MT89M
(2D Scan Engine)

# Integration Guide

Version 1.0

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1. 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 RS232 communication; USB interface emulates a USB HID Keyboard or Virtual COM port device and communicates with the host system over USB.

1-1. Block Diagram
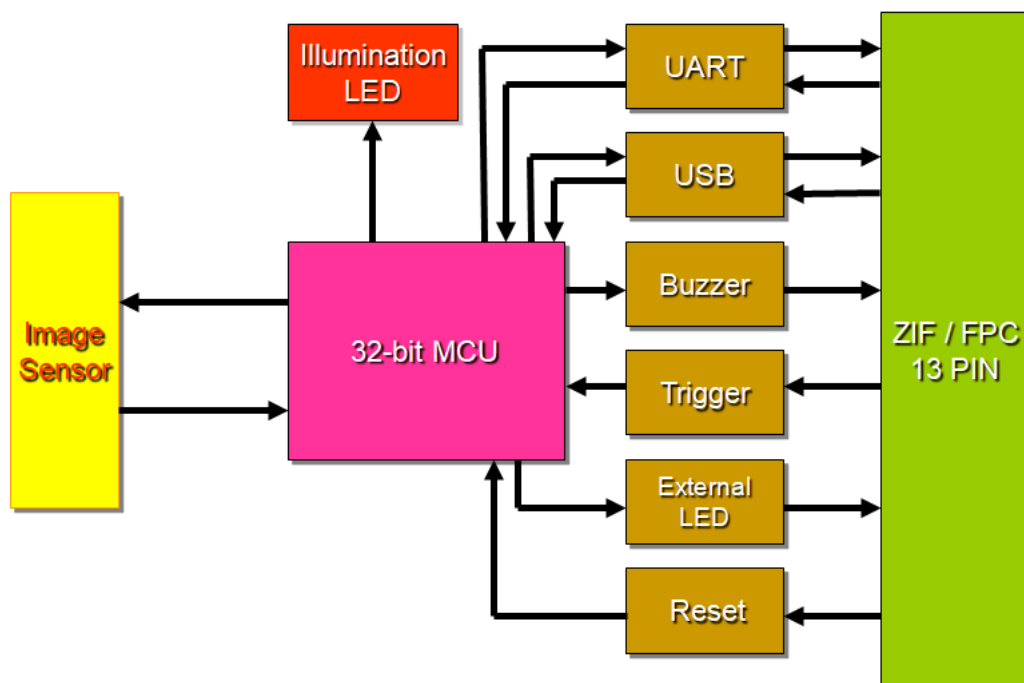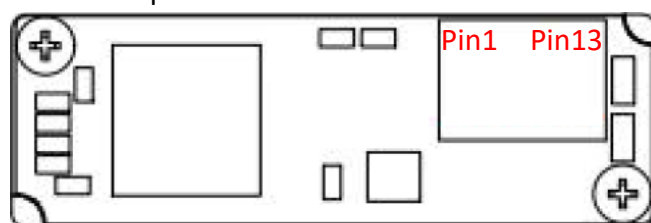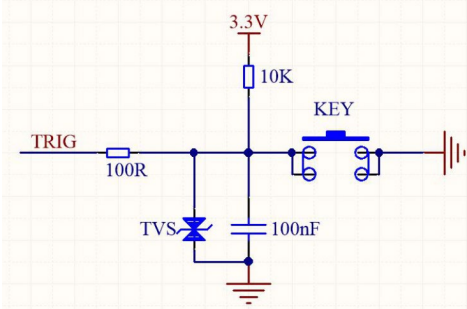
1-2. Electric Interface
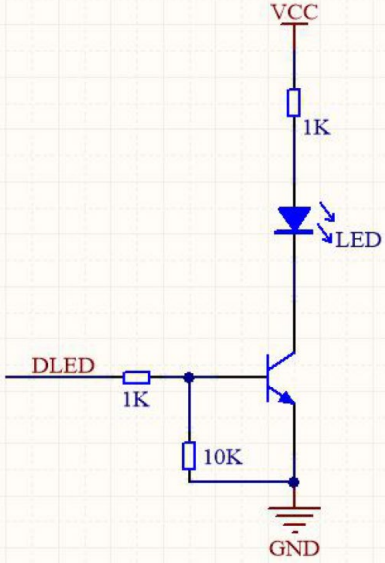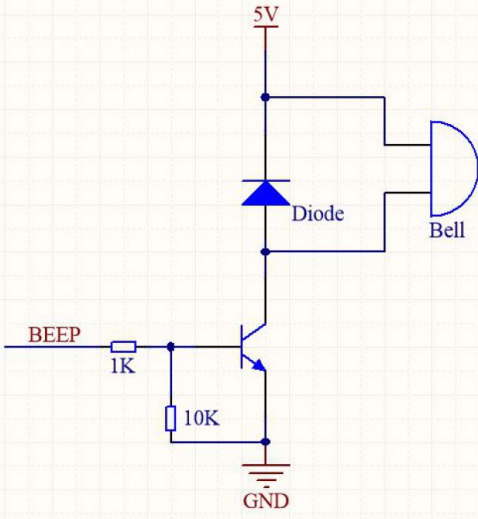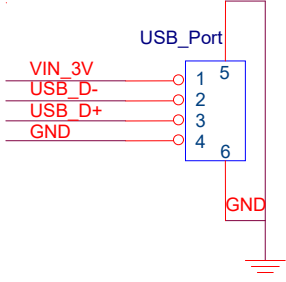
1-2-1. Pin Assignment
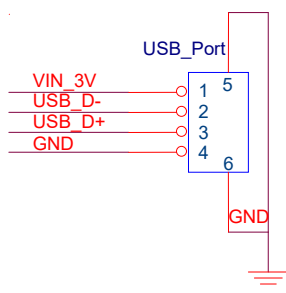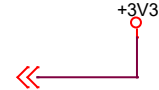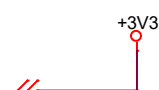
(Back View of MT89M)

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 capacity is limited and not enough to driver LED directly. A supporting LED drive circuit is required.	
5	BEEP	Output	When scanning is successful (Good Read), it outputs a high-level pulse. 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 D+)	

8	DN	Bidirectional	USB Differential Signal Transmission (USB D-)	
9	UART_TX	Output	UART TTL data output.	Sipex® Vendor P/N: SP232ACT
10	UART_RX	Input	UART TTL data input.	Sipex® Vendor P/N: SP232ACT
11	GND	------------	Power and signal ground.	
12	VCC	------------	Supply voltage input. Must always be connected to 3.3V power supply.	
13	VCC	------------	Supply voltage input. Must always be connected to 3.3V power supply.	

1-2-2. Electric Characteristics

Symbol	Ratings	Min	Max	Unit
V_{IH}	Input high level	V_{DD} x 0.7	---	V
V_{IL}	Input low level	---	V_{DD} x 0.3	V
V_{OH}	Output high level	V_{DD} - 0.3	---	V
V_{OL}	Output low level	---	0.4	V

*Note:

1. Power Supply**:** V_{DD}=3.15 ± 0.15V

2. Exposure to maximum rating conditions for extended periods may affect device reliability.

2. SPECIFICATIONS

2-1. Technical Specifications

Optic & Performance	
Light Source	White LED
Aiming	Visible red LED
Sensor	640 x 480 pixels
Resolution	4mil/ 0.01mm (1D) 10mil/ 0.25mm (2D)
Field of View	Horizontal 37° Vertical 28°
Scan Angle	Pitch Angle ±60° Skew Angle ±60° 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
	Code128
	Code39
	Code93
	Codabar
	Interleaved 2 of 5
	Industrial 2 of 5
	Matrix 2 of 5
	Standard 2 of 5
	China Post 25
	Code11
	MSI Plessey
	Plessey
	GS1 Databar
	GS1 Databar Limited
	GS1 Databar Expanded
2D Symbologies	QR Code
	Micro QR Code
	PDF417
	MicroPDF417
	Data Matrix
	Aztec
	MaxiCode
	Han Xin
	Code16K
Regulatory	

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

2-2. Interface

2-2-1. UART Interface

Below are 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:

UART

2-2-2. USB HID Interface

Interface Configuration Barcode:

USB HID

(VID: 0x1FC9, PID: 0x5AA7)

2-2-3. USB VCP Interface

Interface Configuration Barcode:

USB VCP

(VID: 0x1FCA, PID: 0x5AA8)

2-3. 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.

2-4. Mechanical Dimension

(Unit = mm)

Front view   Side view   Bottom view
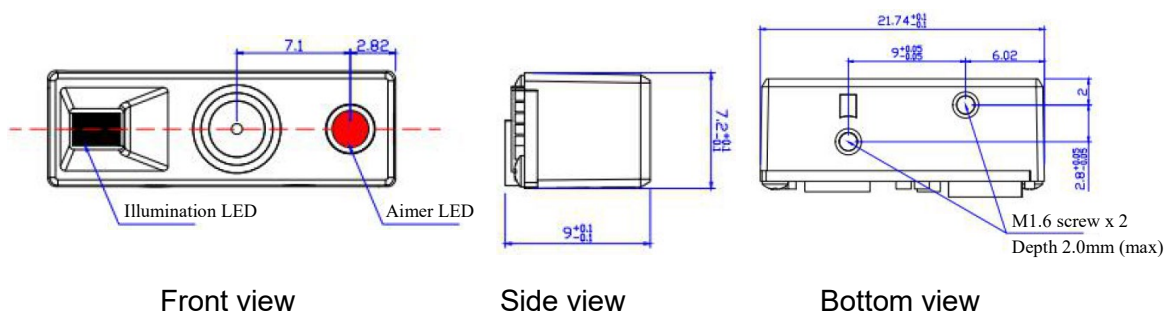
2-5. Connector Specification

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	DLED	Input	Good read LED input
11	NC	------------	Floating
12	TRIG	Output	Trigger signal output

3. 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.

3-1. 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.

3-2. 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.

3-3. Installation Orientation
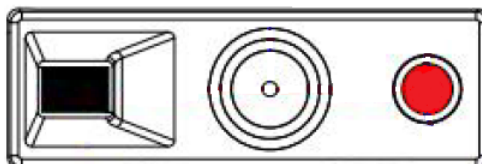
Two M1.6 screw holes (max depth 2mm) are available at the bottom of MT89M. When the screw holes are facing downwards, MT89M's appearance should be identical to above picture.

3-4. 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-39^{TM}, 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.

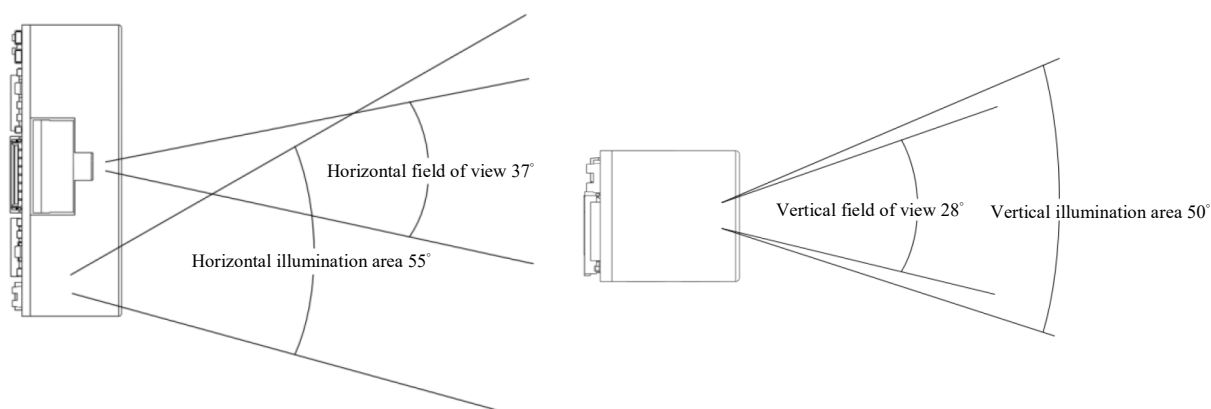| Property	Description
Spectral Transmission	85% minimum from 635 to 690 nanometers
Thickness	< 1 mm
Coating	Both sides to be anti-reflection coated to provide 1% maximum reflectivity from 635 to 690 nanometers at nominal window tilt angle. An anti-reflection coating can reduce the light that is reflected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

3-5. Window Placement

MT89M Side View
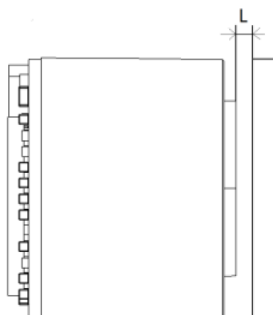
The distance between window and front of MT89M should not exceed L=0.5mm

The thickness of the window should not exceed 1mm

3-6. Window Size

Horizontal field of view 37°

Horizontal illumination area 55°

Vertical field of view 28°   Vertical illumination area 50°

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.

3-7. 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.

4. 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

5. 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)
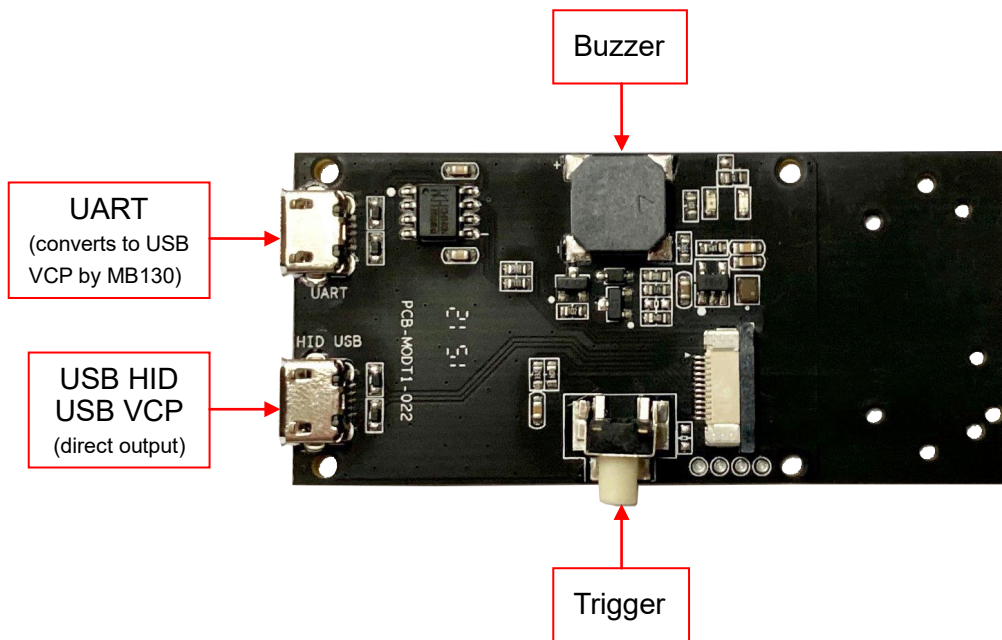
6. PACKAGING

1. Tray (size: 24.7 x 13.7 x 2.7cm)**:** Each tray contains 8pcs of MT89M.
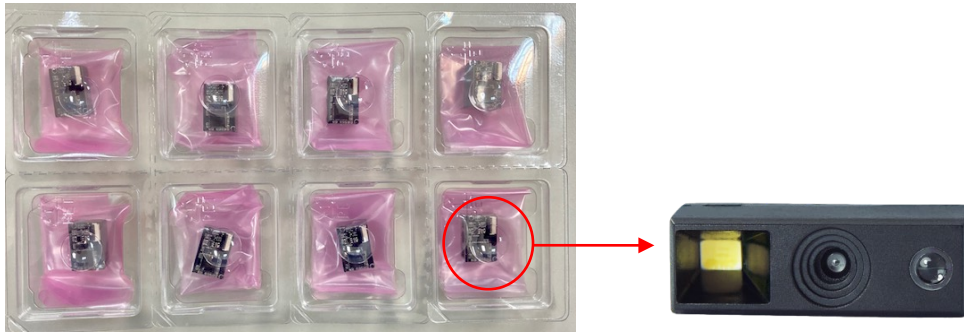
2. Box (size: 25 x 14 x 3.3cm)**:** Each Box contains 1pc of tray, or 8pcs of MT89M.

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

7. VERSION HISTORY

Rev.	Date	Description	Issued	Checked
0.1	2023.01.09	Initial Release	Shaw	Ming

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