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	REV.	DESCRIPTION	DATE	APPROVED



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- Specification subject to change without notice.
- All dimensions and specifications apply to standard modules. This information may vary for modules with optional features.
- All dimensions are in millimetres.
- 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: 24x2 LCD module with optional backlight	
	ISSUED		DWG.NO.	DV2227 and DV4427

RECORD OF REVISION

[illegible]

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GENERAL SPECIFICATION

ITEM	CONTENTS
Display Format	24character(W) ×2line(H)
Character Size	3.20 ×5.55 mm
View Area	93.5 ×15.8 mm
General Dimensions	118.0 ×36.0 ×14.0 mm
LCD Type	☒ STN Gray ☐ STN Yellow Green ☐ STN Blue ☐ FSTN Positive ☐ FSTN Negative ☐ TN
Polarizer mode	☐ Reflective ☒ Transflective ☐ Transmissive
View Angle	☒ 6 O'clock ☐ 12 O'clock ☐ Others_____
Backlight	☒ LED ☐ EL ☐ CCFL
Backlight Driver type	☒ Internal Power ☐ External Power
Backlight Color	☒ Yellow green ☐ White ☐ Amber ☐ Blue Green ☐ Other
Controller/Driver	NT3881 or KS0066U/NT3883 or KS0063B
Temperature Range	☐ 0℃~+50℃ ☒ -20℃~+70℃ ☐ -30℃~+80℃
Character Font Table	☒ English ☐ European ☐ Other_____
DC/DC Converter	Without

MECHANICAL SPECIFICATION

ITEM	CONTENTS
Module Size	118.0(W) ×36.0(H) ×14.0max(D)
View Area	93.5 ×15.8 mm
Character Size	3.20mm ×5.55mm
Character Pitch	3.25mm ×5.59mm
Dot Size	0.60mm ×0.65mm
Dot Pitch	0.65mm ×0.70mm
Duty Ratio	1/16 duty

ABSOLUTE MAXIMUM RATING($T_a=25^{\circ}\text{C}$ $V_{SS}=0\text{V}$)

Item	Symbol	Min.	Type	Max.	Unit	Humidity
Power Supply for Logic	$V_{DD}-V_{SS}$	-0.3	-	7.1	Volt	
Power Supply for LCD	$V_{DD}-V_o$	0	-	10.0	Volt	
Input Voltage	V_{IN}	-0.3	-	$V_{DD}+0.3$	Volt	
Supply Current for LED backlight	I_{LED}	-	-	220	mA	
Operating Temperature	Top	-20	-	+70	$^{\circ}\text{C}$	Note1
Storage Temperature	Tst	-30	-	+80	$^{\circ}\text{C}$	Note2

Note1: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

$T_a \leq 70^{\circ}\text{C}$: 75RH max

$T_a > 70^{\circ}\text{C}$: absolute humidity must be lower than the humidity of 75%RH at 70°C

Note2: T_a at -30°C will be <48hrs, at 80°C will be <120hrs when humidity is

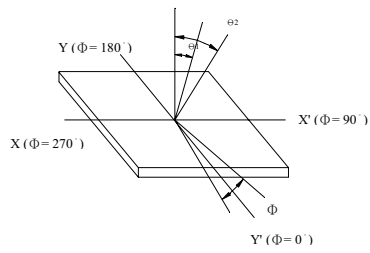
ELECTRICAL CHARACTERISTICS (Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply for Logic	$V_{DD}-V_{SS}$	-	4.7	5.0	5.3	Volt
Input Voltage	V_{IL}	L level	V_{SS}	0.2 V_{DD}	-	Volt
	V_{IH}	H level	0.7 V_{DD}	-	V_{DD}	Volt
LCD Module Driving Voltage	$V_{DD}=5.0V$ $V_{DD}-V_O=4.3V$	Ta=-20°C	-	-	-	Volt
		Ta=0°C	-	-	-	
		Ta=25°C	4.0	4.3	4.6	
		Ta=50°C	-	-	-	
Power Supply Current for LCM	I_{DD} (B/L OFF)	$V_{DD}=5.0V$	-	1.5	3.0	mA
	I_{LED}	$V_{LED}=4.2V$	-	110	180	

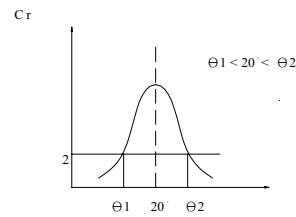
OPTICAL CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Condition	Note
Viewing Angle	Θ 1- Θ 2	-15	--	45	deg.		1.2
	Φ	-35	--	+35	deg.		
Contrast Ratio	Cr	--	10	15	--	$\Theta=20^\circ$ $\Phi=0^\circ$	3
Response Time (rise)	Tr	--	250	750	ms	$\Theta=20^\circ$ $\Phi=0^\circ$	4
Response Time (fall)	Tf	--	300	900	ms	$\Theta=20^\circ$ $\Phi=0^\circ$	4

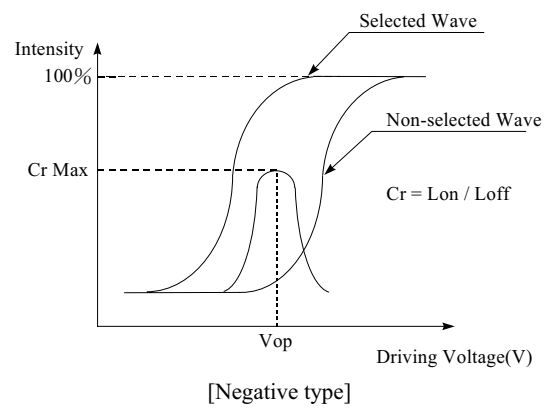
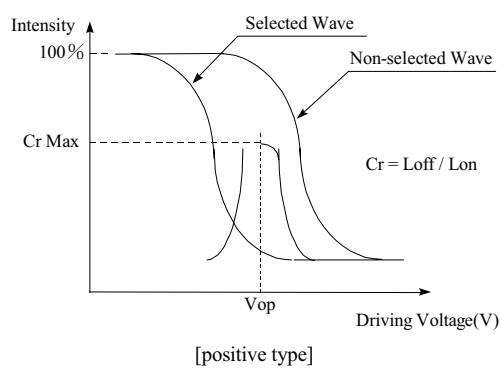
Note 1. Definition of angle Θ & Φ



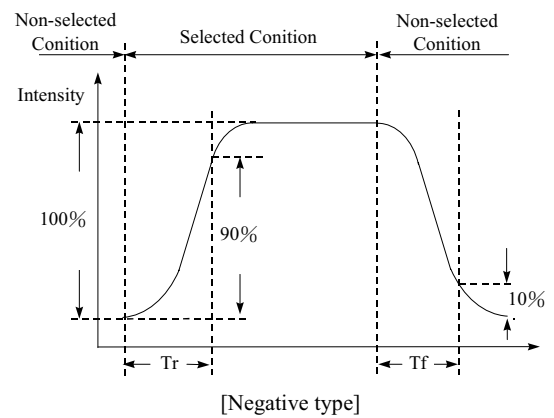
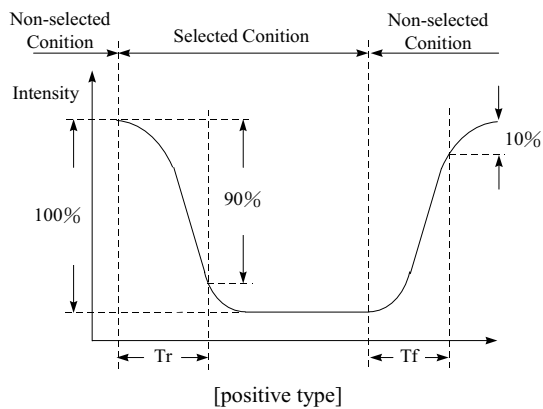
Note 2. Definition of viewing angle Θ_1 & Θ_2



Note 3. Definition of contrast ratio (Cr)



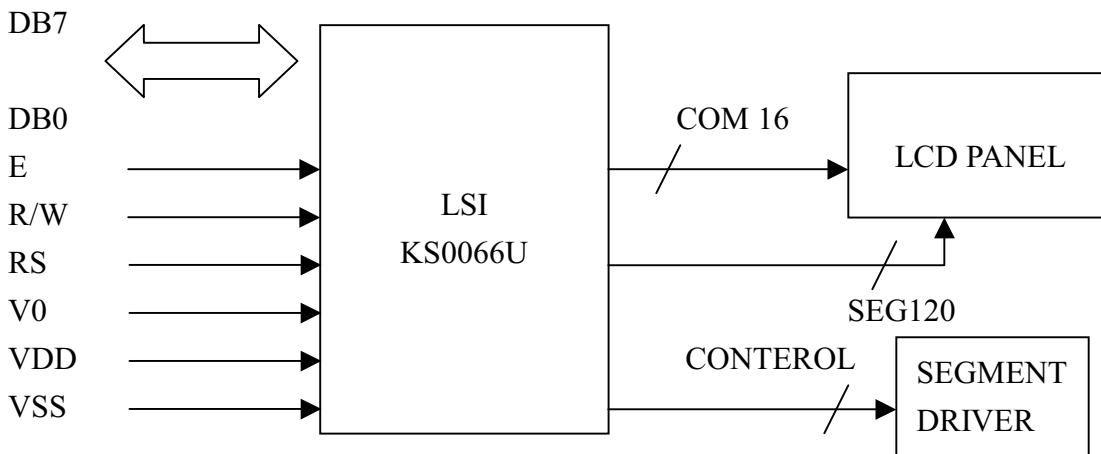
Note 4. Definition of response time



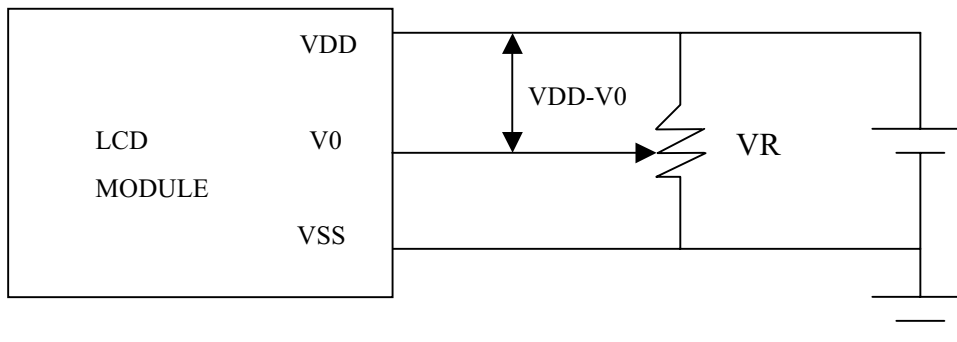
INTERFACE PIN ASSIGNMENT

PIN	SYMBOL	FUNCTIONS
1	VSS	GROUND (0V)
2	VDD	Powersupply for logic circuit (5V)
3	V0	Operating voltage for LCD driving (Variable)
4	RS	H : Data input ; L : Instruction code input
5	R/W	H : Data Read (LCM to MPU) ; L : Data Write (MPU to LCM)
6	E	Enable
7-14	DB0-DB7	Data bus line
15	NC	No connection
16	NC	No connection

BLOCK DIAGRAM



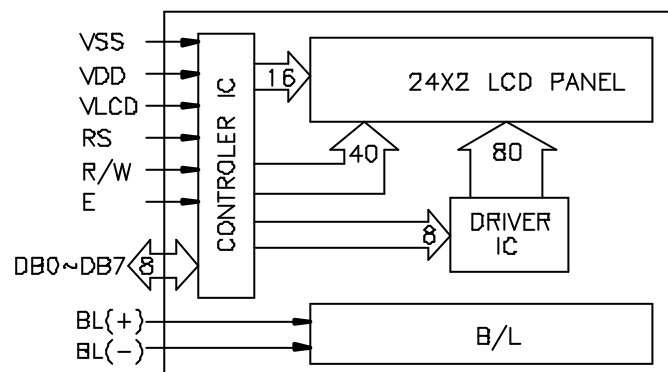
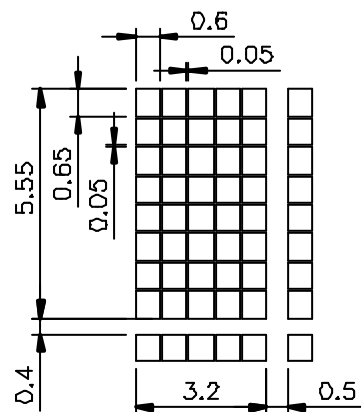
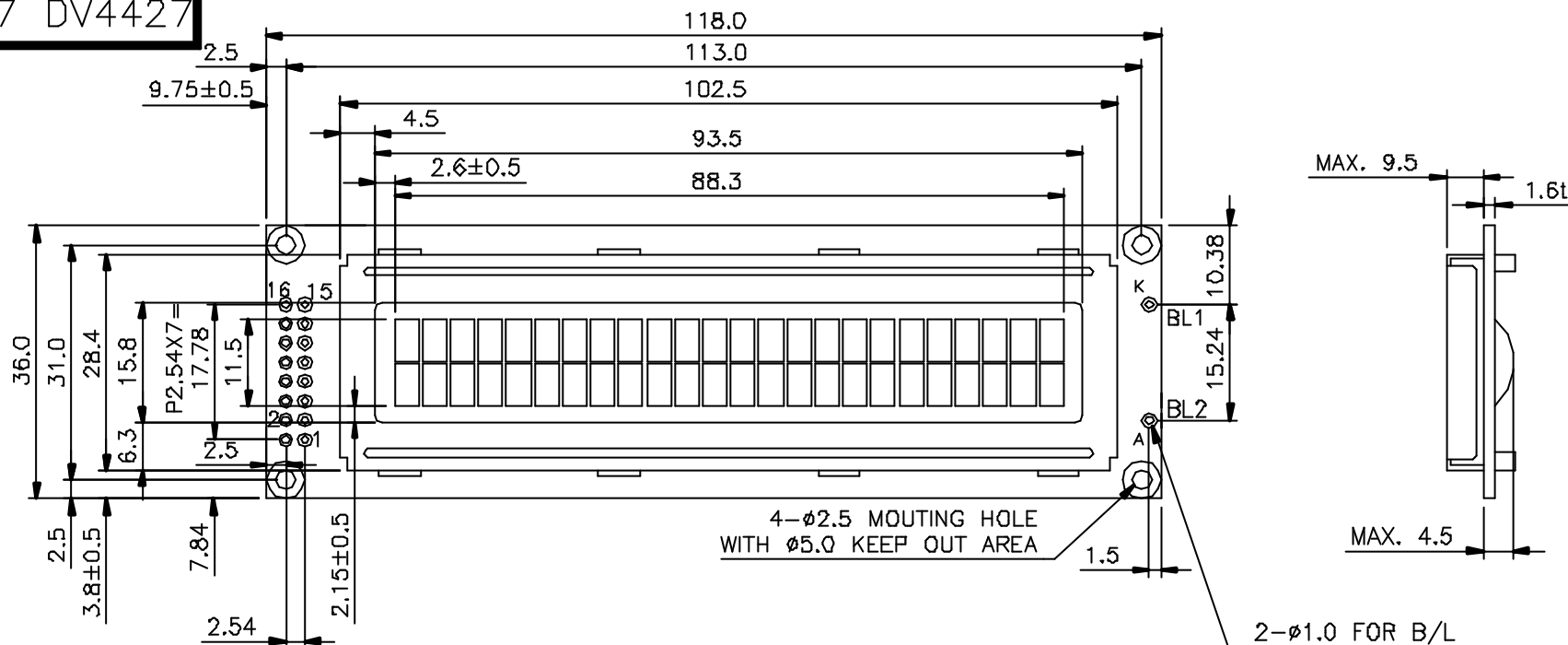
POWER SUPPLY



* $VDD-V0$ = Operating voltage for LCD

* VR = 10 Kohm to 20 Kohm

DV2227 DV4227 DV4427



2000.12.14 modify IO PIN SET
CHANGE 14 HOLES TO 16 HOLE
1 AND 2 PIN BE DOWNED 2.54

INTERFACE PIN B/L TYPE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	BL1	BL2	CHECK BY		/ /	SHEET : 1/1	TOLERANCE: ±0.3	UNIT: mm
LED—SMT	VSS	VDD	VLCD	RS	R/W	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	LED(+)	LED(-)	LED(+)	LED(-)	DRAWING BY	ANGELA	2000.1.2	SIZE : A4	ANGLES: ±0.5°	SCALE: NTS

CHARACTER FONT TABLE

Upper 4 bits Lower 4 bits	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)			0	a	P	`	F				一	9	E	o	p
0001	CG RAM (2)		!	1	A	Q	a	4			o	ア	チ	4	ä	q
0010	CG RAM (3)		"	2	B	R	b	r			「	イ	ツ	×	ρ	θ
0011	CG RAM (4)		#	3	C	S	c	s			」	ウ	テ	E	ε	∞
0100	CG RAM (5)		\$	4	D	T	d	t			、	エ	ト	†	μ	ω
0101	CG RAM (6)		%	5	E	U	e	u			・	オ	ナ	1	ε	ü
0110	CG RAM (7)		&	6	F	V	f	v			ヲ	カ	ニ	ヨ	ρ	Σ
0111	CG RAM (8)		'	7	G	W	g	w			ア	†	ヌ	ラ	g	π
1000	CG RAM (1)		(	8	H	X	h	x			イ	ウ	ホ	リ	、	Σ
1001	CG RAM (2)		)	9	I	Y	i	y			o	ク	ル	ル	、	y
1010	CG RAM (3)		*	:	J	Z	j	z			エ	コ	ハ	ル	j	チ
1011	CG RAM (4)		+	;	K	L	k	l			オ	サ	ヒ	ロ	°	ア
1100	CG RAM (5)		,	<	L	*	1	1			ト	シ	フ	フ	+	ア
1101	CG RAM (6)		—	—	M	J	m	)			ユ	ズ	ハ	フ	+	÷
1110	CG RAM (7)		.	>	N	^	n	+			ヨ	セ	ホ	°	ハ	
1111	CG RAM (8)		/	?	O	_	o	+			ッ	ソ	マ	°	o	