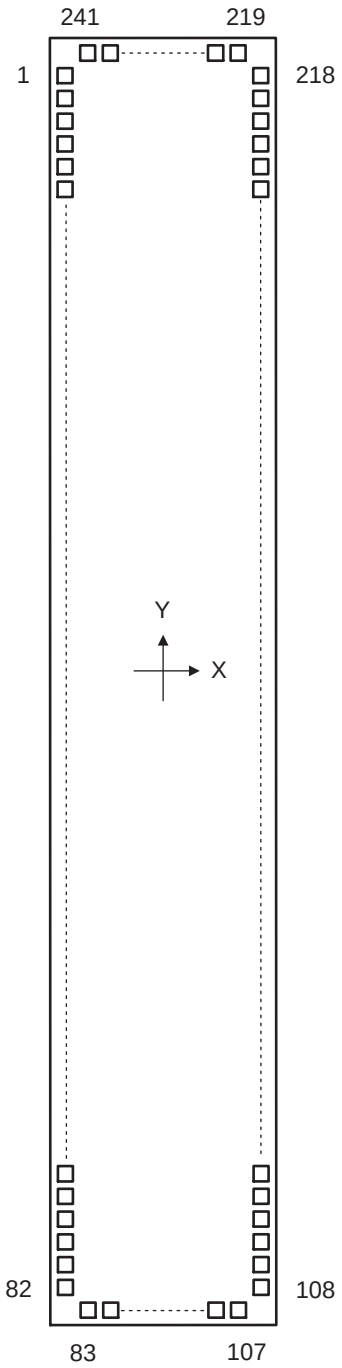


Table 2-1. Pad Layout

PAD No.	Pin Name	X (μm)	Y (μm)	PAD No.	Pin Name	X (μm)	Y (μm)	PAD No.	Pin Name	X (μm)	Y (μm)	PAD No.	Pin Name	X (μm)	Y (μm)
1	DUMMY1	–1273	4800	61	DA_{CHA}	–1273	–2400	121	SEG_{90}	1273	–3735	181	SEG_{30}	1273	1665
2	V_{LCBS1}	–1273	4680	62	AMP_{CHA}	–1273	–2520	122	SEG_{89}	1273	–3645	182	SEG_{29}	1273	1755
3	V_{LCBS1}	–1273	4560	63	SEG_{INV}	–1273	–2640	123	SEG_{88}	1273	–3555	183	SEG_{28}	1273	1845
4	V_{LCBS2}	–1273	4440	64	COM_{INV}	–1273	–2760	124	SEG_{87}	1273	–3465	184	SEG_{27}	1273	1935
5	V_{LCBS2}	–1273	4320	65	OSC_{IN}	–1273	–2880	125	SEG_{86}	1273	–3375	185	SEG_{26}	1273	2025
6	V_{LCBS3}	–1273	4200	66	OSC_{OUT}	–1273	–3000	126	SEG_{85}	1273	–3285	186	SEG_{25}	1273	2115
7	V_{LCBS3}	–1273	4080	67	OSC_{BRI}	–1273	–3120	127	SEG_{84}	1273	–3195	187	SEG_{24}	1273	2205
8	AMP_{OUT}	–1273	3960	68	D_0/DATA	–1273	–3240	128	SEG_{83}	1273	–3105	188	SEG_{23}	1273	2295
9	AMP_{OUT}	–1273	3840	69	D_1	–1273	–3360	129	SEG_{82}	1273	–3015	189	SEG_{22}	1273	2385
10	$AMP_{IN(–)}$	–1273	3720	70	D_2	–1273	–3480	130	SEG_{81}	1273	–2925	190	SEG_{21}	1273	2475
11	$AMP_{IN(–)}$	–1273	3600	71	D_3	–1273	–3600	131	SEG_{80}	1273	–2835	191	SEG_{20}	1273	2565
12	$AMP_{IN(+)}$	–1273	3480	72	D_4	–1273	–3720	132	SEG_{79}	1273	–2745	192	SEG_{19}	1273	2655
13	$AMP_{IN(+)}$	–1273	3360	73	D_5	–1273	–3840	133	SEG_{78}	1273	–2655	193	SEG_{18}	1273	2745
14	V_{LC5}	–1273	3240	74	D_6	–1273	–3960	134	SEG_{77}	1273	–2565	194	SEG_{17}	1273	2835
15	V_{LC5}	–1273	3120	75	D_7	–1273	–4080	135	SEG_{76}	1273	–2475	195	SEG_{16}	1273	2925
16	V_{LC5}	–1273	3000	76	WS	–1273	–4200	136	SEG_{75}	1273	–2385	196	SEG_{15}	1273	3015
17	V_{LC4}	–1273	2880	77	STB	–1273	–4320	137	SEG_{74}	1273	–2295	197	SEG_{14}	1273	3105
18	V_{LC4}	–1273	2760	78	E/SCK	–1273	–4440	138	SEG_{73}	1273	–2205	198	SEG_{13}	1273	3195
19	V_{LC4}	–1273	2640	79	/RESET	–1273	–4560	139	SEG_{72}	1273	–2115	199	SEG_{12}	1273	3285
20	V_{LC3}	–1273	2520	80	$TEST_{OUT}$	–1273	–4680	140	SEG_{71}	1273	–2025	200	SEG_{11}	1273	3375
21	V_{LC3}	–1273	2400	81	DUMMY2	–1273	–4800	141	SEG_{70}	1273	–1935	201	SEG_{10}	1273	3465
22	V_{LC3}	–1273	2280	82	DUMMY3	–1273	–4920	142	SEG_{69}	1273	–1845	202	SEG_9	1273	3555
23	V_{LC2}	–1273	2160	83	DUMMY4	–1120	–5113	143	SEG_{68}	1273	–1755	203	SEG_8	1273	3645
24	V_{LC2}	–1273	2040	84	DUMMY5	–1030	–5113	144	SEG_{67}	1273	–1665	204	SEG_7	1273	3735
25	V_{LC2}	–1273	1920	85	COM_{27}	–940	–5113	145	SEG_{66}	1273	–1575	205	SEG_6	1273	3825
26	V_{LC1}	–1273	1800	86	COM_{28}	–850	–5113	146	SEG_{65}	1273	–1485	206	SEG_5	1273	3915
27	V_{LC1}	–1273	1680	87	COM_{29}	–760	–5113	147	SEG_{64}	1273	–1395	207	SEG_4	1273	4005
28	V_{LC1}	–1273	1560	88	COM_{30}	–670	–5113	148	SEG_{63}	1273	–1305	208	SEG_3	1273	4095
29	V_{LCD}	–1273	1440	89	COM_{31}	–580	–5113	149	SEG_{62}	1273	–1215	209	SEG_2	1273	4185
30	V_{LCD}	–1273	1320	90	COM_{32}	–490	–5113	150	SEG_{61}	1273	–1125	210	SEG_1	1273	4275
31	V_{LCD}	–1273	1200	91	COM_{33}	–400	–5113	151	SEG_{60}	1273	–1035	211	COM_{26}	1273	4365
32	C_1^+	–1273	1080	92	COM_{34}	–310	–5113	152	SEG_{59}	1273	–945	212	COM_{25}	1273	4455
33	C_1^+	–1273	960	93	COM_{35}	–220	–5113	153	SEG_{58}	1273	–855	213	COM_{24}	1273	4545
34	C_1^+	–1273	840	94	COM_{36}	–130	–5113	154	SEG_{57}	1273	–765	214	COM_{23}	1273	4635
35	C_1^-	–1273	720	95	COM_{37}	–40	–5113	155	SEG_{56}	1273	–675	215	COM_{22}	1273	4725
36	C_1^-	–1273	600	96	COM_{38}	50	–5113	156	SEG_{55}	1273	–585	216	COM_{21}	1273	4815
37	C_1^-	–1273	480	97	COM_{39}	140	–5113	157	SEG_{54}	1273	–495	217	DUMMY10	1273	4905
38	C_2^+	–1273	360	98	COM_{40}	230	–5113	158	SEG_{53}	1273	–405	218	DUMMY11	1273	4995
39	C_2^+	–1273	240	99	COM_{41}	320	–5113	159	SEG_{52}	1273	–315	219	DUMMY12	950	5113
40	C_2^+	–1273	120	100	COM_{42}	410	–5113	160	SEG_{51}	1273	–225	220	COM_{20}	860	5113
41	C_2^-	–1273	0	101	COM_{43}	500	–5113	161	SEG_{50}	1273	–135	221	COM_{19}	770	5113
42	C_2^-	–1273	–120	102	COM_{44}	590	–5113	162	SEG_{49}	1273	–45	222	COM_{18}	680	5113
43	C_2^-	–1273	–240	103	COM_{45}	680	–5113	163	SEG_{48}	1273	45	223	COM_{17}	590	5113
44	C_3^+	–1273	–360	104	COM_{46}	770	–5113	164	SEG_{47}	1273	135	224	COM_{16}	500	5113
45	C_3^+	–1273	–480	105	COM_{47}	860	–5113	165	SEG_{46}	1273	225	225	COM_{15}	410	5113
46	C_3^+	–1273	–600	106	DUMMY6	950	–5113	166	SEG_{45}	1273	315	226	COM_{14}	320	5113
47	C_3^-	–1273	–720	107	DUMMY7	1040	–5113	167	SEG_{44}	1273	405	227	COM_{13}	230	5113
48	C_3^-	–1273	–840	108	DUMMY8	1273	–4905	168	SEG_{43}	1273	495	228	COM_{12}	140	5113
49	C_3^-	–1273	–960	109	COM_{48}	1273	–4815	169	SEG_{42}	1273	585	229	COM_{11}	50	5113
50	V_{DD1}	–1273	–1080	110	COM_{49}	1273	–4725	170	SEG_{41}	1273	675	230	COM_{10}	–40	5113
51	V_{DD1}	–1273	–1200	111	COM_{50}	1273	–4635	171	SEG_{40}	1273	765	231	COM_9	–130	5113
52	V_{DD2}	–1273	–1320	112	COM_{51}	1273	–4545	172	SEG_{39}	1273	855	232	COM_8	–220	5113
53	V_{DD2}	–1273	–1440	113	DUMMY9	1273	–4455	173	SEG_{38}	1273	945	233	COM_7	–310	5113
54	V_{DD2}	–1273	–1560	114	$PCOM_2$	1273	–4365	174	SEG_{37}	1273	1035	234	COM_6	–400	5113
55	V_{SS}	–1273	–1680	115	SEG_{96}	1273	–4275	175	SEG_{36}	1273	1125	235	COM_5	–490	5113
56	V_{SS}	–1273	–1800	116	SEG_{95}	1273	–4185	176	SEG_{35}	1273	1215	236	COM_4	–580	5113
57	V_{SS}	–1273	–1920	117	SEG_{94}	1273	–4095	177	SEG_{34}	1273	1305	237	COM_3	–670	5113
58	V_{SS}	–1273	–2040	118	SEG_{93}	1273	–4005	178	SEG_{33}	1273	1395	238	COM_2	–760	5113
59	V_{SS}	–1273	–2160	119	SEG_{92}	1273	–3915	179	SEG_{32}	1273	1485	239	COM_1	–850	5113
60	V_{EXT}	–1273	–2280	120	SEG_{91}	1273	–3825	180	SEG_{31}	1273	1575	240	$PCOM_1$	–940	5113
												241	DUMMY13	–1030	5113

3. PIN FUNCTIONS

3.1 Power Supply System Pins

Pin Symbol	Pin Name	Pad No.	I/O	Description
V_{DD}	Logic power supply pin Boost circuit power supply pin	50-54	–	Power supply pins for logic and boost circuit
V_{SS}	Logic ground Driver ground	55-59	–	Ground pins for logic and driver circuit
V_{LCD}	Driver power supply pins	29-31	–	Power supply pins for driver. Output pin for internal boost circuit. Connect a 1-μF capacitor between these pins and the V_{SS} pins for boosting. If not using the internal boost circuit, a direct driver power supply can be input.
V_{LC1} - V_{LC5}	Reference power supply pins for driver	14-28	–	These are reference power supply pins for the LCD driver. Leave these pins open if an internal bias has been selected. Connect a capacitor to ground.
V_{LCBS1} - V_{LCBS3}	Bias value setting pins	2-7	–	When selecting an internal bias, the bias value can be changed connecting these pins outside of the IC.
C_1^+, C_1^- C_2^+, C_2^- C_3^+, C_3^-	Capacitor connection pins	32-49	–	These are capacitor connection pins for the boost circuit. Connect a 1-μF capacitor.

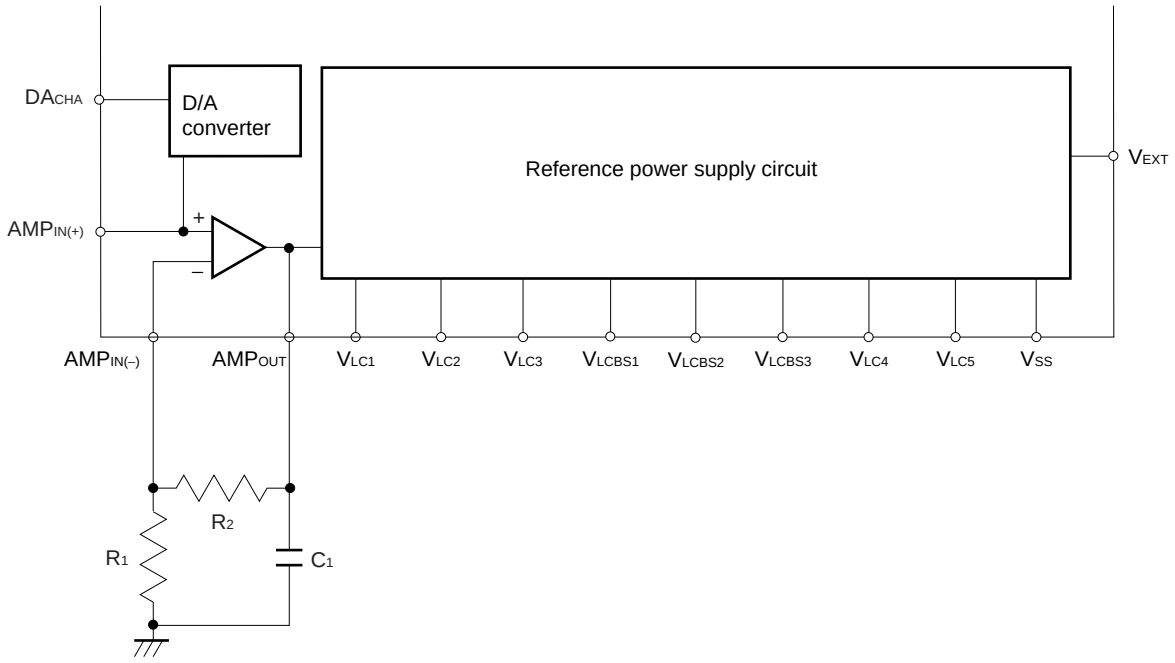
3.2 Logic System Pins

Pin Symbol	Pin Name	Pad No.	I/O	Description
WS	Select word length	76	I	Use this pin to select the word length. An 8-bit parallel interface is used for high level and a serial interface is used for low level. This setting cannot be changed after the power has been switched on.
DA_{CHA}	Select D/A converter	61	I	Use this pin to select whether or not to use the D/A converter for regulating the LCD driver voltage. Select high level to use the D/A converter or low level to not use it.
STB	Strobe	77	I	This is used for the device's select signal and strobe signal for communication. Communication is initialized at the rising edge or falling edge of STB. Command data receive standby status occurs at the falling edge of STB. Communication is enabled when STB is low. Also, enabled status or the shift clock is ignored when STB is high.
E/SCK	Enable/shift clock	78	I	This is an input enable pin for data when the parallel interface is used. During the read-in operation, data is captured in the interface buffer at the signal's rising edge. During a read-out operation, data is read-out from the interface buffer at the signal's falling edge. When using a serial interface, this pin is used for the data shift clock. During the read-in operation, data is captured in the shift register at the signal's rising edge. During a read-out operation, data is read from the shift register at the signal's falling edge.
D_0/DATA	Data bus/data	68	I/O	This pin is used for data bus bit D_0 when using the parallel interface. When using the serial interface, it is an I/O pin (tri-state) for commands and display data.
D_1-D_7	Data bus	69-75	I/O	These pins are used for data bus bits D_1 to D_7 when using the parallel interface. It should be fixed high or low when using the serial interface.
$TEST_{OUT}$	Test output	80	O	This is a test output pin. Leave this pin open when using the device.
/RESET	Reset	79	I	This pin is used for internal resets at low-level.
AMP_{CHA}	Op amp switch for LCD driver's power supply level	62	I	This pin is used to control the op amp that works with the LCD driver's power supply level. High-power mode is set when at low level and normal mode is set when at high level.
V_{EXT}	Reference power supply switch	60	I	This pin is used to select the reference power supply circuit's supply mode. High level sets external mode and low level sets internal mode.
SEG_{INV}	Segment direction switch	63	I	This pin is used to control the segment output direction. Low level sets forward direction and high level sets reverse direction.
COM_{INV}	Common scan direction switch	64	I	This pin is used to switch the common scan direction. Low level sets forward direction and high level sets reverse direction.
OSC_{IN}	Oscillator pins	65	I	These pins are connected to a 100-kΩ resistance. When using an external oscillator, input to OSC_{IN} and leave OSC_{OUT} open.
OSC_{OUT}		66	O	
OSC_{BRI}	External clock for blink function	67	I	This is an input pin for the 2-Hz external clock. Internally, it is divided by half to generate a 1-Hz signal that is used as the synchronization signal for the blink function.

3.3 Driver System Pins

Pin Symbol	Pin Name	Pad No.	I/O	Description
SEG_1 - SEG_{96}	Segment	115-210	O	Segment output pins
COM_1 - COM_{51}	Common	85-105 109-112 211-216 220-239	O	Common output pins 1/52 duty : Use COM_1 to COM_{51} 1/39 duty : Use COM_1 to COM_{19}, COM_{27} to COM_{45} and leave COM_{20} to COM_{26}, COM_{46} to COM_{51} open
$PCOM_1$, $PCOM_2$	Pictograph common	240 114	O	Common output pins for pictographs The same signal is output from $PCOM_1$ and $PCOM_2$.
$AMP_{IN(+)}$	Op amp inputs	10-13	I	These are input pins for the op amp that regulates the LCD driver voltage. Leave the $AMP_{IN(+)}$ pin unconnected when using the on-chip D/A converter. When not using the D/A converter, a reference voltage must be input. Connect the $AMP_{IN(-)}$ pin to a resistor used to regulate the LCD voltage. (See diagram below.)
$AMP_{IN(-)}$				
AMP_{OUT}	Op amp outputs	8,9	O	These are output pins for the op amp that regulates the LCD driver voltage. Normally, they are connected to resistors that are used to regulate the LCD voltage. (See diagram below.) Since the AMP_{OUT} pins are used to stabilize the on-chip amp's output, we recommend connecting them to a capacitor that is rated between 0.1 and 1.0 μF.
DUMMY	DUMMY pins	1,81-84, 106-108, 113, 217-219, 241	–	DUMMY pins are not connected to the internal circuit. Leave open if they are not used.

Figure 3-1. Voltage Control Circuit



4. POWER SUPPLY CIRCUIT

A switchable (3x or 4x) boost circuit is included to generate a current for driving the LCD. A connection to a boost-related capacitor is used to switch the boost circuit's setting.

The V_{EXT} pin (H: external, L: internal) is used to switch between using an external LCD driver power supply or the on-chip boost circuit.

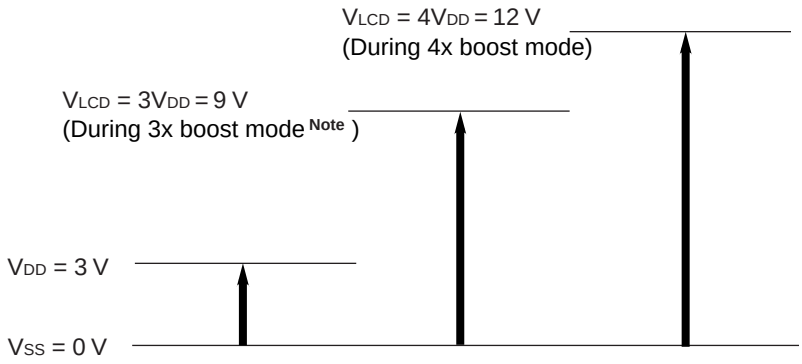
4.1 Boost Circuit

When using the internal power supply, connect the boost-related capacitor between C_1^+ and C_1^-, C_2^+ and C_2^-, and C_3^+ and C_3^-. Also, connect the capacitor for level stabilization between V_{LCD} and V_{SS}, and set V_{EXT} low to boost the potential between V_{DD} and V_{SS} from 3 to 4 times.

Since the boost circuit uses signals from the internal oscillation circuit, the oscillation circuit must be operating. The relation between the boosted voltage and the potential is described below.

The C_1^+, C_1^-, C_2^+, C_2^-, C_3^+, C_3^- and V_{DD} pins all relate to the boost circuit, so the wire impedance should be minimized.

Figure 4-1. 3x and 4x Boost Mode



Note When set for 3x boost, connect boost-related capacitors between C_2^- and C_3^+ and C_1^+ and C_1^-.

4.2 Regulation of LCD Driver Voltage

4.2.1 When not using internal power supply select or D/A converter (V_{EXT} = L, DA_{CHA} = L)

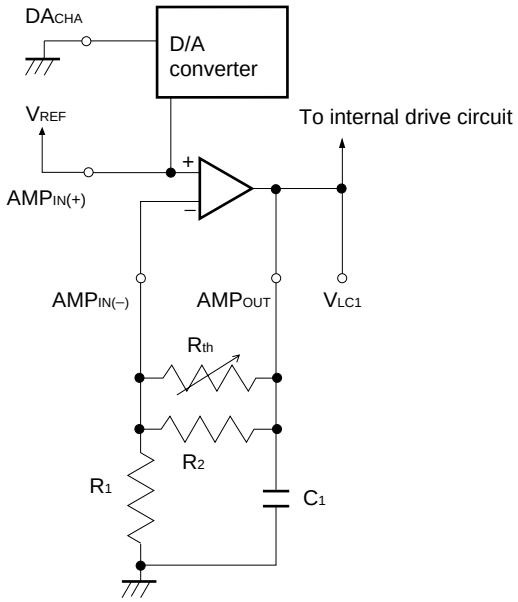
When using the internal power supply, the boosted voltage is used as the power supply for the op amp incorporated in the IC for the LCD driver's voltage. A common mode amplifier circuit can be configured by connecting external resistors R1 and R2 and inputting the reference voltage V_{REF} to $AMP_{IN(+)}$, and this configuration can be used to regulate the potential of the LCD driver voltage V_{LC1}. If using a thermistor to regulate the LCD driver voltage to suit the liquid crystals' temperature characteristics, we recommend connecting in parallel to R2.

The LCD driver voltage V_{LC1} can be determined using the following formula.

$$V_{LC1} = AMP_{OUT} = \left(1 + \frac{R_2'}{R_1}\right) V_{REF}$$

$$R_2' = \frac{R_2 \times R_{th}}{R_2 + R_{th}}$$

Figure 4-2. When Not Using Internal Power Supply Select or D/A Converter



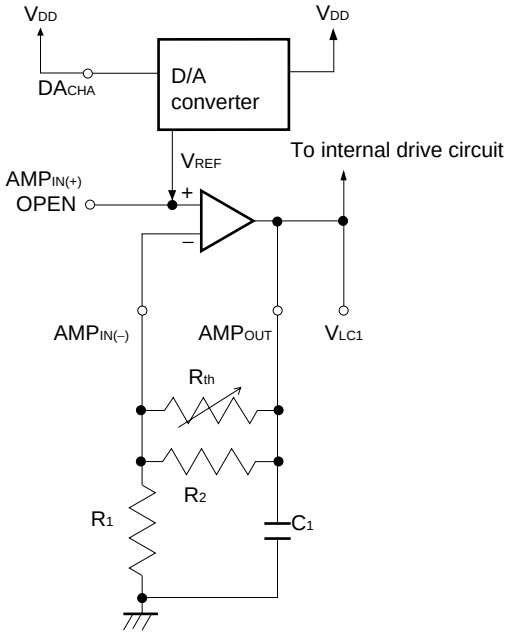
4.2.2 When using internal power supply select and D/A converter (V_{EXT} = L, DA_{CHA} = H)

Using the D/A converter enables commands to be entered to control the reference voltage V_{REF} that is input to the + input of the op amp for the LCD driver voltage.

The D/A converter function sets 6-bit data to the D/A converter set register to set one of the 64 modes for the reference voltage V_{REF} between V_{DD} and 1/2 V_{DD}.

The formula for V_{LC1} is the same as in **4.2.1 When not using internal power supply select or D/A converter (V_{EXT} = L, DA_{CHA} = L)** above.

Figure 4-3. Using Internal Power Supply Select and D/A Converter



4.2.3 When using an external power supply (V_{EXT} = H)

When an external power supply is used for the LCD driver voltage, the op amp incorporate in the μPD16681A (used for the LCD driver voltage) is in OFF mode. Consequently, the LCD driver's op amp and D/A converter function cannot be used when using an external power supply. Instead, regulate the LCD driver voltage by inputting directly to the V_{LCD} and V_{LC1} pins.

Cautions 1. Maintain the following relation for the voltage input to the V_{LCD} and V_{LC1} pins : $V_{LCD} > V_{LC1}$

2. Since the DA_{CHA}, $AMP_{IN(+)}$, and $AMP_{IN(-)}$ pins are CMOS inputs, they should be fixed either high or low.

3. The AMP_{OUT} pin should be left unconnected.

4.3 Reference Voltage

4.3.1 When using internal power supply (V_{EXT} = L)

When using the internal power supply, the μPD16681A's on-chip divider resistor is used to create the six-level potential (V_{LC1}, V_{LC2}, V_{LC3}, V_{LC4}, V_{LC5}, and V_{SS}) required for the LCD driver.

4.3.2 When using an external power supply (V_{EXT} = H)

When use of an external power supply has been selected, the op amp incorporated in the μPD16681A for the LCD driver level power supply is in OFF mode, so a reference potential must be directly input to V_{LC1}, V_{LC2}, V_{LC3}, V_{LC4}, and V_{LC5}.

Ordinarily, these levels are generated by dividing the resistance. Since large resistance values result in poorer LCD display quality, be sure to select a resistance value that suits the type of LCD panel to be used.

The display quality can be improved by connecting capacitors between the level pins and ground pins. As with the resistance values described above, the capacitance values of the capacitors should be selected to suit the divided resistance values and the type of LCD panel to be used.

4.4 Control of Op Amp for Level Power Supply

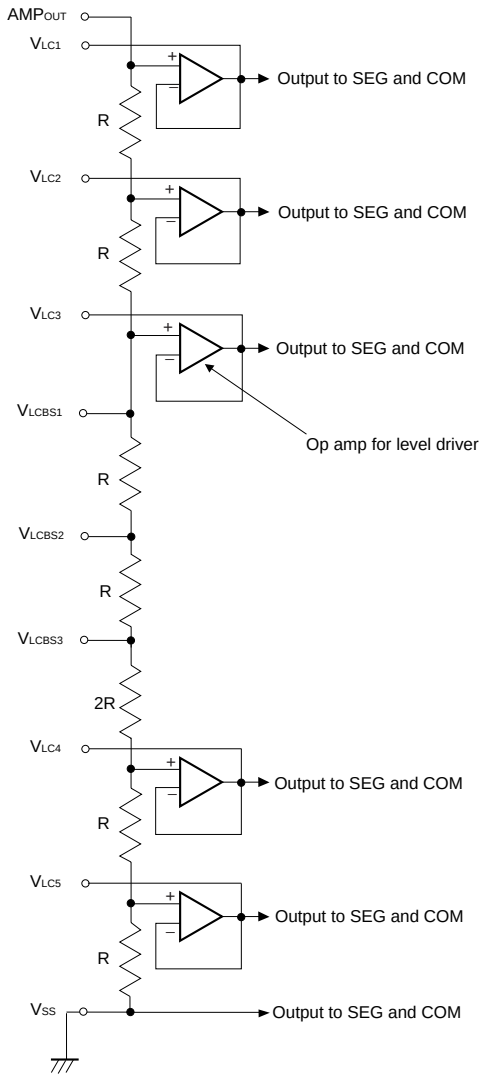
Input to the AMP_{CHA} pin is used to control the op amp for the LCD driver level power supply.

- High power mode (AMP_{CHA} = L)
  This mode maximizes the LCD drive current supply capacity in the op amp for the LCD driver level power supply.

- Normal mode (AMP_{CHA} = H)
  This mode uses a lower LCD drive current supply capacity in the op amp for the LCD driver level power supply, which is suitable for charging the capacitor used to stabilize the external level.

Caution For either mode, be sure to connect a level stabilization capacitor (rated from about 0.1 to 1.0 μF) for the V_{LC1} to V_{LC5} pins. Poorer display quality results when these capacitors are not connected.

Figure 4-4. Reference Voltage Circuit



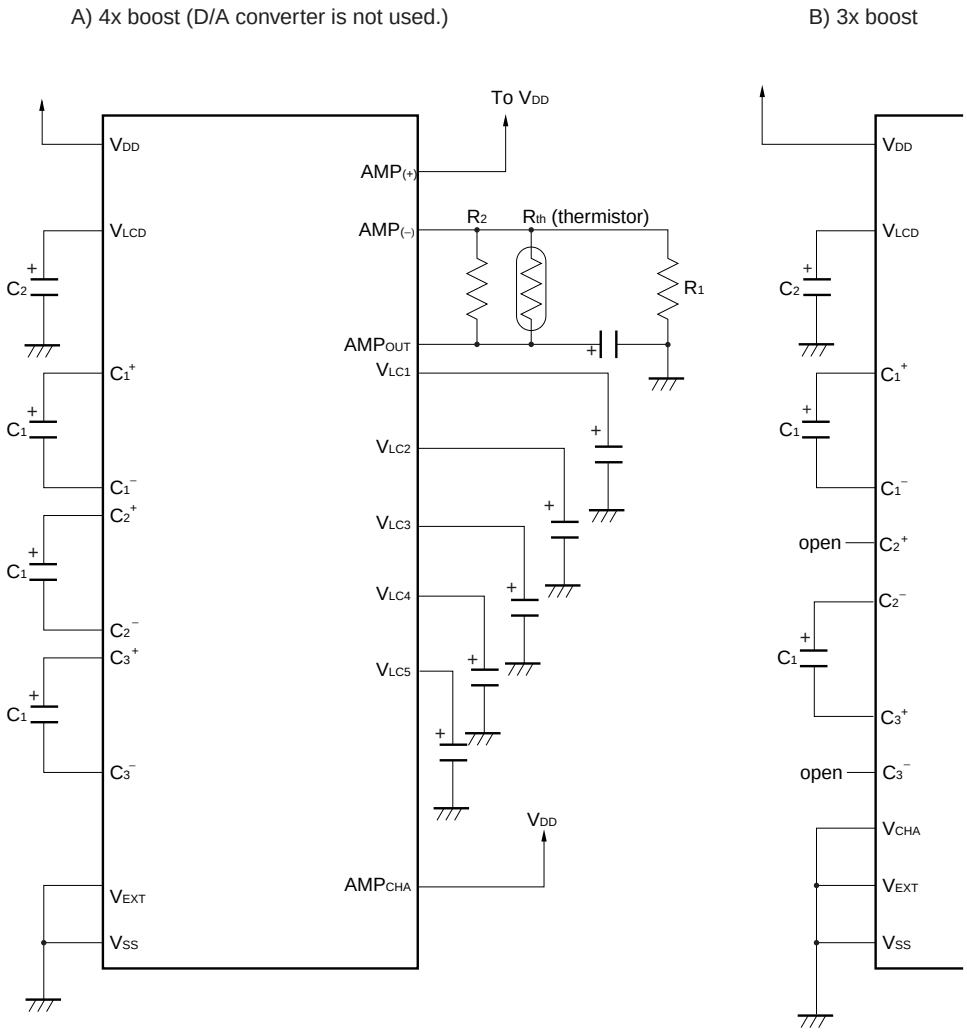
4.5 Bias Value Settings

The bias value can be set as 1/6 bias, 1/7 bias, or 1/8 bias by selecting an internal bias for the (μPD16681A and by connecting externally from the IC among V_{LCBS1}, V_{LCBS2}, and V_{LCBS3} pins.

Bias Value	Connected Pin
1/8 bias	V_{LCBS1}, V_{LCBS2}, and V_{LCBS3} leave open
1/7 bias	Between V_{LCBS1} and V_{LCBS2} or between V_{LCBS2} and V_{LCBS3}
1/6 bias	Between V_{LCBS1} and V_{LCBS3} and V_{LCBS2} leave open

4.6 Power Supply Circuit Use Example

Figure 4-5. Using Internal Power Supply and Normal Mode



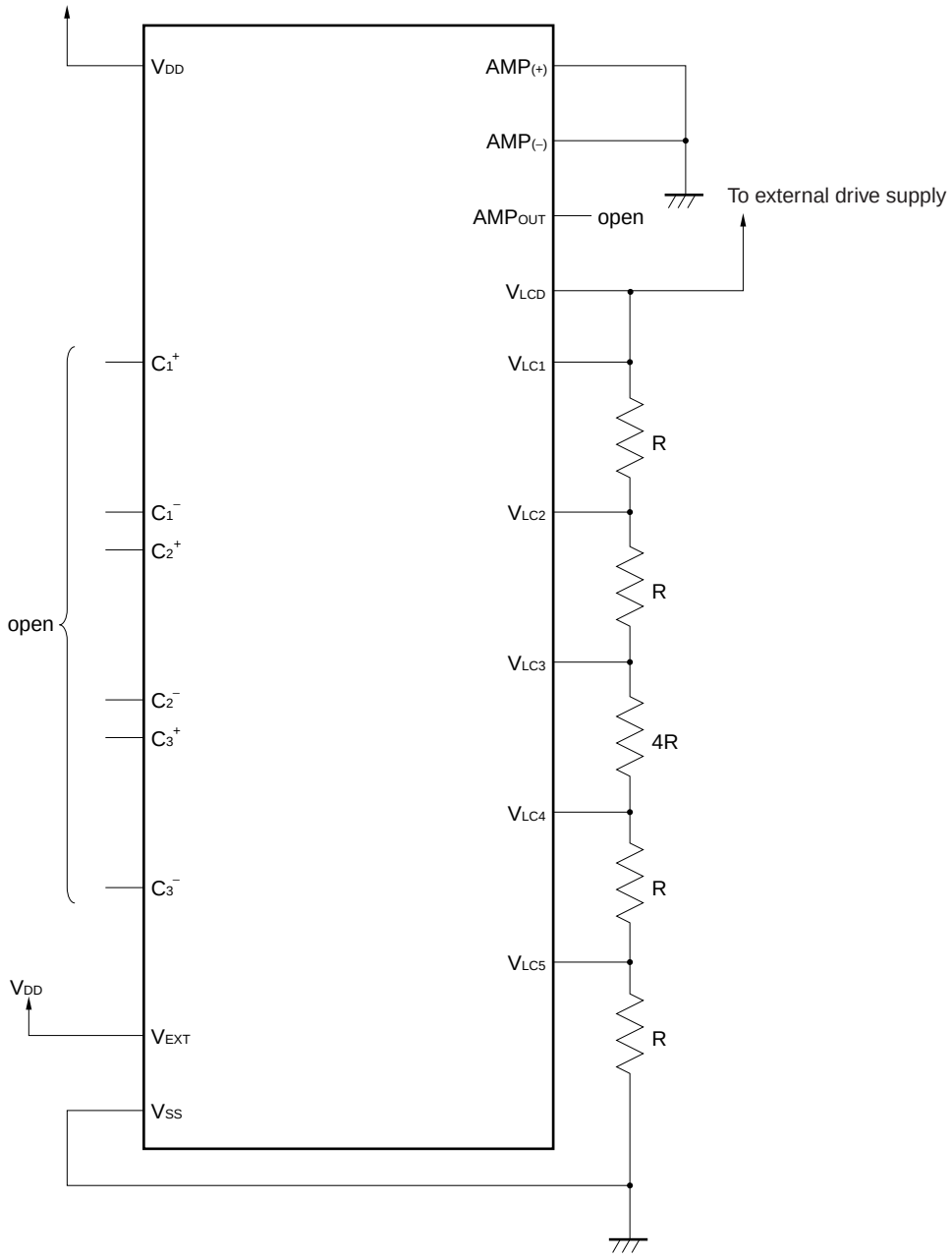
Remarks 1. C_1 = 1.0 μF, C_2 = 1.0 μF

2. Leave C_2^+ and C_3^- pins open during 3x boost.

3. Leave AMP(+) open when using the D/A converter.

Figure 4-6. Using External Power Supply Circuit

A) Use 1/8 bias



Remark Fix all open input pins high or low.

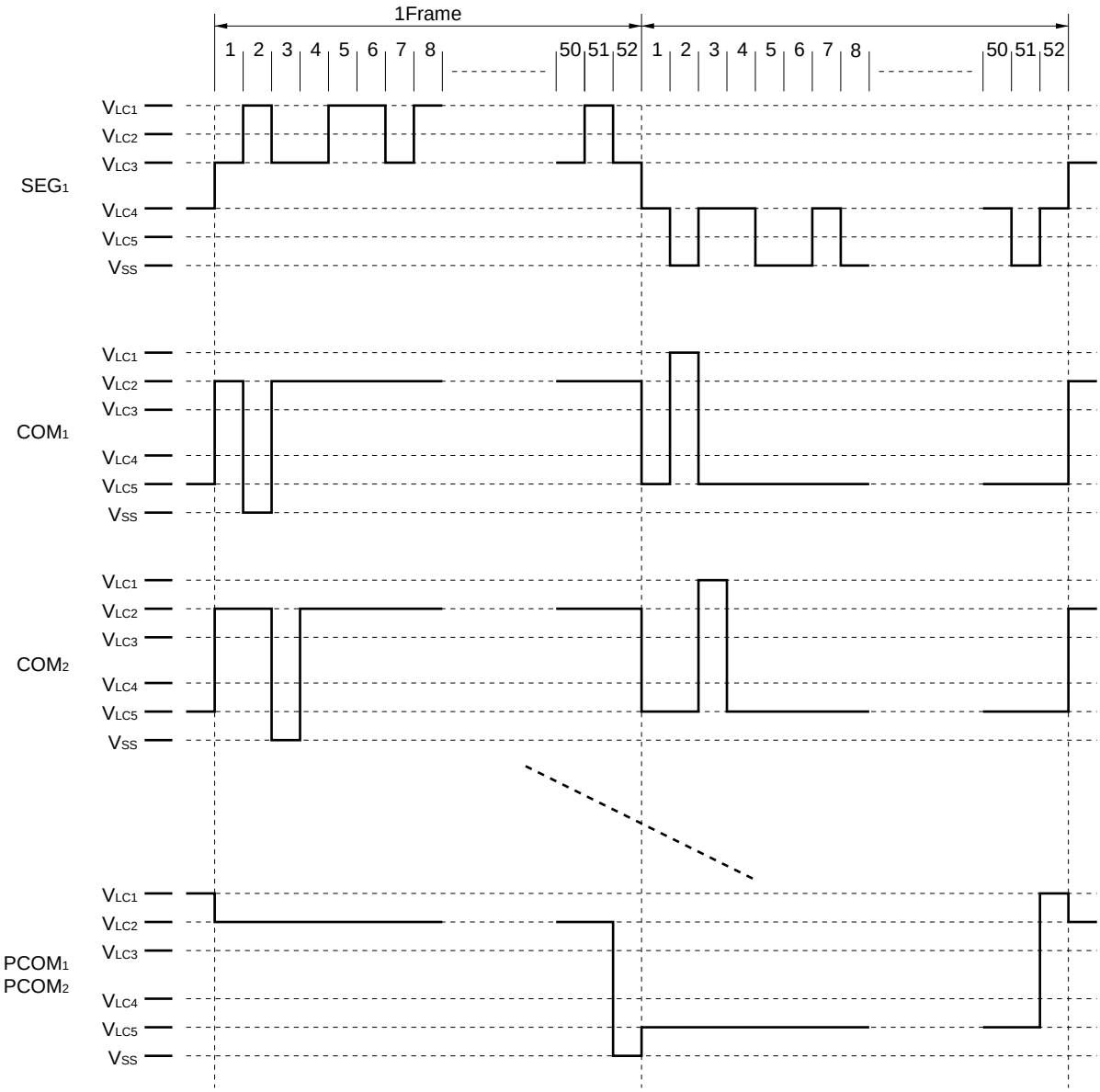
5. LCD DISPLAY DRIVER

Either a 1/52 duty driver or a 1/39 duty driver can be selected for the μPD16681A. Both drivers output a drive waveform using the two-frame AC drive method.

5.1 1/52 Duty Driver

When the 1/52 duty driver is selected for the μPD16681A, a select signal is output once per frame from the dot block's common outputs (COM_1 to COM_{51}) and from the pictograph block's common outputs (same signal output from $PCOM_1$ and $PCOM_2$).

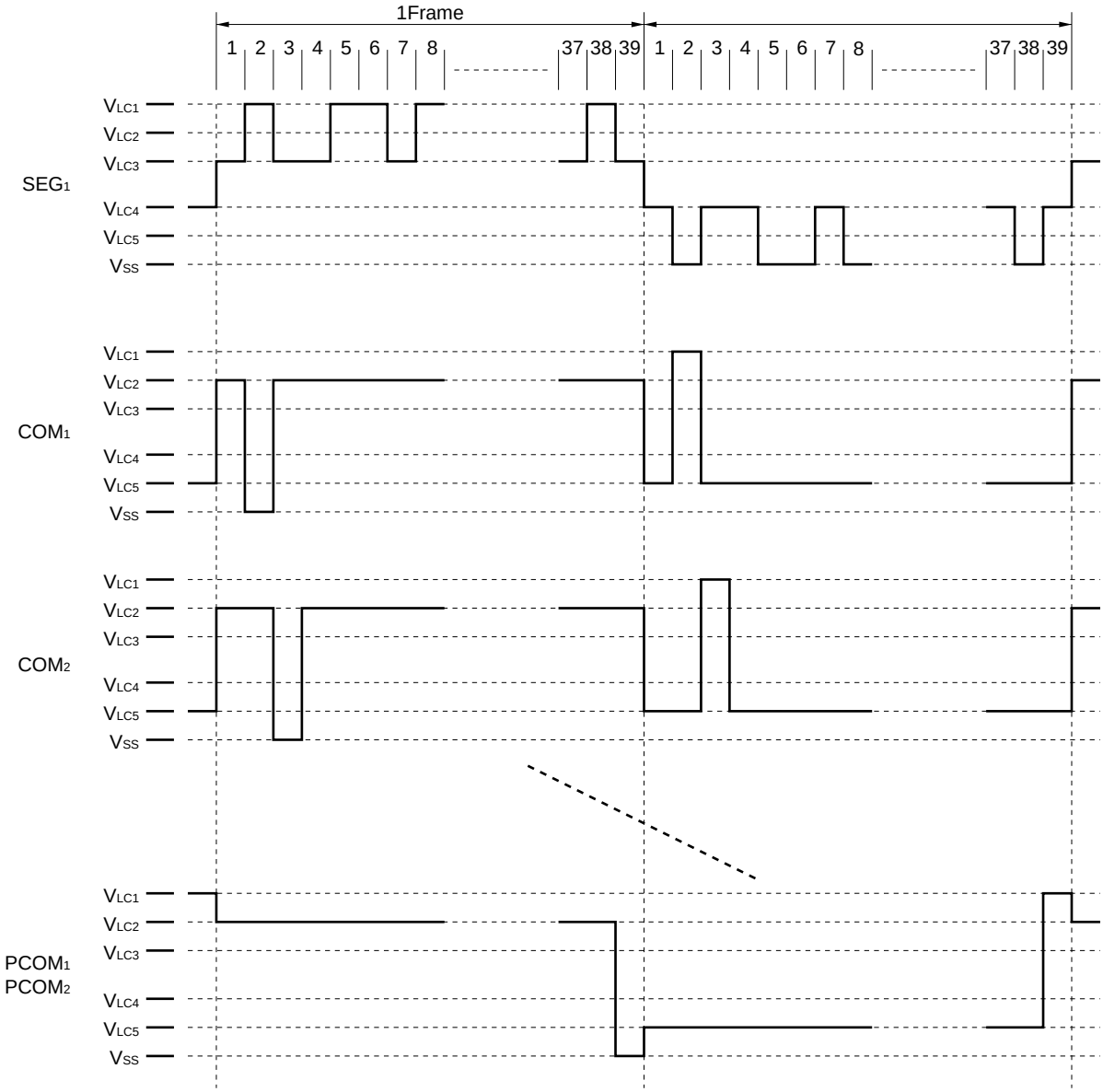
Figure 5-1. 1/52 Duty Driver



5.2 1/39 Duty Driver

When the 1/39 duty driver is selected for the μPD16681A, a select signal is output once per frame from the dot block's common outputs (COM_1 to COM_{19}, COM_{27} to COM_{45}) and from the pictograph block's common outputs (same signal output from $PCOM_1$ and $PCOM_2$).

Figure 5-2 1/39 Duty Driver



6. DESCRIPTION OF BLOCKS

6.1 Display Data RAM (DDRAM)

DDRAM is RAM that contains display data consisting of a 16-bit character code plus a character attribute code. The RAM capacity is 16 x 72 bits, which means that up to 72 characters can be stored in RAM.

The following table shows correspondences between DDRAM addresses and LCD display positions. For further description of these correspondences, see the section **7.1 LCD Display and DDRAM Addresses.**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1st line	00H	01H	02H	03H	04H	05H	06H	07H	08H	09H	0AH	0BH	0CH	0DH	0EH	0FH	10H	11H
2nd line	12H	13H	14H	15H	16H	17H	18H	19H	1AH	1BH	1CH	1DH	1EH	1FH	20H	21H	22H	23H
3rd line	24H	25H	26H	27H	28H	29H	2AH	2BH	2CH	2DH	2EH	2FH	30H	31H	32H	33H	34H	35H
4th line	36H	37H	38H	39H	3AH	3BH	3CH	3DH	3EH	3FH	40H	41H	42H	43H	44H	45H	46H	47H

6.2 Full Width (11x12 dots) Character Generator ROM (FCGROM)

FCGROM generates a total of 7,064 full width character patterns, of which 6,355 are JIS Level 1 + Level 2 kanji, 453 are non-kanji characters and 256 other symbols. These character patterns are displayed in 11 x12 dot font patterns based on 12-bit character codes. The section entitled **7.2.2 Full width(11 x 12 dots) character code setting examples** describes the correspondence between the character codes set to DDRAM and this full width font pattern.

Also, see the section entitled **7.2 Character Codes** for a description of the correspondence between the JIS code and the character code set to DDRAM.

6.3 Half Width(5 x 12 dots) Character Generator ROM (HCGROM)

FCGROM generates a total of 192 half width (5 x 12 dots) character patterns, displayed in 5 x 12 dot font patterns. The section entitled **7.2 Character Codes** describes the correspondence between the character code set to DDRAM and the half width font patterns.

6.4 Character Generator RAM (CGRAM)

CGRAM is RAM to which the user can freely set character patterns. Eight types of 12 x 13 dot character patterns can be defined. To display a character pattern that has been stored in CGRAM, the user specifies a value ranging from “000H” to “007H”.

The relation between character codes and CGRAM addresses used to access CGRAM is shown below.

Figure 6-1. The Relation between Character Codes and CGRAM Addresses

Character code														CGRAM Address								CGRAM Data													
																						A0 ="0"								A0 ="1"							
C12					to						C3	C2	C1	C0	A7	A6	A5	A4	A3	A2	A1	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	A	A	0	0	0	0	0	0	A	A	0	0	0	0	0	0
																				0	1	A	A	0	1	1	1	1	1	A	A	1	1	1	1	0	0
																				1	0	A	A	0	1	0	0	0	0	A	A	0	0	0	1	0	0
																				1	1	A	A	0	1	0	0	0	0	A	A	0	0	0	1	0	0
																				0	0	A	A	0	1	0	0	0	0	A	A	0	0	0	1	0	0
																				0	1	A	A	0	1	0	0	0	0	A	A	0	0	0	1	0	0
																				1	0	A	A	0	1	1	1	1	1	A	A	1	1	1	1	0	0
																				1	1	A	A	0	1	0	0	0	0	A	A	0	0	0	1	0	0
																				0	0	A	A	0	1	0	0	0	0	A	A	0	0	0	1	0	0
																				0	1	A	A	0	1	0	0	0	0	A	A	0	0	0	1	0	0
																				1	0	A	A	0	1	0	0	0	0	A	A	0	0	0	1	0	0
																				1	1	A	A	0	1	1	1	1	1	A	A	1	1	1	1	0	0
																				1	1	A	A	0	0	0	0	0	0	A	A	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0		0	0	1	0	0	1	0	0	0	0	A	A	0	0	0	0	0	1	A	A	0	0	0	0	0	0
																				0	1	A	A	0	0	0	0	0	1	A	A	0	0	0	0	0	0
																				1	0	A	A	1	1	1	1	1	1	A	A	1	1	1	1	1	0
																				1	1	A	A	0	0	0	0	1	1	A	A	1	0	0	0	0	0
																				0	0	A	A	0	0	0	1	0	1	A	A	0	1	0	0	0	0
																				0	1	A	A	0	0	0	1	0	1	A	A	0	1	0	0	0	0
																				1	0	A	A	0	0	1	0	0	1	A	A	0	0	1	0	0	0
																				1	1	A	A	0	0	1	0	0	1	A	A	0	0	1	0	0	0
																				0	0	A	A	0	1	0	0	0	1	A	A	0	0	0	1	0	0
																				0	1	A	A	0	1	0	1	1	1	A	A	1	1	0	1	0	0
																				1	0	A	A	1	0	0	0	0	1	A	A	0	0	0	0	1	0
																				1	1	A	A	0	0	0	0	0	1	A	A	0	0	0	0	0	0
																				0	0	A	A	0	0	0	0	0	0	A	A	0	0	0	0	0	0
					.							.	.	.		.			.			A	A		.					A	A		.				
					.							.	.	.		.			.			A	A		.					A	A		.				
					.							.	.	.		.			.			A	A		.					A	A		.				
0	0	0	0	0	0	0	0	0	0	0		1	1	1	1	1	1	0	0	0	0	A	A							A	A						
																				0	1	A	A							A	A						
																				1	0	A	A							A	A						
																				1	1	A	A							A	A						
																				0	0	A	A							A	A						
																				0	1	A	A							A	A						
																				1	0	A	A							A	A						
																				1	1	A	A							A	A						
																				0	0	A	A							A	A						
																				0	1	A	A							A	A						
																				1	0	A	A							A	A						
																				1	1	A	A							A	A						
																				0	0	A	A							A	A						
																				0	1	A	A							A	A						
																				1	0	A	A							A	A						
																				1	1	A	A							A	A						
																				0	0	A	A							A	A						
																				0	1	A	A							A	A						
																				1	0	A	A							A	A						
																				1	1	A	A							A	A						
																				0	0	A	A							A	A						
																				0	1	A	A							A	A						
																				1	0	A	A							A	A						
																				1	1	A	A							A	A						
																				0	0	A	A							A	A						

Remarks 1. CGRAM is selected when the high-order nine bits (C11 to C3) of a character code are all zeros. At that time, the low-order three bits (C2 to C0) corresponds to CGRAM addresses 7 to 5 (A7 to A5). (Three bits: eight types.)

2. Display ON is selected when the CGRAM data value is “1”. Display OFF is selected when this data value is “0”.

3. The CGRAM address 0 (A0) corresponds to the left and right sides of the character pattern.

4. The high-order two bits of CGRAM are used to control the display attributes of the pattern corresponding to the low-order six bits. In such cases, any display attribute specification made for DDRAM is ignored. When the value of the high-order two bits is “00”, CGRAM’s pattern is displayed.

5. CGRAM addresses 4 to 1 (A4 to A1) corresponds to the line position of the character pattern. (Four bits : 13 lines) The ORed result with the cursor is taken and displayed on the 12th line.

6.5 Pictograph Display RAM (PDRAM)

PDRAM is the RAM that contains pictograph display data that has been assigned to $PCOM_1$ and $PCOM_2$. The data display function is ON when the data value is “1” and OFF when the data value is “0”.

After data is written, the address counter is automatically incremented (by one), and the value after 0FH is 00H.

The correspondence between output from various segments and PDRAM addresses is shown below.

$PCOM_1$,$PCOM_2$

Address	Segment Output No.							
	b7	b6	b5	b4	b3	b2	b1	b0
00H	X	X	6	5	4	3	2	1
01H	X	X	12	11	10	9	8	7
02H	X	X	18	17	16	15	14	13
03H	X	X	24	23	22	21	20	19
04H	X	X	30	29	28	27	26	25
05H	X	X	36	35	34	33	32	31
06H	X	X	42	41	40	39	38	37
07H	X	X	48	47	46	45	44	43
08H	X	X	54	53	52	51	50	49
09H	X	X	60	59	58	57	56	55
0AH	X	X	66	65	64	63	62	61
0BH	X	X	72	71	70	69	68	67
0CH	X	X	78	77	76	75	74	73
0DH	X	X	84	83	82	81	80	79
0EH	X	X	90	89	88	87	86	85
0FH	X	X	96	95	94	93	92	91

Remark X : Don’t care

6.6 Pictograph Blink Data RAM (PBRAM)

PBRAM is the RAM that contains pictograph blink data that has been assigned to $PCOM_1$ and $PCOM_2$. A data value of "1" is written to the address of the pictograph to be set for a blink display.

After data is written, the address counter is automatically incremented (by one), and the value after 0FH is 00H.

The correspondence between output from various segments and PBRAM addresses is shown below.

$PCOM_1$,$PCOM_2$

Address	Segment Output No.							
	b7	b6	b5	b4	b3	b2	b1	b0
00H	X	X	6	5	4	3	2	1
01H	X	X	12	11	10	9	8	7
02H	X	X	18	17	16	15	14	13
03H	X	X	24	23	22	21	20	19
04H	X	X	30	29	28	27	26	25
05H	X	X	36	35	34	33	32	31
06H	X	X	42	41	40	39	38	37
07H	X	X	48	47	46	45	44	43
08H	X	X	54	53	52	51	50	49
09H	X	X	60	59	58	57	56	55
0AH	X	X	66	65	64	63	62	61
0BH	X	X	72	71	70	69	68	67
0CH	X	X	78	77	76	75	74	73
0DH	X	X	84	83	82	81	80	79
0EH	X	X	90	89	88	87	86	85
0FH	X	X	96	95	94	93	92	91

Remark X : Don't care

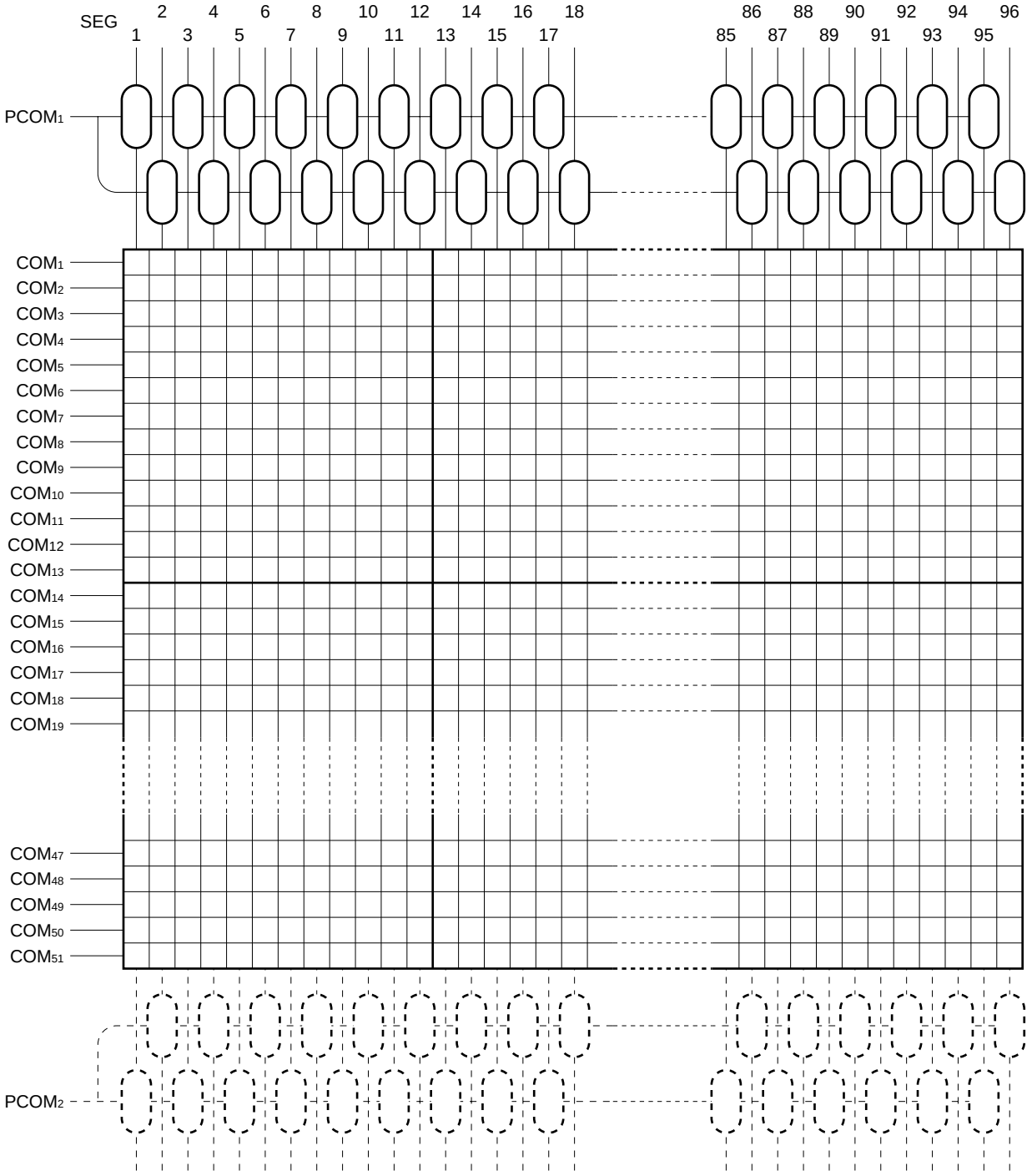
6.7 Relation between Addresses and Various ROM and RAM Devices

The μPD16681A assigned FCGROM addresses as shown below to HCGROM, CGRAM, and user-defined ROM.

Type	No. of Characters	Address Range
JIS kanji	6355	Same as kanji ROM IC
Non-JIS kanji	453	Same as kanji ROM IC
Half width alphanumeric characters	192	Uses addresses 0080H to 039FH in the kanji ROM IC
User defined	256	Uses addresses 1000H to 101FH in the kanji ROM IC
CGRAM	8	Uses addresses 0000H to 0007H in the kanji ROM IC

7. LCD DISPLAY

The μPD16681A's LCD display can display four lines containing up to 8 characters (11 x 12 dots) or 16 characters (5x12 dots) and 96 pictographs.



Remark The same select signal is output from $PCOM_1$ and $PCOM_2$.

7.1 LCD Display and DDRAM Addresses

The character code used in the μPD16681A contains 16 bits (character code + character attribute code). When data is stored to an address in DDRAM, a combination of full width (11 x 12 dots) and half width (5 x 12 dots) characters can be displayed on the LCD.

The relation between the DDRAM's character area and the actual LCD display when displaying a combination of full width and half width characters is shown below.

Figure 7-1. The Relation between The DDRAM's Character Area and The Actual LCD Display

LCD display:

日		本		電		気		株		式		会		社	
神		奈		川		県		川		崎		市		幸	
区		塚		越		三		丁		目		4	8	4	" "
T	E	L	:	0	4	4	−	5	4	8	−	8	8	8	2

"" : Half width(5 x 12 dots) space

DDRAM:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1st line	00H	01H	02H	03H	04H	05H	06H	07H	08H	09H	0AH	0BH	0CH	0DH	0EH	0FH	10H	11H
2nd line	12H	13H	14H	15H	16H	17H	18H	19H	1AH	1BH	1CH	1DH	1EH	1FH	20H	21H	22H	23H
3rd line	24H	25H	26H	27H	28H	29H	2AH	2BH	2CH	2DH	2EH	2FH	30H	31H	32H	33H	34H	35H
4th line	36H	37H	38H	39H	3AH	3BH	3CH	3DH	3EH	3FH	40H	41H	42H	43H	44H	45H	46H	47H

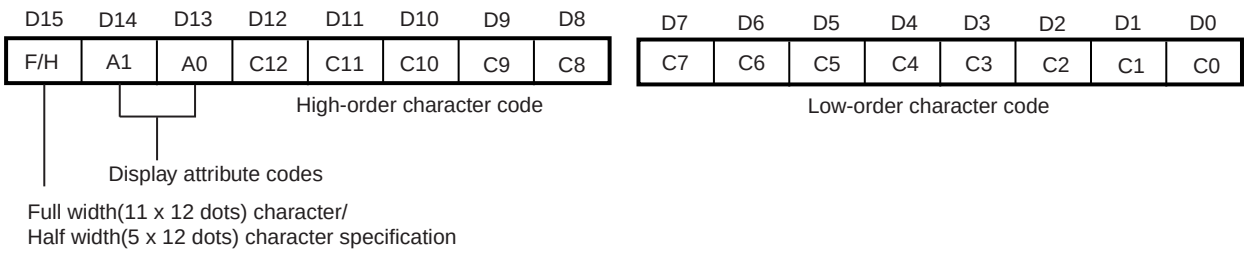
Remark Shaded areas indicate addresses.
Address characters that are not displayed are used as data for character scrolling.

7.2 Character Codes

The μPD16681A is able to combine full width characters (11 x 12 dots) and half width characters (5 x 12 dots) in the same display. The character data that is stored in DDRAM is displayed starting from the top left corner of the LCD screen. A one-dot character interval is added to the left of each character font.

Both full width (11 x 12 dots) and half width (5 x 12 dots) characters are handled using 16-bit code lengths and are stored in DDRAM. The 16-bit code format uses the low-order 13 bits as the character code. The remaining 3 bits are the high-order 3 bits, which specify the character width (full or half) and the display attribute. The MSB is the select bit indicating full width or half width character code: "0" specifies full width characters and "1" specifies half width characters. The character attribute code is assigned to the next two bits, and can specify attributes such as blinking for individual characters. (See the section **7.3 Display Attributes**.)

7.2.1 Code format



7.2.2 Full width (11 x 12 dots) character code setting examples

The following shows the correspondence between 16-bit JIS code and the μPD16681A's 13-bit character code. This correspondence varies according to the values of the high-order 3 bits (b17, b16, and b15) in the first byte of the JIS code.

Convert JIS code as shown below to generate character code for the μPD16681A.

(1) JIS level 1 kanji and non-kanji characters

Table 7-1. When (b17, b16, b15) = (0, 1, 0)

JIS C 6226	First byte							Second byte						
	b17	b16	b15	b14	b13	b12	b11	b27	b26	b25	b24	b23	b22	b21
Character code					C9	C8	C7	C6	C5	C4	C3	C2	C1	C0

Remark C12 = C6 = C5 = 0

Table 7-2. When (b17, b16, b15) = (0, 1, 1) or (1, 0, 0)

JIS C 6226	First byte							Second byte						
	b17	b16	b15	b14	b13	b12	b11	b27	b26	b25	b24	b23	b22	b21
Character code	C11			C10	C9	C8	C7	C6	C5	C4	C3	C2	C1	C0

Remark C12 = 0

(2) JIS level 2 kanji and non-kanji characters

Table 7-3. When (b17, b16, b15) = (1, 1, 1)

JIS C 6226	First byte							Second byte						
	b17	b16	b15	b14	b13	b12	b11	b27	b26	b25	b24	b23	b22	b21
Character code					C9	C8	C7	C11	C10	C4	C3	C2	C1	C0

Remark C12 = 1, C6 = C5 = 0

Table 7-4. When (b17, b16, b15) = (1, 0, 1) or (1, 1, 0)

JIS C 6226	First byte							Second byte						
	b17	b16	b15	b14	b13	b12	b11	b27	b26	b25	b24	b23	b22	b21
Character code		C11		C10	C9	C8	C7	C6	C5	C4	C3	C2	C1	C0

Remark C12 = 1

(3) CGRAM

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	X	X	0	0	0	0	0	0	0	0	0	0	u2	u1	u0

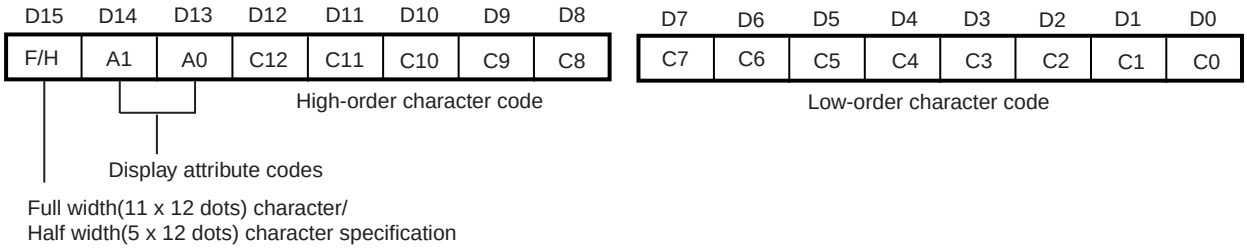
Remark CGRAM addresses for user font: u2 to u0

7.3 Display Attributes

In the μPD16681A, the character code is assigned to 12 bits of the 16-bit data that is specified as full width (11 x 12 dots) characters or half width (5 x 12 dots) characters and the display attribute code is assigned to two of the remaining four bits. Normal display or blink display mode can be specified for each character unit.

The blink cycle for blink display mode is 64 frames, so that display blinks on or off once every 32 frames.

7.3.1 Character code format

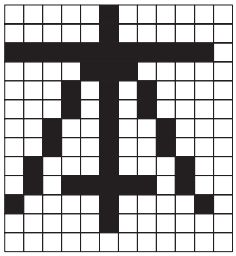


7.3.2 Display attribute specifications

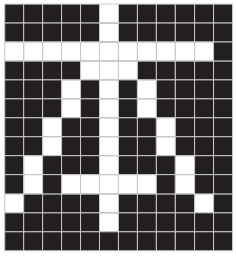
A1	A0	Display mode
0	0	Normal display
0	1	Reverse display
1	0	Character blink
1	1	Reverse character blink

7.3.3 Display examples

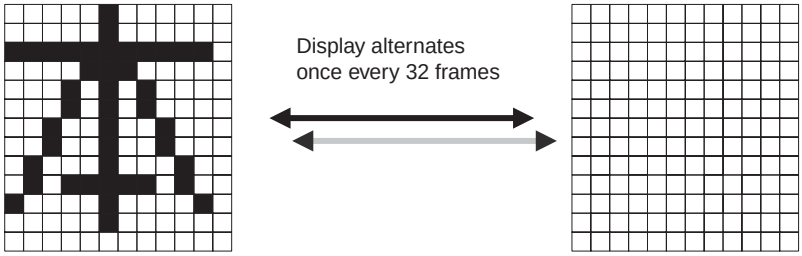
(1) Normal display



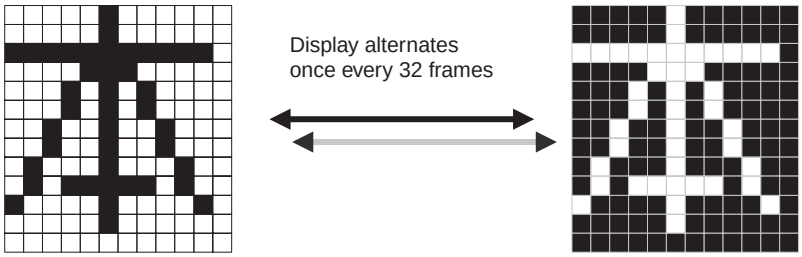
(2) Reverse display



(3) Blink display

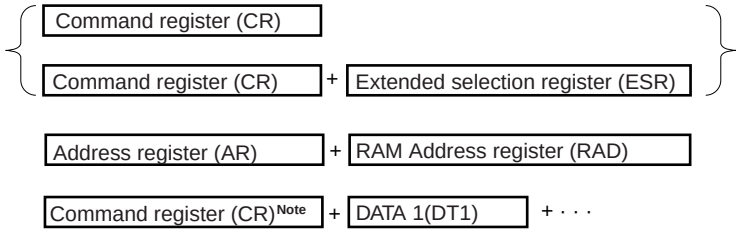


(4) Reverse blink display



8. COMMANDS

8.1 Basic format



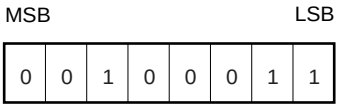
Note The command (1 or 2 bytes) immediately follows the falling edge of the STB signal, and whatever is sent after that is recognized as data.

Table 8-1. Command List

Command	Register Contents								Description
	b7	b6	b5	b4	b3	b2	b1	b0	
Reset	0	0	1	0	0	4	1	1	
Display ON/OFF	0	0	0	0	1	b2	b1	b0	
Standby	0	0	0	1	0	b2	b1	b0	
Duty setting	0	0	0	1	1	0	b1	b0	
Cursor control	0	0	0	1	1	1	b1	b0	
D/A converter setting	0	0	1	0	1	0	0	0	
Scroll control	0	0	1	1	b3	b2	b1	b0	
Blink setting	0	1	0	0	0	0	b1	b0	
Address register	0	1	0	0	1	0	b1	b0	
Data R/W mode	1	0	1	1	0	b2	b1	b0	
Test mode	1	0	1	0	b3	b2	b1	b0	

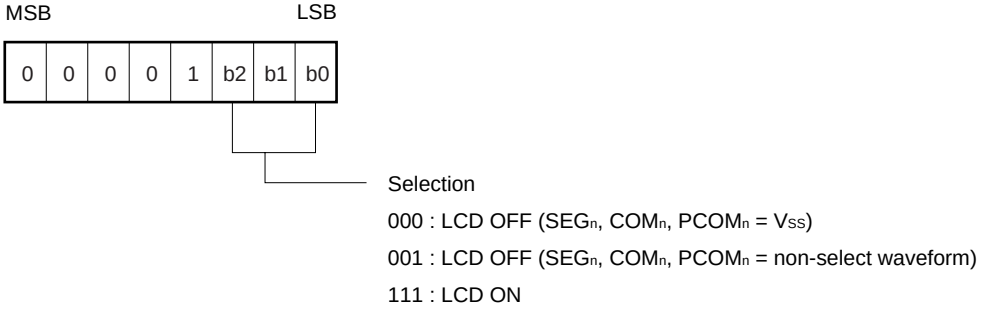
8.1.1 Reset

This command resets all of the commands in the μPD16681A.



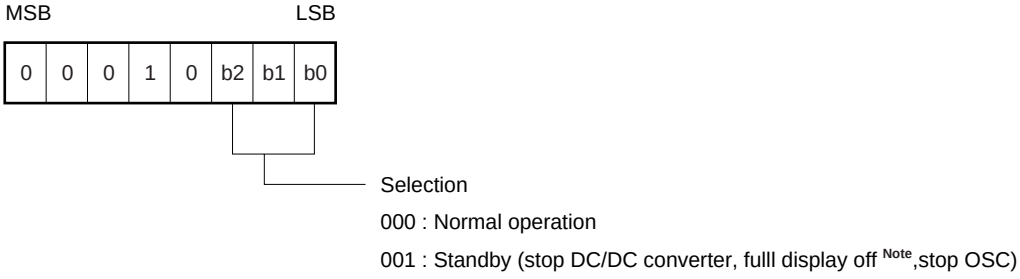
8.1.2 Display ON/OFF

This command controls the display's ON/OFF status.



8.1.3 Standby

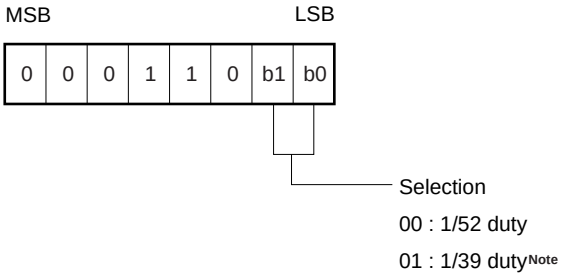
This command stops the DC/DC converter, which reduces the supply current. The display is set to OFF mode (SEGn, COMn = VSS).



Note SEGn, COMn, PCOMn = VEE

8.1.4 Duty setting

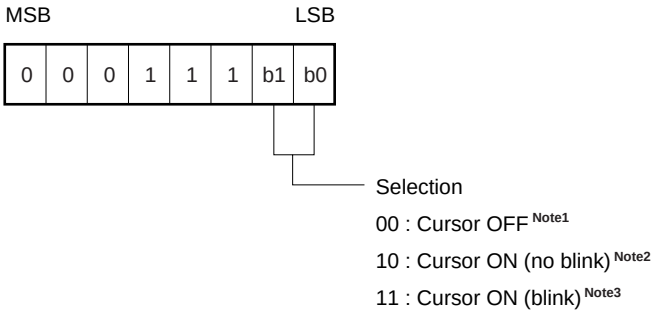
This command specifies the duty setting.



Note Use COM1 to COM19 and COM27 to COM45, leave COM20 to COM26 and COM46 to COM51 open when setting 1/39 duty.

8.1.5 Cursor control

This command controls the cursor's ON/OFF status.



Notes 1. 00 : Sets cursor to OFF mode.

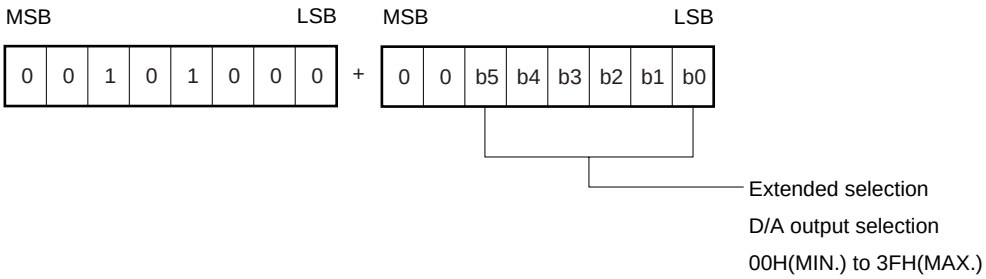
2. 10 : Sets cursor to ON mode (cursor is displayed). The cursor is displayed at the character which occupies the display position of the currently specified DDRAM address. The "address register" + "data R/W command" combination is used to set data to DDRAM addresses. When accessing RAM, the address counter in RAM is automatically incremented (+1) or decremented (–1), and the cursor is moved accordingly.

3. 11 : This sets the cursor to ON mode and causes the cursor to blink. The blink cycle is 64 frames. The correspondence between the cursor and the RAM address is the same as when the cursor is blinking.

Remark The cursor display function is valid only when the display attribute specifies "normal display" (A0 = 0, A1 = 0).

8.1.6 D/A converter set 1

The D/A converter's output for the LCD driver is set in 64 steps from V_{DD} to 1/2 V_{DD}.

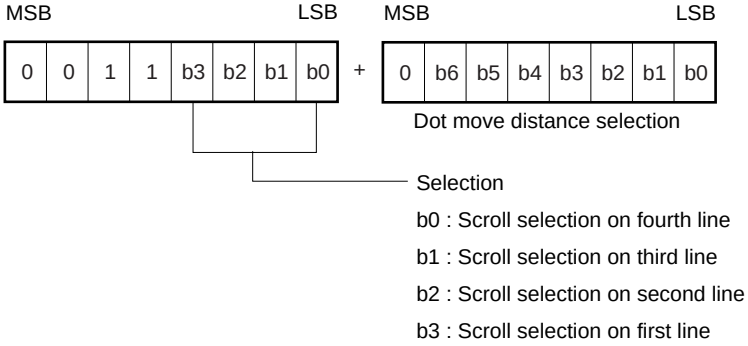


Remark This value is set to 20H after a reset.

8.1.7 Scroll control

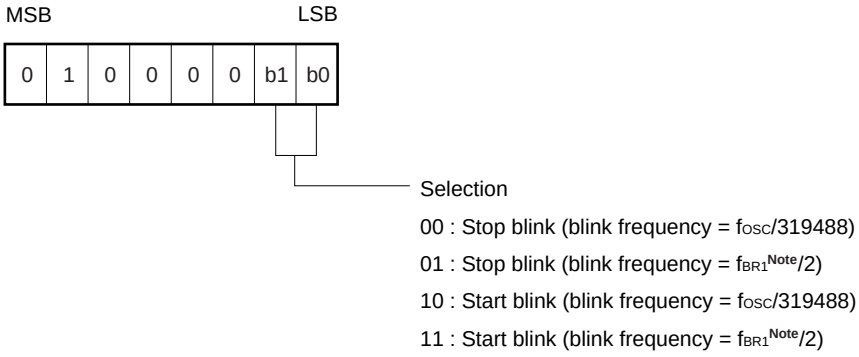
This controls scrolling of displayed characters.

The individual bits in the selection are allocated to their respective display lines. When the data value is “1”, scrolling is enabled for that line. The distance of the dots’ leftward (horizontal) motion is selected via the extended selection register that is input after the command. The dot move distance varies depending on the current LCD display status and the contents of DDRAM. For details, see the section **8.4 Scrolling**.



8.1.8 Pictograph blink setting

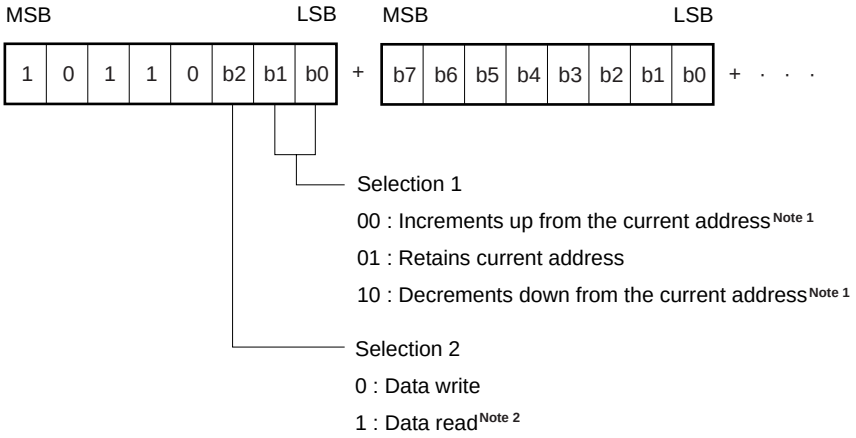
This command performs blink control for the pictograph at addresses where the blink (PBRAM) data value is “1”.



Note This refers to the frequency of the external clock that is input from the OSC_{BR1} pin.

8.1.9 Data R/W command

This command performs data read/write operations.



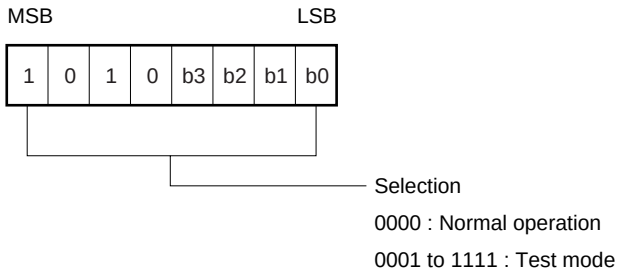
Notes 1. During increment mode, when the current address is the last address the next address becomes 00H. During decrement mode, when the current address is 00H, the next address becomes the last address.

2. Data read mode is cancelled at the rising edge of the STB signal (mode is switched to command/data write mode).

Caution During a serial data transfer, write data in 8-bit or 16-bit segments. If the rising edge of STB occurs during the data transfer operation, the operation is not guaranteed.

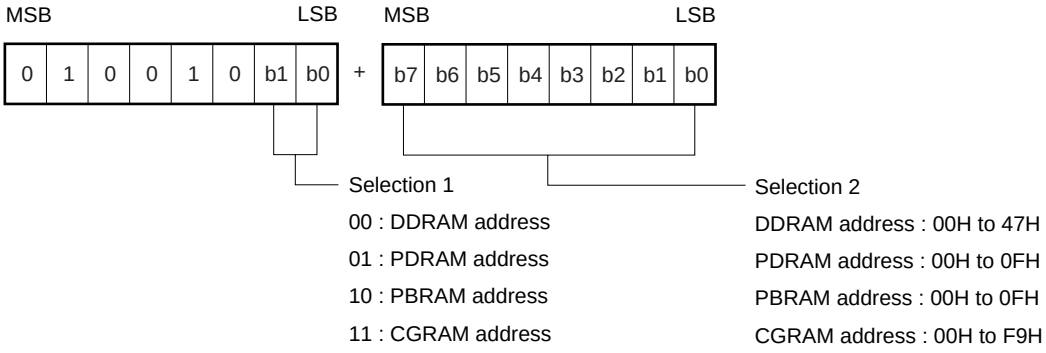
8.1.10 Test mode

This command sets the test mode. The test mode is only for confirming the IC's operation. Regular or continuous use while in test mode is not guaranteed.



8.2 Address Register

This command selects the address type and specifies addresses.



Caution Operation is not guaranteed if an invalid address is set.

8.3 Reset

The contents of the various registers appear as shown below after a reset (command reset or hardware [pin] reset).

Command	Register Contents								Description
	b7	b6	b5	b4	b3	b2	b1	b0	
Display ON/OFF	0	0	0	0	1	0	0	0	LCD OFF (SEG_n, COM_n, $PCOM_n$, = V_{SS})
Standby	0	0	0	1	0	0	0	0	Normal operation
Duty setting	0	0	0	1	1	0	0	0	1/52 duty
Cursor control	0	0	0	1	1	1	0	0	Cursor OFF
D/A converter setting	0	0	1	0	1	0	0	0	Set to 20H
Scroll control	0	0	1	1	0	0	0	0	No specified scroll line
Blink setting	0	1	0	0	0	0	0	0	Blink stop
Address register	0	1	0	0	1	0	0	0	DDRAM is specified
Data R/W mode	1	0	1	1	0	0	0	0	Data write/increment (+1)
Test mode	1	0	1	0	0	0	0	0	Normal operation

8.4 Scrolling

Character scrolling is controlled by inputting scroll control commands (8 bits) plus scroll dot count data (8 bits). The line to be scrolled is specified by the scroll control command and the scroll dot count data sets the number of dots to be scrolled. When this command is input, the characters on the specified line are shifted leftward by the specified number of dots.

The number of dots that can be scrolled differs according to the contents of the data stored in DDRAM (see **8.4.1 Scrollable number of dots** and **8.4.2 Display and scrollable number of dots**). Consequently, if scrolling is specified for an amount of data that exceeds the scrollable data, the character data, only the scrollable data is shifted and overwritten, and scrolling must be performed again.

Caution For character scrolling, be sure to input a scroll control command (8 bits) plus the amount of scrolled data (8 bits).

8.4.1 Scrollable number of dots

Scroll amount = (12 dots x number of non-displayed full width characters that are stored in DDRAM)
+ (6 dots x number of non-displayed half width characters that are stored in DDRAM)

8.4.2 Display and scrollable number of dots

LCD display:

日		本		電		気		株		式		会		社	
神		奈		川		県		川		崎		市		幸	
T	E	L	:	0	4	4	−	5	4	8	−	8	8	8	2
F	A	X	:	0	4	4	−	5	4	8	−	7	9	1	0

DDRAM status :

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1st line	00H	01H	02H	03H	04H	05H	06H	07H	08H	09H	0AH	0BH	0CH	0DH	0EH	0FH	10H	11H
2nd line	12H	13H	14H	15H	16H	17H	18H	19H	1AH	1BH	1CH	1DH	1EH	1FH	20H	21H	22H	23H
3rd line	24H	25H	26H	27H	28H	29H	2AH	2BH	2CH	2DH	2EH	2FH	30H	31H	32H	33H	34H	35H
4th line	36H	37H	38H	39H	3AH	3BH	3CH	3DH	3EH	3FH	40H	41H	42H	43H	44H	45H	46H	47H

Remark Shaded areas indicate addresses.
Address characters that are not displayed are used as data for character scrolling.

Character memory contents :

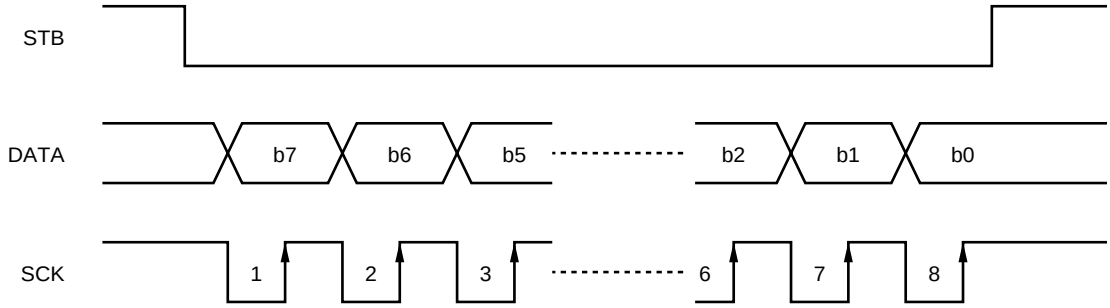
1st line	日	本	電	気	株	式	会	社	半	導	体	ソ	リ	ュ	ー	シ	ョ	ン
2nd line	神	奈	川	県	川	崎	市	幸	区	塚	越	三	丁	目	4	8	4	□
3rd line	T	E	L	:	0	4	4	-	5	4	8	-	3	8	8	2	P	B
4th line	F	A	X	:	0	4	4	-	5	4	8	-	7	9	1	0	夜	間

Remarks 1. Shaded areas indicate addresses.

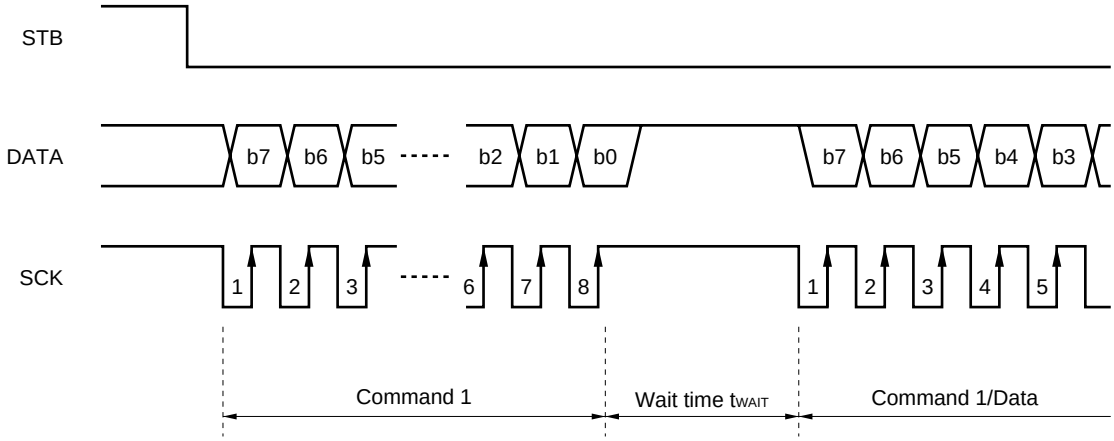
2. First line : "半導体ソリューション"(10 full width (11 x 12 dots) characters)
Second line : "区塚越三丁目"(6 full width (11 x 12 dots) characters),
"484"□(4 half width (5 x 12 dots) characters)
Third line : "PB"(2 half width (5 x 12 dots) characters)
Fourth line : "夜間"(2 full width (5 x 12 dots) characters)
Scrollable dot counts;
First line : (12 dots x 10 characters) + (6 dots x 0 characters) = 120 dots
Second line : (12 dots x 6 characters) + (6 dots x 4 characters) = 96 dots
Third line : (12 dots x 0 characters) + (6 dots x 2 characters) = 12 dots
Fourth line : (12 dots x 2 characters) + (6 dots x 0 characters) = 24 dots
If scroll count data that exceeds the scrollable number of dots is entered using the scroll control command, all dots that are in the area that goes beyond the DDRAM addresses are output as OFF data.

8.5 Serial Communication Format

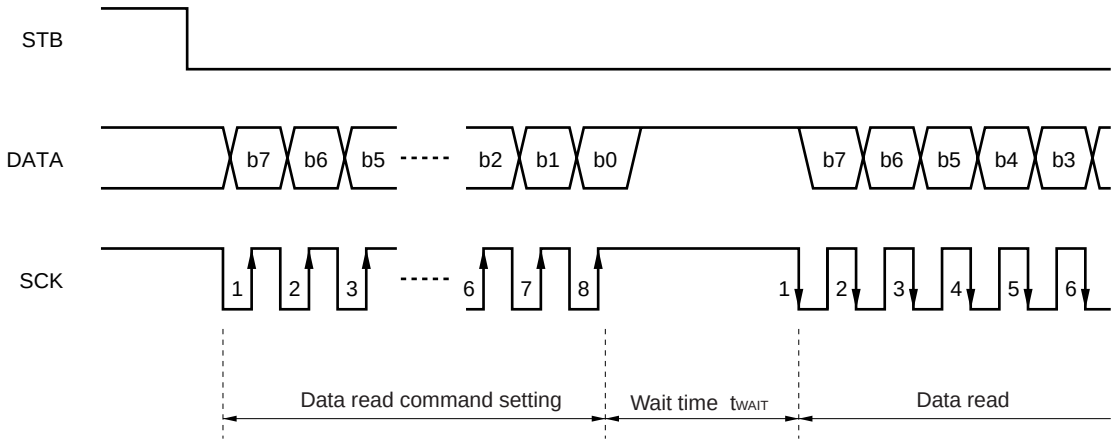
(1) Reception 1 (command write, 1 byte)



(2) Reception 2 (command/data write, 2 bytes or more)

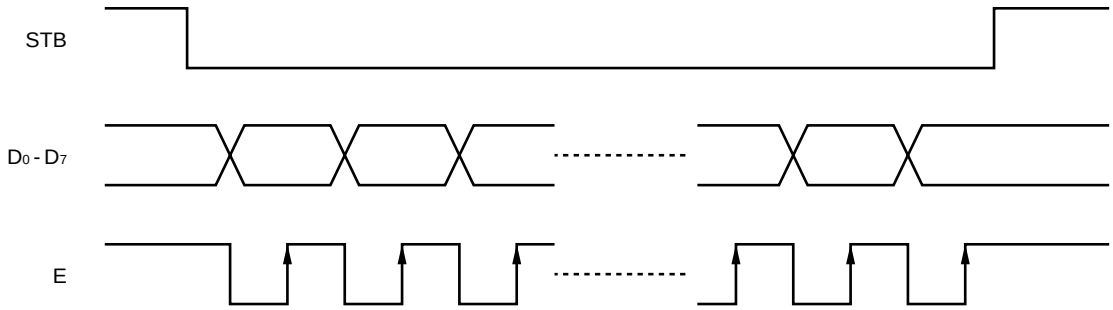


(3) Transmission (command/data read)



8.6 Parallel Communication Format

(1) 8-bit parallel interface



9. COMMAND EXAMPLES

Table 9-1. Initial Setting (1/39 duty) + Data Input

STB	D7	D6	D5	D4	D3	D2	D1	D0	Status
Hard Reset									
H	X	X	X	X	X	X	X	X	
L	0	0	0	1	1	0	0	1	Duty setting (1/39 duty)
H	X	X	X	X	X	X	X	X	
L	0	1	0	0	1	0	0	0	Address register (DDRAM address selection)
	0	0	0	0	0	0	0	0	DDRAM address: 00H
H	X	X	X	X	X	X	X	X	
L	1	0	1	1	0	0	0	0	Data write, address is incremented starting from current address
	D15	D14	D13	D12	D11	D10	D9	D8	Data for first character
	D7	D6	D5	D4	D3	D2	D1	D0	
	D15	D14	D13	D12	D11	D10	D9	D8	Data for second character
	D7	D6	D5	D4	D3	D2	D1	D0	
	:								
	D15	D14	D13	D12	D11	D10	D9	D8	Data for 54th character
	D7	D6	D5	D4	D3	D2	D1	D0	
H	X	X	X	X	X	X	X	X	
L	0	1	0	0	1	0	0	1	Address register (PDRAM address selection)
H	0	0	0	0	0	0	0	0	PDRAM address: 00H
L	X	X	X	X	X	X	X	X	
L	1	0	1	1	0	0	0	0	Data write, address is incremented starting from current address
	X	X	D	D	D	D	D	D	PDRAM: data at 00H
	X	X	D	D	D	D	D	D	PDRAM: data at 01H
	:								
	X	X	D	D	D	D	D	D	PDRAM: data at 0FH
H	X	X	X	X	X	X	X	X	
L	0	1	0	0	1	0	1	0	Address register (PBRAM address selection)
	0	0	0	0	0	0	0	0	PBRAM address : 00H
H	X	X	X	X	X	X	X	X	
L	1	0	1	1	0	0	0	0	Data write, address is incremented starting from current address
	X	X	D	D	D	D	D	D	PBRAM: data at 00H
	X	X	D	D	D	D	D	D	PBRAM: data at 01H
				:					
	X	X	D	D	D	D	D	D	PBRAM: data at 0FH
H	X	X	X	X	X	X	X	X	
L	0	0	0	0	1	1	1	1	Display ON
H	X	X	X	X	X	X	X	X	
To next processing									

Remark X : Don't care

Table 9-2. CGRAM Data Write

STB	D7	D6	D5	D4	D3	D2	D1	D0	Status
Start									
H	X	X	X	X	X	X	X	X	
L	0	1	0	0	1	0	1	1	Address register (CGRAM address selection)
	0	0	0	0	0	0	0	0	CGRAM address: 00H
H	X	X	X	X	X	X	X	X	
L	1	0	1	1	0	0	0	0	Data write, address is incremented starting from current address
	A	A	D5	D4	D3	D2	D1	D0	Data for first character (at 000H)
	A	A	D5	D4	D3	D2	D1	D0	Data in first line of pattern
	A	A	D5	D4	D3	D2	D1	D0	Data for first character (at 000H)
	A	A	D5	D4	D3	D2	D1	D0	Data in second line of pattern
	:								
	A	A	D5	D4	D3	D2	D1	D0	Data for Xth character (at 00mH)
	A	A	D5	D4	D3	D2	D1	D0	Data in nth line of pattern
H	X	X	X	X	X	X	X	X	
To next processing									

Remark X : Don't care

10. ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings (T_A = 25 °C, V_{SS} = 0 V)

Parameter	Symbol	Rating	Unit
Supply voltage (4x boost)	V_{DD}	–0.3 to +3.75	V
Supply voltage (3x boost)	V_{DD}	–0.3 to +5.0	V
Driver supply voltage	V_{LCD}	–0.3 to +15.0, $V_{DD} \leq V_{LCD}$	V
Driver reference supply input voltage	V_{LC1}-V_{LC5}	–0.3 to V_{LCD}+0.3	V
Logic system input voltage	V_{IN1}	–0.3 to V_{DD}+0.3	V
Logic system output voltage	V_{OUT1}	–0.3 to V_{DD}+0.3	V
Logic system input/output voltage	$V_{I/O1}$	–0.3 to V_{DD}+0.3	V
Driver system input voltage	V_{IN2}	–0.3 to V_{LCD}+0.3	V
Driver system output voltage	V_{OUT2}	–0.3 to V_{LCD}+0.3	V
Operating ambient temperature	T_A	–40 to +85	°C
Storage temperature	T_{stg}	–55 to +150	°C

Caution If the absolute maximum rating of even one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

Recommended Operating Range

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply voltage (4x boost)	V_{DD}	2.0		3.0	V
Supply voltage (3x boost)	V_{DD}	2.0		4.0	V
Driver supply voltage	V_{LCD}	5.0	10	12	V
Logic system input voltage	V_{IN}	0		V_{DD}	V
Driver system input voltage	V_{LC1}-V_{LC5}	0		V_{LCD}	V

Remarks 1. When using an external power supply, be sure to maintain these relations:
$V_{SS} < V_{LC5} < V_{LC4} < V_{LC3} < V_{LC2} < V_{LC1} \leq V_{LCD}$

2. Maintain $V_{DD} \leq V_{LCD}$ when turning the power on or off.

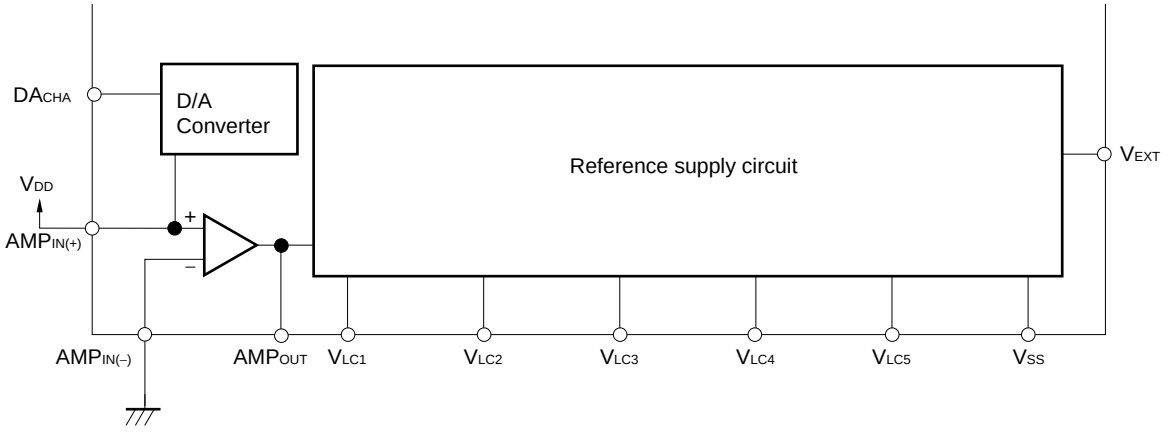
3. Keep voltage input to the $AMP_{IN(+)}$ pin between 1.0 V and V_{DD} when using an internal power supply but not using the D/A converter.

Electrical characteristics (unless otherwise specified, T_A = –40 to +85 °C, V_{DD} = 2.0 to 3.0 V during 4x boost mode or 2.0 to 4.0 V during 3x boost mode)

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
High-level input voltage	V_{IH}		$0.8V_{DD}$			V
Low-level input voltage	V_{IL}				$0.2V_{DD}$	V
High-level input current	I_{IH1}	Except for D_0/DATA and D_1 to D_7			1	μA
Low-level input current	I_{IL1}	Except for D_0/DATA and D_1 to D_7			–1	μA
High-level output voltage	V_{OH}	I_{OUT} = –1.0 mA, except OSC_{OUT}	V_{DD}–0.5			V
Low-level output voltage	V_{OL}	I_{OUT} = 2.0 mA, except OSC_{OUT}			0.5	V
High-level leakage current	I_{LOH}	D_0/DATA and D_1 to D_7, $V_{IN/OUT} = V_{DD}$			10	μA
Low-level leakage current	I_{LOL}	D_0/DATA and D_1 to D_7, $V_{IN/OUT} = V_{SS}$			–10	μA
Common output ON resistance	R_{COM}	$V_{LCn} \rightarrow COM_n$, $V_{LCD} \geq 3V_{DD}$, I_{LOL} = 50 μA			2	kΩ
Segment output ON resistance	R_{SEG}	$V_{LCn} \rightarrow SEG_n$, $V_{LCD} \geq 3V_{DD}$, I_{LOL} = 50 μA			4	kΩ
Driver voltage (boost voltage)	V_{LCD}	During 3x boost	$2.7V_{DD}$		$3.0V_{DD}$	V
		During 4x boost	$3.6V_{DD}$		$4.0V_{DD}$	V
Current consumption (normal mode)	I_{DD11}	f_{OSC} = 375 kHz, all display OFF data output, V_{DD} = 3.0 V during 3x boost mode		100	180	μA
		f_{OSC} = 375 kHz, all display OFF data output, V_{DD} = 3.0 V during 4x boost mode		135	210	μA
Current consumption (high-power mode)	I_{DD12}	f_{OSC} = 375 kHz, all display OFF data output, V_{DD} = 3.0 V during 3x boost mode		150	280	μA
		f_{OSC} = 375 kHz, all display OFF data output, V_{DD} = 3.0 V during 4x boost mode		200	340	μA
Driver system current consumption (V_{DD}) (Standby)	I_{DD21}	V_{DD} = 3.0 V		1	10	μA

Remark The TYP. value is a reference value when T_A = 25 °C

Test Circuit



Switching characteristics (unless otherwise specified, T_A = –40 to +85 °C)

V_{DD} = 2.0 to 2.7 V

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Oscillation frequency	f_{OSC}	Self-oscillation, oscillation resistance R = 100 kΩ	180		500	kHz
Transfer delay time	t_{PHL}	SCK↓→DATA↓			150	ns
Transfer delay time	t_{PLH}	SCK↓→DATA↑			150	ns

Remark The TYP. value is a reference value when T_A = 25 °C

V_{DD} = 2.7 to 3.3 V

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Oscillation frequency	f_{OSC}	Self-oscillation, oscillation resistance R = 100 kΩ	240	378	560	kHz
Transfer delay time	t_{PHL}	SCK↓→DATA↓			60	ns
Transfer delay time	t_{PLH}	SCK↓→DATA↑			60	ns

Remark Use the following equation to determine the time per frame.

1 frame = 1/f_{OSC} x 96 x number of duty

f_{OSC} = 375 kHz, Given a 1/52 duty,

1 frame = 2.67 μs (96 x 52 = 13.1 ms ≅ 75 Hz)

Required timing conditions (unless otherwise specified, T_A = –40 to +85 ºC)

Common (1) (V_{DD} = 2.0 to 2.7 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Clock frequency	f_{OSC}	OSC_{IN} external clock		375		kHz
High-level clock pulse width	t_{WHC1}	OSC_{IN} external clock	1000			ns
Low-level clock pulse width	t_{WLC1}	OSC_{IN} external clock	1000			ns
High-level clock pulse width	t_{WHC2}	OSC_{BRI} external clock	1000			ns
Low-level clock pulse width	t_{WLC2}	OSC_{BRI} external clock	1000			ns
Rise/fall time	tr,tf	OSC_{BRI} external clock			100	ns
Reset pulse width	t_{WRE}	/RESET pin	100			μs
Reset cancellation time	t_{RRE}	/RESET pin	100			μs

Remark The TYP. value is a reference value when T_A = 25 °C

Common (2) (V_{DD} = 2.7 to 3.3 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Clock frequency	f_{OSC}	OSC_{IN} external clock	240	375	560	kHz
High-level clock pulse width	t_{WHC1}	OSC_{IN} external clock	500			ns
Low-level clock pulse width	t_{WLC1}	OSC_{IN} external clock	500			ns
High-level clock pulse width	t_{WHC2}	OSC_{BRI} external clock	400			ns
Low-level clock pulse width	t_{WLC2}	OSC_{BRI} external clock	400			ns
Rise/fall time	t_r,t_f	OSC_{BRI} external clock			100	ns
Reset pulse width	t_{WRE}	/RESET pin	50			μs
Reset cancellation time	t_{RRE}	/RESET pin	50			μs

Remark The TYP. value is a reference value when T_A = 25 °C

Serial interface (1) (V_{DD} = 2.0 to 2.7 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Shift clock cycle	t_{CYK}	SCK	2000			ns
High-level shift clock pulse width	t_{WHK}	SCK	1000			ns
Low-level shift clock pulse width	t_{WLK}	SCK	1000			ns
Shift clock hold time	t_{HSTBK}	STB↓→SCK↓	300			ns
Data setup time	t_{DS1}	DATA→SCK↑	150			ns
Data hold time	t_{DH1}	SCK↑→DATA	150			ns
STB hold time	t_{HKSTB}	SCK↑→STB↑	300			ns
STB pulse width	t_{WSTB}		300			ns
★ Wait time	t_{WAIT}	8th SCK↑→1st SCK↓	1000			ns

Remarks 1. The TYP. value is a reference value when T_A = 25 °C

2. T.B.D To be determine

Serial interface (2) (V_{DD} = 2.7 to 3.3 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Shift clock cycle	t_{CYK}	SCK	500			ns
High-level shift clock pulse width	t_{WHK}	SCK	260			ns
Low-level shift clock pulse width	t_{WLK}	SCK	210			ns
Shift clock hold time	t_{HSTBK}	STB↓→SCK↓	260			ns
Data setup time	t_{DS1}	DATA→SCK↑	40			ns
Data hold time	t_{DH1}	SCK↑→DATA	40			ns
STB hold time	t_{HKSTB}	SCK↑→STB↑	260			ns
STB pulse width	t_{WSTB}		210			ns
Wait time	t_{WAIT}	8th SCK↑→1st SCK↓	260			ns

Remark The TYP. value is a reference value when T_A = 25 °C

Parallel interface (1) (V_{DD} = 2.0 to 2.7 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Enable cycle time	t_{CYCE}	E↑→E↑	2000			ns
High-level enable pulse width	t_{WHE}	E	1000			ns
Low-level enable pulse width	t_{WLE}	E	1000			ns
STB pulse width	t_{WSTB}		300			ns
STB hold time	t_{WKSTB}		300			ns
Enable hold time	t_{HSTBK}		300			ns
Data setup time	t_{DS2}	D_0 to D_7→E↑	150			ns
Data hold time	t_{DH2}	D_0 to D_7→E↓	150			ns

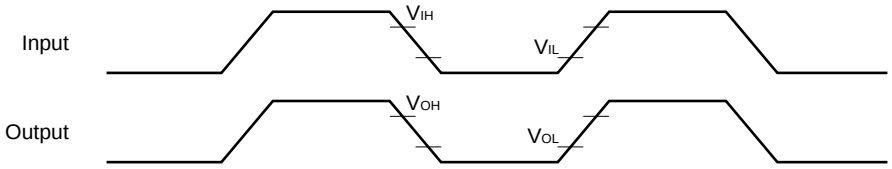
Remark The TYP. value is a reference value when T_A = 25 °C

Parallel interface (2) (V_{DD} = 2.7 to 3.3 V)

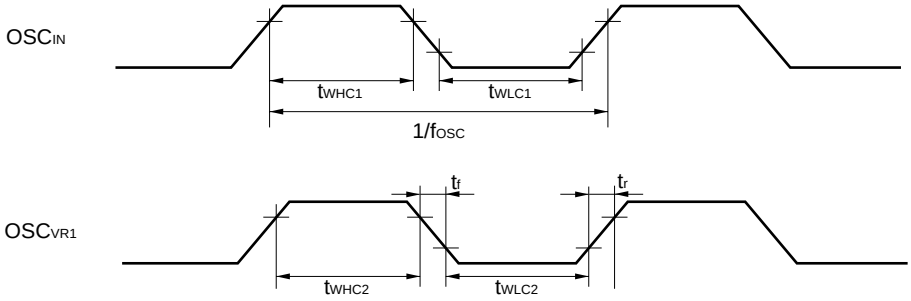
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Enable cycle time	t_{CYCE}	E↑→E↑	500			ns
High-level enable pulse width	t_{WHE}	E	260			ns
Low-level enable pulse width	t_{WLE}	E	210			ns
STB pulse width	t_{WSTB}		210			ns
STB hold time	t_{WKSTB}		260			ns
Enable hold time	t_{HSTBK}		260			ns
Data setup time	t_{DS2}	D_0 to D_7→E↑	40			ns
Data hold time	t_{DH2}	D_0 to D_7→E↓	40			ns

Remark The TYP. value is a reference value when T_A = 25 °C

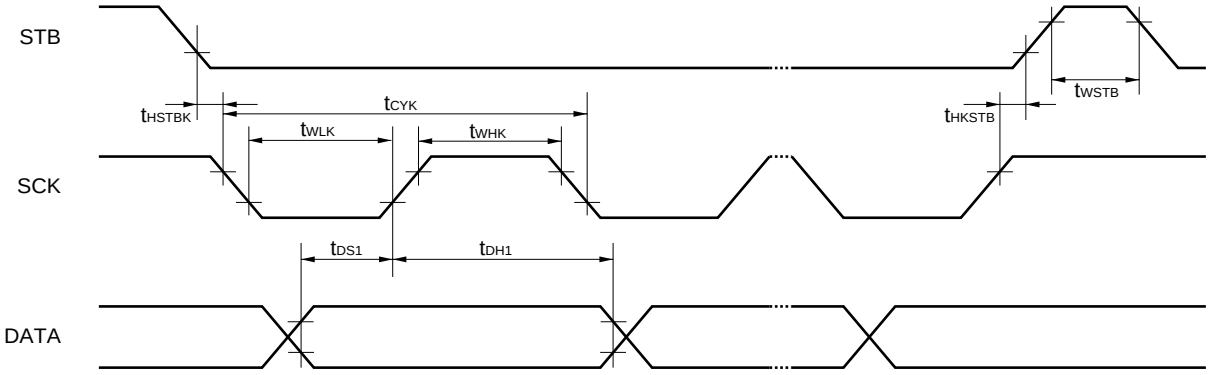
AC timing measurement voltages



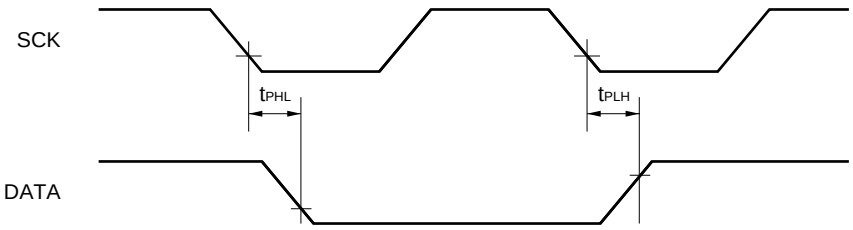
AC characteristics waveforms



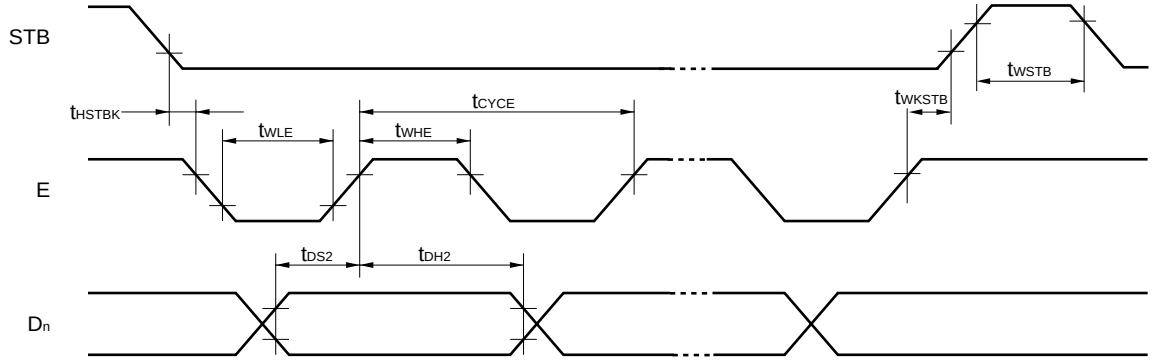
Serial interface (input)



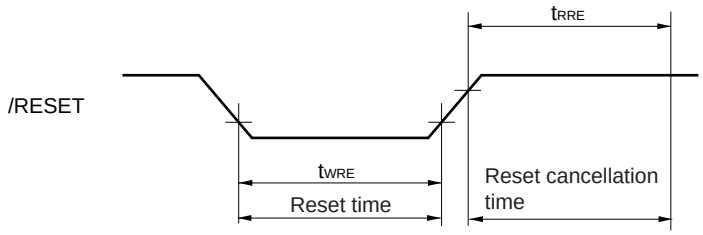
Serial interface (output)



8-bit parallel interface



Reset



11. CHARACTER CODE TABLES (standard ROM code, μPD16681AW/P-001)

The following tables show the correspondences between character codes and characters. Character codes ranging from 0000H to 0007H are assigned to CGRAM and those ranging from 1000H to 1380H are assigned to an area that is defined by the user when establishing custom ROM codes.

Character allocation table (1)

C12 = 0

C11	C10	C9	C8	C7		C6	C5	C4	C3	C2	C1	C0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	0	0	0	0	0	0	0	0	0	0	0	CGRAM status																																
0	0	0	0	1	1	0	0	0	0	0	0	1		!	″	#	$	%	&	’	(	)	*	+	,	−	.	/	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
0	0	0	1	0	2	0	0	0	0	0	1	0	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[	¥	]	^	_
0	0	0	1	1	3	0	0	0	0	0	1	1	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	{	|	}	→	←
0	0	1	0	0	4	0	0	0	0	1	0	0		。	「	」	、	・	ヲ	ァ	ィ	ゥ	ェ	ォ	ャ	ュ	ョ	ッ	ー	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ
0	0	1	0	1	5	0	0	0	0	1	0	1	タ	チ	ツ	テ	ト	ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ	マ	ミ	ム	メ	モ	ヤ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ	ン	″	°
0	0	1	1	0	6	0	0	0	0	1	1	0	【	】	年	月	火	水	木	金	土	日	~	▼	▲	◀	▶	▮	百	千	万	円	x	÷	↑	↓	↵	〒						
0	0	1	1	1	7	0	0	0	0	1	1	1																																	
0	1	0	0	0	8	0	1	0	0	0	0	0		—	|	┌	┐	┘	└	├	┬	┤	┴	┼	━	┃	┏	┓	┛	┗	┣	┳	┫	┻	╋	┠	┯	┨	┷	┿	┝	┰	┥	┸
0	1	0	0	1	9	0	1	0	0	0	0	1		㈱	゛	゜	;	゛	・	:	;	?	!	゛	゜	´	`	¨	^	￣	_	ヽ	ヾ	ゝ	ゞ	〃	仝	々	〆	〇	ー	―	‐	／
0	1	0	1	0	10	0	1	0	0	0	1	0		◆	□	■	△	▲	▽	▼	※	〒	→	←	↑	↓	=												∈	∋	⊆	⊇	⊂	⊃
0	1	0	1	1	11	0	1	0	0	0	1	1																	0	1	2	3	4	5	6	7	8	9						
0	1	1	0	0	12	0	1	1	0	0	0	0		ぁ	あ	ぃ	い	ぅ	う	ぇ	え	ぉ	お	か	が	き	ぎ	く	ぐ	け	げ	こ	ご	さ	ざ	し	じ	す	ず	せ	ぜ	そ	ぞ	た
0	1	1	0	1	13	0	1	1	0	0	0	1		ァ	ア	ィ	イ	ゥ	ウ	ェ	エ	ォ	オ	カ	ガ	キ	ギ	ク	グ	ケ	ゲ	コ	ゴ	サ	ザ	シ	ジ	ス	ズ	セ	ゼ	ソ	ゾ	タ
0	1	1	1	0	14	0	1	1	1	0	1	0		Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω						
0	1	1	1	1	15	0	1	1	1	0	1	1		А	Б	В	Г	Д	Е	Ё	Ж	З	И	Й	К	Л	М	Н	О	П	Р	С	Т	У	Ф	Х	Ц	Ч	Ш	Щ	Ъ	Ы	Ь	Э
1	0	0	0	0	16	1	0	0	0	0	0	0	┼																																
1	0	0	0	1	17	1	0	0	0	0	0	1	＼	～	‖	|	…	‥	‘	’	“	”	（	）	〔	〕	［	］	｛	｝	〈	〉	《	》	「	」	『	』	【	】	＋	－	±	×
1	0	0	1	0	18	1	0	0	1	0	0	0	∪	∩									∧	∨	¬	⇒	⇔	∀	∃												∠	⊥	⌒	∂
1	0	0	1	1	19	1	0	0	1	1	0	0		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z					
1	0	1	0	0	20	1	0	1	0	0	0	0	だ	ち	ぢ	っ	つ	づ	て	で	と	ど	な	に	ぬ	ね	の	は	ば	ぱ	ひ	び	ぴ	ふ	ぶ	ぷ	へ	べ	ぺ	ほ	ぼ	ぽ	ま	み
1	0	1	0	1	21	1	0	1	0	0	0	1	ダ	チ	ヂ	ッ	ツ	ヅ	テ	デ	ト	ド	ナ	ニ	ヌ	ネ	ノ	ハ	バ	パ	ヒ	ビ	ピ	フ	ブ	プ	ヘ	ベ	ペ	ホ	ボ	ポ	マ	ミ
1	0	1	1	0	22	1	0	1	1	0	1	0		α	β	γ	δ	ε	ζ	η	θ	ι	κ	λ	μ	ν	ξ	ο	π	ρ	σ	τ	υ	φ	χ	ψ	ω						
1	0	1	1	1	23	1	0	1	1	1	0	0	Ю	Я																а	б	в	г	д	е	ё	ж	з	и	й	к	л	м	н
1	1	0	0	0	24	1	1	0	0	0	0	0																																	
1	1	0	0	1	25	1	1	0	0	1	0	1	÷	＝	≠	＜	＞	≦	≧	∞	∴	♂	♀	゛	゜	″	℃	¥	$	¢	£	%	#	&	*	@	§	☆	★	○	●	◎	◇		
1	1	0	1	0	26	1	1	0	1	0	1	0	∇	≡	≒	≪	≫	√	∽	∝	∵	∫	∬								Å	‰	#	♭	♪	†	‡	¶					○		
1	1	0	1	1	27	1	1	0	1	1	0	0		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z					
1	1	1	0	0	28	1	1	1	0	0	0	0	む	め	も	ゃ	や	ゅ	ゆ	ょ	よ	ら	り	る	れ	ろ	ゎ	わ	ゐ	ゑ	を	ん												
1	1	1	0	1	29	1	1	1	0	1	0	1	ム	メ	モ	ャ	ヤ	ュ	ユ	ョ	ヨ	ラ	リ	ル	レ	ロ	ヮ	ワ	ヰ	ヱ	ヲ	ン	ヴ	ヵ	ヶ								
1	1	1	1	0	30	1	1	1	1	0	1	0																																	
1	1	1	1	1	31	1	1	1	1	1	1	1	о	п	р	с	т	у	ф	х	ц	ч	ш	щ	ъ	ы	ь	э	ю	я														

Half width (5 x 12 dots) character

Character allocation table (2)

C12 = 0

						C6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
						C5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
						C4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
						C3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1
						C2	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0
						C1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
						C0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
C11	C10	C9	C8	C7			32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	0	0	0	0	0		亜	唖	娃	阿	哀	愛	挨	姶	逢	葵	茜	穐	悪	握	渥	旭	葦	芦	鯵	梓	圧	斡	扱	宛	姐	虻	飴	絢	綾	鮎	或
0	0	0	0	1	1		院	陰	隠	韻	吋	右	宇	烏	羽	迂	雨	卯	鵜	窺	丑	碓	臼	渦	嘘	唄	鬱	蔚	鰻	姥	厩	浦	瓜	閏	噂	云	運
0	0	0	1	0	2		押	旺	横	欧	殴	王	翁	襖	鴬	鴎	黄	岡	沖	荻	億	屋	憶	臆	桶	牡	乙	俺	卸	恩	温	穏	音	下	化	仮	何
0	0	0	1	1	3		魁	晦	械	海	灰	界	皆	絵	芥	蟹	開	階	貝	凱	劾	外	咳	害	崖	慨	概	涯	碍	蓋	街	該	鎧	骸	浬	馨	蛙
0	0	1	0	0	4		粥	刈	苅	瓦	乾	侃	冠	寒	刊	勘	勧	巻	喚	堪	姦	完	官	寛	干	幹	患	感	慣	憾	換	敢	柑	桓	棺	款	歓
0	0	1	0	1	5		機	帰	毅	気	汽	畿	祈	季	稀	紀	徽	規	記	貴	起	軌	輝	飢	騎	鬼	亀	偽	儀	妓	宜	戯	技	擬	欺	犠	疑
0	0	1	1	0	6		供	侠	僑	兇	競	共	凶	協	匡	卿	叫	喬	境	峡	強	彊	怯	恐	恭	挟	教	橋	況	狂	狭	矯	胸	脅	興	蕎	郷
0	0	1	1	1	7		掘	窟	沓	靴	轡	窪	熊	隈	粂	栗	繰	桑	鍬	勲	君	薫	訓	群	軍	郡	卦	袈	祁	係	傾	刑	兄	啓	圭	珪	型
0	1	0	0	0	8		検	権	牽	犬	献	研	硯	絹	県	肩	見	謙	賢	軒	遣	鍵	険	顕	験	鹸	元	原	厳	幻	弦	減	源	玄	現	絃	舷
0	1	0	0	1	9		后	喉	坑	垢	好	孔	孝	宏	工	巧	巷	幸	広	庚	康	弘	恒	慌	抗	拘	控	攻	昂	晃	更	杭	校	梗	構	江	洪
0	1	0	1	0	10		此	頃	今	困	坤	墾	婚	恨	懇	昏	昆	根	梱	混	痕	紺	艮	魂	些	佐	叉	唆	嵯	左	差	査	沙	瑳	砂	詐	鎖
0	1	0	1	1	11		察	挿	撮	擦	札	殺	薩	雑	皐	鯖	捌	錆	鮫	皿	晒	三	傘	参	山	惨	撒	散	桟	燦	珊	産	算	纂	蚕	讃	賛
0	1	1	0	0	12		次	滋	治	爾	璽	痔	磁	示	而	耳	自	蒔	辞	汐	鹿	式	識	鴫	竺	軸	宍	雫	七	叱	執	失	嫉	室	悉	湿	漆
0	1	1	0	1	13		宗	就	州	修	愁	拾	洲	秀	秋	終	繍	習	臭	舟	蒐	衆	襲	警	蹴	輯	週	酋	酬	集	醜	什	住	充	十	従	戎
0	1	1	1	0	14		勝	匠	升	召	哨	商	唱	嘗	奨	妾	娼	宵	将	小	少	尚	庄	床	廠	彰	承	抄	招	掌	捷	昇	昌	昭	晶	松	梢
0	1	1	1	1	15		拭	植	殖	燭	織	職	色	触	食	蝕	辱	尻	伸	信	侵	唇	娠	寝	審	心	慎	振	新	晋	森	榛	浸	深	申	疹	真
1	0	0	0	0	16		澄	摺	寸	世	瀬	畝	是	凄	制	勢	姓	征	性	成	政	整	星	晴	棲	栖	正	清	牲	生	盛	精	聖	声	製	西	誠
1	0	0	0	1	17		繊	羨	腺	舛	船	薦	詮	賤	践	選	遷	銭	銑	閃	鮮	前	善	漸	然	全	禅	繕	膳	糧	噌	塑	岨	措	曾	曽	楚
1	0	0	1	0	18		臓	蔵	贈	造	促	側	則	即	息	捉	束	測	足	速	俗	属	賊	族	続	卒	袖	其	揃	存	孫	尊	損	村	遜	他	多
1	0	0	1	1	19		叩	但	達	辰	奪	脱	巽	竪	辿	棚	谷	狸	鱈	樽	誰	丹	単	嘆	坦	担	探	旦	歎	淡	湛	炭	短	端	箪	綻	耽
1	0	1	0	0	20		帖	帳	庁	弔	張	彫	徴	懲	挑	暢	朝	潮	牒	町	眺	聴	脹	腸	蝶	調	諜	超	跳	銚	長	頂	鳥	勅	捗	直	朕
1	0	1	0	1	21		邸	鄭	釘	鼎	泥	摘	擢	敵	滴	的	笛	適	鏑	溺	哲	徹	撤	轍	迭	鉄	典	填	天	展	店	添	纏	甜	貼	転	顛
1	0	1	1	0	22		童	蕩	藤	討	謄	豆	踏	逃	透	鐙	陶	頭	騰	闘	働	動	同	堂	導	憧	撞	洞	瞳	童	胴	萄	道	銅	峠	鴇	匿
1	0	1	1	1	23		如	尿	韮	任	妊	忍	認	濡	禰	祢	寧	葱	猫	熱	年	念	捻	撚	燃	粘	乃	廼	之	埜	嚢	悩	濃	納	能	脳	膿
1	1	0	0	0	24		函	箱	硲	箸	肇	筈	櫨	幡	肌	畑	畠	八	鉢	溌	発	醗	髪	伐	罰	抜	筏	閥	鳩	噺	塙	蛤	隼	伴	判	半	反
1	1	0	0	1	25		鼻	柊	稗	匹	疋	髭	彦	膝	菱	肘	弼	必	畢	筆	逼	桧	姫	媛	紐	百	謬	俵	彪	標	氷	漂	瓢	票	表	評	豹
1	1	0	1	0	26		福	腹	複	覆	淵	弗	払	沸	仏	物	鮒	分	吻	噴	墳	憤	扮	焚	奮	粉	糞	紛	雰	文	聞	丙	併	兵	塀	幣	平
1	1	0	1	1	27		法	泡	烹	砲	縫	胞	芳	萌	蓬	蜂	褒	訪	豊	邦	鋒	飽	鳳	鵬	乏	亡	傍	剖	坊	妨	帽	忘	忙	房	暴	望	某
1	1	1	0	0	28		漫	蔓	味	未	魅	巳	箕	岬	密	蜜	湊	蓑	稔	脈	妙	粍	民	眠	務	夢	無	牟	矛	霧	鵡	椋	婿	娘	冥	名	命
1	1	1	0	1	29		諭	輸	唯	佑	優	勇	友	宥	幽	悠	憂	揖	有	柚	湧	涌	猶	猷	由	祐	裕	誘	遊	邑	郵	雄	融	夕	予	余	与
1	1	1	1	0	30		痢	裏	裡	里	離	陸	律	率	立	葎	掠	略	劉	流	溜	琉	留	硫	粒	隆	竜	龍	侶	慮	旅	虜	了	亮	僚	両	凌
1	1	1	1	1	31		蓮	連	錬	呂	魯	櫓	炉	賂	路	露	労	婁	廊	弄	朗	楼	榔	浪	漏	牢	狼	篭	老	聾	蝋	郎	六	麓	禄	肋	録

Character allocation table (3)

C12 = 0

					C6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
					C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					C4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
					C3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1
					C2	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	1	1
					C1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
					C0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
C11	C10	C9	C8	C7		64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
0	0	0	0	0	0	粟	袷	安	庵	按	暗	案	闇	鞍	杏	以	伊	位	依	偉	囲	夷	委	威	尉	惟	意	慰	易	椅	為	畏	異	移	維	緯	胃
0	0	0	0	1	1	雲	荏	餌	叡	営	嬰	影	映	曳	栄	永	泳	洩	瑛	盈	穎	頴	英	衛	詠	鋭	液	疫	益	駅	悦	謁	越	閲	榎	厭	円
0	0	0	1	0	2	伽	価	佳	加	可	嘉	夏	嫁	家	寡	科	暇	果	架	歌	河	火	珂	禍	禾	稼	箇	花	苛	茄	荷	華	菓	蝦	課	嘩	貨
0	0	0	1	1	3	垣	柿	蛎	鈎	劃	嚇	各	廓	拡	撹	格	核	殻	獲	確	穫	覚	角	赫	較	郭	閣	隔	革	学	岳	楽	額	顎	掛	笠	樫
0	0	1	0	0	4	汗	漢	澗	潅	環	甘	監	看	竿	管	簡	緩	缶	翰	肝	艦	莞	観	諌	貫	還	鑑	間	閑	関	陥	韓	館	舘	丸	含	岸
0	0	1	0	1	5	祇	義	蟻	誼	議	掬	菊	鞠	吉	吃	喫	桔	橘	詰	砧	杵	黍	却	客	脚	虐	逆	丘	久	仇	休	及	吸	宮	弓	急	救
0	0	1	1	0	6	鏡	響	饗	驚	仰	凝	尭	暁	業	局	曲	極	玉	桐	粁	僅	勤	均	巾	錦	斤	欣	欽	琴	禁	禽	筋	緊	芹	菌	衿	襟
0	0	1	1	1	7	契	形	径	恵	慶	慧	憩	掲	携	敬	景	桂	渓	畦	稽	系	経	継	繋	罫	茎	荊	蛍	計	詣	警	軽	頚	鶏	芸	迎	鯨
0	1	0	0	0	8	言	諺	限	乎	個	古	呼	固	姑	孤	己	庫	弧	戸	故	枯	湖	狐	糊	袴	股	胡	菰	虎	誇	跨	鈷	雇	顧	鼓	五	互
0	1	0	0	1	9	浩	港	溝	甲	皇	硬	稿	糠	紅	紘	絞	綱	耕	考	肯	肱	腔	膏	航	荒	行	衡	講	貢	購	郊	酵	鉱	砿	鋼	閤	降
0	1	0	1	0	10	裟	坐	座	挫	債	催	再	最	哉	塞	妻	宰	彩	才	採	栽	歳	済	災	采	犀	砕	砦	祭	斎	細	菜	裁	載	際	剤	在
0	1	0	1	1	11	酸	餐	斬	暫	残	仕	仔	伺	使	刺	司	史	嗣	四	士	始	姉	姿	子	屍	市	師	志	思	指	支	孜	斯	施	旨	枝	止
0	1	1	0	0	12	疾	質	実	蒔	篠	偲	柴	芝	屡	蕊	縞	舎	写	射	捨	赦	斜	煮	社	紗	者	謝	車	遮	蛇	邪	借	勺	尺	杓	灼	爵
0	1	1	0	1	13	柔	汁	渋	獣	縦	重	銃	叔	夙	宿	淑	祝	縮	粛	塾	熟	出	術	述	俊	峻	春	瞬	竣	舜	駿	准	循	旬	楯	殉	淳
0	1	1	1	0	14	樟	樵	沼	消	渉	湘	焼	焦	照	症	省	硝	礁	祥	称	章	笑	粧	紹	肖	菖	蒋	蕉	衝	裳	訟	証	詔	詳	象	賞	醤
0	1	1	1	1	15	神	秦	紳	臣	芯	薪	親	診	身	辛	進	針	震	人	仁	刃	塵	壬	尋	甚	尽	腎	訊	迅	陣	靭	笥	諏	須	酢	図	厨
1	0	0	0	0	16	誓	請	逝	醒	青	静	斉	税	脆	隻	席	惜	戚	斥	昔	析	石	積	籍	績	脊	責	赤	跡	蹟	碩	切	拙	接	摂	折	設
1	0	0	0	1	17	狙	疏	疎	礎	祖	租	粗	素	組	蘇	訴	阻	遡	鼠	僧	創	双	叢	倉	喪	壮	奏	爽	宋	層	匝	惣	想	捜	掃	挿	掻
1	0	0	1	0	18	太	汰	詑	唾	堕	妥	惰	打	柁	舵	楕	陀	駄	騨	体	堆	対	耐	岱	帯	待	怠	態	戴	替	泰	滞	胎	腿	苔	袋	貸
1	0	0	1	1	19	胆	蛋	誕	鍛	団	壇	弾	断	暖	檀	段	男	談	値	知	地	弛	恥	智	池	痴	稚	置	致	蜘	遅	馳	築	畜	竹	筑	蓄
1	0	1	0	0	20	沈	珍	賃	鎮	陳	津	墜	椎	槌	追	鎚	痛	通	塚	栂	掴	槻	佃	漬	柘	辻	蔦	綴	鍔	椿	潰	坪	壷	嬬	紬	爪	吊
1	0	1	0	1	21	点	伝	殿	澱	田	電	兎	吐	堵	塗	妬	屠	徒	斗	杜	渡	登	菟	賭	途	都	鍍	砥	砺	努	度	土	奴	怒	倒	党	冬
1	0	1	1	0	22	得	徳	涜	特	督	禿	篤	毒	独	読	栃	橡	凸	突	椴	届	鳶	苫	寅	酉	瀞	噸	屯	惇	敦	沌	豚	遁	頓	呑	曇	鈍
1	0	1	1	1	23	農	覗	蚤	巴	把	播	覇	杷	波	派	琶	破	婆	罵	芭	馬	俳	廃	拝	排	敗	杯	盃	牌	背	肺	輩	配	倍	培	媒	梅
1	1	0	0	0	24	叛	帆	搬	斑	板	氾	汎	版	犯	班	畔	繁	般	藩	販	範	采	煩	頒	飯	挽	晩	番	盤	磐	蕃	蛮	匪	卑	否	妃	庇
1	1	0	0	1	25	廟	描	病	秒	苗	錨	鋲	蒜	蛭	鰭	品	彬	斌	浜	瀕	貧	賓	頻	敏	瓶	不	付	埠	夫	婦	富	冨	布	府	怖	扶	敷
1	1	0	1	0	26	弊	柄	並	蔽	閉	陛	米	頁	僻	壁	癖	碧	別	瞥	蔑	箆	偏	変	片	篇	編	辺	返	遍	便	勉	娩	弁	鞭	保	舗	鋪
1	1	0	1	1	27	棒	冒	紡	肪	膨	謀	貌	貿	鉾	防	吠	頬	北	僕	卜	墨	撲	朴	牧	睦	穆	釦	勃	没	殆	堀	幌	奔	本	翻	凡	盆
1	1	1	0	0	28	明	盟	迷	銘	鳴	姪	牝	滅	免	棉	綿	緬	面	麺	摸	模	茂	妄	孟	毛	猛	盲	網	耗	蒙	儲	木	黙	目	杢	勿	餅
1	1	1	0	1	29	誉	輿	預	傭	幼	妖	容	庸	揚	揺	擁	曜	楊	様	洋	溶	熔	用	窯	羊	耀	葉	蓉	要	謡	踊	遥	陽	養	慾	抑	欲
1	1	1	1	0	30	寮	料	梁	涼	猟	療	瞭	稜	糧	良	諒	遼	量	陵	領	力	緑	倫	厘	林	淋	燐	琳	臨	輪	隣	鱗	麟	瑠	塁	涙	累
1	1	1	1	1	31	論	倭	和	話	歪	賄	脇	惑	枠	鷲	亙	亘	鰐	詫	藁	蕨	椀	湾	碗	腕												

Character allocation table (4)

C12 = 0

					C6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
					C5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
					C4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
					C3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
					C2	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1
					C1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1
					C0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
C11	C10	C9	C8	C7		96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
0	0	0	0	0	0	萎	衣	謂	違	遺	医	井	亥	域	育	郁	磯	一	壱	溢	逸	稲	茨	芋	鰯	允	印	咽	員	因	姻	引	飲	淫	胤	蔭
0	0	0	0	1	1	園	堰	奄	宴	延	怨	掩	援	沿	演	炎	焔	煙	燕	猿	縁	艶	苑	薗	遠	鉛	鴛	塩	於	汚	甥	凹	央	奥	往	応
0	0	0	1	0	2	迦	過	霞	蚊	俄	峨	我	牙	画	臥	芽	蛾	賀	雅	餓	駕	介	会	解	回	塊	壊	廻	快	怪	悔	恢	懐	戒	拐	改
0	0	0	1	1	3	橿	梶	鰍	潟	割	喝	恰	括	活	渇	滑	葛	褐	轄	且	鰹	叶	椛	樺	鞄	株	兜	竈	蒲	釜	鎌	噛	鴨	栢	茅	萱
0	0	1	0	0	4	巌	玩	癌	眼	岩	翫	贋	雁	頑	顔	願	企	伎	危	喜	器	基	奇	嬉	寄	岐	希	幾	忌	揮	机	旗	既	期	棋	棄
0	0	1	0	1	5	朽	求	汲	泣	灸	球	究	窮	笈	級	糾	給	旧	牛	去	居	巨	拒	拠	挙	渠	虚	許	距	鋸	漁	禦	魚	亨	享	京
0	0	1	1	0	6	謹	近	金	吟	銀	九	倶	句	区	狗	玖	矩	苦	躯	駆	駈	駒	具	愚	虞	喰	空	偶	寓	遇	隅	串	櫛	釧	屑	屈
0	0	1	1	1	7	劇	戟	撃	激	隙	桁	傑	欠	決	潔	穴	結	血	訣	月	件	倹	倦	健	兼	券	剣	喧	圏	堅	嫌	建	憲	懸	拳	捲
0	1	0	0	0	8	伍	午	呉	吾	娯	後	御	悟	梧	檎	瑚	碁	語	誤	護	醐	乞	鯉	交	佼	侯	候	倖	光	公	功	効	勾	厚	口	向
0	1	0	0	1	9	項	香	高	鴻	剛	劫	号	合	壕	拷	濠	豪	轟	麹	克	刻	告	国	穀	酷	鵠	黒	獄	漉	腰	甑	忽	惚	骨	狛	込
0	1	0	1	0	10	材	罪	財	冴	坂	阪	堺	榊	肴	咲	崎	埼	碕	鷺	作	削	咋	搾	昨	朔	柵	窄	策	索	錯	桜	鮭	笹	匙	冊	刷
0	1	0	1	1	11	死	氏	獅	祉	私	糸	紙	紫	肢	脂	至	視	詞	詩	試	誌	諮	資	賜	雌	飼	歯	事	似	侍	児	字	寺	慈	持	時
0	1	1	0	0	12	酌	釈	錫	若	寂	弱	惹	主	取	守	手	朱	殊	狩	珠	種	腫	趣	酒	首	儒	受	呪	寿	授	樹	綬	需	囚	収	周
0	1	1	0	1	13	準	潤	盾	純	巡	遵	醇	順	処	初	所	暑	曙	渚	庶	緒	署	書	薯	藷	諸	助	叙	女	序	徐	恕	鋤	除	傷	償
0	1	1	1	0	14	鉦	鍾	鐘	障	鞘	上	丈	丞	乗	冗	剰	城	場	壌	嬢	常	情	擾	条	杖	浄	状	畳	穣	蒸	譲	醸	錠	嘱	埴	飾
0	1	1	1	1	15	逗	吹	垂	帥	推	水	炊	睡	粋	翠	衰	遂	酔	錐	錘	随	瑞	髄	崇	嵩	数	枢	趨	雛	据	杉	椙	菅	頗	雀	裾
1	0	0	0	0	16	窃	節	説	雪	絶	舌	蝉	仙	先	千	占	宣	専	尖	川	戦	扇	撰	栓	栴	泉	浅	洗	染	潜	煎	煽	旋	穿	箭	線
1	0	0	0	1	17	操	早	曹	巣	槍	槽	漕	燥	争	痩	相	窓	糟	総	綜	聡	草	荘	葬	蒼	藻	装	走	送	遭	鎗	霜	騒	像	増	憎
1	0	0	1	0	18	退	逮	隊	黛	鯛	代	台	大	第	醍	題	鷹	滝	瀧	卓	啄	宅	托	択	拓	沢	濯	琢	託	鐸	濁	諾	茸	凧	蛸	只
1	0	0	1	1	19	逐	秩	窒	茶	嫡	着	中	仲	宙	忠	抽	昼	柱	注	虫	衷	註	酎	鋳	駐	樗	瀦	猪	苧	著	貯	丁	兆	凋	喋	寵
1	0	1	0	0	20	釣	鶴	亭	低	停	偵	剃	貞	呈	堤	定	帝	底	庭	廷	弟	悌	抵	挺	提	梯	汀	碇	禎	程	締	艇	訂	諦	蹄	逓
1	0	1	0	1	21	凍	刀	唐	塔	塘	套	宕	島	嶋	悼	投	搭	東	桃	梼	棟	盗	淘	湯	涛	灯	燈	当	痘	祷	等	答	筒	糖	統	到
1	0	1	1	0	22	奈	那	内	乍	凪	薙	謎	灘	捺	鍋	楢	馴	縄	畷	南	楠	軟	難	汝	二	尼	弐	迩	匂	賑	肉	虹	廿	日	乳	入
1	0	1	1	1	23	楳	煤	狽	買	売	賠	陪	這	蝿	秤	矧	萩	伯	剥	博	拍	柏	泊	白	箔	粕	舶	薄	迫	曝	漠	爆	縛	莫	駁	麦
1	1	0	0	0	24	彼	悲	扉	批	披	斐	比	泌	疲	皮	碑	秘	緋	罷	肥	被	誹	費	避	非	飛	樋	簸	備	尾	微	枇	毘	琵	眉	美
1	1	0	0	1	25	斧	普	浮	父	符	腐	膚	芙	譜	負	賦	赴	阜	附	侮	撫	武	舞	葡	蕪	部	封	楓	風	葺	蕗	伏	副	復	幅	服
1	1	0	1	0	26	圃	捕	歩	甫	補	輔	穂	募	墓	慕	戊	暮	母	簿	菩	倣	俸	包	呆	報	奉	宝	峰	峯	崩	庖	抱	捧	放	方	朋
1	1	0	1	1	27	摩	磨	魔	麻	埋	妹	昧	枚	毎	哩	槙	幕	膜	枕	鮪	柾	鱒	桝	亦	俣	又	抹	末	沫	迄	侭	繭	麿	万	慢	満
1	1	1	0	0	28	尤	戻	籾	貰	問	悶	紋	門	匁	也	冶	夜	爺	耶	野	弥	矢	厄	役	約	薬	訳	躍	靖	柳	薮	鑓	愉	愈	油	癒
1	1	1	0	1	29	沃	浴	翌	翼	淀	羅	螺	裸	来	莱	頼	雷	洛	絡	落	酪	乱	卵	嵐	欄	濫	藍	蘭	覧	利	吏	履	李	梨	理	璃
1	1	1	1	0	30	類	令	伶	例	冷	励	嶺	怜	玲	礼	苓	鈴	隷	零	霊	麗	齢	暦	歴	列	劣	烈	裂	廉	恋	憐	漣	煉	簾	練	聯
1	1	1	1	1	31																															

Character allocation table (5)

C12 = 1

C11	C10	C9	C8	C7		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
C6						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C5						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C4						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C3						0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
C2						0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
C1						0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
C0						0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
0	0	0	0	0	0																																
0	0	0	0	1	1																																
0	0	0	1	0	2																																
0	0	0	1	1	3																																
0	0	1	0	0	4	Area not yet defined by user																															
0	0	1	0	1	5																																
0	0	1	1	0	6																																
0	0	1	1	1	7																																
0	1	0	0	0	8		陝	陟	陶	陲	陬	陼	陽	陰	陰	陲	陰	陲	陰	陬	陽	陲	隶	隸	隹	雎	雋	雉	雍	襍	雜	霍	雕	雹	霄	霆	霈	霓
0	1	0	0	1	9		顱	顴	顳	颪	颯	颱	颶	飄	飉	飆	飩	飫	餃	餉	餒	餔	餘	餡	餝	餞	餤	餅	餬	餮	餽	餾	饅	饉	饅	饐	饋
0	1	0	1	0	10		髻	鬆	鬘	鬚	鬟	鬢	鬣	鬥	鬧	鬨	鬩	鬪	鬮	鬯	鬲	魁	魄	魅	魏	魍	魎	魑	魘	魴	魵	鮃	鮑	鮖	鮗	鮟	鮠	鮨
0	1	0	1	1	11		鵝	鵞	鵤	鵑	鵐	鵙	鵲	鶉	鶇	鶫	鶵	鶺	鶻	鶼	鷄	鷁	鷃	鷏	鷓	鷔	鷙	鷦	鷭	鷯	鷲	鷹	鷺	鸊	鸚	鸛	鸞
0	1	1	0	0	12		堯	槇	遙	瑤	凜	熙																									
0	1	1	0	1	13																																
0	1	1	1	0	14	Maintenance area																															
0	1	1	1	1	15																																
1	0	0	0	0	16	霎	霑	霏	霖	霙	霤	霪	霰	霹	霽	霾	靄	靆	靈	靆	靉	靜	靠	靤	靦	靨	勒	靫	靭	靹	鞅	靼	鞁	靸	鞆	鞋	鞏
1	0	0	0	1	17	饑	饒	饌	饕	饗	饑	饐	饜	馮	馭	馳	馹	馱	馹	駁	駄	駈	駑	駒	駟	駸	駾	騁	騏	騅	騒	騙	騫	騒	驅	驂	驀	驃
1	0	0	1	0	18	鰍	鰊	鰲	鰌	鰡	鰯	鰊	鰡	鰯	鰕	鰌	鰒	鰊	鰯	鰺	鰌	鰡	鰯	鰺	鰌	鰡	鰯	鰺	鰌	鰡	鰯	鰺	鰌	鰡	鰯	鰺	鰌	鰡
1	0	0	1	1	19	鸚	鸛	鸞	鹵	鹹	鹽	麁	麈	麋	麕	麒	麕	麑	麝	麥	麩	麸	麪	麭	靡	黌	黎	黏	黝	黔	黜	點	黝	黠	黥	黨	黯
1	0	1	0	0	20																																
1	0	1	0	1	21	Maintenance area																															
1	0	1	1	0	22																																
1	0	1	1	1	23																																
1	1	0	0	0	24	鞣	鞜	鞨	鞦	鞳	鞴	鞦	鞳	鞴	鞦	韋	韜	韭	齏	齎	竟	韶	韵	頏	頌	頸	頤	頡	頷	頽	顆	顏	顋	顫	顯	顰	
1	1	0	0	1	25	驟	驕	驍	驛	驗	驟	驢	驥	驤	驩	驫	驪	骭	骰	骼	髀	髑	髓	體	髏	鬆	髭	髯	髦	髯	髫	髢	髪	髴	髷	髻	
1	1	0	1	0	26	鰤	鰺	鰲	鱒	鰾	鱚	鱠	鱧	鱶	鱸	鳧	鳥	鳰	鳶	鳫	鴟	鴣	鴦	鴫	鴨	鴪	鴬	鴒	鴕	鴎	鴛	鴟	鴣	鴪	鴾	鵁	
1	1	0	1	1	27	黴	黶	黷	黼	黻	黼	黽	鼇	鼈	皷	鼕	鼬	鼬	鼾	齊	齒	齟	齣	齟	齠	齡	齦	齬	齪	齲	齶	齷	齲	龕	龜	龠	
1	1	1	0	0	28																																
1	1	1	0	1	29	Maintenance area																															
1	1	1	1	0	30																																
1	1	1	1	1	31																																

Character allocation table (6)

C12 = 1

	C6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	C4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	C3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	C2	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1
	C1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	1
	C0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1

C11	C10	C9	C8	C7			32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	0	0	0	0	0			弋	丐	丕	个	丱	丶	并	丿	乂	乖	乘	亂	亅	豫	事	舒	弍	于	亞	亟	亠	亢	亰	亳	亶	从	仍	仄	仆	仂	仗
0	0	0	0	1	1			僉	僭	傳	僂	僖	僞	僥	僭	僣	僮	價	僵	儉	儁	儂	儀	儔	儕	儒	儚	儡	儺	儷	儼	儻	儿	兀	兒	兌	兔	兢	競
0	0	0	1	0	2			瓣	劬	劭	劼	劵	勁	勍	勗	勞	勣	勦	飭	勠	勳	勵	勸	勹	匆	匈	甸	匍	匐	匏	匕	匚	匣	匯	匱	匳	匸	區
0	0	0	1	1	3			咫	哂	咤	唪	哂	哳	哥	哦	唏	唔	哽	哮	哭	哺	哢	唹	啀	啀	售	啜	啅	啖	啗	唸	唳	喙	喀	喀	喊
0	0	1	0	0	4			圈	國	圍	圓	團	圖	嗇	圜	圠	圻	圾	圻	址	坏	坩	埀	垈	坡	埒	垉	垳	垓	垠	垳	垤	垪	垉	埃	埆	埔	埒
0	0	1	0	1	5			奸	妁	妝	佞	佚	妣	妲	姆	姨	姜	妍	姙	姚	娥	娟	娑	娜	娉	娚	婀	婬	婉	娵	娶	婢	婪	媚	媼	媾	嫋	嫂
0	0	1	1	0	6			屐	屏	孱	屬	屮	屺	岑	屹	峩	岑	岔	崖	岫	岱	岷	峅	峪	峭	峽	峺	峩	峙	峩	峽	峺	峭	嵩	崚	崋	崕	崗	嵜
0	0	1	1	1	7			廖	廣	廝	廚	廬	廢	廡	廨	廩	廬	廳	廳	廳	廴	廸	廾	弃	弉	彝	彜	弋	弍	弖	弩	弭	弸	彁	彈	彌	彎	彑
0	1	0	0	0	8			悄	悛	悖	悗	悃	悧	悋	惡	悸	惠	惓	悴	忰	悽	惆	悵	惘	慍	愕	愆	惶	憊	愀	惴	惺	愃	懌	惻	惱	愍	愎
0	1	0	0	1	9			戞	戡	截	戮	戰	戲	戳	扁	扎	扞	扣	扛	扠	扨	扼	抂	抉	找	抒	抓	抖	拔	抃	抔	拗	拑	抻	拏	拿	拆	擔
0	1	0	1	0	10			據	擒	擅	擇	撻	擘	擂	擱	擧	舉	擠	擡	抬	擣	擯	攬	擶	擴	擲	擺	攀	攙	攜	攢	攣	攫	攴	攵	攷
0	1	0	1	1	11			曄	暸	曖	曚	曠	昡	曦	曩	曰	曳	曷	朏	朖	朞	朦	朧	霸	朮	朿	朵	杁	杓	杇	杆	杞	杠	杙	杣	杤	枉	杰
0	1	1	0	0	12			棔	棧	棕	椶	椒	椄	棗	棣	椥	棹	棠	棯	椨	椪	椚	椎	楸	楪	椹	楡	楹	楷	楜	楸	楫	楔	楝	楮	椹	楠	楡
0	1	1	0	1	13			檗	蘗	檻	櫃	櫂	檸	檳	檬	櫞	櫑	櫟	檪	櫚	櫪	櫻	欅	櫻	欅	蘗	櫺	欒	欖	鬱	欟	欸	欷	盜	欹	飮	歇	歃	歐
0	1	1	1	0	14			沺	泛	泯	泙	泪	洟	衍	洶	洫	洽	洸	洙	洵	洳	洒	洌	浣	涓	浤	浚	浹	浙	涎	涕	濤	涅	淹	渕	渊	涵	淇
0	1	1	1	1	15			漾	漓	滷	澆	潺	潸	澁	澀	潯	潛	濳	潭	澂	潼	潘	澎	澑	濂	潦	澳	漸	澡	澤	澹	濆	澪	濕	澣	瀾	濘
1	0	0	0	0	16			燹	燿	爍	爐	爛	爨	爭	爬	爰	爲	爻	爼	爿	牀	牆	牋	牘	牴	牾	犂	犁	犇	犒	犖	犢	犧	犹	狃	狃	狆	狄
1	0	0	0	1	17			瓠	瓣	疋	疽	瓮	疏	瓿	甌	甍	甎	甓	甕	甄	甕	甌	甎	甍	甕	甕	甓	甦	甬	甲	畄	畋	畊	畉	畛	畚	畉	畤
1	0	0	1	0	18			癲	癶	癸	發	皂	皃	皈	皋	皎	皖	皓	皙	皚	皰	皴	皸	皹	盂	盍	盖	盒	盞	盡	盥	盧	盪	蘆	盼	盱	眇
1	0	0	1	1	19			磧	磚	磽	磴	礇	礒	礑	礙	礫	祀	祠	祇	祟	祚	祕	祓	祺	祿	禊	禧	齋	禪	禮	禳	禹	禺	秉	秕	秧
1	0	1	0	0	20			篁	笄	筍	箏	筌	筅	筵	筥	筴	筧	箝	箘	箙	箍	箋	箒	箔	箘	箙	箍	箜	箚	箋	箒	箏	筝	箙	箇	篁	篌	篏	篋
1	0	1	0	1	21			紂	紜	紕	紊	絅	紘	絮	紲	紿	紂	絆	絳	絖	絎	絲	絨	絮	絏	絣	經	綉	絛	綏	絽	綛	綺	綮	綣	綵	緇	綽
1	0	1	1	0	22			罅	罌	罍	罐	罐	网	罕	罔	罘	罟	罠	罨	罩	罸	罰	罸	罷	羆	羈	羌	羔	羞	羝	羚	羣	羯	羲	羹	羌	羶
1	0	1	1	1	23			隋	腆	脾	腓	腑	胼	腱	腮	腥	腦	腴	膃	膈	膊	膀	膂	膠	膕	膤	膣	腟	腸	膩	膰	膵	膾	膸	膽	臀	臂	膺
1	1	0	0	0	24			茵	茴	茖	茲	茱	荀	茹	荐	荅	茯	茫	茗	荔	莅	莚	莪	莟	莢	莫	莎	莇	莊	莖	莵	莟	莘	莠	莉	莨	菴
1	1	0	0	1	25			蓼	蘂	蔬	蓿	蓋	薙	薈	薑	薤	蕭	薈	薛	藪	薇	薜	蕨	蕾	蔆	藉	薺	藏	薹	藐	藕	藝	藥	藜	藹	蘊	蘓
1	1	0	1	0	26			蝓	蝪	蝪	蠅	螢	螟	螂	螯	蟋	蠡	蠭	螻	螟	蛹	螽	蟄	蟄	螳	蟇	蟆	螻	蟯	蟲	蟠	蠏	蠍	蟾	蟶	蟯	蟬	蟻	蠖
1	1	0	1	1	27			襦	襤	褪	襪	襷	襴	襷	襾	覃	覈	覊	覓	覘	覩	覦	覬	覯	覲	覺	覽	覿	觀	觚	觜	觴	觸	訃	訖
1	1	1	0	0	28			譟	譬	譯	譴	譽	讀	讌	讎	讒	讓	讖	谿	豁	豸	豺	貂	貉	貅	貍	貎
1	1	1	0	1	29			蹇	蹉	蹌	蹐	蹈	蹙	蹤	蹠	蹟	蹣	躅	躋	躑	躔	躙	躪	躰	軆	體	躱	躾
1	1	1	1	0	30			遏	遐	遑	遒	逎	遉	逾	遖	遘	遞	遨	遯	遶	隨	遲	邂	邉	邊	邉	邏	郤	郢	郤	郢	郢	郤	扈	郛	鄂
1	1	1	1	1	31			鎒	錢	錚	錣	錙	錵	錻	鍜	鍠	鍼	鍮	鍖	鎰	鎬	鎭	鎔	鏡	鏖	鏗	鏨	鏥	鏘	鏃	鏝	鏐	鏈	鏤	鐚	鐔	鐓	鐃

Character allocation table (7)

C12 = 1

	C6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	C3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	C2	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
	C1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
	C0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

C11	C10	C9	C8	C7		64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
0	0	0	0	0	0	仞	伋	仟	价	伉	佚	估	佛	佝	佗	佇	佶	侈	侏	侘	佻	佩	佰	侑	佯	來	侖	儘	俔	俟	俎	俘	俛	俑	俚	俐	俤
0	0	0	0	1	1	兩	俞	兮	冀	冂	冏	冊	冉	冏	冑	冓	冕	冖	冤	冦	冢	冩	冪	冫	决	冱	冲	冰	况	冽	凅	凉	凛	几	處	凩	凭
0	0	0	1	0	2	刳	刪	刪	卉	卍	準	卞	卩	卮	卯	卻	卷	厂	厖	厠	厦	厥	厮	厰	厶	參	簒	雙	叟	曼	燮	叮	叨	叭	叺	吁	吽
0	0	0	1	1	3	喟	啻	啾	喘	喞	單	啼	喃	喩	喇	喨	嗚	嗅	嗟	嗄	嗜	嗤	嗔	嗺	嘔	嗾	嗽	嘛	嘩	噎	噐	營	嘴	嘶	嘲	嘸
0	0	1	0	0	4	塒	塁	垉	埣	堋	堙	堝	塲	堡	塢	塋	塹	毀	塒	堙	塹	墅	墫	墟	墫	墺	壞	墻	墸	墮	壅	壓	壑	壗	壙	壘	壜
0	0	1	0	1	5	媽	嫣	嫗	嫦	嫩	嫖	嫺	嫻	嬌	嬋	嬖	嬲	嫐	嬪	嫵	嬉	嬢	嬬	嬰	孀	孑	孕	孚	孛	孳	孩	孰	孳	孵	學	孝	孺
0	0	1	1	0	6	崟	崛	崑	崔	崢	崚	崙	崘	嵌	嵒	嵎	嵋	嵬	嵳	嵶	嶄	嶂	嶄	嶇	嶋	嶮	嶽	嶸	嶷	巍	巓	巒	巖	巛
0	0	1	1	1	7	旦	彖	彗	彙	彡	彭	彳	彷	徃	徂	彿	徊	很	徑	徇	從	徙	徘	徠	徨	徭	徼	忖	忻	忤	忸	忱	忝	悳	忿	怡	恠
0	1	0	0	0	8	慇	慍	慤	愧	慊	愿	愼	愬	愾	慱	慳	慷	慘	慙	慚	慫	慴	慯	慙	慈	慴	慱	慟	慝	慓	慵	慧	憖	憩	憬	憔	憚
0	1	0	0	1	9	拈	拜	拌	拊	拂	拇	抛	拉	挌	拮	拱	挧	挂	挈	拾	拵	捐	挾	捍	搜	捏	掖	掎	掀	掫	捶	掣	掏	掉	掟	掵	捫
0	1	0	1	0	10	收	攸	畋	效	敖	敕	敍	敘	敞	敝	敲	數	斂	斃	變	斛	斟	斫	斷	旃	旆	旁	旄	旌	旋	旒	旛	旙	无	旡	旱	杲	昊
0	1	0	1	1	11	杰	杼	杪	杤	枋	枦	枡	枡	枷	柯	柈	柬	枳	柩	枸	柤	柞	柝	柢	柮	枹	桍	柆	桅	桷	桍	桾	栩	栞	桀	桍	栲	桎
0	1	1	0	0	12	榆	楞	棟	椶	楪	榲	榮	槐	榿	槁	槓	榾	槎	寨	槊	榻	槝	槧	樑	樗	槫	榜	榕	榴	槞	樂	樛	槿	權	槨
0	1	1	0	1	13	歙	歔	歛	歟	歡	歸	歹	歿	殀	殄	殃	殍	殘	殕	殞	殪	殫	殯	殲	殱	殳	殷	殼	毆	毋	毓	毟	毬	毫	毳	毯
0	1	1	1	0	14	淦	涸	淆	淬	淞	淌	淨	淒	淅	淺	淙	淤	淥	淪	淮	渭	湮	渟	渙	湲	湟	渾	渣	湫	湫	涼	湍	渟	湃	渺	湎	渤
0	1	1	1	1	15	濱	濮	濛	瀉	瀋	濺	瀑	瀁	瀏	濾	瀛	瀚	瀦	瀝	瀘	瀟	瀰	瀾	瀲	灑	灣	炙	炒	炯	烱	炬	炸	炳	炮	烟	烋	烝
1	0	0	0	0	16	狎	狒	狢	狠	狡	狹	狷	倏	猗	猊	猜	猖	猝	猴	猯	猩	猥	猾	獎	獏	默	獗	獪	獨	獰	獣	獵	獻	獺	珈	玳	珎
1	0	0	0	1	17	畧	畫	晻	畸	當	疆	疇	畴	疊	疂	疂	疔	疚	疝	疥	疣	痂	疳	痃	疱	痍	疵	痊	痒	痙	痣	痞	痾	痿	痲	痳	瘁
1	0	0	1	0	18	眄	眩	眤	眞	眥	眦	眛	眷	眸	睇	睚	睨	睫	睛	睥	睿	睾	睹	瞎	瞋	瞑	瞠	瞞	瞰	瞶	瞹	瞿	瞼	瞽	瞻	矇	矍
1	0	0	1	1	19	秬	秡	秣	稈	稍	稘	稙	稠	稟	禀	稱	稻	穡	稷	稼	穂	穉	穡	穢	穩	龝	穰	穹	穿	窈	窗	窕	窘	窖	窩	竈	窰
1	0	1	0	0	20	篝	篩	簔	簑	篦	篥	籠	簀	簇	簑	篳	篷	簗	簍	篶	篋	篁	簣	簧	簪	簟	簷	簫	簽	籌	籃	籔	籏	籀	籐	籟	籤	籖
1	0	1	0	1	21	綫	總	綢	綯	縣	綸	綟	綰	緘	緝	緤	緞	緻	緲	緡	縅	緘	縱	縣	綷	縒	縱	縟	繙	繖	繚	繹	繻	纈	纉	纃	纈
1	0	1	1	0	22	贏	贔	翅	翠	翊	翕	翔	翡	翦	翩	翳	翹	翡	翫	翕	耋	耄	耋	耒	耘	耙	耜	耡	耨	耿	耻	聊	聆	聒	聘	聚	聟	聢	聯
1	0	1	1	1	23	臉	臍	臑	臙	臘	膕	臚	臟	臠	臧	臺	臻	與	舁	舂	舅	與	舊	舍	舐	舗	舩	舫	舸	舳	艀	艙	艘	艚	艟	艤
1	1	0	0	0	24	萓	葷	菎	菽	萃	菘	蓼	菁	蒂	萇	菠	菲	萍	菢	葡	萠	莽	萸	蔆	萩	葭	萼	蓁	蒄	葷	葫	蒡	葭	蒂	葩	葆	萬
1	1	0	0	1	25	蘋	藾	藺	蘆	藷	蘚	蘿	虍	虒	虔	號	虧	虱	蚓	蚣	蚩	蚪	蚋	蚌	蚶	蚯	蛄	蛆	蚰	蛉	蠣	蚫	蛔	蛞	蛩	蛬	蛯
1	1	0	1	0	26	蠕	蠢	蠡	蠱	蠶	蠹	蠧	蠻	衄	衂	衒	衙	衞	衢	衫	袁	衾	衰	衵	衽	衿	袒	袗	袍	袤	袰	袿	袷	袮	袙	袵	袴
1	1	0	1	1	27	訐	訌	訛	訝	訥	訶	詁	詛	詒	詆	詈	詼	詭	詬	詢	詵	誂	誄	誨	誡	誑	誥	誦	誚	誣	諄	諍	諂	諚	諫	諳	諧
1	1	1	0	0	28	貔	貅	貘	貶	貭	貪	貽	貲	貳	貮	貶	賈	賁	賤	賣	賚	賽	賺	賻	贄	贅	贊	贇	贏	贍	贐	齎	贓	賍	贔	贖	赧
1	1	1	0	1	29	軅	軈	軋	軛	軦	軼	軻	軫	軾	軽	軺	軽	軿	輀	輅	輕	輌	輟	輪	輳	輻	輹	輙	轂	轅	轌	轉	轆	轎	轗	轜
1	1	1	1	0	30	鄒	鄙	鄲	鄰	酊	酖	酘	酣	酥	酩	酳	酲	醋	醉	醂	醢	醫	醯	醪	醵	醴	醺	釀	釁	釉	釋	釐	釖	釟	釜	釙	釼
1	1	1	1	1	31	鑞	鑚	鑁	鑓	鐡	鐵	鐺	鑁	鑒	鑄	鑛	鑠	鑢	鑪	鈩	鑰	鑵	鑷	鑽	鑚	鑼	鑾	鑽	鑾	鑿	門	閇	間	閔	閖	閘	閙

Character allocation table (8)

C12 = 1

					C6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
					C5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
					C4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
					C3	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1
					C2	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1
					C1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1
					C0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
C11	C10	C9	C8	C7		96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
0	0	0	0	0	0	俥	倚	倨	倔	倪	倥	倅	伜	俶	倡	倩	倬	俾	俯	們	倆	偃	假	會	偕	偐	偈	做	俵	傯	傴	傀	傚	傅	傴	傲
0	0	0	0	1	1	凰	凵	函	刃	刋	刎	刎	刧	刪	刮	刳	刹	刼	剋	剌	剞	剔	剪	剴	剩	剳	剿	剽	劍	劒	劒	剱	劈	劑	辨
0	0	0	1	0	2	呀	听	吭	吼	吮	吶	吩	吝	呎	咏	呵	咎	咳	呱	呷	呫	咒	呻	咀	呶	咄	咐	咆	哇	唪	咸	咥	咬	哄	哈	咨
0	0	0	1	1	3	噫	噤	噦	噬	噪	噱	噂	噁	噘	噎	噓	嚏	嚮	嚶	嚴	囂	嚼	嚇	嚥	嚮	嚕	囑	嚼	口	囘	圄	圊	囿	圄	圉
0	0	1	0	0	4	壘	壤	壟	壯	壺	壹	壻	壺	壽	夂	夊	夐	夛	梦	夥	夬	夭	本	夸	夾	竒	奕	奐	奎	奚	奘	奢	奠	奧	奬	奩
0	0	1	0	1	5	它	宦	宸	寃	寇	寉	寔	寐	寤	實	寢	寞	寥	寫	寰	寶	寳	尅	將	專	對	尓	尠	尢	尨	尸	尹	屁	屆	屎	屓
0	0	1	1	0	6	巫	已	巵	帋	帚	帙	帑	帛	帶	帷	幄	幃	幀	幎	幗	幔	幟	幢	幣	幇	幵	并	幺	麼	广	庠	廁	廂	廈	廐	廏
0	0	1	1	1	7	怙	恂	怩	怎	恕	恒	怕	怫	怦	怏	悀	恚	恁	悪	悒	悚	悩	悸	恠	恪	悠	恟	悚	恤	恬	恫	恙	悁	悍	惧	悃	悚
0	1	0	0	0	8	憊	憑	憫	憮	懌	懊	應	懷	懈	懃	懆	憺	懋	罹	懍	懦	懣	懶	懺	懴	懿	懽	攝	戀	戈	戉	戍	戌	戔	戛
0	1	0	0	1	9	捩	掾	揩	揀	揆	揣	揉	插	揶	揄	搖	搴	搆	搓	搦	搶	攝	搗	揚	搏	搉	摯	搏	摎	攪	撕	撓	撥	撩	撈	撼
0	1	0	1	0	10	旻	昊	昔	昵	昶	昴	昜	晏	晄	晉	晁	晞	晝	晤	晧	晨	晟	晢	晰	暈	暌	暉	暄	暘	暝	暨	暹	曉	暾	曄
0	1	0	1	1	11	梳	桾	桁	桍	桝	桿	梟	梧	梭	梔	條	梛	梃	檮	棹	棠	棯	椶	椹	椄	棗	棔	棊	棟	棘	椢	棆	椌	椌	棍
0	1	1	0	0	12	梱	椈	樅	榱	樞	槭	樔	槫	梨	榕	槾	樣	樓	橄	檑	檜	檄	檪	檎	橙	橦	橈	樸	樢	檐	檍	檠	檄	檢	檣
0	1	1	0	1	13	麾	氈	氓	气	氛	氤	氣	汞	汕	汢	汪	沂	沍	沚	沁	沛	汾	汨	汳	沒	沐	泄	泱	泓	沽	泗	泅	泝	沮	沱	沾
0	1	1	1	0	14	滿	渝	游	溂	溪	溘	滉	溷	滓	溽	溯	滄	溲	滔	滕	溏	溥	滂	滐	頖	漑	灌	滬	滜	滾	漿	滲	漱	滯	漲	滌
0	1	1	1	1	15	烙	焉	烽	焜	焙	煥	熙	煕	照	煢	煌	煖	煬	熏	燻	熄	熕	熨	熬	燗	熹	熾	燒	燉	燔	燎	燠	燬	燧	燵	燼
1	0	0	0	0	16	玻	珀	珥	珮	珞	璢	琅	瑯	琥	珸	琲	琺	瑕	琿	瑟	瑙	瑁	瑜	瑩	瑰	瑣	瑪	瑶	瑾	璋	璞	璧	瓊	瓏	瓔	珱
1	0	0	0	1	17	痼	痒	痰	痺	痲	痳	瘋	瘍	瘉	瘟	瘧	瘠	瘡	瘢	瘤	瘴	瘰	瘻	癇	癈	癆	癜	癘	癡	癢	癨	癩	癪	癧	癬	癰
1	0	0	1	0	18	蠹	矚	矜	矣	矮	矼	砌	砒	礦	砠	礪	硅	碎	硼	磬	硼	碆	碌	碣	碵	磧	磑	磆	磋	碟	碾	碼	磅	磊	磬
1	0	0	1	1	19	窶	竅	竄	窿	邃	竇	竊	竗	奸	竚	竝	竡	竢	竟	竦	竭	竰	笂	笏	笊	笆	笳	笘	笙	答	笵	笨	笶	筐
1	0	1	0	0	20	籥	籬	粁	粃	粐	粤	粭	粢	粨	粡	粨	粳	粱	粮	粹	粽	糀	糅	糘	糠	糲	粻	糲	鬻	糯	糲	糲	糴	糶	糺	紆
1	0	1	0	1	21	縲	縺	縹	繝	繖	繞	繙	繚	繹	繪	繩	繼	繻	纃	緕	繽	辮	纈	纀	纁	纉	纈	纓	纔	纖	纎	纛	缸	缺
1	0	1	1	0	22	聳	聲	聰	聶	聹	聽	聿	肄	肆	肅	肛	肓	肚	肭	冐	肬	胛	胥	胙	胝	胄	胚	胖	脉	胯	脱	脛	脩	脣	脯	腋
1	0	1	1	1	23	膸	朦	膵	膕	舩	艱	艶	艸	艾	芍	芒	芫	芟	芻	芬	苡	苣	苟	苒	苴	苳	苺	莓	范	荇	荜	包	荊	茆	茉	苣
1	1	0	0	0	24	葯	蒔	蒿	蓊	蓋	蒹	蒿	蒟	蓙	蒼	翡	蓁	蓉	蒻	蓼	蓆	蓖	蒭	蓁	蔡	蓿	蓴	蕭	蔘	蔬	蔟	蒂	蔔	蓼	蕘	蕈
1	1	0	0	1	25	蛟	蛛	蛯	蜒	蜆	蜈	蜀	蜃	蛻	蜑	蜉	蜍	蛹	蜊	蜴	蜿	蜷	蜻	蛺	蝴	蝨	蝠	蝿	蝸	蝌	蝎	蝴	蝗	蝨	蝮	蝙
1	1	0	1	0	26	袱	裃	裄	裔	裘	裙	裝	裹	褂	楊	裴	裨	裲	褄	褊	褌	褓	襃	褞	褥	褪	褫	襁	襄	褻	褶	褸	襌	褝	襠	襞
1	1	0	1	1	27	諤	諱	謔	諠	諢	諷	諞	諛	謌	謇	謚	諡	謖	謐	謗	謠	謳	鞫	謦	謫	謾	謨	譁	譌	譏	譎	證	譖	譛	譚	譫
1	1	1	0	0	28	赭	辷	赳	趁	趙	跂	趾	趺	跏	跚	跖	跌	跛	跋	跪	跫	跟	跣	跼	踈	踉	跿	踝	踞	踐	踟	蹂	踵	踰	踴	蹊
1	1	1	0	1	29	轣	轢	轤	辜	辟	辣	辭	辯	辶	迚	迥	迢	迪	迯	邇	迴	逅	迹	迺	逑	逕	逡	逍	逞	逖	逋	逧	逶	達	逵	逝
1	1	1	1	0	30	釵	釶	鈎	釿	鈔	鈬	鈕	鈑	鉞	鉗	鉅	鉉	鉤	鉈	銕	鈿	鉋	鉐	銜	銖	銓	銛	鉚	鋏	銹	銷	鍇	鋩	錺	錙	錮
1	1	1	1	1	31	閏	閨	閧	閭	閙	閻	閹	閾	闋	闥	濶	闃	闍	闌	闕	闔	闖	關	闡	闥	闘	阡	阪	阮	阯	陂	陌	陏	陋	陷	陜	陞

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NOTES FOR CMOS DEVICES

① PRECAUTION AGAINST ESD FOR SEMICONDUCTORS

Note:

Strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred. Environmental control must be adequate. When it is dry, humidifier should be used. It is recommended to avoid using insulators that easily build static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work bench and floor should be grounded. The operator should be grounded using wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with semiconductor devices on it.

② HANDLING OF UNUSED INPUT PINS FOR CMOS

Note:

No connection for CMOS device inputs can be cause of malfunction. If no connection is provided to the input pins, it is possible that an internal input level may be generated due to noise, etc., hence causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using a pull-up or pull-down circuitry. Each unused pin should be connected to V_{DD} or GND with a resistor, if it is considered to have a possibility of being an output pin. All handling related to the unused pins must be judged device by device and related specifications governing the devices.

③ STATUS BEFORE INITIALIZATION OF MOS DEVICES

Note:

Power-on does not necessarily define initial status of MOS device. Production process of MOS does not define the initial operation status of the device. Immediately after the power source is turned ON, the devices with reset function have not yet been initialized. Hence, power-on does not guarantee out-pin levels, I/O settings or contents of registers. Device is not initialized until the reset signal is received. Reset operation must be executed immediately after power-on for devices having reset function.

Reference Documents

NEC Semiconductor Device Reliability/Quality Control System (C10983E)

Semiconductor Device Mounting Technology (C10535E)

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  - Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
  - Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
  - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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