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DOGM GRAPHIC SERIES

128x64 DOTS

27.6.2007

available from 1 pc. off !
flat: 5.6mm incl. LED



EA DOGM128W-6 +
EA LED55x46-A



EA DOGM128B-6 +
EA LED55x46-W



EA DOGM128W-6 +
EA LED55x46-W

TECHNICAL DATA

- * HIGH-CONTRAST LCD SUPERTWIST DISPLAY (STN AND FSTN) WITH 15µA DOT GAP
- * OPTIONAL LED BACKLIGHTS IN DIFFERENT COLORS
- * 128x64 PIXELS (CORRESPONDS TO 8x21 CHARACTERS OR 4x10 LARGE CHARACTERS)
- * ST 7565R CONTROLLER WITH SPI (4-WIRE) INTERFACE
- * POWER SUPPLY: SINGLE SUPPLY 3.0V TO 3.3V (TYPICALLY 150µA)
- * NO ADDITIONAL VOLTAGES REQUIRED
- * OPERATING TEMPERATURE RANGE -20°C TO +70°C (STORAGE -30°C TO +80°C)
- * LED BACKLIGHTING 5mA TO 45mA
- * NO MOUNTING REQUIRED: SIMPLY SOLDER ONTO PCB

ORDERING CODE

GRAPHICS DISPLAY, 128x64, 55x46mm

x: *B* = blue background

E = yellow/green background

L = yellow/green background (cannot be backlit)

S = black background

W = white background

LED BACKLIGHT, WHITE

LED BACKLIGHT, YELLOW/GREEN

LED BACKLIGHT, BLUE

LED BACKLIGHT, RED

LED BACKLIGHT, AMBER

LED BACKLIGHT, GREEN

LED BACKLIGHT, FULL COLOR RGB (IN PREPARATION)

EA DOGM128X-6

EA LED55X46-W

EA LED55X46-G

EA LED55X46-B

EA LED55X46-R

EA LED55X46-A

EA LED55X46-E

EA LED55X46-RGB

ACCESSORIES

TOUCH PANEL, 4-WIRE, ANALOG, STICK-ON

SOCKET CONNECTOR 4.8 mm HEIGHT (2 PCS. REQUIRED)

USB TEST BOARD FOR PC (WINDOWS)

EA TOUCH128-1

EA FL-20P

EA 9780-1USB

**ELECTRONIC
ASSEMBLY**

making things easy

EA DOGM128

The EA DOGM128, a 128x64-pixel graphics display, is a new addition to ELECTRONIC ASSEMBLY's EA DOGM series. It, too, has pins that allow it to be mounted quickly and easily.

7 different optional LED backlights are available. These can be combined with 5 different display technologies, making it possible to have up to around 20 different designs.

Designed for compact, handheld devices, this modern LCD series offers a number of genuine benefits with and without backlighting:

- * Extremely compact (55x46 mm) with a large viewing area of 51x31 mm
- * Super-flat: 2.0 mm without an LED backlight, 5.8 mm with one
- * Serial SPI interface (4-wire)
- * Single supply +3.0 V or +3.3 V
- * Typical power consumption of only 150µA in full operation (white LED backlight from 5mA)
- * Easily mounted by soldering
- * Wide range of design variants orderable as single units
- * Backlighting color changes possible

CONTRAST ADJUSTMENT

The contrast can be set by means of a command for all the displays in the EA DOGM series. The contrast is generally set once and then kept constant throughout the entire operating temperature range (-20°C to +70°C) thanks to integrated temperature compensation. This adjustment is made once only, but is always necessary.

LED-BACKLIGHT

7 different variants are available for individual backlighting: white, yellow/green, green, blue, red, amber and a full-color version.

There are 3 separate LED paths available for each monochrome backlight that can be switched in parallel or in series to suit the system voltage. This means that most backlights can be run at either 3.3 V or 5 V.

To operate the backlight, we recommend a current source (e.g. CAT4238TD) or an external series resistor to limit the current. This can be calculated from $R=U/I$; you will find the values in the table on the right. To prolong the life of the backlights, we recommend that you use a current source.

The operating life of the yellow/green, red and amber backlights is 100,000 hours. The life of the white and blue backlights is considerably shorter. We recommend that you dim these or switch them off whenever possible.

Important: Never operate the backlight directly on a 5 V/3.3 V supply; this can immediately destroy the LEDs. Note that derating applies at temperatures greater than 25°C.

LED backlight	Forward voltage (V)			Current max. (mA)	Limiting resistor (ohm, each path)	
	min	typ	max		@3,3 V	@5 V
yellow/green EA LED55x46-G		2,1		40	40	97
white EA LED55x46-W		3,3		25	-	82
amber EA LED55x46-A		1,9		40	47	103
green EA LED55x46-E		3		40	8,5	57
blue EA LED55x46-B		3,3		30	-	68
red EA LED55x46-R		1,9		40	47	103
full color EA LED55x46-RGB	red	green	blue	tbd.	tbd.	tbd.
	tbd.	tbd.	tbd.			






ASSEMBLING

First, the display and the corresponding backlight are clipped together. The complete unit is then inserted into a PCB and soldered. Please note that the 6 pins for the backlight must also be soldered from the top.

Important: The display has a protective film on the top and/or the bottom, and there is also one on the backlight. These must be removed.

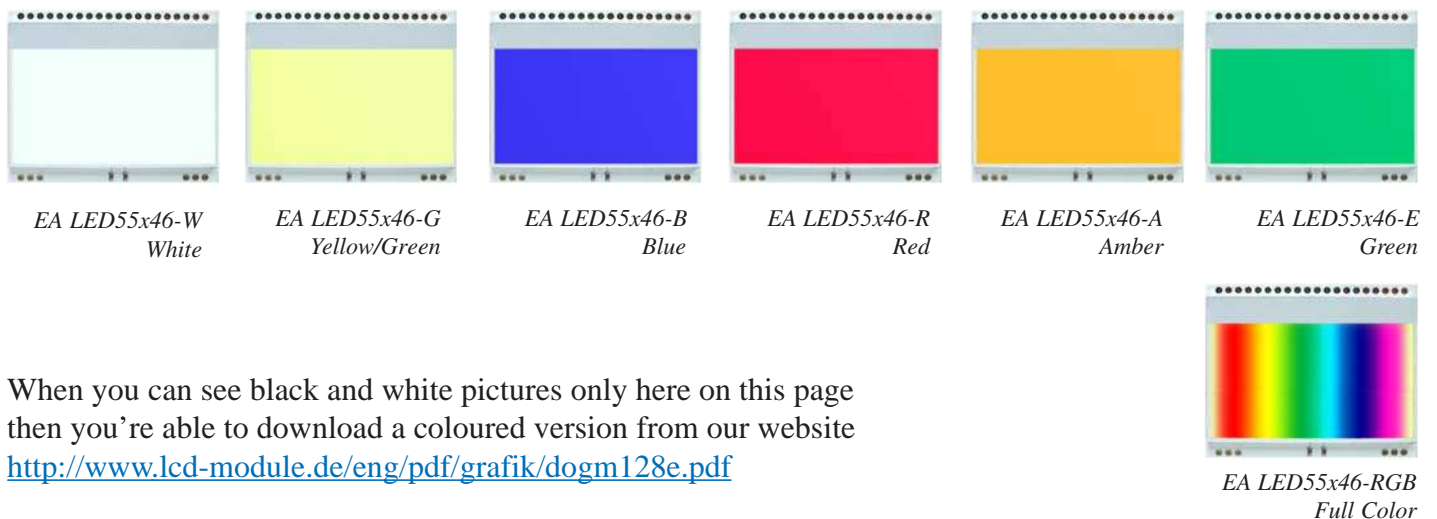
5 DIFFERENT TECHNOLOGIES

All as standard 5 different technologies in STN and FSTN are available:

display type	technology	optional backlight	readability	display color non backlighted	display color with backlighted	recommended backlight color
	FSTN pos. transfective	it's fine with and without backlight	readable even without backlight	black on white	black on backlight color	white, blue, green, RGB
	STN pos. yellow/green transmissive	backlight unit required	readable even without backlight	dark green on yellow/green	black on yellow/green or amber	yellow/green, amber
	STN neg. blue transmissive	usage only with backlight	---	---	backlight color on blue background	white, yellow/green
	FSTN neg. transmissive	usage only with backlight	---	---	backlight color on black background	white, green, RGB
	STN pos. yellow/green reflective	no backlight possible	finest readable without backlight	dark green on yellow/green	---	---

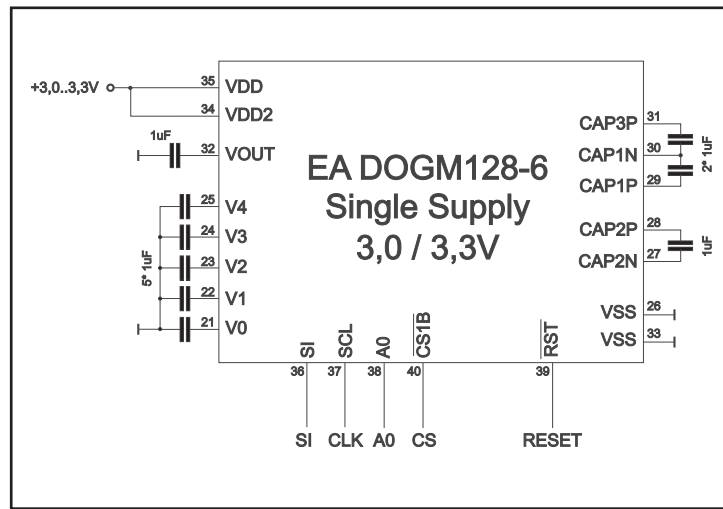
6 AND MORE DIFFERENT BACKLIGHTS

6 and more different backlight colors are available to match equipments design as much as possible. The most effective and brightest one is the white one EA LED55x31-W.

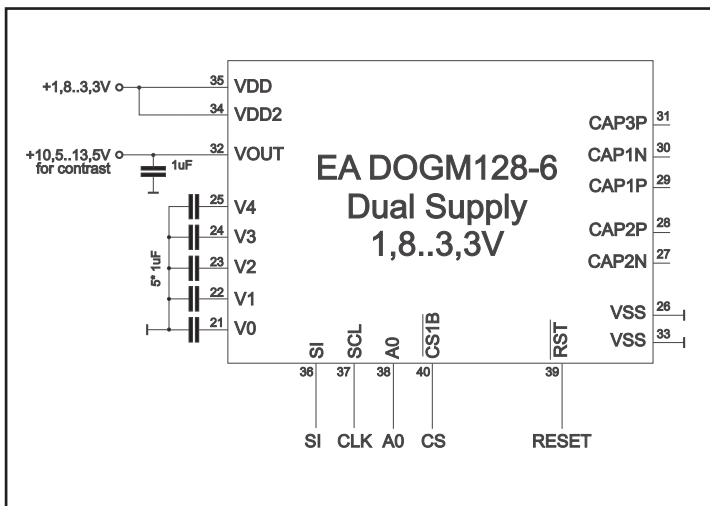


When you can see black and white pictures only here on this page then you're able to download a coloured version from our website <http://www.lcd-module.de/eng/pdf/grafik/dogm128e.pdf>

APPLICATION EXAMPLES



+3.0V or +3.3V (single supply) operation requires 9 external capacitors



If there are additional +10.5 ~ +13.5V (non-stabilized) available, then external components are less.

TABLE OF COMMAND

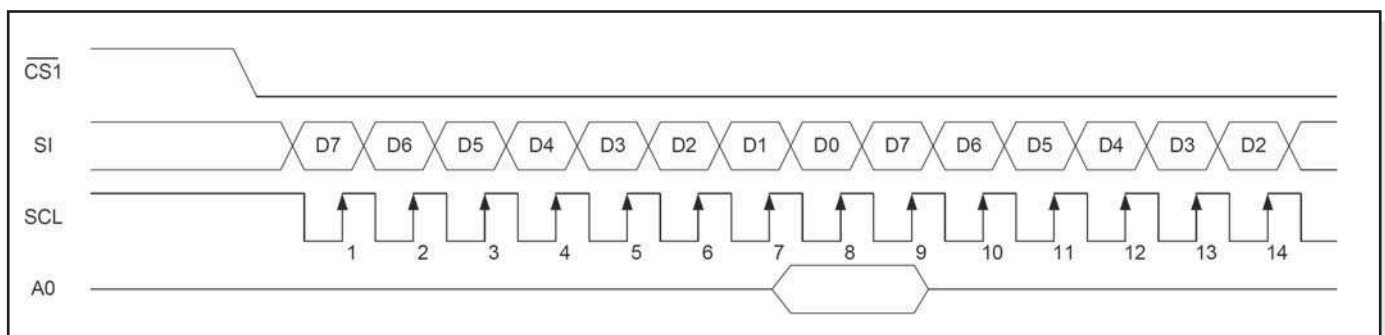
Command	Command Code										Function	
	A0	D7	D6	D5	D4	D3	D2	D1	D0			
(1) Display ON/OFF	0	1	0	1	0	1	1	1	1	0	LCD display ON/OFF 0: OFF, 1: ON	
(2) Display start line set	0	0	1	Display start address								Sets the display RAM display start line address
(3) Page address set	0	1	0	1	1	Page address					Sets the display RAM page address	
(4) Column address set upper bit	0	0	0	0	1	Most significant column address					Sets the most significant 4 bits of the display RAM column address.	
Column address set lower bit		0	0	0	0	Least significant column address					Sets the least significant 4 bits of the display RAM column address.	
(6) Display data write	1	Write data									Writes to the display RAM	
(8) ADC select	0	1	0	1	0	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	0	1	1	0	1	Sets the LCD display normal/ reverse 0: normal, 1: reverse	
(10) Display all points ON/OFF	0	1	0	1	0	0	1	0	0	1	Display all points 0: normal display 1: all points ON	
(11) LCD bias set	0	1	0	1	0	0	0	1	0	1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565R)	
(14) Reset	0	1	1	1	0	0	0	1	0		Internal reset	
(15) Common output mode select	0	1	1	0	0	0	*	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction	
(16) Power control set	0	0	0	1	0	1	Operating mode				Select internal power supply operating mode	
(17) V ₀ voltage regulator internal resistor ratio set	0	0	0	1	0	0	Resistor ratio				Select internal resistor ratio(Rb/Ra) mode.	
(18) Electronic volume mode set	0	1	0	0	0	0	0	0	0	1	Set the V ₀ output voltage electronic volume register	
Electronic volume register set		0	0	Electronic volume value								
(19) Static indicator ON/OFF	0	1	0	1	0	1	1	0	0	1	0: OFF, 1: ON	
Static indicator register set		0	0	0	0	0	0	0	0	0	Mode	Set the flashing mode
(20) Booster ratio set	0	1	1	1	1	1	0	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x	
(21) Power save	0										Display OFF and display all points ON compound command	
(22) NOP	0	1	1	1	0	0	0	1	1		Command for non-operation	

Column address 0-----127

D0 D7	Page 0
D0 D7	Page 1
D0 D7	Page 2
D0 D7	Page 3
D0 D7	Page 4
D0 D7	Page 5
D0 D7	Page 6
D0 D7	Page 7

DATA TRANSFER

Data transfer is unidirectional. That means that data can only be written; it cannot be read again. In contrast to other displays, a busy query is not necessary with this display. The clock-pulse rate of the SCL line can be up to 20 MHz, depending on the supply voltage. You will find more detailed information on timing on pages 64 and 65 of the data sheet of the ST7565R controller, which you will find on our website at <http://www.lcd-module.de/eng/pdf/zubehoer/st7565r.pdf>



INITIALISATION EXAMPLE

Internal contrast voltage generator (single supply +3.0V / +3.3V)

Initialisation example for single supply +3.3V (bottom view)												
Command	A0	D7	D6	D5	D4	D3	D2	D1	D0	Hex	Remark	
(2) Display start line set	0	0	1	0	0	0	0	0	0	\$40	Display start line 0	
(8) ADC set	0	1	0	1	0	0	0	0	1	\$A1	ADC reverse *)	
(15) Common output mode select	0	1	1	0	0	0	0	0	0	\$C0	Normal COM0~COM63	
(9) Display normal/reverse	0	1	0	1	0	0	1	1	0	\$A6	Display normal	
(11) LCD bias set	0	1	0	1	0	0	0	1	0	\$A2	Set bias 1/9 (Duty 1/65)	
(16) Power control set	0	0	0	1	0	1	1	1	1	\$2F	Booster, Regulator and Follower on	
(20) Booster ratio set	0	1	1	1	1	1	0	0	0	\$F8	Set internal Booster to 4x	
		0	0	0	0	0	0	0	0	\$00		
(17) V0 voltage regulator set	0	0	0	1	0	0	1	1	1	\$27	Contrast set	
(18) Electronic volume mode set	0	1	0	0	0	0	0	0	1	\$81		
		0	0	0	1	0	1	1	0	\$16		
(19) Static indicator set	0	1	0	1	0	1	1	0	0	\$AC	No indicator	
		0	0	0	0	0	0	0	0	\$00		
(1) Display ON/OFF	0	1	0	1	0	1	1	1	1	\$AF	Display on	

*) Make sure that for 6:00 viewing direction ADC has to be set to „reverse“ (mirrored layout) !



Orientation for 6:00 (Bottom View)

INITIALISATION EXAMPLE

External contrast voltage (dual power supply)

Initialisation example for dual power supply (bottom view)												
Command	A0	D7	D6	D5	D4	D3	D2	D1	D0	Hex	Remark	
(2) Display start line set	0	0	1	0	0	0	0	0	0	\$40	Display start line 0	
(8) ADC set	0	1	0	1	0	0	0	0	1	\$A1	ADC reverse *)	
(15) Common output mode select	0	1	1	0	0	0	0	0	0	\$C0	Normal COM0~COM63	
(9) Display normal/reverse	0	1	0	1	0	0	1	1	0	\$A6	Display normal	
(11) LCD bias set	0	1	0	1	0	0	0	1	0	\$A2	Set bias 1/9 (Duty 1/65)	
(16) Power control set	0	0	0	1	0	1	0	1	1	\$2D	Booster off, Regulator, Follower on	
(17) V0 voltage regulator set	0	0	0	1	0	0	1	1	1	\$27	Contrast set	
(18) Electronic volume mode set	0	1	0	0	0	0	0	0	1	\$81		
		0	0	0	1	0	1	1	0	\$16		
(19) Static indicator set	0	1	0	1	0	1	1	0	0	\$AC	No indicator	
		0	0	0	0	0	0	0	0	\$00		
(1) Display ON/OFF	0	1	0	1	0	1	1	1	1	\$AF	Display on	

*) Make sure that for 6:00 viewing direction ADC has to be set to „reverse“ (mirrored layout) !

12:00 VIEWING ANGLE, TOP VIEW OPTION

If the display is read mostly from above (on the front of a laboratory power supply unit, for example), the preferred angle of viewing can be set at 12 o'clock. To this end, the display is installed rotated by 180° and the contents adjusted by software. Slightly different initialization is required for this. The column address on the extreme left then moves to address 4.



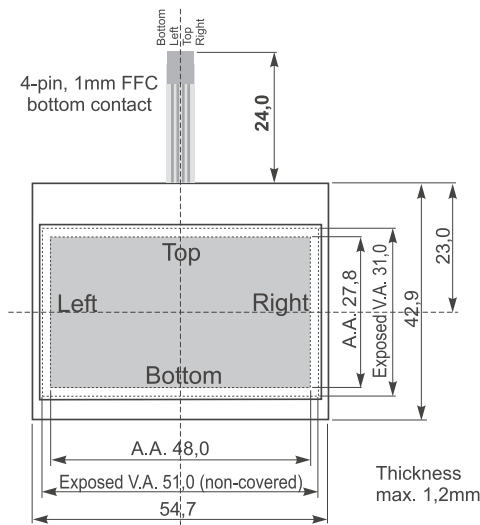
Assembling for 12:00 (Top View)

4 Column address 131	
D0 D7	Page 0
D0 D7	Page 1
D0 D7	Page 2
D0 D7	Page 3
D0 D7	Page 4
D0 D7	Page 5
D0 D7	Page 6
D0 D7	Page 7

Initialisation example top view												
Command	A0	D7	D6	D5	D4	D3	D2	D1	D0	Hex	Remark	
(8) ADC set	0	1	0	1	0	0	0	0	0	\$A0	ADC normal	
(15) Common output mode select	0	1	1	0	0	1	0	0	0	\$C8	Reverse COM63--COM0	

TOUCH PANEL EA TOUCH128-1 (OPTIONAL)

An analog touch panel is available as an accessory. It has a self-adhesive material on its rear surface and is simply stuck onto the display. The connection is made by means of a 4-pin flexible cable for a ZIF connector with a grid of 1.0 mm. Bending radius is defined with min. 5mm. For optimum readability we recommend that you use a backlight with the display.



Specification				
Specification	min	typ	max	Unit
Top-Bottom	120		220	Ω
Left-Right	580		900	Ω
Voltage	3		12	V
Current	5		25	mA
Linearity			1,5	%
Force	45		65	g
Contact Bounce	5		10	ms
Op. Temperatur	-20		+60	°C
Stor. Temperatur	-20		+70	°C
Transmission	75		85	%
Life Time	100000			Cycles

USB-TEST BOARD EA 9780-1USB

For easy startup, a USB test board is available that can be connected to a PC. A USB cable and Windows software is supplied with the product. This allows text and images (BMP) to be displayed directly on the connected display. You will find more information on the test board in the EA 9780-1USB data sheet.

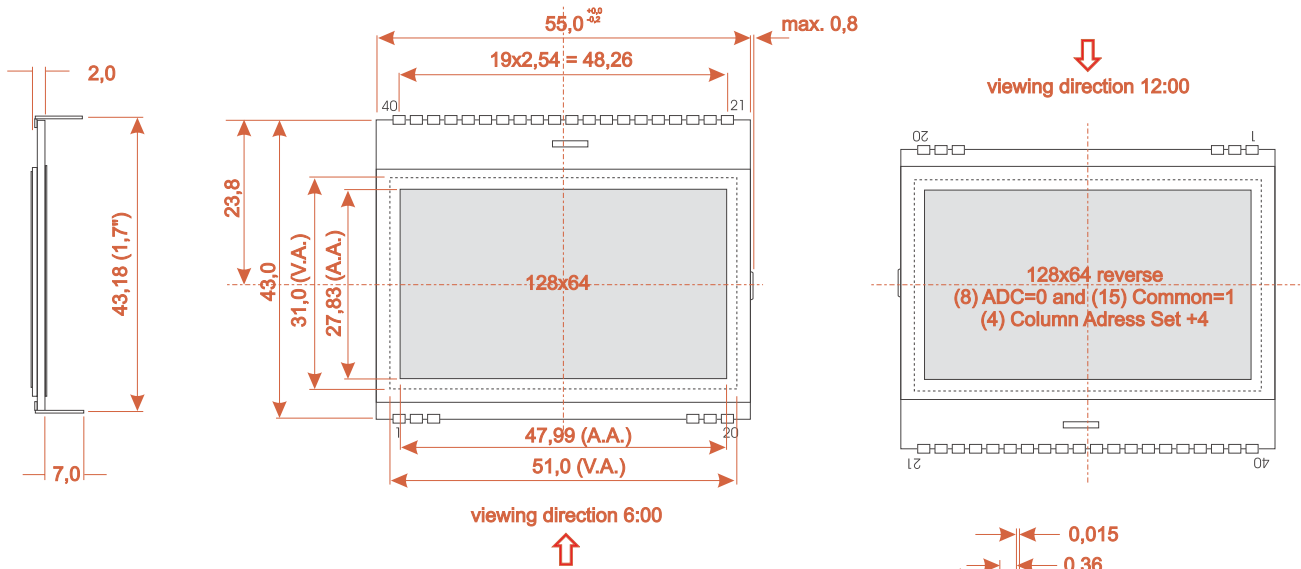
SIMULATION WITH WINDOWS

A simulator window also displays the contents of the display. The software can simulate all the displays and colors even without the hardware. You can download the software free from our website:

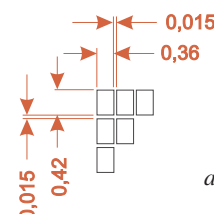
<http://www.lcd-module.de/deu/disk/startdog.zip>



DIMENSION EA DOGM128



Pin	Symbol	Level	Function	Pin	Symbol	Level	Function
1	NC		(A1+: LED backlight)	21	V0	-	LC Drive
2	NC		(A2+: LED backlight)	22	V1	-	LC Drive
3	NC		(A3+: LED backlight)	23	V2	-	LC Drive
4				24	V3	-	LC Drive
5				25	V4	-	LC Drive
6				26	VSS	L	Power Supply 0V (GND)
7				27	CAP2N	-	Voltage Converter
8				28	CAP2P	-	Voltage Converter
9				29	CAP1P	-	Voltage Converter
10				30	CAP1N	-	Voltage Converter
11				31	CAP3P	-	Voltage Converter
12				32	VOOUT	-	Voltage Output about +12V
13				33	VSS	L	Power Supply 0V (GND)
14				34	VDD2	H	Power Supply Booster
15				35	VDD	H	Power Supply +2.4..3.3V
16				36	SI	H/L	Serial Data In
17				37	SCL	H/L	Serial Clock
18	NC		(C1-: LED backlight)	38	A0	H/L	L= Command, H= Data
19	NC		(C2-: LED backlight)	39	RST	L	Reset (active low)
20	NC		(C3-: LED backlight)	40	CS1B	L	Chip Select (active low)

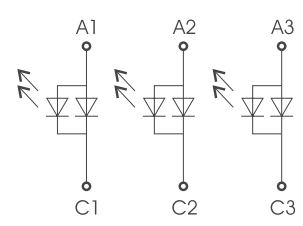
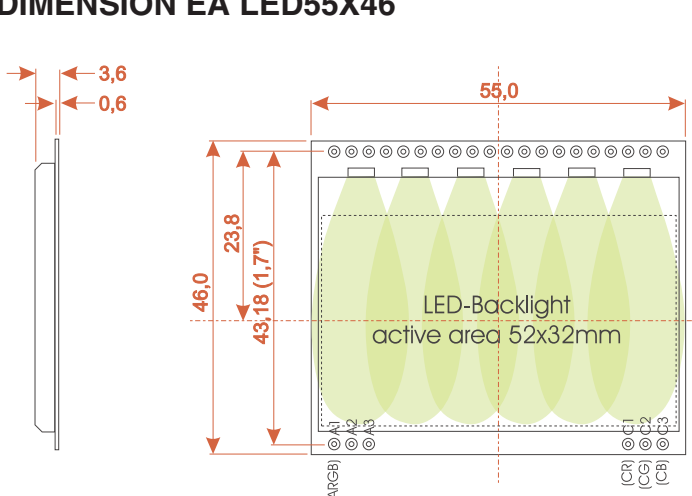


all dimension are in mm

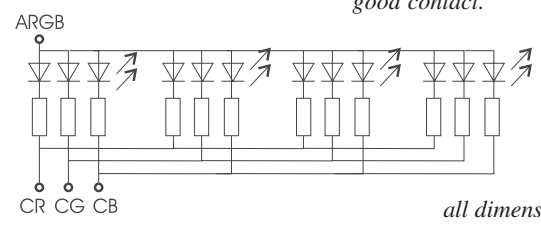


Note:
 - LC displays are generally not suited to wave or reflow soldering. Temperatures of over 80°C can cause lasting damage.
 - The surfaces of the displays and backlights are protected from scratching by self-adhesive protective foils. Please remove these before mounting.

DIMENSION EA LED55X46



Note:
 The 6(4) LED pins A1 to A3 and C1 to C3 also have to be soldered from above to ensure good contact.



all dimension are in mm

ELECTRONIC ASSEMBLY

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