# MARSON MT89M 2D Scan Engine and Barcode Scan Module User Guide



Contents



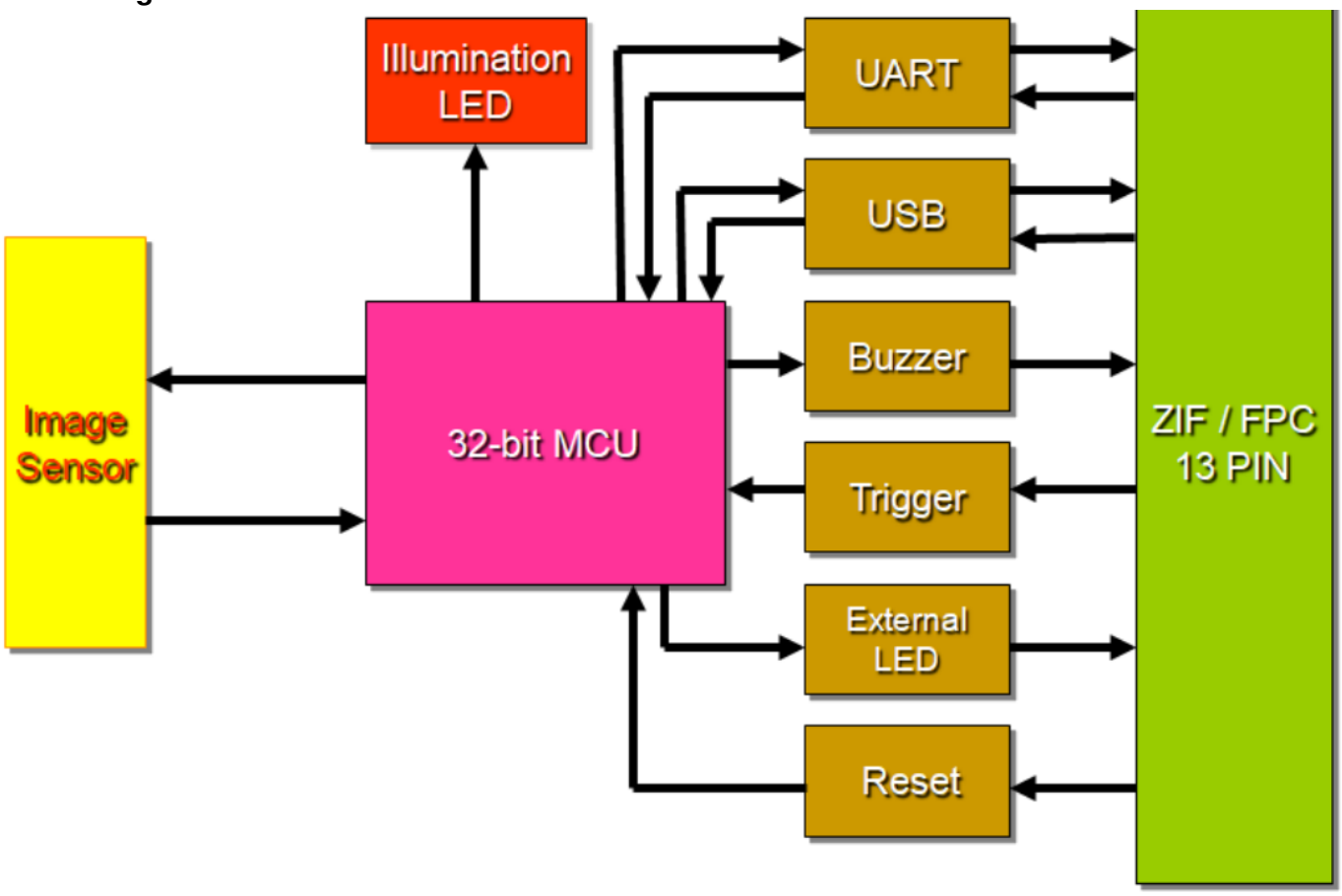
MARSON

**MARSON MT89M 2D Scan Engine and Barcode Scan Module**

## INTRODUCTION

- MT89M One-piece Compact 2D Scan Engine provides snappy scanning performance at a competitive cost and compact form factor. With its all-in-one design, MT89M 2D scan engine can be easily integrated with specific applications such as access control, lottery kiosk and consumer electronics.
- The MT89M 2D Scan Engine consists of 1 illumination LED, 1 aimer LED and a high-quality image sensor with a microprocessor that contains powerful firmware to control all aspects of operations and enable communication with the host system over the standard set of communication interfaces.
- Two interfaces, UART & USB, are available. UART interface communicates with the host system over TTL-level R$232 communication; USB interface emulates a USB HID Keyboard or Virtual COM port device and communicates with the host system over USB.

## Block Diagram

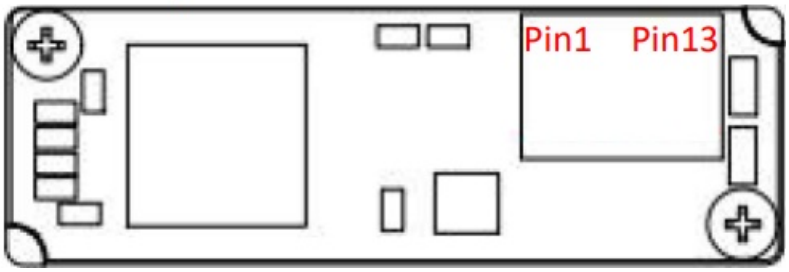


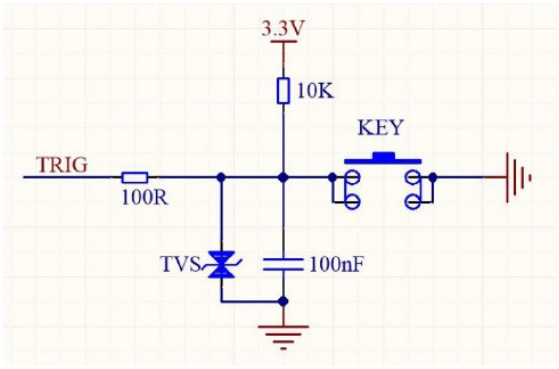

### Electric Interface

### Pin Assignment

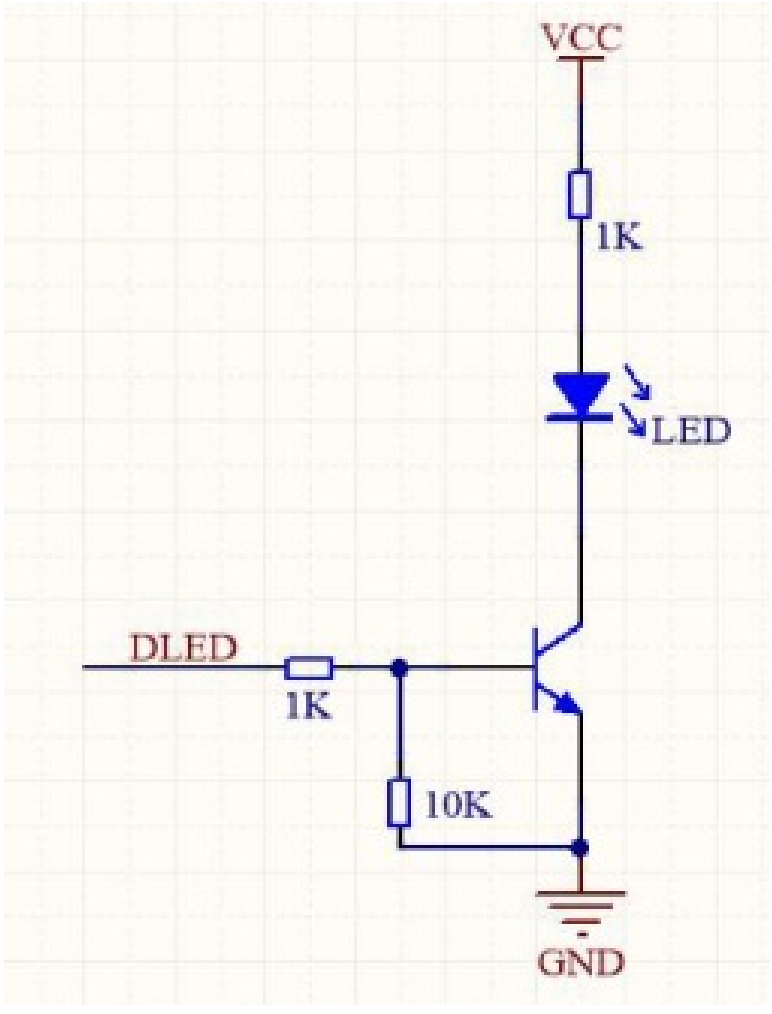
(Back View of MT89M)

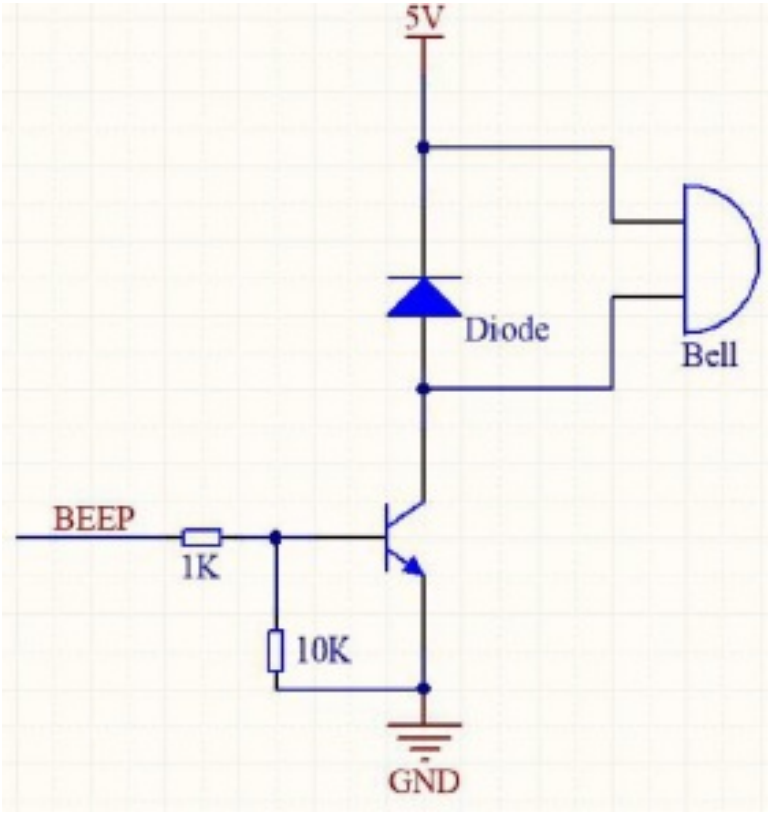
Contact points of connector are on the inside

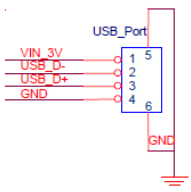


| Pin# | Definition | I/O | Description | Schematic Example |
|---|---|---|---|---|
| 1 | GND | ———— | Power and signal ground. |  |
| 2 | TRIG | Input | High: Stop Scanning Low: Start Scanning |  |
| 3 | NC | ———— | Reserved | Leave it unconnected. |

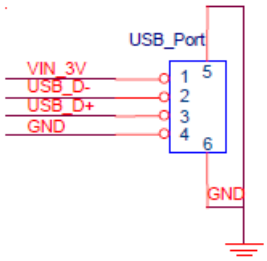
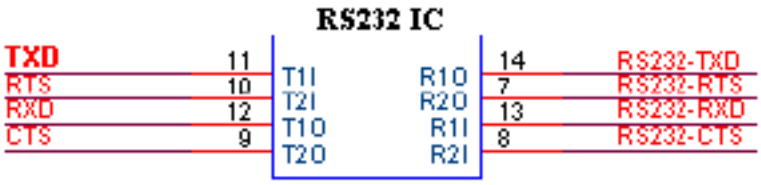
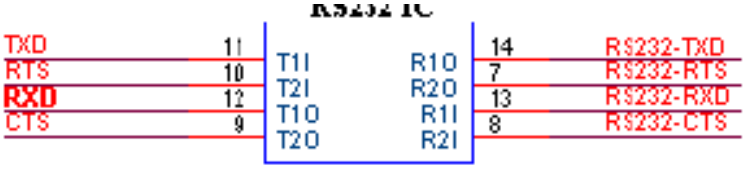
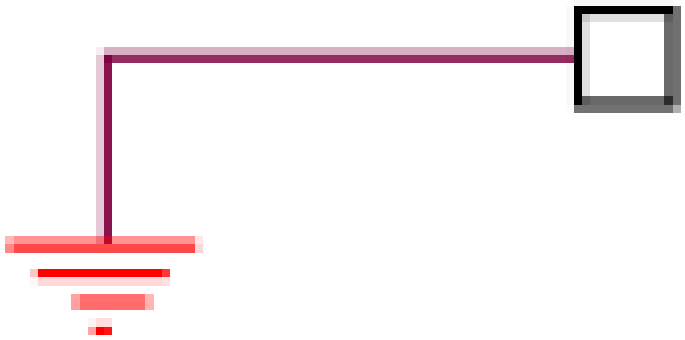


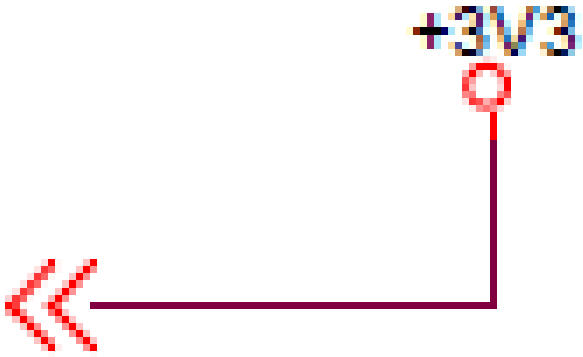
| | | | | |
|---|---|---|---|---|
| 4 | DLED | Output | When scanning is successful (Good Read), it outputs a high-level pulse, whose load capac ity is limited and n ot enough to drive r LED directly. A s upporting LED dri ve circuit is requir ed. |  |

| | | | | |
|---|---|---|---|---|
| 5 | BEEP | Output | When scanning is successful (Good Read), it outputs a high-level pulse.<br>PWM controlled signal can be used to drive an external passive buzzer for a successful barcode decode (Good Read). |  |
| 6 | NC | ———— | Reserved | Leave it unconnected. |
| 7 | DP | Bidirectional | USB Differential Signal | |
| | | | Transmission | USB_Port |
| | | | (USB D+) | VIN_3V<br>USB_D- USB_D+<br>GND<br>1<br>2<br>3<br>4 |



| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | DN | Bidirectional | USB Differential Signal Transmission<br><br>(USB D-) | | | |
| | | | | USB_Port | | |
| | | | | VIN_3V<br><br>USB_D- USB_D+<br>GND |  | |
| | | | | | GND | |
| | | | | | | |
| 9 | UART_TX | Output | UART TTL data output. |  <br>Sipex® Vendor P/N: SP232ACT | | |
| 10 | UART_RX | Input | UART TTL data input. |  <br>Sipex® Vendor P/N: SP232ACT | | |
| 11 | GND | ———— | Power and signal ground. |  | | |

| | | | | |
|---|---|---|---|---|
| 12 | VCC | ———— | Supply voltage in put. Must always be connected to 3 .3V<br><br>power supply. |  |
| 13 | VCC | ———— | Supply voltage in put. Must always be connected to 3 .3V<br><br>power supply. |  |

**Electric Characteristics**

| Symbol | Ratings | Min | Max | Unit |
|---|---|---|---|---|
| **VIH** | Input high level | $V_{DD}$x 0.7 | — | V |
| **VIL** | Input low level | — | $V_{DD}$x 0.3 | V |
| **VOH** | Output high level | $V_{DD}$– 0.3 | — | V |
| **VOL** | Output low level | — | 0.4 | V |

**Note:**

1. **Power Supply:** VDD=3.15 ± 0.15V
2. Exposure to maximum rating conditions for extended periods may affect device reliability.

## SPECIFICATIONS

#### Technical Specifications

| | |
|---|---|
| **Optic & Performance** | |
| **Light Source** | White LED |
| **Aiming** | Visible red LED |
| **Sensor** | 640 x 480 pixels |
| **Resolution** | 4mil/ 0.01mm (1D)<br>10mil/ 0.25mm (2D) |
| **Field of View** | Horizontal 37°<br>Vertical 28° |
| **Scan Angle** | Pitch Angle ±60°<br>Skew Angle ±60°<br>Roll Angle 360° |
| **Print Contrast Ratio** | 15% |
| **Width of Field** | 141mm (13Mil Code39) |
| **Typical Depth Of Field** (Environment: 800 lux) | 5 Mil Code39: 50 ~ 90mm |
| | 13 Mil UPC/EAN: 40 ~ 210mm |
| | 15 Mil Code128: 45 ~ 250mm |
| | 15 Mil QR Code: 40 ~ 180mm |
| | 6.67 Mil PDF417: TBD |
| | 10 Mil Data Matrix: TBD |
| **Physical Characteristics** | |
| **Dimension** | W21.7 x L9 x H7.2 mm |
| **Weight** | 1.4g |

| | |
|---|---|
| **Color** | Black |
| **Material** | Plastic |
| **Connector** | 13pin ZIF (pitch=0.3mm) |
| **Cable** | 13pin to 12pin flex cable (pitch=0.5mm) |
| **Electrical** | |
| **Operation Voltage** | 3.3VDC ± 5% |
| **Working Current** | 170mA |
| **Standby Current** | TBD |
| **Idle Current (Sleep Mode)** | 800uA |

| | |
|---|---|
| **Connectivity** | |
| **Interface** | UART (TTL-level RS232) |
| | USB (HID Keyboard) |
| | USB (Virtual COM) |
| **User Environment** | |
| **Operating Temperature** | -20°C ~ 60°C |
| **Storage Temperature** | -40°C ~ 70°C |
| **Humidity** | 5% ~ 95%RH (Non-condensing) |
| **Drop Durability** | 1.5M |
| **Ambient Light** | 100,000 Lux (Sunlight) |

| | |
|---|---|
| **1D Symbologies** | UPC-A / UPC-E0 / UPC-E1 EAN-8 / EAN-13<br>Code128 Code39 Code93 Codabar<br>Interleaved 2 of 5<br>Industrial 2 of 5<br>Matrix 2 of 5<br>Standard 2 of 5<br>China Post 25 Code11<br>MSI Plessey Plessey<br>GS1 Databar<br>GS1 Databar Limited GS1 Databar Expanded |
| **2D Symbologies** | QR Code<br>Micro QR Code PDF417<br>MicroPDF417 Data Matrix Aztec MaxiCode Han Xin<br>Code16K |
| **Regulatory** | |

| | |
|---|---|
| **END** | Functional after 4KV contact, 8KV air discharge<br>*(It requires housing that is designed for ESD protection and stray s from electric fields.)* |
| **EMC** | TBA |
| **Safety Approval** | TBA |
| **Environmental** | RoHS 2.0 |

## Interface

### UART Interface

- Below are the default communication protocols:
- **Baud rate:** 9600
- **Data Bits:** 8
- **Parity:** None

- **Stop Bit:**1
- **Handshaking:** None
- **Flow Control Timeout:** None
- **ACK/NAK:** OFF
- **BCC:** OFF

**Interface Configuration Barcode:**


**USB HID Interface**

**Interface Configuration Barcode:**


**(VID:** 0x1FC9, PID: 0x5AA7)

**USB VCP Interface**

**Interface Configuration Barcode:**

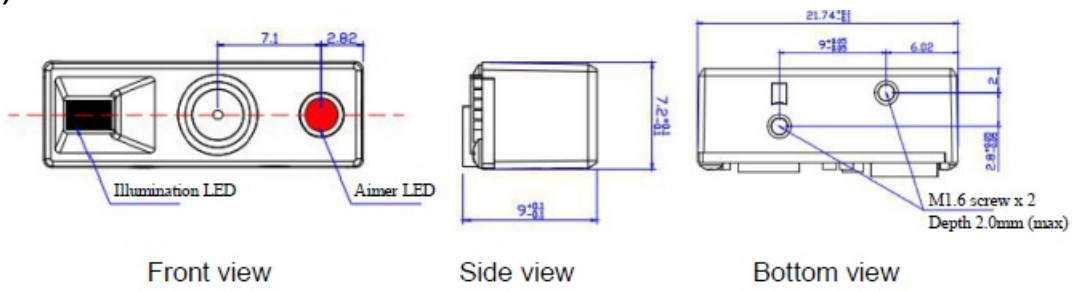

**(VID:** 0x1FCA, PID: 0x5AA8)

**Operation Method**

1. At power-up, the MT89M sends the Power-Up signals over Buzzer and LED pins as an indication that the MT89M enters Standby Mode and is ready for operation.
2. Once the MT89M triggered by either hardware or software method, MT89M will emit a beam of light which is aligned with the sensor's field of view.
3. The area image sensor captures the image of barcode and produces an analog waveform, which is sampled and analyzed by the decoder firmware running on the MT89M.
4. Upon a successful barcode decoded, the MT89M turns off the illumination LEDs, sending the Good Read signals over Buzzer and LED pins and transmitting the decoded data to the host.

**Mechanical Dimension**

**(Unit = mm)**




**Connector Specification**

MT89M is built with a 13-pin pitch 0.3mm FPC connector. The recommended Model No. of 13-pin connector is FH35C-13S-0.3SHW(50)
When the 13-pin to 12-pin FPC cable (shipped with MT89M by default) is used, the recommended Model No. of 12-pin pitch 0.5mm FPC connector on the host side is

**FH34SRJ-12S-0.5SH(50), with pin assignment below:**

| Pin# | Definition | I/O | Description |
|---|---|---|---|
| 1 | NC | ———— | Floating |
| 2 | VCC | ———— | 3.3V power supply. |
| 3 | GND | ———— | Power and signal ground. |
| 4 | UART_TX | Output | UART TTL data output. |
| 5 | UART_RX | Input | UART TTL data input. |
| 6 | DM | Bidirectional | USB D- signal |
| 7 | DP | Bidirectional | USB D+ signal |
| 8 | NC | ———— | Floating |
| 9 | BEEP | Input | Buzzer input |
| 10 | DIED | Input | Good read LED input |
| 11 | NC | ———— | Floating |
| 12 | TRIG | Output | Trigger signal output |

## INSTALLATION

- The scan engine is designed specifically for integration into customer's housing for OEM applications. However, the scan engine's performance will be adversely affected or permanently damaged when mounted into an unsuitable enclosure.
- **Warning:** The limited warranty is void if the following recommendations are not adhered to when mounting the scan engine.

**Electrostatic Discharge Cautions**

All scan engines are shipped in ESD protective packaging due to the sensitive nature of the exposed electrical components.

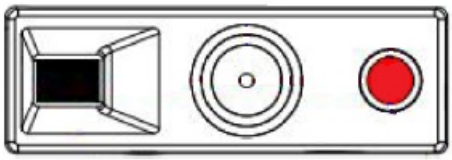
1. ALWAYS use grounding wrist straps and a grounded work area when unpacking and handling the scan engine.
2. Mount the scan engine in a housing that is designed for ESD protection and stray electric fields.

## Installation Recommendations

**When securing the scan engine by utilizing the machine screws:**

1. Leave sufficient space to accommodate the maximum size of the scan engine.
2. Do not exceed 1kg-cm (0.86 lb-in) of torque when securing the scan engine to the host.
3. Use safe ESD practices when handling and mounting the scan engine.
4. Do not enclose the scan engine with thermal insulation material. Failure of heat dissipation may deteriorate the scan engine's performance.

**Installation Orientation**



- Two M1.6 screw holes (max depth 2mm) are available at the bottom of MT89M.
- When the screw holes are facing downwards, MT89M's appearance should be identical to above picture.

## Window Materials

**Following are descriptions of three popular window materials:**

1. Poly-methyl Methacrylic (PMMA)
2. Allyl Diglycol Carbonate (ADC)
3. Chemically tempered float glass

**Cell Cast Acrylic (ASTM: PMMA)**

- Cell cast Acrylic, or Poly-methyl Methacrylic is fabricated by casting acrylic between two precision sheet of glass. This material has very good optical quality, but is relatively soft and susceptible to attack by chemicals, mechanical stress and UV light. It is strongly recommended to have acrylic hard-coated with Polysiloxane to provide abrasion resistance and protection from environmental factors. Acrylic can be laser-cut into odd shapes and ultrasonically welded.

**Cell Cast ADC, Allyl Diglycol Carbonate (ASTM: ADC)**

- Also known as CR-39TM, ADC, a thermal setting plastic widely used for plastic eyeglasses, has excellent chemical and environmental resistance. It also has an inherently moderate surface hardness and therefore

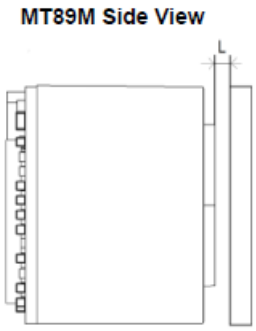
does not require hard-coating. This material cannot be ultrasonically welded.

**Chemically Tempered Float Glass**

- Glass is a hard material which provides excellent scratch and abrasion resistance. However, un-annealed glass is brittle. Increased flexibility strength with minimal optical distortion requires chemical tempering. Glass cannot be ultrasonically welded and is difficult to cut into odd shapes.

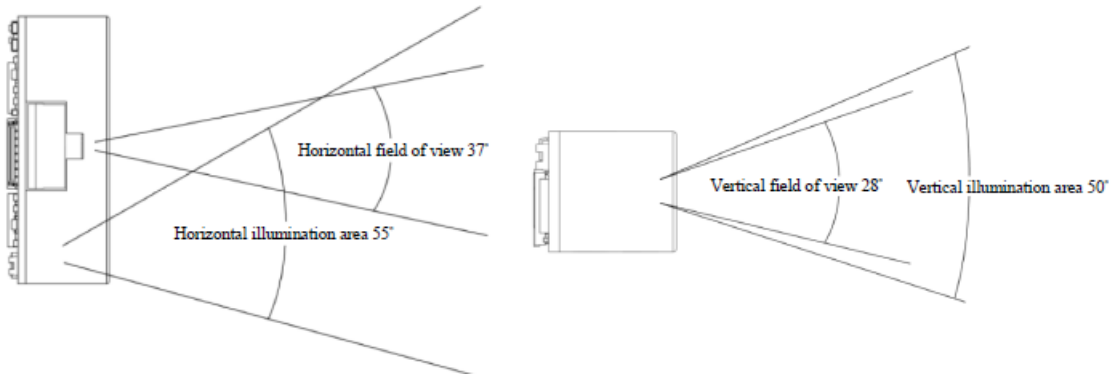
| Property | Description |
|---|---|
| **Spectral Transmission** | 85% minimum from 635 to 690 nanometers |
| **Thickness** | < 1 mm |
| **Coating** | Both sides to be anti-reflection coated to provide 1% maximum reflectivity from 635 to 690 nanometers at nominal window tilt angle. An anti-reflecti on coating can reduce the light that is reflected back to the host case. Co atings will comply with the hardness adherence<br>requirements of MIL-M-13508. |

**Window Placement**




- The distance between window and front of MT89M should not exceed L=0.5mm
- The thickness of the window should not exceed 1mm

**Window Size**




- The window size should ensure that field of view is not blocked, and the illumination area should not be blocked as well. For the size of window, please refer to above diagram of each optical area.

**Window Care**

- In the aspect of window, the performance of MT89M will be reduced due to any kind of scratch.
- Thus, reducing the damage of window, there are few things have to be noticed.

1. Avoid touching the window as much as possible.
2. When cleaning the window surface, please use non-abrasive cleaning cloth, and then gently wipe the host window with the cloth that is already sprayed with glass cleaner.

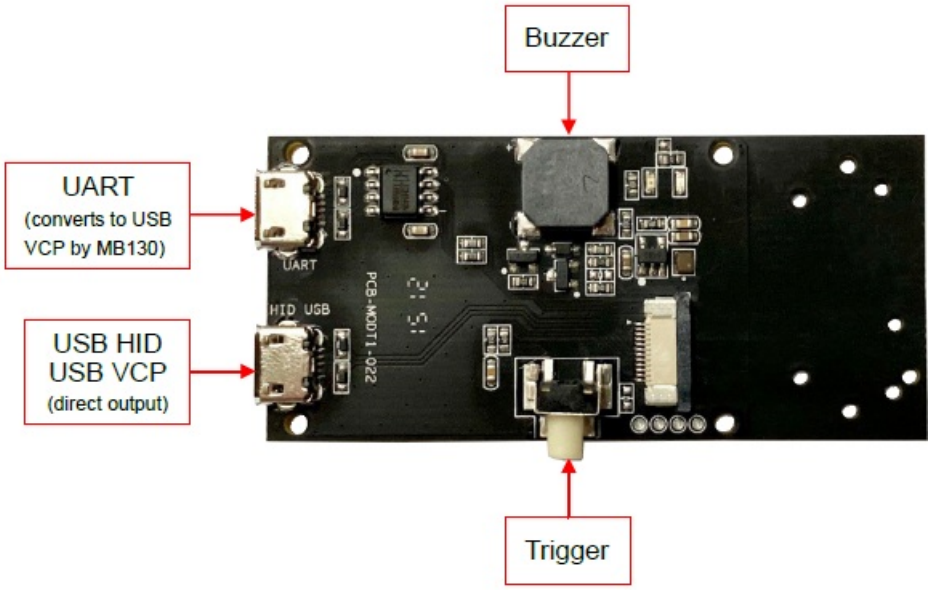
## REGULATIONS

**The MT89M scan engine conforms to the following regulations:**

1. **Electromagnetic Compliance –** TBA
2. **Electromagnetic Interference –** TBA
3. **Photobiological Safety –** TBA
4. **Environmental Regulations –** RoHS 2.0

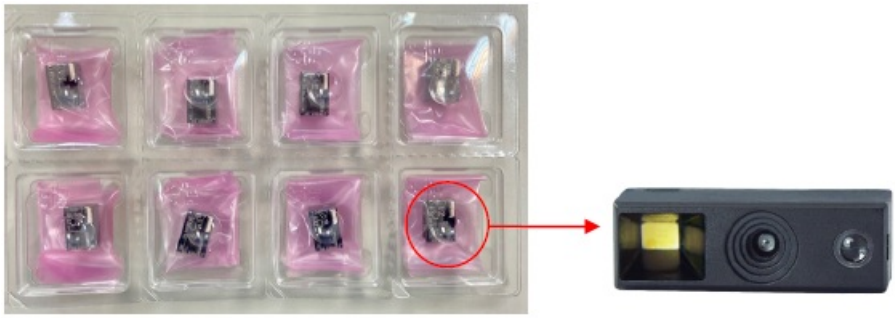
## DEVELOPMENT KIT

- **MB130 Demo Kit (P/N: 11D0-A020000) includes an MB130 Multi I/O Board (P/N:** 9014-3100000) and a micro USB cable. MB130 Multi I/O Board serves as an interface board for MT89M and accelerates the testing and integration with the host system.
- Please contact your sales representative for ordering information.
- MB130 Multi I/O Board (P/N: 9014-3100000)




## PACKAGING

1. **Tray (size: 24.7 x 13.7 x 2.7cm):** Each tray contains 8pcs of MT89M.



2. **Box (size: 25 x 14 x 3.3cm):** Each Box contains 1pc of tray, or 8pcs of MT89M

3. **Carton (size: 30 x 27 x 28cm):** Each Carton contains 16pcs of boxes, or 128pcs of MT89M.

## VERSION HISTORY

| Rev. | Date | Description | Issued | Checked |
|---|---|---|---|---|
| 0.1 | 2023.01.09 | Initial Release | Shaw | Ming |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- **Web: www.marson.com.tw**


## Documents / Resources

| | |
|---|---|
|  | **MARSON MT89M 2D Scan Engine and Barcode Scan Module** [pdf] User Guide<br>MT89M, 2D Scan Engine and Barcode Scan Module, MT89M 2D Scan Engine and Barcode Scan Module, 2D Scan Engine, Barcode Scan Module |
|  | **MARSON MT89M 2D Scan Engine** [pdf] User Guide<br>MT89M 2D Scan Engine, MT89M, 2D Scan Engine, Scan Engine, Engine |

## References

- Barcode Scanner | Scan Engines | RFID Reader | Custom Manufacturer AIDC solution - Marson