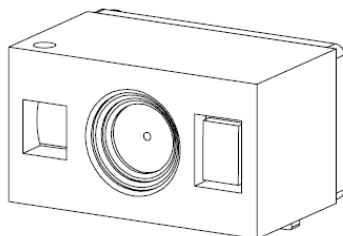


# **MT84G**

## **2D Mini Scan Engine**

# **Integration Guide**



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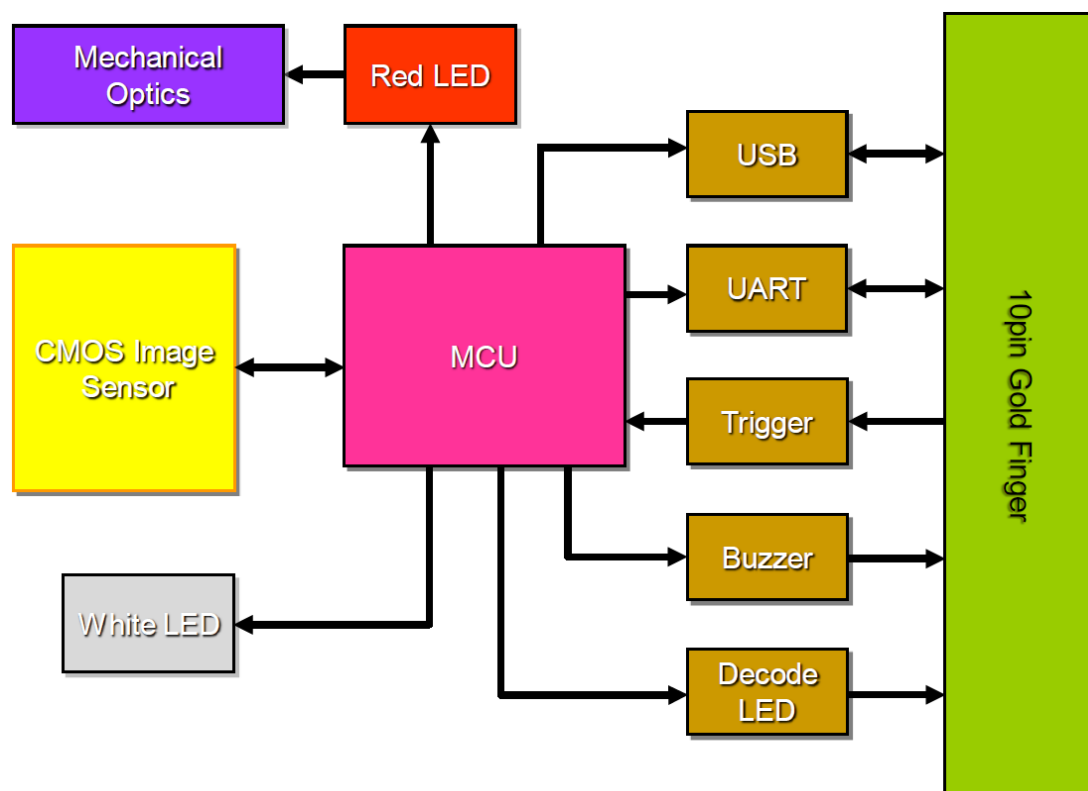
# 1. INTRODUCTION

The MT84G 2D Mini Barcode Scan Engine is the smallest 2D barcode scan engines in the industry; it features middle range reading, high performance barcode scanning with optimal performance and easy integration. MT84G is ideal for integration into data terminals and small mobile devices with limited space.

The MT84G consists of 1 illumination LED, 1 aimer LED, a high-quality CMOS image sensor and 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.

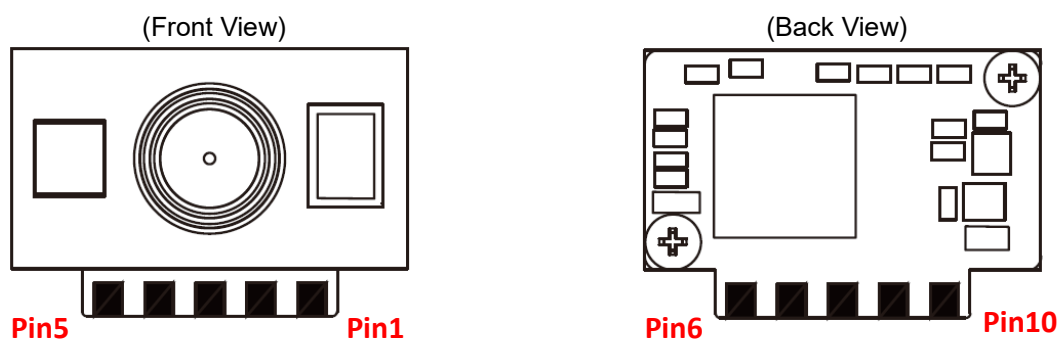
Three interfaces, UART, USB HID, USB VCP are available. UART interface communicates with the host system over TTL-level RS232 communication; USB interface emulates a USB keyboard device or virtual COM device and communicates with the host system over USB.

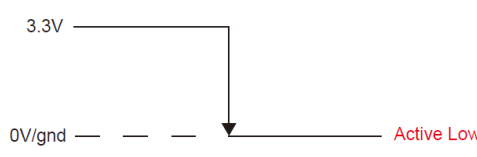

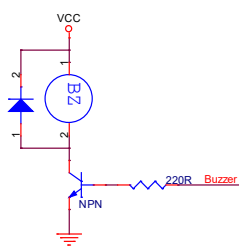
**1-1. Block Diagram**

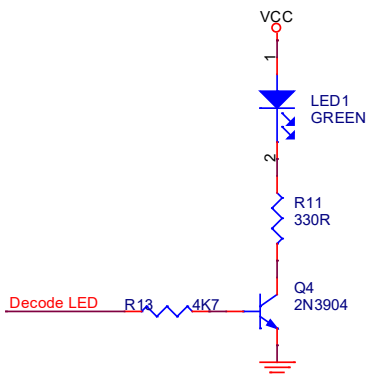
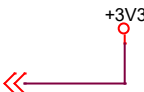




## 1-2. Electric Interface

### 1-2-1. Pin Assignment



Pin#	Definition	I/O	Description	Schematic Example
1	Trigger	Input	High: Power-up/Standby Low: Scanning Operation (External pull-up resistor 10K)	
2	GND	---	Ground	
3	Buzzer	Output	Buzzer PWM output	

Pin#	UART	I/O	Description	Schematic Example
4	Decode LED	Output	Decode LED output	
5	VCC	---	3.3V supply voltage input	
6	UART RXD	Input	UART TTL data input	<p><b>RS232 IC</b></p>  <p>Sipex® Vendor P/N: <b>SP232ACT</b></p>
7	UART TXD	Output	UART TTL data output	
8	USB_DM	Input / Output	USB Signal D-	Differential Signal Transmission
9	USB_DP	Input / Output	USB Signal D+	Differential Signal Transmission
10	GND	---	Ground	

## 1-2-2. Electric Characteristics

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

**\*Note:**

1. Power Supply:  $V_{DD}=3.15 \pm 0.15V$
2. Exposure to maximum rating conditions for extended periods may affect device reliability.

## 1-3. Operational Timing

This chapter describes the timing associated with the various operating modes of the MT84G including Power Up, Sleep Mode, and Decode Timing.

### 1-3-1. Power Up

When power is initially applied, the MT84G is activated and begins the process of initialization. Once initialization (duration  $\geq 1000mS$ ) is completed, the MT84G emits power-up beeps, enters **Standby Mode** and is ready for barcode scanning.

### 1-3-2. Sleep Mode

The MT84G will enter **Sleep Mode** after a programmable time period has elapsed without any activity. Please see Chapter 6 for more details about Sleep Mode.

### 1-3-3. Decode Timing

In **Standby Mode**, the MT84G is activated by the Trigger signal which

MUST be kept low for at least 15mS until the successful scan is achieved, as indicated by the Buzzer signal.

The total scan and decode time is approximately equal to the time from the Trigger signal going low to the Buzzer signal going high. This time will vary slightly based on several factors including barcode quality, barcode type and the distance between MT84G and the barcode scanned.

Upon a successful scan, the MT84G outputs the Buzzer signal and keeps this signal for the duration of the transmission of the data decoded to the host side. The duration is about 80mS.

Therefore, the total duration of a typical scanning operation (from Trigger turning low to the end of Buzzer PWM signal) is approximately 100mS.

In **Sleep Mode**, the MT84G can be waken up by the Trigger signal which MUST be kept low for at least 15mS, to prompt the scan engine into **Standby Mode**.

#### **1-3-4. Summary of Operation Timings**

The minimum duration of initialization is 1000mS.

The minimum duration of valid Trigger signal is 15mS.

The minimum duration of waking up MT84G from **Sleep Mode** by Trigger signal is also 15mS.

The minimum duration of scanning operation in **Standby Mode** is 100mS.

The minimum duration of waking up MT84G from **Sleep Mode** by Trigger signal and completing decode is about 150ms.

## 2. SPECIFICATIONS

### 2-1. Introduction

This chapter provides technical specifications of the MT84G scan engine.

Operating method, scanning range and scan angle are also presented.

### 2-2. Technical Specifications

Optic & Performance		
Light Source		White LED Red LED
Sensor		640 x 480 pixels
Resolution		5mil/ 0.125mm (1D) 10mil/ 0.25mm (2D)
Scan Angle		Horizontal 37° Vertical 27.5°
Print Contrast Ratio		25%
Width of Field		141mm (13Mil Code39)
Guaranteed Depth Of Field (Environment: 800 lux)	5 mil Code39	55 ~ 115mm
	13 mil UPC/ EAN	55 ~ 280mm
	15 mil Code128	55 ~ 380mm
	15 mil QR Code	40 ~ 200mm
	10 mil Data Matrix	40 ~ 100mm
Physical Characteristics		
Dimension		W14 x L9.5 x H9.3 mm W14 x L9.5 x H7.8 mm (when mounted on PCB)
Weight		1.2g
Color		Black
Material		PC
Connector		Edge-board Contact x 10 pads
Electrical		
Operation Voltage		3.15VDC±0.15VDC
Working Current		< 156 mA
Standby Current		< 85 mA
Idle Current (Sleep Mode)		< 1.5 mA



Connectivity	
Interface	UART (TTL-level RS232)
	USB HID (HID Keyboard)
	USB VCP (Virtual COM)
User Environment	
Operating Temperature	-20°C ~ 60°C
Storage Temperature	-40°C ~ 70°C
Humidity	0% ~ 95%RH (Non-condensing)
Drop Durability	1.5M
Ambient Light	100,000 Lux (Sunlight)
1D Symbolologies	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 Symbolologies	QR Code Micro QR Code PDF417 MicroPDF417

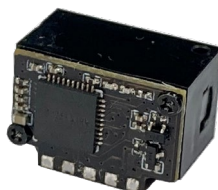
	Data Matrix Aztec MaxiCode Han Xin Code16K
<b>Regulatory</b>	
<b>ESD</b>	Functional after 4KV contact, 8KV air discharge (it requires housing that is designed for ESD protection and stray from electric fields.)
<b>EMC</b>	FCC – Part15 Subpart B (Class B) CE – EN55032, EN55035
<b>Safety Approval</b>	IEC 62471 (Exempt Group)
<b>Environmental</b>	WEEE, RoHS 2.0

## 2-3. Configurations

MT84G configurations include:

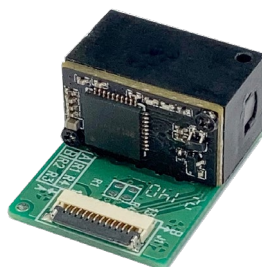
### **MT84G** (P/N: [1084-A020000](#))

Standard Version, PCB Gold Finger x 10 pads



### **MT84G with interface board** (P/N: [1084-A020001](#))

Demo Version, ZIF Connector x 12 pins, works with MB100 demo board. (see Chapter 5 for details)



## 2-4. Interface

### 2-4-1. UART Interface

Below are default communication parameters

**Baud rate:** 9600

**Data Bits:** 8

**Parity:** None

**Stop Bit:** 1

**Hardware Flow Control:** None

#### **Characteristics:**

- (1) Configurable by scanning configuration barcodes.
- (2) Configurable by serial commands.
- (3) Supports both software & hardware trigger

#### **Interface Configuration Barcode:**



**UART**

Scanning above barcode will set your MT84G to UART interface.

### 2-4-2. USB Interface

#### **Characteristics:**

- (1) Configurable by scanning configuration barcodes.
- (2) Supports hardware trigger only

#### **Interface Configuration Barcode:**



**USB HID**

Scanning above barcode will set your MT84G to USB HID interface.

### 2-4-3. USB Interface

#### Characteristics:

- (1) Configurable by scanning configuration barcodes.
- (2) Configurable by serial commands.
- (3) Supports both software & hardware trigger

#### Interface Configuration Barcode:



#### USB VCP

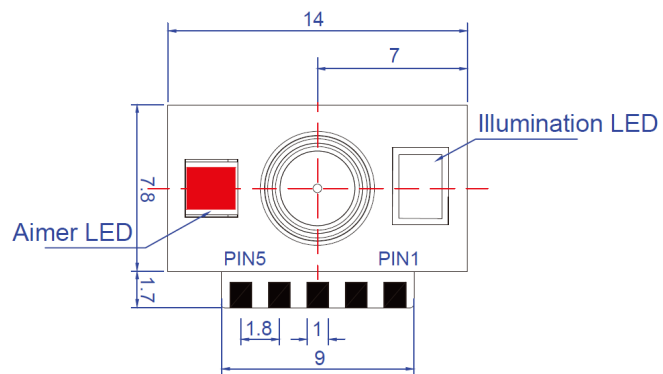
Scanning above barcode will set your MT84G to USB VCP interface.

### 2-4. Operation Method

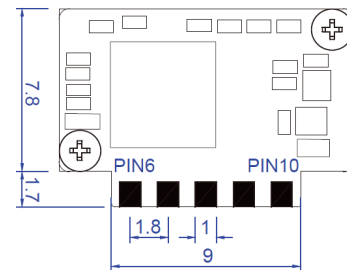
1. At power-up, the MT84G sends the Power-Up (PWM) signals over Buzzer pin as an indication that the MT84G enters **Standby Mode** and is ready for operation.
2. Once the MT84G triggered by either hardware or software method, it will emit white illumination with a narrow, horizontal slab of red light which helps user target the barcode.
3. The CMOS image sensor captures the image of barcode and produces an analog waveform, which is sampled and analyzed by the decoder firmware running on the MT84G.
4. Upon a successful barcode decoded, the MT84G turns off the illumination LEDs, sends the Good Read (PWM) signals over Buzzer pin and transmits the decoded data to the host.
5. The MT84G may enter **Sleep Mode** (Please see Chapter 6 for more details) after a period of inactivity in order to reduce power consumption.

## 2-4. Mechanical Dimension

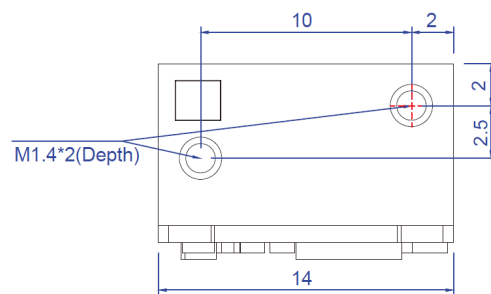
(unit = mm)



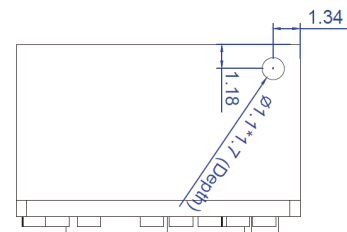
Front View



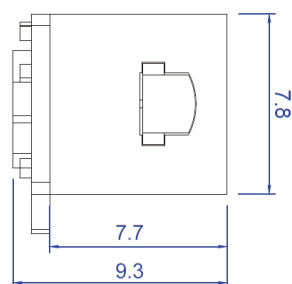
Back View



Bottom View



Top View



Side View

## 2-5. Scanning Range

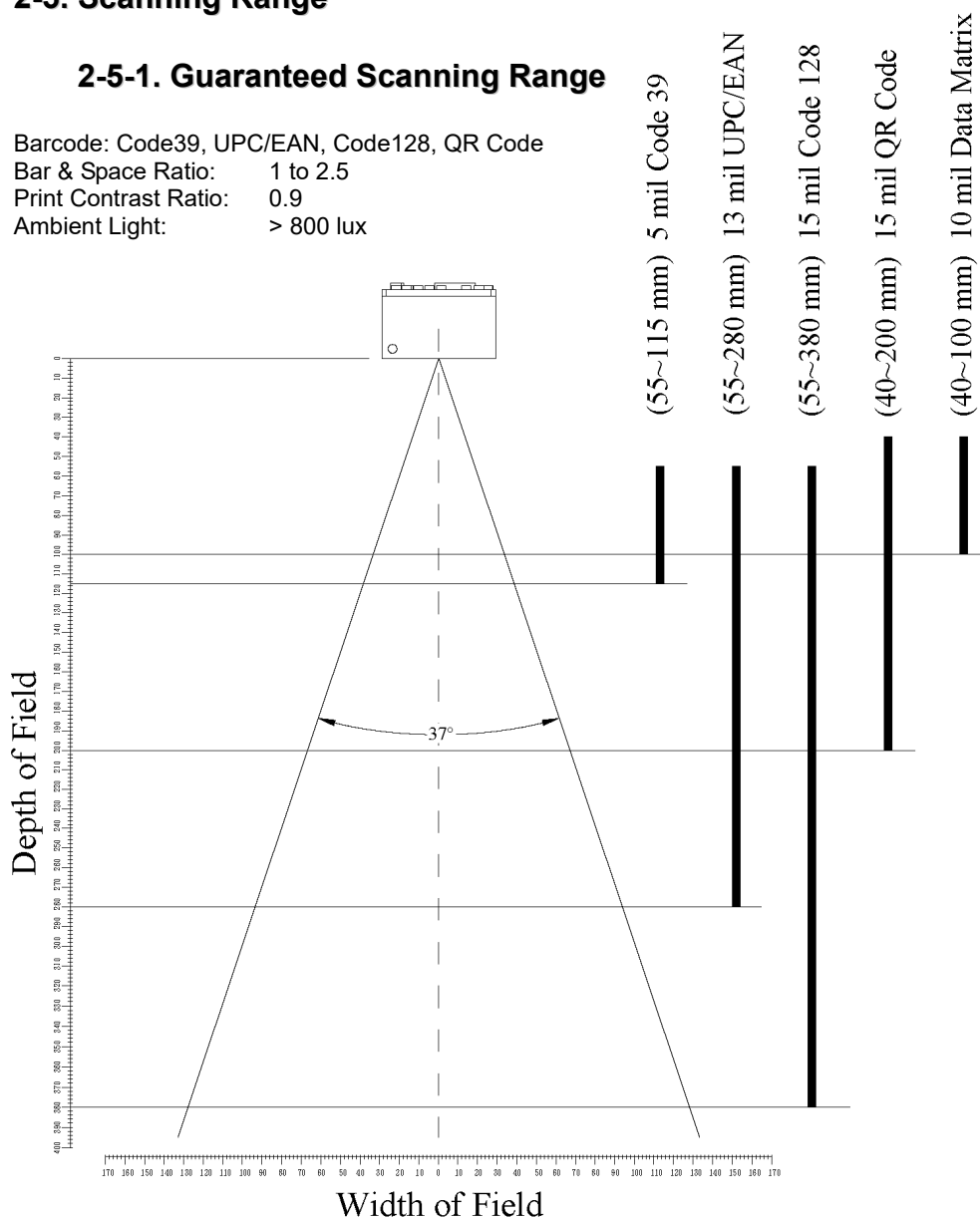
### 2-5-1. Guaranteed Scanning Range

Barcode: Code39, UPC/EAN, Code128, QR Code

Bar & Space Ratio: 1 to 2.5

Print Contrast Ratio: 0.9

Ambient Light: > 800 lux



### Minimum & Maximum Scan Distance

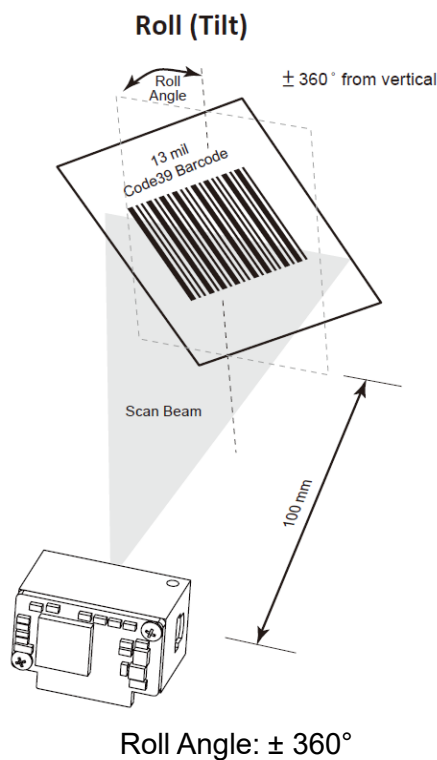
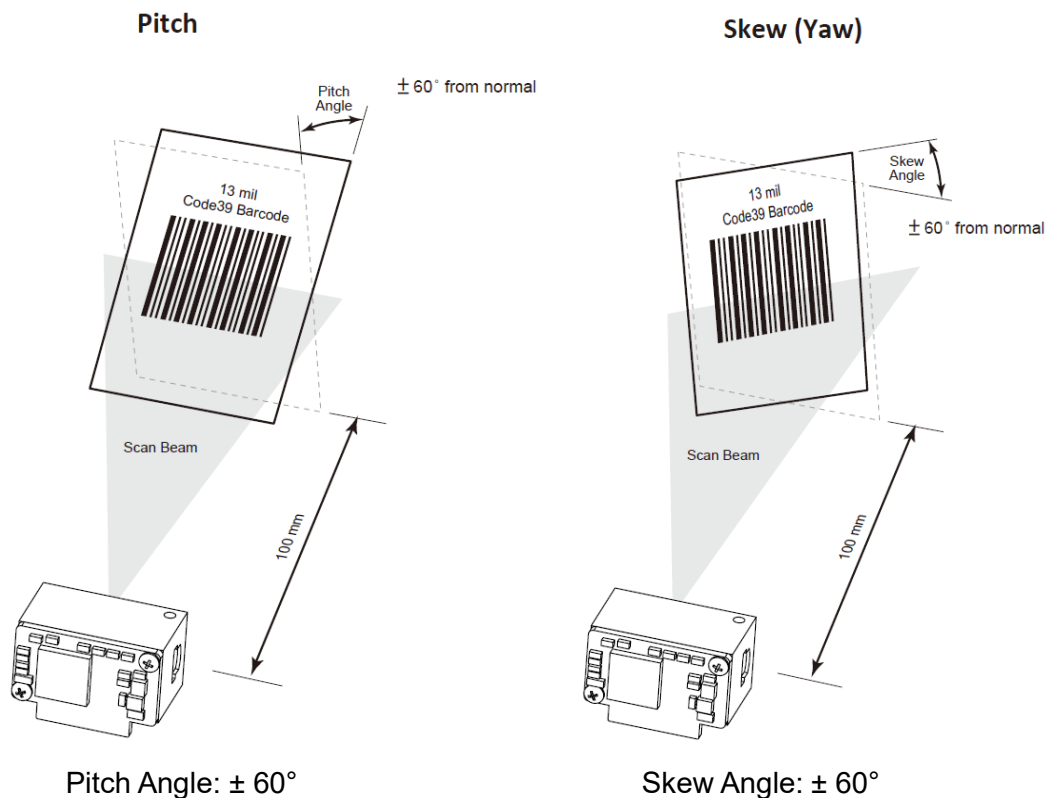
Symbology	Resolution	Distance
Code 39	5 Mil	55 ~ 115 mm
UPC/EAN	13 Mil	55 ~ 280 mm
Code 128	15 Mil	55 ~ 380 mm
QR Code	15 Mil	40 ~ 200 mm
Data Matrix	10 Mil	40 ~ 100 mm

### Maximum Scan Width

Symbology	Resolution	Barcode Length
Code 39	13 Mil	141 mm

## 2-6. Pitch Angle, Roll Angle and Skew Angle

Be aware of the tolerance for the pitch, roll and skew angle of barcode you are trying to scan.



## 3. INSTALLATION

The MT84G scan engine is designed specifically for integration into customer's housing for OEM applications. However, the MT84G'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 MT84G.

### 3-1. Electrostatic Discharge Cautions

All MT84Gs 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 MT84G.
2. Mount the MT84G in a housing that is designed for ESD protection and stray electric fields.



## 3-2. Integration and Soldering

### Mounting the MT84G

First of all, the MT84G should be fixed with machine screws on the host PCBA. To secure MT84G the maximum thread depth is 2.0 mm and operator must use safe ESD practices when handling and mounting the MT84G.

The thickness of PCBA: 0.8mm (for M1.4 x 2.5mm screw)

The size of screw hole: 1.4mm dia., 2.0mm deep

The size of screw: M1.4 X 2.5mm (Default)

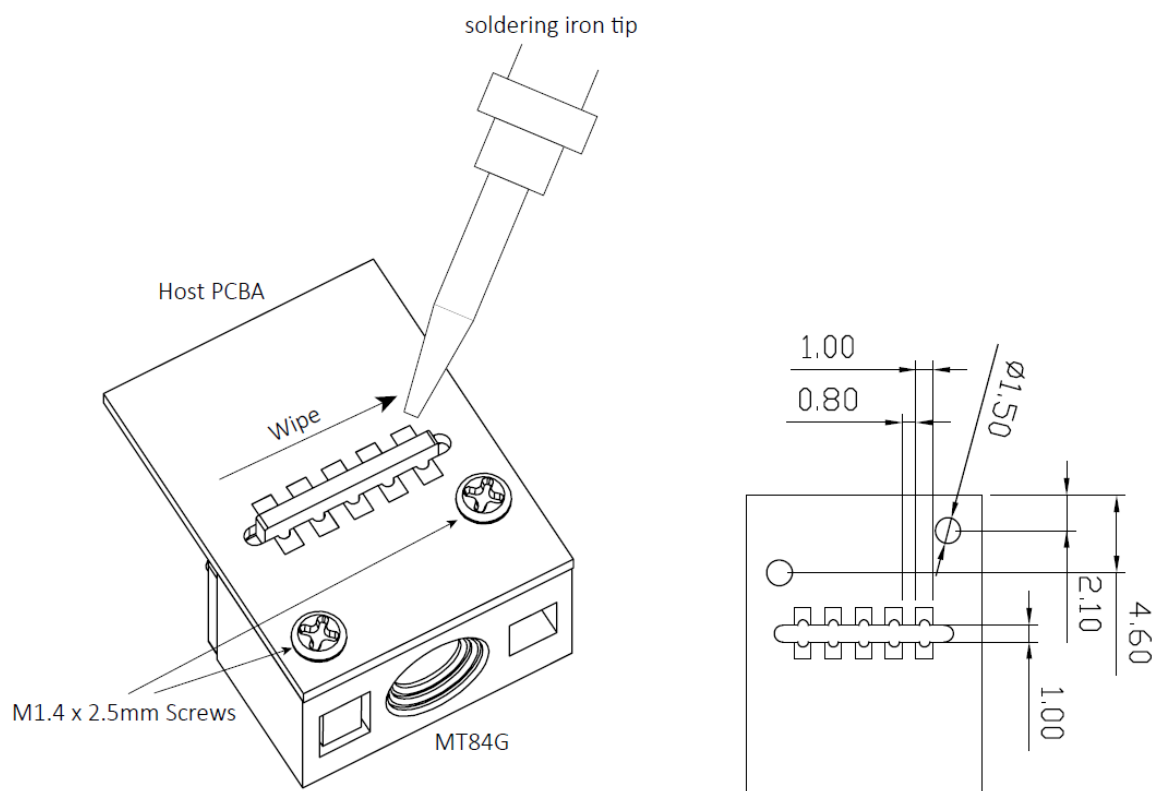
The torque of screwdriver:  $\leq 500\text{g-cm}$  (0.43 lb-in)

### Soldering Method

Wiping the soldering iron tip steadily and dragging a ball of solder across the pads. Please see figure below, the solder will go where it needs to go. With a bit of practice, this method has the most consistent results and the least chance of failure.

### Soldering Temperature

$380 \pm 10^\circ\text{C}$  (Do not solder each pad for more than 3 seconds.)



### 3-3. 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™, 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.

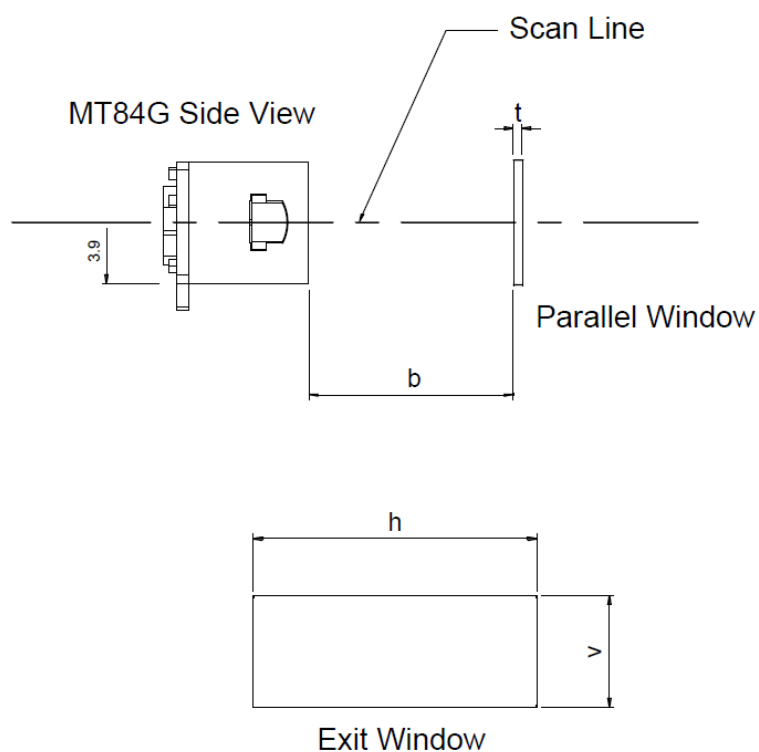
#### **Chemically Tempered Float Glass**

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.

### 3-4. Window Specifications

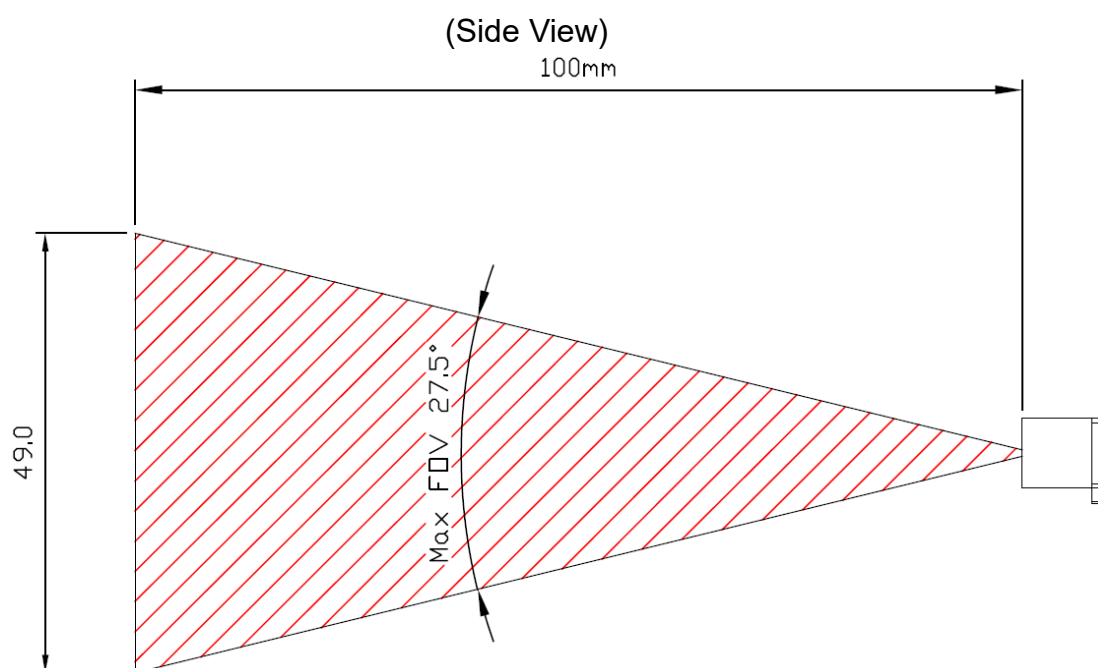
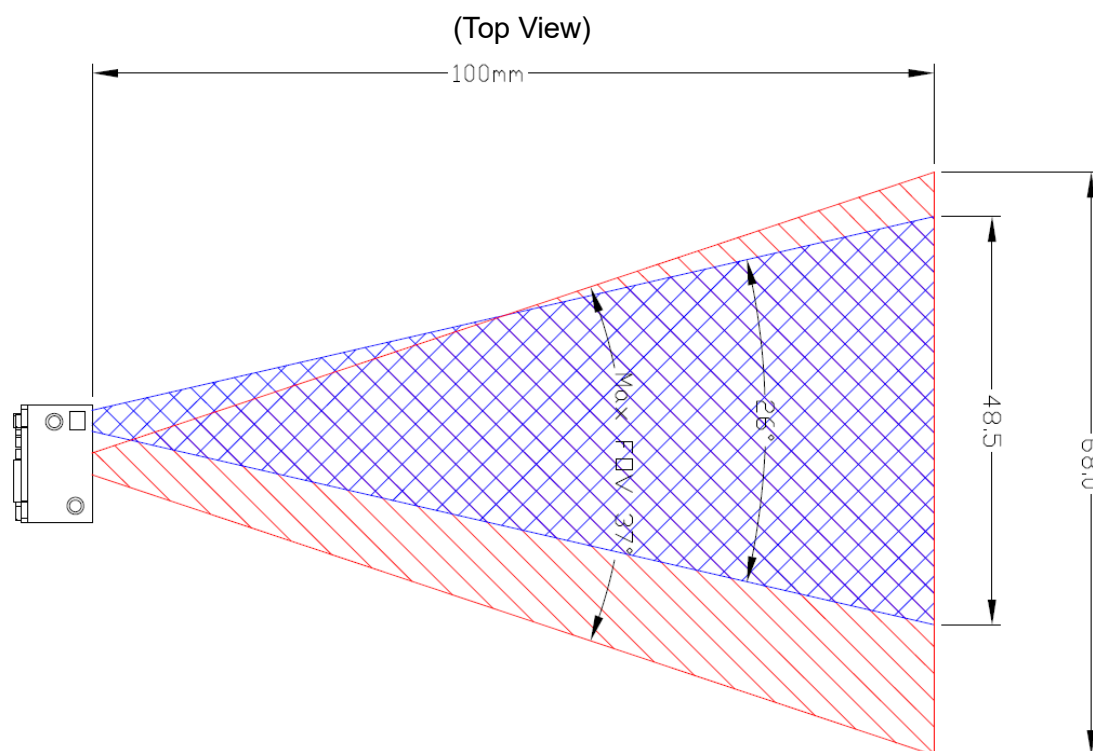
The recommended thickness of window is 0.8~1.0 mm.

The recommended distance between window and scan engine is < 0.5 mm.



Window Specifications for MT84G Integration			
Distance	Minimum Window Size		
	Horizontal (h)	Vertical (v)	Thickness (t)
< 0.5mm (b)	14.0 mm	8.0 mm	0.8~1.0 mm

The window size must increase as it is moved away from MT84G and should be sized to accommodate the field of view and illumination envelopes shown below:



### **3-5. Window Care**

In the aspect of window, the performance of MT84G 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 MT84G scan engine conforms to the following regulations:

1. Electromagnetic Compliance – CE EN55032, EN55035
2. Electromagnetic Interference – FCC Part15 Subpart B (Class B)
3. Photobiological Safety – IEC 62471 (Exempt Group)
4. Environmental Regulations – RoHS 2.0, WEEE

## 5. DEVELOPMENT KIT

MARSON MB100 Demo Kit (P/N: [11A0-9801A20](#)) enables the development of products and systems using the MT84G on various platforms. Besides the Multi I/O board (P/N: [2006-1007X00](#)), the MB100 Demo Kit provides the software and hardware tools required for testing the MT84G applications before integrating it into the host device. Please contact your sales representative for ordering information.

### MB100 Multi I/O Board (P/N: [21A0-204A000](#))



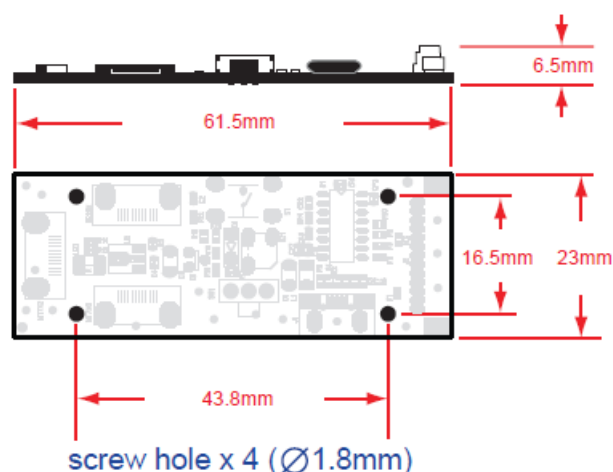
Connects to MT84G with interface board

### MB100 Demo Kit Accessories

O: Supported X: Not Supported

Interface			
	RS232	USB HID	USB VCP
<b>Cable</b>			
External Y-cable (P/N: <a href="#">7090-1583A00</a> )	O	O	O
Internal Y-cable (P/N: <a href="#">5300-1315X00</a> )	O	O	O
Micro USB Cable (P/N: <a href="#">7005-9892A50</a> )	X	O	O

Due to the advantage of its small size, MB100 Multi I/O board is also suitable for being installed inside the host system, as an interface board connecting MT84G to the host device.



## 6. SLEEP MODE

The **Sleep Mode** is disabled by default. To enable **Sleep Mode**, please scan Enable Sleep Mode configuration barcode below. When enabled, MT84G automatically sleeps (with idle current < 1mA) after a period of inactivity, or **Sleep Timeout** (default = 30 sec). Please note that **Sleep Mode** only works in UART interface and **Sleep Timeout** can only be configured by serial command.



Enable Sleep Mode



Disable Sleep Mode\*

To configure **Sleep Mode** and **Sleep Timeout** with serial commands via UART interface, please follow below format:

[Head] [Type] [Length] [Address] [Data] [CRC]

[Head] = 0x7E 0x00 (2 bytes)

[Type] = 0x08 (1 byte, 0x08 = write)

[Length] = 0x02 (1 byte, 0x02 = number of byte in [Data] field)

[Address] = 0x07 (1 byte, 0x07 = **Sleep Mode** & **Sleep Timeout**'s address)

[Data] = variable (2 bytes, bit 15 = **Sleep Mode**, with 0 as disable, 1 as enable; bit 14~0 = **Sleep Timeout** in 100ms increments)

[CRC] = 2 options below

(1) 0xAB 0xCD (2 bytes, 0xAB 0xCD = no CRC required)

(2) variable (2 bytes, the result of CRC\_CCITT calculation of [Type] [Length] [Address] [Data])

For example, to enable **Sleep Mode** and set **Sleep Timeout** as 3 seconds

Host sends: 0x7E 0x00 0x08 0x02 0x00 0x07 0x80 0x1E 0xAB 0xCD

Device responds: 0x02 0x00 0x00 0x01 0x00 0x33 0x31 (= write success)

**\*Note:** For full functions of serial commands, please refer to [MT84G Serial Commands Manual](#).

## 7. PARAMETER SETUP

You can set up your MT84G using the following method:

- 1. Configuration Barcode:**

Scan configuration barcodes from the [MT84G Users Manual](#).

- 2. Serial Command:**

Send command based on [MT84G Serial Commands Manual](#).



## 8. VERSION HISTORY

Rev.	Date	Description	Issued	Checked
0.1	2021.10.07	Initial Draft Release	Shaw	Jou & Alice
0.2	2021.10.21	Updated Pitch/Skew Angle Updated Window Specifications	Shaw	Alice
0.3	2021.11.01	Added Electric Characteristics	Shaw	Jou
0.4	2021.12.24	Updated Guaranteed D.O.F, W.O.F, Voltage, MT84G P/N, MB100 P/N	Shaw	Jou
0.5	2022.03.04	Updated Pitch/Skew Angle	Shaw	Jou
0.6	2022.09.07	Removed Scan Rate	Shaw	Jou

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Web: [www.marson.com.tw](http://www.marson.com.tw)