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Specification	
Part Number:	MCOT22005AX-EYM
Version:	1
Date:	17/04/2013
Revision	

Content

Midas Displays OLED Part Number System

MCO	B	21605	A	*	V	-	E	W	I	*
1	2	3	4	5	6		7	8	9	10

1	=	**MCO:**	Midas Displays OLED
2	=	**Blank:**	**B**: COB (Chip on Board) **T**: TAB (Taped Automated Bonding)
3	=	**No of dots:**	**(**e.g. 240064 = 240 x 64 dots) (e.g. 21605 = 2 x 16 5mm C.H.)
4	=	**Series**	A to Z
5	=	**Series Variant:**	A to Z and 1 to 9 **– see addendum**
6	=	**Operating Temp Range:**	**A:** -30+85° C **V:** -40+80° C **Y:** -40 +70° C **Z:** -30+70° C **X**: -40 +85° C
7	=	**Character Set:**	**Blank**: Not Applicable **E:** Multi European Font Set (English/Japanese – Western European (K) – Cyrillic (R))
8	=	**Colour:**	**Y:** Yellow **W:** White **B:** Blue **R:** Red **G:** Green **RGB**: Full Colour
9	=	**Interface:**	**P:** Parallel **I:** I²C **S:** SPI **M:** Multi
10	=	**Voltage Variant:**	e.g. **3** = 3v

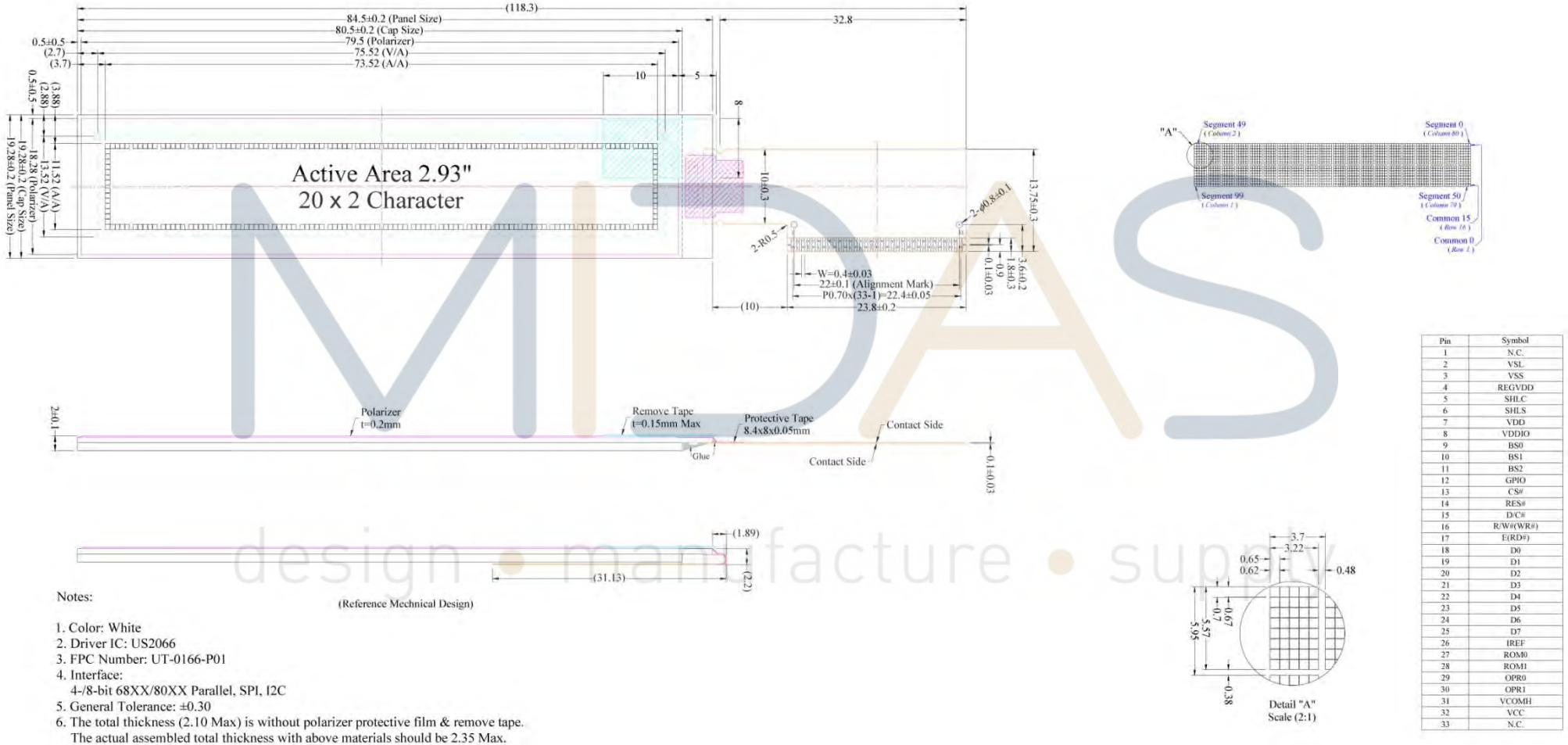
Functions and Features

- 2 lines x 20 characters
- Built-in controller
- Parallel or serial MPU interface
- +2.8V ~ +5.3V Power Supply
- viewing angle “Free”
- Wide Temperature -40℃ ~ +80℃ (Operating)
- Sunlight Readable Technology
- RoHS compliant

Mechanical Specification

Item	Description	
Product No.	MCOT22005AX-EYM	
Active Area	73.52(W)×11.52(H)	mm
Module Size	84.5(W)×19.28(H)×2.00 (D)	mm
Dot Size	0.62(W)×0.67(H)	mm
Dot Pitch	0.65(W)×0.70(H)	mm
Display Format	20 characters (W)×2 lines (H)	
Duty Ratio	1/16	Duty
Controller	SSD1311 or Equivalent	
Operation Temperature	-40~80	°C
Storage Temperature	-40~85	°C
Response Time	≤10	us
Assembly	Soldering	

Mechanical Drawing



Pin	Symbol
1	N.C.
2	VSL
3	VSS
4	REGVDD
5	SHLC
6	SHLS
7	VDD
8	VDDIO
9	BS0
10	BS1
11	BS2
12	GPIO
13	CS#
14	RES#
15	D/C#
16	R/W#(WR#)
17	E(RD#)
18	D0
19	D1
20	D2
21	D3
22	D4
23	D5
24	D6
25	D7
26	IREF
27	ROM0
28	ROM1
29	OPR0
30	OPR1
31	VCOMH
32	VCC
33	N.C.

(Reference Mechnical Design)

Notes:

1. Color: White
2. Driver IC: US2066
3. FPC Number: UT-0166-P01
4. Interface:
   4-/8-bit 68XX/80XX Parallel, SPI, I2C
5. General Tolerance: ±0.30
6. The total thickness (2.10 Max) is without polarizer protective film & remove tape.
   The actual assembled total thickness with above materials should be 2.35 Max.

Pin Description

Power Supply

Pin Number	Symbol	Type	Function
7	VDD	P	**Power Supply for Logic Circuit** This is a voltage supply pin which is supplied externally or regulated internally. A capacitor should be connected between this pin and VSS under all circumstances. When internal VDD is disabled, this is a power input pin. It must be connected to VDDIO or external source and always be equal to or lower than VDDIO. (Low Voltage I/O Application) When internal VDD is enabled, it is regulated internally from VDDIO (5V I/O Application)
8	VDDIO		**Power Supply for Interface Logic Level** This is a voltage supply pin. It should match with the MCU interface voltage level and must be connected to external source
3	VSS		**Ground of OEL System** This is a ground pin. It also acts as a reference for the logic pins, the OEL driving voltages, and the analog circuits. It must be connected to external ground.
32	VCC		**Power Supply for OEL Panel** This is the most positive voltage supply pin of the chip. It must be connected to external source.

Dirver

Pin Number	Symbol	Type	Function
26	IREF	I	**Current Reference for Brightness Adjustment** This pin is segment current reference pin. A resistor should be connected between this pin and VSS. Set the current at 15μA.
31	VCOMH	P	**Voltage Output High Level for COM Signal** This pin is the input pin for the voltage output high level for COM signals. A capacitor should be connected between this pin and VSS.
2	VSL	P	**Voltage Output Low Level for SEG Signal** This is segment voltage reference pin. When external VSL is not used, this pin should be left open. When external VSL is used, this pin should connect with resistor and diode to ground.

External IC Communication

Pin Number	Symbol	Type	Function
12	GPIO	I/O	**General Purpose Input/output** This pin could be left open individually or have signal inputted/outputted. It is able to use as the external DC/DC converter circuit enabled/disabled control or other applications.

Configuration

<table>
<tr><th>Pin Number</th><th>Symbol</th><th>Type</th><th>Function</th></tr>
<tr><td>4</td><td>REGVDD</td><td rowspan="4">I</td><td>5V I/O Regulator Configuration
This is internal VDD regulator selection pin in 5V I/O application mode.
When this pin is pulled “Low”, internal VDD regulator is disabled.
(Low Voltage I/O Application)
When this pin is pulled “High”, internal VDD regulator is enabled.
(5V I/O Application)</td></tr>
<tr><td>5</td><td>SHLC</td><td>Scanning Direction for COM Signal
This pin is used to determine COM output scanning direction. It can still be programmable and defined by fundamental command.</td></tr>
<tr><td>6</td><td>SHLS</td><td>Mapping Direction for SEG Signal
This pin is used to change the mapping between the display data column address and the segment driver. It can still be programmable and defined by fundamental command.</td></tr>
<tr><td>27
28</td><td>ROM0
ROM1</td><td>Built-in Character ROM Selection
These pins are used to select the appropriate character ROM.
<table>
<tr><td></td><td>ROMO</td><td>ROM1</td></tr>
<tr><td>ROM A</td><td>0</td><td>0</td></tr>
<tr><td>ROM B</td><td>1</td><td>0</td></tr>
<tr><td>ROM C</td><td>0</td><td>1</td></tr>
<tr><td>Software Selectable</td><td>1</td><td>1</td></tr>
</table>
It can still be programmable and defined by extended command.</td></tr>
<tr><td>29
30</td><td>OPR0
OPR1</td><td>Character ROM/RAM Management
These pins are used to manage the character number of character generator.
<table>
<tr><td>CGROM</td><td>CGRAM</td><td>OPR0</td><td>OPR1</td></tr>
<tr><td>240</td><td>8</td><td>0</td><td>0</td></tr>
<tr><td>248</td><td>8</td><td>1</td><td>0</td></tr>
<tr><td>250</td><td>6</td><td>0</td><td>1</td></tr>
<tr><td>256</td><td>0</td><td>1</td><td>1</td></tr>
</table>
It can still be programmable and defined by extended command.</td></tr>
</table>

Interface

<table>
<tr><th>Pin Number</th><th>Symbol</th><th>Type</th><th>Function</th></tr>
<tr><td>9
10
11</td><td>BS0
BS1
BS2</td><td rowspan="6">I</td><td>Communicating Protocol Select
These pins are MCU interface selection input. See the following table:
<table>
<tr><td></td><td>BS0</td><td>BS1</td><td>BS2</td></tr>
<tr><td>I2C</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>SPI</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>4-Bit 68xx Parallel</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>4-Bit 80xx Parallel</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>8-bit 68xx Parallel</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>8-bit 80xx Parallel</td><td>0</td><td>1</td><td>1</td></tr>
</table></td></tr>
<tr><td>14</td><td>RES#</td><td>Power Reset for Controller and Driver
This pin is reset signal input. When the pin is low, initialization of the chip is executed.</td></tr>
<tr><td>13</td><td>CS#</td><td>Chip Select
This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled low.</td></tr>
<tr><td>15</td><td>D/C#</td><td>Data/Command Control
This pin is Data/Command control pin. When the pin is pulled high, the input at D7~D0 will be interpreted as display data. When the pin is pulled low, the input at D7~D0 will be transferred to the command register. When the pin is pulled high and serial interface mode is selected, the data at SDIN will be interpreted as data. When it is pulled low, the data at SDIN will be transferred to the command register. In I2C mode, this pin acts as SA0 for slave address selection.</td></tr>
<tr><td>17</td><td>E/RD#</td><td>Read/Write Enable or Read
This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled high and the CS# is pulled low. When connecting to an 80XX-microprocessor, this pin receives the Read (RD#) signal. Data read operation is initiated when this pin is pulled low and CS# is pulled low.</td></tr>
<tr><td>16</td><td>R/W#</td><td>Read/Write Select or Write
This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Pull this pin to “High” for read mode and pull it to “Low” for write mode. When 80XX interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled low</td></tr>
</table>

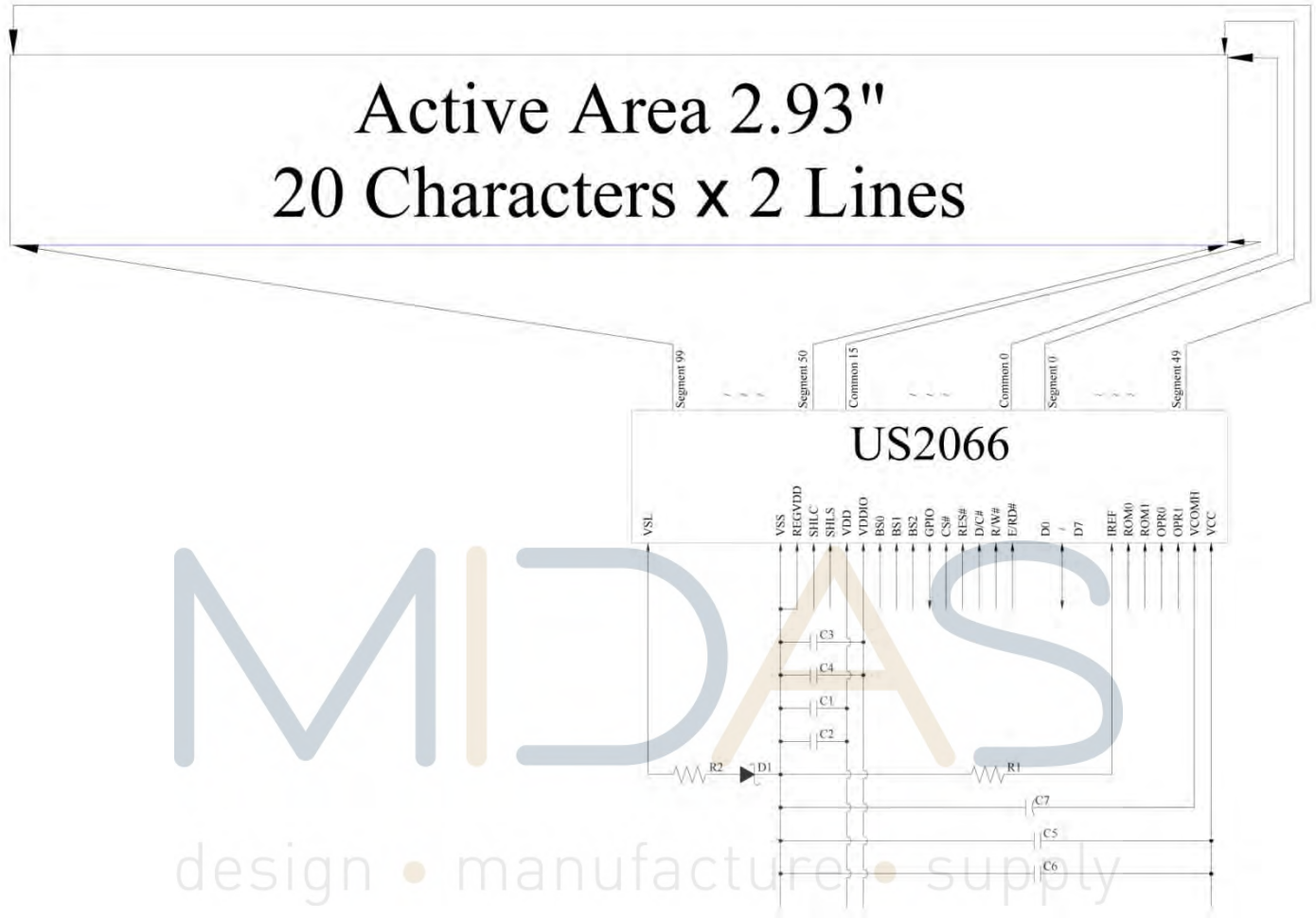
			and the CS# is pulled low.
18~25	D0~D7	I/O	**Host Data Input/output Bus** These pins are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial mode is selected, D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK. When I2C mode is selected, D2, D1 should be tired together and serve as SDAOUT, SDAIN in application and D0 is the serial clock input, SCL.

Reserve

Pin Number	Symbol	Type	Function
1,33	N.C. (GND)	-	**Reserved Pin (Supporting Pin)** The supporting pins can reduce the influences from stresses on the function pins. These pins must be connected to external ground as the ESD protection circuit.

Block Diagram

Low Voltage I/O Application



Pins connected to MCU interface: CS#, RES#, D/C#, R/W#, E/RD#, and D0~D7

* SHLC, SHLC, ROM0, ROM1, OPR0 and OPR1 should be configured.

C1, C3, C5: 0.1μF

C2, C4: 4.7μF

C6: 10μF

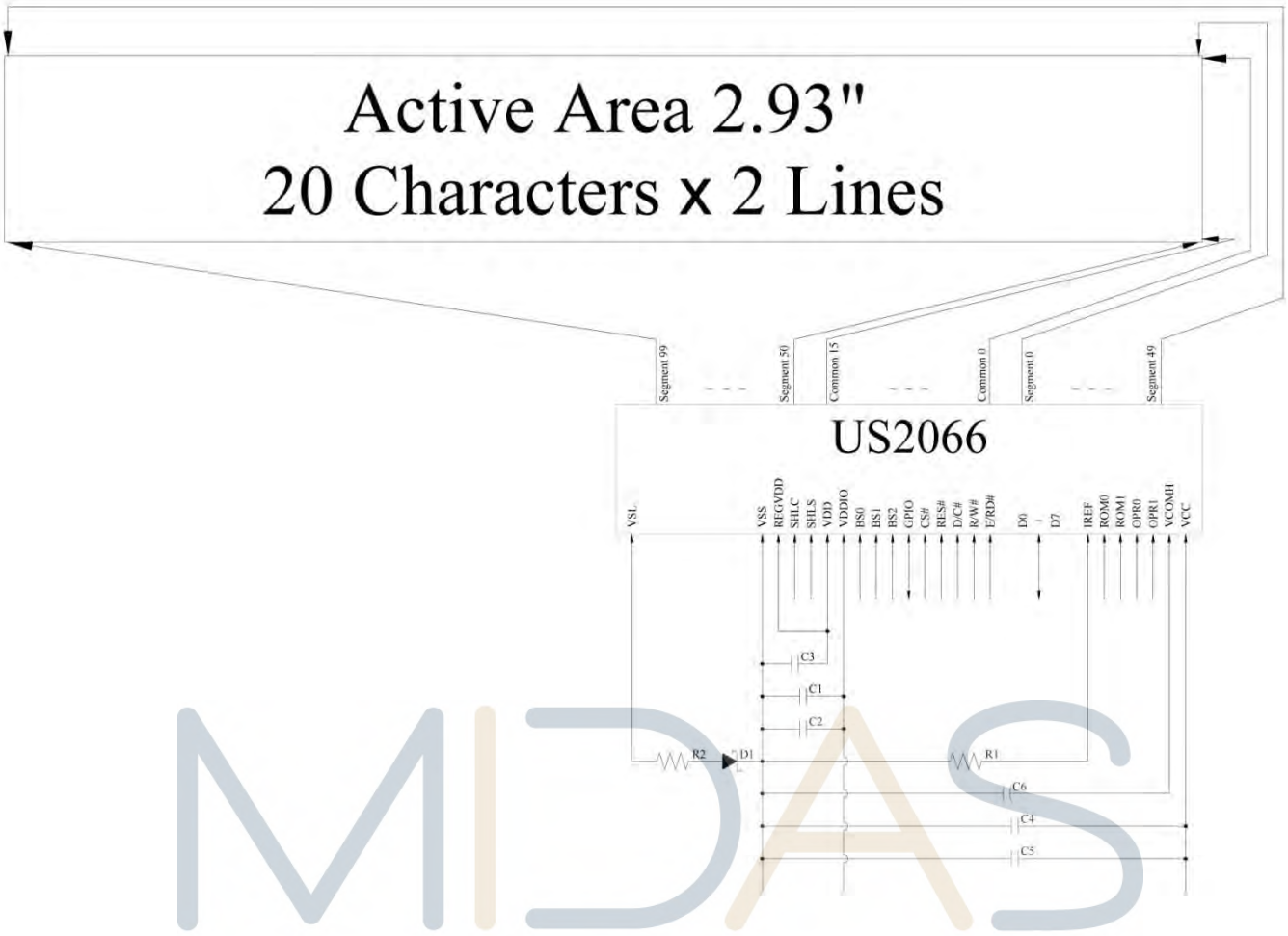
C7: 4.7μF / 25V Tantalum Capacitor

R1: 470kΩ, R1 = (Voltage at IREF - VSS) / IREF

R2: 50Ω, 1/4W

D1: ≤1.4V, 0.5W

5V I/O Application



MCU Interface Selection: BS0, BS1 and BS2

Pins connected to MCU interface: CS#, RES#, D/C#, R/W#, E/RD#, and D0~D7

* SHLC, SHLC, ROM0, ROM1, OPR0 and OPR1 should be configured.

C1, C4: 0.1μF

C2: 4.7μF

C3: 1μF

C5: 10μF

C6: 4.7μF / 25V Tantalum Capacitor

R1: 470kΩ, R1 = (Voltage at IREF - VSS) / IREF

R2: 50Ω, 1/4W

D1: ≤1.4V, 0.5W

DC Characteristics

Item	Symbol	Condition	Min.	Type	Max.	Unit
Supply Voltage for Logic	VDD	(Low Voltage I/O Application)	2.4	2.8	VDDIO	Volt
Supply Voltage for I/O Pins	VDDIO		2.4	2.8	3.6	Volt
Supply Voltage for Logic	VDD	(5V I/O Application)	-	-	-	Volt
Supply Voltage for I/O Pins	VDDIO		4.4	5.0	5.3	Volt
Supply Voltage for Display	VCC	Note 5	11.5	12.0	12.5	Volt
Operating Current for VDD	IDD			180	300	μA
Operating Current for VCC	ICC	Note 6	-	13.5	17.0	mA
		Note 7	-	21.1	25.8	mA
		Note 8	-	40.0	48.0	mA
Sleep Mode Current for VDD	IDD,SLEEP	Note	-	1	10	μA
Sleep Mode Current for VCC	ICC,SLEEP		-	2	10	μA

Note 5: Brightness (Lbr) and Supply Voltage for Display (VCC) are subject to the change of the panel characteristics and the customer's request.

Note 6: VDDIO = 2.8V or 5.0V, VCC = 12.0V, 30% Display Area Turn on.

Note 7: VDDIO = 2.8V or 5.0V, VCC = 12.0V, 50% Display Area Turn on.

Note 8: VDDIO = 2.8V or 5.0V, VCC = 12.0V, 100% Display Area Turn on.

Optical Characteristics

Item	Symbol	Min.	Typ	Max.	Unit
Viewing angle range			Free		Degree
Dark Room Contrast	Cr		>10,000:1		
Brightness	Lbr	100	120		cd/m^2
Peak Emission Wavelength	C.I.E 1931	X=0.46 Y=0.45	X=0.50 Y=0.49	X=0.54 Y=0.53	

Electrical Absolute Ratings

Item	Symbol	Min.	Max.	Unit	Notes
Supply Voltage for Logic	VDD	-0.3	6	Volt	1,2
Supply Voltage for I/O Pins	VDDIO	-0.3	6	Volt	1,2
Supply Voltage for Display	VCC	0	15	Volt	1,2
Life Time (100 cd/㎡)	100,000	-	-	Hours	3

Note 1: All the above voltages are on the basis of “VSS = 0V”.

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to Section 3. “Optics”. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

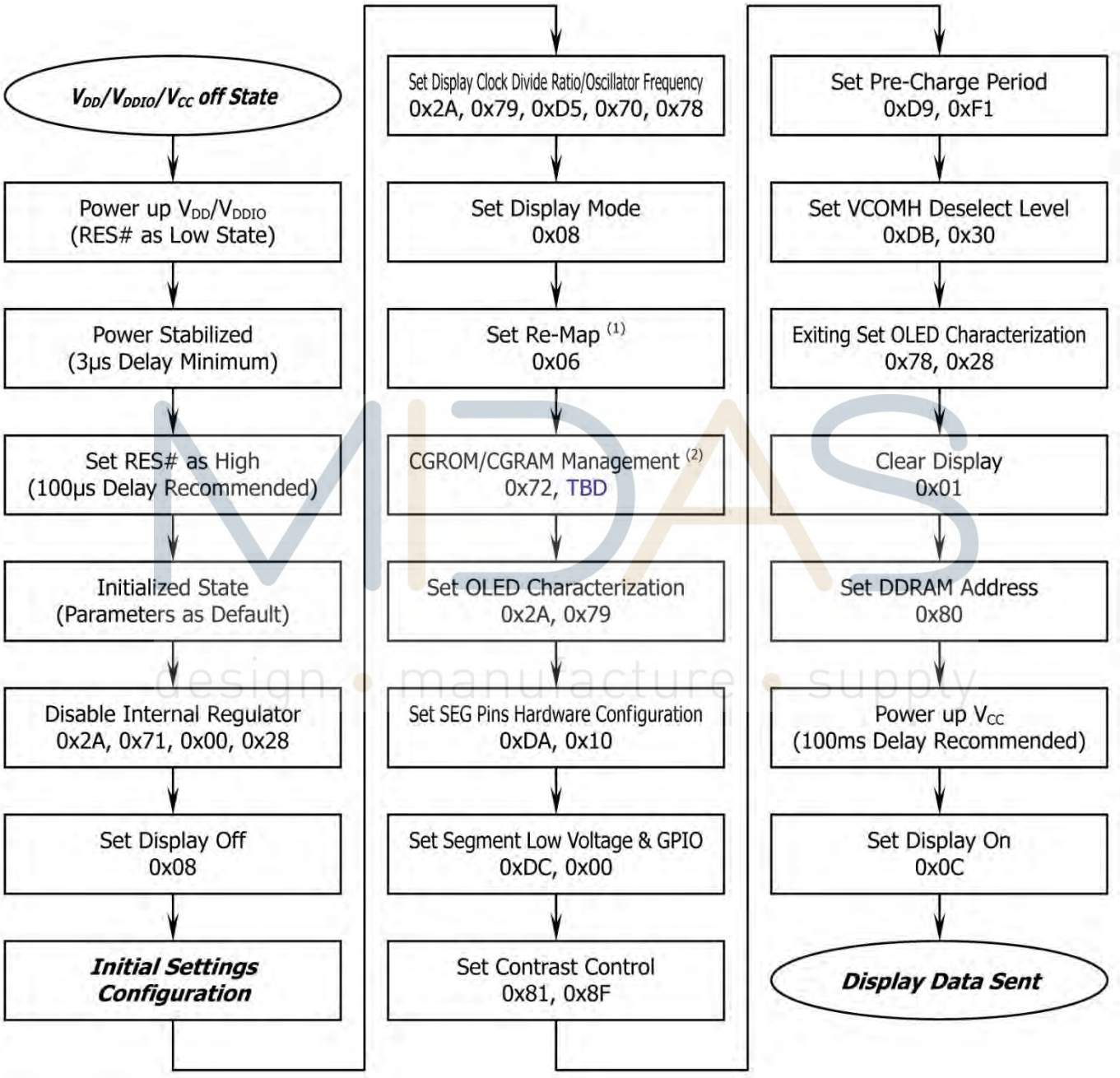
Note 3: VCC = 12.0V, Ta = 25°C, 50% Checkerboard.

Actual Application Example

Command usage and explanation of an actual example

Low Voltage I/O Application

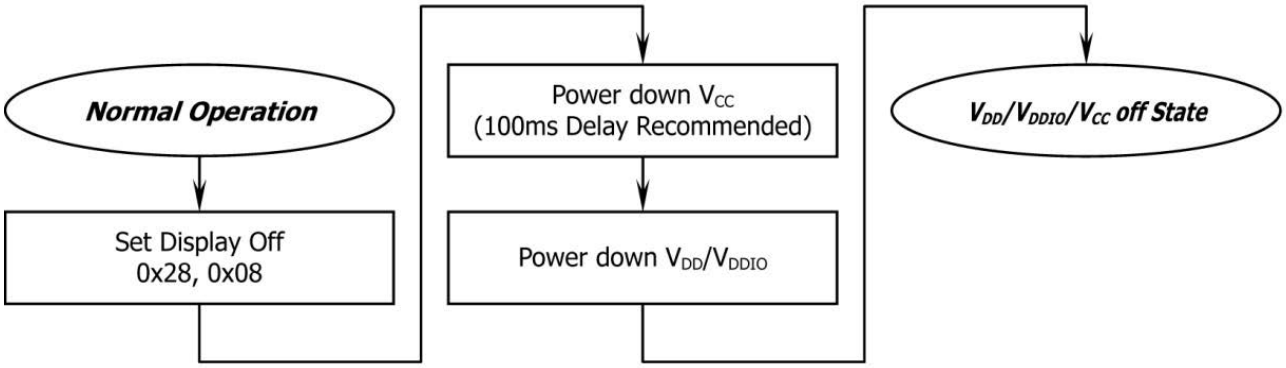
Power up Sequence



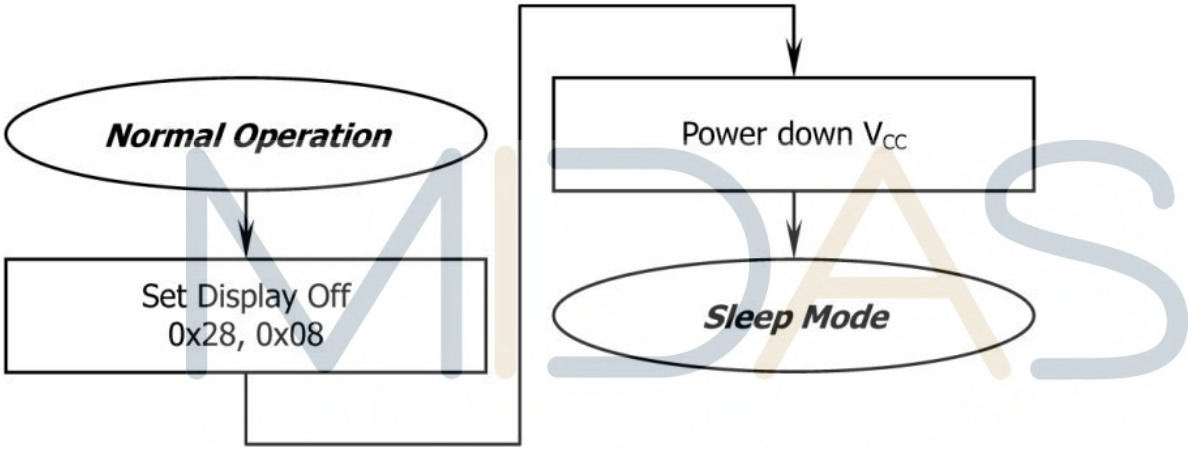
(1) This command could be programmable or defined by pin configuration.

If the noise is accidentally occurred at the displaying window during the operation, please reset the display in order to recover the display function.

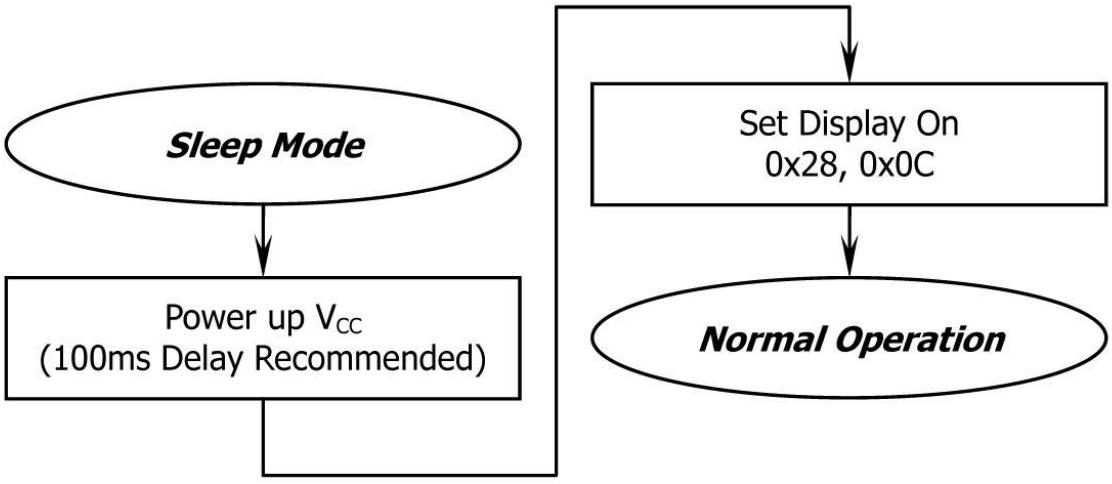
Power down Sequence



Entering Sleep Mode

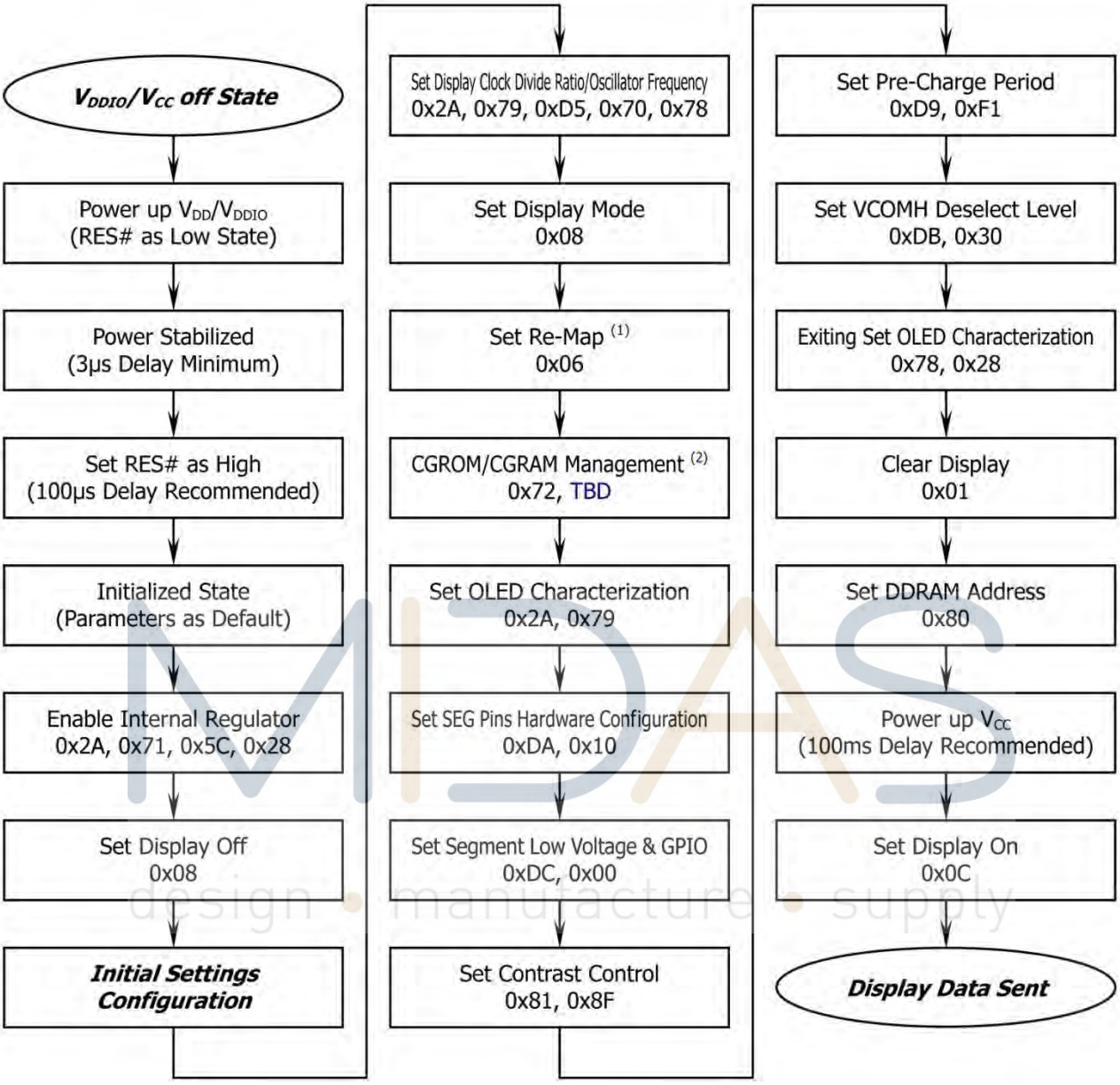


Exiting Sleep Mode



5V I/O Application

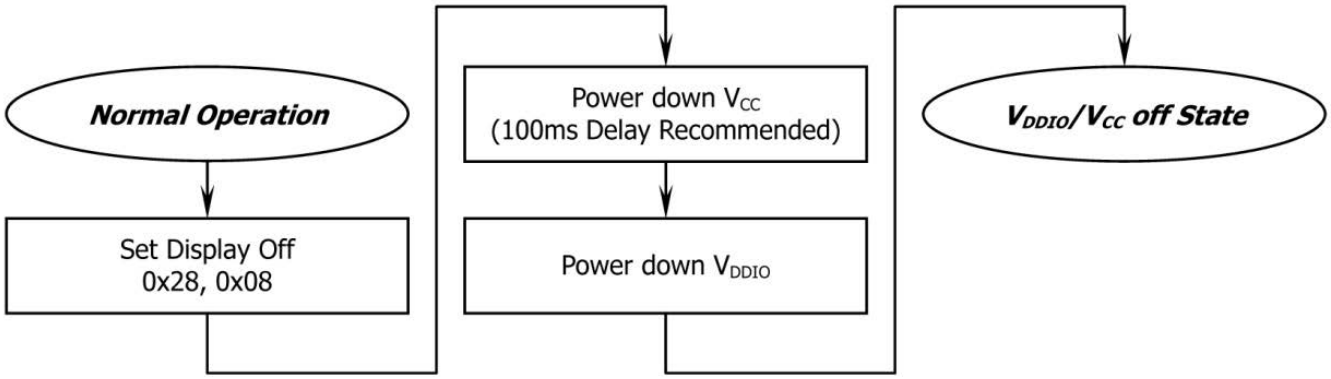
Power up Sequence



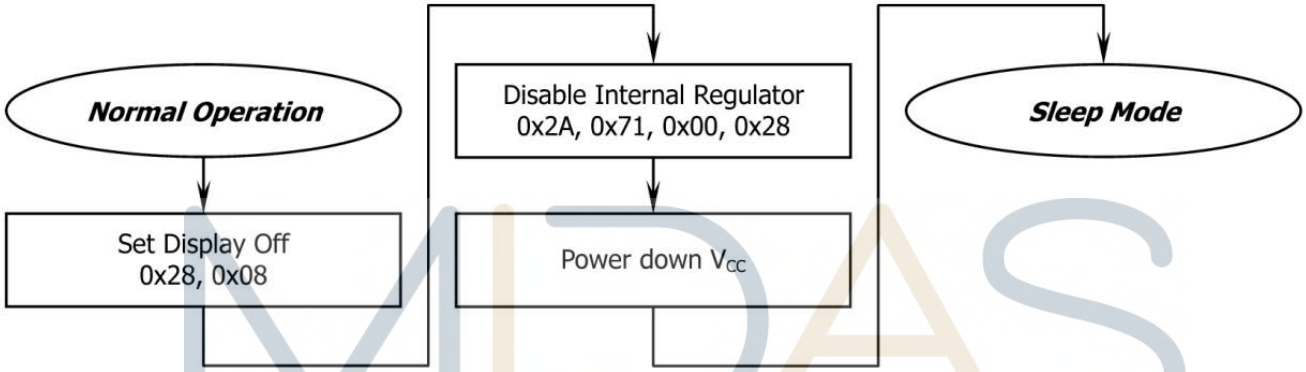
(1) This command could be programmable or defined by pin configuration.

If the noise is accidentally occurred at the displaying window during the operation, please reset the display in order to recover the display function.

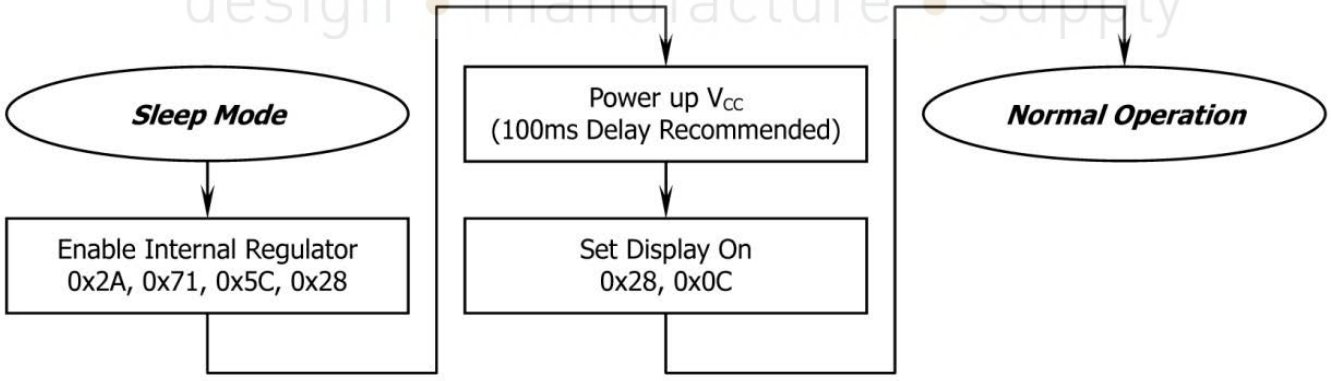
Power down Sequence



Entering Sleep Mode

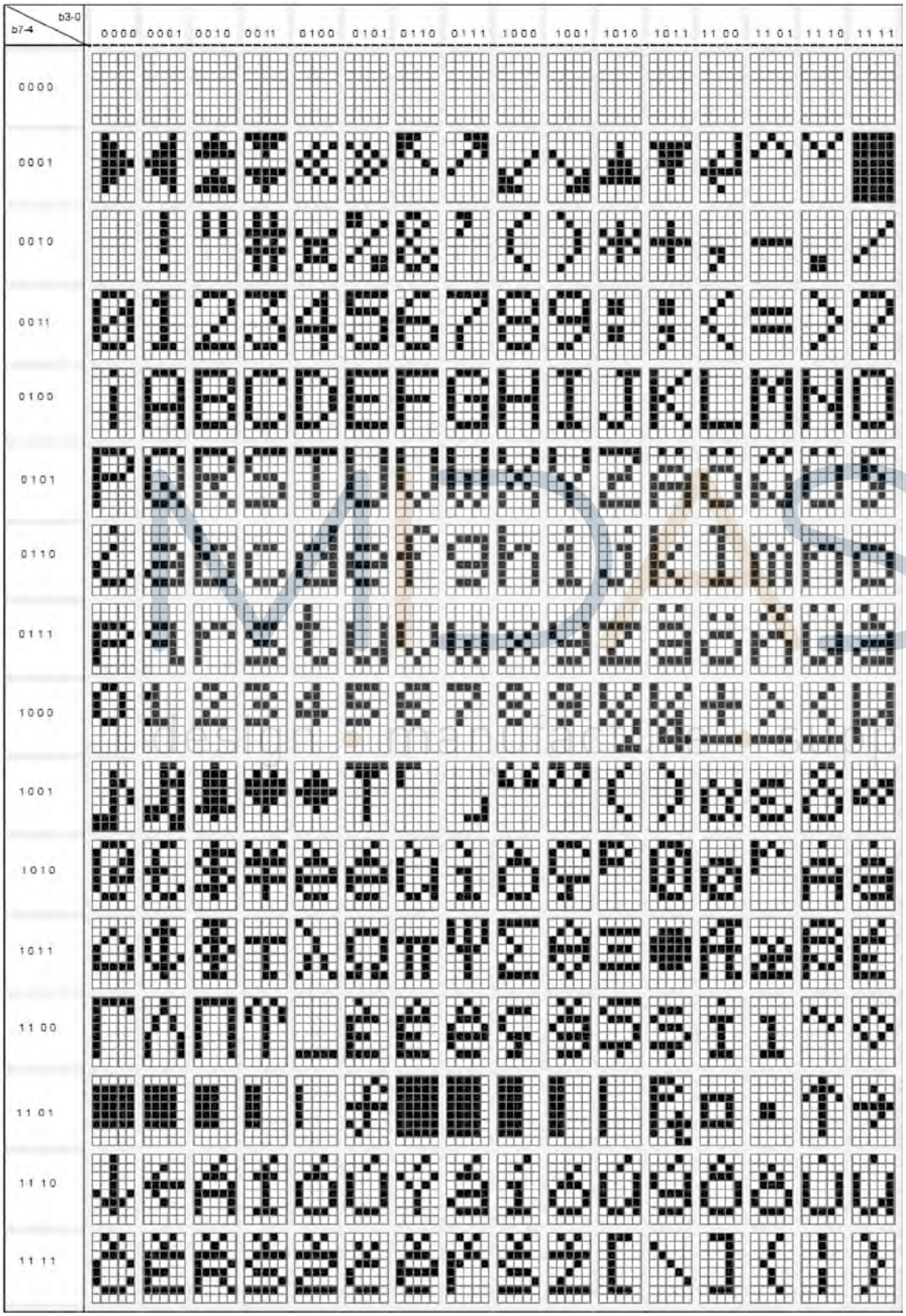


Exiting Sleep Mode

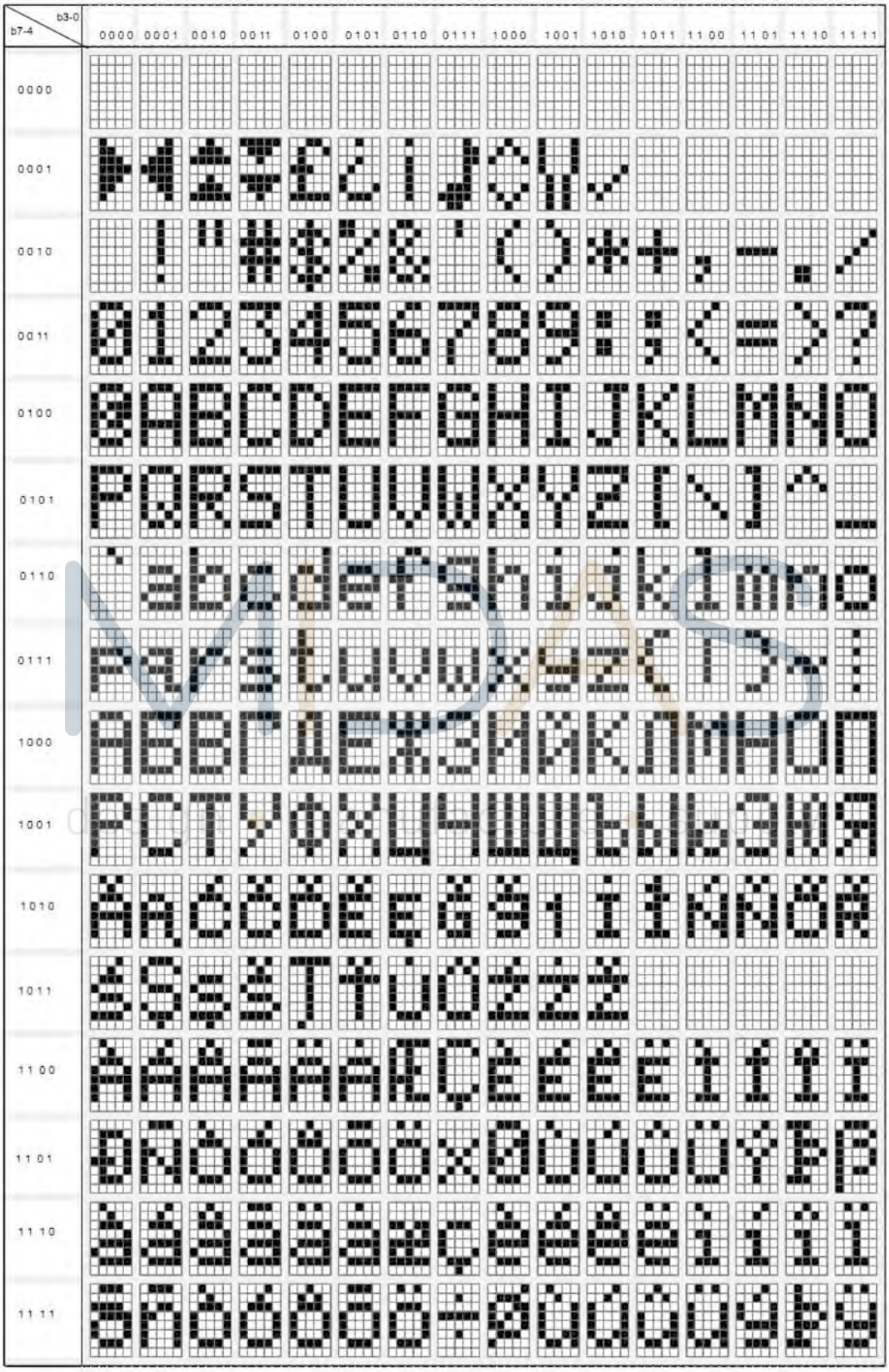


SSD1311 CGROM CHARACTER CODE

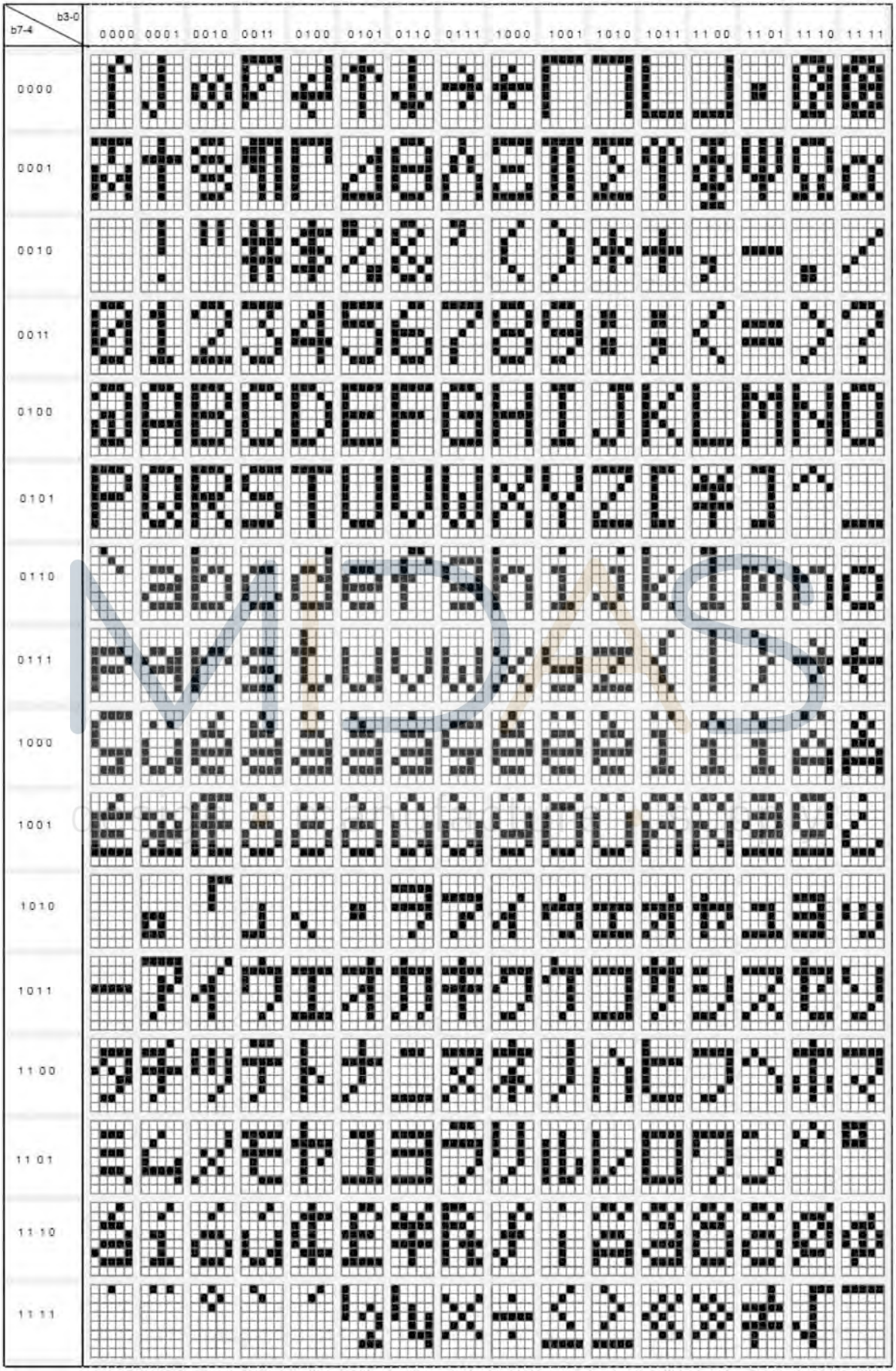
ROM A



ROM B


b3-0
b7-4
0000 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011 1100 1101 1110 1111
0000
0001
0010
0011
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111

ROM C


b3-0
b7-4
0000 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011 1100 1101 1110 1111
0000
0001
0010
0011
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111