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SPECIFICATIONS

PASSIVE MATRIX LCD MODULE

(40 CHARACTERS × 2 LINES)

MODEL NO.

HC40201NYU-EW

NOV. 03. 1995

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CONTENTS

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1. FEATURES

The features of HC40201NYU-EW are as follows :

* Display mode : STN - Yellow/Green mode, positive type display
* Display format : 40 characters × 2 lines
* Driving method : 1/16 Duty, 1/5 Bias
* Viewing direction : 12 O'clock
* Backlighting : EL unit (White + Transflective)

2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size (W × H × T)	182.0 × 33.5 × 11.0 Max	mm
Viewing Area (W × H)	152.5 × 16.5	mm
Character Font (W × H)	5 × 7	dots
Character Size (W × H)	3.20 × 4.85	mm
Character Pitch (W)	3.70 × 5.95	mm
Dot Size (W × H)	0.60 × 0.65	mm
Weight	About 70	g

3. ELECTRICAL SPECIFICATIONS

3-1. Absolute Maximum Ratings

Item		Symbol	Value			Unit	Condition	Remark
			Min.	Typ.	Max.			
Supply voltage	Logic	V_{DD}	- 0.3	-	7.0	V	Ta = 25 ℃	
	LCD	V_{DD} - V_0	V_{DD} - 13.5	-	V_{DD} + 0.3	V	Ta = 25 ℃	
Input voltage		V_I	- 0.3	-	V_{DD} + 0.3	V	Ta = 25 ℃	
Operating temp.		Topr	0	-	+ 50	℃	-	
Storage temp.		Tstg	- 20	-	+ 70	℃	-	

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3-2. Electrical Characteristics

Item		Symbol	Spec. Value			Unit	Condition
			Min.	Typ.	Max.		
Supply voltage	Logic	$V_{DD} - V_{SS}$	4.5	5.0	5.5	V	
	LCD	$V_{DD} - V_0$	-	4.7	-	V	Ta = 0 ℃
			4.2	4.4	4.6	V	Ta = 25 ℃
			-	4.1	-	V	Ta = 50 ℃
Supply current	Logic	I_{DD}	-	2.0	3.0	mA	V_{DD} = 5 V ± 10 % V_{SS} = 0 V Ta = 25 ℃
	LCD	I_0	-	1.0	1.5	mA	
Power consumption		P_d	-	10.6	15.9	mW	
Input voltage "HIGH" level		V_{IH}	2.2	-	V_{DD}	V	
Input voltage "LOW" level		V_{IL}	- 0.3	-	0.6	V	
Output voltage "HIGH" level		V_{OH}	2.4	-	-	V	
Output voltage "LOW" level		V_{OL}	-	-	0.4	V	
Frame frequency		F_F	-	84.3	-	Hz	F_{osc} = 270 KHz
Oscillation frequency		F_{osc}	-	270	-	KHz	R_{osc} = 91 KΩ ± 2 %

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4. CHARACTERISTICS OF BACKLIGHTING (EL UNIT)

4-1. Absolute maximum ratings

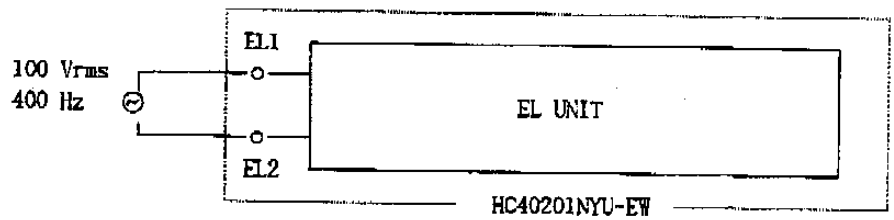
Item	Symbol	Condition	Min.	Max.	Unit
Applied voltage	Va	Ta = 25 ℃	-	150	AC Vrms
Applied frequency	Fa	Ta = 25 ℃	-	1000	Hz
Operating temperature	Topr		- 20	+ 60	℃
Storage temperature	Tstg		- 30	+ 70	℃
Operating humidity		40 ℃	-	95	% RH

4-2. Opto-electric Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Applied voltage	Va	Ta = 25 ℃	80	100	120	AC Vrms
Applied frequency	Fa	Ta = 25 ℃	-	400	-	Hz
Luminous		Va = 100 Vrms Fa = 400 Hz Ta = 25 ℃	45	55	-	cd / m^2
Current	Id		-	0.12	0.17	mA / cm^2

4-3. EL circuit diagram

To the EL backlight, apply AC signal from low-frequency constant voltage source or from EL inverter.



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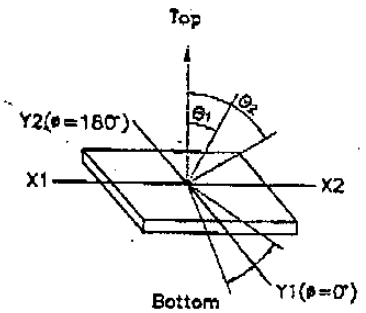
5. ELECTRO - OPTICAL CHARACTERISTICS

(V_{DD} = 5 V, V_{SS} = 0 V, Ta = 25 ℃)

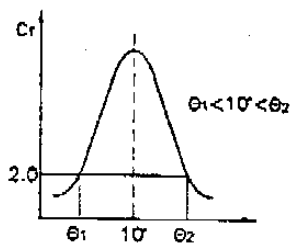
Item	Symbol	Min.	Typ.	Max.	Unit	Condition	Note
Viewing Angle	$\theta_2 - \theta_1$	30	40	-	deg.	Cr = 2.0	1.2
	Ø	± 30	-	-			
Contrast Ratio	Cr	2	3	-	-	θ = 0° Ø = 0°	3
Response Time(rise)	Tr	-	150	300	ms	θ = 0° Ø = 0°	4
Response Time(fall)	Tf	-	150	300	ms	θ = 0° Ø = 0°	4

* Above data are mesured under 1/16 duty STN yellow/green mode.
* Ø = 0 means viewing direction.

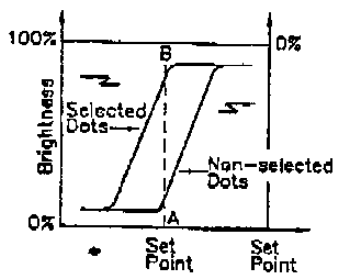
Note 1. Definition of angle θ and ø



Note 2. Definition of viewing angle θ1 and θ2

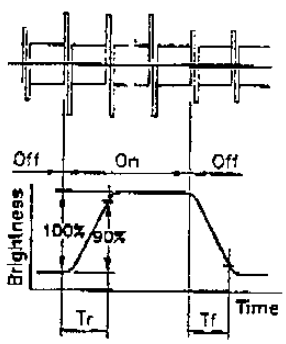


Note 3. Definition of contrast Cr



$Cr=(A/B)^{P}$ {Negative : P=−1, Positive : P=+1}

Note 4. Definition of optical response



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6. PIN ASSIGNMENT

Pin No.	Symbol	Level	Function
1	V_{SS}(GND)	0 V	Ground
2	V_{DD}(V_{CC})	+ 5 V	Logic supply voltage
3	V_0	-	LCD driving voltage
4	RS	H/L	H : Data input L : Instruction input
5	R/W	H/L	H : Data read L : Data write
6	E	H, H→L	Enable signal
7	DB0	H/L	Data bus line
8	DB1	H/L	
9	DB2	H/L	
10	DB3	H/L	
11	DB4	H/L	
12	DB5	H/L	
13	DB6	H/L	
14	DB7	H/L	
15	EL1	AC 100 Vrms 400 Hz	EL power
16	EL2		

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7. TIMING CHARACTERISTICS

V_{DD} = 5.0 V ± 10 %, V_{SS} = 0 V

Item		Symbol	Value			Unit
			Min.	Typ.	Max.	
Enable Cycle Time	Fig1, 2	tcyc	1000	-	-	ns
Enable Pulse Width, High Level	Fig1, 2	PWEH	450	-	-	ns
Enable Rise and Fall Time	Fig1, 2	tEr, tEf	-	-	25	ns
Addreass Setup Time, RS, R/W, E	Fig1, 2	tAS	140	-	-	ns
Data Delay Time	Fig2	tDDR	-	-	320	ns
Data Setup Time	Fig1	tDSW	195	-	-	ns
Data Hold Time	Fig1	tH	10	-	-	ns
Data Hold Time	Fig2	tDHR	20	-	-	ns
Address Hold Time	Fig1, 2	tAH	10	-	-	ns

FIG.1 Write Operation (MPU → LCD MODULE)

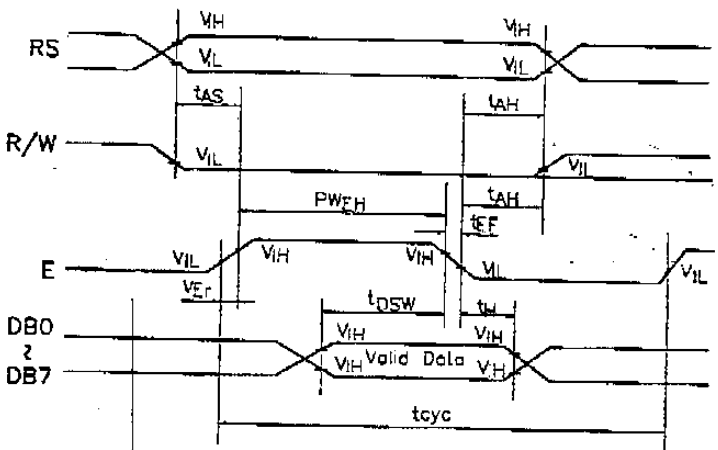
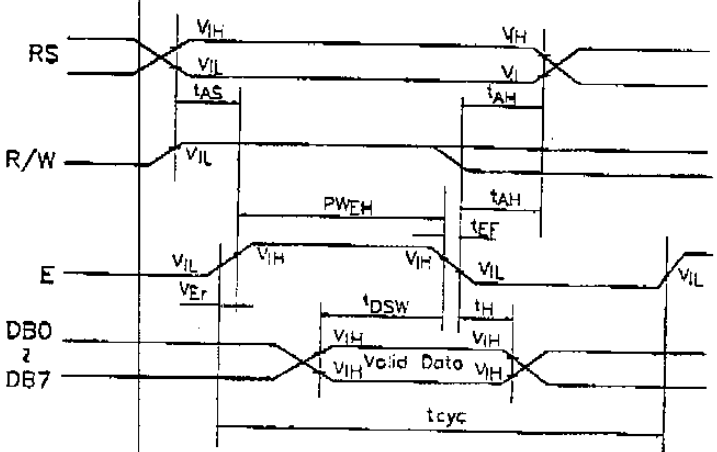


FIG.2 Read Operation (LCD MODULE → MPU)



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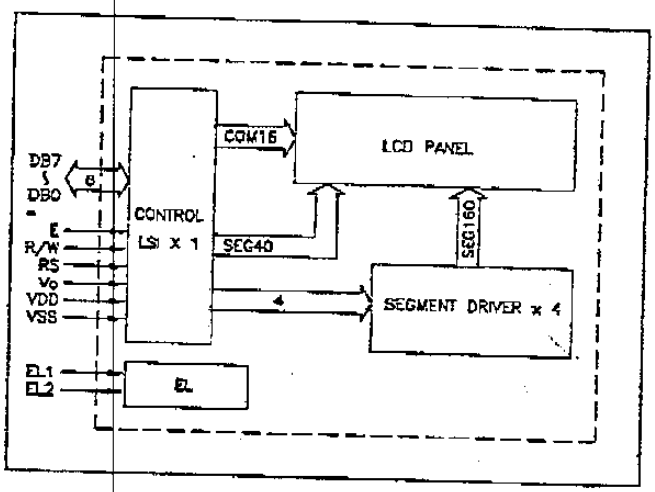
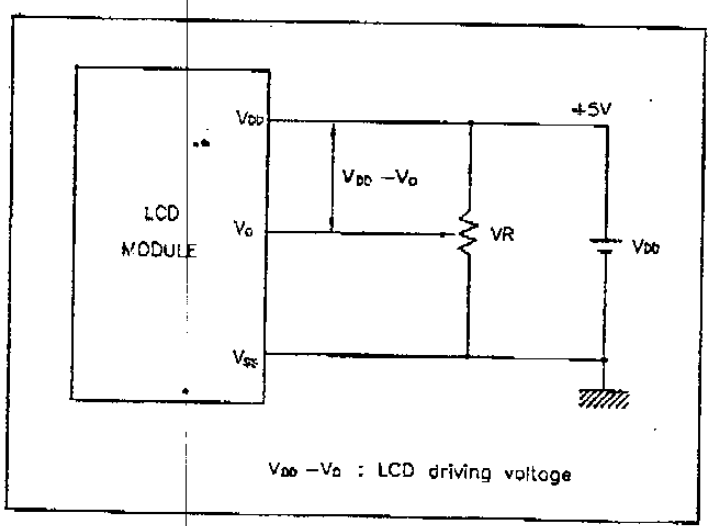
8. BLOCK DIAGRAM



9. POWER SUPPLY BLOCK DIAGRAM



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10. INSTRUCTION SETS

10-1. Instructions

Instruction	Code										Description	Execution Time(Max) Fosc is 270 KHz
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears entire display.	1.52 ms
Return Home	0	0	0	0	0	0	0	0	1	*	Returns display being shifed to original position.	1.52 ms
Entry mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction & specifies shift of display.	37 μs
Display On/Off Control	0	0	0	0	0	0	1	D	C	B	D : Display On/Off C : Cursor On/Off B : Cursor Blink/Not	37 μs
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves cursor & shifts display without changing DD RAM address contents.	37 μs
Function Set	0	0	0	0	1	DL	N	F	*	*	Refer to remark.	37 μs
Set CG RAM Address	0	0	0	1	ACG						Sets CG RAM address.	37 μs
Set DD RAM Address	0	0	1	ADD							Sets DD RAM address.	37 μs
Read Busy Flag and Address	0	1	BF	AC							Reads Busy flag(BF) & address counter contents.	0 μs
Write Data to CG or DD RAM	1	0	Write Data								Writes data into DD RAM or CG RAM.	37 μs
Read Data From CG or DD RAM	1	1	Read Data								Reads data from DD RAM or CG RAM.	37 μs

Remark

I/D	1	Increment	0	Decrement
S	1	Accompanies Display Shift	0	
S/C	1	Display Shift	0	Cursor Move
R/L	1	Shift to the right	0	Shift to the Left
DL	1	8 Bits	0	4 Bits
N	1	2 Lines	0	1 Line
F	1	5×10 Dots	0	5×7 Dots
BF	1	Internally Operating	0	Can Accept Instruction

* : No Effect (Don' t Care)

DD RAM : Display Data RAM

CG RAM : Character Generator RAM

ACG : CG RAM Address

ADD : DD RAM Address : Corresponds to cursor address

AC : Address counter used for both DD and CG RAM Address

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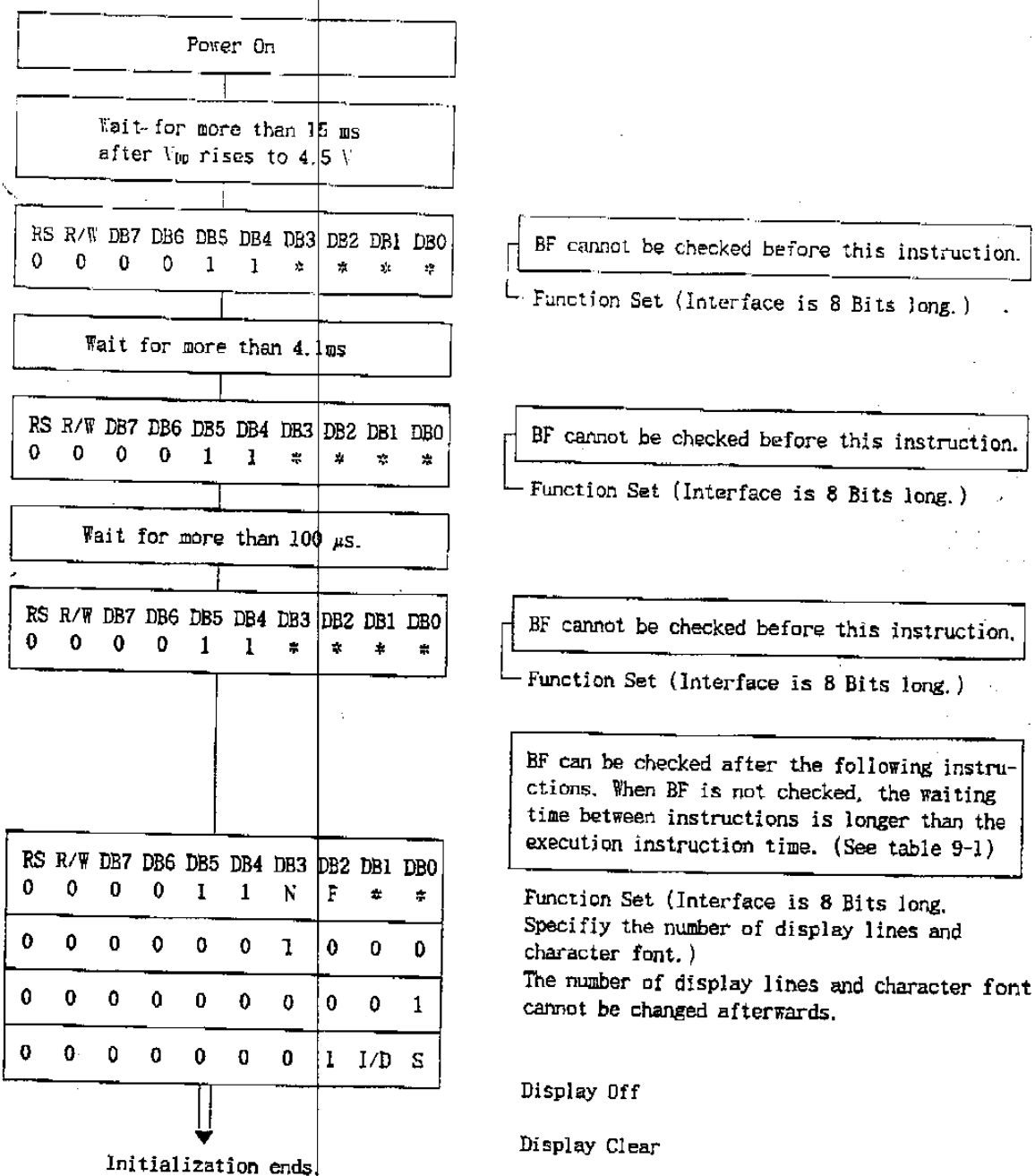
10-2. INITIALIZING BY INSTRUCTION

If the power supply conditions for correctly operating the internal reset circuit are not met, initialization by instruction is required.

Use the following procedure for initialization.

10-2-1. When Interface is 8 Bits long :



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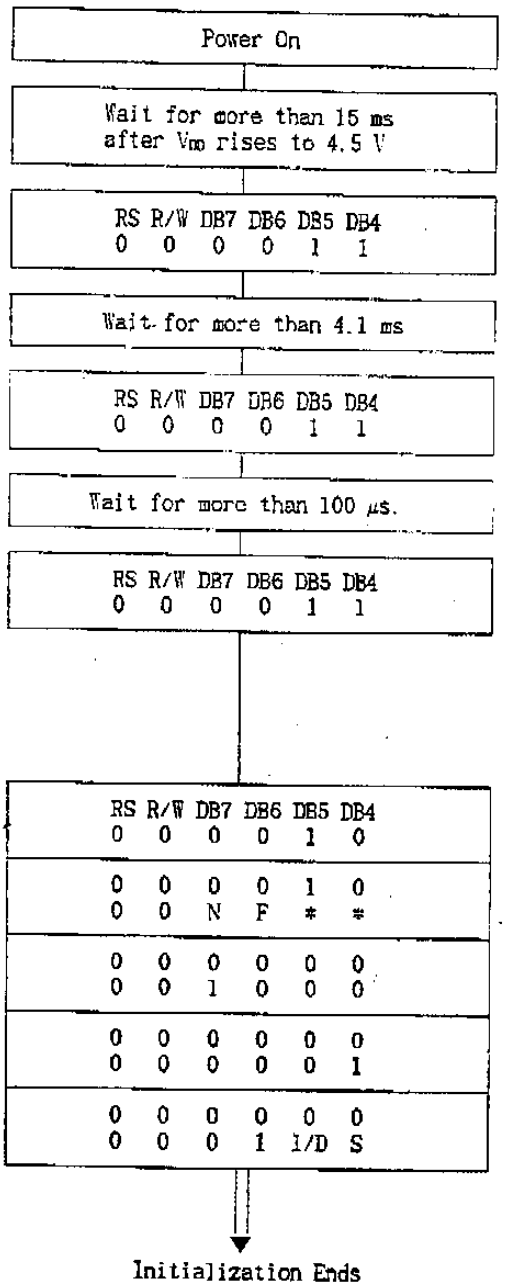
10-2-2. When Interface is 4 Bits long :



BF cannot be checked before this instruction.
Function Set (Interface is 8 Bits long.)

BF cannot be checked before this instruction.
Function Set (Interface is 8 Bits long.)

BF cannot be checked before this instruction.
Function Set (Interface is 8 Bits long.)

BF can be checked after the following instructions. When BF is not checked, the waiting time between instructions is longer than the execution instruction time. (See table 9-1)

Function Set (Set interface to be 4 Bits long.)
Interface is 8 Bits long.

Function Set (Interface is 4 Bits long. Specify the number of display lines and character font.)
the number of display lines and character font cannot be changed afterwards.

Display Off

Display Clear

Entry Mode Set

10-3. DD RAM Address

Digit	1	2	3	4	5	6	7	8	. . .	32	33	34	35	36	37	38	39	40	Display position
1-Line	00	01	02	03	04	05	06	07	. . .	1F	20	21	22	23	24	25	26	27	DD RAM address (Hexadecimal)
2-Line	40	41	42	43	44	45	46	47	. . .	5F	60	61	62	63	64	65	66	67	

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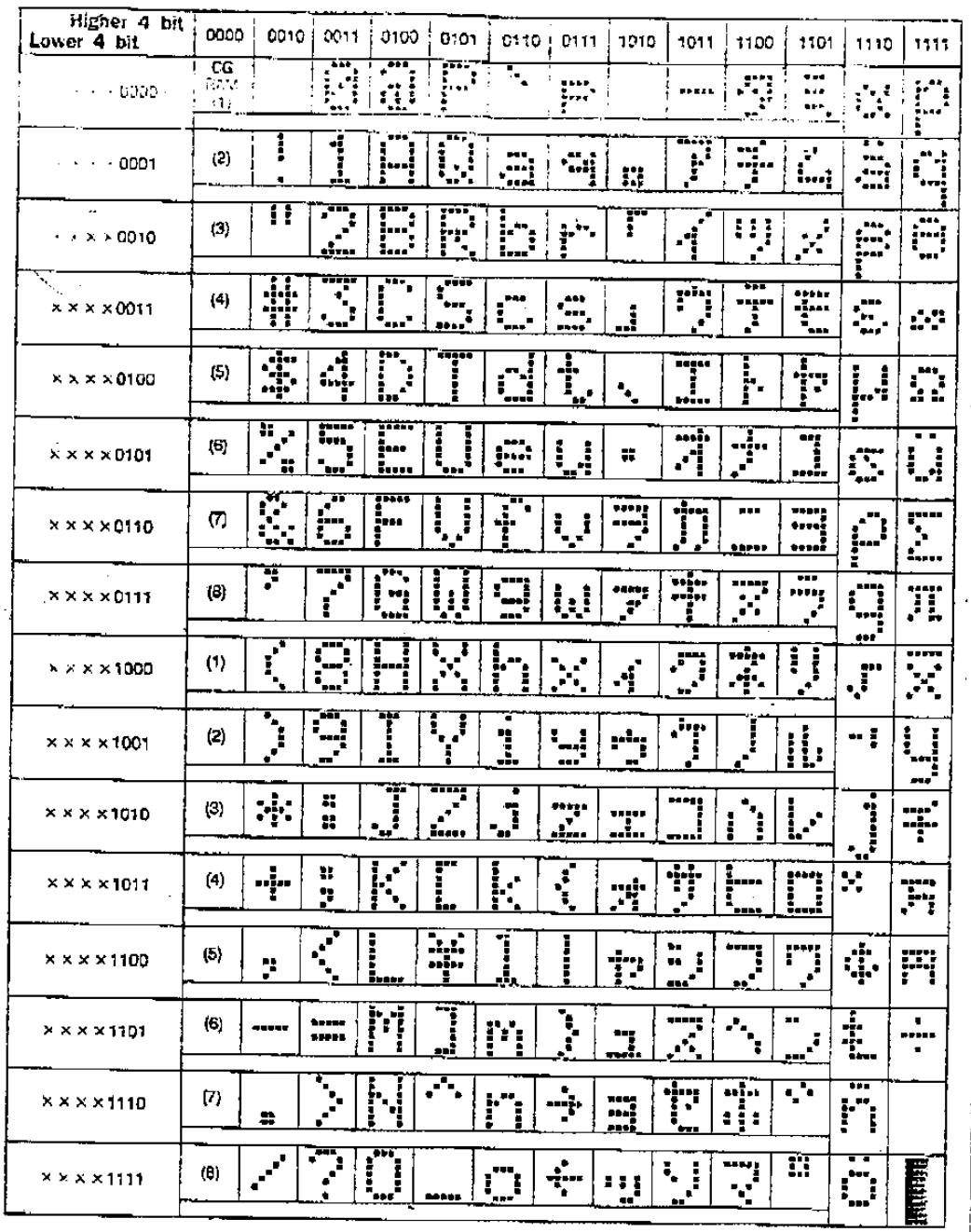
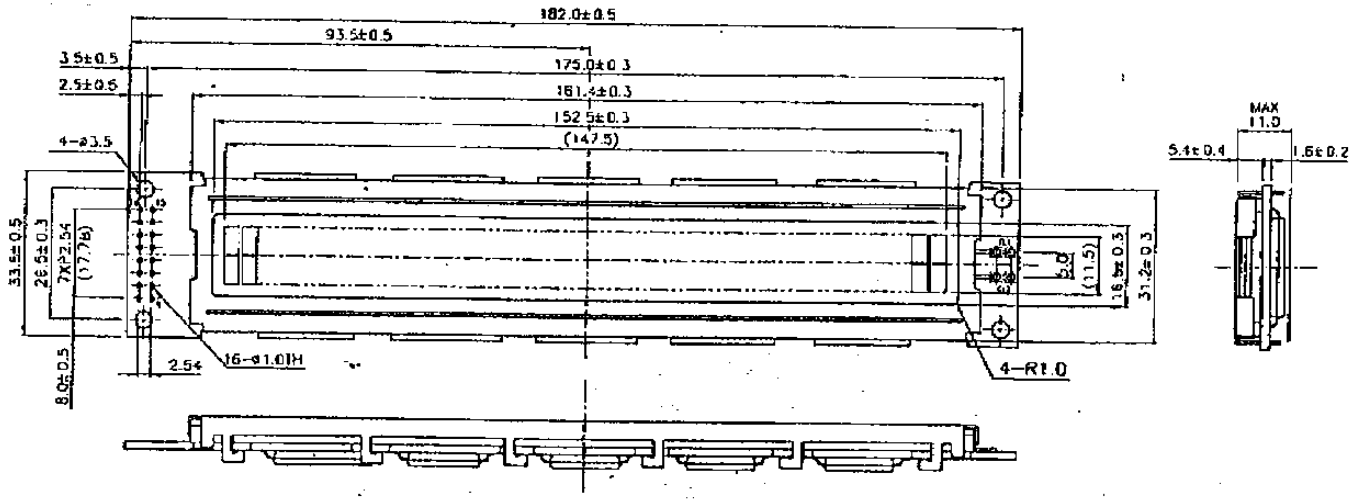
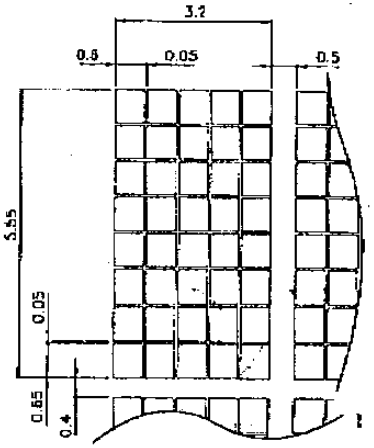
11. CHARACTER FONT TABLE



ZONE	LTR	ECN NO.	REVISION	DATE	APP'L





DOTS DETAIL (SCALE 10/1)

PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	EL1
16	EL2

PART NO.	DESCRIPTION	MATERIAL	COLOR/FINISH	Q'TY	REMARKS

DRAWN | PLANNED | CHECKED | APPROVED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN m/m(INCHES) TOLERANCES ARE: LINEAR ANGLES ± ± FACE UNLESS NOTED

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

ANGLE 1/0 | TITLE EXTERNAL DIAGRAM | REV

SCALE 1/1 | 40CHX2LINE(1/16D) | O

MDL HC40201-E | SIZE | DWG NO. L3-SY-96-005-0 | SHEET 1/1

REF NO. ME-94-017