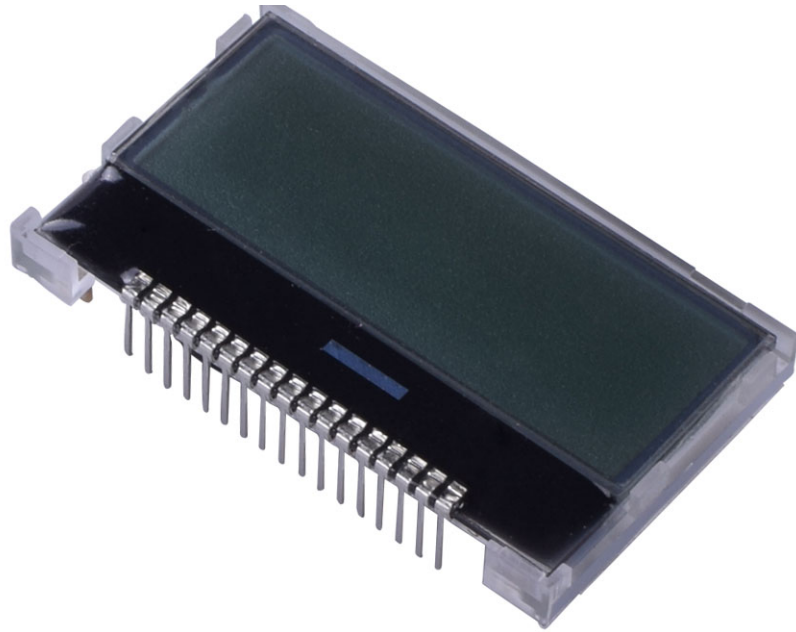


# DisplayModule



**DM-COG12832-704**  
**12832 COG GRAPHIC LCD WITH**  
**4-LINE SPI MPU INTERFACE**

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## 1 Revision History

Date	Changes
2015-03-13	First release
2020-07-21	Modify backlight color

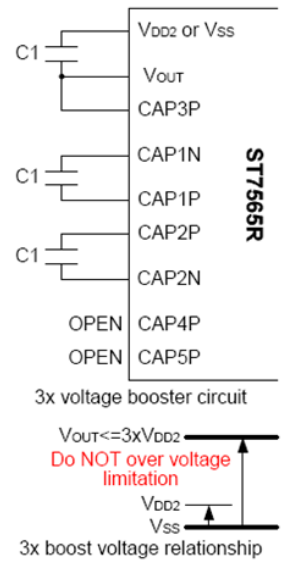
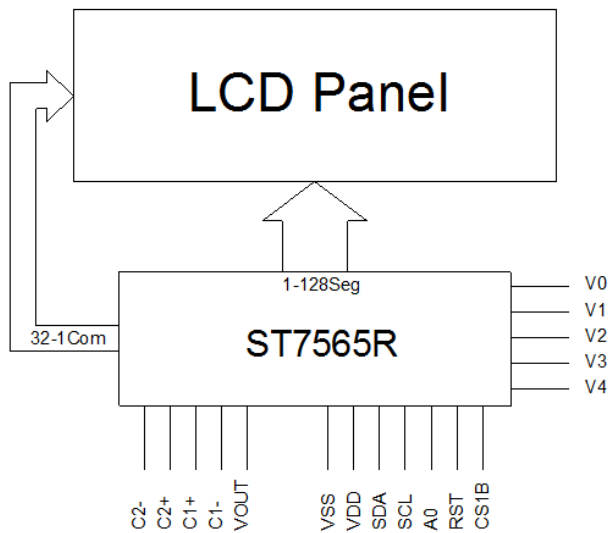
## 2 Main Features

Item	Specification	Unit
Resolution	128 x 32	pixels
Display Mode	FSTN, Transflective	-
Controller IC	ST7565R	-
Interface	4-line SPI MPU interface	-
Power Supply	3V	V
View Direction	6:00	-
Duty	1/33 duty, 1/6 bias	
Backlight	EDGE white LED	-
Weight	5.6	g

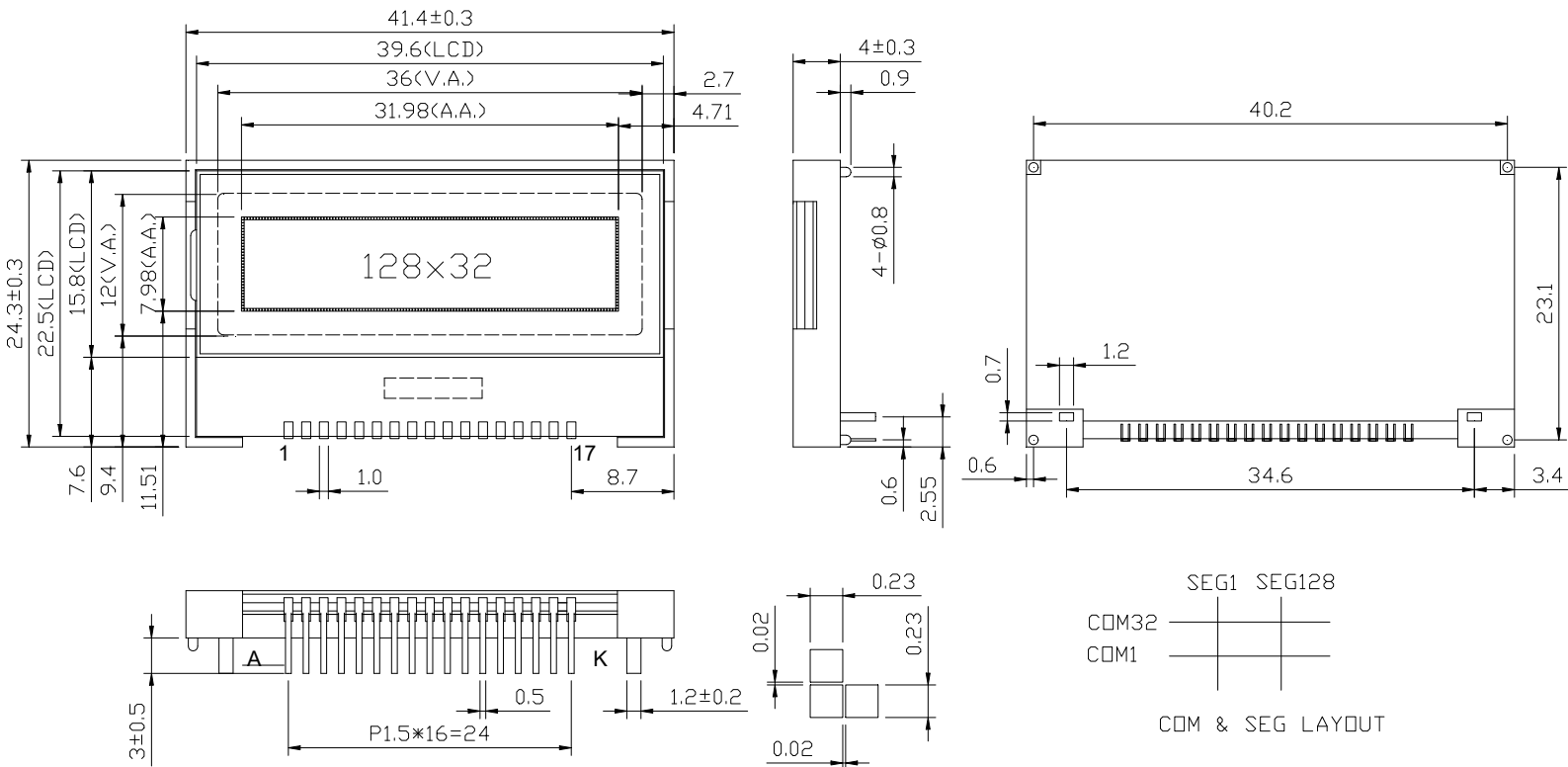
### 3 Pin Description

Pin No.	Symbol	Function Description
1~5	VO~V4	Power supply LCD
6	C2+	For voltage booster circuit. External capacitor about 0.47uF~2.2Uf.
7	C2-	
8	C1+	
9	C1-	
10	VOUT	
11	VSS	Signal ground for LCM
12	VDD	Power supply for logic for LCM
13	SDA(SI)	Input Data
14	SCL	Serial Clock
15	A0	Select registers. 0: Instruction, 1: Data register
16	RST	External reset PIN. Must be fixed to VDD low active.
17	CS1B	Chip select in serial interface low active
A	LED+	Power supply for BKL
K	LED-	Power supply for BKL

### 4 Block diagram



## 5 Mechanical Drawing



otes:

- 1). Driver Method: 1/33duty, 1/6bias, VDD3.0V VLCD6.0V
- 2). Display Type: FSTN/Positive/Transflective
- 3). Viewing Angle: 6:00
- 4). Operating Temp: -20°C~70°C
- 5). Storage Temp: -30°C~80°C
- 6). Drvier: ST7565R 4-Line SPI
- 7). BKL Type: Edge White 2.8V~3.0V/45mA
- 8). RoHS Compliant

## 6 Electrical Characteristics

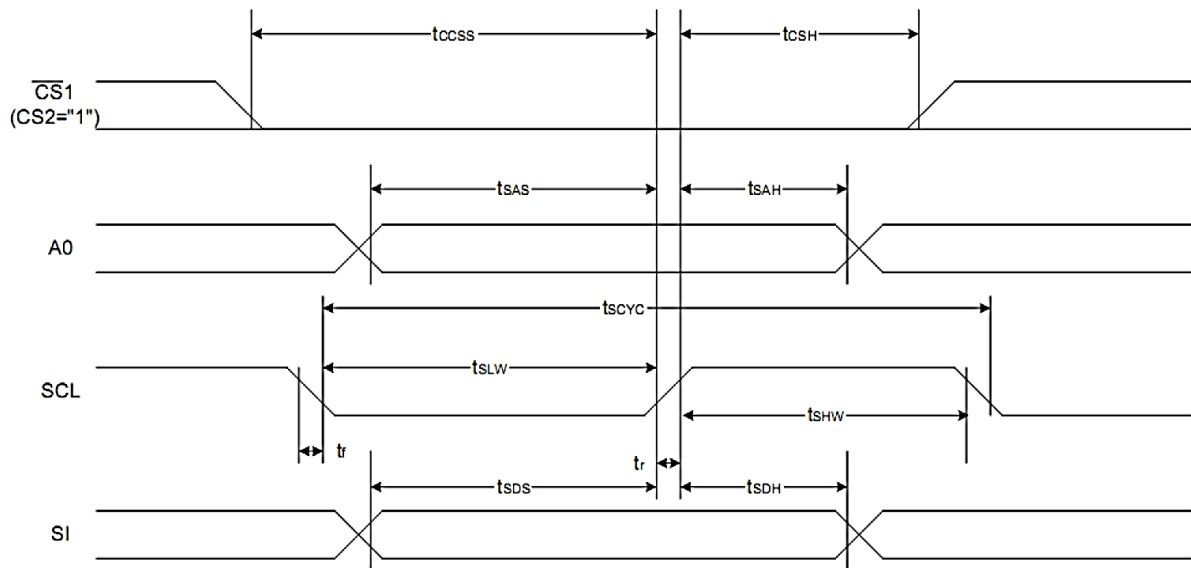
Item	Symbol	Condition	Min	Typ.	Max	Unit
Supply Voltage for LCD	VDD		-	3.0	-	V
Input Current	IDD	-	-	0.25	0.45	mA
Low Level Input Voltage	V <sub>IL</sub>		-	-	0.6	V
High Level Input Voltage	V <sub>IH</sub>		2.2	-	VDD	V
Low Level Output Voltage	V <sub>OL</sub>		0	-	0.4	V
High Level Output Voltage	V <sub>OH</sub>		2.4	-	-	V
Backlight Forward Voltage	V <sub>LED</sub>		2.8		3.4	V
Backlight Forward Current	I <sub>LED</sub>		-	15	20	mA
Operating Temperature	TOP	Absolute Max	-20		70	°C
Storage Temperature	TST	Absolute Max	-30		80	°C

## 7 Optical Characteristics

Item	Symbol	Min	Typ	Max	Unit
View Angles-Vertical	AV		70		°
View Angles-Horizontal	AH		60		
Response Time (25°C)	Tr + Tf		350	550	ms
Contrast Ratio	CR	3	5		
Luminance	L <sub>y</sub>				cd/m <sup>2</sup>

## 8 Timing Characteristics

The Serial interface

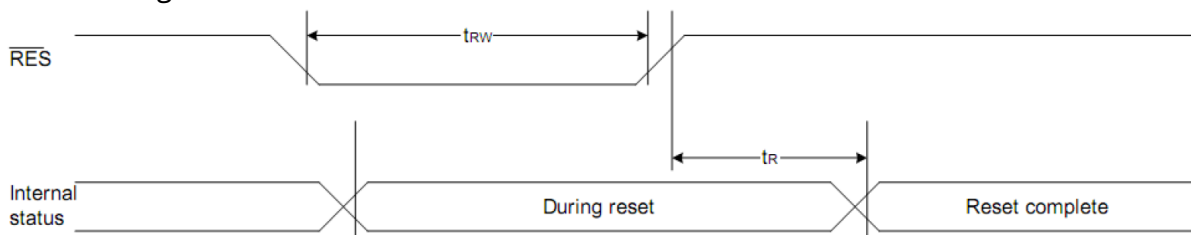


Symbol	Item	Min	Typ	Max	Unit
$t_{SCYC}$	Serial Clock Period	100	-	-	ns
$t_{SHW}$	SCL 'H' pulse width	50	-	-	ns
$t_{SLW}$	SCL 'L' pulse width	50	-	-	ns
$t_{SAS}$	Address setup time	30	-	-	ns
$t_{SAH}$	Address hold time	20	-	-	ns
$t_{SDS}$	Data setup time	30	-	-	ns
$t_{SDH}$	Data hold time	20	-	-	ns
$t_{CSS}$	CS-SCL time	30	-	-	ns
$t_{CSH}$	CS-SCL time	60	-	-	ns

Note: The input signal rise and fall time ( $t_r$ ,  $t_f$ ) are specified at 15 ns or less

All timing is specified using 20% and 80% of  $V_{DD}$  as the standard

### Reset Timing



Item	Signal	Symbol	Min.	Typ.	Max.	Unit
Reset time		$t_R$	-	-	2.0	us
Reset 'L' pulse width	/RES	$t_{RW}$	2.0	-	-	

## 9 Table of Commands

Command	Command Code										Function		
	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1		D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	LCD display ON/OFF 0: OFF, 1: ON	
(2) Display start line set	0	1	0	0	1	Display start address					1	Sets the display RAM display start line address	
(3) Page address set	0	1	0	1	0	1	Page address					Sets the display RAM page address	
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address					Sets the most significant 4 bits of the display RAM column address. Sets the least significant 4 bits of the display RAM column address.
Column address set lower bit				0	0	0	0	Least significant column address					
(5) Status read	0	0	1	Status				0	0	0	0	Reads the status data	
(6) Display data write	1	1	0	Write data							Writes to the display RAM		
(7) Display data read	1	0	1	Read data							Reads from the display RAM		
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse	
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	Sets the LCD display normal/ reverse 0: normal, 1: reverse	
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	Display all points 0: normal display 1: all points ON	
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565R)	
(12) Read-modify-write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0	
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write	
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset	
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction	
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode		Select internal power supply operating mode		
(17) V <sub>D</sub> voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio		Select internal resistor ratio(Rb/Ra) mode		
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the V <sub>D</sub> output voltage electronic volume register	
Electronic volume register set				0	0	Electronic volume value							
(19) Sleep mode set	0	1	0	1	0	1	0	1	1	0	0	0: Sleep mode, 1: Normal mode	
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x	
				0	0	0	0	0	0	0	step-up value		
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation	
(22) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command	

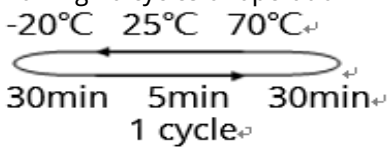
## 10 Driver/Controller Information

Built-in ST7565R Controller

<https://drive.google.com/file/d/0Bxu0OURUiyL5TUVKSnIURXRUBFE/view?usp=sharing>



## 11 Reliability

Test Item	Content of Test	Test Condition	Note
High Temperature Storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature Storage	Endurance test applying the high storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20 °C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max, for 96hrs under no-load condition excluding the polarizer. Then taking it out and drying it at normal temperature.	60°C,90%RH 96hrs	1,2
Thermal Shock Resistance	The sample should be allowed stand the following 10 cycles of operation 	-20°C/70°C 10 cycles	-
Vibration Test	Endurance test applying the vibration during transportation and using	Total fixed amplitude: 15mm; Vibration: 10~55Hz; One cycle 60 seconds to 3 directions of X, Y, Z, for each 16 minutes.	3
Static Electricity Test	Endurance test apply the electric stress to the terminal.	VS=800V, RS=1.5kΩ, CS=100pF, 1 time.	-

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal. Temperature and humidity after remove from the rest chamber.

Note3: Test performed on product itself, not inside a container.

## 12 Warranty and Conditions

<http://www.displaymodule.com/pages/faq>