



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CG12864C - _ _ - _ _ - _ _ - _ _

Revision	03
Engineering	Timothy Chan
Date	4 November 2019
Our Reference	X9054

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MODE OF DISPLAY**Display mode**

- STN : Yellow green
 Grey
 Blue (negative)
 FSTN positive
 FSTN negative

Display condition

- Reflective type
 Transflective type
 Transmissive type
 Others

Viewing direction

- 6 O' clock
 12 O' clock
 3 O' clock
 9 O' clock

LCD MODULE NUMBER NOTATION:

CG12864C- N N - S R - N 6 - T

| | | | | | | |
(1) (2) (3) (4) (5) (6) (7) (8)

*(1)---Model number of standard LCD Modules

*(2)---Backlight type

- N – No backlight
E – EL backlight
L – Side-lited LED backlight
M– Array LED backlight
C – CCFL

*(3)---Backlight color

- N – No backlight
A – Amber
B – Blue
O– Orange
W–White
Y – Yellow green
G – Green
R – Red

*(4)---Display mode

- T – TN
V – TN (Negative)
S – STN Yellow green
G – STN Grey
B – STN Blue (Negative)
F – FSTN
N – FSTN (Negative)

*(5)---Rear polarizer type

- R – Reflective
F – Transflective
T – Transmissive

*(6)---Temperature range

- N – Normal
W– Extended

*(7)---Viewing direction

- 6 – 6 O'clock
2 – 12 O'clock
3 – 3 O'clock
9 – 9 O'clock

*(8)---Special code for other requirements

(Can be omitted if not used)

GENERAL DESCRIPTION

Display mode	:	128 x 64 dots, Graphic COG LCD module
Interface	:	Serial
Driving method	:	1/65 duty, 1/9 bias
Controller IC	:	Sitronix ST7565R or equivalent For the detailed information, please refer to the IC specifications

MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
No Backlight (N)	34.4(L)x32.6(W)x2.1max(H)	mm	Viewing Area	30.4(L)x20.9(W)	mm
LED Sided Backlight(L)	34.4(L)x32.6(W)x5.7max(H)	mm	Dot Pitch	0.22(L)x0.30(W)	mm
RGB Backlight	34.4(L)x32.6(W)x6.4max(H)	mm	Dot Size	0.195(L)x0.275(W)	mm

CONNECTOR PIN ASSIGNMENT**CN1**

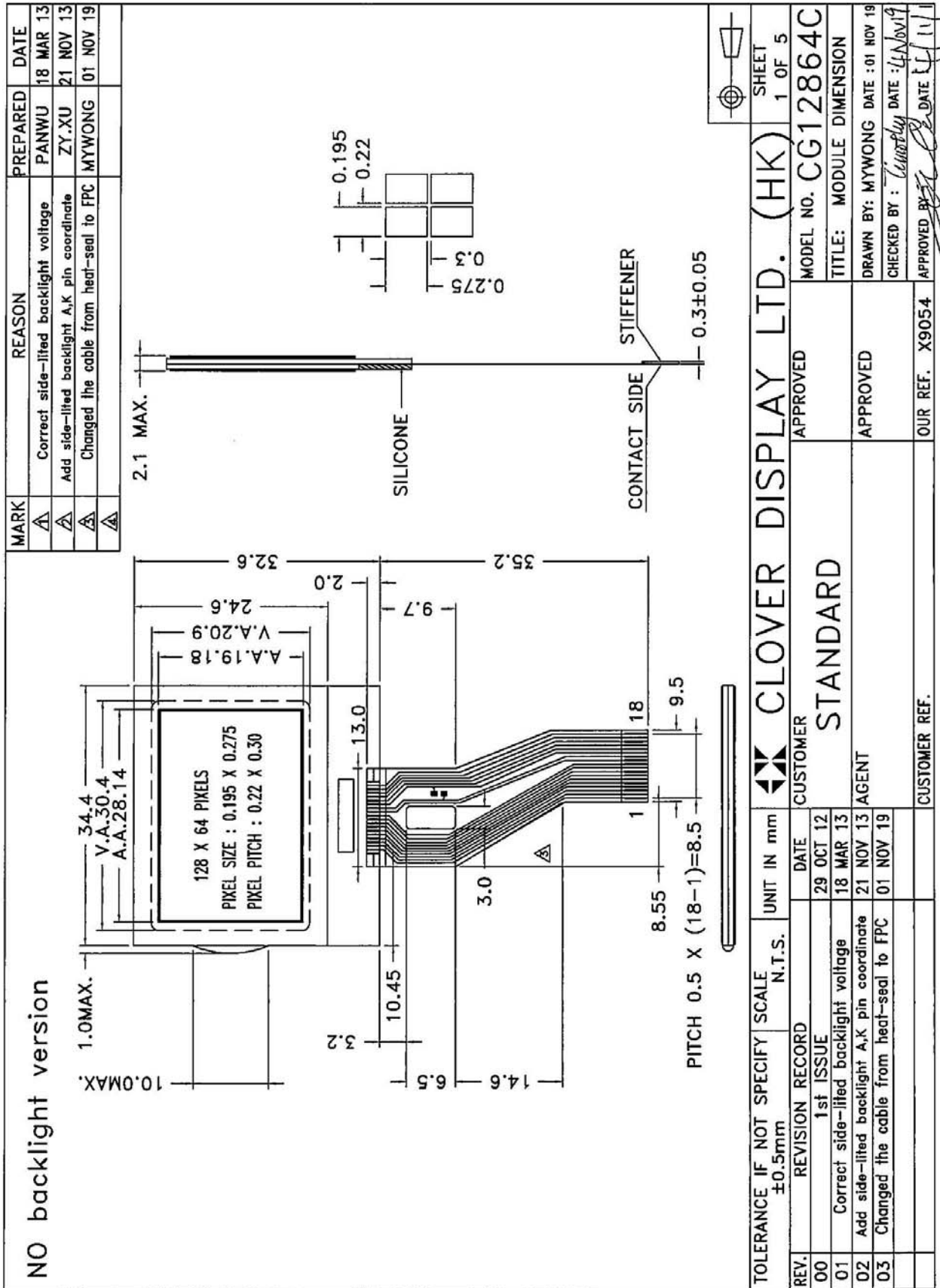
Pin No.	Symbol	Function
1	V0	Power supply for LCD
2	V1	
3	V2	
4	V3	
5	V4	
6	CAP2N	Voltage Converter
7	CAP2P	
8	CAP1P	
9	CAP1N	
10	CAP3P	
11	VOUT	Voltage Converter Input / Output
12	VSS	Ground
13	VDD	Power Supply for Logic
14	D7(SI)	Serial Data Input pin
15	D6(SCL)	Serial Clock Input pin
16	A0	Register Select pin
17	RST	External Reset input
18	CS1B	Chip Select

CN2

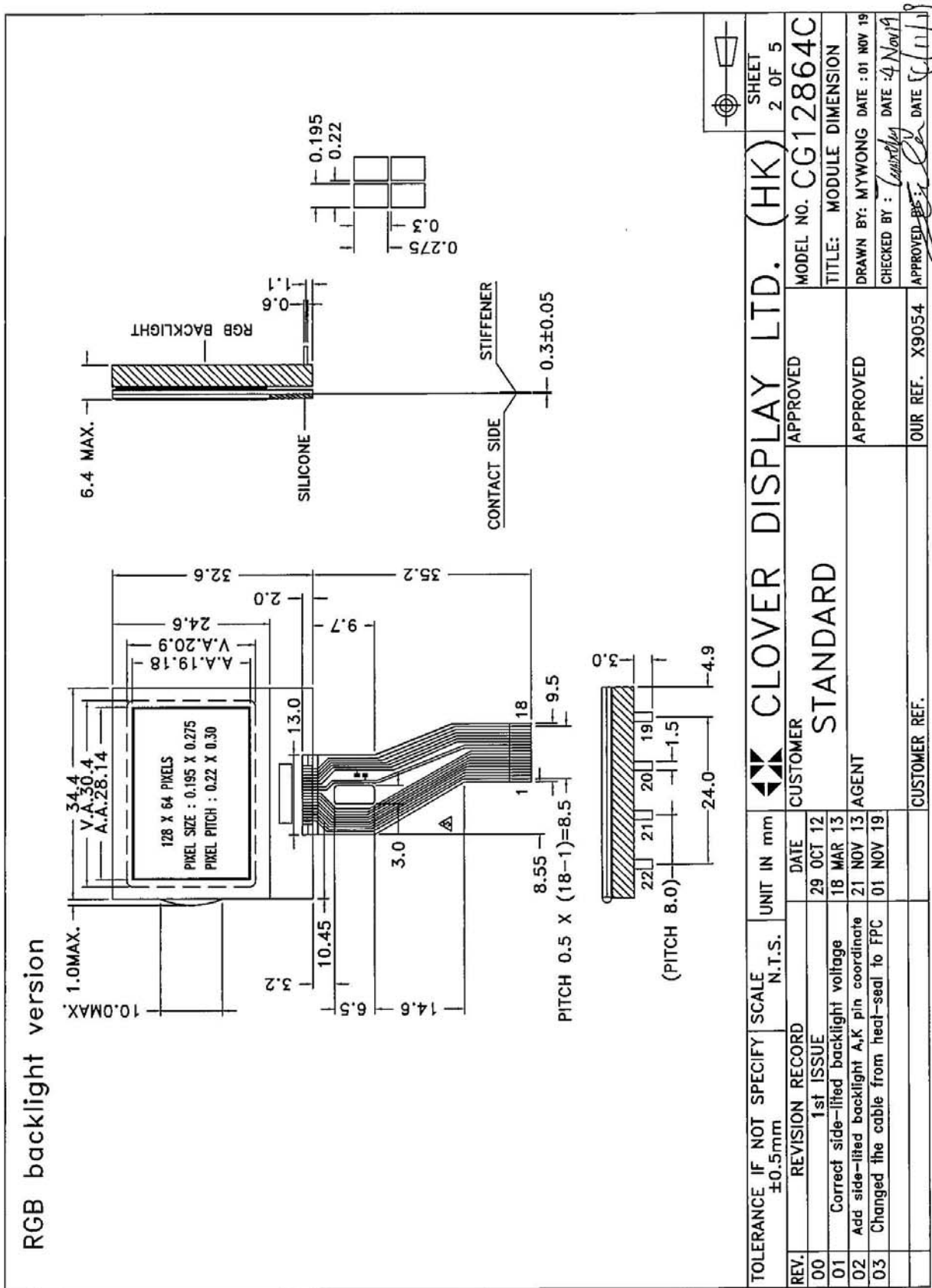
Pin No.	Symbol	Function
(*19)	A	Supply voltage for backlight (+)
(*20)	K	Supply voltage for backlight (-)
(*19)	A	Supply voltage for backlight (+)
(*20)	KR	Supply voltage for backlight (-)
(*21)	KG	Supply voltage for backlight (-)
(*22)	KB	Supply voltage for backlight (-)

Note (*): CN2 are for backlight versions only.

COUNTER DRAWING OF MODULE DIMENSION
(NO BACKLIGHT VERSION)

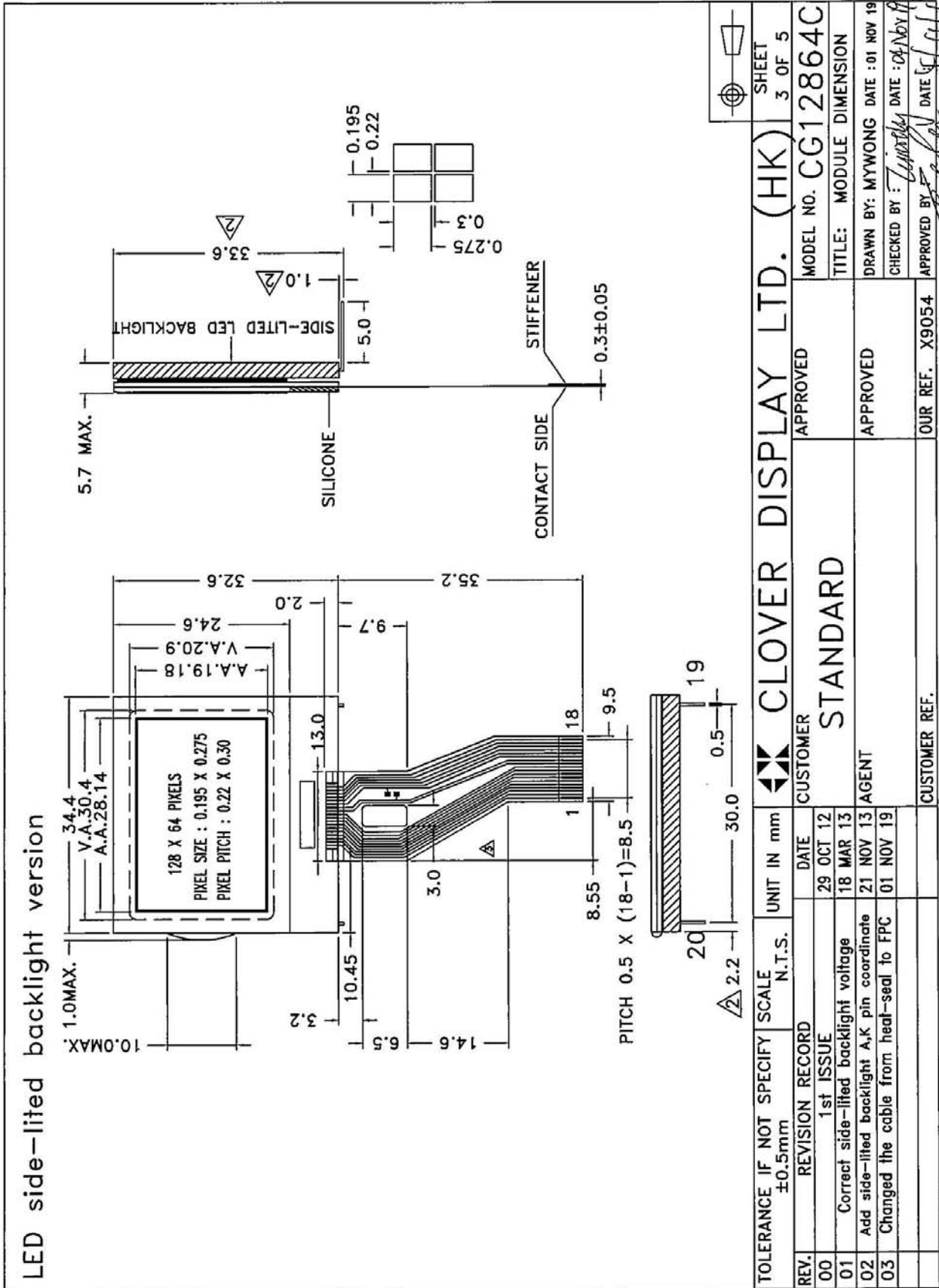


COUNTER DRAWING OF MODULE DIMENSION
(RGB BACKLIGHT VERSION)



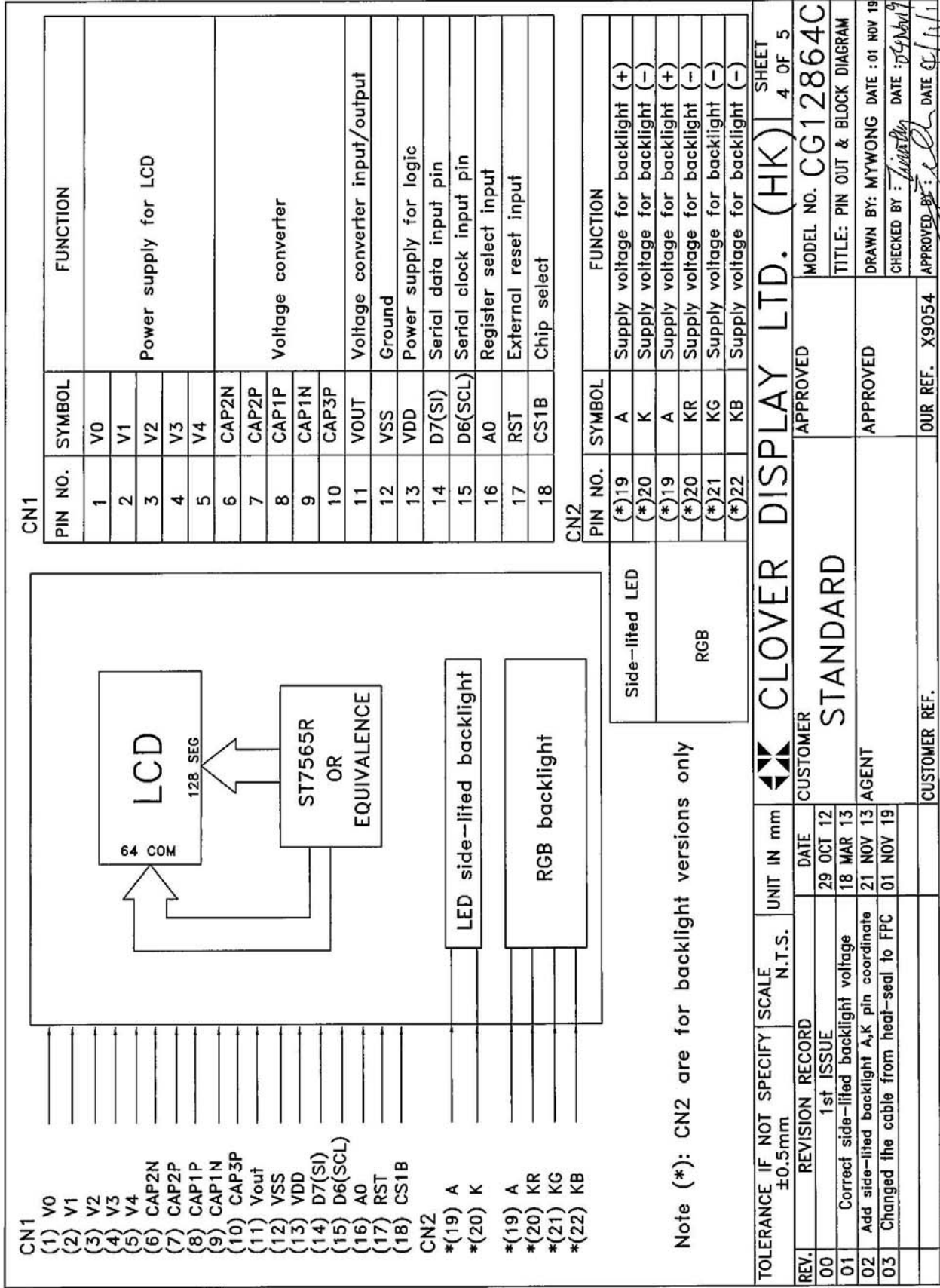
TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 2 OF 5
REV.	REVISION RECORD	DATE	CUSTOMER	APPROVED	MODEL NO. CG12864C	TITLE: MODULE DIMENSION
00	1st ISSUE	29 OCT 12	STANDARD	APPROVED		DRAWN BY: MYWONG DATE: 01 NOV 19
01	Correct side-lifted backlight voltage	18 MAR 13	AGENT	APPROVED		CHECKED BY: <i>Leung</i> DATE: 4 Nov 19
02	Add side-lifted backlight A,K pin coordinate	21 NOV 13				APPROVED BY: <i>Leung</i> DATE: 4 Nov 19
03	Changed the cable from heat-seal to FPC	01 NOV 19				
			CUSTOMER REF.	OUR REF. X9054		

COUNTER DRAWING OF MODULE DIMENSION
(LED SIDE-LITED BACKLIGHT VERSION)



TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 3 OF 5
REV.	REVISION RECORD	DATE	CUSTOMER	APPROVED	MODEL NO. CG12864C	TITLE: MODULE DIMENSION
00	1st ISSUE	29 OCT 12	STANDARD	APPROVED		
01	Correct side-lited backlight voltage	18 MAR 13	AGENT	APPROVED		
02	Add side-lited backlight A,K pin coordinate	21 NOV 13				
03	Changed the cable from heat-seal to FPC	01 NOV 19				
			CUSTOMER REF.	OUR REF. X9054	DRAWN BY: MYWONG	DATE: 01 NOV 19
					CHECKED BY: <i>[Signature]</i>	DATE: 01 NOV 19
					APPROVED BY: <i>[Signature]</i>	DATE: 01 NOV 19

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



CN1

PIN NO.	SYMBOL	FUNCTION
1	V0	Power supply for LCD
2	V1	
3	V2	
4	V3	
5	V4	
6	CAP2N	Voltage converter
7	CAP2P	
8	CAP1P	
9	CAP1N	
10	CAP3P	Voltage converter input/output
11	VOUT	
12	VSS	Ground
13	VDD	Power supply for logic
14	D7(SI)	Serial data input pin
15	D6(SCL)	Serial clock input pin
16	A0	Register select input
17	RST	External reset input
18	CS1B	Chip select

CN2

PIN NO.	SYMBOL	FUNCTION
(*)19	A	Supply voltage for backlight (+)
(*)20	K	Supply voltage for backlight (-)
(*)19	A	Supply voltage for backlight (+)
(*)20	KR	Supply voltage for backlight (-)
(*)21	KG	Supply voltage for backlight (-)
(*)22	KB	Supply voltage for backlight (-)

Note (*): CN2 are for backlight versions only

TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 4 OF 5
REV.	REVISION RECORD	DATE	DATE	APPROVED	CUSTOMER	MODEL NO. CG12864C
00	1st ISSUE	29 OCT 12	18 MAR 13		STANDARD	TITLE: PIN OUT & BLOCK DIAGRAM
01	Correct side-lit backlight voltage				AGENT	DRAWN BY: MYWONG DATE :01 NOV 19
02	Add side-lit backlight A,K pin coordinate			APPROVED		CHECKED BY: <i>Li</i> DATE :04 Nov 19
03	Changed the cable from heat-seal to FPC					APPROVED BY: <i>Jed</i> DATE :04 Nov 19
				OUR REF. X9054	CUSTOMER REF.	

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, @Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	2.75	3.0	3.3	V
Supply Current for Logic	IDD	—	0.18	0.26	mA
Operating Voltage for LCD (*)	V0	10.45	11.0	11.55	V
'High' Level Input Voltage	VIH	0.8VDD	—	—	V
'Low' Level Input Voltage	VIL	—	—	0.2VDD	V

Note (*): There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

Side BL:

Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Red	I _{BL}	—	20	30	mA	V _{BL} = 3.5V
White	I _{BL}	—	12	14	mA	V _{BL} = 3.5V
Green	I _{BL}	—	20	30	mA	V _{BL} = 3.5V
Blue	I _{BL}	—	20	30	mA	V _{BL} = 3.5V

RGB BL:

Constant voltage driving:

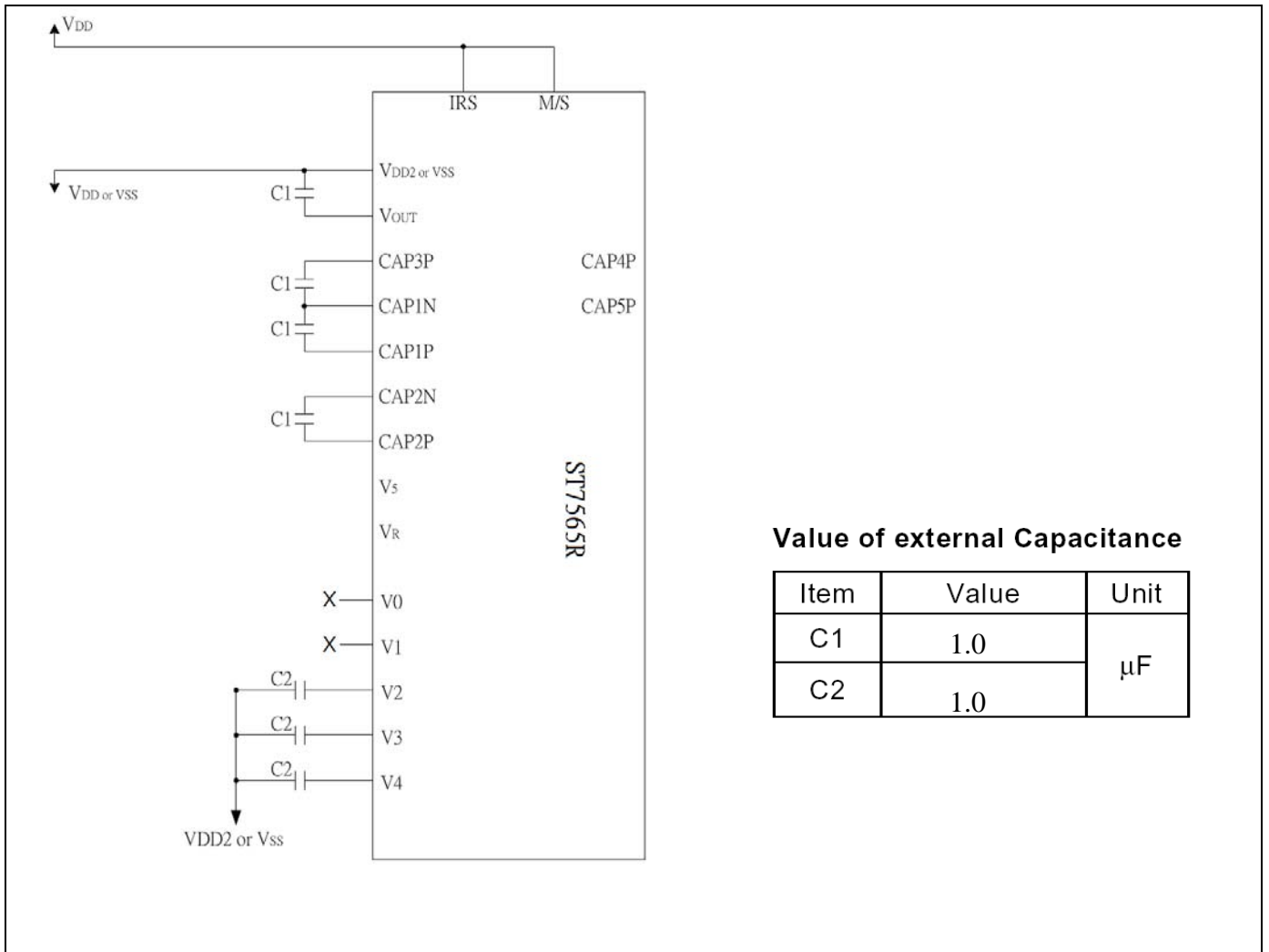
Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Red	I _{BL}	—	14	20	mA	V _{BL} = 5.0V
Green	I _{BL}	—	22	30	mA	V _{BL} = 5.0V
Blue	I _{BL}	—	10	16	mA	V _{BL} = 5.0V

ABSOLUTE MAXIMUM RATINGS

Please make sure not to exceed the following maximum rating values under the worst application conditions

Item	Symbol	Rating (for normal temperature)	Rating (for wide temperature)	Unit
Supply Voltage	VDD	-0.3 to 3.6	-0.3 to 3.6	V
Input Voltage	VT	-0.3 to 13.5	-0.3 to 13.5	V
Operating Temperature	T _{opr}	0 to 50	-20 to 70	°C
Storage Temperature	T _{stg}	-10 to 60	-30 to 80	°C

REFERENCE CIRCUIT EXAMPLE



Value of external Capacitance

Item	Value	Unit
C1	1.0	μF
C2	1.0	

INSTRUCTION TABLE

INSTRUCTION	A0	R/W (RWR)	COMMAND BYTE								DESCRIPTION	
			D7	D6	D5	D4	D3	D2	D1	D0		
Display ON/OFF	0	0	1	0	1	0	1	1	1	1	D	D=1, display ON D=0, display OFF
Set Start Line	0	0	0	1	S5	S4	S3	S2	S1	S0		Set display start line
Set Page Address	0	0	1	0	1	1	Y3	Y2	Y1	Y0		Set page address
Set Column Address	0	0	0	0	0	1	X7	X6	X5	X4		Set column address (MSB)
	0	0	0	0	0	0	X3	X2	X1	X0		Set column address (LSB)
Read Status	0	1	BUSY	MX	D	RST	0	0	0	0		Read IC Status
Write Data	1	0	D7	D6	D5	D4	D3	D2	D1	D0		Write display data to RAM
Read Data	1	1	D7	D6	D5	D4	D3	D2	D1	D0		Read display data from RAM
SEG Direction	0	0	1	0	1	0	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
Inverse Display	0	0	1	0	1	0	0	1	1	1	INV	INV =1, inverse display INV =0, normal display
All Pixel ON	0	0	1	0	1	0	0	1	0	0	AP	AP=1, set all pixel ON AP=0, normal display
Bias Select	0	0	1	0	1	0	0	0	1	0	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
Read-modify-Write	0	0	1	1	1	0	0	0	0	0	0	Column address increment: Read:+0, Write:+1
END	0	0	1	1	1	0	1	1	1	0	0	Exit Read-modify-Write mode
RESET	0	0	1	1	1	0	0	0	1	0	0	Software reset
COM Direction	0	0	1	1	0	0	MY	-	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
Power Control	0	0	0	0	1	0	1	VB	VR	VF		Control built-in power circuit ON/OFF
Regulation Ratio	0	0	0	0	1	0	0	RR2	RR1	RR0		Select regulation resistor ratio
Set EV	0	0	1	0	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	0	
Power Save Mode Set	0	0	1	0	1	0	1	1	0	0	MD	MD=0, sleep mode MD=1, normal
	0	0	0	0	0	0	0	0	0	0	0	
Power Save	0	0	Compound Command									Display OFF + All Pixel ON
Set Booster	0	0	1	1	1	1	1	0	0	0		Double command!! Set booster level: BL[1:0]=(0,0), x2, x3, x4 BL[1:0]=(0,1), x5 BL[1:0]=(1,1), x6
	0	0	0	0	0	0	0	0	0	BL1	BL0	
NOP	0	0	1	1	1	0	0	0	1	1		No operation
Test	0	0	1	1	1	1	-	-	-	-	-	Do NOT use. Reserved for testing.

Note: Symbol "-" means this bit can be "H" or "L".

RECOMMENDED INITIAL SETTINGS

Set Start Line : 40H

Set Page Address : B0H

Set COM Direction : C8H

Set SEG Direction : A0H

Set LCD Bias Select : A2H

Set Power Control : 2FH

Set Regulation Ratio : 27H

Set Electronic volume register : 81H 1FH

Set Display On : AFH

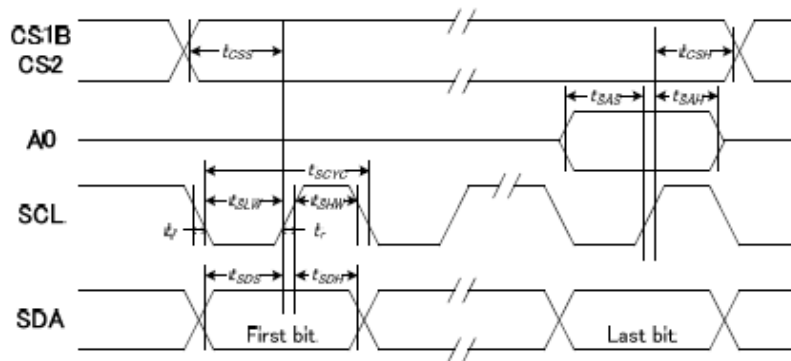
DISPLAY DATA RAM (DDRAM)

Page Address				Data	Column Address (Hex)																PAD No. (8E0)																																															
D3	D2	D1	D0		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F		10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E
0	0	0	0	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	116
0	0	0	1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	117
0	0	1	0	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	118
0	0	1	1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	119
0	1	0	0	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	120
0	1	0	1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	121
0	1	1	0	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	122
0	1	1	1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	123
1	0	0	0	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	124

COM Output Map																PAD No. (COM)	
1/86 Duty		1/48 Duty		1/33 Duty		1/66 Duty		Reserved									
MY=0	MY=1	MY=0	MY=1	MY=0	MY=1	MY=0	MY=1										
COM0	COM63	COM0	COM47	COM0	COM31	COM0	COM53									116	
COM1	COM62	COM1	COM46	COM1	COM30	COM1	COM52									115	
COM2	COM61	COM2	COM45	COM2	COM29	COM2	COM51									114	
COM3	COM60	COM3	COM44	COM3	COM28	COM3	COM50									113	
COM4	COM59	COM4	COM43	COM4	COM27	COM4	COM49									112	
COM5	COM58	COM5	COM42	COM5	COM26	COM5	COM48									111	
COM6	COM57	COM6	COM41	COM6	COM25	COM6	COM47									110	
COM7	COM56	COM7	COM40	COM7	COM24	COM7	COM46									109	
COM8	COM55	COM8	COM39	COM8	COM23	COM8	COM45									108	
COM9	COM54	COM9	COM38	COM9	COM22	COM9	COM44									107	
COM10	COM53	COM10	COM37	COM10	COM21	COM10	COM43									106	
COM11	COM52	COM11	COM36	COM11	COM20	COM11	COM42									105	
COM12	COM51	COM12	COM35	COM12	COM19	COM12	COM41									104	
COM13	COM50	COM13	COM34	COM13	COM18	COM13	COM40									103	
COM14	COM49	COM14	COM33	COM14	COM17	COM14	COM39									102	
COM15	COM48	COM15	COM32	COM15	COM16	COM15	COM38									101	
COM16	COM47	COM16	COM31				COM37									100	
COM17	COM46	COM17	COM30				COM36									99	
COM18	COM45	COM18	COM29				COM35									98	
COM19	COM44	COM19	COM28				COM34									97	
COM20	COM43	COM20	COM27				COM33									96	
COM21	COM42	COM21	COM26				COM32									95	
COM22	COM41	COM22	COM25				COM31									94	
COM23	COM40	COM23	COM24				COM30									93	
COM24	COM39						COM29									92	
COM25	COM38						COM28									91	
COM26	COM37						COM27									90	
COM27	COM36															89	
COM28	COM35															88	
COM29	COM34															87	
COM30	COM33															86	
COM31	COM32															85	
COM32	COM31															250	
COM33	COM30															251	
COM34	COM29															252	
COM35	COM28															253	
COM36	COM27															254	
COM37	COM26						COM27	COM26									255
COM38	COM25						COM28	COM25									256
COM39	COM24						COM29	COM24									257
COM40	COM23	COM24	COM23				COM30	COM23									258
COM41	COM22	COM25	COM22				COM31	COM22									259
COM42	COM21	COM26	COM21				COM32	COM21									260
COM43	COM20	COM27	COM20				COM33	COM20									261
COM44	COM19	COM28	COM19				COM34	COM19									262
COM45	COM18	COM29	COM18				COM35	COM18									263
COM46	COM17	COM30	COM17				COM36	COM17									264
COM47	COM16	COM31	COM16				COM37	COM16									265
COM48	COM15	COM32	COM15	COM16	COM15	COM38	COM15	COM38									266
COM49	COM14	COM33	COM14	COM17	COM14	COM39	COM14	COM39									267
COM50	COM13	COM34	COM13	COM18	COM13	COM40	COM13	COM40									268
COM51	COM12	COM35	COM12	COM19	COM12	COM41	COM12	COM41									269
COM52	COM11	COM36	COM11	COM20	COM11	COM42	COM11	COM42									270
COM53	COM10	COM37	COM10	COM21	COM10	COM43	COM10	COM43									271
COM54	COM9	COM38	COM9	COM22	COM9	COM44	COM9	COM44									272
COM55	COM8	COM39	COM8	COM23	COM8	COM45	COM8	COM45									273
COM56	COM7	COM40	COM7	COM24	COM7	COM46	COM7	COM46									274
COM57	COM6	COM41	COM6	COM25	COM6	COM47	COM6	COM47									275
COM58	COM5	COM42	COM5	COM26	COM5	COM48	COM5	COM48									276
COM59	COM4	COM43	COM4	COM27	COM4	COM49	COM4	COM49									277
COM60	COM3	COM44	COM3	COM28	COM3	COM50	COM3	COM50									278
COM61	COM2	COM45	COM2	COM29	COM2	COM51	COM2	COM51									279
COM62	COM1	COM46	COM1	COM30	COM1	COM52	COM1	COM52									280
COM63	COM0	COM47	COM0	COM31	COM0	COM53	COM0	COM53									281
ICON (COM51, COM52)																282, 117	

SERIAL INTERFACE TIMING DIAGRAM

System Bus Timing for 4-Line Serial Interface



(VDD = 3.3V , Ta =25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		50	—	ns
SCLK "H" pulse width		tSHW		25	—	
SCLK "L" pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CS-SCLK time	CS1B	tCSS		20	—	
CS-SCLK time	CS2	tCSH		40	—	

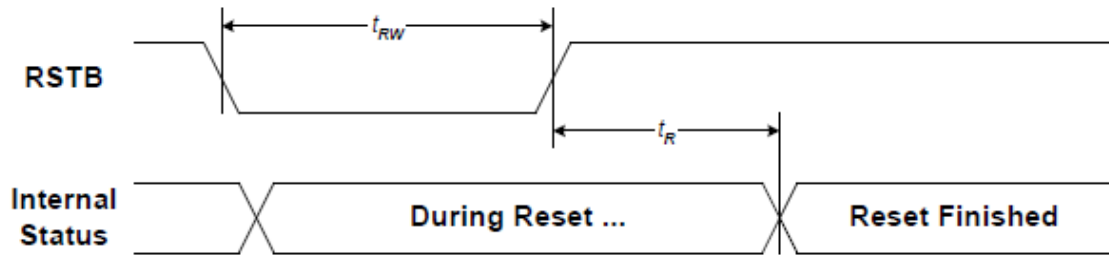
(VDD = 2.7V , Ta =25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		100	—	ns
SCLK "H" pulse width		tSHW		50	—	
SCLK "L" pulse width		tSLW		50	—	
Address setup time	A0	tSAS		30	—	
Address hold time		tSAH		20	—	
Data setup time	SDA	tSDS		30	—	
Data hold time		tSDH		20	—	
CS-SCLK time	CS1B	tCSS		30	—	
CS-SCLK time	CS2	tCSH		60	—	

*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.

*2 All timing is specified using 20% and 80% of VDD as the standard.

RESET TIMING



(VDD = 3.3V , Ta =25°C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	us
Reset "L" pulse width	tRW		1.0	—	

(VDD = 2.7V , Ta =25°C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	2.0	us
Reset "L" pulse width	tRW		2.0	—	

THE RESET CIRCUIT

Setting RSTB to "L" can initialize internal function. While RSTB is "L", no instruction except read status can be accepted. RSTB pin must connect to the reset pin of MPU and initialization by RSTB pin is essential before operating. Please note the hardware reset is not same as the software reset. When RSTB becomes "L", the hardware reset procedure will start. When RESET instruction is executed, the software reset procedure will start. The procedure is listed below:

Procedure	Hardware Reset	Software Reset
Display OFF: D=0, all SEGs/COMs output at VSS	V	X
Normal Display: INV=0, AP=0	V	X
SEG Normal Direction: MX=0	V	X
Clear Serial Counter and Shift Register (if using Serial Interface)	V	X
Bias Selection: BS=0	V	X
Booster Level BL=0	V	X
Exit Power Saving Mode	V	X
Power Control OFF: VB=0, VR=0, VF=0	V	X
Exit Read-modify-Write mode	V	V
Static Indicator OFF	V	V
Static Indicator Register SIR[1:0]=(0,0)	V	V
Start Line S[5:0]=0	V	V
Column Address X[7:0]=0	V	V
Page Address Y[3:0]=0	V	V
COM Normal Direction: MY=0	V	V
V0 Regulation Ratio RR[2:0]=(1,0,0)	V	V
EV[5:0]=(1,0,0,0,0,0)	V	V
Exit Test Mode	V	V

After power-on, RAM data are undefined and the display status is "Display OFF". It's better to initialize whole DDRAM (ex: fill all 00h or write the display pattern) before turning the Display ON. Besides, the power is not stable at the time that the power is just turned ON. A hardware reset is needed to initialize those internal registers after the power is stable.

ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = $V_{OP} / 64 \text{ Hz}$
 TEMPERATURE = $23 \pm 5 \text{ }^\circ\text{C}$
 RELATIVE HUMIDITY = $60 \pm 20 \%$

ITEM	SYMBOL	UNIT	TYP. STN
RESPONSE TIME	T_{on}	ms	220
	T_{off}	ms	280
CONTRAST RATIO	Cr	-	12
VIEWING ANGLE (6 O'clock) $Cr \geq 2$	V3:00	°	40
	V6:00	°	70
	V9:00	°	40
	V12:00	°	50

THE ELECTRO-OPTICAL CHARACTERISTICS ARE MEASURED VALUE BUT NOT GUARANTEED ONES.

RELIABILITY OF LCD MODULE

ITEM	TEST CONDITION FOR NORMAL TEMPERATURE	TEST CONDITION FOR WIDE TEMPERATURE	TIME
High temperature operating	50°C	70°C	240 hours
Low temperature operating	0°C	-20°C	240 hours
High temperature storage	60°C	80°C	240 hours
Low temperature storage	-10°C	-30°C	240 hours
Temperature-humidity storage	40°C 90% R.H.	60°C 90% R.H.	96 hours
Temperature cycling	-10°C to 60°C 30 Min Dwell	-30°C to 80°C 30 Min Dwell	5 cycle
Vibration Test at LCM Level	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	—

SAMPLING METHOD

SAMPLING PLAN: ANSI/ASQ Z1.4

CLASS OF AQL: LEVEL II/ SINGLE SAMPLING
 MAJOR-0.65% MINOR – 1.5%

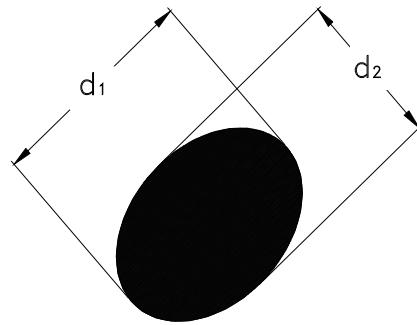
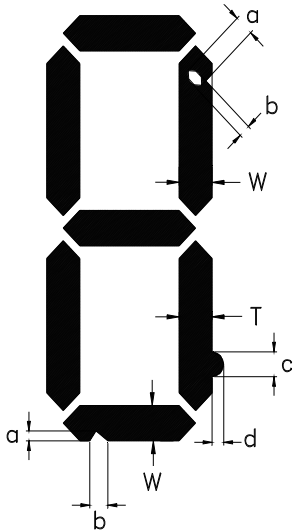
QUALITY STANDARD

DEFECT	CRITERIA	TYPE	FIGURE
SHORT CIRCUIT	-	MAJOR	-
MISSING SEGMENT	-	MAJOR	-
UNEVEN / POOR CONTRAST	-	MAJOR	-
CROSS TALK	-	MAJOR	-
PIN HOLE	$MAX(a,b) \leq 1 / 3 W$	MINOR	1
EXCESS SEGMENT	$MAX(c,d) \leq 1 / 3 T$	MINOR	1
BUBBLES	$d^* \geq 0.5$ QTY=0	MINOR	2
SPOTS	$d \leq 0.6$ N.A.** $0.6 < d \leq 0.7$ QTY \leq 2 $0.7 < d$ QTY=0	MINOR	2
LINE SCRATCHES	$x \geq 0.7$ $y \geq 0.05$ QTY=0	MINOR	3
BLACK LINE	$x \geq 0.7$ $y \geq 0.05$ QTY=0	MINOR	3

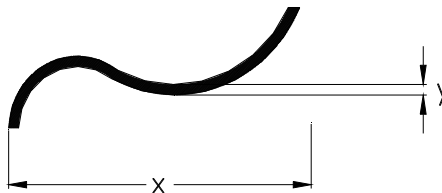
*d = MAX (d₁,d₂)

** N. A . = NOT APPLICABLE

DEFECT TABLE : E



POLARIZER BUBBLES / SPOTS
fig . 2



LINE SCRATCHES / BLACK LINE
fig . 3

QUALITY STANDARD (CONT .)

DEFECT		CRITERIA	TYPE	FIGURE
CHIPS	CONTACT EDGE	$e \leq T$ $f \leq 1/2W$ $g: N.A.$	MINOR	4
	BOTTOM GLASS	$p \leq V.A.***$ $q: N.A.$ $r \leq T$		4
	CORNER	$a: N.A.$ $b \leq W$		4
	TOP GLASS	$a: N.A.$ $b \leq T$ $c \leq W$		5
GLASS PROTRUSION		$a \leq 1/3 W$	MINOR	6
RAINBOW		-	MINOR	-

UNLESS STATE OTHERWISE , ALL UNIT ARE IN MILLIMETER .

***CANNOT EXTEND IN V.A.

DEFECT TABLE : E

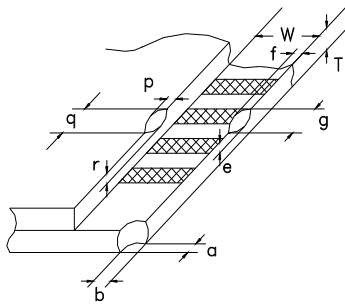


fig . 4

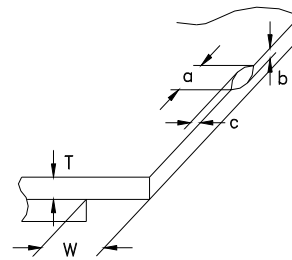


fig . 5

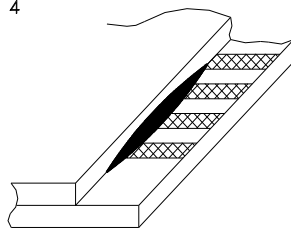


fig . 6

HANDLING PRECAUTIONS

(1) CAUTION OF LCD HANDLING & CLEANING

Use soft cloth with solvent (recommended below) to clean the display surface and wipe lightly.
- Isopropyl alcohol, ethyl alcohol, trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface. Do not use the following solvent;
-water, ketone, aromatics

(2) CAUTION AGAINST STATIC CHARGE

The LCD modules use CMOS LSI drivers, so customers are recommended that any unused input terminal would be connected to V_{DD} or V_{SS} , do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

Remove the protective film slowly and, if possible, under ESD control device like ion blower and humidity of working room should be kept over 50%RH to reduce risk of static charge.

(3) PACKAGING

Avoid intense shock and falls from a height and do not operate or store them exposed direct to sunshine or high temperature/humidity.

(4) CAUTION FOR OPERATION

It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life. The use of direct current drive should be avoided because an electrochemical reaction due to direct current causes LCD's undesirable deterioration.

Response time will be extremely delayed at low temperature, and LCD's show dark color at high temperature. However those phenomena do not mean malfunction or out of order with LCD's.

Some font will be abnormally displayed when the display area is pushed hard during operation. But it resumes normal condition after turning off once.

(5) SOLDERING (for Pin type)

It is recommended to complete dip soldering at 270 °C or hand soldering at 280 °C within 3 seconds. The soldering position is at least 3mm apart from the pin head. Wave or reflow soldering are not recommended. Metal pins should not be soldered for more than 3 times and each soldering should be done after cool down of metal pins

(6) SAFETY

For crash damaged or unnecessary LCD's, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.

When any liquid leaked out of a damaged glass cell comes in contact with your hands, wash it off with soap and water.

WARRANTY

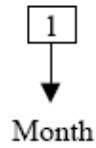
CLOVER will replace or repair any of her LCD module in accordance with her LCD specification for a period of one year from date of shipment. The warranty liability of Clover is limited to repair and/or replacement. Clover will not be responsible for any subsequent or consequential event.

APPENDIX

LOT INDICATION OF LCD MODULE

CODING SYSTEM:

1 DIGIT COLOR CODE:



COLOR CODE:

MONTH	COLOR	
1	BROWN	棕
2	RED	紅
3	ORANGE	橙
4	YELLOW	黃
5	GREEN	綠
6	BLUE	藍
7	PURPLE	紫
8	GREY	灰
9	WHITE	白
10	BLACK	黑
11	GOLD	金
12	SILVER	銀

3 TYPES OF LOCATION AS SHOWN BELOW:

