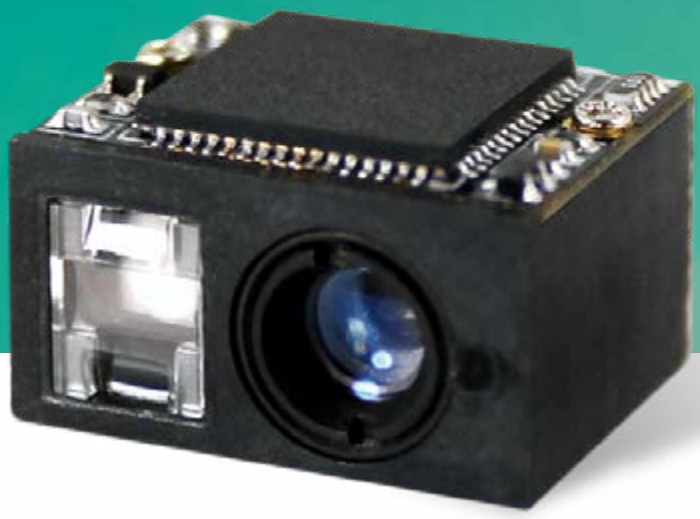
Newland

SCANNING MADE SIMPLE



EM3080-W

OEM scan engine

integration guide

Disclaimer

Please read through the manual carefully before using the product and operate it according to the manual. It is advised that you should keep this manual for future reference.

Do not disassemble the device or remove the seal label from the device, doing so will void the product warranty provided by Fujian Newland Auto-ID Tech. Co., Ltd.

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Revision History

Version	Description	Date
V1.0.0	Initial release.	July 30, 2018
V1.0.1	Added a note in the Host Interface Connector section.	October 31, 2019

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About This Guide

Introduction

The NLS-EM3080-W OEM scan engines (hereinafter referred to as “the EM3080-W” or “the engine”) are armed with CMOS image capturer and the Newland patented UIMG®, a computerized image recognition system-on-chip, featuring fast scanning and accurate decoding on barcodes on virtually any medium-paper, magnetic card, mobile phones and LCD displays. The EM3080-Ws can be easily integrated into OEM equipment or systems, such as handheld, portable, or stationary barcode scanners. EM3080-W also provides re-developed features, including image capture interface, raw data interface and I / O operation interface. Users can easily satisfy their own needs with the SDK provided by Newland.

※ Note: This guide provides general instructions for the installation of the engine into a customer's device. Fujian Newland Auto-ID Tech. Co., Ltd. recommends an opto-mechanical engineer should conduct an opto-mechanical analysis before integration.

Chapter Description

Chapter 1, Getting Started	Gives a general description of the EM3080-W.
Chapter 2, Installation	Describes how to install the engine, including installation information, housing design, optical, grounding, ESD, and environmental considerations
Chapter 3, Specifications	Provides technical specifications for the engine.
Chapter 4, Interface	Provides the definition of interface, connector drawings and timing sequence Diagram.
Chapter 5, Configuration Tools	Introduces useful tools you can use to set up the EM3080-W.

Explanation of Symbols

- This symbol indicates lists of required steps.

※ This symbol indicates something important to the readers. Failure to read the notice will not lead to harm to the reader, device or data.

⚠ Caution: This symbol indicates if the information is ignored, it may result in serious injury to the reader, equipment or data.

Chapter 1 Getting Started

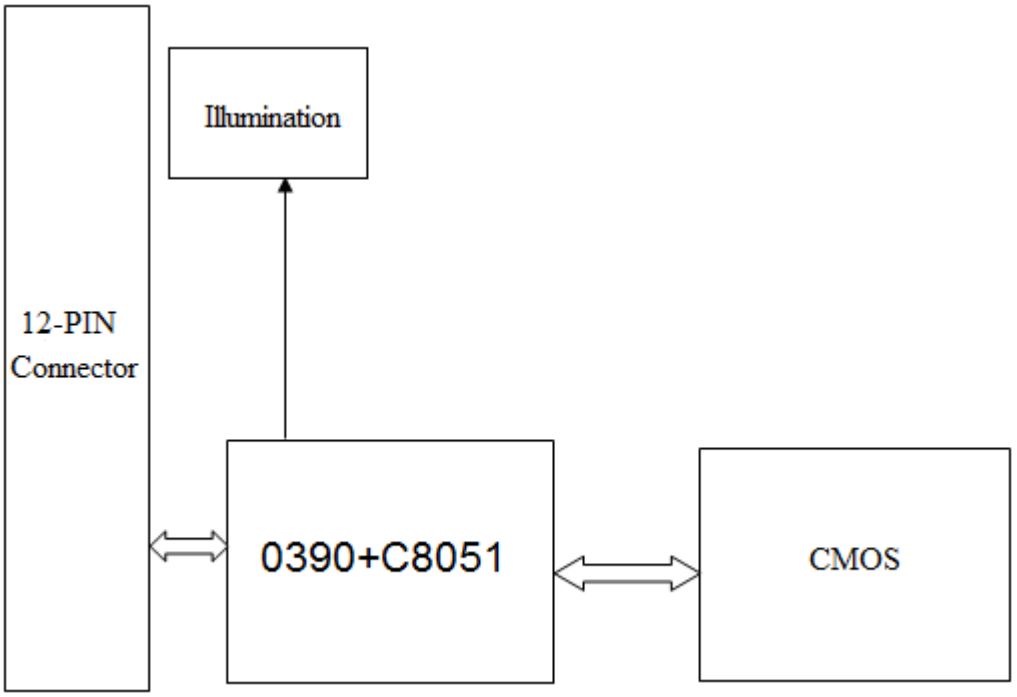
Introduction

The EM3080-W is an area image engine for bar code reading. It includes an LED illumination system.

The EM3080-W includes:

- 1 CMOS imaging sensor
- 1 LED based on illumination system

Figure 1-1 Block Diagram



The engine connected with the host via the 12-pin FPC cable. For more details about the 12-pin FPC cable, please see **12-pin FPC** in Chapter 4.

Illumination

The EM3080-W has 1 white LED for supplementary lighting, making it possible to scan barcodes even in complete darkness. The illumination can be turned On or Off.

Chapter 2 Installation

Introduction

This chapter mainly describes how to install the engine and provides physical and electrical information, cautions and window properties.

⚠ Caution：Do not touch the imaging lens during the installation. Do not leave the fingerprints on the lens.

⚠ Caution：Do not touch the LED when handling to prevent damage to the LED lens.

General Requirements

ESD

ESD protection has been taken into account when designing the EM3080-W and the engine is shipped in ESD safe packaging. Always exercise care when handling the engine outside its package. Be sure grounding wrist straps and properly grounded work areas are used.

Dust and Dirt

The EM3080-W must be sufficiently enclosed to prevent dust particles from gathering on the lens and circuit board. Dust and other external contaminants will eventually degrade the engine's performance.

Ambient Environment

The following environmental requirements should be met to ensure good performance of the EM3080-W.

Table 2-1

Operating Temperature	-20℃ to 50℃
Storage Temperature	-40℃ to 70℃
Humidity	5% ~95% (non-condensing)

Thermal Considerations

Electronic components in the EM3080-W will generate heat during the course of their operation. Operating the EM3080-W in continuous mode for an extended period may cause temperatures to rise on CPU, CIS, LEDs, DC/DC, etc. Overheating can degrade image quality and affect scanning performance. Given that, the following precautions should be taken into consideration when integrating the EM3080-W.

- ✧ Avoid running the engine continuously with LEDs on for long time.
- ✧ Reserve sufficient space for good air circulation in the design.
- ✧ Avoid wrapping the EM3080-W with thermal insulation materials such as rubber.

External optical elements

Do not subject external optical elements on the engine to any external force and avoid holding the engine by an external optical element, which will result in excessive stress and cause failure.

Installation Orientation

The **Figure 2-1** illustrates a front view of the EM3080-W after correct installation.

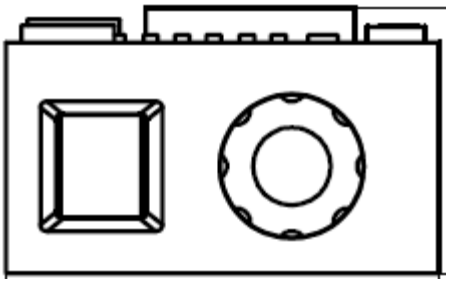


Figure 2-1

Mounting

The illustrations below show the mechanical mounting dimensions for the EM3080-W. The structural design should leave some space between components.

Front View (unit: mm)

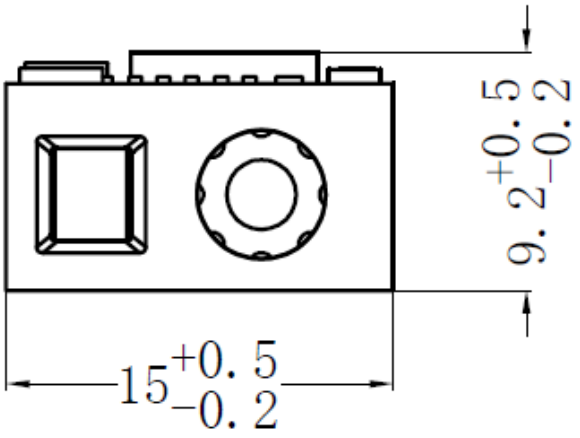


Figure 2-2

Bottom View (unit: mm)

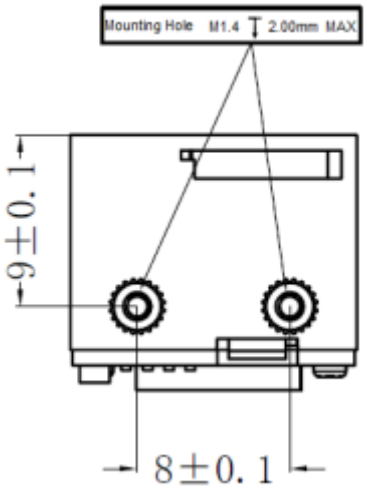


Figure 2-3

Side View (unit: mm)

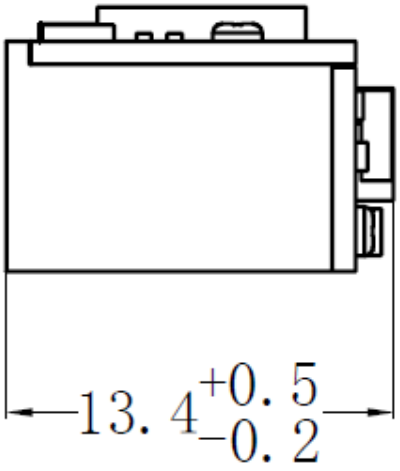


Figure 2-4

Housing Design

※ **Note :** Conduct optical analysis for the housing design to obtain optimal scanning and imaging operation.

Housing design intends to prevent reflections from the aiming and illumination system. Especially reflections from the tilted window can bounce off from the top or the bottom and finally reach the engine. Keep away from the bright objects that can be reflected. Consider baffles or matte-finished dark colors.

Optics

The EM3080-W uses a sophisticated optical system. An improper enclosure window material will have an influence on the performance of the engine.

Window Placement

Properly place the window in order to prevent reflection back into the engine. If the enclosure can't meet the recommended window angle, contact Newland to discuss positioning matters. Improper position will dramatically affect the performance.

There are two alternatives to position the window.

• Parallel - The window should be positioned properly to let the illumination beam pass through as much as possible and no reflections back into the engine.

The window should be mounted close to the front of the engine (parallel). The maximum distance is measured from the front of the engine housing to the farthest surface of the window. In order to reach better reading performance, the distance from the front of the engine housing to the furthest surface of the window should not exceed 3mm and the distance from the front of the engine housing to the nearest surface of the window should be less than 1mm.

For the window distance, please see **Figure 2-5**.

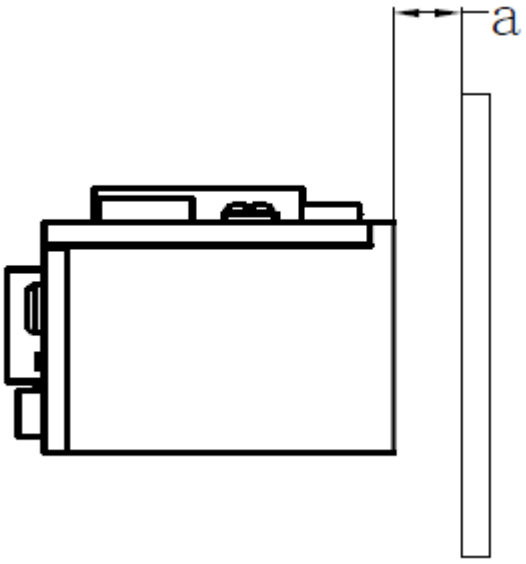


Figure 2-5

• Tilted - This is for laser or imager engines. For the window distance, please see **Table 2-2**.

※ **Note**: Use the parallel or tilted window to read the barcodes. The dust and scratches on the tilted window will result in bad performance in the imaging system.

The window should be positioned properly to let the illumination beams pass through as much as possible and no reflections back into the engine (reflections can degrade the reading performance).

The window should be mounted close to the front of the engine (parallel). The maximum distance is measured from the front of the engine housing to the farthest surface of the window. Avoid unwanted reflections and use thin material for window so as to reach better reading performance.The vertical distance between the farthest surface of the window and the engine front surface should not exceed a + d, and that between the nearest surface of the window and the engine front surface should not exceed a mm (a=1mm, d=2mm).

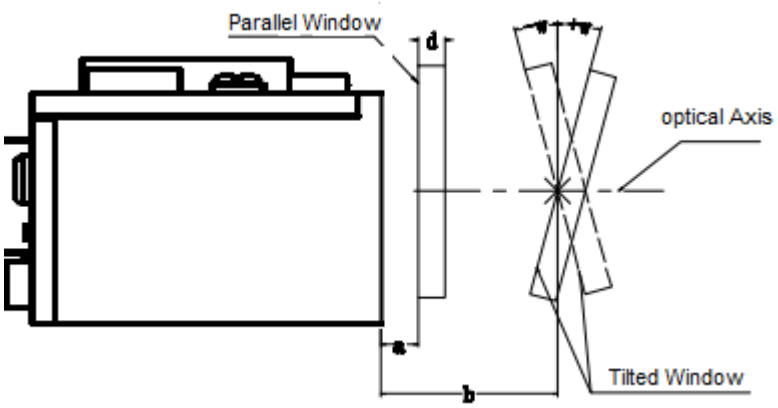


Figure 2-6

Table 2-2

Minimum Angle (Tilted Window)	Distance from Engine Front Surface (b) (Unit:mm)			
	5mm	10mm	15mm	20mm
No coating, minimum window positive tilt（+ w）	56°	50°	45°	40°
No coating, minimum window negative tilt（-w）				
Anti-reflection coating with one side, minimum window positive tilt（+ w）	50°	45°	40°	35°
Anti-reflection coating with one side, minimum window negative tilt（-w）				
Anti-reflection coating with two sides, minimum window positive tilt（+ w）	45°	40°	35°	30°
Anti-reflection coating with two sides, minimum window negative tilt（-w）				

If the window is required to be in a tilted position, the distance requirements above should be met and tilt angle should

ensure that no reflections back into the lens.

Window Material and Color

Many window materials include stresses and distortions, which leads to poor performance. So use only cell-cast plastics or optical glass. There are three common window materials, chemically tempered glass, PMMA and ADC. Below are the recommended window features.

Table 2-3

Feature	Description
Thickness	Generally 0.8-2.0mm
Wavefront Distortion	PV maximum: 0.2λ RMS maximum: 0.04λ
Clear Aperture	To extend the area within 1.0mm
Surface	60-20 scratch/dig

Consider the wavefront distortion when using plastic materials.

Plastic materials are not recommended if the window is designed as tilted, because scratches will reduce the performance. If the motion detection mode is needed, colored windows are not recommended as well.

Wavelength of the illumination and aiming light should be taken into consideration when choosing window material and color, in order to achieve the possible highest spectral transmission, lowest haze level and homogeneous refractive index. It is suggested to use PMMA or optical glass with spectral transmittance of red light over 90% and haze less than 1%. Whether to use an anti-reflection coating or not depends on the material and application needs.

PMMA

PMMA is made by casting acrylic between two sheets of glass. It obtains the advtanges of high quality, good impact resistance and low cost, while it is soft and brittle. Polysiloxane coating is recommended to avoid attack from stresses. Acrylic is enabled to be cut into kinds of shapes and welded ultrasonically.

ADC

ADC obtain good chemical and environmental resistance and impact resistance. Because of its hardness, coating is not required except some terrible circumstances. Ultrasonical welding is not allowed..

Chemical Tempering Glass

Glass offers optimal scratch and abrasion resistance. But, unannealed glass is easily broken. Chemical tempering can greatly enhance its flexibility. Glass is hard to be cut into different shapes and can't be ultrasonically welded.

Coatings

Anti-reflection coatings

Anti-reflection coatings are applied for stray light control. The window with anti-reflection coatings can minimize influence caused by the reflection. But they have high cost and terrible abrasion and scratch resistance.

Polysiloxane Coating

Polysiloxane coatings are used to prevent plastic surfaces from scratch and abrasion.

The specifications below are available if anti-reflective coating is applied. Polysiloxane coating is not needed.

Table 2-4

Specifications	Description
Material	Exit windows made of tempered glass or plastic can be AR coated. The AR coated glass features better adhesion. What's more, putting AR coating on the glass is more cost-effective.
Anti-reflection Coating	Single side: the minimum transmittance is 92% within spectrum range from 420 nm to 730 nm. Double side: the minimum transmittance is 97% within spectrum range from 420 nm to 730 nm. For more details about parallel windows, please see **Figure 2-6**.

Scratch Resistance and Coating

Scratch on the window can greatly reduce the performance of the EM3080-W. It is suggested to use abrasion resistant window material or coating.

Window Size

The window must not block the field of view and should be sized to accommodate the illumination envelope shown below.

Optical areas for illumination

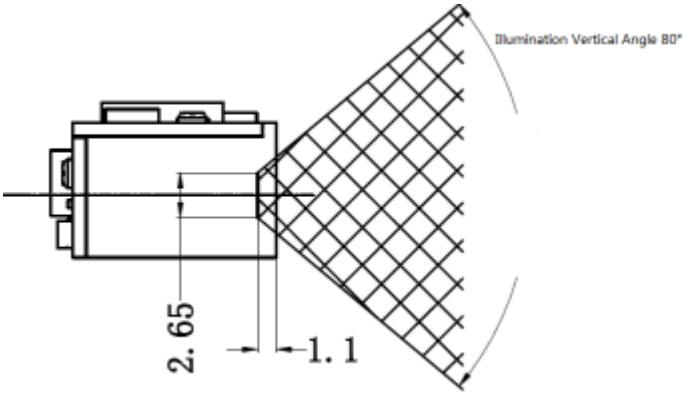


Figure 2-7

Optical Area of Lens

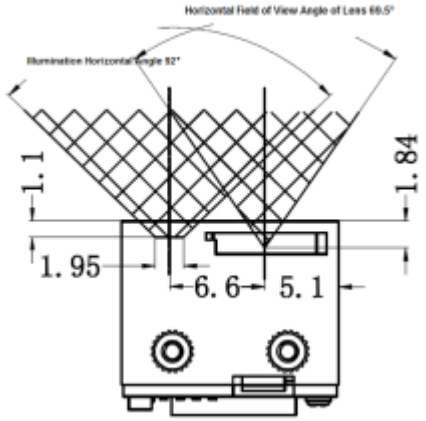


Figure 2-8

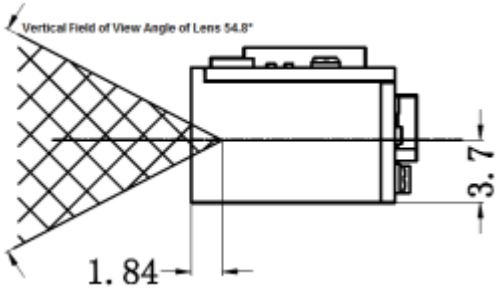


Figure 2-9

Ambient Light

The EM3080-W shows better performance with ambient light. However, high-frequency pulsed light can result in performance degradation.

Eye Safety

The EM3080-W has no lasers. It uses LEDs to produce illumination and aiming beams. The LEDs are bright, but testing has been done to demonstrate that the engine is safe for its intended application under normal usage conditions. However, the user should avoid looking into the beam.

Chapter 3 Electrical Specifications

Power Supply

Do not power up the EM3080-W until it is properly connected. Be sure the power is cut off before connecting a flexible cable to or disconnecting a flexible cable from the host interface connector. Hot-plugging could damage the engine.

Unstable power supply or sharp voltage drops or unreasonably short interval between power-ons may lead to unstable performance of the engine. Do not resupply the power immediately after cutting it off. It is advised that the minimum interval should exceed 500ms.

The EM3080-W itself does not provide a power switch. Users can switch the engine off by cutting off the power. Switching it on and off frequently will not shorten the service life of the EM3080-W.

The EM3080-W's start-up time is less than 200ms.

Ripple Noise

Image sensor and decoder chip are directly fed by the input power of EM3080-W. To ensure the image quality, a power supply with low ripple noise is needed.

Acceptable ripple range (peak-to-peak) : ≤50mV (≤30mV recommended).

DC Characteristics

Operating Voltage

Table 3-1 （T=23℃）

Parameter	Description	Minimum	Typical	Maximum	Unit
V_{DD}	Voltage Drain	3.0	3.3	3.6	V
V_{IH}	High Level Input Voltage	0.7*V_{DD}	-	-	V
V_{IL}	Low Level Input Voltage	-	-	0.2*V_{DD}	V
V_{OH}	High Level Output Voltage	0.9*V_{DD}	-	-	V
V_{OL}	Low Level Output Voltage	-	-	0.1*V_{DD}	V

Operating Current

Table 3-2

Operating Current	Sleep Current	Unit
55.1 (typical) 100.5 (max.)	3.5	mA

I/O Operation

Table 3-3

VDD=3.3 V, VSS=0 V, T=23°C

Parameter	Minimum	Maximum	Unit
VIL	-0.3	0.8	V
VIH	2.0	3.6	V
VOL	VSS	0.4	V
VOH	2.4	VDD	V

Technical Specifications

Please search the Newland website or contact the sales for technical specifications.

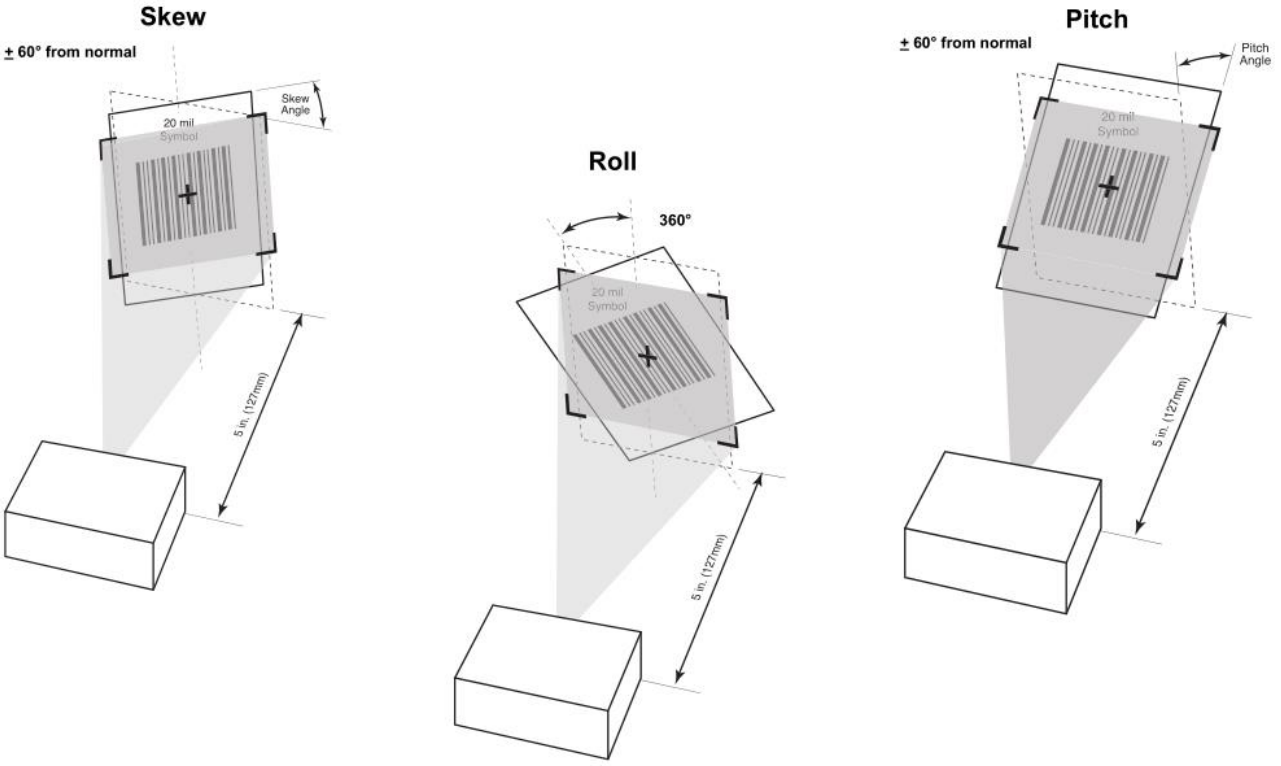

Skew
± 60° from normal
Skew Angle
20 mil Symbol
5 in. (127mm)
Roll
360°
20 mil Symbol
5 in. (127mm)
Pitch
± 60° from normal
Pitch Angle
20 mil Symbol
5 in. (127mm)

Figure 3-1

Chapter 4 Interfaces

Host Interface Connector

Note: Due to the limited space, TVS can't be added to the EM30 for static protection. The client should take static protection into consideration.

The host interface connector on the EM3080-W is a 12-pin FPC connector.

The 12-pin FPC connector supports TTL-232 and USB communication.

The following figure shows the location of the 12-pin FPC on the decoder board.

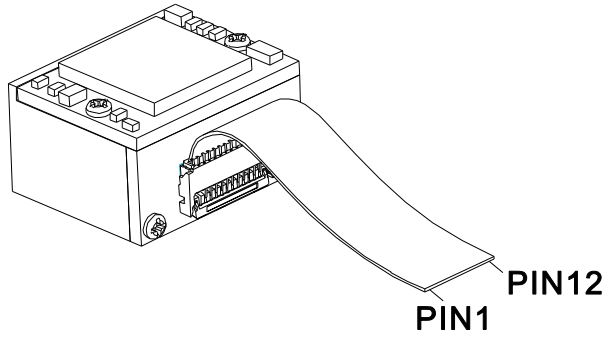


Figure 4-1

12-pin FPC

The following table lists the pin functions of the 12-pin host interface connector.

Table 4-1

PIN#	Signal	I/O	Function
1	-	-	Not connected.
2	VDD	-	3.3V power supply.
3	GND	-	Power-supply ground.
4	RXD	I	TTL level 232 receive data.
5	TXD	O	TTL level 232 transmit data.
6	USB_D-	I/O	USB D- differential data signal
7	USB_D+	I/O	USB D+ differential data signal

8	-	-	Not connected.
9	BUZZ	O	Beeper output.
10	VIB	O	LED output: When using this signal, a driver circuit is needed to drive an external LED.
11	RESET	I	Reset signal input: Active low. Driving this pin low for 100us resets the engine.
12	TRIG	I	Trigger signal input: Driving this pin low for 50ms causes the engine to start a scan and decode session.

※ 1 Beeper output statuses.

a. Power on beep: When powered on, PWM signal output will occur 200ms later and last for 350ms. The frequency is 1.67~2.5khz Khz.The duration is regular. The beep can be programmed On or Off. For more details, please see the EM3080-W user guide.

b. Good read beep: PWM output will occur after successful decode. The default duration and the frequency are respectively 80ms and 2.46Khz. These parameters can be programmed. For more details, please see the EM3080-W user guide.

c. For beeper driver circuit, please see **Beeper** in Chapter 4.

d. If this pin is not used, leave it unconnected.

※ 2 Good read LED

a. The low level output will occur after successful decode. The default duration is 220ms. The length of time can be programmed. For more details, please see the EM3080-W user guide.

b. For LED driver circuit, please see **Good Read LED** in Chapter 4.

c. If this pin is not used, leave it unconnected.

※ 3 There are two kinds of trigger signal input statuses.

a. Level trigger: A trigger pull keeps level low to activate a decode session until a barcode is decoded.

b. Pulse trigger: When a trigger is pulled and released, scanning is activated until a barcode is decoded or the decode session timeout expires.

c. For trigger driver circuit, please see **Trigger** in Chapter 4.

Dimensions of the Connector

The EM3080-W uses a 12-pin FPC connector.

12-pin FPC Connector

The EM3080-W uses a 12-pin ZIF connector (bottom contact). This connector can be connected to a host device with an FFC cable. Parameters are shown as below.

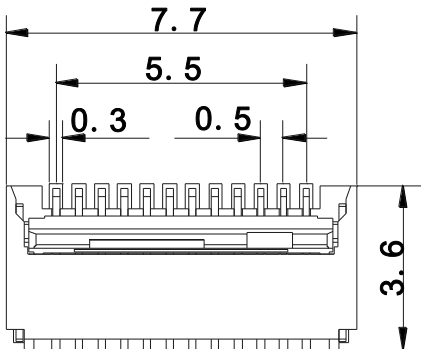


Figure 4-2

FFC Cable (unit: mm)

A 12-pin FFC cable (contacts on the same side or on opposite sides) can be used to connect the EM3080-W to a host device. The cable design must be consistent with the specifications shown below. Use reinforcement material for the connectors on the cable and reduce cable impedance for reliable connection and stable performance.

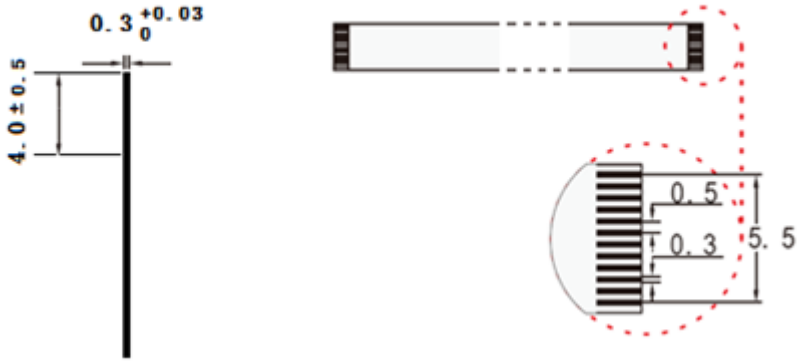


Figure 4-3

Timing Sequence

Power Up and Power Down Timing Sequence

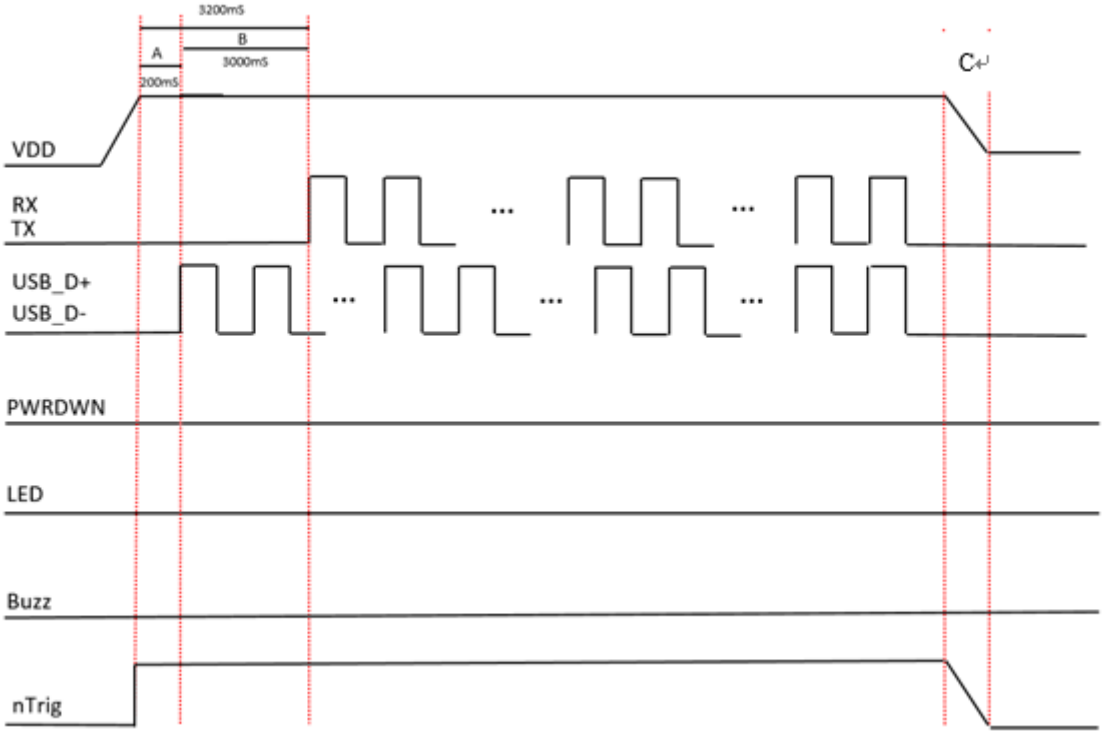


Figure 4-4

1. A represents reset time, about 200ms.

2. B represents time for starting the engine. The total is A plus B, about 3200ms. The engine can receive serial commands or USB communication immediately when it is powered on.

3. C is the power-down time, indicating all the voltages' drop time in the module, that is, the communication is stopped and the level is low. In order to ensure the voltage is fully down and the level of each interface is low, at least 700ms interval is required to start the engine again.

External Circuit

Good Read LED

The Figure below lists the Good Read LED driver circuit. The nGoodRead signal is from the pin 10.

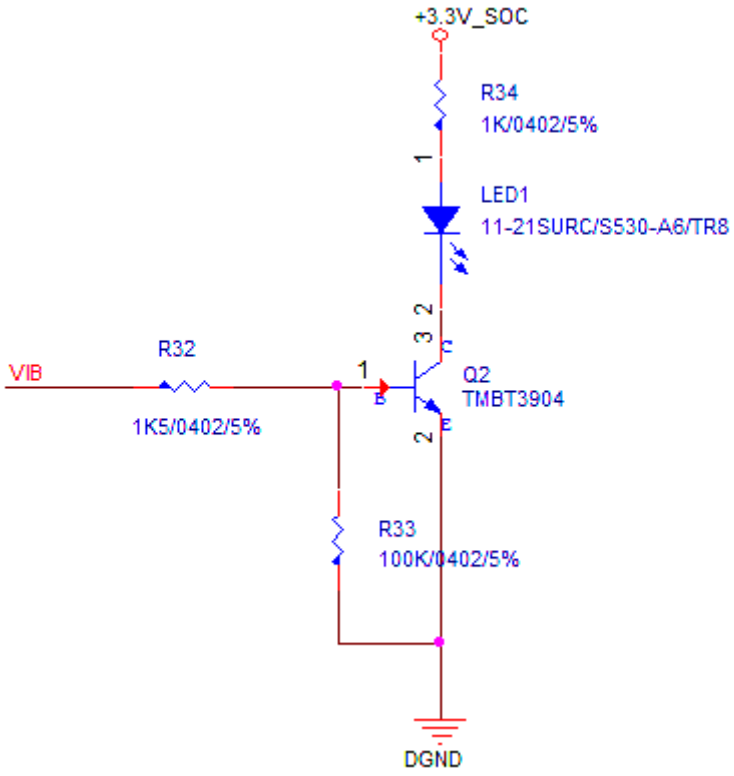


Figure 4-5

Beeper

The Figure below lists the Beeper driver circuit. The nBEEPER signal is from the pin 9.

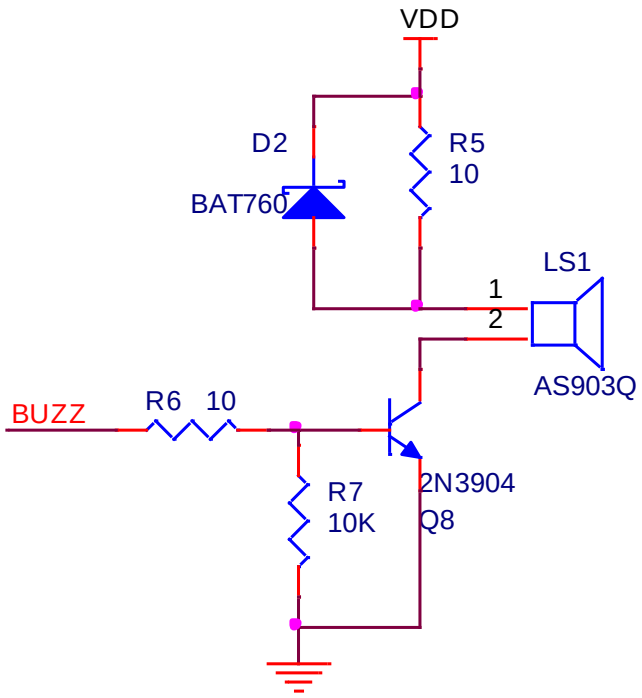


Figure 4-6

Trigger

The Figure below lists the Trigger driver circuit. The nTRIG signal is from the pin 12.

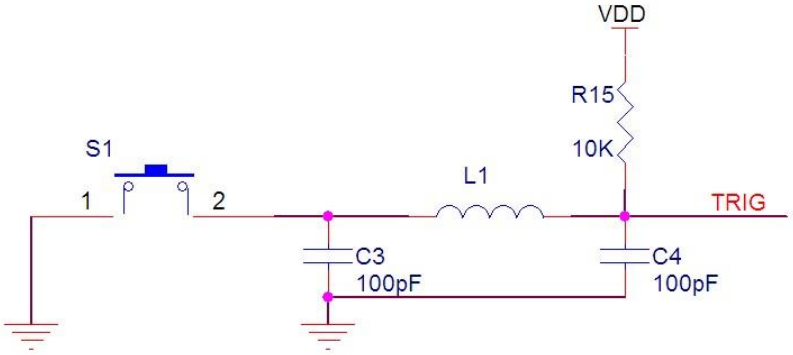


Figure 4-7

Chapter 5 Configuration Tools

There are two configuration tools which support application development for the EM3080-W. They can meet the needs of rapid assessment and development and functional configuration.

EVK

The supplied EVK tool can assist users in application development for the EM3080-W. EVK contains Beeper, Beeper driver circuit, LED, LED driver circuit, Trigger key, Reset key, RS-232 interface and USB interface. You can connect the EVK with the EM3080-W via the 12-PIN FFC cable and connect the EVK to PC via a USB connection or an RS-232 connection.

EasySet

EasySet, developed by Fujian Newland Auto-ID Tech. Co., Ltd., is a Windows-based configuration tool. Connect the Easyset with the EM3080-W, enabling users to gain access to decoded data and captured images and to configure the engine.

Newland

SCANNING MADE SIMPLE

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