REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED

DV3 Displays Ltd
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1. **Specification subject to change without notice.**
2. **All dimensions and specifications apply to standard modules. This information may vary for modules with optional features.**
3. **All dimensions are in millimetres.**
4. **Precautions: These precautions apply equally to modules from all makers, not just Densitron. Violation of these guidelines may void the warranty and can cause problems ranging from erratic operation to catastrophic display failure.**

Handling precautions:
? ?   This device is susceptible to Electro-Static Discharge (ESD) damage. Observe Anti-Static precautions.

Power supply precautions:
? ?   Identify and, at all times, observe absolute maximum ratings for both logic and LC drivers. Note that there is some variance between models.
? ?   Prevent the application of reverse polarity to VDD and VSS, however briefly.
? ?   Use a clean power source free from transients. Power up conditions are occasionally "jolting" and may exceed the maximum ratings of the module.
? ?   The +5V power of the module should also supply the power to all devices that may access the display. Don't allow the data bus to be driven when the logic supply to the module is turned off.
? ?   DO NOT install a capacitor between the VO (contrast) pin and ground. VDD must, at all times, exceed the VO voltage level. The capacitor combines with the contrast potentiometer to form an R-C network which "holds-up" VO, at power-down, possibly damaging the module.

Operating precautions:
? ?   DO NOT plug or unplug the module when the system is powered up.
? ?   Minimise the cable length between the module and host MPU. (Recommended max. length 30 cm).
? ?   For models with EL backlights, do not disable the backlight by interrupting the HV line. Unloaded inverters produce voltage extremes that may arc within a cable or at the display.
? ?   Operate the module within the limits of the modules temperature specifications.

Mechanical / Environmental precautions:
? ?   Improper soldering is the major cause of module difficulty. Use of flux cleaner is not recommended as they may seep under the elastomeric connection and cause display failure. Densitron recommends the use of Kester "245" no-clean solder.
? ?   Mount the module so that it is free from torque and mechanical stress.
? ?   Surface of LCD panel should not be touched or scratched. The display front surface is an easily scratched, plastic polariser. Avoid contact and clean only when necessary with soft, absorbent cotton dampened with petroleum benzene.
? ?   ALWAYS employ anti-static procedure while handling the module.
? ?   Prevent moisture build-up upon the module and observe the environmental constraints for storage temperature and humidity.
? ?   DO NOT store in direct sunlight.
? ?   If leakage of the liquid crystal material should occur, avoid contact with this material, particularly ingestion. If the body or clothing becomes contaminated by the liquid crystal material, wash thoroughly with water and soap.

Notes: (unless otherwise specified)

| Unless otherwise specified: Dimensions are mm Tolerances are: X = ? 3 0.X = ? 0.5 0.XX = ? 0.05	APPROVALS	DATE	DV3 Displays Ltd BIGGIN HILL, ENGLAND	
	DRAWN			
	CHECKED		TITLE: 102x50 LCD module - COG type	
	ISSUED		DWG.NO. **DV5521**	SHEET 1 of 8

1.0 COMPOSITION

Display type: [102 x 50 Dots with 14 Icons Matrix LCD Module]
Driving method: [1/65 Duty, 1/9 Bias]
View Direction: [6 O' clock]
Backlight: |None|

2.0 MECHANICAL SPECIFICATIONS

ITEM	STANDARD VALUES	UNITS
LCD type	FSTN Positive/Transfective Mode	
Dot arrangement	102 x 50 dots with 14 Icons	dots
Module size	32.48 (W) x 41.98 (H) x 1.85 (D)	mm
View area	28.98 (W) x 21.48 (H)	mm
Active area	22.425 (W) x 12.485 (H)	mm
Dot size	0.205 (W) x 0.235 (H)	mm
Dot pitch	0.22 (W) x 0.25 (H)	mm
Viewing direction	6 O' clock	
Weight	About 6	g

3.0 DIMENSIONAL DIAGRAM

NOTES :
1. DISPLAY TYPE: FSTN.
2. VIEWING DIRECTION.   6 O'CLOCK
3. POLARIZER MODE.   TRANSFLECTIVE/POSITIVE
4. DRIVE METHOD: 1/65 DUTY, 1/9 BIAS
5. OPERATING VOLTAGE: 9.0 V
6. OPERATING TEMP: -20°C ~ +70°C
7. STORAGE TEMP: -30°C ~ +80°C
8. CONNECTOR: CDSB(C VD: 4527131)
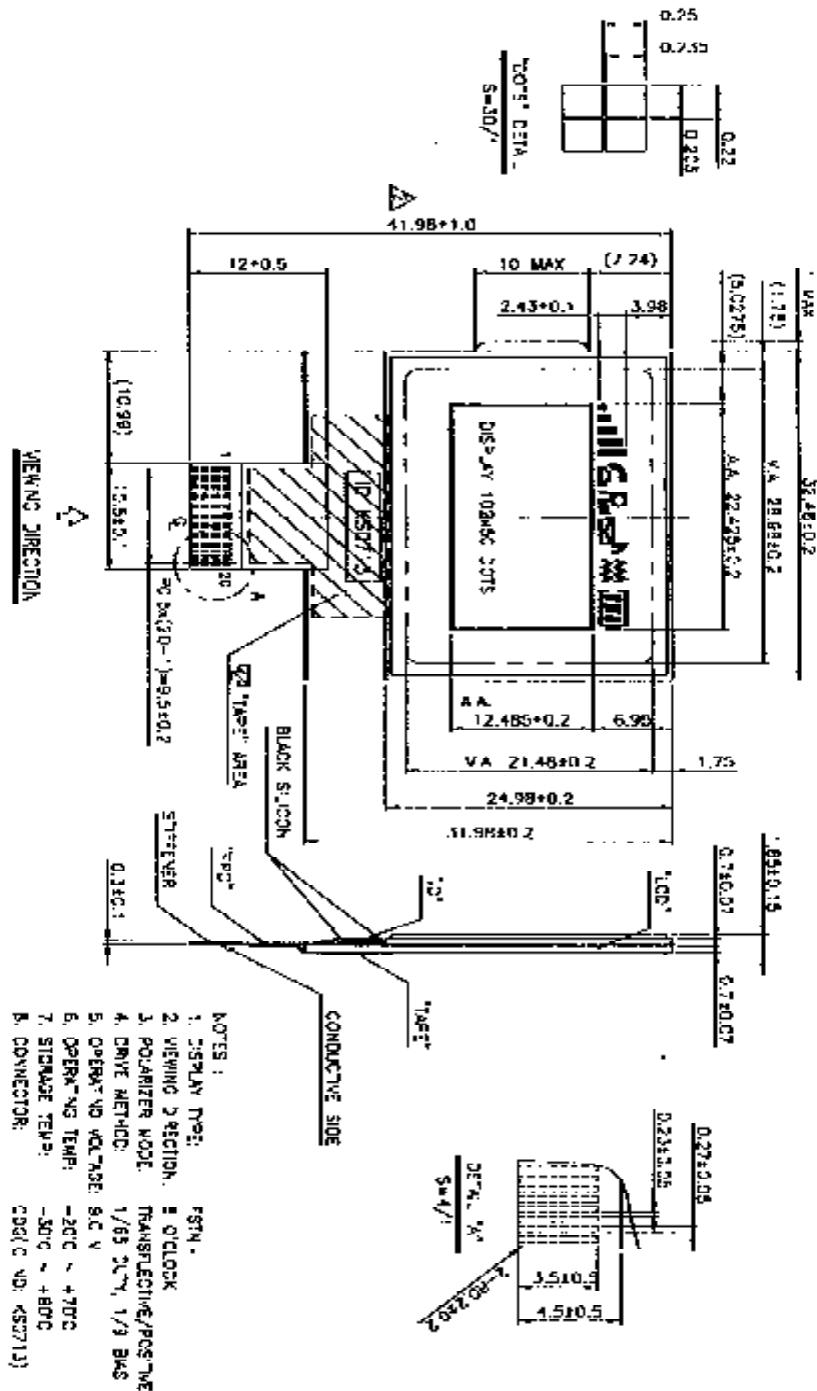
3.1 Icons
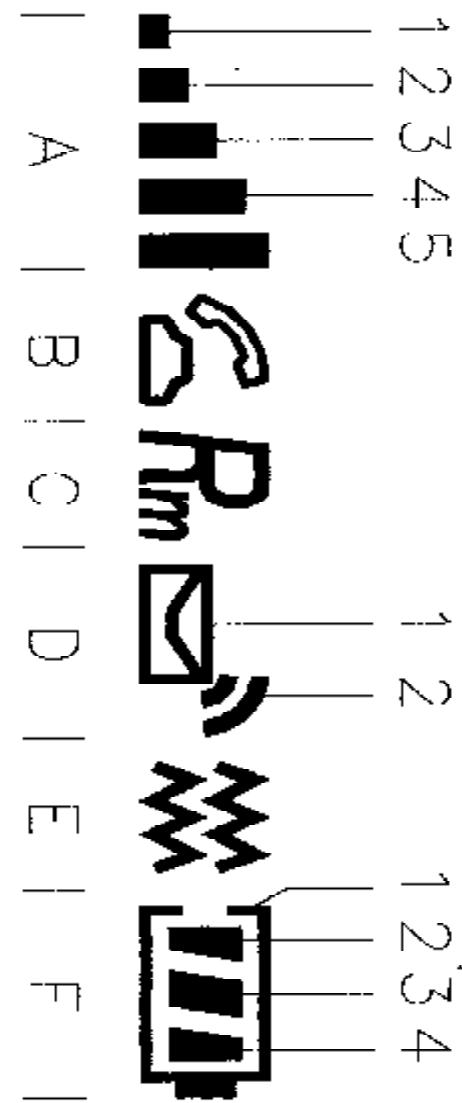
4.0 OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Viewing angle	θ	$\phi = 0°$	$T_a = 25$ °C $C_r \geq 2.0$	---	35		Deg
		$\phi = 180°$			30		
		$\phi = 90°$			30	—	
		$\phi = 270°$		—	30		
Contrast Ratio	C_r (MAX)	$T_a = 25$ °C		5	8	—	
Response Time	T_R	$T_a = -20$ °C		—	2450		ms
	T_F				5980	—	
	T_R	$T_a = -10$ °C		—	1200		
	T_F			—	1600	—	
	T_R	$T_a = 0$°C		—	450		
	T_F			—	650		
	T_R	$T_a = 25$ °C		—	120		
	T_F				180		
	T_R	$T_a = 50$ °C			45	—	
	T_F				75	—	
	T_R	$T_a = 70$ °C		—	55		
	T_F				61		
Frame Frequency	f_{ILM}	—			64		Hz

4.1 θ and ϕ

View Direction

- *The contrast of the display is optimal when viewed in the "View Direction" (ϕ -- 0°).*
- $0° \leq \theta < 90°, 0° \leq \phi < 360°$

4.4 Optical measurement system

Light source (for reflective type LCD)

Photo-meter

Normal

θ

θ_0

LCD front side

Measurement apparatus:
$\theta_0 - \theta \quad 30°$

Light source (for transmissive/transflective type LCD)
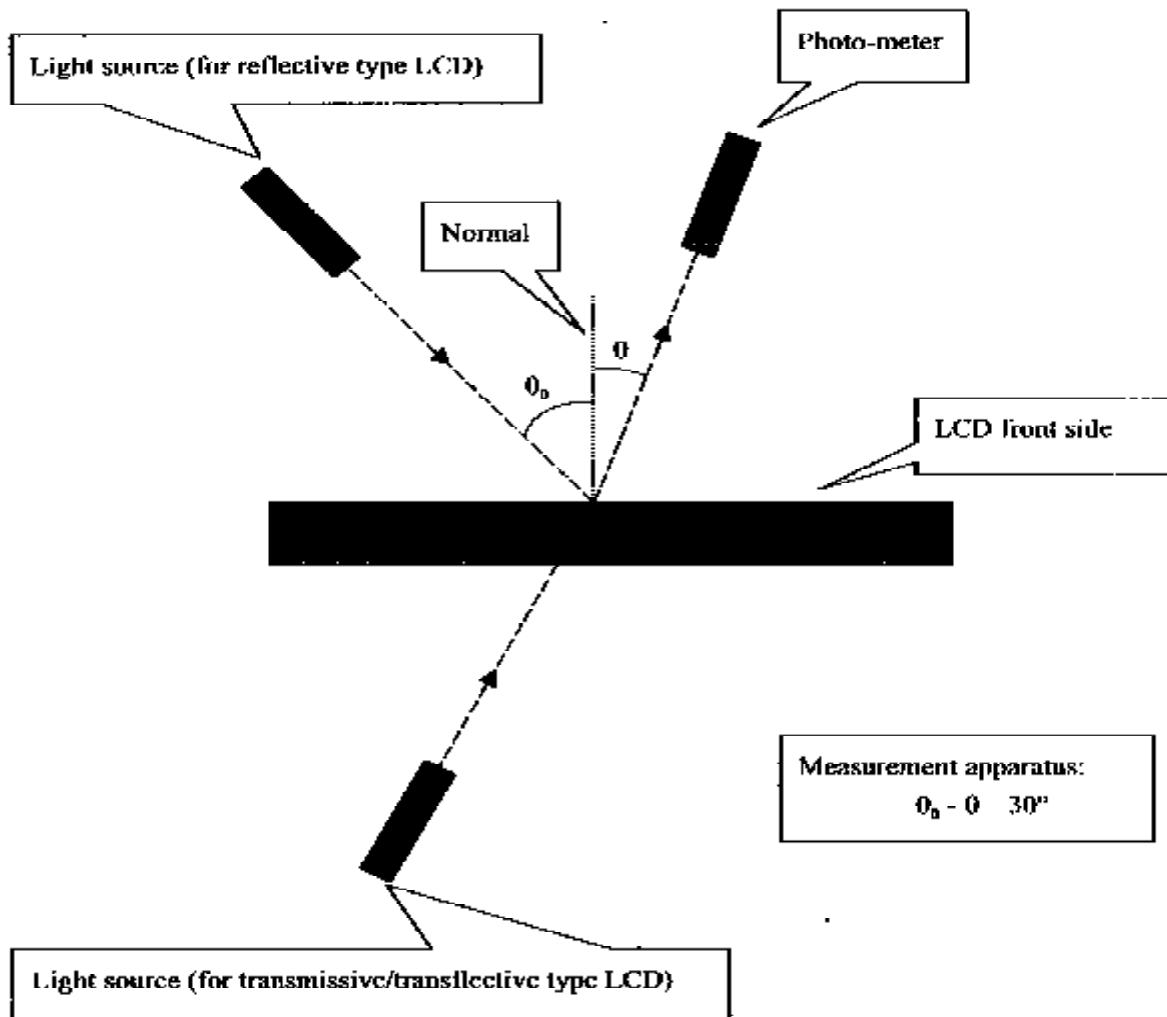
4.2 Contrast ratio Cr

Contrast Ratio: $C_r = B_{ns} / B_s$
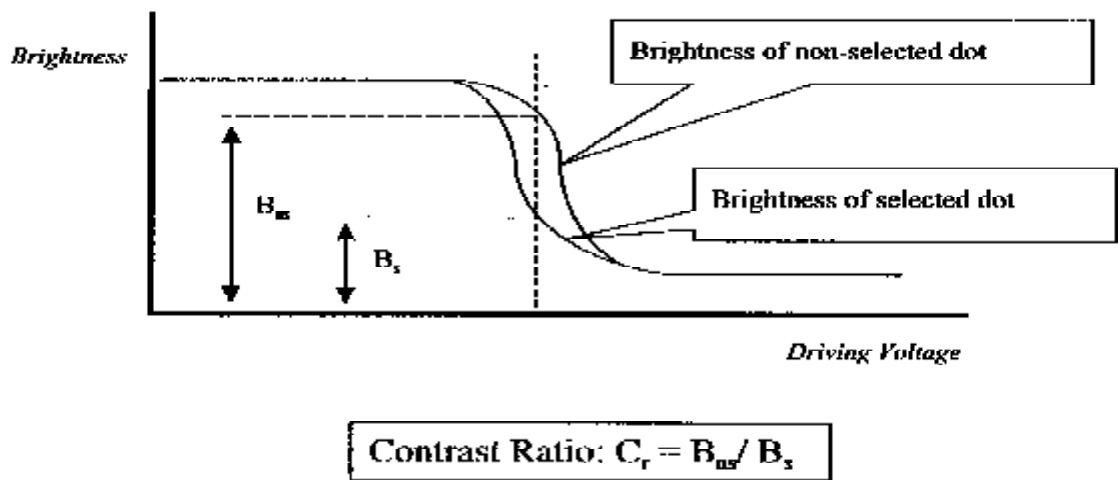
4.3 Response times T_{R} and T_{F}
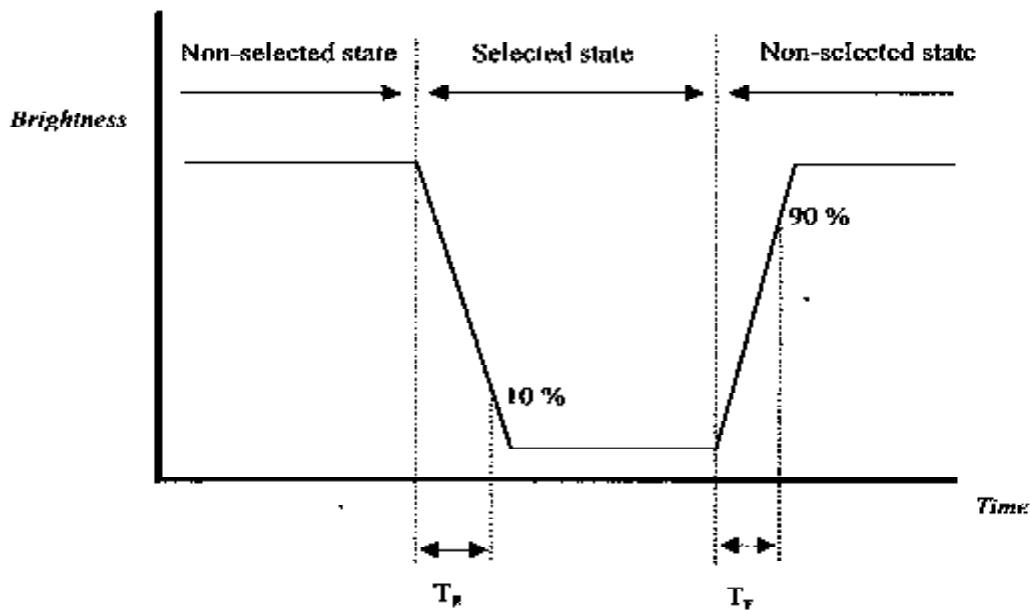
5.0 ELECTRICAL SPECIFICATIONS

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Power-supply voltage	V_{DD}-V_{SS}	$T_a = 25\ ℃$	2.4	2.8	5.5	
Input voltage	V_{IH}	—	$0.8\times V_{DD}$	—	V_{DD}	V
	V_{IL}		0	—	$0.2\times V_{DD}$	
Supply current for logic	I_{DD}	$V_{DD} = 2.8\ V$	—	0.4	1.0	mA
LCD driving voltage	V_{LCD}	$T_a = -20\ ℃$	13.1	13.5	13.9	V
		$T_a = -10\ ℃$	9.70	10.0	10.3	
		$T_a = 0\ ℃$	9.31	9.60	9.89	
		$T_a = 25\ ℃$	8.73	9.00	9.27	
		$T_a = 50\ ℃$	8.34	8.60	8.86	
		$T_a = 70\ ℃$	7.86	8.10	8.34	

6.0 INTERFACE PIN DESCRIPTION

PIN NO.	SYMBOL	FUNCTION
1	RS	REGISTER SELECT INPUT PIN
2	V4	
3	V3	
4	V2	LCD DRIVE SUPPLY VOLTAGES
5	V1	
6	V0	
7	VOUT	VOLTAGE CONVERTER OUTPUT
8	C2-	
9	C2+	
10	C1-	
11	C1+	SET-UP CAPACITOR TERMINAL
12	C3-	
13	C3+	
14	VDD	POWER SUPPLY
15	VDD	POWER SUPPLY

16	VSS	GROUND
17	SID	SERIAL DATA INPUT
18	SCLK	SERIAL CLOCK INPUT
19	CSI	CHIP SELECT INPUTS
20	RESETB	RESET INPUT PIN

7.0 BLOCK DIAGRAM

COM33~50

14 ICONS

102× 50 DOTS

COM1~32

SEG 1~102

KS0713

LCM INTERFACE
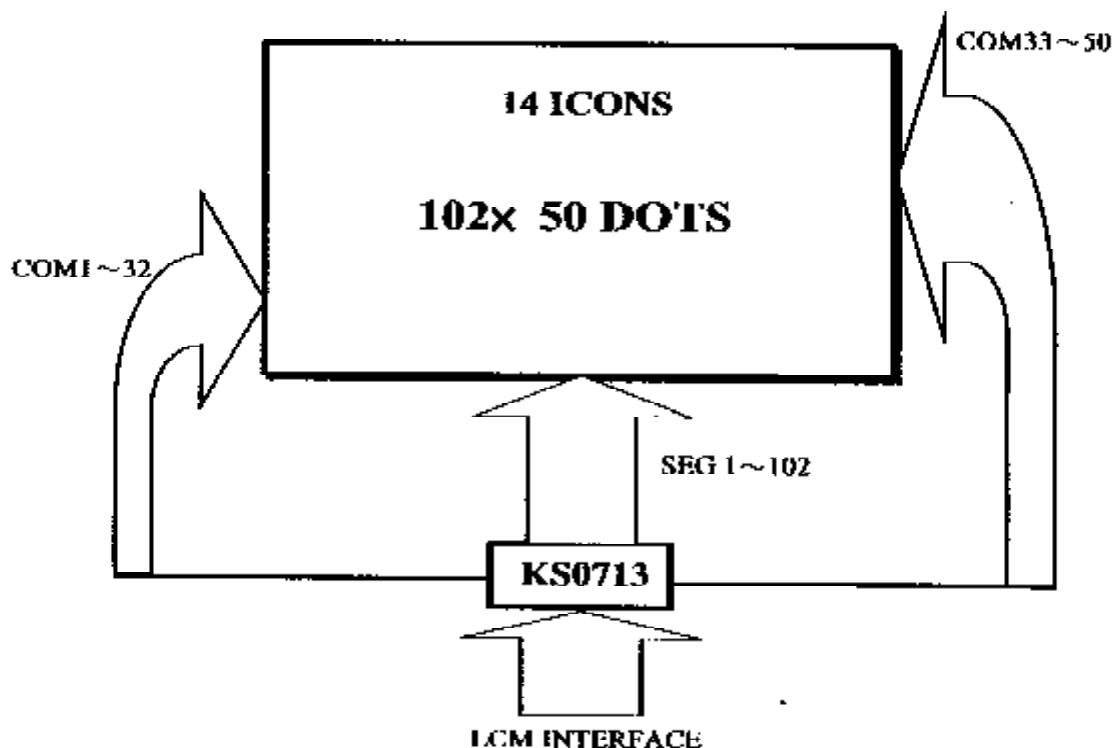
8.0 POWER SUPPLY CIRCUIT DIAGRAM

PCT79HWX01 MODULE

2.8 V ●

V_{DD}

V_{SS}

8.1 Reference Circuit

When using internal regulator resistors

VDD

4 X Step-Up

C1

| MS | INTRS |

VOUT
C3+
C3-
C2+
C2-
C1+
C1-

VR

V0
V1
V2
V3
V4

Vss
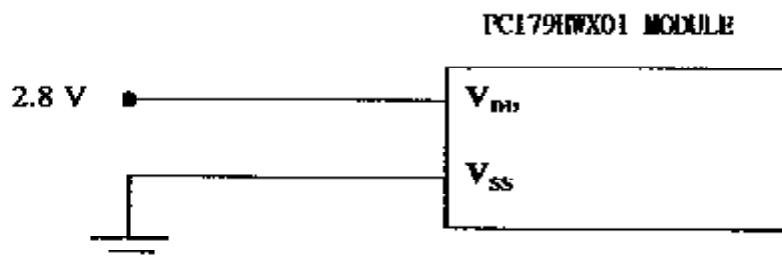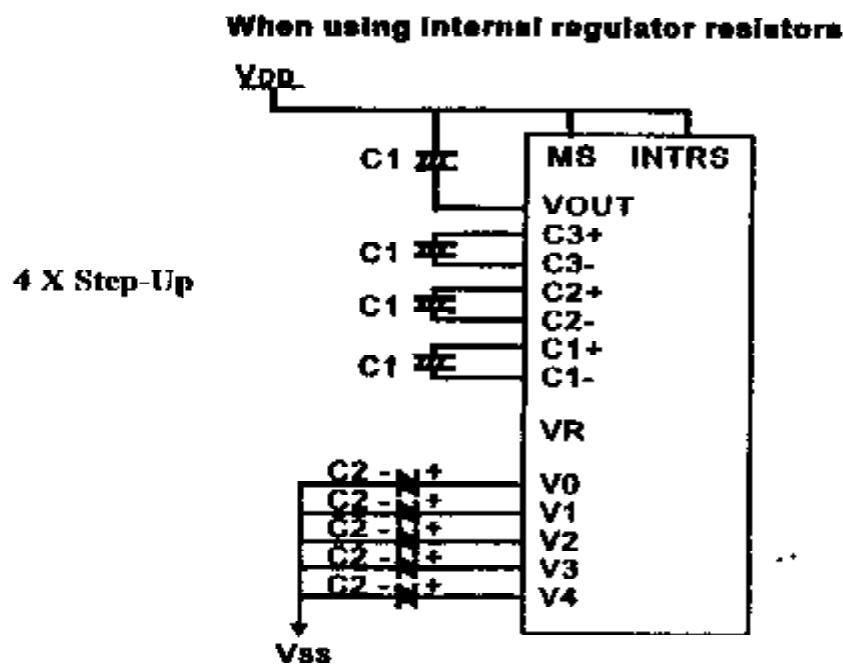
Item	Value	Unit
C1	1.0 to 4.7	uF
C2	0.47 to 1.0	

8.2 Pin Table

	Seg1	Seg7	Seg12	Seg17	Seg23	Seg30	Seg45
Cons	A1	A2	A3	A4	A5	B	C

	Seg63	Seg67	Seg71	Seg85	Seg83	Seg84	Seg82
Coms	D1	D2	E	F1	F2	F3	F4