



**RT211**

**OEM Scan Engine**

**Integration Guide**



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## Chapter 1 Introduction

### Overview

The RT211 OEM scan engines (hereinafter referred to as “the RT211” or “the engine”), armed with a computerized image recognition system, bring about a new era of 2D barcode scan engines.

The RT211’s 2D barcode decoder chip ingeniously blends technology and advanced chip design & manufacturing, which significantly simplifies application design and delivers superior performance and solid reliability with low power consumption.

The RT211 supports the following barcode symbologies:

1D: EAN-13, EAN-8, UPC-A, UPC-E, ISSN, ISBN, Codabar, Code 128 (including FNC1, FNC2 and FNC3), Code 93, ITF-6, ITF-14, Interleaved 2 of 5, Industrial 2 of 5, Standard 2 of 5, Matrix 2 of 5, GS1 Databar (RSS-Expand, RSS-Limited, RSS-14), Code 39, Code 11, MSI-Plessey, Plessey.

2D: PDF 417, QR Code (QR1, QR2, Micro QR), Data Matrix, Chinese Sensible Code.

### Illumination

The RT211 has a white LED for supplementary lighting. The illumination can be programmed On or Off.

### Aimer

The RT211 has a view finder that produces a red aiming pattern to help the user to easily position the target barcode within the engine’s field of view to increase scan efficiency. The aiming pattern can be turned On or Off. It is advisable to turn it on when scanning barcodes.

## Chapter 1 Introduction

### General Requirements

#### ESD

ESD protection has been taken into account when designing the RT211 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 RT211 must be sufficiently enclosed to prevent dust particles from gathering on the imager, lens and circuit board. Dust and other external contaminants will eventually degrade the engine's performance.

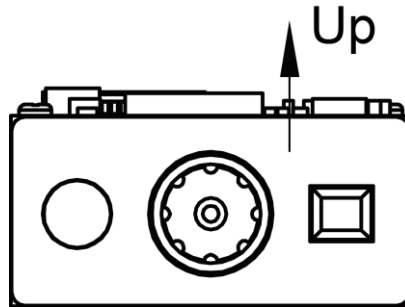
#### Thermal Considerations

Electronic components in the RT211 will generate heat during the course of their operation. Operating the RT211 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 RT211.

- ✧ Reserve sufficient space for good air circulation in the design.
- ✧ Avoid wrapping the RT211 with thermal insulation materials such as rubber.

## Installation Orientation

There are two threaded mounting holes in the bottom of the RT211 for fastening the engine to a mounting surface with machine screws. The following figure illustrates a front view of the RT211 after correct installation.

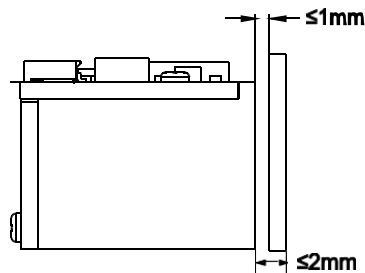


## Optics

### 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). 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 2mm and the distance from the front of the engine housing to the nearest surface of the window should not exceed 1mm.



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

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

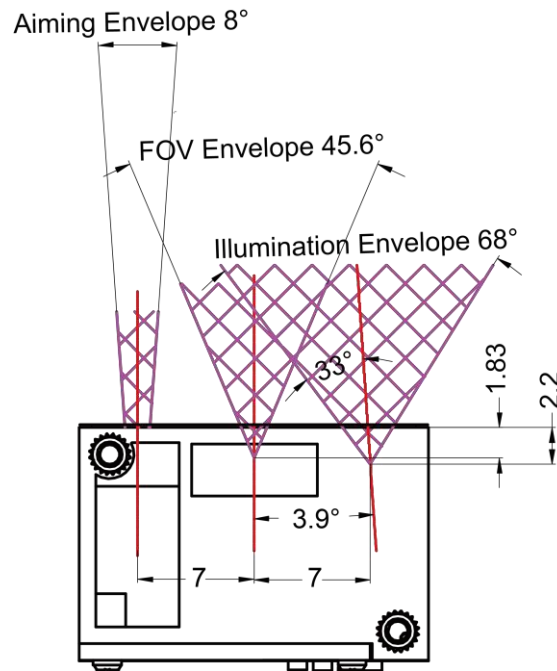
## Scratch Resistance and Coating

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

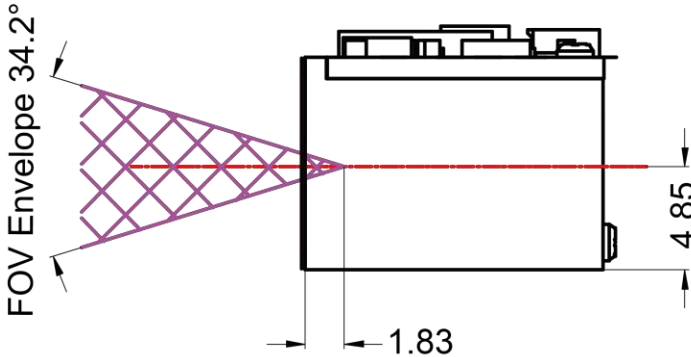
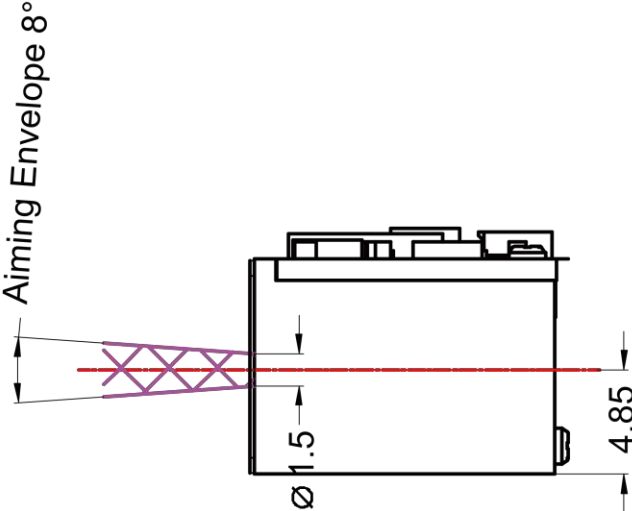
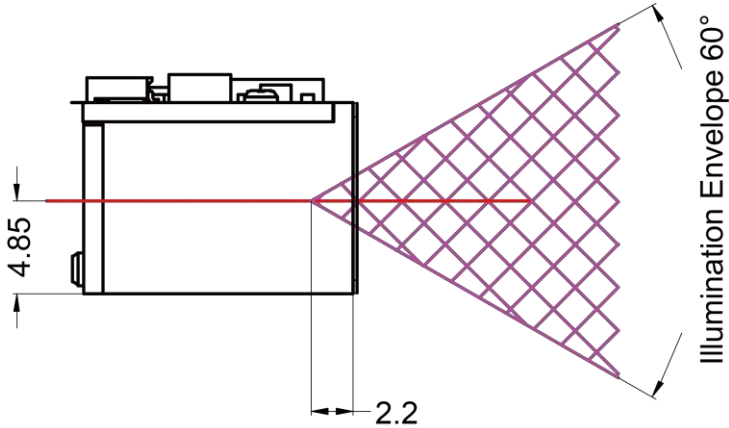
## Window Size

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

### Horizontal:



Vertical:





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## **Ambient Light**

The RT211 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.

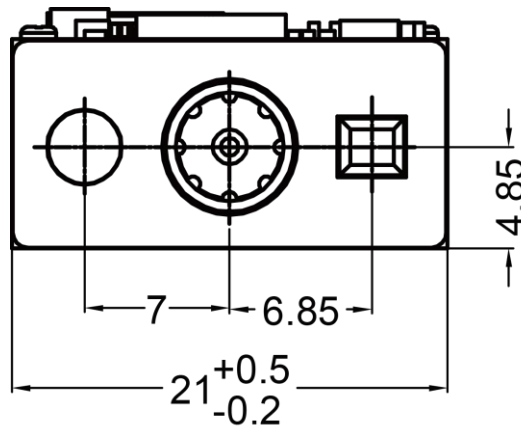
## **Eye Safety**

The RT211 uses LEDs to create the aiming and illumination 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.

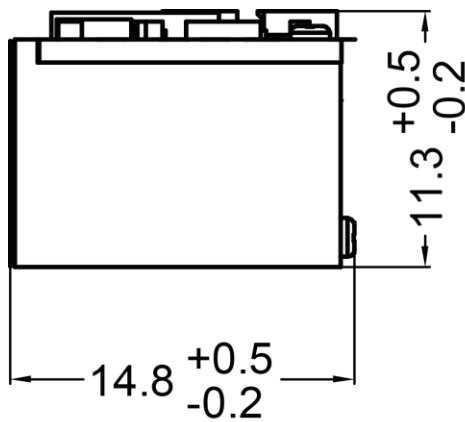
## Mounting

The illustrations below show the mechanical mounting dimensions for the RT211. The structural design should leave some space between components.

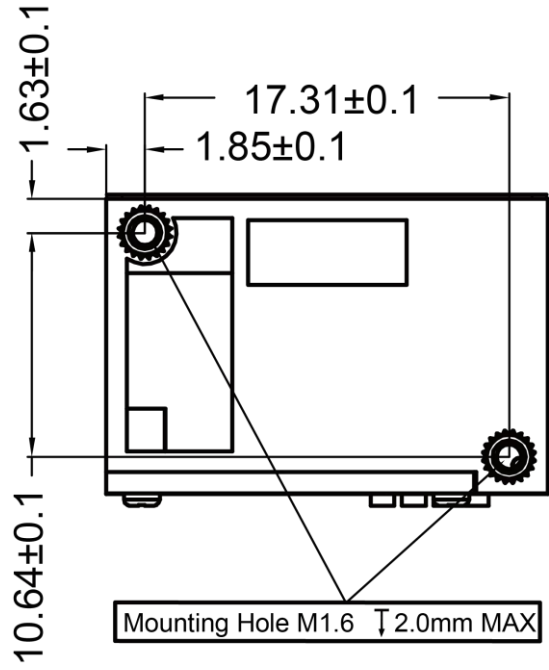
### Front View (unit: mm)



### Side View (unit: mm)



Top View (unit: mm)



## Chapter 3 Electrical Specifications

### Power Supply

Do not power up the RT211 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 RT211. To ensure the image quality, a power supply with low ripple noise is needed.

Acceptable ripple range (peak-to-peak) :  $\leq 50\text{mV}$  ( $\leq 30\text{mV}$  recommended).

### DC Characteristics

#### Operating Voltage $T_a=23^\circ\text{C}$

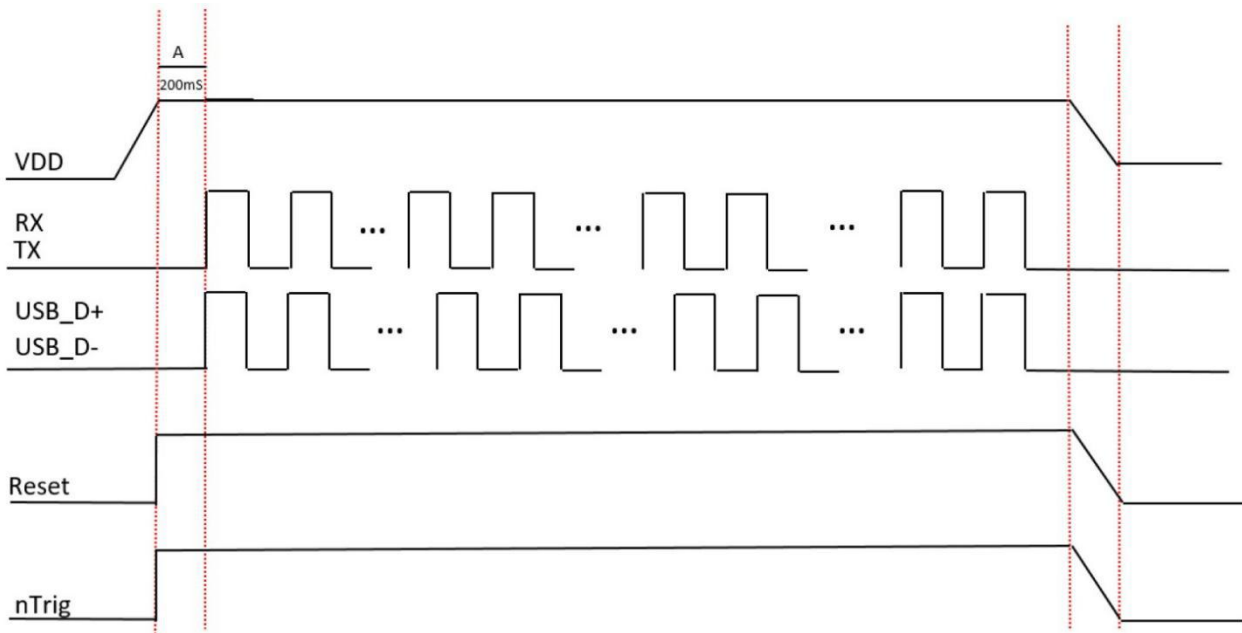
Parameter	Description	Minimum	Typical	Maximum	Unit
$V_{DD}$	Voltage Drain Drain	3.15	3.3	3.45	V
$V_{IH}$	High Level Input Voltage	$V_{DD}-0.5$	-	-	V
$V_{IL}$	Low Level Input Voltage	-	-	0.5	V
$V_{OH}$	High Level Output Voltage	$V_{DD}-0.3$	-	-	V
$V_{OL}$	Low Level Output Voltage	-	-	0.3	V

#### Operating Current $T_a=23^\circ\text{C}$ , $V_{DD}=3.3\text{V}$

Operating Current	Standby Current
56mA (typical), 132mA (max.)	3.4mA (TTL mode) 55.2mA (USB mode)

## Chapter 3 Electrical Specifications

### Power sequencing



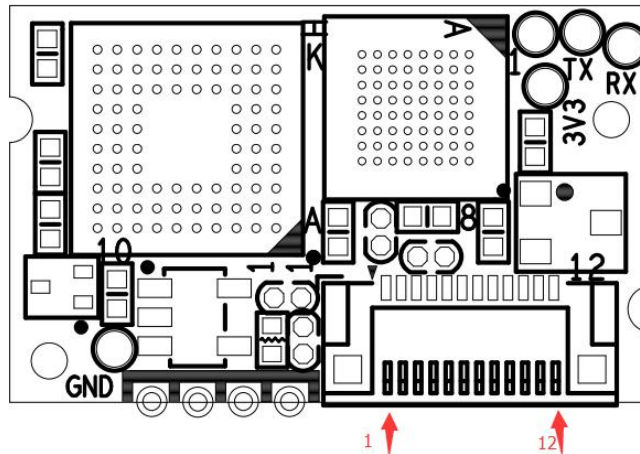
Please note:

1. In the above picture, A is the Boot's startup completion time, B is the kernel's startup completion time, C is the decode chip's initialization completion time, and the total boot's completion time is about 400ms.
2. In the above picture, D is the reset time. If there is no additional operation on the Reset signal during power on, the system boot time starts when VDD reaches 3.3V.
3. When powering off, make sure that all communication interface data is transmitted and then powered off to avoid transmission errors.
4. The level of other signals must be kept low before VDD is powered on to prevent the module from working abnormally due to the current backflow.

## Chapter 4 Interfaces

### Host Interface Connector

The following table lists the pin functions of the 12-pin host interface connector on the RT211.

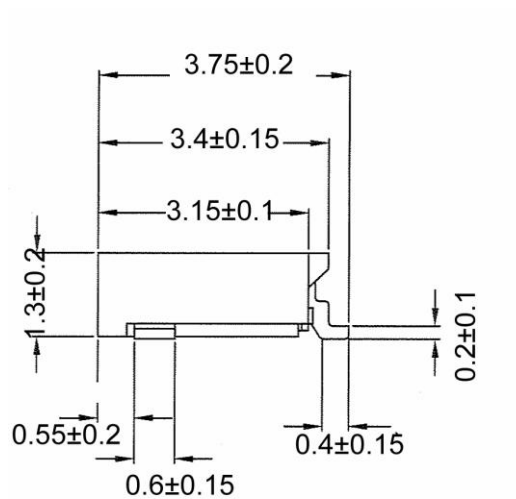
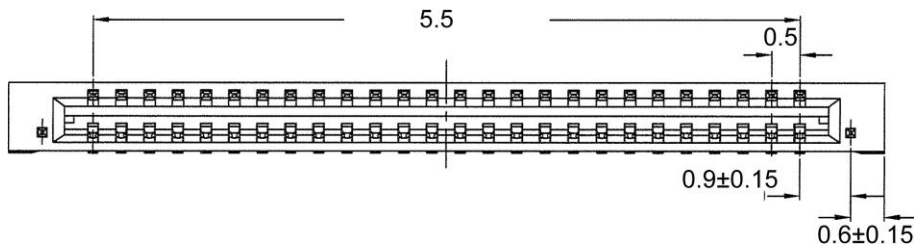
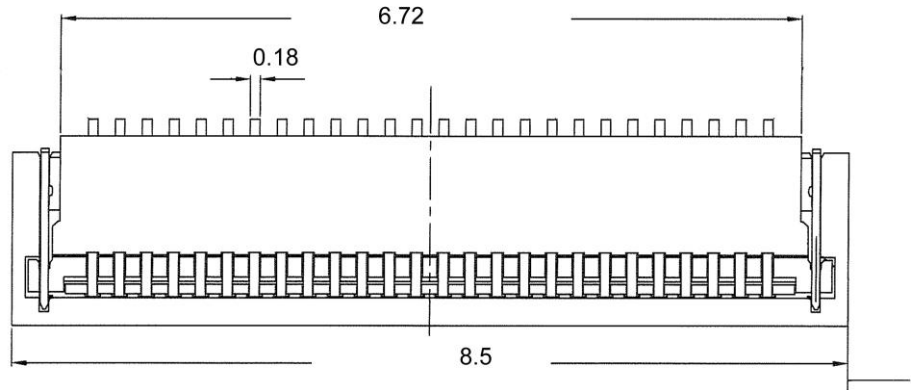


PIN#	Signal	I/O	Function
1	NC	-	Not connected.
2	VDD	-	3.3V power supply.
3	GND	-	Power-supply ground.
4	RX	I	TTL level 232 receive data.
5	TX	O	TTL level 232 transmit data.
6	USB_D-	I/O	USB D- differential data signal (optional)
7	USB_D+	I/O	USB D+ differential data signal (optional)
8	NC	-	Not connected.
9	Buzz	O	Beeper output. For the information of beeper driver circuit, see the “Beeper” section in this chapter.
10	LED	O	Good Read LED output. For the information of LED driver circuit, see the “Good Read LED” section.
11	Reset	I	Reset signal input: Active low. Driving this pin low for 100us-500us resets the engine.
12	nTrig	I	Trigger signal input: Driving this pin low for at least 10ms causes the engine to start a scan and decode session.

## Chapter 4 Interfaces

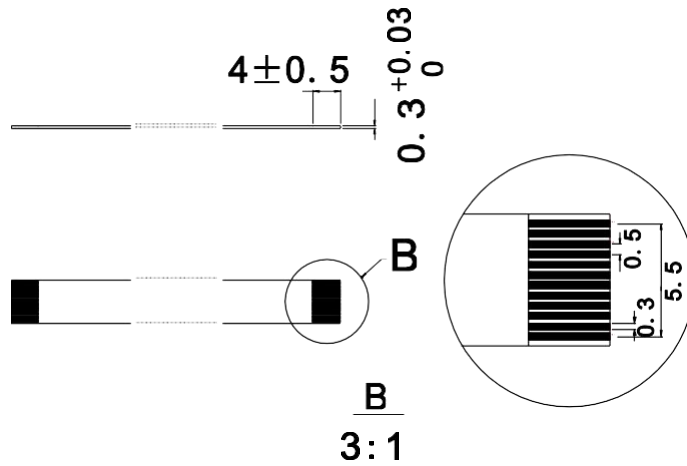
### Dimensions of the Host Interface Connector (unit: mm)

The RT211 uses a 12-pin FPC ZIF socket (bottom contact, model: 10051922-1210ELF) manufactured by FCI. The socket can be connected to a host device with an FFC cable.



**FFC Cable (unit: mm)**

A 12-pin FFC cable can be used to connect the RT211 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.





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## Communication Interfaces

The RT211 can communicate with the host device via any of the following interfaces:

- ✧ 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. The RT211's TTL-232 interface supports baud rates from 1200bps to 115200bps; it does not support hardware or software flow control. Its default settings are 9600bps, 8 data bits, no parity check and 1 stop bit.
- ✧ USB HID Keyboard: 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.
- ✧ HID-POS (optional): HID-POS does not require a custom driver. However, an HID interface on Windows 98 does. All HID interfaces employ standard driver provided by the operating system. Use defaults when installing the driver. (Important note: if you need HID-POS mode, please do confirm with RTscan before your order, the hardware is a little different with other interfaces)

## Control Interfaces

### Reset

Driving the Reset pin (PIN 11) on the host interface connector low for 100us-500us can reset the RT211. However, do not reset the engine at unreasonably short intervals. The minimum interval between resets must exceed 2 seconds.

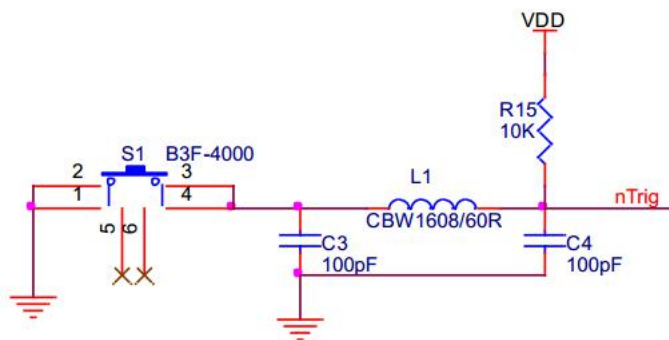
### Trigger

Driving the nTrig pin (PIN 12) on the host interface connector low for over 10ms causes the RT211 to start a scan and decode session. If barcode is decoded, the RT211 waits for the voltage at the nTrig pin to turn high (or the trigger to be released) after sending the data to the Host. If the trigger is released during a scan attempt, the RT211 immediately stops decoding.

Next decode session does not happen until the RT211 receives active trigger signal (driving the nTrig pin low) again.

As a decode session involves image capture, barcode decoding and other steps, it is suggested that the minimum interval between triggers should exceed 50ms.

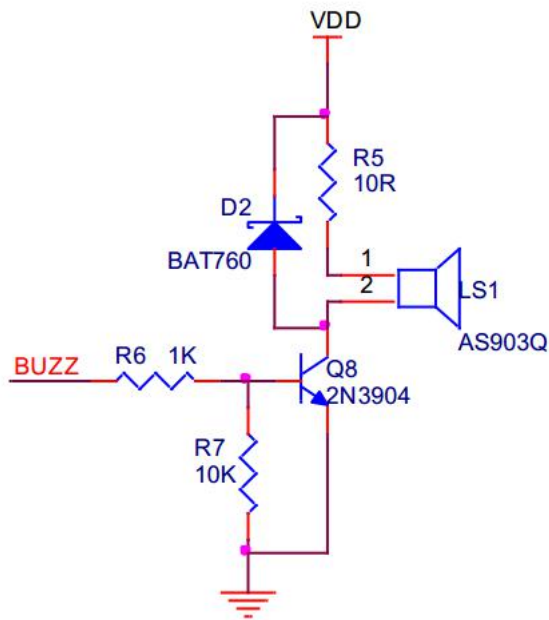
The following trigger circuit is provided for reference.



## Beeper

The RT211 provides a pin (Buzz, 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 or good read. The PWM output is not strong enough to drive a beeper, thus a beeper driver circuit is needed.

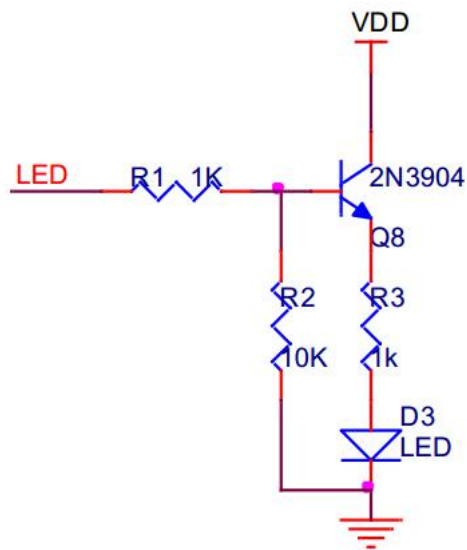
The following beeper driver circuit is provided for reference.



## Good Read LED

The RT211 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 Read status. When a good read occurs, the LED pin produces a high level output for about 300ms and then the signal is back to a low level. This Good Read LED output is not strong enough to drive an LED, so an LED driver circuit is needed.

The following LED driver circuit is provided for reference.



### **EVK**

The EVK is provided to help users to test and evaluate the RT211, 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 RT211 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.

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