Newland

NLS-EM20

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 24, 2015
V1.0.1	1. Deleted the “Ambient Environment” section in Chapter 2. 2. Modified the “Operating Voltage” and “Operating Current” sections in Chapter 3.	November 20, 2016

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Chapter 1 Introduction

Overview

The EM20 OEM scan engine, armed with the Newland patented UIMG®, a computerized image recognition system, brings about a new era of 2D barcode scan engines.

The EM20's 2D barcode decoder chip ingeniously blends UIMG® technology and advanced chip design & manufacturing, which significantly simplifies application design and delivers superior performance and solid reliability with low power consumption.

The EM20 supports all mainstream 1D as well as PDF417, QR Code (QR1, QR2, Micro QR), Data Matrix and GS1-DataBar™(RSS) (Limited/ Stacked/ Expanded versions).

Illumination

The EM20 has four white LEDs for supplementary lighting. The illumination can be programmed On or Off.

Aimer

The EM20 does not have an aimer. Barcodes presented at supported scan angles and within supported scan distances are to be read.

Chapter 2 Installation

General Requirements

ESD

ESD protection has been taken into account when designing the EM20 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 EM20 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.

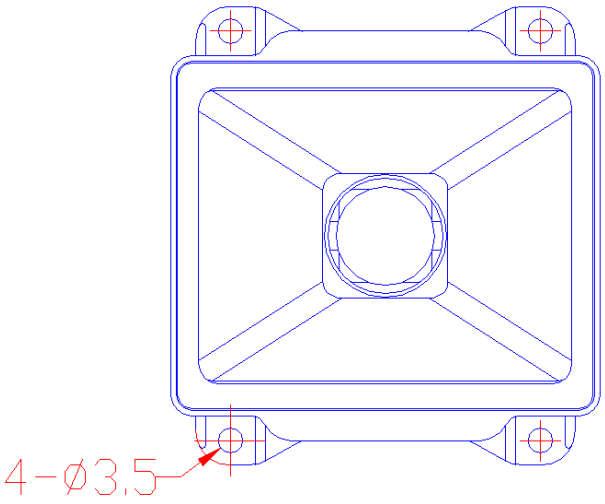
Thermal Considerations

Electronic components in the EM20 will generate heat during the course of their operation. Operating the EM20 in continuous mode for an extended period may cause temperatures to rise on CIS and decoder chip. Overheating can degrade image quality and affect scanning performance. Given that, the following precautions should be taken into consideration when integrating the EM20.

- ✧ Reserve sufficient space for good air circulation in the design.
- ✧ Avoid wrapping the EM20 with thermal insulation materials such as rubber.

Installation Orientation

There is a threaded mounting hole at each of the EM20's four corners for fastening the engine to a mounting surface with machine screws. The following figure illustrates a front view of the EM20 after correct installation.



Optics

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).

The window should be mounted close to the front of the engine (parallel) and the window should be as thin as possible.

If the window is required to be in a tilted position, the requirements above should be met and tilt angle should ensure no reflections back into the lens.

Window Material and Color

CIS's responsiveness (mainly to wavelengths of white 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 white light over 90% and haze less than 1%. Whether to use an anti-reflection coating or not depends on the material and application needs.

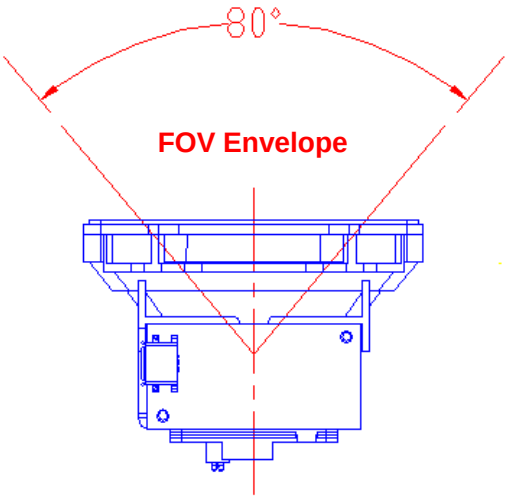
Scratch Resistance and Coating

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

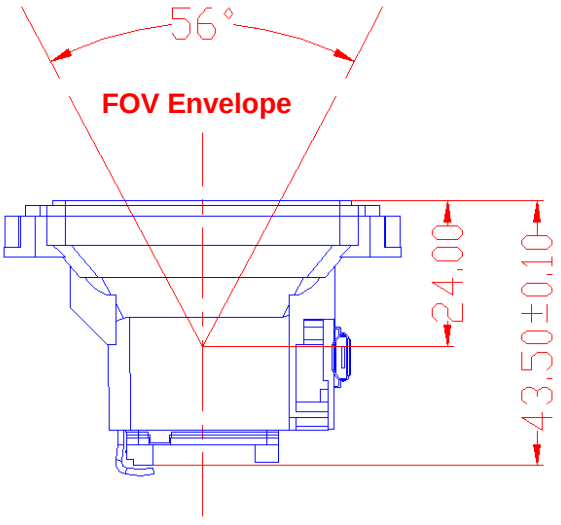
Window Size

The window must not block the field of view.

Horizontal:



Vertical:



Ambient Light

The EM2096 shows better performance with ambient light and it is well able to handle the flicker in fluorescent lights using 50-60Hz AC power. However, high-frequency pulsed light can result in performance degradation.

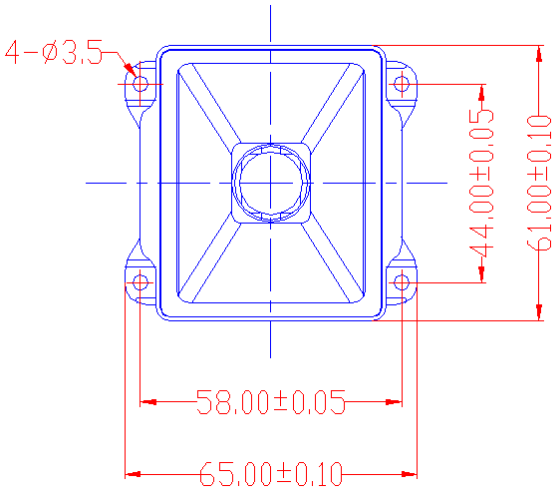
Eye Safety

The EM20 has no lasers. It uses white LEDs to create illumination beam. 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.

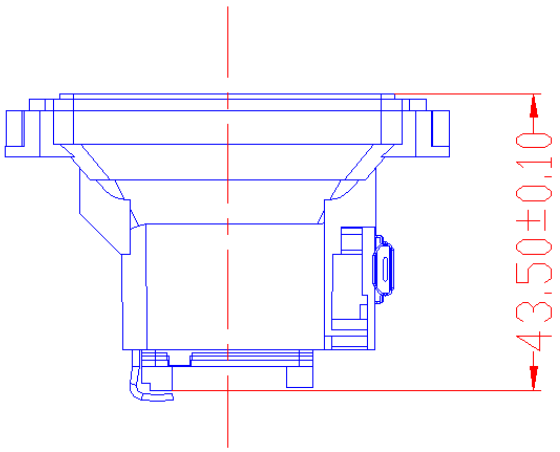
Mounting

The illustrations below show the mechanical mounting dimensions for the EM20. The structural design should leave some space between components.

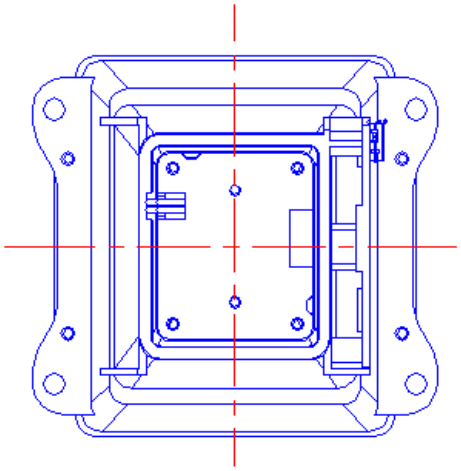
Front View (unit: mm)



Side View (unit: mm)



Top View (unit: mm)



Chapter 3 Electrical Specifications

Power Supply

Do not power up the EM20 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. The minimum interval must exceed 2 seconds.

Ripple Noise

Image sensor and decoder chip are directly fed by the input power of EM20. 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

Ta=23℃

Parameter	Description	Minimum	Typical	Maximum	Unit
V_{DD}	Voltage Drain Drain	3.3	5.0	5.5	V
V_{IH}	High Level Input Voltage	V_{DD}-0.5	-	-	V
V_{IL}	Low Level Input Voltage	-	-	0.5	V
V_{OH}	High Level Output Voltage	V_{DD}-0.3	-	-	V
V_{OL}	Low Level Output Voltage	-	-	0.3	V

Operating Current

Ta=23℃，V_{DD}=5V

Operating Current	Standby Current	Sleep Current
198mA (typical) 236mA (max.)	16mA	10mA

Chapter 4 Interfaces

Connections & Pinouts

The EM20 is equipped with a 12-pin FPC connector and a Micro USB connector.

- ✧ The 12-pin FPC connector can be used as TTL-232 interface or USB interface.
- ✧ The Micro USB connector can only be used as standard USB interface.

Fig. 4-1 illustrates the positions of the 12-pin FPC connector and Micro USB connector on the EM20's decoder board, as well as the pin layout of FPC connector.

See the following **TTL-232** and **USB** sections to learn about the pinouts of the 12-pin FPC connector.

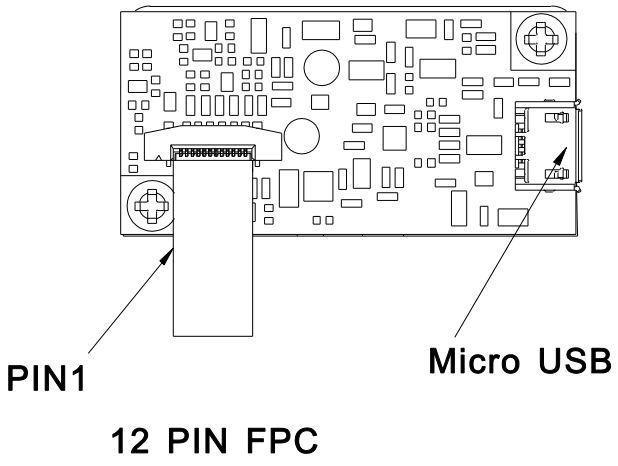


Fig. 4-1

TTL-232

The table below describes the pin functions of FPC connector used as TTL-232 interface.

PIN#	Signal Name	I/O	Function
1	232INV	O	Output: High = TTL-232 interface; Low = USB interface
2	VIN	-	Power: supply voltage input
3	GND	-	Ground: power and signal ground
4	RXD	I	Input: TTL level 232 receive data
5	TXD	O	Output: TTL level 232 transmit data
6	nCTS	I	Input: TTL level 232 clear to send
7	nRTS	O	Output: TTL level 232 request to send
8	PWRDWN	O	Output: Active high, scan engine is in sleep mode
9	nBEEPER	O,od	Output-Open Drain: Beeper output
10	nGoodRead	O,od	Output-Open Drain: Good read LED output
11	nWAKE	I,	Input: Active low, wakes the engine from sleep mode
12	nTrig	I	Input: Active low, signal used as trigger input to activate the engine to start a scan and decode session

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

USB

The table below describes the pin functions of FPC connector used as USB interface.

PIN#	Signal Name	I/O	Function
1	232INV	O	Output: High=TTL-232 interface; Low=USB interface
2	VIN	-	Power: supply voltage input
3	GND	-	Ground: power and signal ground
4	D-	I/O	Input/Output: USB D- signal
5	Reserved	O	Reserved
6	D+	I/O	Input/Output: USB D+ signal
7	Reserved	O	Reserved
8	PWRDWN	O	Output: Active high, scan engine is in sleep mode
9	nBEEPER	O,od	Output-Open Drain: Beeper output
10	nGoodRead	O,od	Output-Open Drain: Good read LED output
11	nWAKE	I	Input: Active low, wakes the engine from sleep mode
12	nTrig	I	Input: Active low, signal used as trigger input to activate the engine to start a scan and decode session

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

Micro USB

The Micro USB connector on the EM20 is a standard connector and can be used accordingly.

Host Interface Connectors

The EM20 is equipped with a 12-pin FPC connector and a Micro USB connector.

12-Pin FPC Connector

The EM20 uses an FFC/FPC connector (CF20121V0R0-LF) manufactured by CviLux.

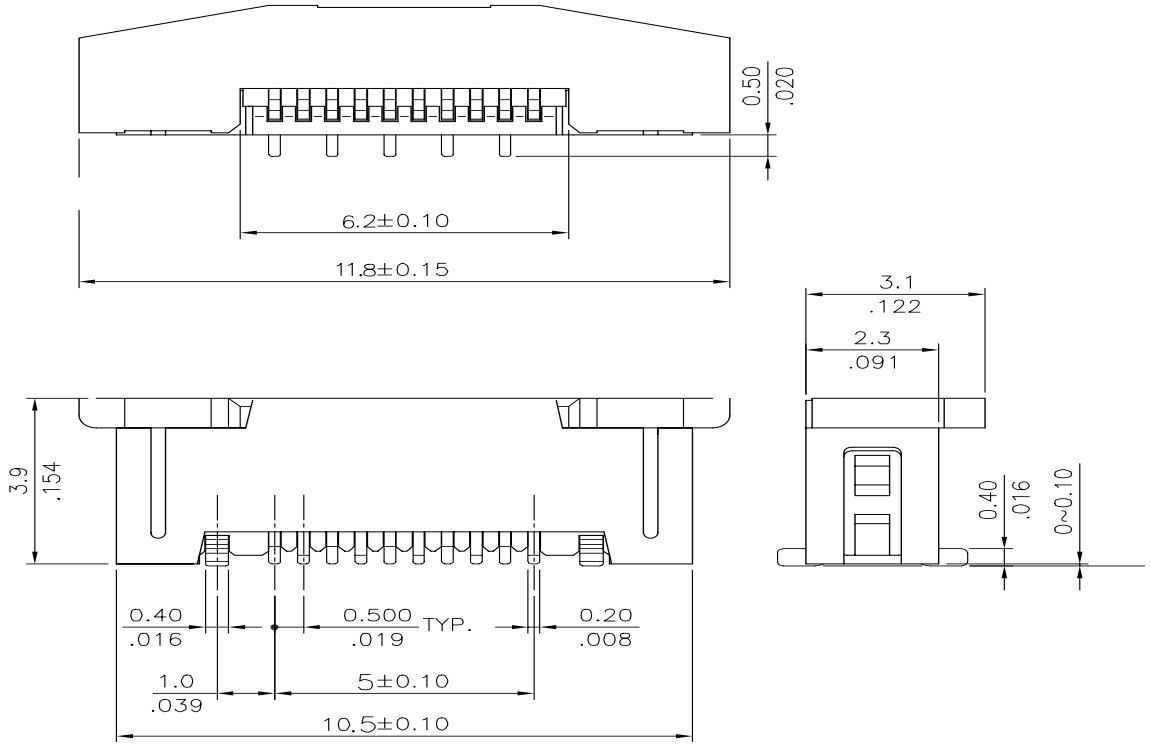


Fig. 4-2

Micro USB Connector

The EM20’s Micro USB connector is a standard connector and can be used accordingly.

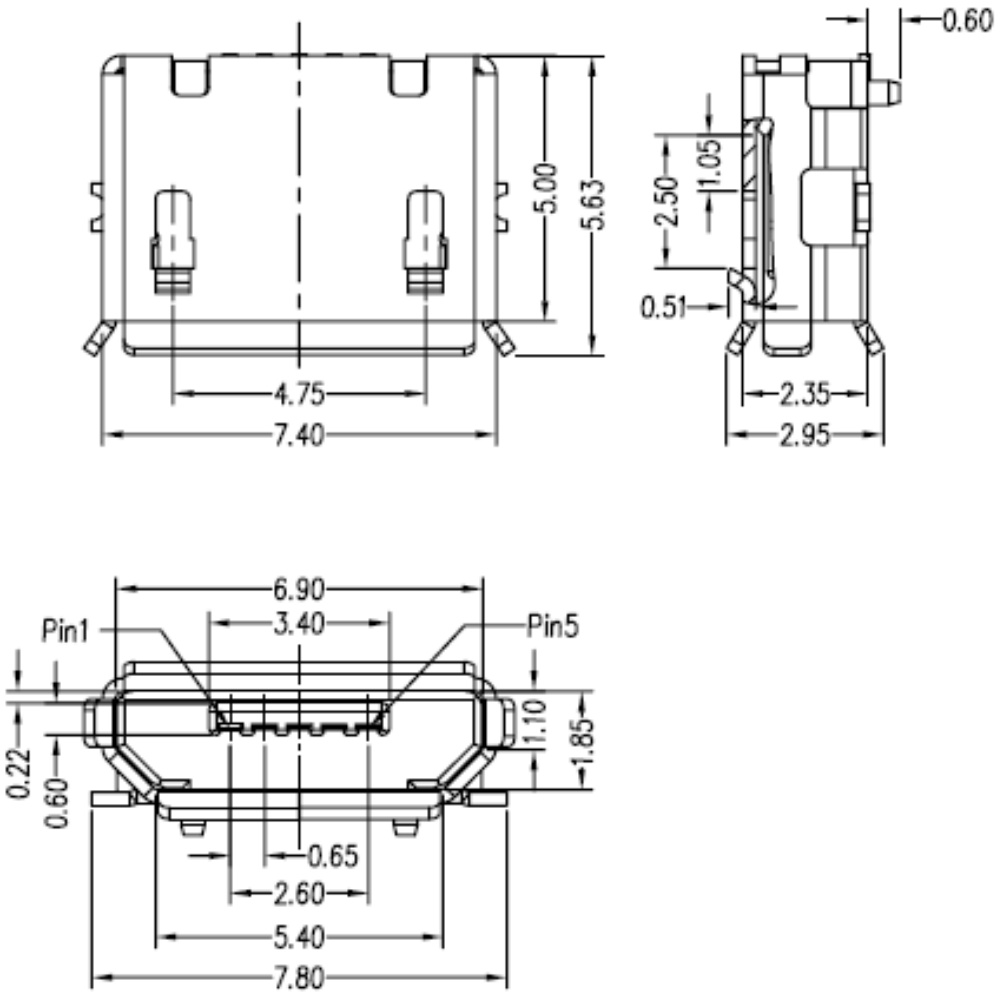


Fig. 4-3

Communication Interfaces

The EM20 can communicate with the host device via its TTL-232 interface. This interface is applicable to most system architectures. For those requiring RS-232, a TTL-232 to RS-232 conversion circuit is needed.

The EM20's TTL-232 interface supports baud rates from 1200bps to 115200bps; it does not support hardware flow control. Its default settings are 9600bps, 8 data bits, no parity check and1 stop bit.

Besides, the EM20 can also communicate with the host device via its USB interface (optional).

1. USB HID-KBW: Based on USB connection, the engine's transmission is simulated as USB keyboard input. It works on a Plug and Play basis and no driver is required.
2. USB COM Port Emulation: The USB interface on the host device is emulated as a serial port with the same data transmission and configuration as a real serial port. A driver is required.
3. USB HID-POS: It is based on HID with no need for custom driver and is way more efficient in communication than keyboard emulation and traditional RS-232 interface.

External Circuits

Good Read LED Circuit

The circuit below is used to drive an external LED for indicating good read. The left part shows internal Good Read LED driver circuit on the decoder board and the right part shows external circuit that users may utilize in actual application. The nGoodRead signal is from Pin 10 of the 12-pin FPC connector.

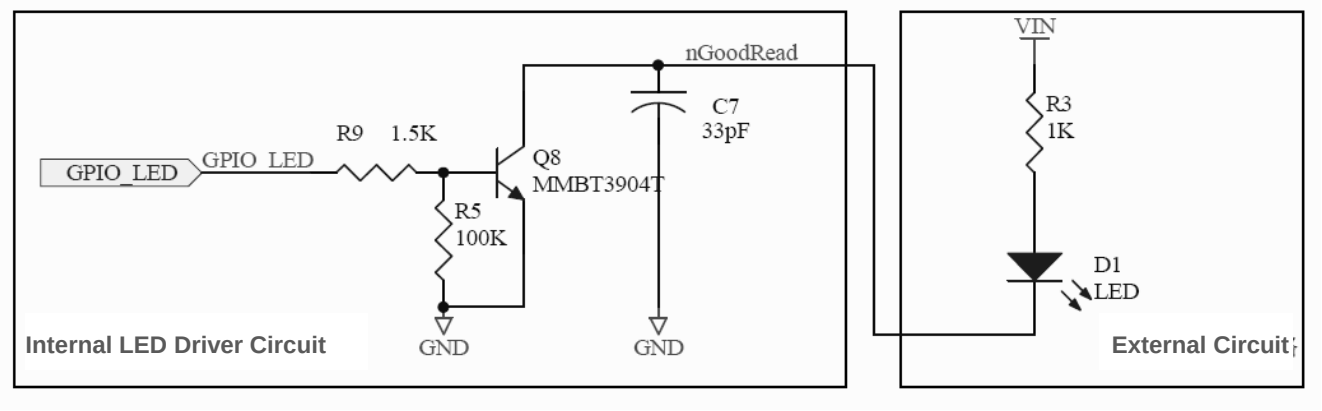


Fig. 4-4

Beeper Circuit

The circuit below is used to drive an external beeper. The left part shows internal beeper driver circuit on the decoder board and the right part shows external circuit that users may utilize in actual application. The nBEEPER signal is from Pin 9 of the 12-pin FPC connector.

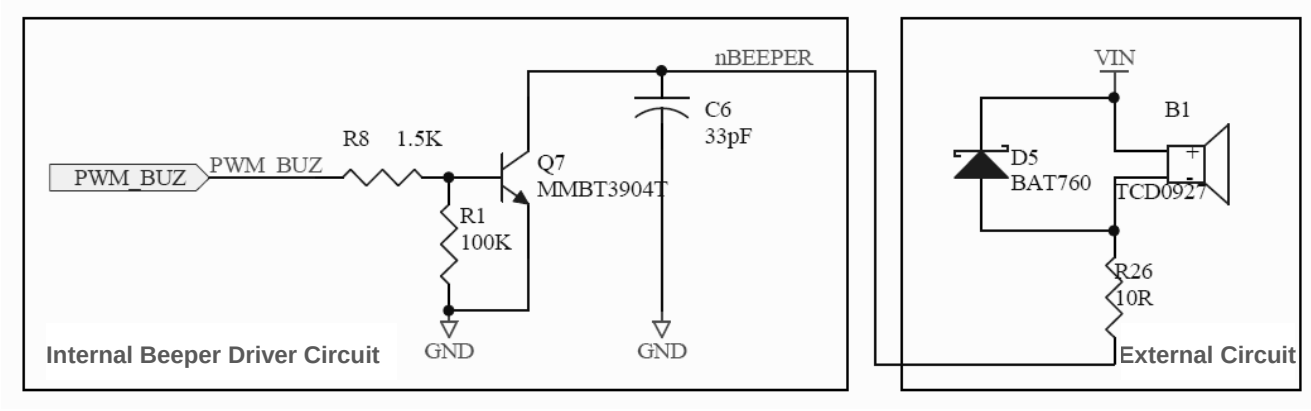


Fig. 4-5

Sleep Mode LED Circuit

The circuit below is used to drive an external LED for indicating that the engine is in sleep mode. The left part shows internal Sleep Mode LED driver circuit on the decoder board and the right part shows external circuit that users may utilize in actual application. The PWRDWN signal is from Pin 8 of the 12-pin FPC connector.

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

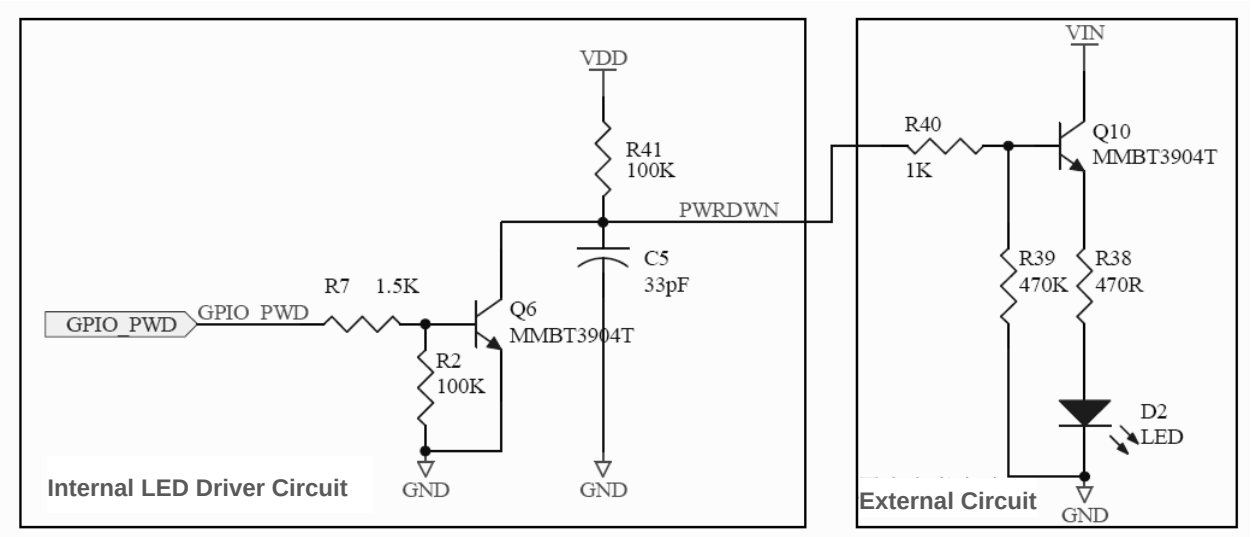


Fig. 4-6

Wake-Up Circuit

The circuit below is used to wake the engine from sleep mode. The right part shows internal driver circuit on the decoder board and the left part shows external circuit that users may utilize in actual application. The nWAKE signal is from Pin 11 of the 12-pin FPC connector.

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

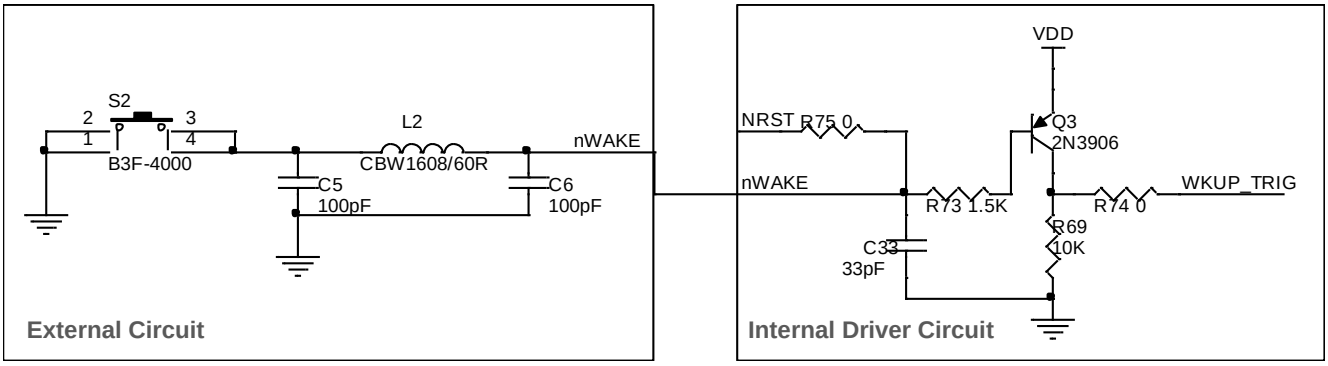


Fig. 4-7

Trigger Circuit

The circuit below is used to provide the engine with an active low signal to activate a scan and decode session. The right part shows internal driver circuit on the decoder board and the left part shows external circuit that users may utilize in actual application. The nTrig signal is from Pin 12 of the 12-pin FPC connector.

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

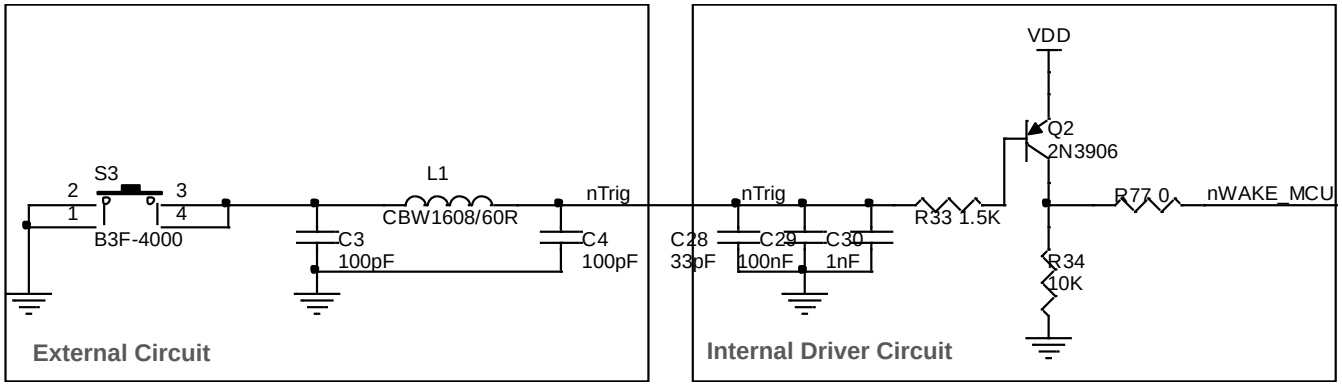


Fig. 4-8

Chapter 5 Development Tools

The EM20's development tools include both software and hardware and can be utilized for engine performance evaluation, application development and engine configuration.

EVK

The EVK is provided to help users to test and evaluate the EM20, which contains beeper & beeper driver circuit, LED & LED driver circuit, trigger & reset buttons, TTL-232 to RS-232 converter & TTL-232 to USB converter, RS-232 & USB interfaces, etc. The EM20 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.

QuickSet/uExpress

A bunch of software such as QuickSet and uExpress is provided to assist users in function settings for the EM20 under Windows.

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