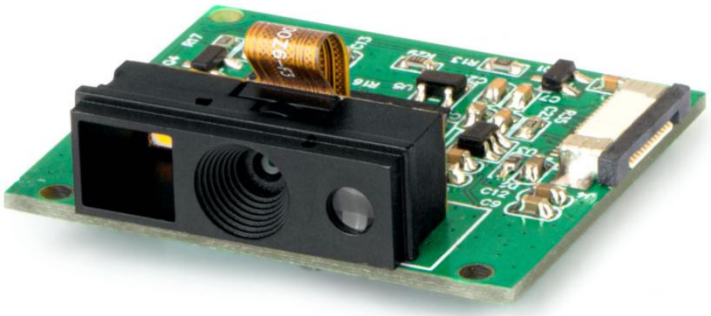
Integration Guide

For RT217 Series (RT217&RT217A)



Contents

Introduction

The RT217 series include two items RT217 and the RT217A. Referring to below picture, both items use same scanner engine but the RT217A combines the camera engine and the decoder board in one integrated unit while the decoder board and camera engine for RT217 are separated. Both items are area image engines for barcode reading. Each of them includes an illumination LED and an aiming LED.

RT217A- the integrated version

RT217- the separated version

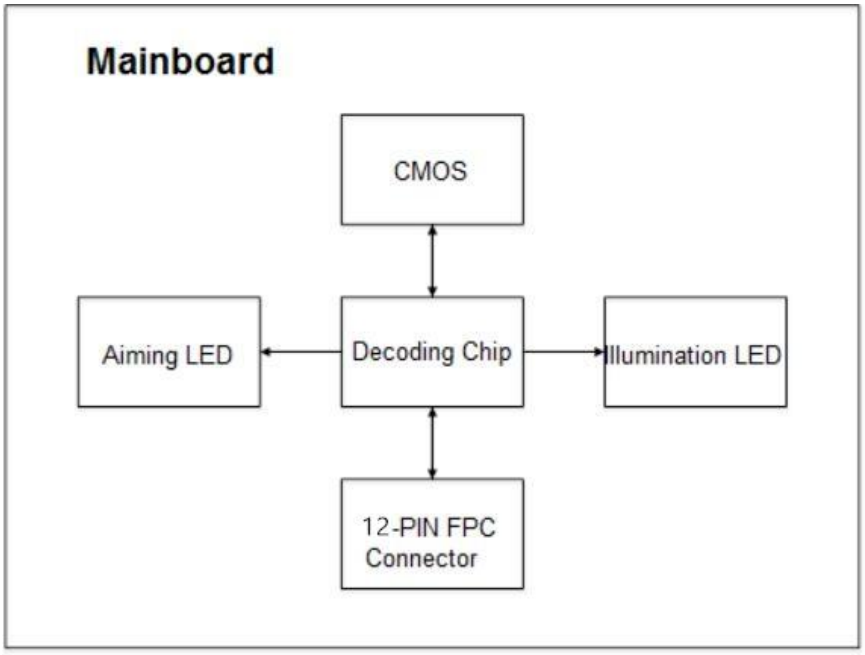
LED Compliance Statement

The RT217 series complies with IEC 62471:2006 for LED safety.

The RT217 contains:

- a CMOS image sensor and its lens
- an LED based illumination system
- an LED aiming system

Figure 1-1 System Block Diagram



Illumination

The RT217 series have a white LED for supplementary lighting, making it possible to scan barcodes even in complete darkness. The illumination can be programmed On or Off.

Aimer

The RT217 contains a red LED aimer 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 in regular circumstances. For applications in the background of different materials and colors or in the strong light or backlight environment, it is advised to turn off the aimer.

Introduction

This chapter explains how to install the RT217 Series, 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 RT217 Series. 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 RT217 Series 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 RT217 Series.

Table 2-1

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

Thermal Considerations

Electronic components in the RT217 Series will generate heat during the course of their operation. Operating the RT217 Series 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 RT217 Series.

- ✧ Reserve sufficient space for good air circulation in the design.
- ✧ Avoid wrapping the RT217 Series 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.

Mounting

The illustrations below show the mechanical mounting dimensions (unit: mm) for the RT217 Series.

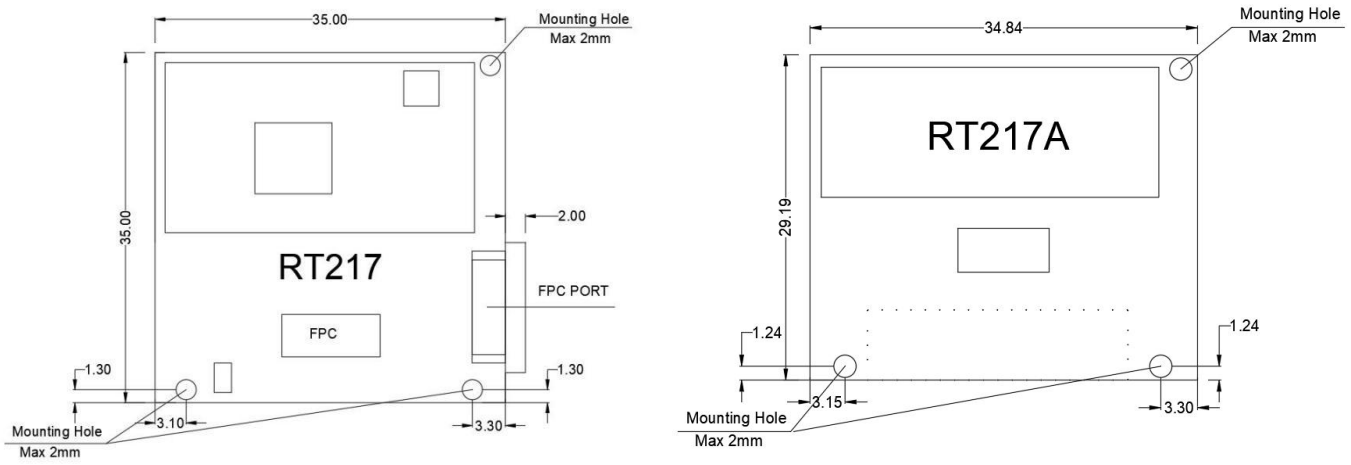


Figure 2-1

Note: Tolerance of dimension is ±0.15mm.

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. 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 RT217 Series use 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=0.1mm) and the distance from the front of the engine housing to the furthest surface of the window should not exceed **a+d** (a=0.1mm, d=2mm), as shown in **Figure 2-2**.

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

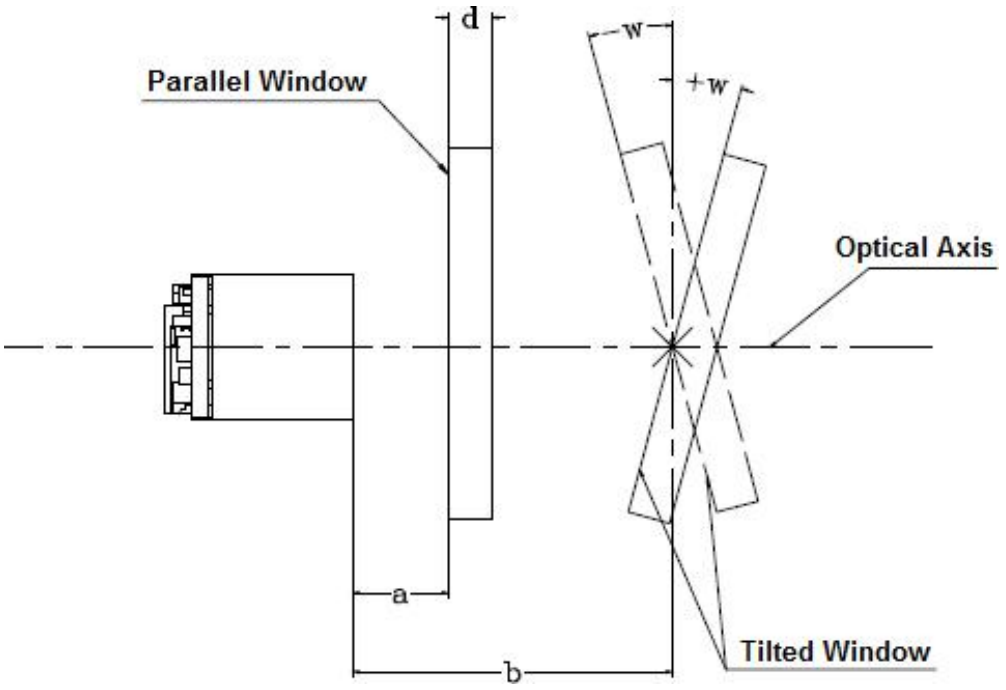


Figure 2-2

Table 2-2

Minimum Angle (Tilted Window)	Distance from the front of the engine housing (b)		
	10mm	15mm	20mm
Uncoated, minimum window positive tilt (+w)	35°	30°	28°
Uncoated, minimum window negative tilt (-w)			

Window Material and Color

Window material must be clear. Use only cell-cast plastics or optical glass. PMMA and chemically tempered glass are recommended. Window material selected for the engine should meet or exceed the specifications specified in **Table 2-3**. When using a clear plastic window, it is recommended to apply anti-reflection (AR) coating on it.

- **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.
- **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% (PMMA) ≥91% (Chemically tempered glass)
Thickness	0.5-2.0mm
Light Wavelength	400-780nm
Clear Aperture	1.0mm to edges
Surface Quality	60-20 scratch/dig

Pay extra attention to the light wavelength when using plastic materials. 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 RT217 Series. 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. Multi-layer AR coatings on windows help to achieve less than 0.5% reflectance and covered wavelength is 400-780nm.

- **Scratch resistance coatings:** Scratch resistance coatings require a degree of greater than 5H in its hardness. 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: 93% minimum transmittance within spectrum range from 400 nm to 780 nm.
Double side AR coating: 97% minimum transmittance within spectrum range from 400 nm to 780 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:

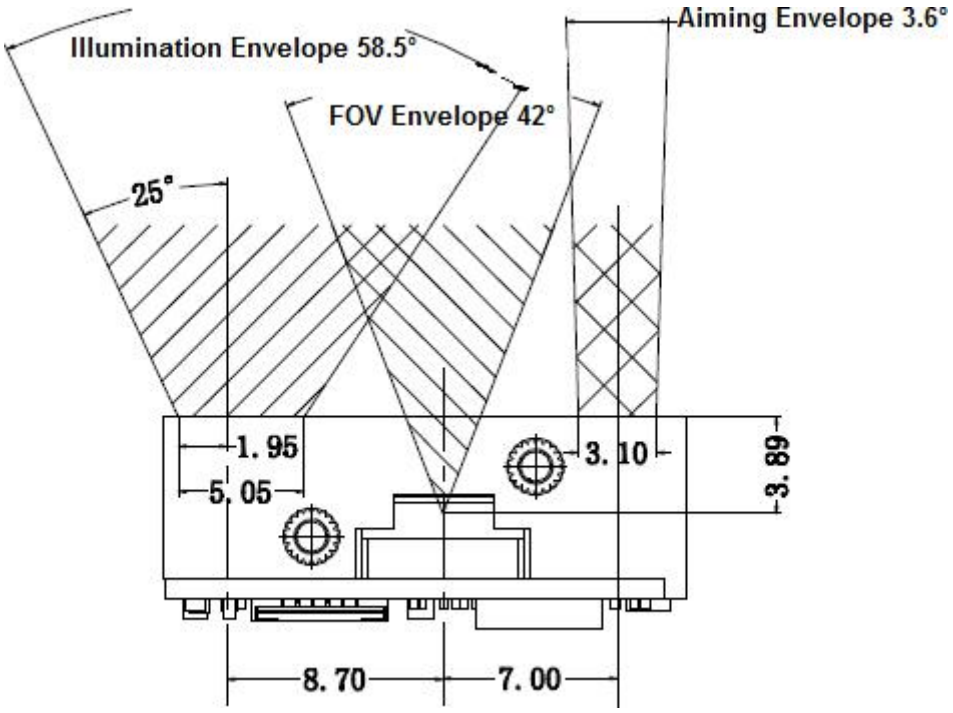


Figure 2-3

Vertical:

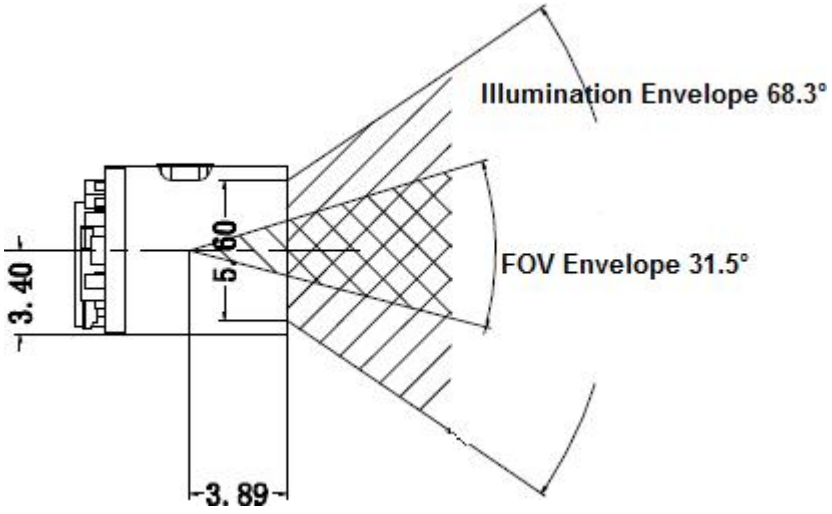


Figure 2-4

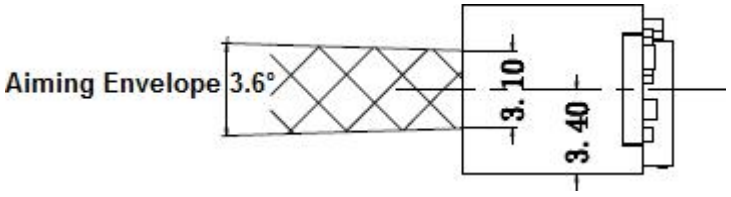


Figure 2-5

Roll, Skew and Pitch

Three different reading angles, roll, skew and pitch are illustrated in **Figure 2-6**. 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 RTscan website or contact your dealer.

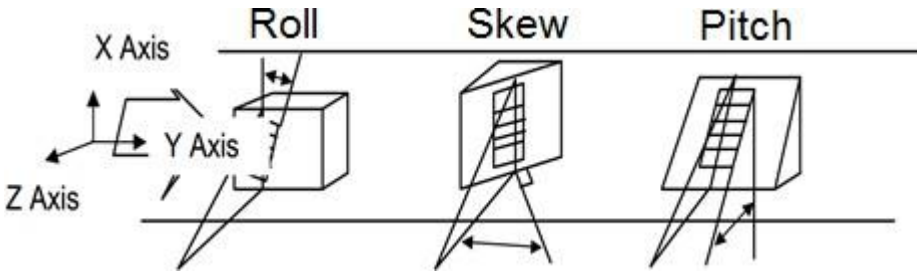


Figure 2-6

Ambient Light

The RT217 Series shows better performance with ambient light. However, high-frequency pulsed light can result in performance degradation.

Eye Safety

The RT217 Series have no lasers. They use LEDs to produce 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.

Power Supply

Do not power up the RT217 Series 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.

※ When designing, the user should ensure that the input power of RT217 Series is fully decoupled. It is recommended to place a 22uF and a 100nF X5R or X7R ceramic capacitor beside the power input pin on the connector which is soldered on the board. The capacitor mounted on the external input power supply is recommended to be controlled within 50uF.

※ Ensure that the input power drops below 0.5V before powering the RT217 Series on again, otherwise it will lead to abnormal function.

Ripple Noise

To ensure the image quality, a power supply with low ripple noise is needed. Acceptable ripple range (peak-to-peak) :≤100mV

DC Characteristics

Operating Voltage

Table 3-1

T=25°C

Parameter	Description	Minimum	Typical	Maximum	Unit
VDD	Input Voltage	3.14	3.3	3.47	V

Operating Current

Table 3-2

T=25°C

Description	State	Typical	Maximun	Unit
Working Current	VDD=3.3V	218	234	mA
Standby Current		52.8	-	mA

Interface Pinouts

The physical interface of the RT217 Series consists of a 12-pin FPC connector:

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

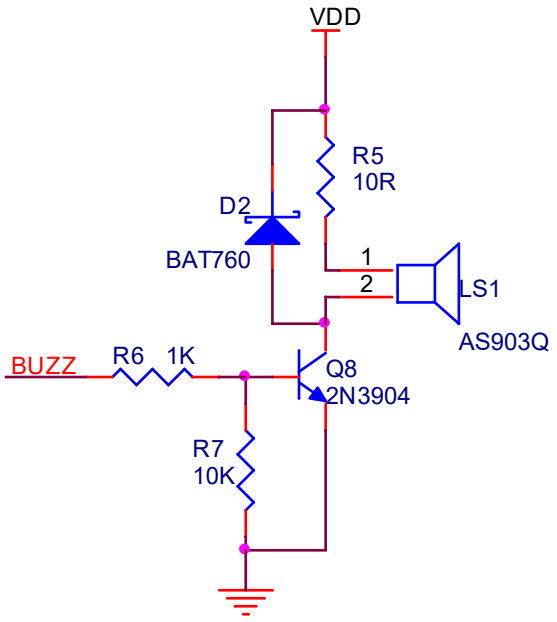
12-pin FPC Connector

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

PIN#	Singal Name	-	Function
1	NC	-	-
2	VDD	-	3.3V power input
3	GND		Power-supply ground
4	RX	I	TTL-232 receive data
5	TX	O	TTL-232 transmit data
6	USB_D-	I/O	USB_D- Signal
7	USB_D+	I/O	USB_D+ Signal
8	NC	-	-
9	Buzz	O	Beeper output signal, refer to circuit diagram as below
10	LED	O	Indicator Led output signal, refer to circuit diagram as below
11	NC	-	-
12	nTrig	I	Trigger button input signal, maintain low level 10ms+ to trigger barcode reading

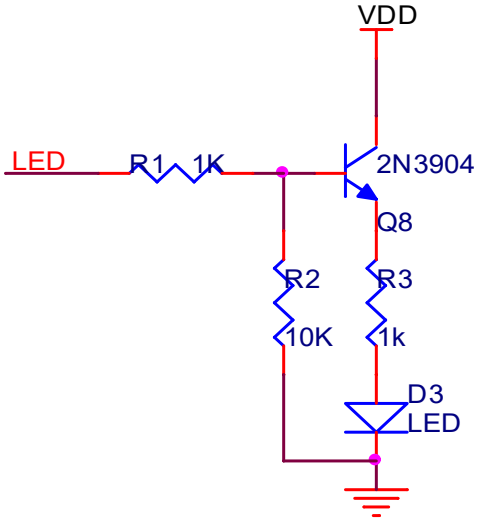
Beeper Signal Circuit

Using PWM mode in Buzz pin (PIN 9) to provide Buzzer (Beeper) signal output. When the scanner engine starts and reads successfully, the Buzz PIN9 will output PWM signal according to the original setting. This signal output can drive a Beeper tone via the external supporting circuit.The load capacity of the Buzz pin is limited, and it cannot directly drive the buzzer to sound to avoid damaging the chips on the scanner scanner engine. Referring to the buzzer driving circuit diagram as following :



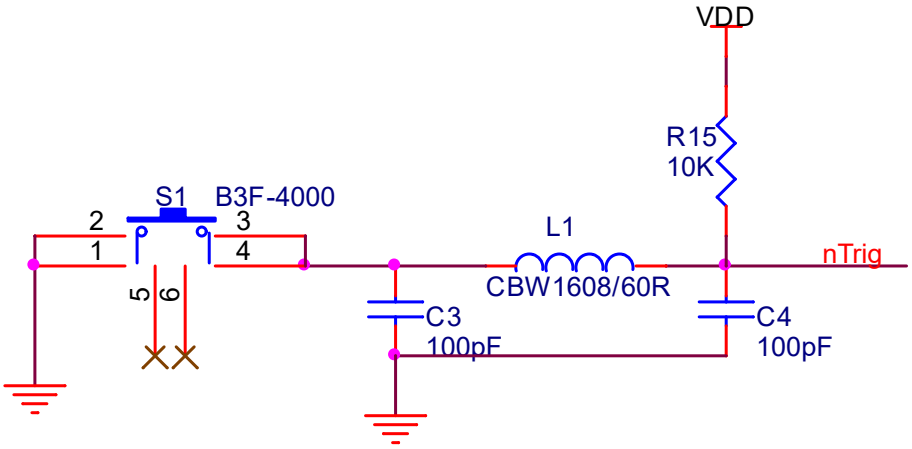
Good read LED signal

The scanner engine's LED (PIN 10) pin can provide a level prompt signal when decoding is successful, and is usually used as an input control signal for external decoding LED prompts. When it sounds a good read beeper , the LED pin will output a high-level pulse with a duration of about 300ms, and finally return to a low-level pulse. The load capacity of the LED signal output pin is limited, and it is not possible to directly drive the light-emitting diode, and a supporting light-emitting diode drive circuit is required.
Refer to the following supporting LED prompt driving circuit diagram :



Trigger control

The nTrig pin (PIN 12) of the scanner engine indicates a trigger when it inputs at a low level, and it indicates the trigger is stopped (or released) when it is at a high level. The scanner engine starts to read after receiving the trigger, and will output the decoded information after the read is successful, and then it waits for the trigger signal to stop (or release). During the triggering process, the trigger signal stops (or releases), the reading process is terminated. A new reading process needs to regenerate the trigger signal. The reading process needs to go through the steps of capturing image, barcode recognition and interpretation. It is recommended that the interval between two trigger signals is not less than 10ms.
Refer to the following trigger circuit design:



EVK

The EVK is provided to help users to test and evaluate the RT217 Series, which contains beeper & beeper driver circuit, LED & LED driver circuit, and trigger, TTL-232 to RS-232 converter, RS-232 & USB interfaces, reserved signal debugging interface, etc. The RT217 Series can be connected to the EVK via a 12-pin FPC cable to 12-PIN FPC cable.

For any technical support, welcome to contact us at :
support@rtscan.net