Specification of LED Dot Matrix Module

MODEL : SLM1606M

Version 3.1

1993. 2. 20.

DISPLAY DEVELOPMENT SECTION

SAMSUNG WATCH CO., LTD.

1. MODEL : SLM1606M V.3.1

2. SPECIFICATION

DISPLAY COLOR	RED, GREEN, AMBER
DOT SIZE (mm)	5
DOT PITCH (mm)	6
NO. OF DOTS	256 (16 X 16)
DIMENSION (mm)	96 X 96 X 20
WEIGHT (g)	100

3. ELECTRICAL CHARACTERISTICS

- ABSOLUTE MAXIMUM RATING(Ta=25°C)

ITEM	SYMBOL	CONDITION	UNIT
SUPPLY VOLTAGE	Vcc	5.25	V
CLOK FREQUENCY	f	40	MHz
INPUT VOLTAGE	Vin	-0.3 + Vcc+0.3	V
OPERATING TEMPERATURE	Topr	-10 - +45	°C
STORAGE TEMPERATURE	Tstg	-20 - +70	°C

* LED surface temperature must be maintained below 60°C. So loading the ventilation fan is recommendable.

- ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	RATING /CONDITION	UNIT
SUPPLY VOLTAGE	Vcc	5.0 +- 0.25	V
CLOCK FREQUENCY	f	MAX. 40	MHz
CURRENT CONSUMPTION	I	MAX 2.8	A
FRAME FREQUENCY	Ffr	70 - 100	Hz

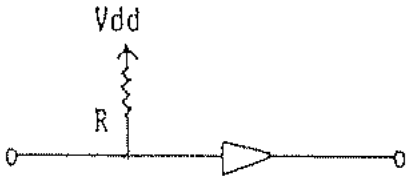
4. RECOMMENDABLE OPERATING CONDITIONS

ITEM	SYMBOL	CONDITION	UNIT
SUPPLY VOLTAGE	Vcc	5	V
OPERATING TEMPERATURE	Topr	0 - 40	°C

5. INPUT LEVEL

ITEM	SYMBOL	Min.	Typ.	Max.	UNIT
INPUT "L"	Vil	-	-	0.8	V
INPUT "H"	Vih	2.2	-	-	

* All input is pulled up by 50 kOhm.

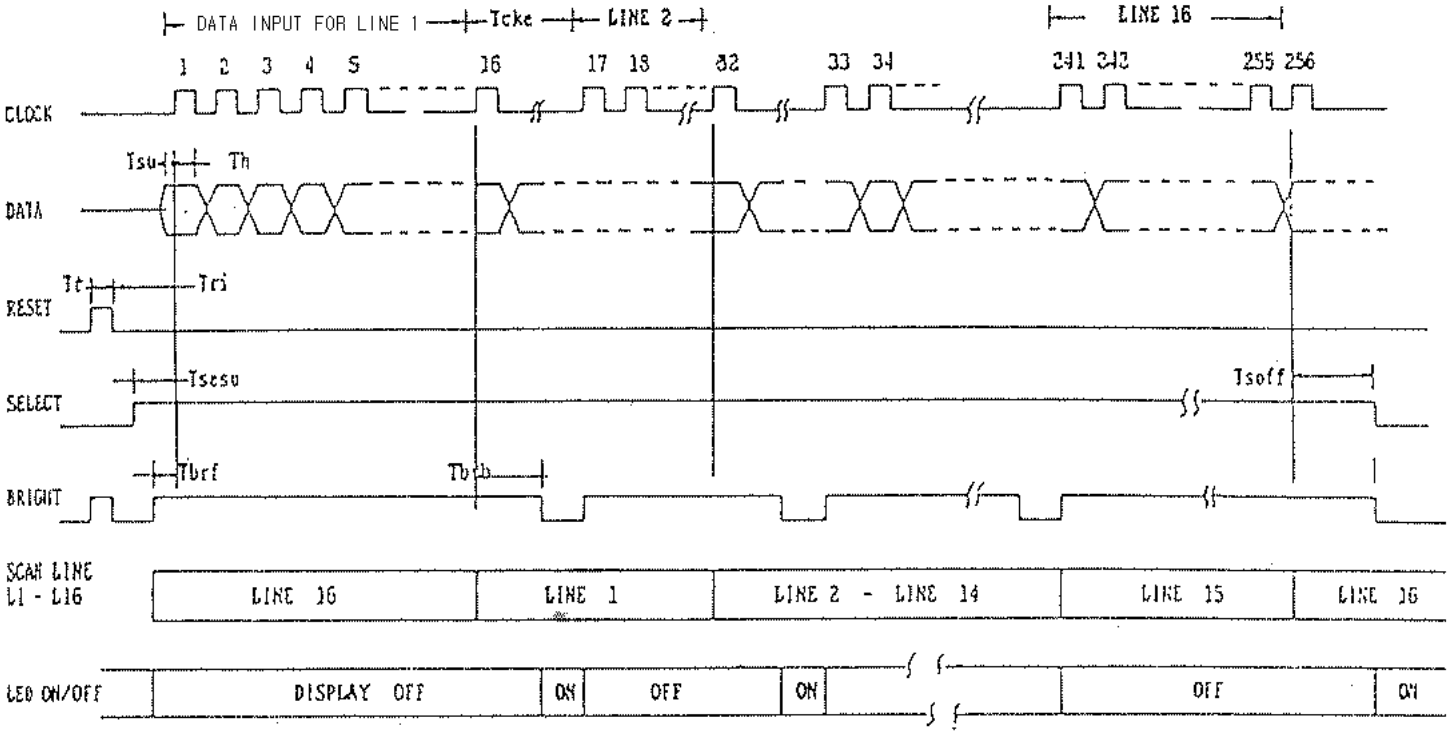


INPUT BUFFER (R = 50 kOhm)

6. FUNCTION

PIN NAME	FUNCTION DESCRIPTION
Vcc	Power supply of the module
GND	Ground of the module
RED DATA	Data input for red color
GREEN DATA	Data input for green color
SELECT	Data input control "H" : Data input and display "L" : Data input disable and display memorized data
BRIGHT-WRITE	Total brightness control data write (48bit pattern) "H" : Data write "L" : normal display
BRIGHT-CLOCK	Shift clock of total brightness control data pattern (5- 20 MHz continuous clock)
BRIGHT	Display on/off control "H" : Display off "L" : Display on Brightness can be controlled using pulse width.
CLOCK	clock signal for data input and display
RESET	For initializing counter value "H" : counter initializing "L" : normal operation The memorized data in the module are not cleared.

7. TIMING CHART



(Ta=25 C, Vcc=5V)

CHARACTERISTICS	SYMBOL	MIN	MAX	UNIT
CLOCK CYCLE	T	-	25	ns
DATA SETUP TIME	Tsu	10	-	ns
DATA HOLD TIME	Th	10	-	ns
CLOCK ENABLE TIME	Tcke	NOTE 1	-	ns
RESET INPUT TIME	Tri	10	-	ns
RESET TIME	Tr	20	-	ns
SELECT SETUP TIME	Tsesu	10	-	ns
SELECT OFF TIME	Tsoff	10	-	ns

NOTE 1 : BRIGHTNESS IS DECIDED BY WIDTH OF Tcke.

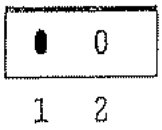
8. OPTICAL CHARACTERISTICS

PARAMETER		SYMBOL	Min.	Typ.	Max.	UNIT
LUMINANCE	RED GREEN	Lv	90 80	120 100	150 120	cd/m2
PEAK EMISSION WAVELENGTH	RED GREEN	p	- -	630 565	- -	nm
SPECTRUM RADIATION BANDWIDTH	RED GREEN		- -	35 30	- -	nm

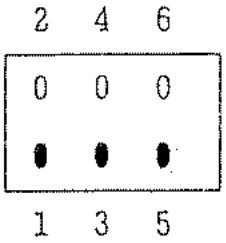
* DUTY RATIO : 1/16 , FRAME FREQUENCY : 100Hz

9. CONNECTIONS

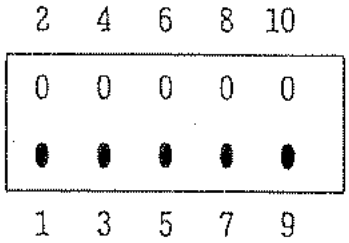
CN1



CN2



CN3



CN1

1	GND
2	Vcc

CN2

1	GND
2	SELECT
3	GND
4	BRT-WRITE
5	GND
6	BRT-CLOCK

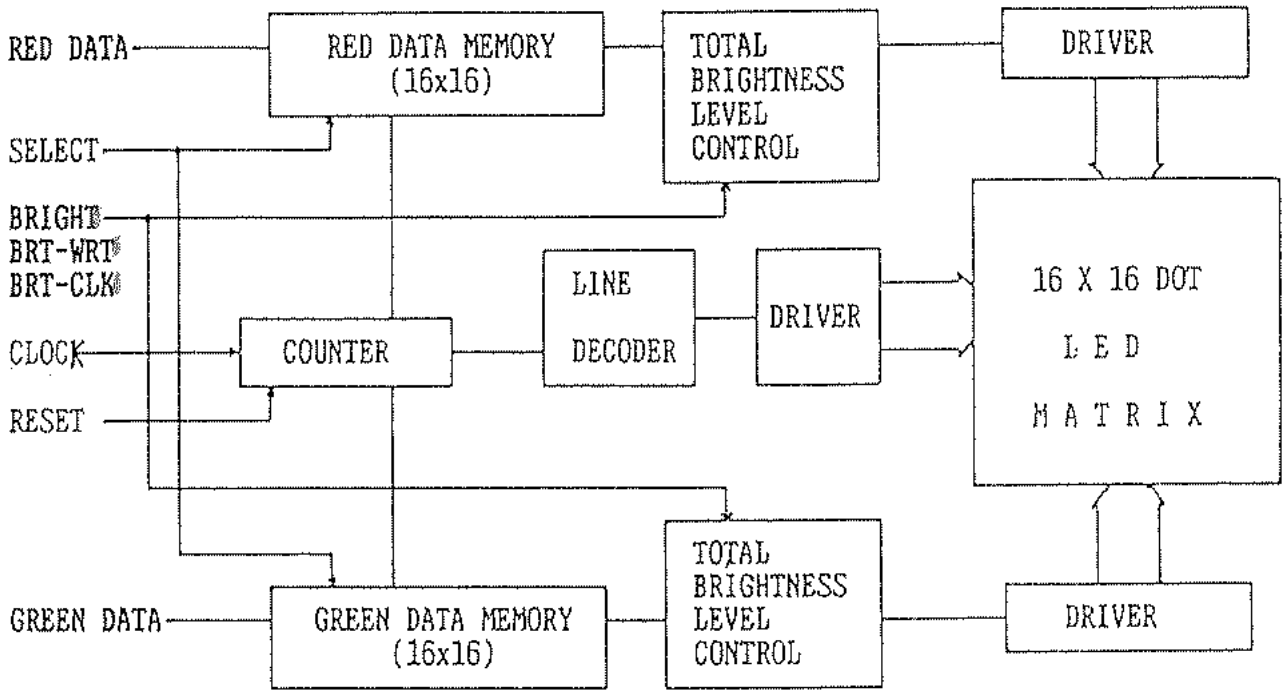
CN3

1	GND	2	RED DATA
3	GND	4	GREEN DATA
5	GND	6	CLOCK
7	GND	8	BRIGHT
9	GND	10	RESET

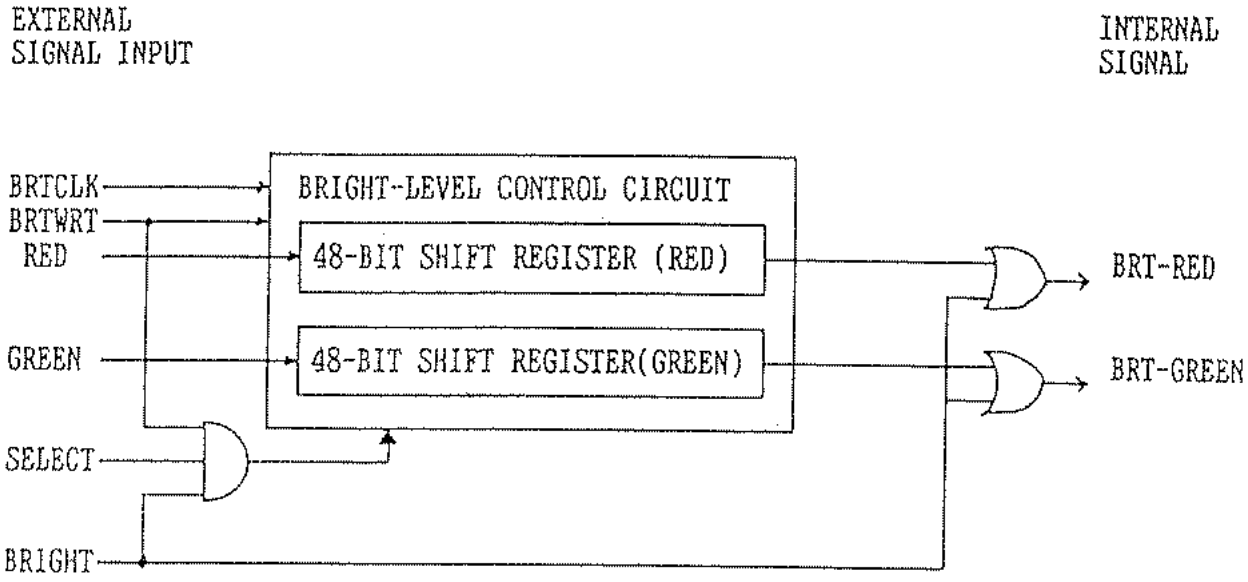
CONNECTOR TYPE NAME :

CN1 : DF1-2P-2.5DSA (HIROSE KOREA, Ltd.)
CN2 : A71308-0106N (MOLEX)
CN3 : HIF3FB-10PA-2.54DS (HIROSE KOREA, Ltd.)

10. BLOCK DIAGRAM



11. TOTAL BRIGHTNESS LEVEL CONTROL BLOCK



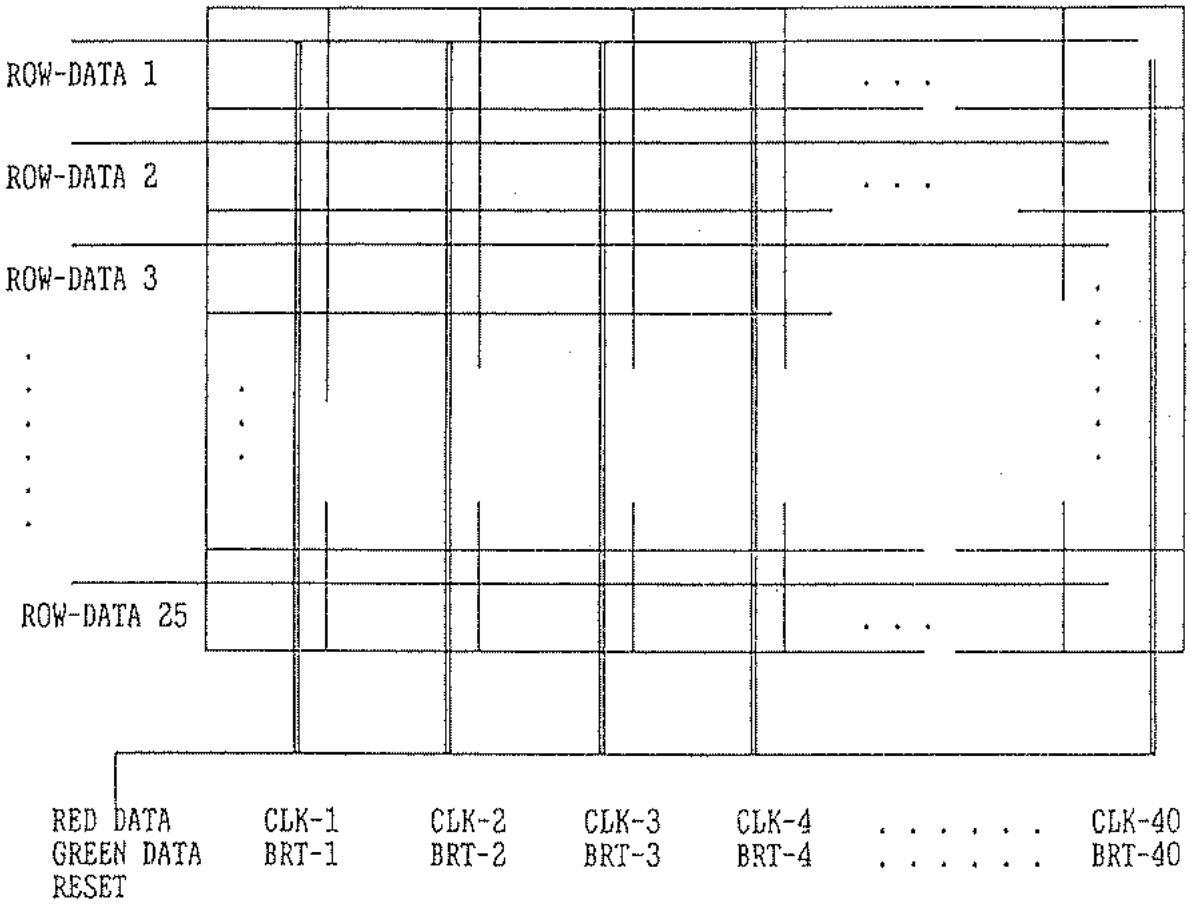
* FUNCTION

DURING NORMAL DISPLAY, TOTAL BRIGHTNESS OF A MODULE CAN BE CONTROLLED THROUGH PULSE WIDTH OF "BRIGHT" SIGNAL. BUT UNBALANCE OF BRIGHTNESS BETWEEN MODULES HAS CAUSED SIGNIFICANT PROBLEMS IN DISPLAY QUALITY. THEREFORE, OUR DESIGN TARGET OF THIS FUNCTION IS TO GIVE SYSTEM-MAKER USEFUL METHOD FOR ADJUSTING UNIFORMITY OF WHOLE DISPLAY BOARD BY SETTING THE BRIGHTNESS LEVEL OF EACH COLOR IN INDIVIDUAL MODULE.

TWO 48-BIT DATA PATTERNS ARE STORED IN SHIFT-REGISTERS RESPECTIVELY FOR RED AND GREEN COLOR, AND THOSE PATTERNS ARE LOGICALLY OR-ED WITH "BRIGHT" SIGNAL TO GENERATE NEW INTERNAL SIGNALS WHICH CONTROLS BRIGHTNESS OF EACH COLOR.

12. CONNECTION OF LARGE DISPLAY PANEL

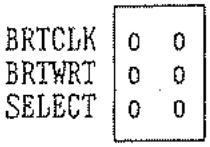
EX.) 40 X 25 MODULES



ROW-DATA 1 - 25	COMMON	: BRT-WRITE BRT-CLOCK
	EACH ROW	: SEL-1 .... SEL-25
COLUMN-DATA 1 - 40	COMMON	: RED DATA GREEN DATA RESET
	EACH COLUMN	: CLK-1 .... CLK-40 BRT-1 .... BRT-40

* PIN ASSIGN

CONNECTOR 2



BRTCLK : 5-20 MHz CONTINUOUS CLOCK SIGNAL
BRTWRT : WHEN "HIGH", LEVEL DATA ARE STORED
SELECT : SAME AS IN "SLM1606M"

* METHOD OF BRIGHT-LEVEL DATA SET-UP

LEVEL BIT PATTERN DATA INPUT PATH : SAME PATH(PIN) AS DISPLAY DATA INPUT

MODULE SELECT : MODULE OF A MATCHED POINT WHICH IS ON THE BRIGHT & SELECT SIGNAL MATRIX. THAT IS, THE MODULE IS SELECTED WHEN BOTH OF SIGNALS "BRIGHT" AND "SELECT" ARE HIGH SIMULTANEOUSLY.

BRIGHT-LEVEL DATA SET-UP : WHEN SIGNAL "BRT-WRT" IS "HIGH", THE LEVEL DATA OF RED AND GREEN ARE MEMORIZED IN TWO 48-BIT SHIFT-REGISTORS RESPECTIVELY ACCORDING TO THE PULSE OF "BRT-CLK". AFTER SETTING UP DATA, THE SIGNAL "BRTWRT" MUST BE LOW DURING NORMAL DISPLAY RUN.

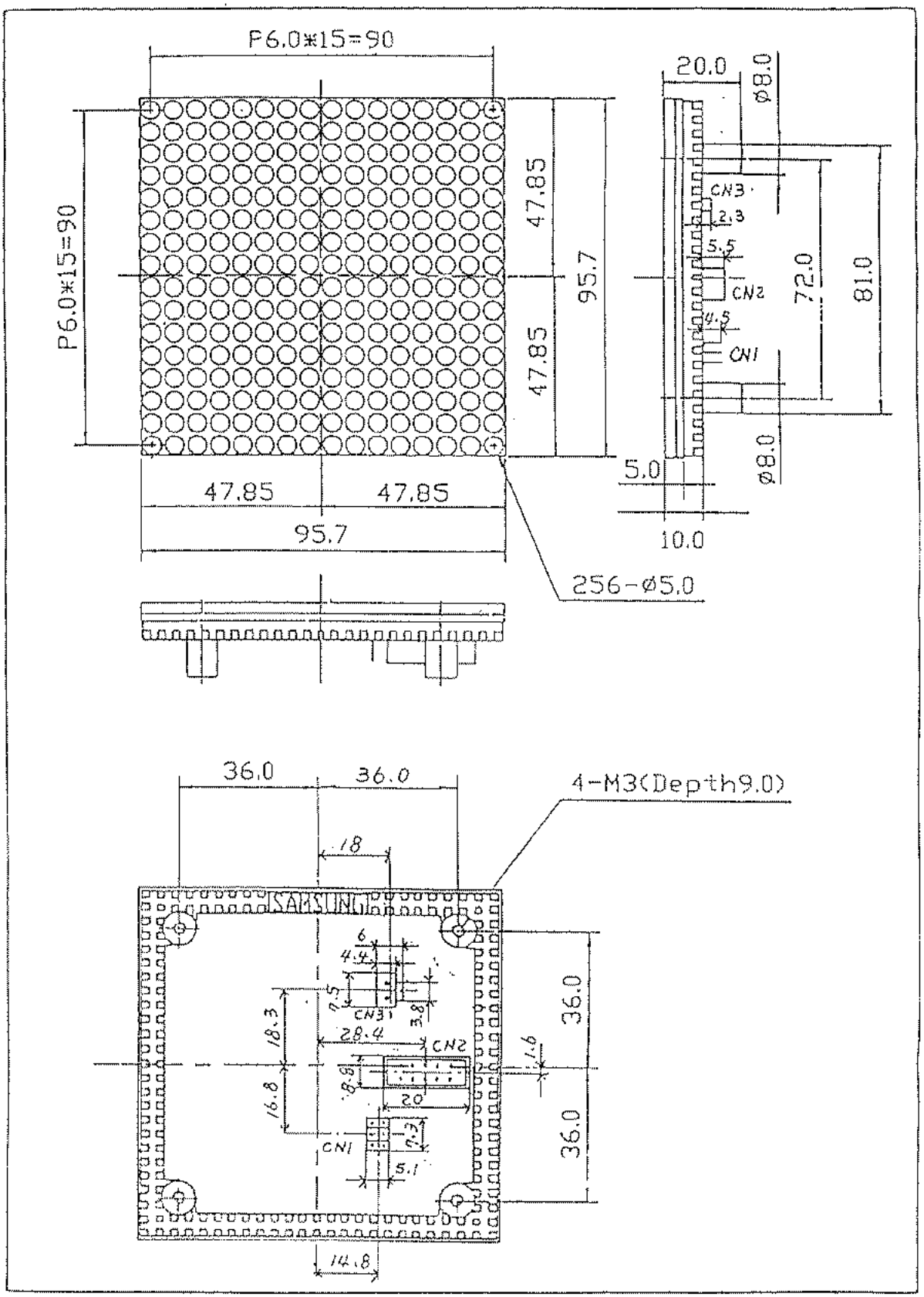
* DISABLE BRIGHTNESS-LEVEL CONTROL FUNCTION

PLEASE FIX THE SIGNAL "BRT-WRT" TO HIGH.

* ADJUSTMENT OF BRIGHT-LEVEL IN EACH COLOR AND MODULE

- DESIGN 48-BIT LENGTH TEMPLATE PATTERN FOR EACH BRIGHT-LEVEL CONTROL STEP.
- FOR CONTROLLING SENSITIVITY OF THIS FUNCTION, ADJUST THE SPEED OF CONTINUOUS CLOCK SIGNAL "BRT-CLK"
- TO ADJUST BRIGHT-LEVEL OF INDIVIDUAL COLOR OR MODULE, A CERTAIN KIND OF H/W AND S/W TOOL IS REQUIRED. DURING THE ASSEMBLY AND TESTING A DISPLAY BOARD, A MAN CAN TRY VARIOUS LEVEL FOR INDIVIDUAL MODULE AND COLOR TO REDUCE THE BRIGHTNESS UNBALANCE BETWEEN MODULES. AFTER TUNING OF UNIFORMITY IN A WHOLE BOARD, THE BRIGHT-LEVEL DATA OF ALL MODULES AND THEIR COLOR SHOULD BE MEMORIZED IN ROM OR S/W DISKETTE. BECAUSE THE MEMORY IN MODULE IS VOLATILE, THESE DATA SHOULD BE SUPPLIED EVERYTIME WHEN THE DISPLAY BOARD SYSTEM IS INITIATED.
- WHEN SYSTEM IS POWER ON, INITIALIZATION PROCEDURE IS REQUIRED FOR STORING BRIGHT-LEVEL DATA WITH HARDWARE OR SOFTWARE METHOD.

13. OUTLINE DIMENSIONS



14. PRECAUTIONS ON INSTALLING

- Please pay attention to radiate the heat from LED modules especially when the size of the display panel is large and ventilation condition is not good.
- Please do not give a mechanical shock to avoid reformation of the LED DOT MATRIX MODULE.
- Please do not scratch the surface of the LED MODULE.
- Modules should be handled under anti-static control.
- Twisted cable or shielded wire is recommendable for safety operation from high frequency noise.

15. PACKING METHOD

1) SLM1606 : EACH PIECE IS ENVELOPED IN ANTI-STATIC ENVELOPE.
SMALL INNER BOX CONTAINS 10 PIECES. (125x125x275 mm)
OUTER BOX CONTAINS 10 SMALL BOXES.(= 100 PIECES)
(290x260x650 mm)

2) SLM1604 : EACH PIECE IS ENVELOPED IN ANTI-STATIC ENVELOPE.
SMALL INNER CARTON CONTAINS 20 PIECES. (90x150x275 mm)
OUTER BOX CONTAINS 10 INNER BOXES.(= 200 PIECES)
(290x320x475 mm)

3) SLM1608 : EACH PIECE IS ENVELOPED IN ANTI-STATIC ENVELOPE.
SMALL INNER BAX CONTAINS 10 PIECES. (150x150x275 mm)
OUTER BOX CONTAINS 6 INNER BOXES.(= 60 PIECES)
(290x320x475 mm)

< PACKING BOX DIMENSIONS >

MODEL	INNER BOX		OUTER BOX	
	DIMENSION (mm)	NO. OF MODULE	DIMENSION (mm)	NO. OF MODULE
SLM1606 (96mm)	125x125x275	10	290x260x650	100
SLM1604 (64mm)	90x150x275	20	290x320x475	200
SLM1608 (128mm)	150x150x275	10	290x320x475	60