Newland

NLS-EM3080 V2

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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Fujian Newland Auto-ID Tech. Co., Ltd.
3F, Building A, No.1, Rujiang West Rd., Mawei, Fuzhou, Fujian, China 350015
http://www.newlandaidc.com

Revision History

Version	Description	Date
V1.0.0	Initial release.	November 21, 2018

Table of Contents

About This Guide

Introduction

The NLS-EM3080 V2 OEM scan engines (hereinafter referred to as “the EM3080 V2” 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 V2 can be easily integrated into OEM equipment or systems, such as handheld, portable, or stationary barcode scanners. The EM3080 V2 offers fully open image acquisition interface, raw data interface and I/O interface, which enable users to easily develop their own applications with Newland’s SDK.

※ 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 V2.
Chapter 2, Installation	Describes how to install the engine, including installation information, housing design, optical, grounding, ESD, and environmental considerations.
Chapter 3, Electrical Specifications	Lists the electrical characteristics for the engine.
Chapter 4, Interfaces	Includes interface pinout, connector specifications and timing sequences.
Chapter 5, Auxiliary Tools	Introduces useful tools you can use to test and evaluate the EM3080 V2 as well as conduct secondary development.

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.

⚠ This symbol indicates caution that, if ignored, may cause data or device damage or even personal injury.

Related Documents

- 12-pin FFC connector specification, Xiamen Mos Electronic Technology Co., Ltd, Model:0.5-23-12PBX-P, http://www.fjmos.com/.

Chapter 1 Getting Started

Introduction

The EM3080 V2 is an area image engine for barcode reading.

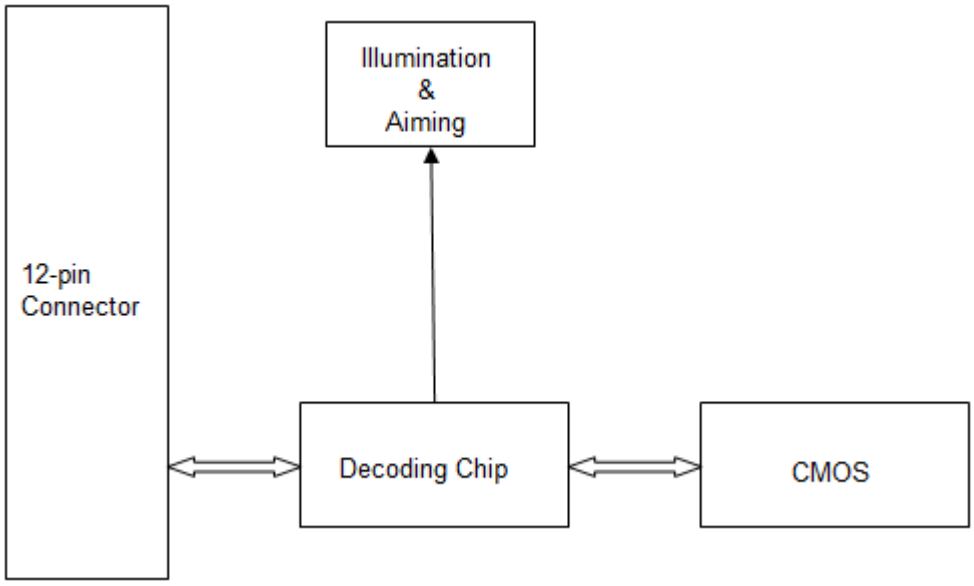
LED Compliance Statement

The EM3080 V2 complies with IEC 62471:2006 for LED safety.

The EM3080 V2 contains:

- a CMOS image sensor and its lens
- 1 LED for illumination and aiming

Figure 1-1 System Block Diagram



The 12-pin FFC connector on the engine can be connected to a host device with an FFC cable. For information about this cable, please see the “12-pin FFC Cable” section in Chapter 4.

Illumination & Aimer

The EM3080 V2 uses one red LED for supplementary lighting and to produce a square-shaped aiming pattern to help the

user to position the target barcode within the engine’s field of view. The illumination can be programmed On or Off.

The EM3080 V2 uses the red LED for illumination, so the engine shows better reading performance on barcodes printed in non-red colors. For applications involving red barcodes, it is advised to use non-red supplementary lighting (such as green). The user can conduct some tests to determine the proper wavelengths to be used.

Chapter 2 Installation

Introduction

This chapter explains how to install the EM3080 V2, including general requirements, housing design, and physical and optical information.

⚠ Caution: Do not touch the imaging lens when installing the engine. Be careful not to leave fingerprints on the lens.

⚠ Caution: Do not touch the illumination LED during handling. Improper handling may damage the LED.

General Requirements

ESD

ESD protection has been taken into account when designing the EM3080 V2. However, due to limited board space, additional ESD protection, such as TVS protection, is not provided on the engine's I/O interface. It is advised to take corresponding protection measures when integrating the engine.

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 V2 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 V2.

Table 2-1

Operating Temperature	-20℃ to 60℃
Storage Temperature	-40℃ to 70℃
Humidity	5% ~95% (non-condensing)

Thermal Considerations

Electronic components in the EM3080 V2 will generate heat during the course of their operation. Operating the EM3080 V2 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 V2.

- ✧ Avoid continuous use of the LED for prolonged periods.
- ✧ Reserve sufficient space for good air circulation in the design.
- ✧ Avoid wrapping the EM3080 V2 with thermal insulation materials such as rubber.

External Optical Elements

Do not subject external optical components on the engine to any external force. Do not hold the engine by an external optical component, which may cause the mechanical joints that secure the components to crack or break due to excessive stress.

Installation Orientation

The **Figure 2-1** illustrates a front view of the EM3080 V2 after correct installation.

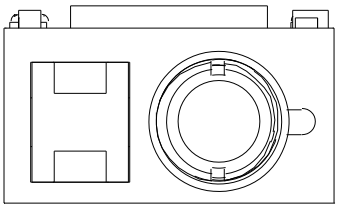


Figure 2-1

Mounting (Unit: mm)

The illustrations below show the mechanical mounting dimensions for the EM3080 V2. The structural design should leave some space between components and reserve sufficient room for the installation of the FFC cable.

Front View

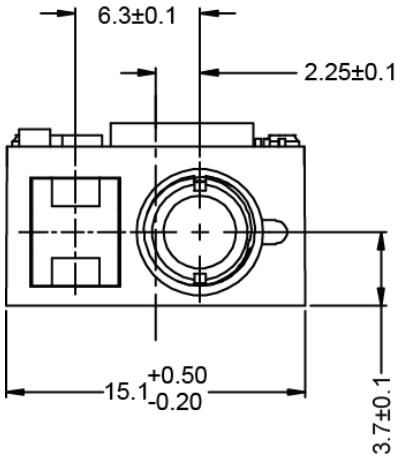


Figure 2-2

Bottom View

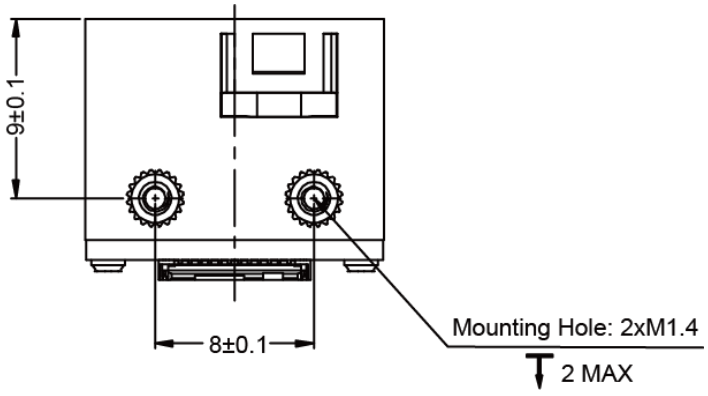


Figure 2-3

Side View

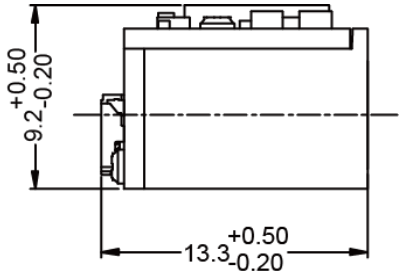


Figure 2-4

Housing Design

※ Note: Conduct an optical analysis for the housing design to ensure optimal scanning and imaging performance.

Housing design should make sure that internal reflections from the aiming and illumination system are not directed back to the engine. The reflections from the housing or window can cause problems. For particular window tilt angles, the unwanted reflections can bounce off the top or bottom and reach the engine. Avoid any highly reflective objects around the engine that can cause bright spots to appear in the captured image. It is recommended to use baffles or matte-finished dark internal housing colors.

Optics

The EM3080 V2 uses a sophisticated optical system. An improperly designed internal housing or improper selection of window material can degrade the engine's performance.

Window Placement

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

There are two window placement options.

• **Parallel window** – Primary option for imager engines. The following window distance requirements should be satisfied: The maximum distance is measured from the front of the engine housing to the furthest surface of the window. In order to reach better reading performance, the distance from the front of the engine housing to the nearest surface of the window should not exceed **a** (a=1mm) and the distance from the front of the engine housing to the furthest surface of the window should not exceed **a+d** (a=1mm, d=2mm), as shown in **Figure 2-5**.

• **Tilted window** – This is not recommended. For the tilted window distance requirements, please see **Table 2-2**.

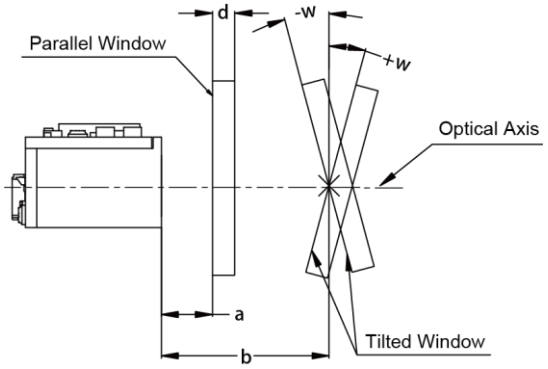


Figure 2-5

Table 2-2

Minimum Angle (Tilted Window)	Distance from the front of the engine housing (b)			
	5mm	10mm	15mm	20mm
Uncoated, minimum window positive tilt (+w)	30°	28°	26°	25°
Uncoated, minimum window negative tilt (-w)				
Anti-reflection coated, single side, minimum window positive tilt (+w)	26°	24°	22°	20°
Anti-reflection coated, single side, minimum window negative tilt (-w)				
Anti-reflection coated, double sides, minimum window positive tilt (+w)	22°	20°	18°	18°
Anti-reflection coated, double sides, minimum window negative tilt (-w)				

Window Material and Color

Window material must be clear. Use only cell-cast plastics or optical glass. PMMA, ADC and chemically tempered glass are recommended. Window material selected for the engine should meet or exceed the specifications specified in **Table 2-3**.

- **PMMA (Cell-cast acrylic):** When fabricated by cell-casting, has very good optical quality and low initial cost, but surface must be protected from the environment due to its susceptibility to attack by chemcials, mechanical stresses, and UV light. Reasonably good impact resistance. This material can be laser-cut into odd shapes and ultrasonically welded.
- **ADC (CR-39):** A thermal-setting plastic produced by the cell-casting process. Excellent chemical and environmental resistance. Quite good surface hardness, and therefore does not have to be hard-coated. Reasonably good impact resistance. This material cannot be ultrasonically welded.
- **Chemically tempered glass:** Glass is a hard material which provides excellent scratch and abrasion resistance. But unannealed glass is brittle. Increased flexibility strength with minimal optical distortion requires chemical tempering. Glass is hard to be cut into odd shapes and cannot be ultrasonically welded.

Table 2-3

Specification	Description
Spectral Transmittance	≥90%
Thickness	0.8-2.0mm
Wavefront Distortion	PV maximum: 0.2λ RMS maximum: 0.04λ
Clear Aperture	1.0mm to edges
Surface Quality	60-20 scratch/dig

Pay extra attention to the wavefront distortion when using plastic materials. Plastic materials are not recommended for tilted windows; colored windows are not recommended if the engine is used to scan barcodes on moving objects.

Coatings and Scratch Resistance

Scratch on the window can greatly reduce the performance of the EM3080 V2. It is suggested to use abrasion resistant window material or coating.

The following introduces two commonly-used types of coatings:

- **Anti-reflection coatings:** Anti-reflection (AR) coatings can be applied to window surfaces to reduce reflected light from the window back into the engine. But they are expensive and have poor abrasion/scratch resistance.
- **Polysiloxane coatings:** Polysiloxane coatings can be applied to plastic surfaces to increase the surfaces' abrasion and scratch resistance.

Both tempered glass and plastic windows can be AR coated. However, it is easier and more cost-effective to put an AR coating on the glass than on the plastic.

The AR coating specifications below should be met when using an AR coated window.
Single side AR coating: 92% minimum transmittance within spectrum range from 420 nm to 730 nm.
Double side AR coating: 97% minimum transmittance within spectrum range from 420 nm to 730 nm.

Window Size

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

Horizontal:

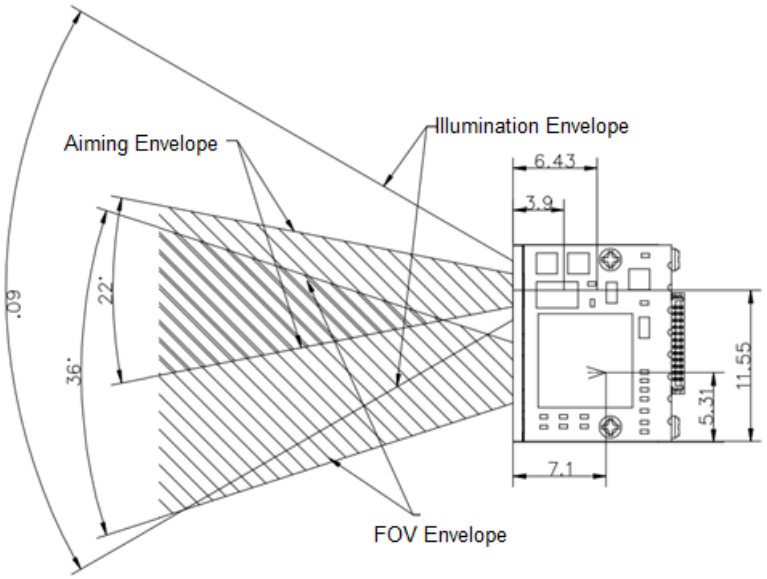


Figure 2-6

Vertical:

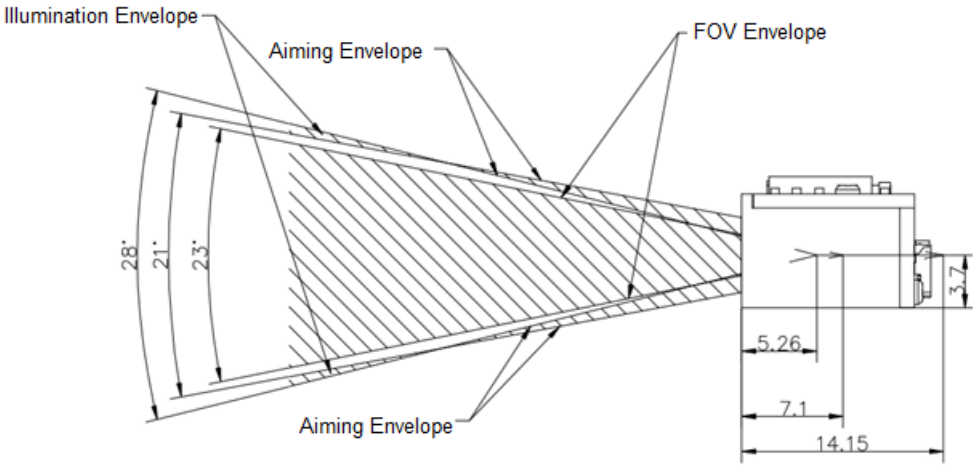


Figure 2-7

Roll, Skew and Pitch

Three different reading angles, roll, skew and pitch are illustrated in **Figure 2-8**. Roll refers to rotation around the Z axis, skew to rotation around the X axis and pitch to rotation around the Y axis. For the engine's technical specifications, please visit the Newland website or contact your dealer.

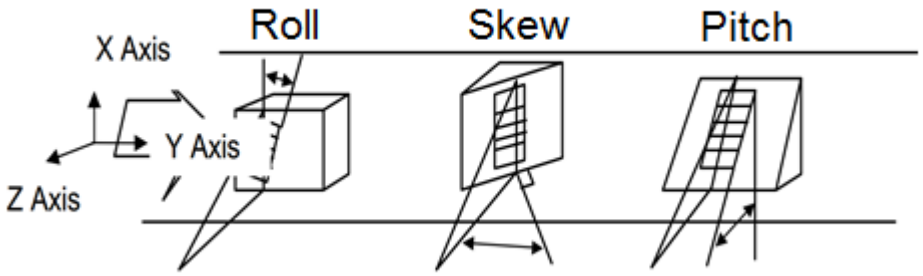


Figure 2-8

Ambient Light

The EM3080 V2 shows better performance with ambient light. However, high-frequency pulsed light can result in performance degradation.

Eye Safety

The EM3080 V2 has no lasers. It uses one LED to produce illumination and aiming beams. The LED is 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 V2 until it is properly connected. Be sure the power is cut off before connecting a cable to or disconnecting a 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.

Ripple Noise

To ensure the image quality, a power supply with low ripple noise is needed.

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

DC Characteristics

Operating Voltage / Current

Table 3-1

T=23°C

Parameter	Description	Minimum	Typical	Maximum	Unit
Operating Voltage	VIN (12-pin FFC Connector)	3.0	3.3	3.6	V
Current (@3.3V)	Operating Current	-	85	124	mA
	Idle Current	-	1	-	mA

I/O Voltage

Table 3-2

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

Timing Sequence

Power Up and Power Down Timing Sequence

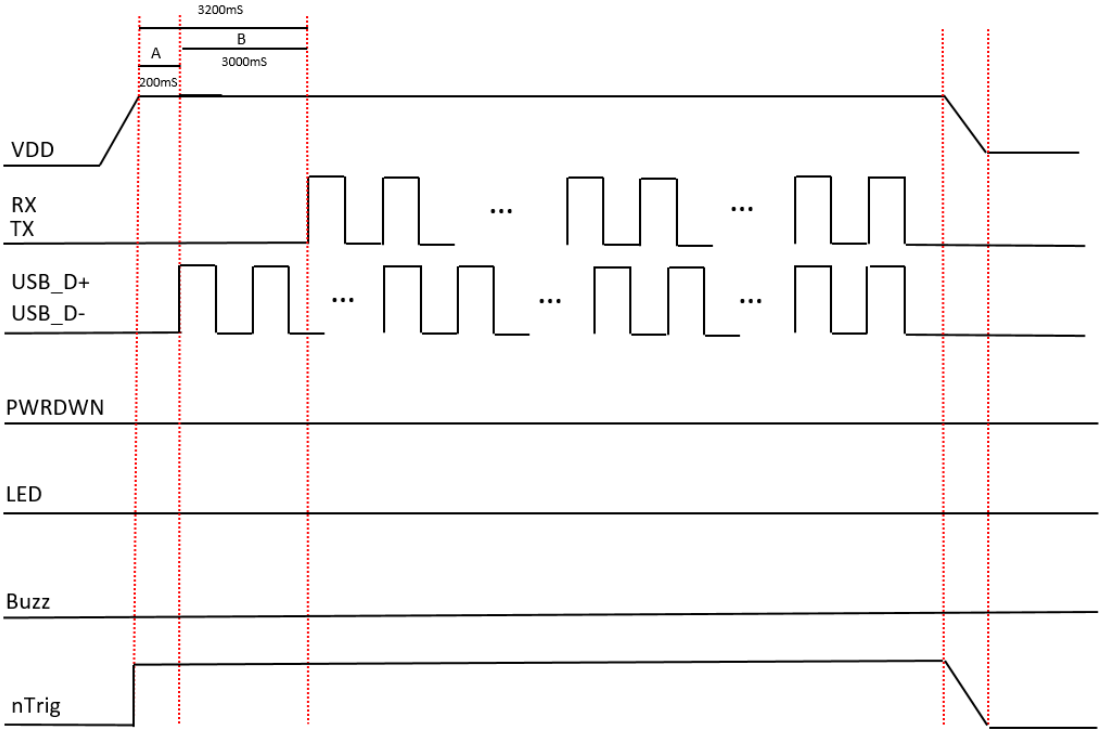


Figure 3-1

1. In the diagram above, it takes **A+B** (about 3200ms) for the engine to power up: **A** is reset time (about 200ms), **B** is time needed to start the engine. The engine is ready to receive commands via its serial/USB port after the power-up sequence completes.
2. **C** is the time it takes to power down the engine (during power-down, all voltages in the engine ramp down, with all communication stopped and all signals at a low level). To ensure that all voltages are fully down and signals on the interfaces at a low level, the minimum interval between removing and resupplying the power must exceed 700ms.

Chapter 4 Interfaces

Interface Pinouts

The physical interface of the EM3080 V2 consists of 12-pin FFC connector:

- 12-pin FFC connector can be used as TTL-232 interface or USB interface.

The figure below illustrates the positions of 12-pin FFC connector on the EM3080 V2's decoder board, as well as the pin layout of the FFC connector.

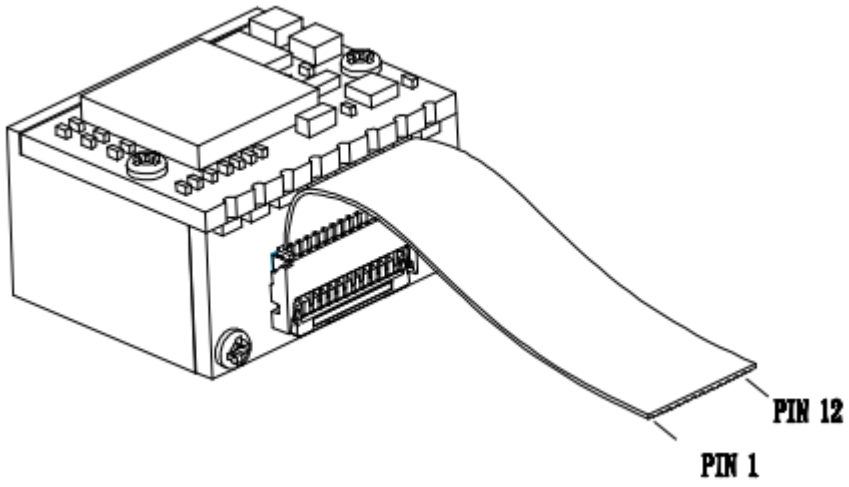


Figure 4-1

12-pin FFC Connector

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

Table 4-1

PIN#	Signal	I/O	Function	Remark
1	NC	-	Unconnected	
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	NC	-	Unconnected	
9	BUZZ	O,od	Beeper output	See Note 1
10	NC	-	Unconnected	
11	NC	-	Unconnected	
12	TRIG	I	Trigger signal input	See Note 2

※ I = Input; O = Output; od = Open Drain.

※ 1 This output signal can be used by an external beeper circuit to generate audible feedback to the user to indicate power-on and good read statuses.

Power On beep: The BUZZ pin (PIN 9) produces a PWM output (duration: 350ms; frequency: 1.67~2.5khz, both parameters are **NOT** user-programmable) 200ms after power-on. The beep can be programmed On or Off. To learn how to program the parameter, please see the EM3080 V2 user guide.

Good Read beep: The BUZZ pin (PIN 9) produces a PWM output (default duration: 80ms; default frequency: 2.46Khz, both parameters are user-programmable) when a good read occurs. The beep can be programmed On or Off. To learn how to program these parameters, please see the EM3080 V2 user guide.

For the external beeper circuit design, please see the “Beeper Circuit” section in this chapter. If the BUZZ pin is not used, leave it unconnected.

※ 2 This external trigger signal is level trigger.

A trigger pull (i.e. driving the TRIG pin low for over 10ms) activates a decode session. The decode session continues until a barcode is decoded or the trigger is released.

For the external trigger circuit, please see the “Trigger Circuit” section in this chapter. If the TRIG pin is not used, leave it unconnected.

Connector/Cable Specifications (Unit: mm)

The EM3080 V2 is equipped with a 12-pin FFC connector.

12-pin FFC Connector

The 12-pin FFC connector on the EM3080 V2 is a Xiamen Mos Electronic Technology Co., LTD FFC connector (Model No.: 0.5-23-12PBX-P).

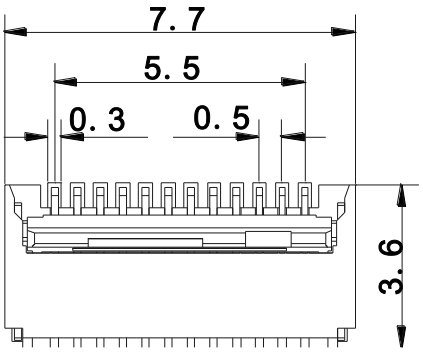


Figure 4-2

12-pin FFC Cable

A 12-pin cable can be used to connect the engine's 12-pin FFC connector to a host device.

Unit:mm

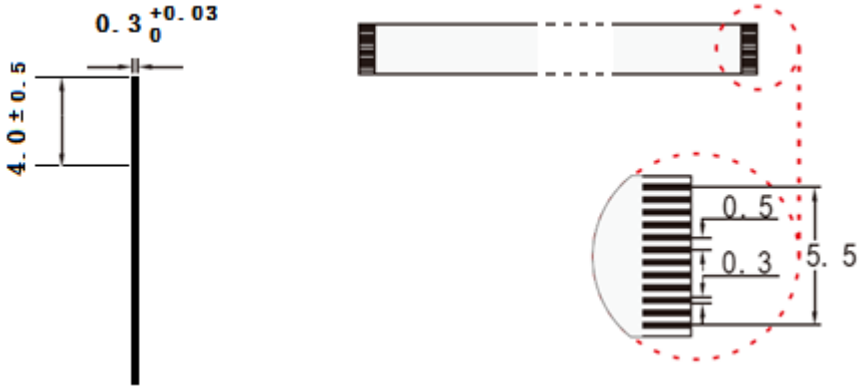


Figure 4-3

External Circuit Design

Beeper Circuit

The circuit below is used to drive an external beeper. The nBUZZ signal is from PIN 9 of the 12-pin FFC connector.

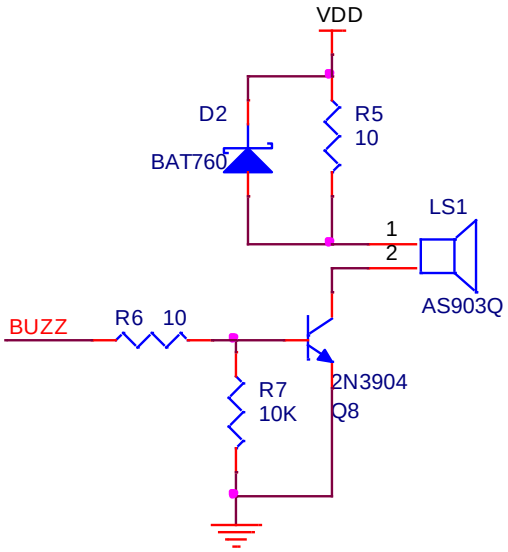


Figure 4-4

Trigger Circuit

The circuit below is used to provide the engine with a signal to trigger a scan and decode session. The TRIG signal is from PIN 12 of the 12-pin FFC connector.

Users can adjust the external circuit and its function as per actual needs, on condition that the external circuit matches the internal circuit.

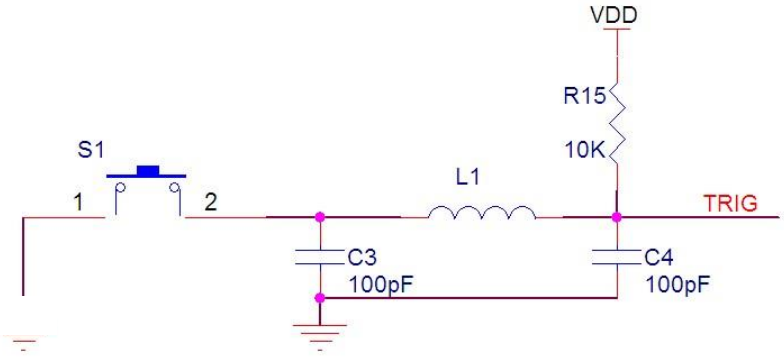


Figure 4-5

Chapter 5 Auxiliary Tools

The EM3080 V2 provides the following tool to assist users in engine performance evaluation, application development and engine configuration.

EVK

The EVK is provided to help users to test and evaluate the EM3080 V2, which contains beeper & beeper driver circuit, trigger & reset buttons, TTL-232 to RS-232 converter & TTL-232 to USB converter, RS-232 & USB interfaces, etc. The EM3080 V2 can be connected to the EVK via a 12-pin FFC cable type 1 (contacts on the same side). Either USB connection or RS-232 connection can be used when connecting the EVK to a host device.

Newland Auto-ID Tech. Co., Ltd.
(Headquarters)
3F, Building A, No.1, Rujiang West Rd., Mawei, Fuzhou, Fujian, China 350015
Tel: +86 - (0) 591-83978605
Fax: +86 - (0) 591-83979216
E-mail: contact@nlscan.com
Web: www.newlandaidc.com

Newland Europe BV
Rolweg 25, 4104 AV Culemborg, The Netherlands
Tel: +31 (0) 345 87 00 33
Fax: +31 (0) 345 87 00 39
Email: info@newland-id.com
Web: www.newland-id.com
Tech Support: tech-support@newland-id.com

Newland North America Inc.
46559 Fremont Blvd., Fremont, CA 94538, USA
Tel: 510 490 3888
Fax: 510 490 3887
Email: info@newlandna.com
Web: www.newlandamerica.com

Newland Latin America
Tel: +1 (239) 598 0068
Fax: +1 (239) 280 1238
Email: info@newlandla.com
Web: www.newlandamerica.com

Newland Taiwan Inc.
7F-6, No. 268, Liancheng Rd., Jhonghe Dist. 235, New Taipei City, Taiwan
Tel: +886 2 7731 5388
Fax: +886 2 7731 5389
Email: info@newland-id.com.tw
Web: www.newland-id.com.tw

Newland Korea
Biz. Center Best-one, Jang-eun Medical Plaza 6F, Bojeong-dong 1261-4, Kihung-gu, Yongin-City, Kyunggi-do, South Korea
Tel: +82 10 8990 4838
Fax: +82 70 4369 0009
Email: th.sung@newland-id.com.tw
Web: www.newlandaidc.com/kor/