



MULTI-INNO TECHNOLOGY CO., LTD.

LCD MODULE SPECIFICATION

Model : MI1602K1

Revision	1.3
Engineering	
Date	
Our Reference	

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**RECORDS OF REVISION**

Date	Ver.	Description	Page	Design by
2007/1/9	1.0	NEW SAMPLE Used white LED B/L Based		
2008/3/14	1.1	Used Gray LCD: D-SC00022B-01 Changed viewing Direction to 12 O'clock		
2009/4/12	1.2	Mass Production		
2010/8/14	1.3	Update Timing Characteristics and Display Command	12,14	



Contents

1. SPECIFICATIONS

- 1.1 Features
- 1.2 Mechanical Specifications
- 1.3 Absolute Maximum Ratings
- 1.4 DC Electrical Characteristics
- 1.5 Optical Characteristics
- 1.6 Backlight Characteristics

2. MODULE STRUCTURE

- 2.1 Counter Drawing
- 2.2 Interface Pin Description
- 2.3 Timing Characteristics
- 2.4 Display Command
- 2.5 Character Pattern

3. QUALITY ASSURANCE SYSTEM

- 3.1 Quality Assurance Flow Chart
- 3.2 Inspection Specification

4. RELIABILITY TEST

- 4.1 Reliability Test Condition

5. PRECAUTION RELATING PRODUCT HANDLING

- 5.1 Safety
- 5.2 Handling
- 5.3 Storage
- 5.4 Terms of Warranty

Note : For detailed information please refer to IC data sheet : ST7066U-0A-B, ST-7065C

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	16*2 Characters
LCD Type	STN, Gray, Positive, Transflective, Normal Temp
Driver Condition	LCD Module : 1/16Duty, 1/5Bias
Viewing Direction	12 O'clock
Backlight	White LED B/L
Weight	13g
Interface	-

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	53.0 (L)* 20.0 (W)*8.6 max.(H)	mm
Viewing Area	36.0(L)*10.0(W)	mm
Active Area	34.1(L)*7.4(W)	mm
Dot Size	0.33(L)* 0.35(W)	mm
Dot Pitch	0.38(L)* 0.40(W)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V_{dd}	—	-0.3	7.0	V
LCD Driver Supply Voltage	V_{LCD}	—	$V_{DD}-10.0$	$V_{DD}+0.3$	V
Input Voltage	V_{IN}	—	-0.3	$V_{DD}+0.3$	V
Operating Temperature	T_{OP}	—	0	50	°C
Storage Temperature	T_{ST}	—	-20	70	°C
Storage Humidity	H_D	$T_a < 40\text{ °C}$	-	90	%RH



1.4 DC Electrical Characteristics

 $V_{dd} = 5.0 \pm 0.5V$, $V_{SS} = 0V$, $T_a = 25^\circ C$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{dd}	-	4.5	5.0	5.5	V
“H” Input Voltage	V_{IH}	-	$0.7V_{DD}$	-	V_{DD}	V
“L” Input Voltage	V_{IL}	-	-0.3	-	0.6	V
“H” Output Voltage	V_{OH}	$I_{OH} = -0.1mA$	3.9	-	V_{DD}	V
“L” Output Voltage	V_{OL}	$I_{OL} = 0.1mA$	-	-	0.4	V
Supply Current	I_{dd}	$V_{DD} = 5.0V; V_{OP} = 4.6V;$ Pattern= Full display	-	1.3	-	mA
		$V_{DD} = 5.0V; V_{OP} = 4.6V;$ Pattern= Horizontal line*1		1.5	3.0	
LCM Driver Voltage	V_{OP}	$0^\circ C$	4.6	4.8	5.0	V
		$25^\circ C$ *2	4.4	4.6	4.8	
		$50^\circ C$	4.2	4.4	4.6	

NOTE: *1 The Maximum current display;

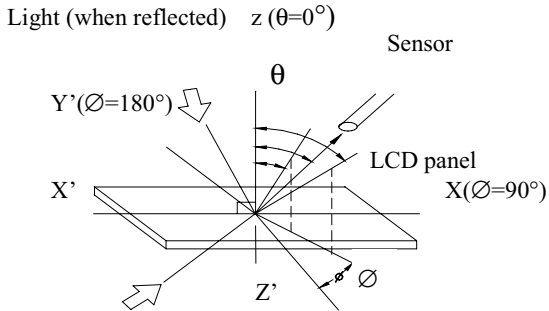
*2 The VOP test point is $V_{DD} - V_{O}$.

1.5 Optical Characteristics

LCD Panel : 1/16Duty , 1/5Bias , $V_{LCD} = 4.67V$, $T_a = 25^\circ C$

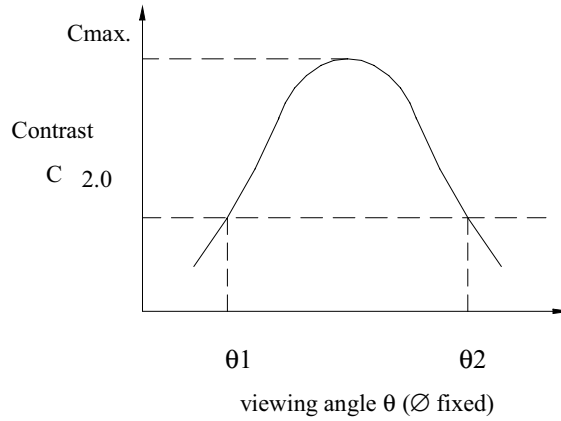
Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	θ	$C \geq 2.0, \varnothing = 180^\circ$	0	-	40°	Notes 1 & 2
Contrast Ratio	C	$\theta = -5, \varnothing = 180^\circ$	5	7	-	Note 3
Response Time(rise)	t_r	$\theta = -5, \varnothing = 180^\circ$	-	150mS	-	Note 4
Response Time(fall)	t_f	$\theta = -5, \varnothing = 180^\circ$	-	300mS	-	Note 4

Note 1: Definition of angles θ and \varnothing



Light (when transmitted) $Y(\varnothing=0^\circ)$
 $(\theta=90^\circ)$

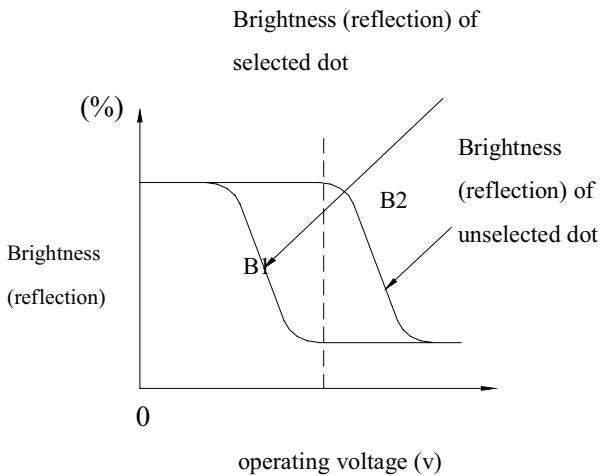
Note 2: Definition of viewing angles θ_1 and θ_2



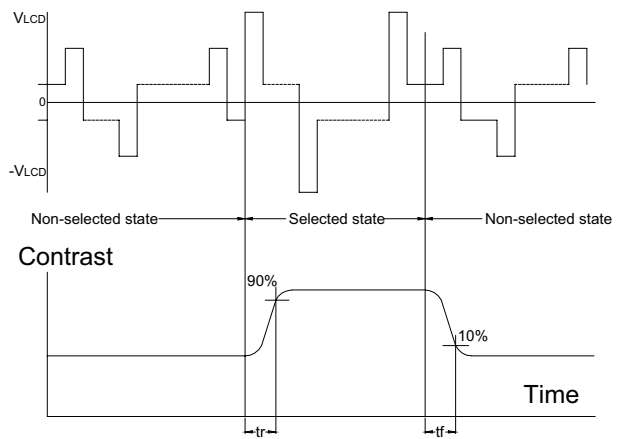
Note : Optimum viewing angle with the naked eye and viewing angle θ at C_{max} . Above are not always the same

Note 3: Definition of contrast C

$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$



Note 4: Definition of response time



Note: Measured with a transmissive LCD panel which is displayed 1 cm^2

V_{LCD} : Operating voltage f_{FRM} : Frame frequency
 t_r : Response time (rise) t_f : Response time (fall)

1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	TYP	Unit
Forward Current	IF	Ta =25°C	40	mA
Reverse Voltage	VR	Ta =25°C	8	V
Power Dissipation	Pd	Ta =25°C	0.26	W

Electrical / Optical Characteristics

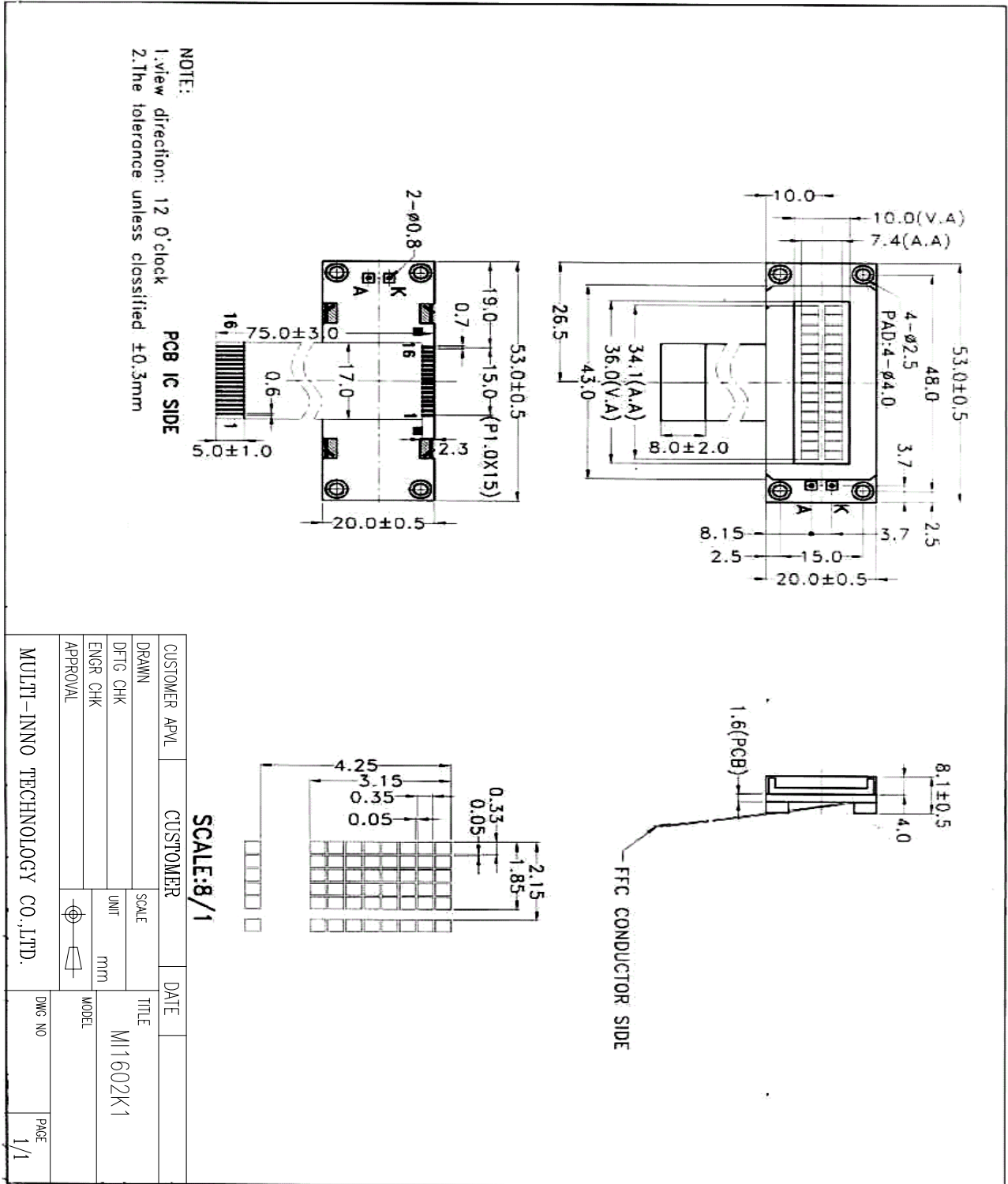
Item	Symbol	Conditions	Ta =25°C			Unit
			Min.	Typ.	Max.	
Forward Voltage	VF	IF= 40 mA	5.8	-	7.4	V
Reverse Current	IR	VR= 5 V	-	-	-	μA
Average Brightness (with LCD) *1	IV	IF=40 mA	35	55	-	cd/m ²
Color of CIE Coordinate	X	IF=40mA	0.26	0.30	0.34	
	Y	IF=40mA	0.26	0.30	0.34	
Uniformity *2	△B	IF= 40mA	70	-	-	%
Color	White LED B/L					

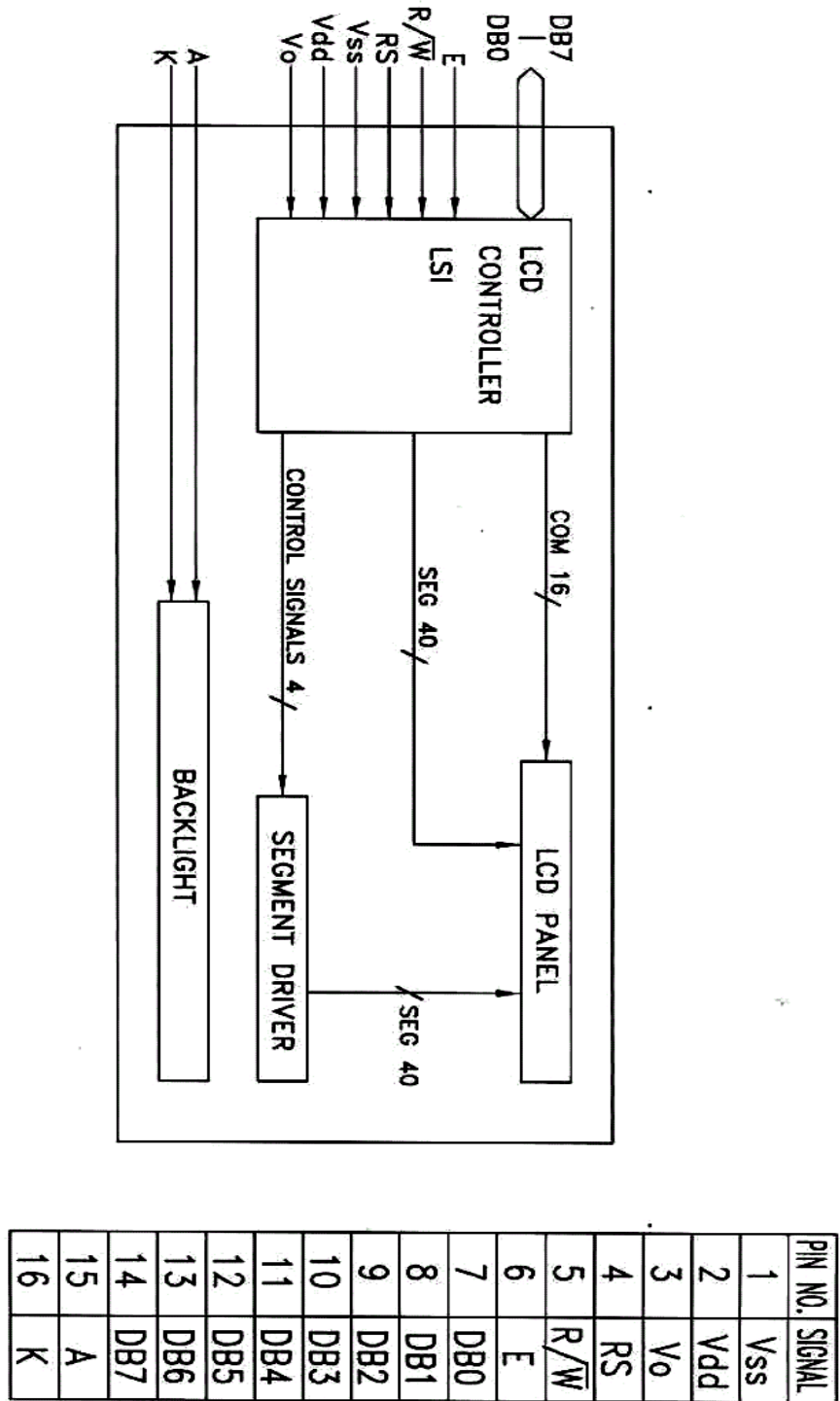
*1 This vaule will be changed while mass production.

*2 : $\Delta B = B(\min) / B(\max)$

2. MODULE STRUCTURE

2.1 Counter Drawing



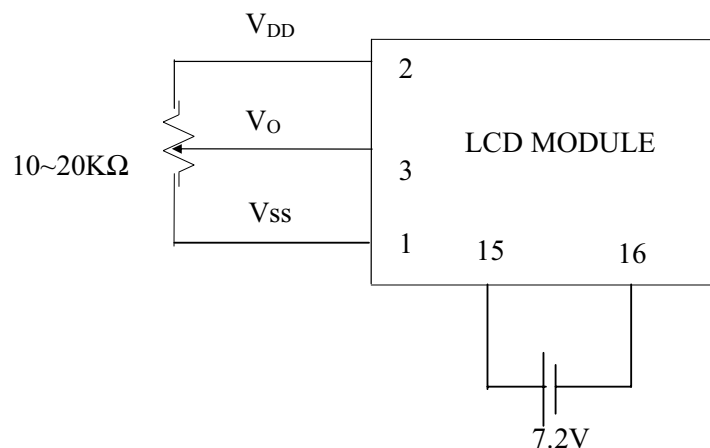


CUSTOMER APVL	CUSTOMER	DATE	
DRAWN	SCALE	TITLE	
DFTG CHK	UNIT	MI1602K1	
ENGR CHK	mm		
APPROVAL	MODEL		
MULTI-INNO TECHNOLOGY CO.,LTD.		DWG NO	PAGE
			1/1

2.2 Interface Pin Description

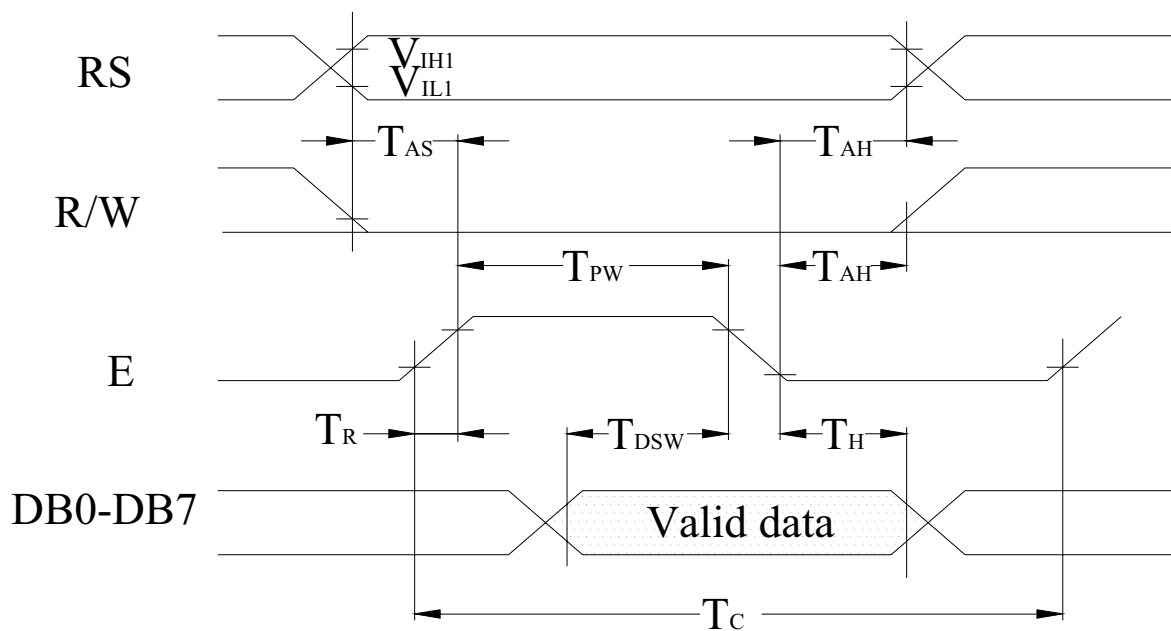
Pin No.	Symbol	Function
1	Vss	Signal ground (GND)
2	VDD	Power Supply for logic ($V_{DD} > V_{ss}$)
3	VO	Operating Voltage for LCD (variable)
4	RS	Register selection input High = Data register Low = Instruction register (for write) Busy flag address counter (for read)
5	— R/W	R/W signal input is used to select the read/write mode High = Read mode, Low = Write mode
6	E	Start enable signal to read or write the data
7-10	DB0 ~ DB3	Four low order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module. These four are not used during 4-bit operation.
11~14	DB4~DB7	Four high order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module. DB7 can be used as a busy flag.
15	A	Power supply LED backlight (+)
16	K	Power supply LED backlight (-)

Contrast Adjust

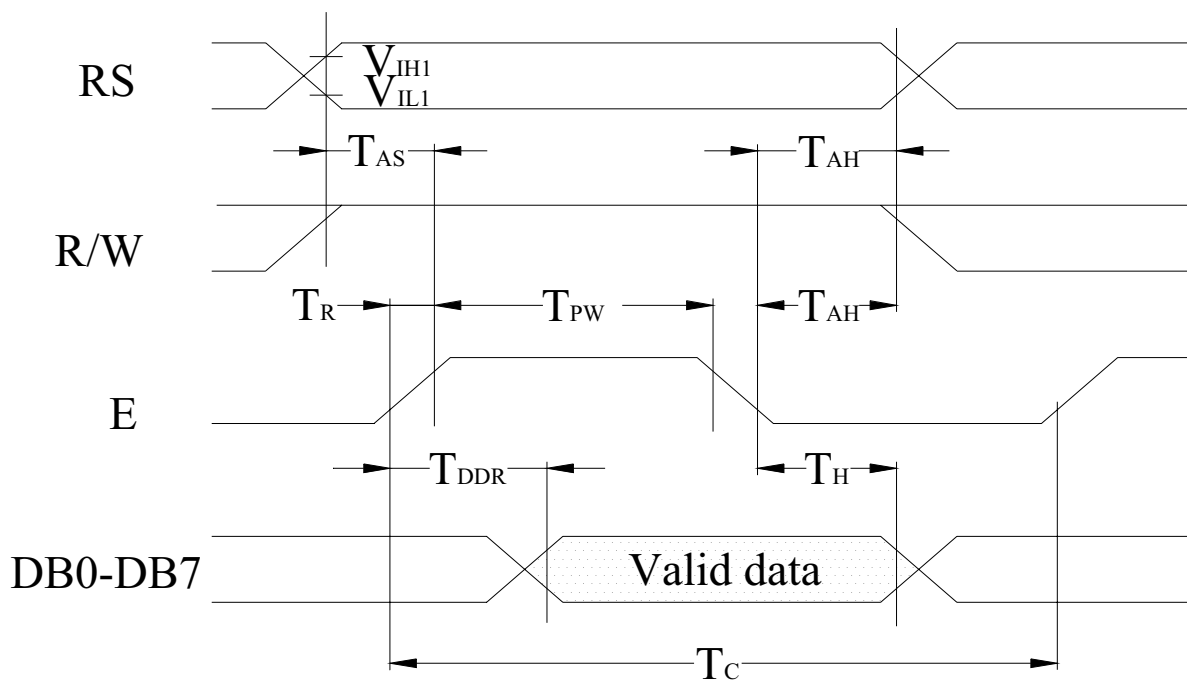


2.3 Timing Characteristics

- Writing data from MPU to ST7066U



- Reading data from ST7066U to MPU



• Write Mode (Writing data from MPU to ST7066U)

(V_{cc} = +5V, T_a = 25°C)

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
T _C	Enable Cycle Time	Pin E	1200	-	-	ns
T _{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T _R , T _F	Enable Rise / Fall Time	Pin E	-	-	25	ns
T _{AS}	Address Setup Time	Pins: RS, RW, E	0	-	-	ns
T _{AH}	Address Hold Time	Pins: RS, RW, E	10	-	-	ns
T _{DSW}	Data Setup Time	Pins: DB0~DB7	40	-	-	ns
T _H	Data Hold Time	Pins: DB0~DB7	10	-	-	ns

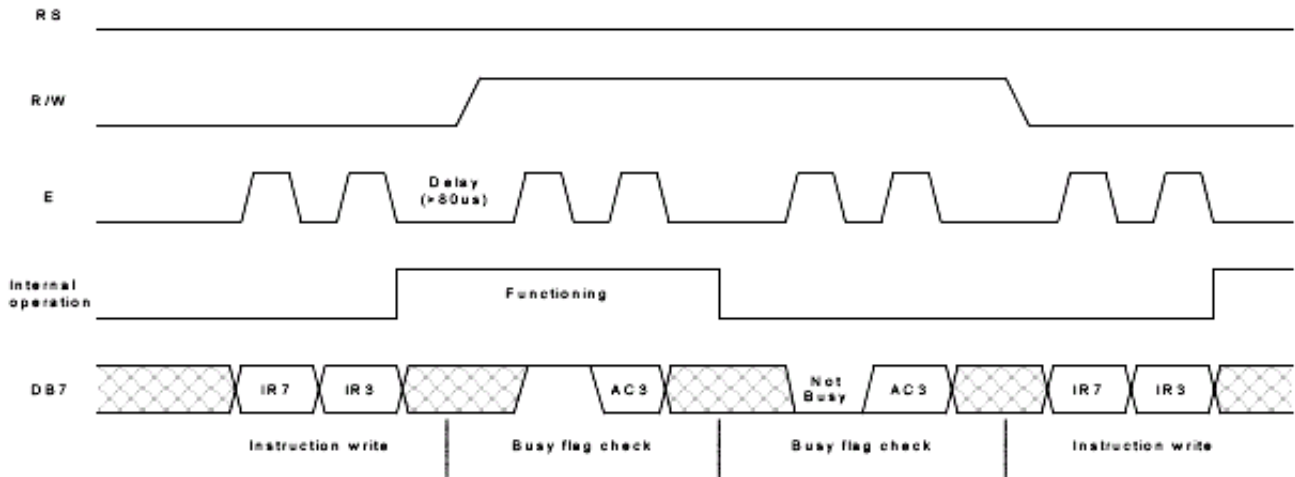
• Read Mode (Reading data from ST7066U to MPU)

(V_{cc} = +5V, T_a = 25°C)

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
T _C	Enable Cycle Time	Pin E	1200	-	-	ns
T _{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T _R , T _F	Enable Rise / Fall Time	Pin E	-	-	25	ns
T _{AS}	Address Setup Time	Pins: RS, RW, E	0	-	-	ns
T _{AH}	Address Hold Time	Pins: RS, RW, E	10	-	-	ns
T _{DDR}	Data Setup Time	Pins: DB0~DB7	-	-	100	ns
T _H	Data Hold Time	Pins: DB0~DB7	10	-	-	ns

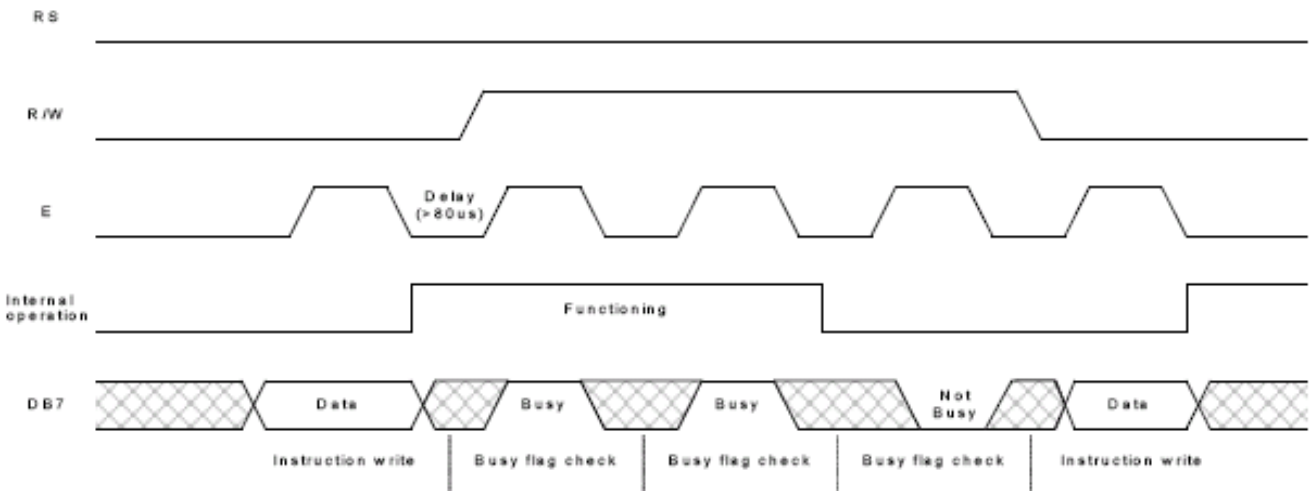
For 4-bit interface date, only four bus lines (DB4 to DB7) are used for transfer.

Example of busy flag check timing sequence



For 8-bit interface date, all eight bus lines (DB0 to DB7) are used .

Example of busy flag check timing sequence





2.4 Display Command

Instructions	Instruction Code										Description	Description Time (270KHz)	
	RS	R/W	DB 7	DB 6	DB 5	DB 4	DB 3	DB 2	DB 1	DB 0			
Clear Display	0	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC.	1.52ms
Return Home	0	0	0	0	0	0	0	0	0	1	×	Set DDRAM address to "00H" from AC and return cursor to it's original position if shifted. The contents of DDRAM are not changed.	1.52ms
Entry Mode Set	0	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read .	37μs
Display ON/OFF	0	0	0	0	0	0	0	1	D	C	B	D=1 : entire display on C=1 : cursor on B=1 : cursor position on	37μs
Cursor or Display Shift	0	0	0	0	0	0	1	S/C	R/L	×	×	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	37μs
Function Set	0	0	0	0	0	1	DL	N	F	×	×	DL: interface data is 8/4 bits NL: number of line is 2/1 F: font size is 5×11/5×8	37μs
Set CGRAM Address	0	0	0	1	AC 5	AC 4	AC 3	AC 2	AC 1	AC 0		Set CGRAM address in address counter.	37μs
Set DDRAM Address	0	0	1	AC 6	AC 5	AC 4	AC 3	AC 2	AC 1	AC 0		Set DDRAM address in address counter.	37μs



Read Busy Flag and Address	0	1	BF	AC 6	AC 5	AC 4	AC 3	AC 2	AC 1	AC 0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 μ s
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	37 μ s
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	37 μ s

Note:

Be sure the ST7066U is not in the busy state (BF=0) before sending an instruction from the MPU to the ST7066.

If an instruction is sent without checking the busy flag , the time between the first instruction and next instruction will take much longer than the instruction time itself.

Before checking BF, be sure to wait at least 80us.. Do not keep “E” always “High” for checking BF.

Refer to Instruction Table for the list of each instruction execution time.

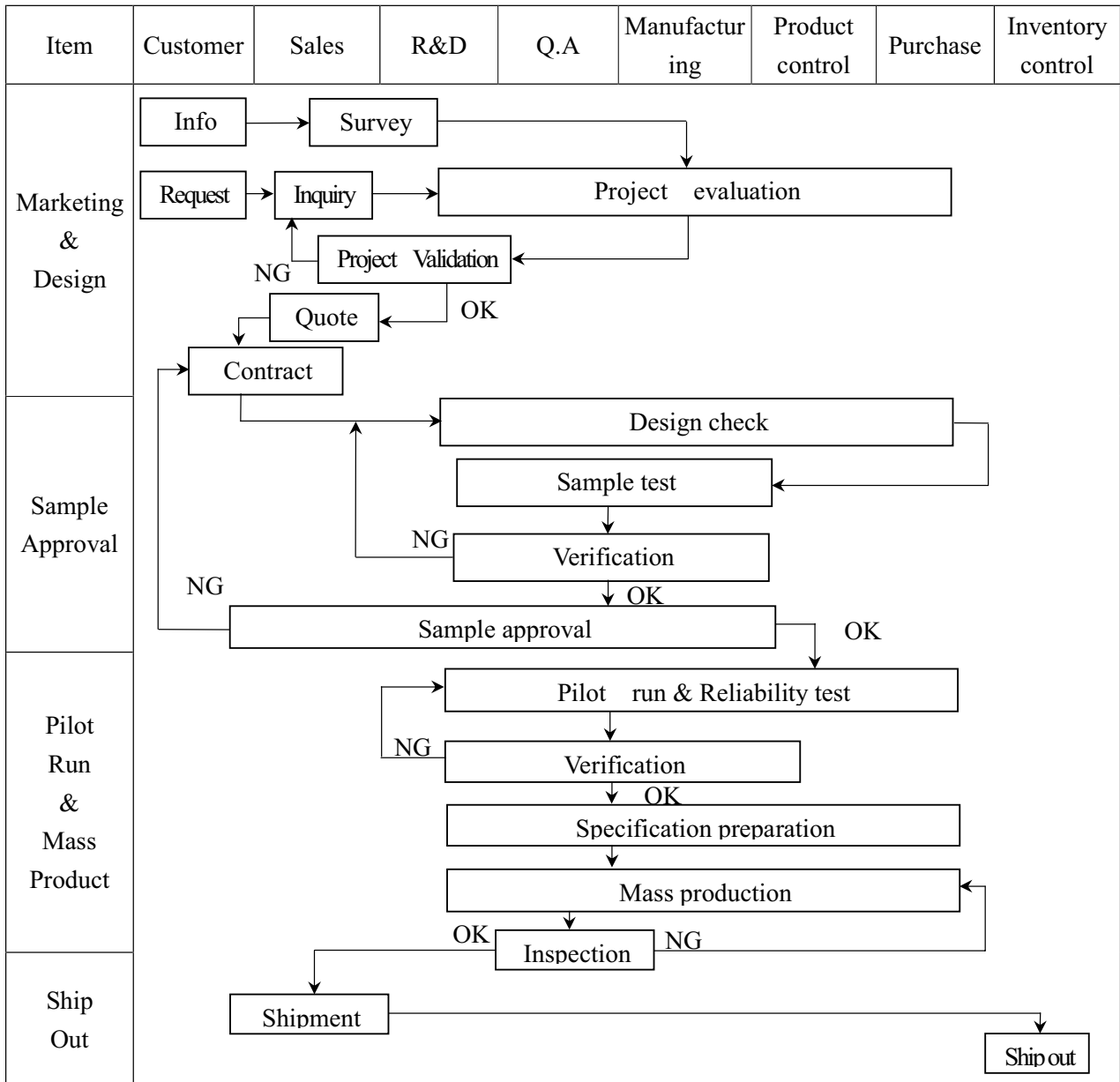
2.5 Character Pattern

CHARACTER PATTERN(SO/HO/EA,WA)

Upper 4 Bits Lower 4 Bits	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)			0	a	p	\	p				—	5	3	0	p
xxxx0001	(2)	!	1	Q	a	g			a	7	*	4	3	3	3	g
xxxx0010	(3)	"	2	R	b	r			"	4	v	x	p	a	a	
xxxx0011	(4)	#	3	S	c	s			#	5	t	e	e	e	e	
xxxx0100	(5)	\$	4	T	d	t			\$	6	r	k	k	k	k	d
xxxx0101	(6)	%	5	E	u	u			%	7	*	*	4	3	0	u
xxxx0110	(7)	&	6	F	v	v			&	8	n	c	3	a	p	k
xxxx0111	(8)	'	7	w	w	w			'	9	*	*	7	9	7	*
xxxx1000	(1)	(	8	X	x	x			(	0	0	u	v	v	v	x
xxxx1001	(2)	)	9	V	v	v			)	1	u	u	u	u	u	v
xxxx1010	(3)	*	0	Z	z	z			*	2	v	v	v	v	v	*
xxxx1011	(4)	+	1	K	k	k			+	3	*	*	4	3	0	k
xxxx1100	(5)	.	2	L	l	l			.	4	3	0	7	9	7	l
xxxx1101	(6)	—	3	M	m	m			—	5	x	x	4	3	0	m
xxxx1110	(7)	=	4	N	n	n			=	6	3	0	7	9	7	n
xxxx1111	(8)	/	5	O	o	o			/	7	v	v	8	3	0	o

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

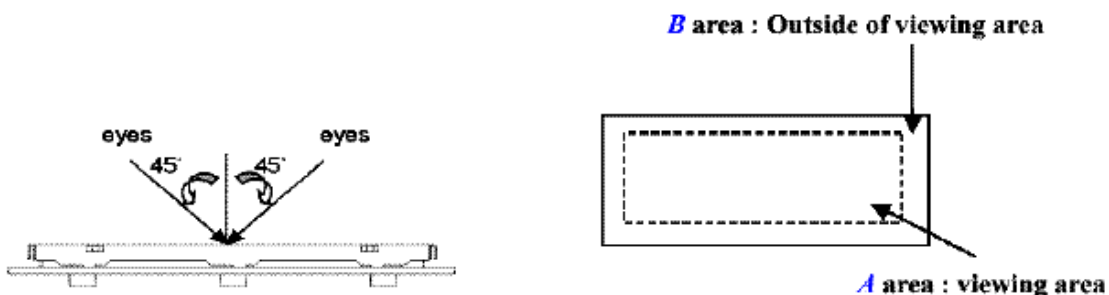




Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service	<pre> graph TD Info[Info] --> Claim[Claim] Claim --> FA[Failure analysis] Claim --> AR[Analysis report] FA --> CA[Corrective action] CA --> Tracking[Tracking] </pre>							
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management				2. Process improvement proposal 4. Education And Training Activities			

3.2 Inspection Specification

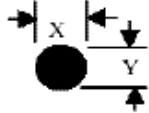
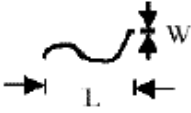

- ◆ Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II .
- ◆ Equipment : Gauge 、 MIL-STD 、 Tester 、 Sample
- ◆ Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5 .
- ◆ OUT Going Defect Level : Sampling .
- ◆ Manner of appearance test :
 - (1). The test be under 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)



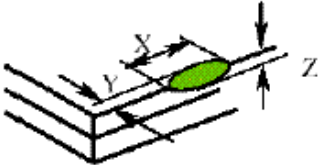

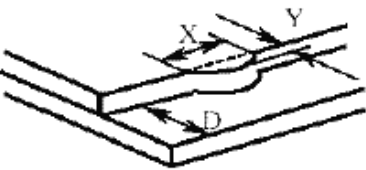
◆ Specification:

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 : <ul style="list-style-type: none"> • White and black spots on display $\leq 0.25\text{mm}$, 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  $\Phi = (x+y)/2$ 	5.1.2 Nom-display : <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Dimension (diameter : Φ)</th> <th>Acceptance(Q'ty)</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10\text{mm}$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.10\text{mm} < \Phi \leq 0.20\text{mm}$</td> <td>3</td> </tr> <tr> <td>$0.20\text{mm} < \Phi \leq 0.25\text{mm}$</td> <td>2</td> </tr> <tr> <td>Total</td> <td>4</td> </tr> </tbody> </table> 5.1.3 Line type: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Dimension (diameter : Φ)</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>Length</th> <th>width</th> <th>A area</th> <th>B area</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$w \leq 0.03\text{mm}$</td> <td>Accept no dense</td> <td>Don't count</td> </tr> <tr> <td>$L \leq 3.0\text{mm}$</td> <td>$0.03\text{mm} < \Phi \leq 0.05\text{mm}$</td> <td rowspan="2" style="text-align: center;">4</td> <td>Don't count</td> </tr> <tr> <td>$L \leq 2.5\text{mm}$</td> <td>$0.05\text{mm} < \Phi \leq 0.075\text{mm}$</td> <td>Don't count</td> </tr> <tr> <td>---</td> <td>$w > 0.075\text{mm}$</td> <td colspan="2" style="text-align: center;">As round type</td> </tr> </tbody> </table>	Dimension (diameter : Φ)	Acceptance(Q'ty)	$\Phi \leq 0.10\text{mm}$	Accept no dense	$0.10\text{mm} < \Phi \leq 0.20\text{mm}$	3	$0.20\text{mm} < \Phi \leq 0.25\text{mm}$	2	Total	4	Dimension (diameter : Φ)		Acceptance (Q'ty)		Length	width	A area	B area	---	$w \leq 0.03\text{mm}$	Accept no dense	Don't count	$L \leq 3.0\text{mm}$	$0.03\text{mm} < \Phi \leq 0.05\text{mm}$	4	Don't count	$L \leq 2.5\text{mm}$	$0.05\text{mm} < \Phi \leq 0.075\text{mm}$	Don't count	---	$w > 0.075\text{mm}$	As round type		Minor
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06	Polarizer Bubble	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">Dimension (diameter : Φ)</th> <th colspan="2">Acceptance(Q'ty)</th> </tr> <tr> <th>A area</th> <th>B area</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20\text{mm}$</td> <td>Accept no dense</td> <td>Don't count</td> </tr> <tr> <td>$0.20\text{mm} < \Phi \leq 0.50\text{mm}$</td> <td>3</td> <td>Don't count</td> </tr> <tr> <td>$0.50\text{mm} < \Phi \leq 1.00\text{mm}$</td> <td>2</td> <td>Don't count</td> </tr> <tr> <td>$\Phi > 1.00\text{mm}$</td> <td>0</td> <td>Don't count</td> </tr> <tr> <td>Total quantity</td> <td>4</td> <td>Don't count</td> </tr> </tbody> </table>	Dimension (diameter : Φ)	Acceptance(Q'ty)		A area	B area	$\Phi \leq 0.20\text{mm}$	Accept no dense	Don't count	$0.20\text{mm} < \Phi \leq 0.50\text{mm}$	3	Don't count	$0.50\text{mm} < \Phi \leq 1.00\text{mm}$	2	Don't count	$\Phi > 1.00\text{mm}$	0	Don't count	Total quantity	4	Don't count	Minor													
Dimension (diameter : Φ)	Acceptance(Q'ty)																																			
	A area	B area																																		
$\Phi \leq 0.20\text{mm}$	Accept no dense	Don't count																																		
$0.20\text{mm} < \Phi \leq 0.50\text{mm}$	3	Don't count																																		
$0.50\text{mm} < \Phi \leq 1.00\text{mm}$	2	Don't count																																		
$\Phi > 1.00\text{mm}$	0	Don't count																																		
Total quantity	4	Don't count																																		
07	The crack of glass 	<ul style="list-style-type: none"> ● Glass Crack: 7.1 Crack on the circuit of electrode terminal : <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>Front</td> <td>$X \leq 1/5 a$</td> <td>$Y \leq 1/2 D$</td> <td>$Z \leq t$</td> </tr> <tr> <td>Back</td> <td colspan="3" style="text-align: center;">Neglect</td> </tr> </tbody> </table>		X	Y	Z	Front	$X \leq 1/5 a$	$Y \leq 1/2 D$	$Z \leq t$	Back	Neglect			Minor																					
	X	Y	Z																																	
Front	$X \leq 1/5 a$	$Y \leq 1/2 D$	$Z \leq t$																																	
Back	Neglect																																			

◆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	<p>● Glass Crack:</p> <p>7.2 General glass crack and corner edge:</p> <p>7.2.1</p>  <table border="1" data-bbox="576 853 1233 947"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>Neglect</td> <td>Out A area</td> <td>Neglect</td> </tr> </table> <p>7.2.2</p>  <table border="1" data-bbox="576 1196 1233 1290"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>Neglect</td> <td>Out A area</td> <td>Neglect</td> </tr> </table>	X	Y	Z	Neglect	Out A area	Neglect	X	Y	Z	Neglect	Out A area	Neglect	Minor
X	Y	Z													
Neglect	Out A area	Neglect													
X	Y	Z													
Neglect	Out A area	Neglect													
		<p>7.3 Glass remain:</p>  <table border="1" data-bbox="711 1727 1126 1821"> <tr> <td>X</td> <td>Y</td> </tr> <tr> <td>Neglect</td> <td>$\leq 1/3 d$</td> </tr> </table>	X	Y	Neglect	$\leq 1/3 d$	Minor								
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◆Specification :

NO	Item	Criterion	Level									
07	<p>The crack of glass</p> <p>X: The length of Crack</p> <p>Y: The width of crack</p> <p>Z: The thickness of crack</p> <p>D: terminal length</p> <p>T: The thickness of glass</p> <p>A : The length of glass</p>	<p>7.4 Corner crack and medial crack:</p> <table border="1" data-bbox="475 1037 1340 1211"> <thead> <tr> <th data-bbox="475 1037 647 1077">X</th> <th data-bbox="647 1037 1051 1077">Y</th> <th data-bbox="1051 1037 1340 1077">Z</th> </tr> </thead> <tbody> <tr> <td data-bbox="475 1077 647 1126">$\leq 1/5a$</td> <td data-bbox="647 1077 1051 1126">Crack can't enter viewing area</td> <td data-bbox="1051 1077 1340 1126">$\leq 1/2t$</td> </tr> <tr> <td data-bbox="475 1126 647 1211">$\leq 1/5a$</td> <td data-bbox="647 1126 1051 1211">Crack can't exceed the half of width of SP</td> <td data-bbox="1051 1126 1340 1211">$1/2t < Z \leq 2t$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 1/5a$	Crack can't enter viewing area	$\leq 1/2t$	$\leq 1/5a$	Crack can't exceed the half of width of SP	$1/2t < Z \leq 2t$	Minor
X	Y	Z										
$\leq 1/5a$	Crack can't enter viewing area	$\leq 1/2t$										
$\leq 1/5a$	Crack can't exceed the half of width of SP	$1/2t < Z \leq 2t$										
08	Backlight elements	<p>8.1 Backlight can't work normally.</p> <p>8.2 Backlight doesn't light or color is wrong.</p> <p>8.3 Illumination source flickers when lit.</p>	Major									
09	General appearance	<p>9.1 pin type must match type in specification sheet</p> <p>9.2 No short circuits in components on PCB or FPC</p> <p>9.3 Product packaging must the same as specified on packaging specification sheet.</p> <p>9.4 The folding and peeled off in polarizer are not acceptable</p> <p>9.5 The PCB or FPC between B/L assembled distance (PCB or FPC) is $\leq 1.5\text{mm}$</p>	Major									

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO.	TEST ITEM	TEST CONDITION										
1	High Temperature Storage Test	Keep in 70 ±2°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs										
2	Low Temperature Storage Test	Keep in -20 ±2°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs										
3	High Humidity Storage	Keep in +40°C/90%RH duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs										
4	Vibration Test	1. Sine wave 10~55HZ frequency (1 min) 2. The amplitude of vibration :1.5 mm 3. Each direction (XYZ) duration for 2 Hrs										
5	ESD Test	Air Discharge: Apply 6 KV with 5 times Discharge foreach polarity +/-										
		Contact Discharge: Apply 250V with 5 times discharge foreach polarity +/-										
5	ESD Test	1. Temperature ambiance:15°C ~ 35°C 2. Humidity relative:30%~60% 3. Energy Storage Capacitance(Cs+Cd):150pF±10% 4. Discharge Resistance(Rd):330Ω±10% 5. Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 s) (Tolerance lf the output voltage indication: ±5%)										
6	Temperature Cycling Test	$0^{\circ}\text{C} \rightarrow 25^{\circ}\text{C} \rightarrow 50^{\circ}\text{C} \rightarrow 25^{\circ}\text{C}$ $\leftarrow (30\text{mins}) (5\text{mins}) (30\text{mins}) (5\text{mins}) \rightarrow$ <p style="text-align: center;">10 Cycle</p> Surrounding temperature, then storage at normal condition 4hrs										
7	Vibration Test (Packaged)	1. Sine wave 10~55HZ frequency (1 min) 2. The amplitude of vibration :1.5 mm 3. Each direction (XYZ) duration for 2 Hrs										
8	Drop Test (Packaged)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Packing Weight (Kg)</th> <th>Drop Height (cm)</th> </tr> </thead> <tbody> <tr> <td>0 ~ 45.4</td> <td>122</td> </tr> <tr> <td>45.4 ~ 90.8</td> <td>76</td> </tr> <tr> <td>90.8 ~ 454</td> <td>61</td> </tr> <tr> <td>Over 454</td> <td>46</td> </tr> </tbody> </table> <p style="text-align: center;">Drop direction :※3 comer /1 edges /6 sides etch 1times</p>	Packing Weight (Kg)	Drop Height (cm)	0 ~ 45.4	122	45.4 ~ 90.8	76	90.8 ~ 454	61	Over 454	46
Packing Weight (Kg)	Drop Height (cm)											
0 ~ 45.4	122											
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5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

- 5.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.
- 5.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

5.2 HANDLING

- 5.2.1 Avoid any strong mechanical shock which can break the glass.
- 5.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module , be sure to ground your body and any electrical equipment you may be using.
- 5.2.3 Do not remove the panel or frame from the module.
- 5.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully ,do not touch , push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)
- 5.2.5 Do not wipe the polarizing plate with a dry cloth , as it may easily scratch the surface of plate.
- 5.2.6 Do not touch the display area with bare hands , this will stain the display area.
- 5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.
- 5.2.8 To control temperature and time of soldering is $320\pm 10^{\circ}\text{C}$ and 3-5 sec.
- 5.2.9 To avoid liquid (include organic solvent) stained on LCM .

5.3 STORAGE

- 5.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.
- 5.3.2 Do not place the module near organics solvents or corrosive gases.
- 5.3.3 Do not crush , shake , or jolt the module.

5.4 TERMS OF WARRANTY

- 5.4.1 Applicable warrant period
The period is within thirteen months since the date of shipping out under normal using and storage conditions.
- 5.4.2 Unaccepted responsibility
This product has been manufactured to your company's specification as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment , we cannot take responsibility if the product is used in nuclear power control equipment , aerospace equipment , fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.