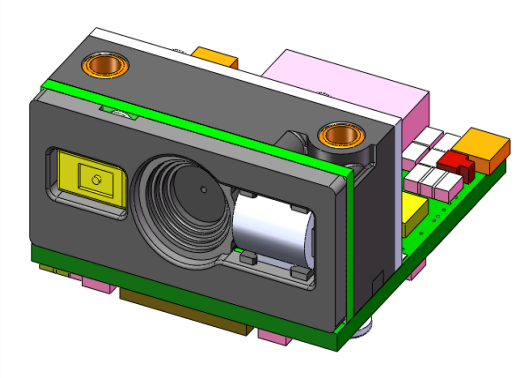
# RT203

## OEM Embedded 2D Barcode Scan Engine

# Integration Guide



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# I. Introduction

## Product Overview

RT203 2D barcode scan engine, a computerized image recognition system, bring about a new era of 2D barcode scan engines.

The RT203's decoder ingeniously blends an advanced chip design & manufacturing, which significantly simplifies application design and delivers superior performance and solid reliability with low power consumption.

The RT203 support all mainstream 1D and standard 2D barcode symbologies (e.g., PDF417, QR Code M1/M2/Micro and Data Matrix) as well as GS1-DataBar™(RSS) (Limited/Stacked/Expanded versions).

### Aimer

The RT203 has a view finder that projects an aiming beam to help the user to position the target barcode within the engine's field of view to increase scan efficiency. The aimer can be programmed On or Off. It is advisable to turn it on when scanning barcodes.

### Illumination

The RT203 has one white LED (6500K) for supplementary lighting, making it possible to scan barcodes even in complete darkness. The illumination can be programmed On or Off.

The RT203's LEDs imaging system is designed to work better with white light, so the engine shows better reading performance on barcodes printed in color. The user can conduct some tests to determine the proper wavelengths to be used.

# II. Installation

## General Requirements

### ESD

ESD protection has been taken into account when designing the RT203 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 RT203 must be sufficiently enclosed to prevent dust particles from gathering on the imager and lens. 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 RT203:

| | |
|---|---|
| Working Temperature | -20℃to 55℃ |
| Storage Temperature | -40℃to 80℃ |
| Humidity | 5% ~95% (non-condensing) |

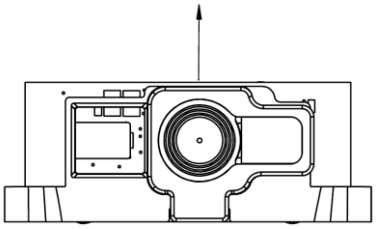
### Thermal Considerations

Electronic components in the RT203 generate heat during the course of their operation. Operating the RT203 in continuous mode for an extended period may result in an increase in temperature by 20℃ inside the engine. The following precautions should be taken when integrating the RT203:

Reserve sufficient space for good air circulation during design.
Avoid wrapping the RT203 with thermal insulation materials such as rubber.

## Installation Orientation

The following figure illustrates a front view of the RT203 after installation.

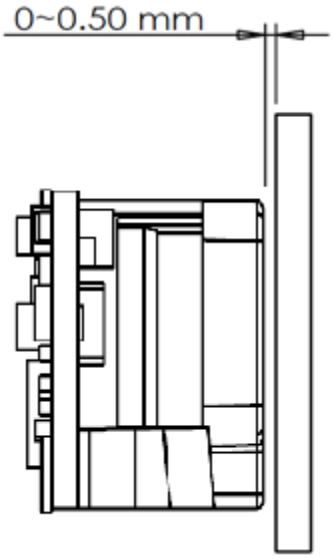


# Optics

## 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). The maximum distance is measured from the front of the engine cover to the farthest surface of the window. Avoid unwanted reflections and use thin material for window so as to reach better reading performance. As shown in the figure below, the distance from the front of the engine cover to the furthest surface of the window should not exceed 0.5mm and its better to make the window contact with the engine rubber cover.




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

## Window Material and Color

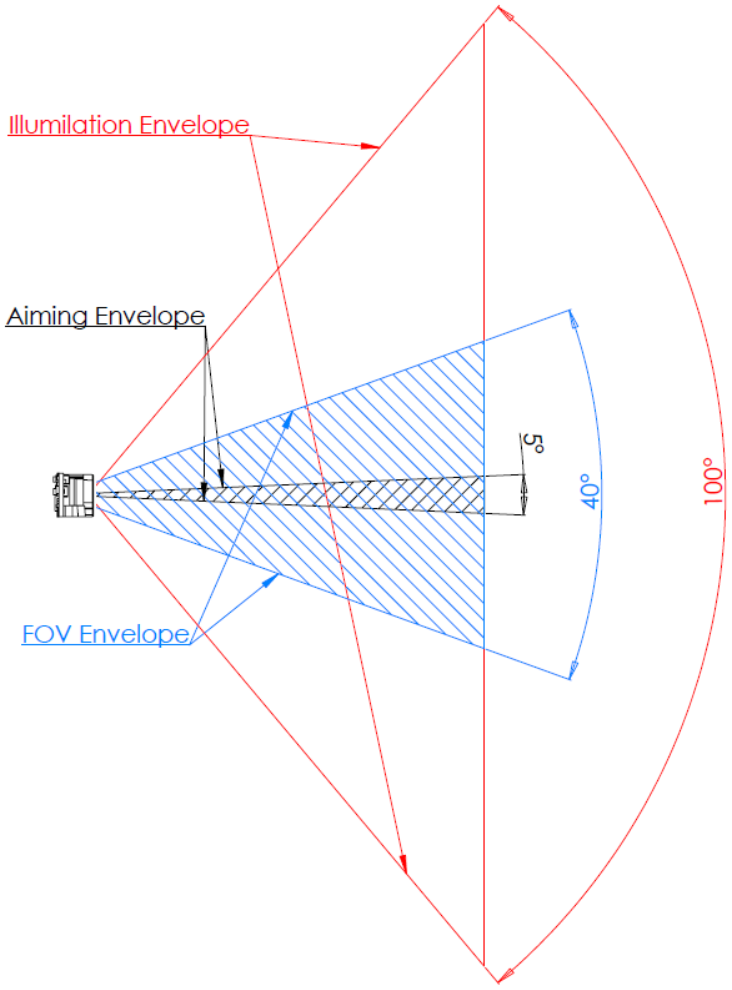
Wavelengths of illumination and aiming beams should be taken into consideration when choosing window material and color, to achieve the possible highest spectral transmission and lowest blurriness. It is suggested PMMA or optical glass with spectral transmittance over 90% and blurriness less than 1%. Whether to use an anti-reflection coating or not depends on the material and application needs.

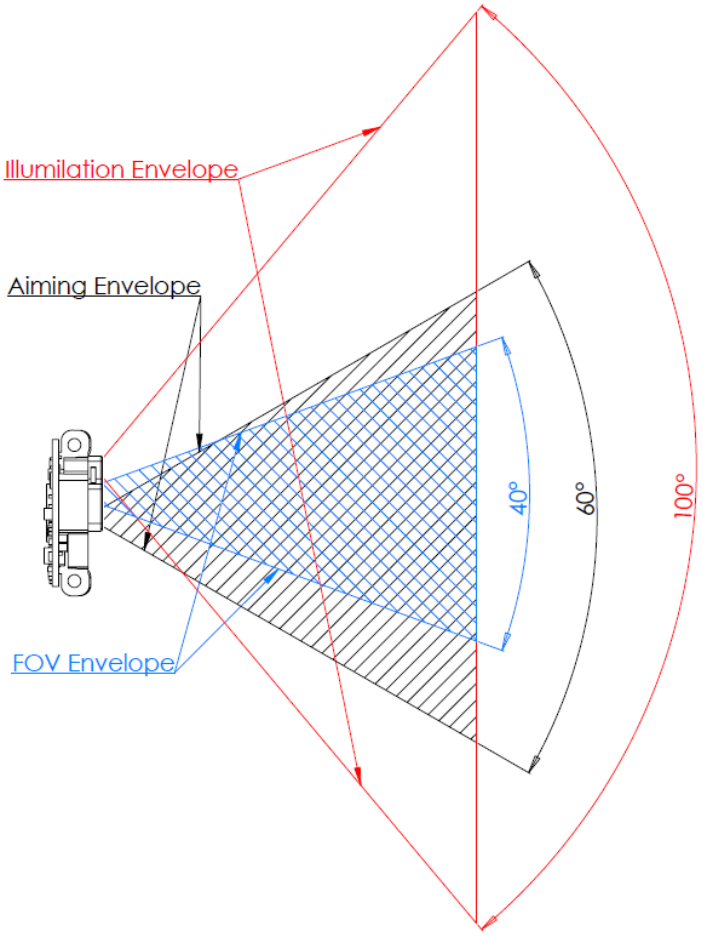
## Scratch Resistance and Coating

Scratch on the window can greatly reduce the performance of the RT203. 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 aiming and illumination envelopes shown below.






## Ambient Light

The RT203 may show better performance with ambient light. However, high-frequency pulsed light can result in performance degradation.

## Eye Safety

The RT203 has LEDs what create the aiming and illumination beams. These 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

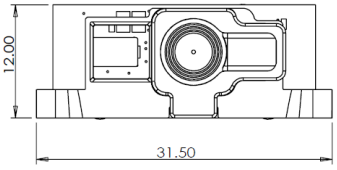
RT203 Engine includes two components: motherboard and Engine camera board assembly. The two components are connected with a FPC cable which length is 50mm.
The illustrations below show the mechanical mounting dimensions for the RT203. The structural design should leave some space between components and provide sufficient space for flat flexible cable.

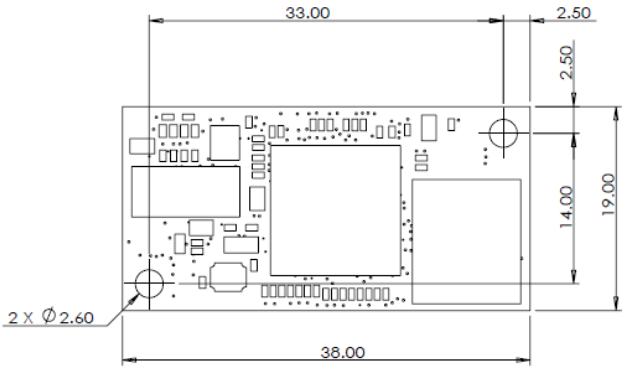
Elements listed in previous sections should also be taken into consideration when integrating the RT203.

**Scan head**

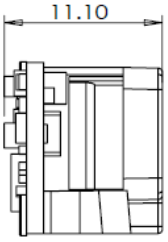
**Decode board**

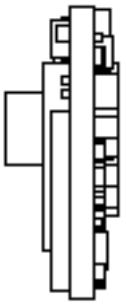
**Front View (unit: mm)**



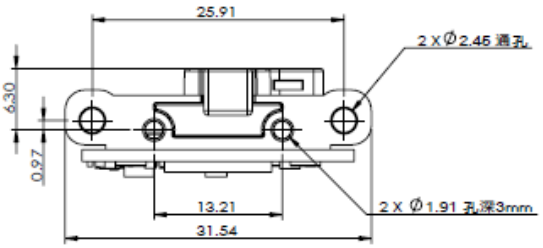

**Left View (unit: mm)**



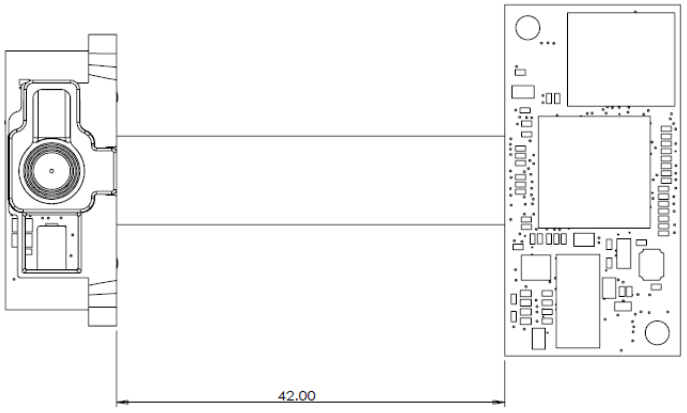
**Bottom View (unit: mm)**

The bottom view shows the mounting screw specification (M2 self-cutting screws to fix the engine head on ).
Note that the part of mounting screws into the engine can not exceed 3mm.




### Assembly View (unit: mm)

The distance is about 42mm between the motherboard with the Engine head, see below pic for detail.




# III. Electrical Specifications

## Power Supply

Do not power up the RT203 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. This could damage the engine.

Unstable power supply or sharp voltage drops may lead to unstable performance of the engine. Do not resupply the power immediately after cutting it off. The interval must be greater than 3 seconds.

## Ripple Noise

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=25℃

| Parameter | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| $V_{CC}$ | 3.3 | 5 | 5.5 | V |
| $V_{IH}$ | $V_{CC}$-0.5 | - | - | V |
| $V_{IL}$ | - | - | 0.5 | V |
| $V_{OH}$ | $V_{CC}$-0.3 | - | - | V |
| $V_{OL}$ | - | - | 0.3 | V |

# IV. Interface



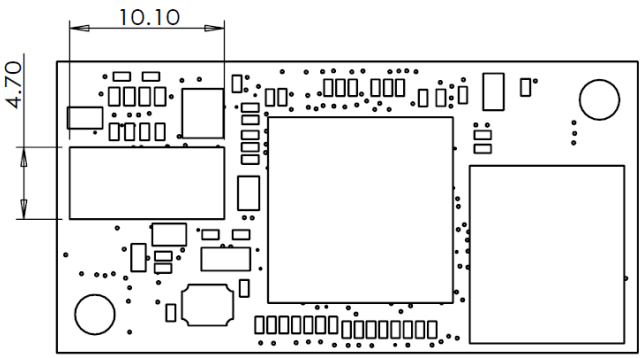
The following table lists the pin functions of the 16-pin host interface connector. Refer to the **"Cable Connection"** section in this chapter for the location of Pin 1.

## Pin out Definition

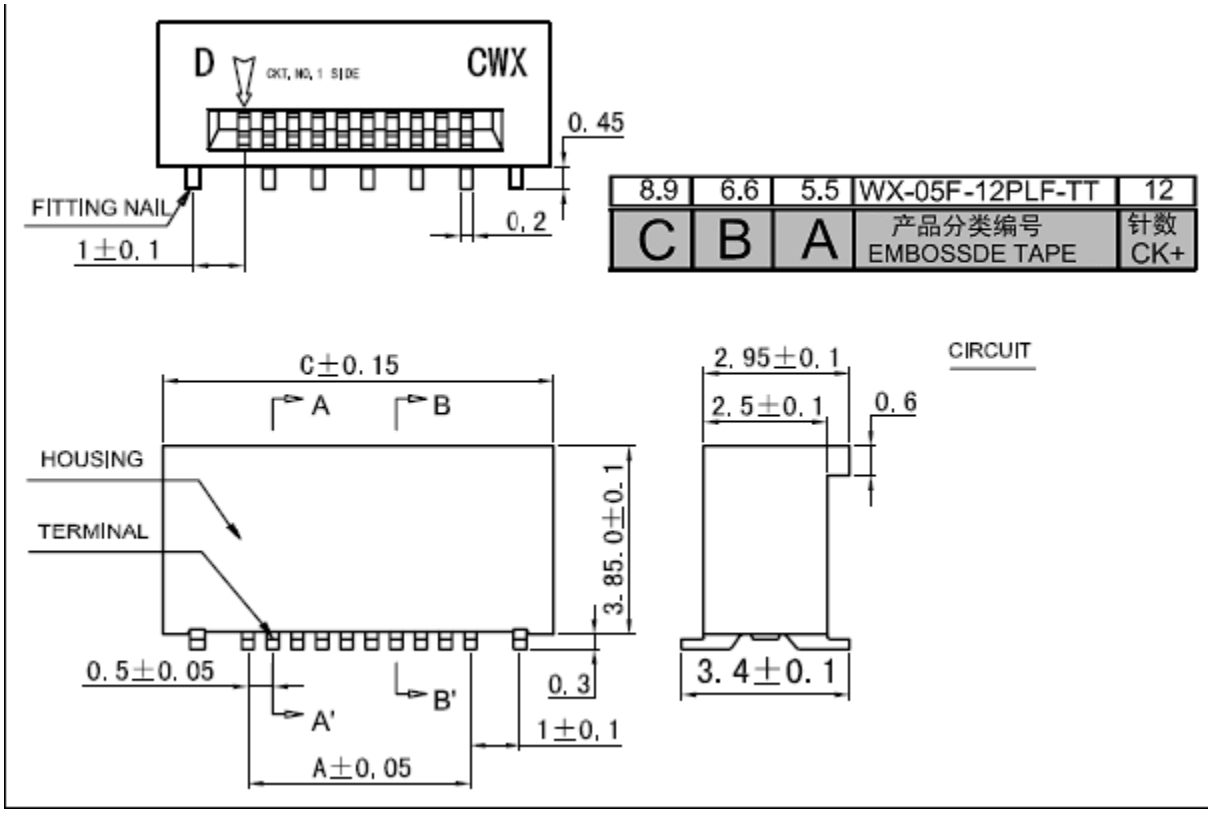
| PIN# | Signal Name | I/O | Function |
|---|---|---|---|
| 1 | NC | - | |
| 2 | VCC | - | Power supply |
| 3 | GND | - | Ground |
| 4 | RX | Input | TTL-232 receiving |
| 5 | TX | Output | TTL-232 transmission |
| 6 | D- | Input/Output | USB D- differential data signal |
| 7 | D+ | Input/Output | USB D+ differential data signal |
| 8 | NC | - | |
| 9 | BUZ | Output | Beeper output. For the information of beeper driver circuit, see the "Control Interfaces" section. |
| 10 | LED1 | Output | Decode LED output. For the information of LED driver circuit, see the "Control Interfaces" section. |
| 11 | LED2 | Input | Decode LED2 output. For the information of LED driver circuit, see the "Control Interfaces" section. |
| 12 | TRIG | Input | Trigger signal input: Driving this pin low for at least 10ms causes the RT203 to start a scan and decode session. |

## Host Interface Connector

The RT203's host interface connector is a 12-pin NONE ZIF socket which can be used to connect a host device (e.g., RT203 software development board EVK) with a flat flexible cable. The following figures show the position and dimensions of the socket. (unit: mm)

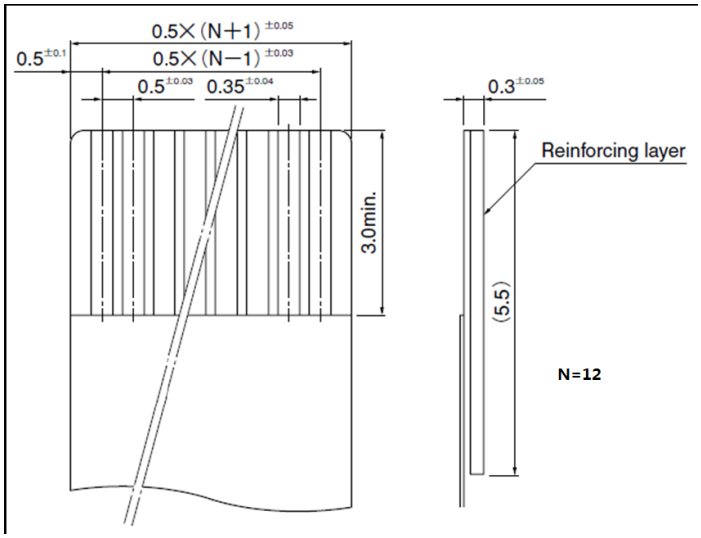



## Dimensions of the Host Interface Connector



## Flat Flexible Cable

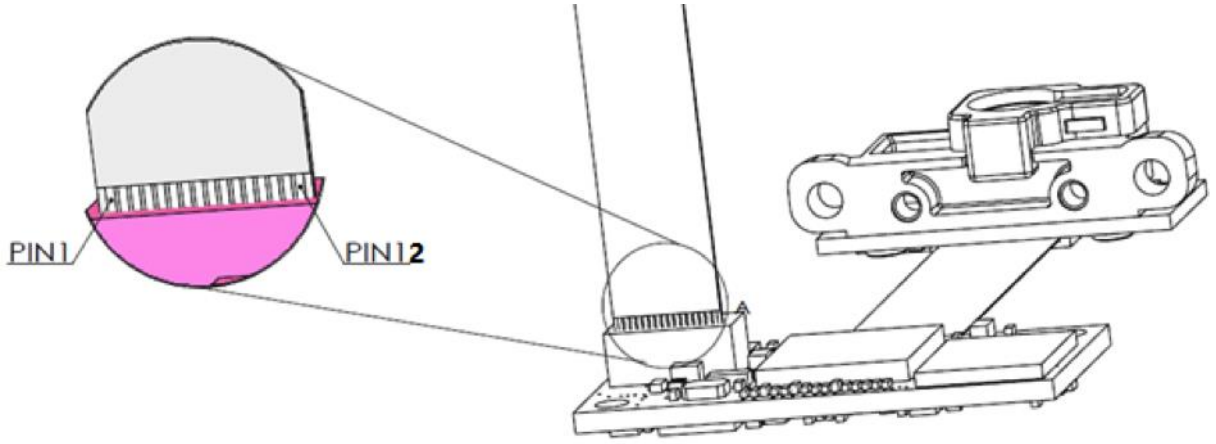
A 12-pin flat flexible cable can be used to connect the RT203 to OEM equipment or to the RT203 EVK. The cable design must be consistent with the following specifications shown below. Use reinforcement material for the connectors on the cable and reduce cable impedance for reliable connection and stable performance.




## Cable Connection

Be sure the power is cut off before connecting a flexible cable to the host interface connector on the RT203. Hot plugging could damage the engine or the host device.

Connect the RT203 to a host device via a 12-pin flexible cable as shown in the following figure.



## Communication Interfaces

The RT203 can communicate with the host device through either TTL-232 serial port or USB port. It provides 3 communication modes:

- TTL-232: This interface is applicable to most system architectures. For those requiring RS-232, a TTL-232 to RS-232 conversion circuit is needed.
- 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.
- USB COM Port Emulation: The USB port 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.

The RT203's serial port does not support hardware flow control.

## Control Interfaces

### Trigger

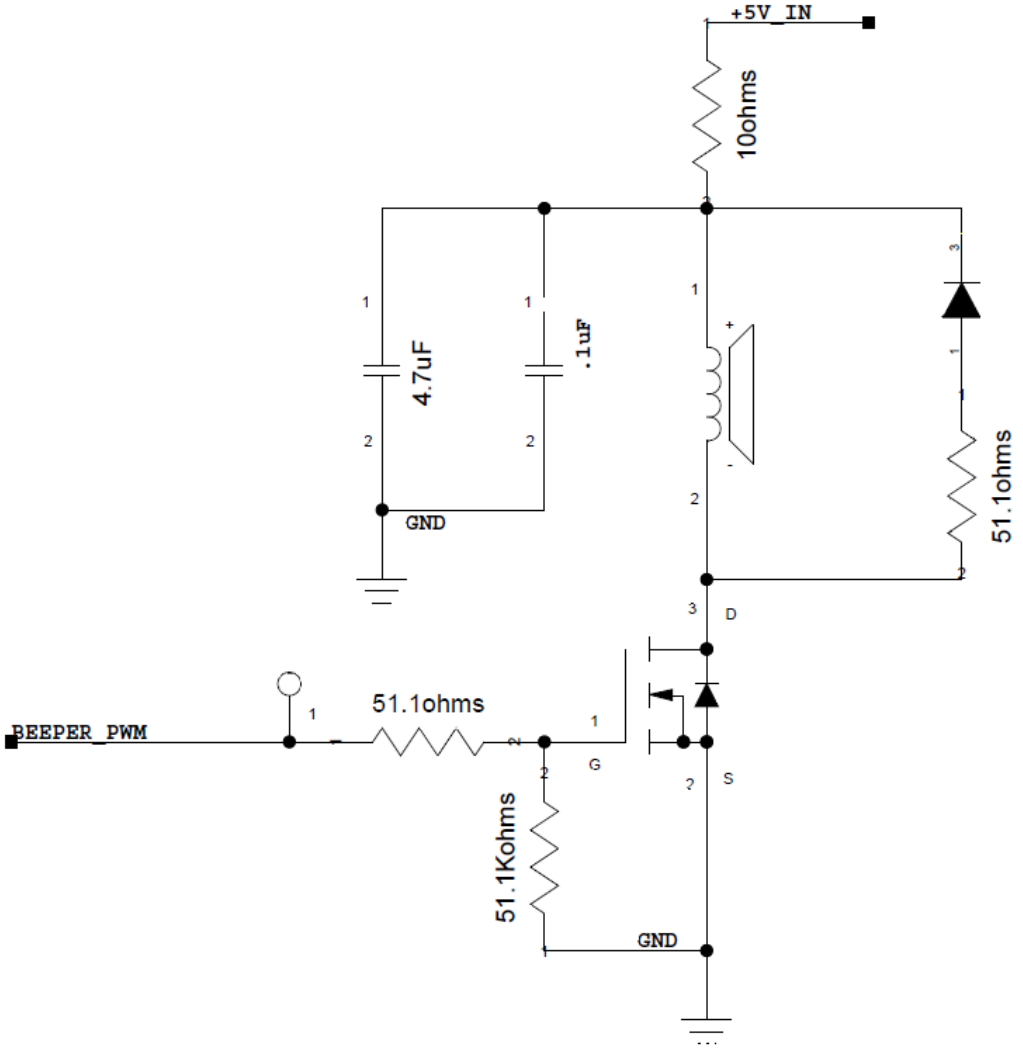
Driving the TRIG pin (PIN 12) on the host interface connector low for a specified time period causes the RT203 to start a scan and decode session. The time period varies from one scan mode to another. Anti-shake mechanism is used in level trigger mode. Trigger is activated in this mode if the signal from the TRIG pin remains low for at least 10ms.

For those scan modes with a timeout mechanism, the engine can automatically deactivate the trigger when a timeout occurs. After one trigger, the engine gets ready for next trigger only if the signal from the TRIG pin remains high for at least 10ms.

## Beeper

The RT203 provides a pin (BUZ, PIN 9) on the host interface connector that provides a PWM output to an external driver circuit for generating audible feedback to the user to indicate statuses like power up, good decode or operation mistake. The PWM output is not strong enough to drive a beeper, so a beeper driver circuit is needed.

The following beeper driver circuit is provided for reference.



## Decode LED

The RT203 provides a pin (LED, PIN 10) on the host interface connector that can be used by an external driver circuit to drive an LED to indicate a Good Decode status. When a good decode occurs, the signal from the LED pin turns from a low level into alternation of high and low levels and then back into a low level. This Decode LED output is not strong enough to drive an LED, so an LED driver circuit is needed.

The following decode LED driver circuit is provided for reference.