Specification Sheet

Model No. : HSM12864K

Description : 128*64 STN LCD Module ,Backlight Color Option , AIP31066 Controller,Wide Temp, Popular Size.

RECORDS OF REVISION

Date	Rev.	Description	Page	Design by
2012/5/26	0	New Sample.	-	-
			-	-

Contents

1. SPECIFICATIONS
   - 1.1 Features
   - 1.2 Mechanical Specifications
   - 1.3 Absolute Maximum Ratings
   - 1.4 Backlight & LED Characteristics

2. MODULE STRUCTURE
   - 2.1 Counter Drawing
   - 2.2 Interface Pin Description
   - 2.3 Timing Characteristics
   - 2.4 Instruction Table
   - 2.5 Inspection Specification

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	128X64 DOTS
Driver Condition	LCD Module : 1/164 Duty , 1/9 Bias
Viewing Direction	6 O'Clock
Interface	8BIT bus MPU interface
Driver IC	UCi 6963 or eqv

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	93(L) *70(W) * 12.5 (T)	mm
Viewing Area	72(L) * 39 (W)	mm
Dot Size (W*H)	0.48*0.48mm	
Dot Pitch (W*H)	0.52*0.52 mm	

HSM12864K Series Table

No.	Part Number	LCD Type	Backlight Color	Graphic & Font Color	Background Color
1	HSM12864K-B	STN,Blue,Negative, Transmissive	White	White	Blue
2	HSM12864K-Y	STN,Yellow-Green, Positive, Transflective	Yellow-Green	Black	Yellow-Green
3	HSM12864K-G	STN,Gray,Positive, Transflective	White	Dark-Blue	Gray
4	HSM12864K-G-W	FSTN,Gray,Positive, Transflective	White	Black	Gray
5	HSM12864K-G-O	FSTN,Gray,Positive, Transflective	Orange	Black	Orange
6	HSM12864K-G-R	FSTN,Gray,Positive, Transflective	Red	Black	Red

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
System Power Supply Voltage	VDD	-	-0.3	5.5	V
LCD Driver Supply Voltage	$VOUT_{IN}$	-	4.8	5.0	V
Input Voltage	V_{IN}	-	-0.3	VDD + 0.2	V
Operating Temperature	T_{OP}	-	-20	70	°C
Storage Temperature	T_{ST}	-	-30	80	°C
Storage Humidity	H_D	Ta < 40 °C	20	90	%RH

1.4 Backlight Characteristics

LCD Module with LED Backlight

Electrical / Optical Characteristics

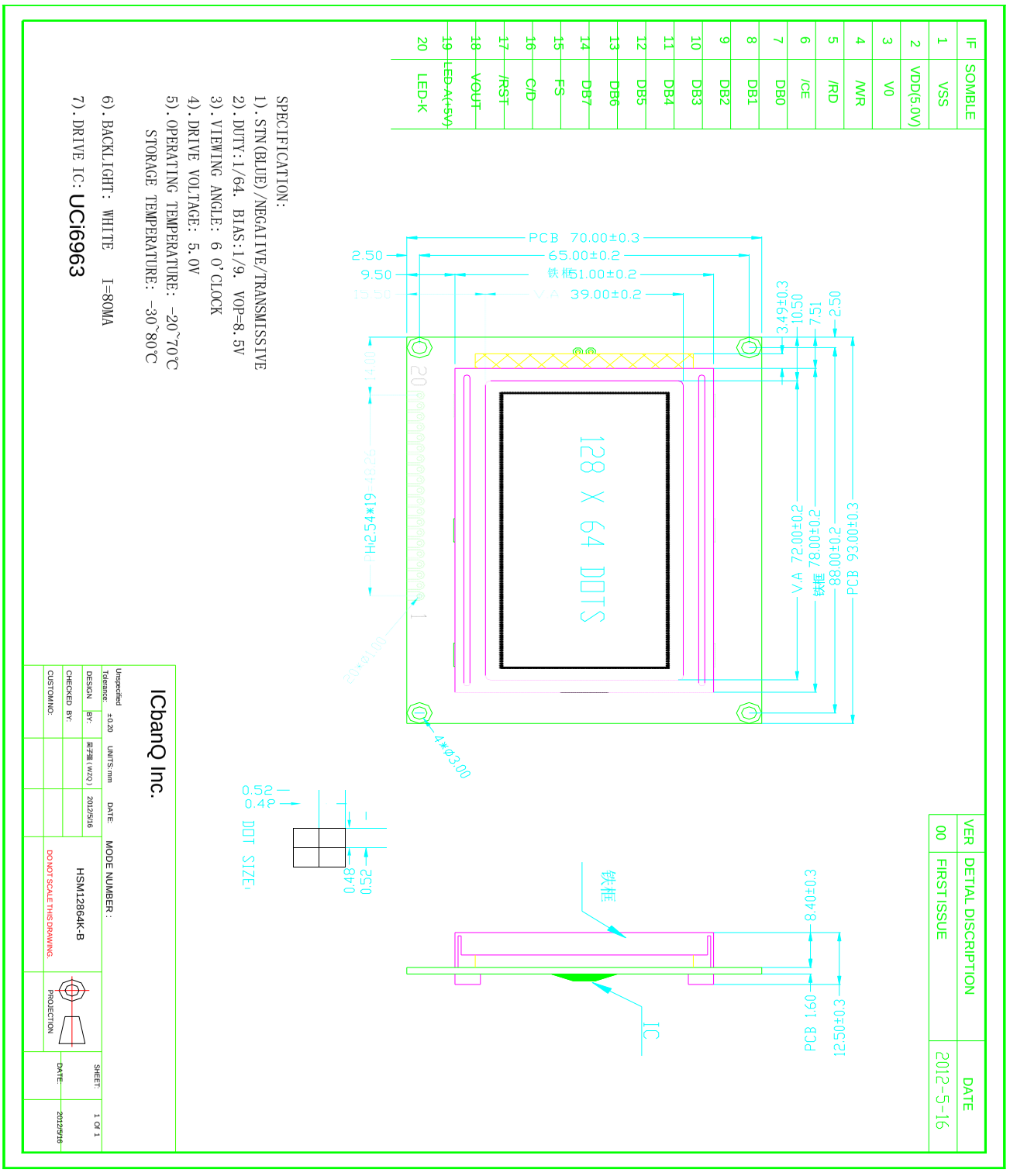
Ta =25℃

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	Vf	If=80mA	3.0	3.1	3.2	V
Reverse Current	Ir	If=5v			--	uA
Average Brightness	IV	If=80mA				cd/m^2
Wavelength (Without LCD)	λ d	If=80mA	--	--	--	nm
Luminous Intensity (without LCD)	Lv Sub	If=80mA				cd/m^2
Uniformity	Δ%	IvMin / IvMax *100%	--	-	-	%
Color	WHITE					

2. MODULE STRUCTURE

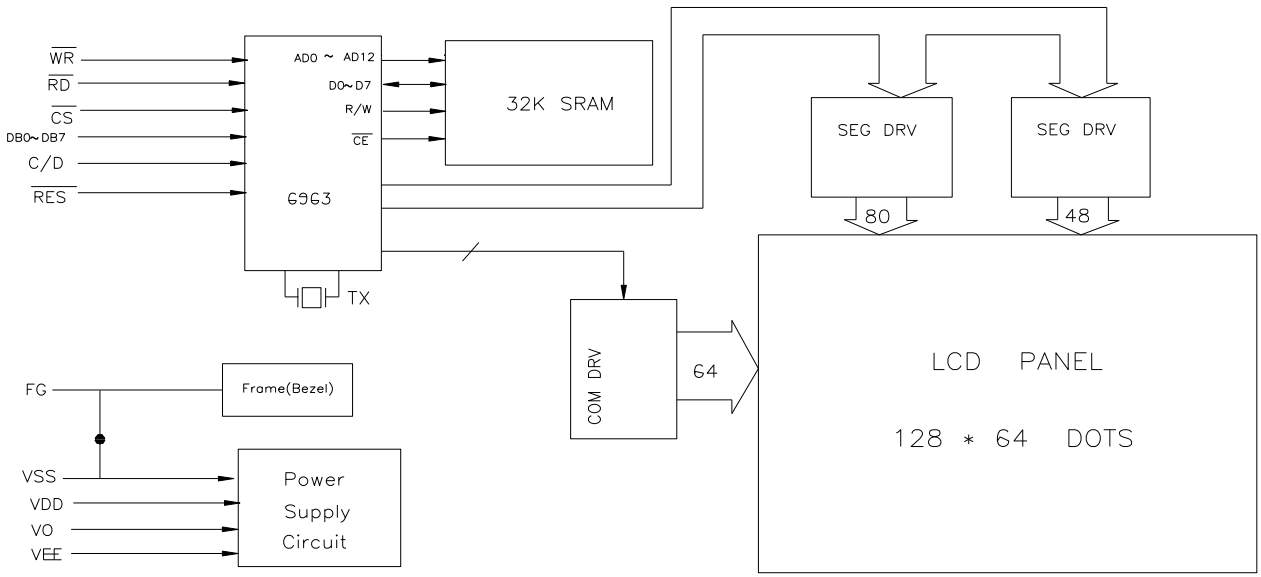
2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram



2.2 Interface Pin Description

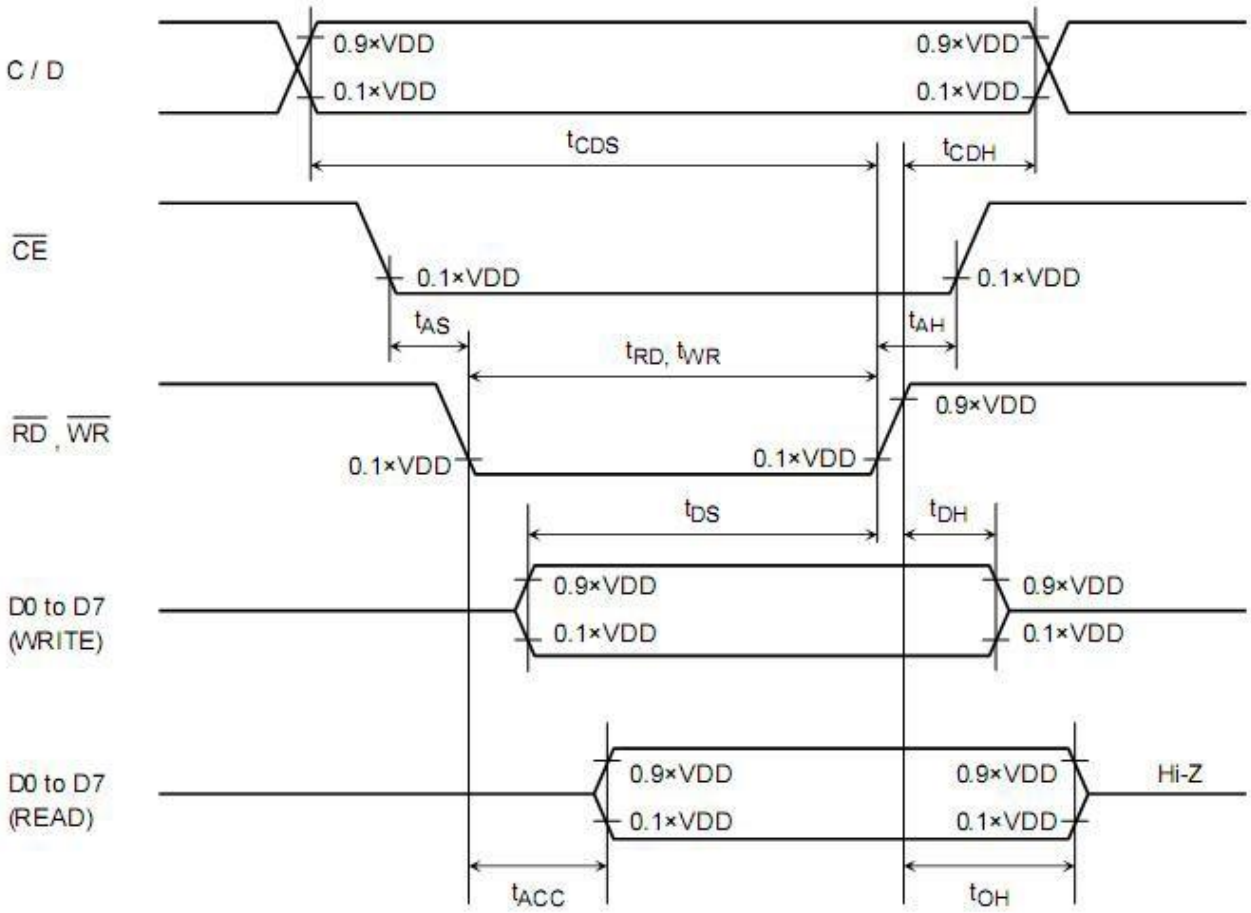
Pin No.	Symbol	Function
1	VSS	Ground (0V)
2	VDD	Power supply input for driver IC (+5V)
3	VO	LCD driver supply voltages, Contrast Adjust
4	/WR	Data write, Write data into T6963C when WR=L
5	/RD	Data read, Read data from T6963C when RD=L
6	/CE	L: Chip enable
7----14	DB0~DB7	Data bus line
15	FS	Pins for selection of font, H=6X8, L=8X8 (PCB selection J1 : L)
16	C/D	WR=L,C/D=H: Command Write C/D=L:Data write RD=L,C/D=H: Status Read C/D=L:Data read
17	/RST	H: Normal L:Initialize
18	VOUT	Output voltage for LCD driving
19	LED+	BACKLIGHT+ （5V）
20	LED-	BACKLIGHT- （0V）



2.3 Timing Characteristics

AC Characteristics

Bus Timing

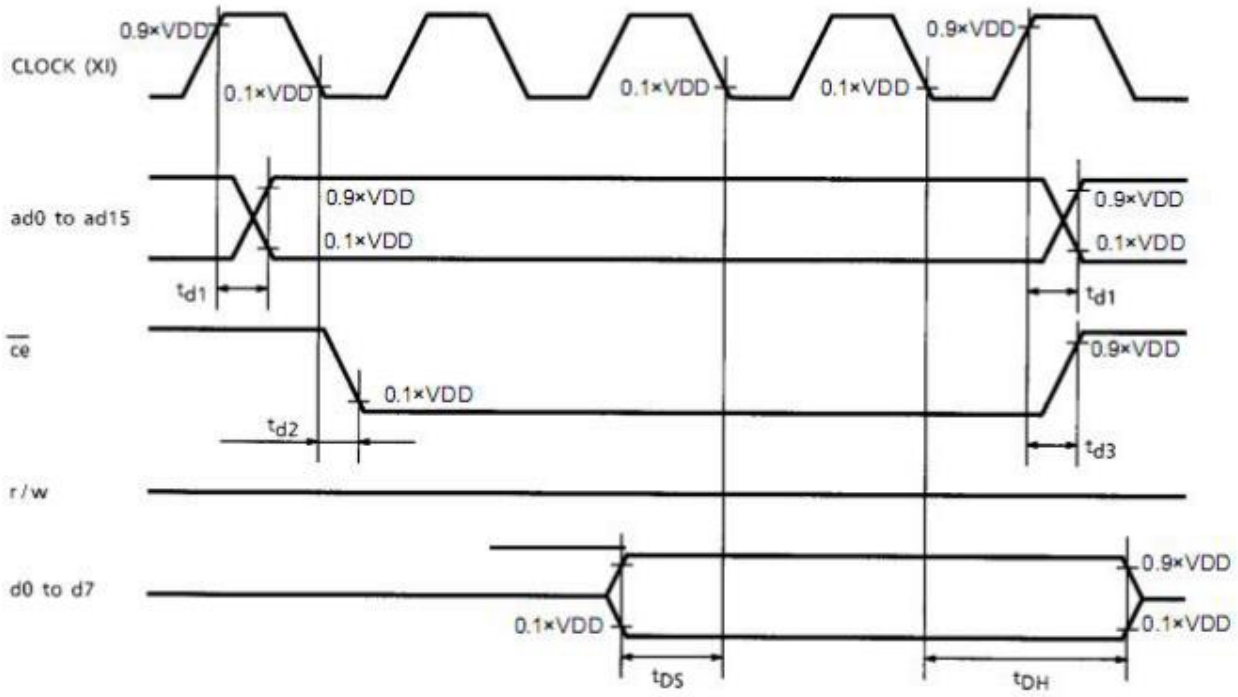


◆

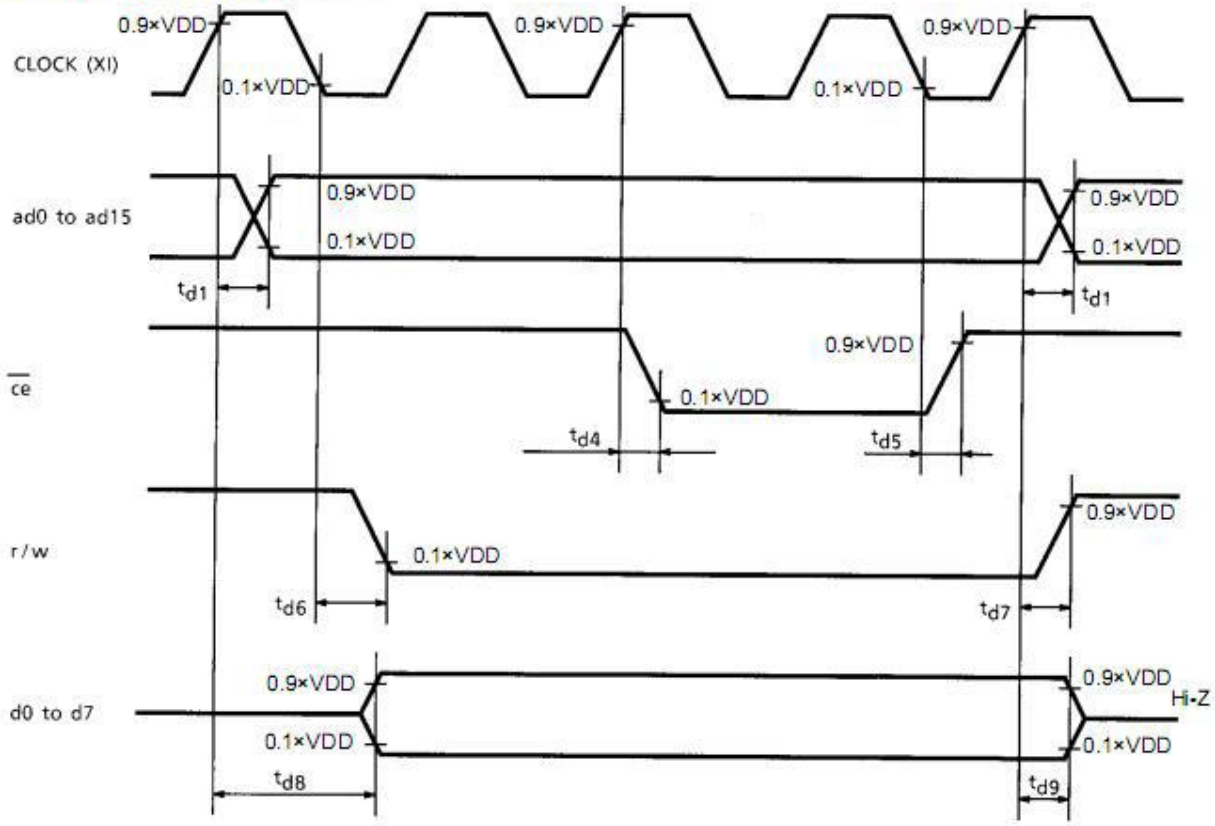
Test Conditions (Unless Otherwise Noted, V_{DD} = 5.0 V ± 10%, V_{SS} = 0 V, Ta = −20 to 75°C)

Item	Symbol	Test Conditions	Min	Max	Unit
C / D Set-up Time	t_{CDS}	—	100	—	ns
C / D Hold Time	t_{CDH}	—	10	—	ns
$\overline{RD}$, $\overline{WR}$ Pulse Width	t_{RD}, t_{WR}	—	80	—	ns
Address Set-up Time	t_{AS}	—	0	—	ns
Address Hold Time	t_{AH}	—	0	—	ns
Data Set-up Time	t_{DS}	—	80	—	ns
Data Hold Time	t_{DH}	(Note)	40	—	ns
Access Time	t_{ACC}	(Note)	—	150	ns
Output Hold Time	t_{OH}	(Note)	10	50	ns

(1) External RAM Read mode



(2) External RAM Write mode



Test Conditions (Unless Otherwise Noted, V_{DD} = 5.0 V ± 10%, V_{SS} = 0 V, Ta = −20 to 70°C)

Item	Symbol	Test Conditions	Min	Max	Unit
Address Delay Time	t_{d1}	—	—	250	ns
$\overline{ce}$ Fall Delay Time (Read)	t_{d2}	—	—	180	ns
$\overline{oe}$ Rise Delay Time (Read)	t_{d3}	—	—	180	ns
Data Set−up Time	t_{DS}	—	0	—	ns
Data Hold Time	t_{DH}	—	30	—	ns
$\overline{ce}$ Fall Delay Time (Write)	t_{d4}	—	—	200	ns
$\overline{oe}$ Rise Delay Time (Write)	t_{d5}	—	—	200	ns
r / w Fall Delay Time	t_{d6}	—	—	180	ns
r / w Rise Delay Time	t_{d7}	—	—	180	ns
Data Stable Time	t_{d8}	(Note)	—	450	ns
Data Hold Time	t_{d9}	—	—	200	ns

◆

DC Characteristics

Test Conditions (Unless Otherwise Noted, V_{SS} = 0 V, V_{DD} = 5.0 V ± 10%, Ta = −20 to 75°C)

Item		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	Pin Name
Operating Voltage		V_{DD}	—	—	4.5	5.0	5.5	V	V_{DD}
Input	H Level	V_{IH}	—	—	V_{DD} − 2.2	—	V_{DD}	V	Input pins
	L Level	V_{IL}		—	0	—	0.8	V	Input pins
Output Voltage	H Level	V_{OH}	—	—	V_{DD} − 0.3	—	V_{DD}	V	Output pins
	L Level	V_{OL}		—	0	—	0.3	V	Output pins
Output Resistance	H Level	R_{OH}	—	V_{OUT} = V_{DD} − 0.5 V	—	—	400	Ω	Output pins
	L Level	R_{OL}	—	V_{OUT} = 0.5 V	—	—	400	Ω	Output pins
Input Pull−up Resistance		RPU	—	—	50	100	200	kΩ	(Note 1)
Operating Frequency		f_{OSC}	—	—	0.4	—	5.5	MHz	
Current Consumption (Operating)		$I_{DD\ (1)}$	—	V_{DD} = 5.0 V (Note 2) f_{OSC} = 3.0 MHz	—	3.3	6	mA	V_{DD}
Current Consumption (Halt)		$I_{DD\ (2)}$	—	V_{DD} = 5.0 V	—	—	3	μA	V_{DD}

Note 1: Applied $\overline{T1}$, $\overline{T2}$, $\overline{RESET}$

Note 2: MDS = L, MD0 = L, MD1 = L, MD2 = H, MD3 = H, FS0 = L, FS1 = L, $\overline{SDSEL}$ = L, $\overline{DUAL}$ = H, D7 to D0 = LHLHLHLH

2.4 Instruction Table

Command	Code	D1	D2	Function
REGISTERS SETTING	00100001 00100010 00100100	X address Data Low address	Y address 00H High address	Set Cursor Pointer Set Offset Register Set Address Pointer
SET CONTROL WORD	01000000 01000001 01000010 01000011	Low address Columns Low address Columns	High address 00H High address 00H	Set Text Home Address Set Text Area Set Graphic Home Address Set Graphic Area
MODE SET	1000X000 1000X001 1000X011 1000X100 10000XXX 10001XXX	— — — — — —	— — — — — —	OR mode EXOR mode AND mode Text Attribute mode Internal CG ROM mode External CG RAM mode
DISPLAY MODE	10010000 1001XX10 1001XX11 100101XX 100110XX 100111XX	— — — — — —	— — — — — —	Display off Cursor on, blink off Cursor on, blink on Text on, graphic off Text off, graphic on Text on, graphic on
CURSOR PATTERN SELECT	10100000 10100001 10100010 10100011 10100100 10100101 10100110 10100111	— — — — — — — —	— — — — — — — —	1−line cursor 2−line cursor 3−line cursor 4−line cursor 5−line cursor 6−line cursor 7−line cursor 8−line cursor
DATA AUTO READ / WRITE	10110000 10110001 10110010	— — —	— — —	Set Data Auto Write Set Data Auto Read Auto Reset
DATA READ / WRITE	11000000 11000001 11000010 11000011 11000100 11000101	Data — Data — Data —	— — — — — —	Data Write and Increment ADP Data Read and Increment ADP Data Write and Decrement ADP Data Read and Decrement ADP Data Write and Nonvariable ADP Data Read and Nonvariable ADP
SCREEN PEEK	11100000	—	—	Screen Peek
SCREEN COPY	11101000			Screen Copy

X: invalid

Command	Code	D1	D2	Function
BIT SET / RESET	11110XXX 11111XXX 1111X000 1111X001 1111X010 1111X011 1111X100 1111X101 1111X110 1111X111	— — — — — — — — — —	— — — — — — — — — —	Bit Reset Bit Set Bit 0 (LSB) Bit 1 Bit 2 Bit 3 Bit 4 Bit 5 Bit 6 Bit 7 (MSB)

X: invalid

- **Setting registers**

Code	Hex.	Function	D1	D2
00100001	21H	SET CURSOR POINTER	X ADRS	Y ADRS
00100010	22H	SET OFFSET REGISTER	DATA	00H
00100100	24H	SET ADDRESS POINTER	LOW ADRS	HIGH ADRS

(1) Set Cursor Pointer

The position of the cursor is specified by X ADRS and Y ADRS. The cursor position can only be moved by this command. Data read / write from the MPU never changes the cursor pointer. X ADRS and Y ADRS are specified as follows.

X ADRS 00H to 4FH (lower 7 bits are valid)
Y ADRS 00H to 1FH (lower 5 bits are valid)

`(Rhmfkdh Rb`m
W @CQR // sn 3EG

Y ADRS 00H to 0FH

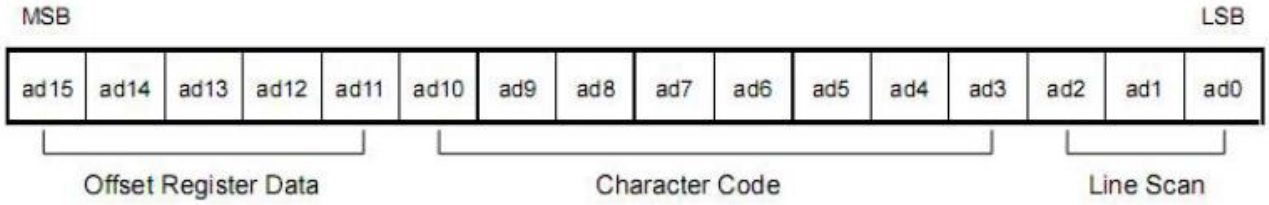
b(Ct`kh Rb`m
W @CQR //G sn 3EG

Y ADRS 00H to 0FH
Upper screen

Y ADRS 10H to 1FH
Lower screen

(2) Set Offset Register

The offset register is used to determine the external character generator RAM area.
The T6963CFG has a 16-bit address bus as follows:



T6963CFG assign External character generator, when character code set 80H to FFH in using internal character generator. Character code 00H to 80H assign External character generator, when External generator mode.
The senior five bits define the start address in external memory of the CG RAM area. The next eight bits represent the character code of the character. In internal CG ROM mode, character codes 00H to 7FH represent the predefined "internal" CG ROM characters, and codes 80H to FFH represent the user' s own "external" characters. In external CG RAM mode, all 256 codes from 00H to FFH can be used to represent the user' s own characters. The three least significant bits indicate one of the eight rows of eight dots that define the character' s shape.

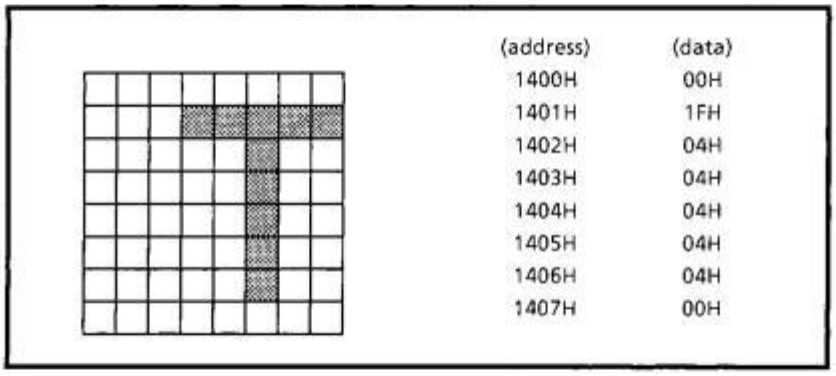
Sgd qdk`shnmrgho adsvddm chrok`x Q@L `ccqdrr `mc neerds qdfhrsdq

Offset register data	CG RAM hex. address (start to end)
00000	0000 to 07FFH
00001	0800 to 0FFFH
00010	1000 to 17FFH

11100	E000 to E7FFH
11101	E800 to EFFFH
11110	F000 to F7FFH
11111	F800 to FFFFH

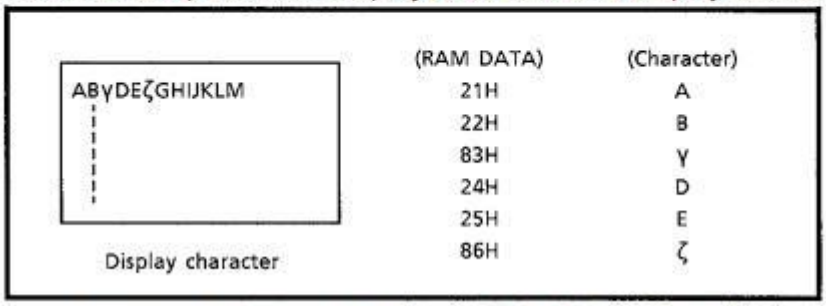
(Example 1)

Offset register	02H				
Character code	80H				
Character generator RAM start address	0001	0100	0000	0000	
	1	4	0	0	H



(address)	(data)
1400H	00H
1401H	1FH
1402H	04H
1403H	04H
1404H	04H
1405H	04H
1406H	04H
1407H	00H

(Example 2) The relationship between display RAM data and display characters



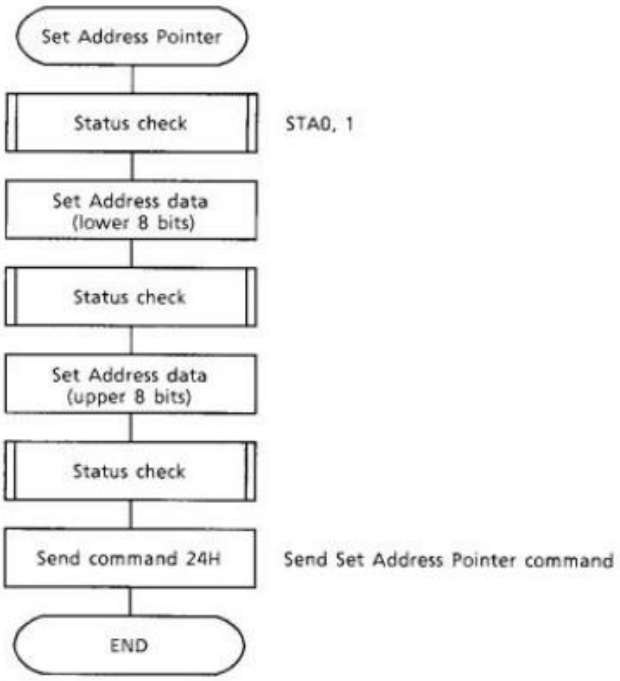
(RAM DATA)	(Character)
21H	A
22H	B
83H	γ
24H	D
25H	E
86H	ζ

γ and ζ are displayed by character generator RAM.

(3) Set Address Pointer

The Set Address Pointer command is used to indicate the start address for writing to (or reading from) external RAM.

Sgd Eknvbg`qs enq Rds @ccqdrr Onhmsdq bnll`mc



- **Set Control Word**

Code	Hex.	Function	D1	D2
01000000	40H	Set Text Home Address	Low address	High address
01000001	41H	Set Text Area	Columns	00H
01000010	42H	Set Graphic Home Address	Low address	High address
01000011	43H	Set Graphic Area	Columns	00H

The home address and column size are defined by this command.

(1) Set Text Home Address

The starting address in the external display RAM for text display is defined by this command. The text home address indicates the leftmost and uppermost position.

Sgd qdk`shnmrgho adsvddm dwsdqm`k chrok`x Q@L `ccqdrr `mc chrok`x onrhshnm

TH		TH + CL
TH +TA		TH + TA + CL
(TH + TA) + TA		TH + 2TA + CL
(TH + 2TA) +TA		TH + 3TA + CL
TH + (n − 1) TA		TH + (n − 1) TA + CL

TH: Text home address
TA: Text area number (columns)
CL: Columns are fixed by hardware (pin-programmable).

(Example)
Text home address : 0000H
Text area : 0020H
MD2 = H, MD3 = H : 32 columns
$\overline{DUAL}$ = H, MDS = L, MD0 = L, MD1 = H: 4 lines

0000H	0001H		001EH	001FH
0020H	0021H		003EH	002FH
0040H	0041H		005EH	005FH
0060H	0061H		007EH	007FH

(2) Set Graphic Home Address

The starting address of the external display RAM used for graphic display is defined by this command. The graphic home address indicates the leftmost and uppermost position.

Sgd qdk`shnmrgho adsvddm dwsdqm`k chrok`x Q@L `ccqdrr `mc chrok`x onrhshnm

GH		GH + CL
GH + GA		GH + GA + CL
(GH + GA) + GA		GH + 2GA + CL
(GH + 2GA) + GA		GH + 3GA + CL
GH + (n − 1) GA		GH + (n − 1) GA + CL

GH: Graphic home address
GA: Graphic area number (columns)
CL: Columns are fixed by hardware (pin-programmable).

(Example)
Graphic home address : 0000H
Graphic area : 0020H
MD2 = H, MD3 = H : 32 columns
$\overline{DUAL}$ = H, MDS = L, MD0 = H, MD1 = H: 2 lines

0000H	0001H		001EH	001FH
0020H	0021H		003EH	003FH
0040H	0041H		005EH	005FH
0060H	0061H		007EH	007FH
0080H	0081H		009EH	009FH
00A0H	00A1H		00BEH	00BFH
00C0H	00C1H		00DEH	00DFH
00E0H	00E1H		00FEH	00FFH
0100H	0101H		011EH	011FH
0120H	0121H		013EH	013FH
0140H	0141H		015EH	015FH
0160H	0161H		017EH	017FH
0180H	0181H		019EH	019FH
01A0H	01A1H		01BEH	01BFH
01C0H	01C1H		01DEH	01DFH
01E0H	01E1H		01FEH	01FFH

(3) Set Text Area

The display columns are defined by the hardware setting. This command can be used to adjust the columns of the display.

(Example)

LCD size : 20 columns, 4 lines
Text home address : 0000H
Text area : 0014H
MD2 = H, MD3 = H : 32 columns
$\overline{\text{DUAL}}$ = H, MDS = L, MD0 = L, MD1 = H : 4 lines

0000	0001	.....	0013	0014	.....	001F
0014	0015	.....	0027	0028	.....	0033
0028	0029	.....	003B	003C	.....	0047
003C	003D	.....	004F	0050	.....	005B

LCD

(4) Set Graphic Area

The display columns are defined by the hardware setting. This command can be used to adjust the columns of the graphic display.

(Example)

LCD size : 20 columns, 2 lines
Graphic home address : 0000H
Graphic area : 0014H
MD2 = H, MD3 = H : 32 columns
$\overline{DUAL}$ = H, MDS = L, MD0 = H, MD1 = H : 2 lines

0000	0001	.....	0013	0014	.....	001F
0014	0015	.....	0027	0028	.....	0033
0028	0029	.....	003B	003C	.....	0047
003C	003D	.....	004F	0050	.....	005B
0050	0051	.....	0063	0064	.....	006F
0064	0065	.....	0077	0078	.....	0083
0078	0079	.....	008B	008C	.....	0097
008C	008D	.....	009F	00A0	.....	00AB
00A0	00A1	.....	00B3	00B4	.....	00BF
00B4	00B5	.....	00C7	00C8	.....	00D3
00C8	00C9	.....	00DB	00DC	.....	00E7
00DC	00DD	.....	00EF	00F0	.....	00FD
00F0	00F1	.....	0103	0104	.....	011F
0104	0105	.....	0127	0128	.....	0123
0128	0129	.....	013B	013C	.....	0147
013C	013D	.....	014F	0150	.....	015B

→ LCD ←

If the graphic area setting is set to match the desired number of columns on the LCD, the addressing scheme will be automatically modified so that the start address of each line equals the end address of the previous line + 1.

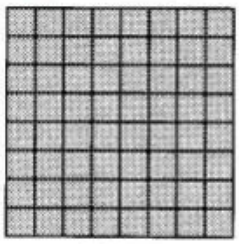
- **Mode set**

Code	Function	Operand
1000X000	OR Mode	—
1000X001	EXOR Mode	—
1000X011	AND Mode	—
1000X100	TEXT ATTRIBUTE Mode	—
10000XXX	Internal Character Generator Mode	—
10001XXX	External Character Generator Mode	—

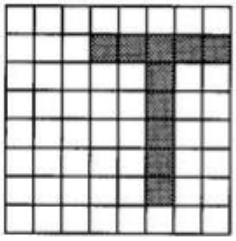
X: invalid

The display mode is defined by this command. The display mode does not change until the next command is sent. The logical OR, EXOR, AND of text or graphic display can be displayed.
In Internal Character Generator mode, character codes 00H to 7FH are assigned to the built−in character generator ROM. The character codes 80H to FFH are automatically assigned to the external character generator RAM.

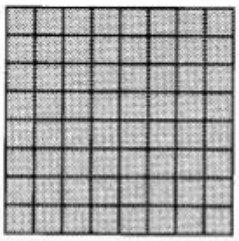
(Example)



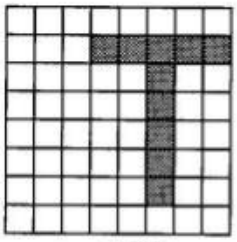
GRAPHIC



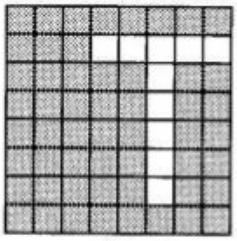
TEXT



"OR"



"AND"



"EXOR"

Note: Attribute functions can only be applied to text display, since the attribute data is placed in the graphic RAM area.

The attribute operations are Reverse display, Character blink and Inhibit. The attribute data is written into the graphic area which was defined by the Set Control Word command. Only text display is possible in Attribute Function mode; graphic display is automatically disabled. However, the Display Mode command must be used to turn both Text and Graphic on in order for the Attribute function to be available.
The attribute data for each character in the text area is written to the same address in the graphic area. The Attribute function is defined as follows.

Attribute RAM 1byte	X	X	X	X	d3	d2	d1	d0

d3	d2	d1	d0	Function
0	0	0	0	Normal display
0	1	0	1	Reverse display
0	0	1	1	Inhibit display
1	0	0	0	Blink of normal display
1	1	0	1	Blink of reverse display
1	0	1	1	Blink of inhibit display

X: invalid

- **Display mode**

Code	Function	Operand
10010000	Display off	—
1001XX10	Cursor on, blink off	—
1001XX11	Cursor on, blink on	—
100101XX	Text on, graphic off	—
100110XX	Text off, graphic on	—
100111XX	Text on, graphic on	—

X: invalid

1	0	0	1	D3	D2	D1	D0

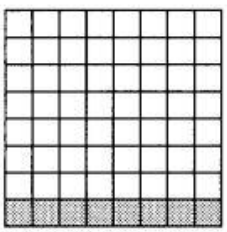
D0 — Cursor blink — on: 1, off: 0
D1 — Cursor display — on: 1, off: 0
D2 — Text display — on: 1, off: 0
D3 — Graphic display — on: 1, off: 0

Note: It is necessary to turn on "Text display" and "Graphic display" in the following cases.
a) Combination of text / graphic display
b) Attribute function

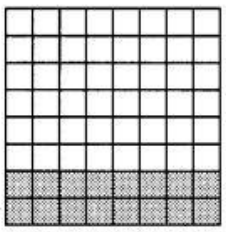
- **Cursor pattern select**

Code	Function	Operand
10100000	1-line cursor	—
10100001	2-line cursor	—
10100010	3-line cursor	—
10100011	4-line cursor	—
10100100	5-line cursor	—
10100101	6-line cursor	—
10100110	7-line cursor	—
10100111	8-line cursor	—

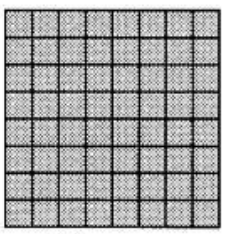
When cursor display is ON, this command selects the cursor pattern in the range 1 line to 8 lines. The cursor address is defined by the Cursor Pointer Set command.



1-line cursor



2-line cursor



8-line cursor

- **Data Auto Read / Write**

Code	Hex.	Function	Operand
10110000	B0H	Set Data Auto Write	—
10110001	B1H	Set Data Auto Read	—
10110010	B2H	Auto Reset	—

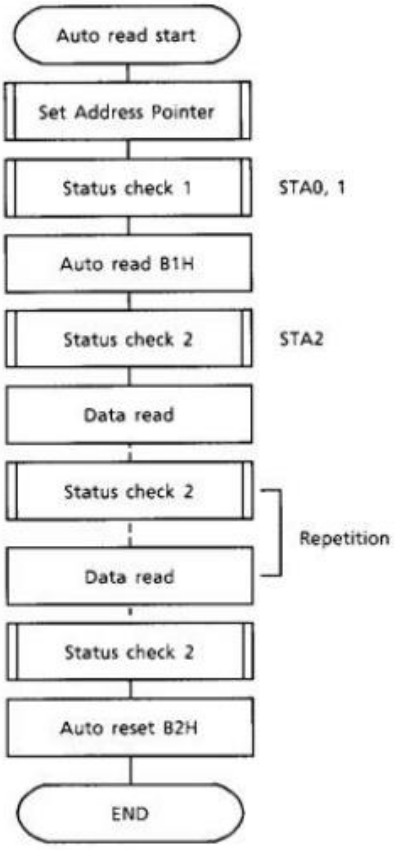
This command is convenient for sending a full screen of data from the external display RAM. After setting Auto mode, a Data Write (or Read) command is need not be sent between each datum. A Data Auto Write (or Read) command must be sent after a Set Address Pointer command. After this command, the address pointer is automatically incremented by 1 after each datum. In Auto mode, the T6963CFG cannot accept any other commands.

The Auto Reset command must be sent to the T6963CFG after all data has been sent, to clear Auto mode.

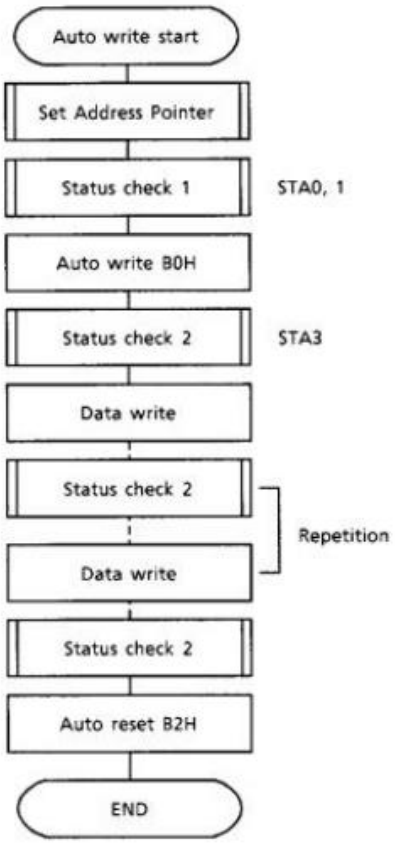
Note: A Status check for Auto mode

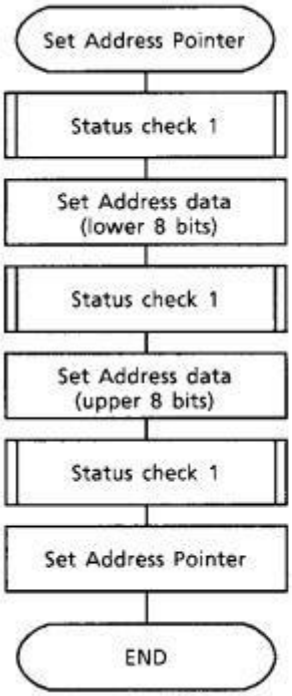
(STA2, STA3 should be checked between sending of each datum. Auto Reset should be performed after checking STA3 = 1 (STA2 = 1). Refer to the following flowchart.

a) Auto Read mode

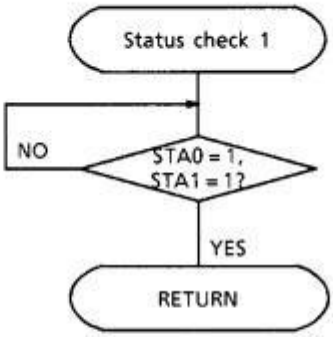


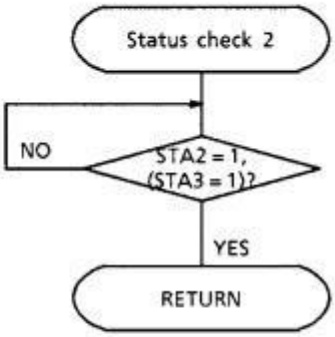
b) Auto Write mode





STA0, 1





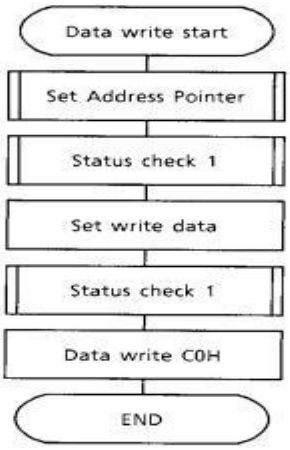
Send Set Address Pointer command

- **Data Read / Write**

Code	Hex.	Function	Operand
11000000	C0H	Data Write and Increment ADP	Data
11000001	C1H	Data Read and Increment ADP	—
11000010	C2H	Data Write and Decrement ADP	Data
11000011	C3H	Data Read and Decrement ADP	—
11000100	C4H	Data Write and Nonvariable ADP	Data
11000101	C5H	Data Read and Nonvariable ADP	—

This command is used for writing data from the MPU to external display RAM, and reading data from external display RAM to the MPU. Data Write / Data Read should be executed after setting address using Set Address Pointer command. The address pointer can be automatically incremented or decremented using this command.

Note: This command is necessary for each 1-byte datum.
Refer to the following flowchart.



(Example)
Address pointer = 1000H

STA0, 1

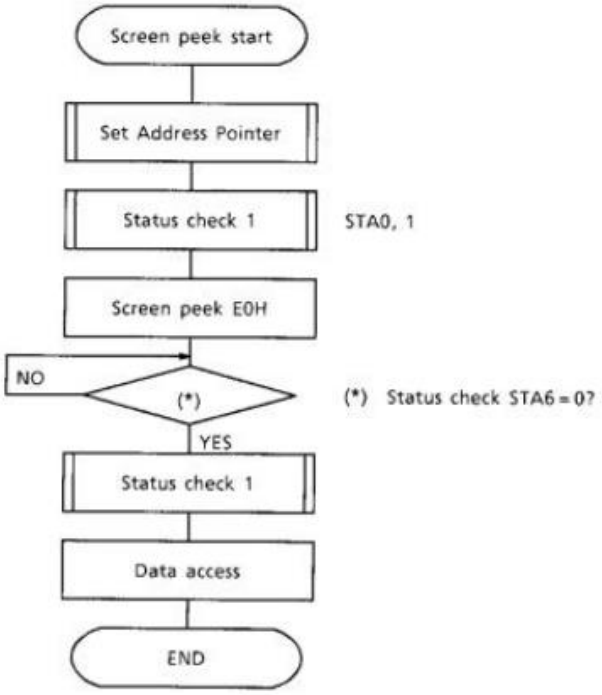
(Example)
Data = AAH

AAH is written in 1000H address.
Address pointer is 1001H.

- **Screen Peek**

Code	Hex.	Function	Operand
11100000	E0H	Screen Peek	—

This command is used to transfer 1 byte of displayed data to the data stack; this byte can then be read from the MPU by data access. The logical combination of text and graphic display data on the LCD screen can be read by this command.
The status (STA6) should be checked just after the Screen Peek command. If the address determined by the Set Address Pointer command is not in the graphic area, this command is ignored and a status flag (STA6) is set.
Refer to the following flowchart.

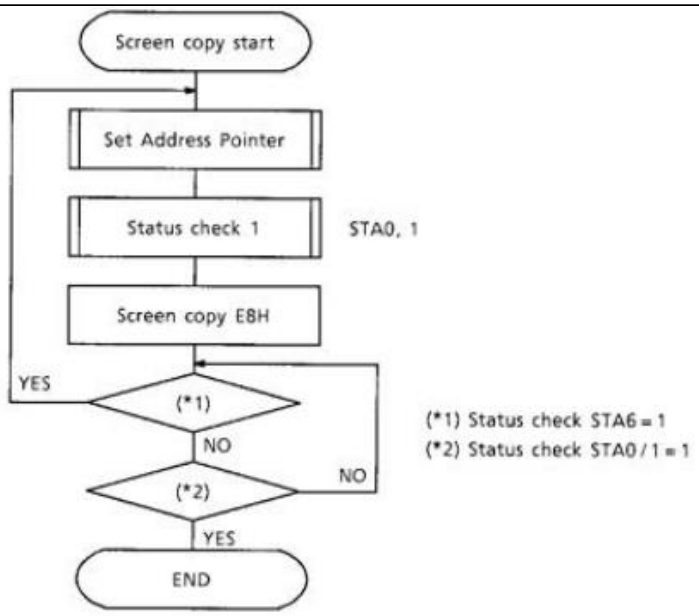


Note: This command is available when hardware column number and software column number are the same.
Hardware column number is related to MD2 and MD3 setting.
Software column number is related to Set Text Area and Set Graphic Area command.

- **Screen Copy**

Code	Hex.	Function	Operand
11101000	E8H	Screen Copy	—

This command copies a single raster line of data to the graphic area.
The start point must be set using the Set Address Pointer command.
Note 1: If the attribute function is being used, this command is not available.
(With Attribute data is graphic area data.)
Note 2: With Dual-Scan, this command cannot be used (because the T6963CFG cannot separate the upper screen data and lower screen data).
Refer to the following flowchart.



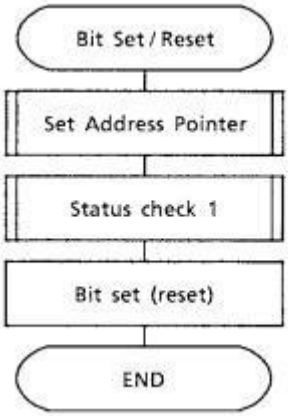
Note: This command is available when hardware column number and software column number are the same.
Hardware column number is related to MD2 and MD3 setting.
Software column number is related to Set Text Area and Set Graphic Area command.

- **Bit Set / Reset**

Code	Function	Operand
11110XXX	Bit Reset	—
11111XXX	Bit Set	—
1111X000	Bit 0 (LSB)	—
1111X001	Bit 1	—
1111X010	Bit 2	—
1111X011	Bit 3	—
1111X100	Bit 4	—
1111X101	Bit 5	—
1111X110	Bit 6	—
1111X111	Bit 7 (MSB)	—

X: invalid

This command use to set or reset a bit of the byte specified by the address pointer. Only one bit can be set / reset at a time.
Refer to the following flowchart.



Character Code Map

The relation between character codes and character pattern (CG ROM TYPE 0101)

MSB \ LSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1																
2																
3																
4																
5																
6																
7																

2.5 Inspection Specification

◆Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level Ⅱ .

◆Equipment : Gauge、MIL-STD、Powertip Tester、Sample

◆Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5 .

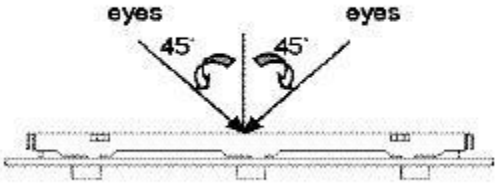
◆OUT Going Defect Level : Sampling .

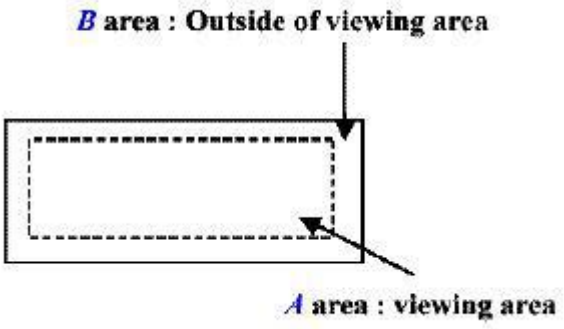
◆Manner of appearance test :

(1). The test be under 40W×2 fluorescent light ' and distance of view must be at 30 cm.

(2). The test direction is base on about around 45° of vertical line. (Fig. 1)

(3). Definition of area . (Fig. 2)

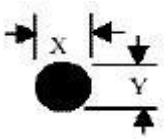


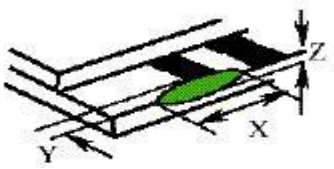


◆ Specification:

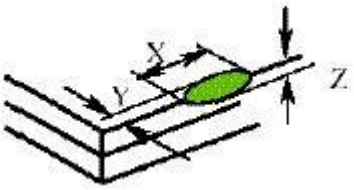
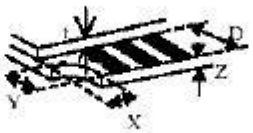
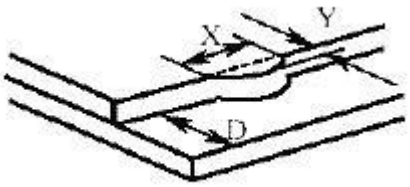
NO	Item	Criterion	level
01	Product condition	1.1 The part number is inconsistent with work order of Production.	Major
		1.2 Mixed production types.	Major
		1.3 Assembled in inverse direction.	Major
02	Quantity	2.1 The quantity is inconsistent with work order of production.	Major
03	Outline dimension	3.1 Product dimension and structure must conform to Structure diagram.	Major
04	Electrical Testing	4.1 Missing line character、dot and icon.	Major
		4.2 No function or no display.	Major
		4.3 Output data is error.	Major
		4.4 LCD viewing angle defect.	Major
		4.5 Current consumption exceeds product specifications.	Major
05	Black or white dot、scratch、contamination Round type	5.1 Round type: 5.1.1 display only : ・White and black spots on display ≦ 0.25mm, no more than Four white or black spots present. ・Densely spaced : NO more than two spots or lines within 3mm	Minor

◆Specification :

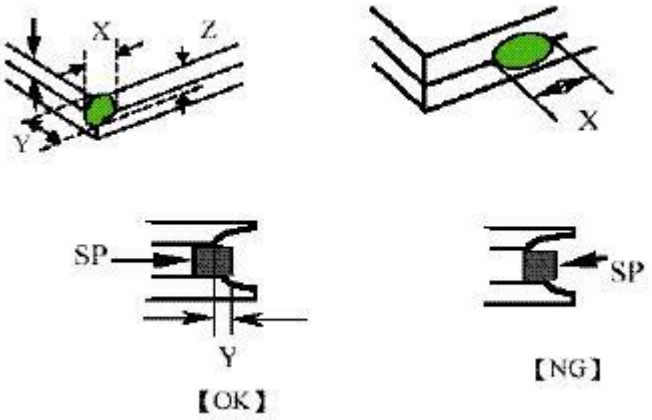
NO	Item	Criterion	level
05	Black or white dot、scratch、contamination Round type  Φ=(x+y)/2  	5.1.2 Nom-display : Dimension (diameter : Φ) Acceptance(Q'ty) Φ≦0.10mm Accept no dense 0.10mm＜Φ≦0.20mm 3 0.20mm＜Φ≦0.25mm 2 Total 4 5.1.3 Line type: Dimension (diameter : Φ) Acceptance (Q'ty) Length width A area B area --- w≦0.03mm Accept no dense Don't count L≦3.0mm 0.03mm＜ [illegible] 4 Don't count L≦2.5mm 0.05mm＜ [illegible] Don't count --- w＞0.075mm As round type	Minor

06	Polarizer Bubble	Dimension (diameter : Φ) Acceptance(Q'ty) A area B area Φ≦0.20mm Accept no dense Don't count 0.20mm＜Φ≦0.50mm 3 Don't count 0.50mm＜Φ≦1.00mm 2 Don't count Φ＞1.00mm 0 Don't count Total quantity 4 Don't count	Minor
07	The crack of glass	● Glass Crack: 7.1 Crack on the circuit of electrode terminal :  X Y Z Front X≦1/5a Y≦1/2D Z≦t Back Neglect	Minor

◆Specification :

NO	Item	Criterion	Level
07	The crack of glass X: The length of Crack Y: The width of crack Z: The thickness of crack D: terminal length T: The thickness of glass A : The length of glass	⬬Glass Crack: 7.2 General glass crack and corner edge: 7.2.1  X Y Z Neglect Out A area Neglect 7.2.2  X Y Z Neglect Out A area Neglect	Minor
		7.3 Glass remain:  X Y Neglect ≦ 1/3 d	Minor

◆Specification :

NO	Item	Criterion	Level
07	The crack of glass X: The length of Crack Y: The width of crack Z: The thickness of crack D: terminal length T: The thickness of glass A : The length of glass	7.4 Corner crack and medial crack:  X Y Z ≦1/5a Crack can't enter viewing area ≦1/2t ≦1/5a Crack can't exceed the half of width of SP width of SP 1/2t<Z≦2t	Minor
08	Backlight elements	8.1 Backlight can't work normally.	Major
		8.2 Backlight doesn't light or color is wrong.	Major
		8.3 Illumination source flickers when lit.	Major
09	General appearance	9.1 pin type must match type in specification sheet	Major
		9.2 No short circuits in components on PCB or FPC	Major
		9.3Product packaging must the same as specified on packaging specification sheet.	Major
		9.4 The folding and peeled off in polarizer are not acceptable	Major
		9.5 The PCB or FPC between B/L assembled distance (PCB or FPC) is ≦1.5mm	Major