

Dot Matrix R Click



PID: MIKROE-4169

Dot Matrix R Click is a display device Click board™ based on a four-digit dot matrix display module, labeled as [HCMS-3906](#) from a company [Avago \(Broadcom Inc\)](#). The module holds four 5x7 dot matrices, with very closely spaced, bright red pixel elements. Characters are very clearly displayed as a result. Pixels emit a bright red color when lit, which makes the display readable in any condition. Each display can be directly interfaced with a microprocessor, thus eliminating the need for cumbersome interface components. The serial IC interface allows higher character count information displays with a minimum of data lines. The easy to read 5x7 pixel format allows the display of upper case, lower case, Katakana, and custom user-defined characters. The bright red display matrix has a wide viewing range, which makes it perfectly suited for low light situations.

Dot Matrix R Click is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click board™ comes as a fully tested product, ready to be used on a system equipped with the mikroBUS™ socket.

How does it work?

Dot Matrix R Click is a high performance, easy to use dot matrix display driven by on-board CMOS IC. Each display can be directly interfaced with a microprocessor, thus eliminating the need for cumbersome interface components. The serial IC interface allows higher character count information displays with a minimum of data lines. The easy to read 5x7 pixel format allows the display of upper case, lower case, Katakana, and custom user-defined characters. These displays are stackable in the x- and y-directions, making them ideal for high character count displays. Typical applications include telecommunication equipment, portable data entry devices, computer peripherals, medical equipment, test equipment, business machines,

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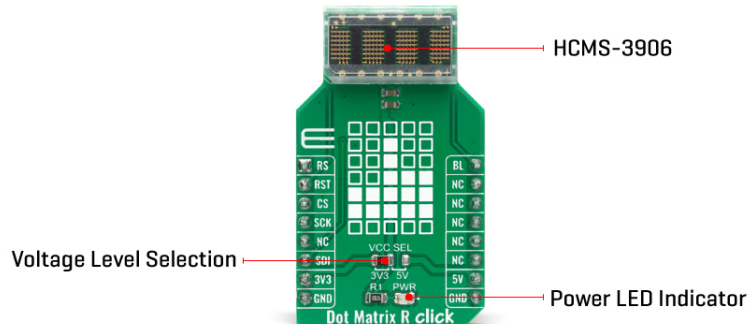


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avionics, industrial controls, etc.



Featured LED display HCMS-3906 consists of LEDs that are configured as 5x7 font characters driven in groups of 4 characters per IC. Each IC consists of a 160-bit shift register (the Dot Register), two 7-bit Control Words, and refresh circuitry. The Dot Register contents are mapped on a one-to-one basis to the display. Thus, an individual Dot Register bit uniquely controls a single LED. Reset initializes the Control Registers (sets all Control Register bits to logic low) and places the display in the sleep mode. The Dot Registers are not cleared upon power-on or by Reset. After power-on, the Dot Register contents are random; however, Reset will put the display in sleep mode, thereby blanking the LEDs. The Control Register and the Control Words are cleared to all zeros by Reset. To operate the display after being Reset, load the Dot Register with logic lows. Then load Control Word 0 with the desired brightness level and set the sleep mode bit to logic high.

The Dot Register holds the pattern to be displayed by the LEDs. First RS is brought low, then CE is brought low. Next, each successive rising CLK edge will shift in the data at the DIN pin. Loading a logic high will turn the corresponding LED on; a logic low turns the LED off. When all 160 bits have been loaded, CE is brought to logic high. When CLK is next brought to logic low, new data is latched into the display dot drivers. Loading data into the Dot Register takes place while the previous data is displayed and eliminates the need to blank the display while loading data.

In a 4-character display, the 160 bits are arranged as 20 columns by 8 rows. This array can be conceptualized as four 5x8 dot matrix character locations, but only 7 of the 8 rows have LEDs. The bottom row (row 0) is not used. Thus, latch location 0 is never displayed. Column 0 controls the left-most column. Data from Dot Latch locations 0-7 determine whether or not pixels in Column 0 are turned-on or turned-off. Therefore, the lower left pixel is turned on when a logic high is stored in Dot Latch location 1. Characters are loaded in serially, with the left-most character being loaded first and the rightmost character being loaded last. By loading one character at a time and latching the data before loading the next character, the figures will appear to scroll from right to left.

The Control Register allows software modification of the IC's operation and consists of two independent 7-bit control words. Bit D7 in the shift register selects one of the two 7-bit control words. Control Word 0 performs pulse width modulation, pixel map, brightness control, peak pixel current brightness control, and sleep mode. Control Word 1 sets serial/simultaneous data out mode, and external oscillator prescaler. Each function is independent of the others.

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This Click board™ can be supplied and interfaced with both 3.3V and 5V without the need for any external components. The onboard SMD jumper labeled as VCC SEL allows voltage selection for interfacing with both 3.3V and 5V microcontrollers.

Specifications

Type	LED Matrix
Applications	Dot Matrix R click allows simple and fast development of various applications, which require displaying of characters, numbers, or both.
On-board modules	Dot Matrix R click uses the HCMS-3906, a high performance, easy to use alphanumeric display, from Broadcom Limited.
Key Features	Easy to use four-digit 5x7 dot matrix display with dense and brightly lit pixel elements, interfaced directly with the microprocessor, serial input, convenient brightness controls.
Interface	GPIO, SPI
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Dot Matrix R Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
Register Select	RS	1	AN	PWM	16	BL	Display Blank
Reset	RST	2	RST	INT	15	NC	
Chip Enable	CS	3	CS	RX	14	NC	
Clock Input	SCK	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
Data IN	SDI	6	MOSI	SDA	11	NC	
Power Supply	3.3V	7	3.3V	5V	10	5V	Power Supply
Ground	GND	8	GND	GND	9	GND	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Power Supply Voltage Selection 3V3/5V, left position 3v3, right

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Software Support

We provide a library for the Dot Matrix R Click on our [LibStock](#) page, as well as a demo application (example), developed using MikroElektronika [compilers](#). The demo can run on all the main MikroElektronika [development boards](#).

Library Description

Library provides functions for parsing and communicating with device for communication and controlling pins.

Key functions:

- void dotmatrixr_write_ascii (char *ascii_data) - Function for showing string to display
- void dotmatrixr_generic_write (uint8_t *tx_buf, uint8_t buf_len) - Function for writing data to device
- void dotmatrixr_restart (void) - Function for restarting device

Examples description

The application is composed of three sections :

- System Initialization - Initialization of SPI module and additional pins
- Application Initialization - Configures device
- Application Task - Display shows 3 different data in span of 1 second

The full application code, and ready to use projects can be found on our [LibStock](#) page.

Other mikroE Libraries used in the example:

- SPI

Additional notes and informations

Depending on the development board you are using, you may need [USB UART click](#), [USB UART 2 click](#) or [RS232 click](#) to connect to your PC, for development systems with no UART to USB interface available on the board. The terminal available in all MikroElektronika [compilers](#), or any other terminal application of your choice, can be used to read the message.

mikroSDK

This Click board™ is supported with [mikroSDK](#) - MikroElektronika Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the [LibStock](#) and installed for the compiler you are using.

For more information about mikroSDK, visit the [official page](#).

Resources

[mikroBUS™](#)

[mikroSDK](#)

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[Click board™ Catalog](#)

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Downloads

[Dot Matrix R click 2D and 3D files](#)

[HCMS-3906 datasheet](#)

[Dot Matrix R click schematic](#)

[Dot Matrix R click example on Libstock](#)

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