VMA439

RGB DOT MATRIX BOARD & DRIVE BOARD BASED ON ATMEGA328 (UNO)

USER MANUAL

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1. Introduction

To all residents of the European Union

Important environmental information about this product

This symbol on the device or the package indicates that disposal of the device after its lifecycle could harm the environment. Do not dispose of the unit (or batteries) as unsorted municipal waste; it should be taken to a specialized company for recycling. This device should be returned to your distributor or to a local recycling service. Respect the local environmental rules.

If in doubt, contact your local waste disposal authorities.

Thank you for choosing Velleman®! Please read the manual thoroughly before bringing this device into service. If the device was damaged in transit, do not install or use it and contact your dealer.

2. Safety Instructions

- This device can be used by children aged from 8 years and above, and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning the use of the device in a safe way and understand the hazards involved. Children shall not play with the device. Cleaning and user maintenance shall not be made by children without supervision.

- Indoor use only.
  Keep away from rain, moisture, splashing and dripping liquids.

3. General Guidelines

- Refer to the Velleman® Service and Quality Warranty on the last pages of this manual.
- Familiarise yourself with the functions of the device before actually using it.
- All modifications of the device are forbidden for safety reasons. Damage caused by user modifications to the device is not covered by the warranty.
- Only use the device for its intended purpose. Using the device in an unauthorised way will void the warranty.
- Damage caused by disregard of certain guidelines in this manual is not covered by the warranty and the dealer will not accept responsibility for any ensuing defects or problems.
- Nor Velleman nv nor its dealers can be held responsible for any damage (extraordinary, incidental or indirect) – of any nature (financial, physical…) arising from the possession, use or failure of this product.
- Due to constant product improvements, the actual product appearance might differ from the shown images.
- Product images are for illustrative purposes only.
- Do not switch the device on immediately after it has been exposed to changes in temperature. Protect the device against damage by leaving it switched off until it has reached room temperature.
- Keep this manual for future reference.

4. What is Arduino®

Arduino® is an open-source prototyping platform based in easy-to-use hardware and software. Arduino® boards are able to read inputs – light-on sensor, a finger on a button or a Twitter message – and turn it into an output – activating of a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so, you use the Arduino programming language (based on Wiring) and the Arduino® software IDE (based on Processing).

Surf to www.arduino.cc and www.arduino.org for more information.

5. Overview

VMA439

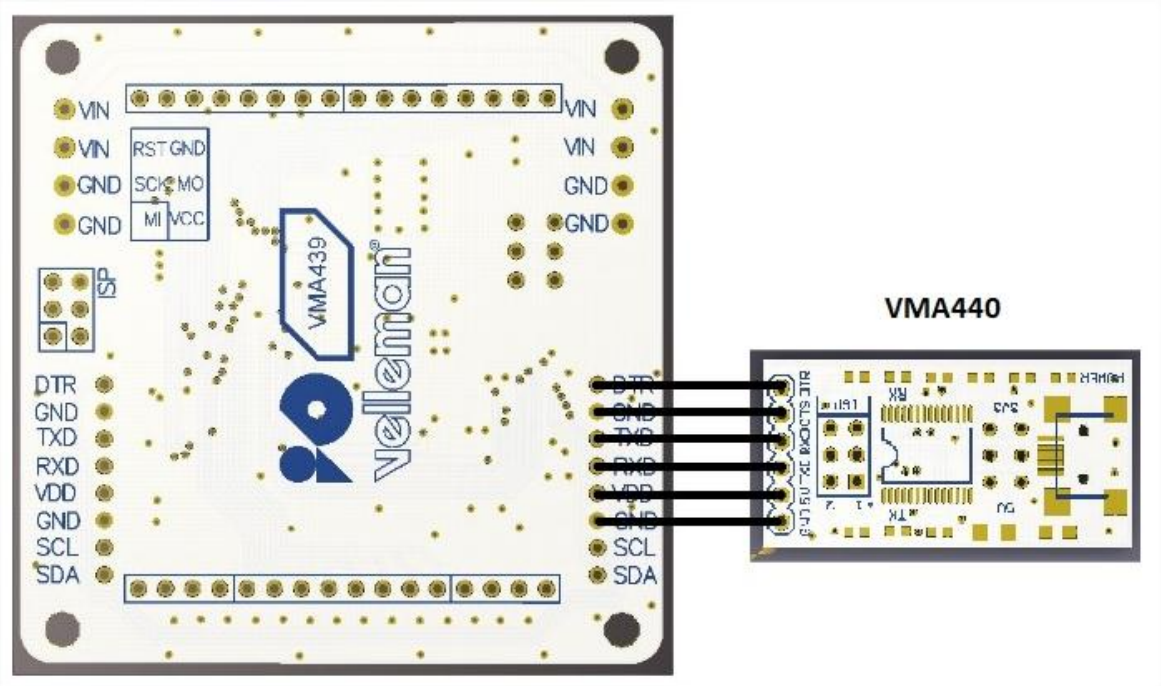
The VMA439 is an RGB LED matrix driver platform based on Arduino® UNO (ATmega328P). It gains three 8+6-bit channels of hardware PWM control of the LEDs. This design is to allow the user to easily modify or write the firmware of VMA439 by Arduino® IDE.

module size: 60 x 60 x 1.6 mm
microprocessor: Atmega328P
indicator: PWR state
power supply: 5-7.5 VDC (7.5 V max.)
cascade power connector: terminal blocks
programme interface: UART/ISP
expansion socket: 100 mil bended pin header pair
communication protocols: UART/IIC
current consumption (except LED matrix): max. 40 mA
drive current (every channel): max. 500 mA
drive current (every dot): max. 58 mA
circuit response time: 10 ms
RGB LED matrix colour resolution per dot: 16 M
UART baud rate: 9600 to 115200

6. Example

6.1 By Using the VMA440 TTL-USB Interface

Insert the VMA440 TTL-USB into the VMA439 controller board. Be sure that the pins correspond (DTR to DTR) Connect the USB connection to the USB port of your Laptop/desktop and start the Arduino® IDE.



6.2 Connecting Your VMA439 by USB Using an Arduino® UNO without VMA440

Carefully remove the ATmega chip from your Arduino® (be careful not to bend the pins).

Make following connections between the VMA439 and the UNO board:

Arduino®	VMA439
RX	RX*
TX	TX*
RST	DTR
+5V	+5V
GND	GND

* Indeed, RX to RX and TX to TX, this is not a mistake!

Now, plug in the Arduino® into the USB port of your computer and the Arduino board will act as a USB-TTL converter.
The RGB display can run on the USB 5 V power. However, we recommend applying a 5 VDC to the green power connectors on the controller board. When using the ArduinoPlasma example, the maximum current drawn is about 150 mA.

Once the VMA439 is connected to your computer, you can start the IDE. Under Tools → Board, select the "Arduino Duemilanova or Diecimila".

Import the Colorduino library, open the ColorduinoPlasma example sketch… and start enjoying your display.
The Colorduino library, ColorduinoPlasma example and 2 other small examples are available from our website.

```
*** CODE BEGIN ***
ColorduinoPlasma - Plasma demo using Colorduino Library for Arduino
  Copyright (c) 2011 Sam C. Lin lincomatic@hotmail.com ALL RIGHTS RESERVED

  based on  Color cycling plasma
    Version 0.1 - 8 July 2009
    Copyright (c) 2009 Ben Combee.  All right reserved.
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    Copyright (c) 2008 Windell H. Oskay.  All right reserved.
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  This demo is distributed in the hope that it will be useful,
  but WITHOUT ANY WARRANTY; without even the implied warranty of
  MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the GNU
  Lesser General Public License for more details.

  You should have received a copy of the GNU Lesser General Public
  License along with this library; if not, write to the Free Software
  Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA  02110-1301  USA
*/
```

```
#include <Colorduino.h>

typedef struct
{
  unsigned char r;
  unsigned char g;
  unsigned char b;
} ColorRGB;

//a color with 3 components: h, s and v
typedef struct
{
  unsigned char h;
  unsigned char s;
  unsigned char v;
} ColorHSV;

unsigned char plasma[ColorduinoScreenWidth][ColorduinoScreenHeight];
long paletteShift;


//Converts an HSV color to RGB color
void HSVtoRGB(void *vRGB, void *vHSV)
{
  float r, g, b, h, s, v; //this function works with floats between 0 and 1
  float f, p, q, t;
  int i;
  ColorRGB *colorRGB=(ColorRGB *)vRGB;
  ColorHSV *colorHSV=(ColorHSV *)vHSV;

  h = (float)(colorHSV->h / 256.0);
  s = (float)(colorHSV->s / 256.0);
  v = (float)(colorHSV->v / 256.0);

  //if saturation is 0, the color is a shade of grey
  if(s == 0.0) {
    b = v;
    g = b;
    r = g;
  }
  //if saturation > 0, more complex calculations are needed
  else
  {
    h *= 6.0; //to bring hue to a number between 0 and 6, better for the calculations
    i = (int)(floor(h)); //e.g. 2.7 becomes 2 and 3.01 becomes 3 or 4.9999 becomes 4
    f = h - i;//the fractional part of h

    p = (float)(v * (1.0 - s));
    q = (float)(v * (1.0 - (s * f)));
    t = (float)(v * (1.0 - (s * (1.0 - f))));

    switch(i)
    {
      case 0: r=v; g=t; b=p; break;
```

```
    case 1: r=q; g=v; b=p; break;
    case 2: r=p; g=v; b=t; break;
    case 3: r=p; g=q; b=v; break;
    case 4: r=t; g=p; b=v; break;
    case 5: r=v; g=p; b=q; break;
    default: r = g = b = 0; break;
   }
  }
  colorRGB->r = (int)(r * 255.0);
  colorRGB->g = (int)(g * 255.0);
  colorRGB->b = (int)(b * 255.0);
}

float
dist(float a, float b, float c, float d)
{
  return sqrt((c-a)*(c-a)+(d-b)*(d-b));
}


void
plasma_morph()
{
  unsigned char x,y;
  float value;
  ColorRGB colorRGB;
  ColorHSV colorHSV;

  for(y = 0; y < ColorduinoScreenHeight; y++)
    for(x = 0; x < ColorduinoScreenWidth; x++) {
      {
          value = sin(dist(x + paletteShift, y, 128.0, 128.0) / 8.0)
            + sin(dist(x, y, 64.0, 64.0) / 8.0)
            + sin(dist(x, y + paletteShift / 7, 192.0, 64) / 7.0)
            + sin(dist(x, y, 192.0, 100.0) / 8.0);
          colorHSV.h=(unsigned char)((value) * 128)&0xff;
          colorHSV.s=255;
          colorHSV.v=255;
          HSVtoRGB(&colorRGB, &colorHSV);

          Colorduino.SetPixel(x, y, colorRGB.r, colorRGB.g, colorRGB.b);
      }
  }
  paletteShift++;

  Colorduino.FlipPage(); // swap screen buffers to show it
}

/*********************************************************
Name: ColorFill
Function: Fill the frame with a color
Parameter:R: the value of RED.   Range:RED 0~255
          G: the value of GREEN. Range:RED 0~255
          B: the value of BLUE.  Range:RED 0~255
```

```
**********************************************************/
void ColorFill(unsigned char R,unsigned char G,unsigned char B)
{
 PixelRGB *p = Colorduino.GetPixel(0,0);
 for (unsigned char y=0;y<ColorduinoScreenWidth;y++) {
  for(unsigned char x=0;x<ColorduinoScreenHeight;x++) {
   p->r = R;
   p->g = G;
   p->b = B;
   p++;
  }
 }

 Colorduino.FlipPage();
}

void setup()
{
 Colorduino.Init(); // initialize the board

 // compensate for relative intensity differences in R/G/B brightness
 // array of 6-bit base values for RGB (0~63)
 // whiteBalVal[0]=red
 // whiteBalVal[1]=green
 // whiteBalVal[2]=blue
 unsigned char whiteBalVal[3] = {36,63,63}; // for LEDSEE 6x6cm round matrix
 Colorduino.SetWhiteBal(whiteBalVal);


 // start with morphing plasma, but allow going to color cycling if desired.
 paletteShift=128000;
 unsigned char bcolor;

 //generate the plasma once
 for(unsigned char y = 0; y < ColorduinoScreenHeight; y++)
  for(unsigned char x = 0; x < ColorduinoScreenWidth; x++)
  {
   //the plasma buffer is a sum of sines
   bcolor = (unsigned char)
   (
        128.0 + (128.0 * sin(x*8.0 / 16.0))
      + 128.0 + (128.0 * sin(y*8.0 / 16.0))
   ) / 2;
   plasma[x][y] = bcolor;
  }

 // to adjust white balance you can uncomment this line
 // and comment out the plasma_morph() in loop()
 // and then experiment with whiteBalVal above
 // ColorFill(255,255,255);
}

void loop()
{
```

```
  plasma_morph();
}
*** CODE END ***
```

7. More Information

Please refer to the VMA439 product page on www.velleman.eu for more information.

Use this device with original accessories only. Velleman nv cannot be held responsible in the event of damage or injury resulting from (incorrect) use of this device. For more info concerning this product and the latest version of this manual, please visit our website www.velleman.eu. The information in this manual is subject to change without prior notice.

Velleman® Service and Quality Warranty

Since its foundation in 1972, Velleman® acquired extensive experience in the electronics world and currently distributes its products in over 85 countries.

All our products fulfil strict quality requirements and legal stipulations in the EU. In order to ensure the quality, our products regularly go through an extra quality check, both by an internal quality department and by specialized external organisations. If, all precautionary measures notwithstanding, problems should occur, please make appeal to our warranty (see guarantee conditions).

General Warranty Conditions Concerning Consumer Products (for EU):

• All consumer products are subject to a 24-month warranty on production flaws and defective material as from the original date of purchase.

• Velleman® can decide to replace an article with an equivalent article, or to refund the retail value totally or partially when the complaint is valid and a free repair or replacement of the article is impossible, or if the expenses are out of proportion.

You will be delivered a replacing article or a refund at the value of 100% of the purchase price in case of a flaw occurred in the first year after the date of purchase and delivery, or a replacing article at 50% of the purchase price or a refund at the value of 50% of the retail value in case of a flaw occurred in the second year after the date of purchase and delivery.

• Not covered by warranty:

- all direct or indirect damage caused after delivery to the article (e.g. by oxidation, shocks, falls, dust, dirt, humidity...), and by the article, as well as its contents (e.g. data loss), compensation for loss of profits;

- consumable goods, parts or accessories that are subject to an aging process during normal use, such as batteries (rechargeable, non-rechargeable, built-in or replaceable), lamps, rubber parts, drive belts... (unlimited list);

- flaws resulting from fire, water damage, lightning, accident, natural disaster, etc.…;

- flaws caused deliberately, negligently or resulting from improper handling, negligent maintenance, abusive use or use contrary to the manufacturer's instructions;

- damage caused by a commercial, professional or collective use of the article (the warranty validity will be reduced to six (6) months when the article is used professionally);

- damage resulting from an inappropriate packing and shipping of the article;

- all damage caused by modification, repair or alteration performed by a third party without written permission by Velleman®.

• Articles to be repaired must be delivered to your Velleman® dealer, solidly packed (preferably in the original packaging), and be completed with the original receipt of purchase and a clear flaw description.

• Hint: In order to save on cost and time, please reread the manual and check if the flaw is caused by obvious causes prior to presenting the article for repair. Note that returning a non-defective article can also involve handling costs.

• Repairs occurring after warranty expiration are subject to shipping costs.

• The above conditions are without prejudice to all commercial warranties.

The above enumeration is subject to modification according to the article (see article's manual).

Made in PRC
Imported by Velleman nv
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