

## LCD Character Display with SPI Interface

Circuit Monkey model 0042 is a SPI compatible LCD character display based on the **Electronic Assembly DOG-M** series and available as a *RobiCon.org* compliant module. The display module is available in three (row x characters) formats, 1x8, 2x16 and 3x16. The module operates at 5V but can be customized to run at 3.3V. This 40mm High x 80mm Wide module is suitable for professional and reliable integration into panels, cabinets, chassis and other off-the-shelf enclosures. The connector is a *Molex Micro-Blade* friction lock type and is designed for use in appliances and commercial equipment.

### Features:

- SPI Compatible Digital I/O
- High Contrast LCD Super-Twist Display
- 1x8, 2x16 or 3x16 character format
- Japanese (JIS X 201) mapped katakana characters.
- +5V Single Supply @ 250uA (without backlight)
- Customizable for 3.3V operation
- Numerous Backlight Options
- *RobiCon.org* compliant module: C04
- Dimensions: 40mm (H) x 80mm (W)
- Operates -20°C to 70°C

**500-0042-01**

LCD Character Display



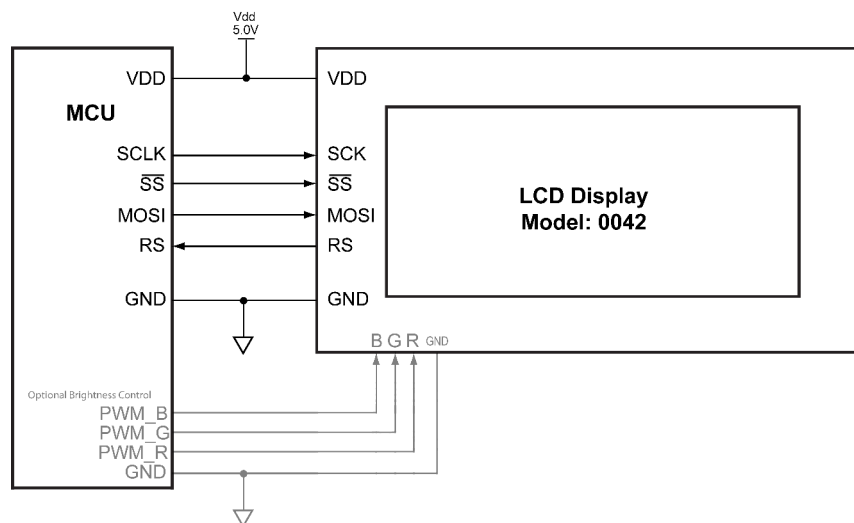
PN: 500-0042-01-3SG shown

RobiCon Compliant Package: C04

### Ordering Information

Device	Feature
500-0042-01-1**	8 characters x 1 row
500-0042-01-2**	16 characters x 2 rows
500-0042-01-3**	16 characters x 3 rows

\*See full Ordering Information section for backlight and socket options.



## Pin Connections

Table 1: J1 Connector Pin-out

Pin	Pin Name	Direction	Formal Name	Definition
1	RST	I	Reset	Reset display.
2	GND	-	Ground	Ground for Logic, Analog and Power.
3	$\overline{SS}$	I	Slave Select	Select device. Active LOW.
4	MOSI	I	Data In	Digital Input to Display
5	RS	I	Command/Data Select	Assert LOW = Command; HIGH = Data Write
6	SCLK	I	Clock	Clock
7	VDD	-	Supply Voltage	Voltage Supply Input +5VDC
8	GND	-	Ground	Ground for Logic, Analog and Power.

Table 2: J2 Connector Pin-out (Optional PWM Brightness Control)<sup>1,2,3</sup>

Pin	Pin Name	Direction	Formal Name	Definition
1	B	I	Blue Intensity	Blue Intensity (for RGB backlight only) PWM
2	G	I	Green Intensity	Green Intensity ( for RGB backlight only) PWM
3	R	I	Red/Monochrome Intensity	Red (or monochrome) Intensity PWM
4	GND	-	Ground	Ground for Logic, Analog and Power.

1. Monochrome backlight LCDs will have a 2-pin connector at this location (at pins 3 and 4).

2. RGB (full color) backlights will have a 4-pin connector at this location.

3. Non-backlight LCDs will have no connector at this location.

## Pin Descriptions

### **RESET ( $\overline{RST}$ )**

Active low reset input pin is used to reset the LCD to power-on defaults.

### **MODE SELECT (RS)**

The system MCU selects whether the current mode is Command or Data. Assert the RS line LOW for Command mode. Assert the RS line HIGH for Data mode.

**Note:** Do not confuse or share the RS line with the SPI MISO line. This LCD does not have a MISO (serial output) line. Although we have placed the RS line at the normal connector location for MISO (on our *RobiCon* 8-pin connector) it should be routed to a different pin on your MCU, especially if you are sharing the SPI with other devices. **But** if you really know what you are doing in this regard (or only have the one SPI device), then please disregard this note.

### **SLAVE SELECT (SS)**

The system MCU selects the LCD to be communicated with through the use of the Chip Select (CS) pin. When the CS pin is in a logic low state, data and commands can be transferred from the MCU to the LCD.

### **SYSTEM CLOCK (SCK)**

The System Clock (SCK) pin clocks the Internal Shift registers of the LCD. The Serial Input (MOSI) pin accepts data on the falling edge of the SCK signal.

### **SERIAL INPUT (MOSI)**

The Serial Input (MOSI) pin is used to transfer data or send commands into the LCD.

### **Blue Intensity (B)**

On full color model, this PWM controlled signal allows the MCU or other source to control the intensity of the blue color channel of the backlight. An internal pull-up resistor turns this channel on when this signal is not connected. Not supported/used on monochrome or non-backlight models.

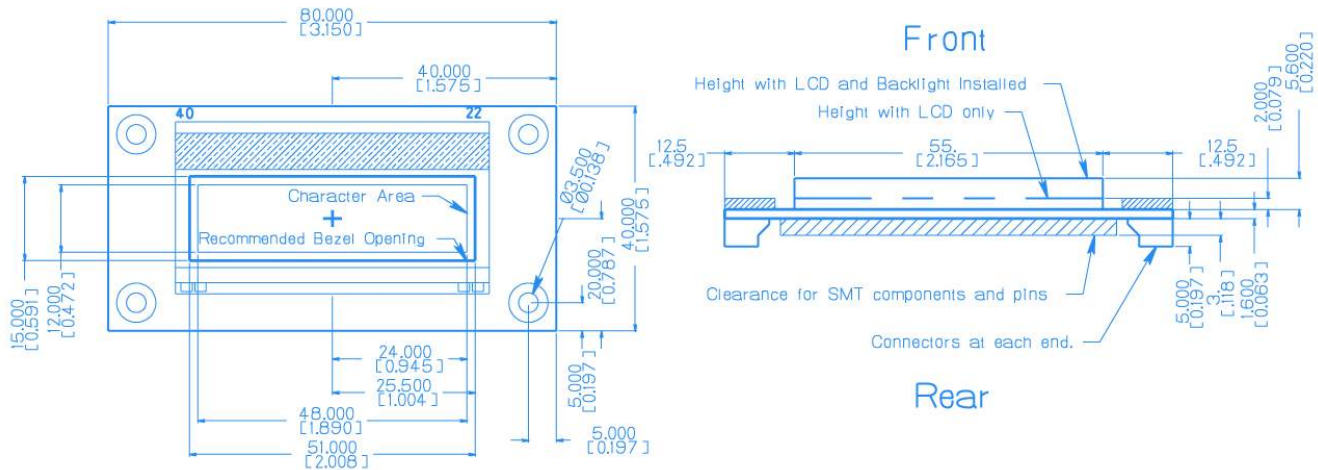
### **Green Intensity (G)**

On full color model, this PWM controlled signal allows the MCU or other source to control the intensity of the green color channel of the backlight. An internal pull-up resistor turns this channel on when this signal is not connected. Not supported/used on monochrome or non-backlight models.

### **Red/Monochrome Intensity (R)**

This PWM controlled signal allows the MCU or other source to control the intensity of the red or monochrome color channel of the backlight. An internal pull-up resistor turns this channel always on when this signal is not connected. Not supported/used on non-backlight models.

## Mechanical Specification



## Other Characteristics

The 0042 module contains a *Electronic Assembly DOG-M* series LCD character display. The DOG-M series is available in 8 character x 1 row (081), 16 x 2 (162) and 16x3 (163). Please consult the data sheet for the LCD component for more information on Available Variants, Electrical Characteristics, Functional Diagram, Timing Diagrams and Communication Protocol.

Circuit Monkey can custom assemble most of these variants (based on component availability). See our comprehensive part number matrix in the next section.

The 8-bit built-in character font table includes 7-bit ASCII-mapped alphabet (0x20 - 0x7D), Japanese ([JIS X 201](#)) katakana mapping (0xA0 – 0xDF), many math and measurement symbols and numerous [lower case Umlauts](#). Refer to the *EA DOG-M* datasheet (link below) for more details.

See the below table for links to the manufacturer's LCD data sheets.

Model	Item	Links
EA DOG-M LCD-Module.com	Web Page	<a href="#">Electronic Assembly - DOG Series Web Page</a>
	Datasheet	<a href="http://www.lcd-module.com/eng/pdf/doma/dog-me.pdf">http://www.lcd-module.com/eng/pdf/doma/dog-me.pdf</a>

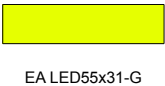
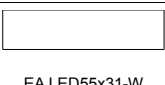



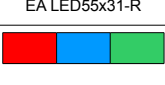
## Part Number Matrix

500-0042-01-<lines><type><backlight>

Lines	Description
-1	8 characters x 1 line (081)
-2	16 characters x 2 lines (162)
-3	16 characters x 3 lines (163)

Term	Definition
STN	Super-Twisted Nematic display
FSTN	Film compensated STN (better contrast).

### Display Type

		W	E	B	S	L	
		FSTN Positive Transflective	STN Positive Yellow/Green Transmissive	STN Negative Blue Transmissive  backlight-colored text on <u>blue</u> background	FSTN Negative Transmissive  backlight-colored text on <u>black</u> background	STN Positive Yellow/Green Reflective	
<b>Backlight Option</b>	No Backlight <b>N</b>	-- NONE --	<a href="#">500-0042-01-1WN</a> <a href="#">500-0042-01-2WN</a> <a href="#">500-0042-01-3WN</a>	500-0042-011E 500-0042-012E 500-0042-013E	-	-	500-0042-011L 500-0042-012L 500-0042-013L
	Yellow/Green <b>G</b>	 EA LED55x31-G	Non-Optimal* 500-0042-01-1WG 500-0042-01-2WG 500-0042-01-3WG	500-0042-01-1EG 500-0042-01-2EG 500-0042-01-3EG	500-0042-01-1BG 500-0042-01-2BG 500-0042-01-3BG	500-0042-01-1SG 500-0042-01-2SG <a href="#">500-0042-01-3SG</a>	-
	White <b>W</b>	 EA LED55x31-W	500-0042-01-1WW 500-0042-01-2WW 500-0042-01-3WW	Non-Optimal* 500-0042-01-1EW 500-0042-01-2EW 500-0042-01-3EW	500-0042-01-1BW 500-0042-01-2BW 500-0042-01-3BW	500-0042-01-1SW 500-0042-01-2SW 500-0042-01-3SW	-
	Blue <b>B</b>	 EA LED55x31-B	500-0042-01-1WB 500-0042-01-2WB 500-0042-01-3WB	Non-Optimal* 500-0042-01-1EB 500-0042-01-2EB 500-0042-01-3EB	-	500-0042-01-1SB 500-0042-01-2SB 500-0042-01-3SB	-
	Amber <b>A</b>	 EA LED55x31-A	Non-Optimal* 500-0042-01-1WA 500-0042-01-2WA 500-0042-01-3WA	500-0042-01-1EA 500-0042-01-2EA 500-0042-01-3EA	Non-Optimal* 500-0042-01-1BA 500-0042-01-2BA 500-0042-01-3BA	500-0042-01-1SA 500-0042-01-2SA 500-0042-01-3SA	-
	Red <b>R</b>	 EA LED55x31-R	Non-Optimal* 500-0042-01-1WR 500-0042-01-2WR 500-0042-01-3WR	Non-Optimal* 500-0042-01-1ER 500-0042-01-2ER 500-0042-01-3ER	Non-Optimal* 500-0042-01-1BR 500-0042-01-2BR 500-0042-01-3BR	500-0042-01-1SR 500-0042-01-2SR 500-0042-01-3SR	-
	RGB <b>T</b>	 EA LED55x31-RGB	500-0042-01-1WT 500-0042-01-2WT 500-0042-01-3WT	Non-Optimal* 500-0042-01-1ET 500-0042-01-2ET 500-0042-01-3ET	Non-Optimal* 500-0042-01-1BT 500-0042-01-2BT 500-0042-01-3BT	500-0042-01-1ST 500-0042-01-2ST 500-0042-01-3ST	-

\* Non-Optimal options may not give the best contrast or readability. You can order this item, but they are not returnable for any reason.

**NOTE:** Non-hyperlinked part numbers are available as a custom order. Linked part numbers are usually in stock (in small quantities). Please contact us for a quote.

## ***Application Information***

### **Code**

The 0042 LCD Character Display module has been tested to work on an Atmel Atmega328P using the SPI communication channel. Test code can be found at the link below and further information can be found at the [Circuit Monkey](#) web site.

[ZIP file with sample code](#)

## ***Revision History***

<b>Revision</b>	<b>Date</b>	<b>Description</b>
1	05/18/10	Create Document