RT218 Integration Guide

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Introduction

The RT218 is an area image engine for barcode reading. It includes an illumination LED and a LASER aimer.
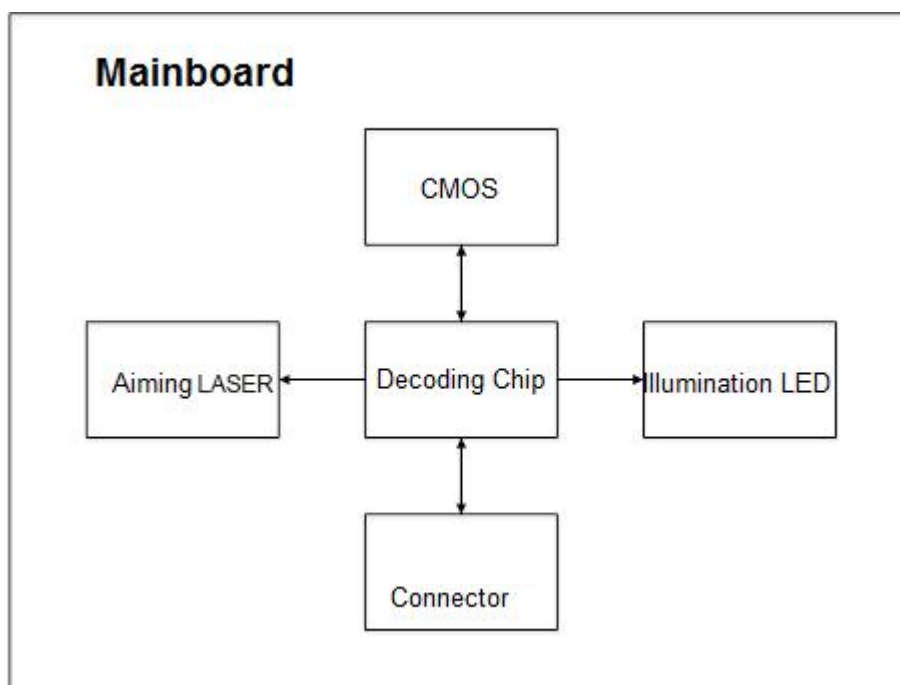
LASER Compliance Statement

The RT218 complies with IEC 60825-1: 2014 for laser aiming safety.

The RT218 contains:

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

Figure 1-1 System Block Diagram

Illumination

The RT218 has 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 RT218 contains a red LASER 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.

Introduction

This chapter explains how to install the RT218, 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 RT218. 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 RT218 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 RT218.

Table 2-1

Operating Temperature	-30°C to 70°C
Storage Temperature	-40°C to 80°C
Humidity	5% ~95% (non-condensing)

Thermal Considerations

Electronic components in the RT218 will generate heat during the course of their operation. Operating the RT218 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 RT218.

✧ Reserve sufficient space for good air circulation in the design.

✧ Avoid wrapping the RT218 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 RT218.
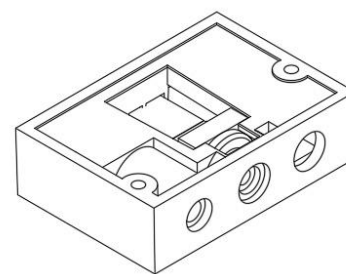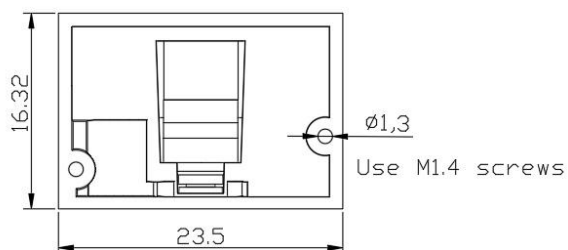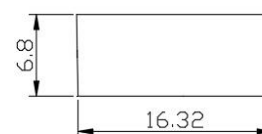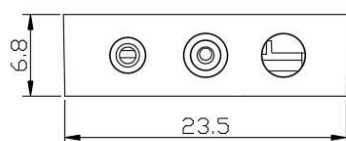

Figure 2-1

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 RT218 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=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**.
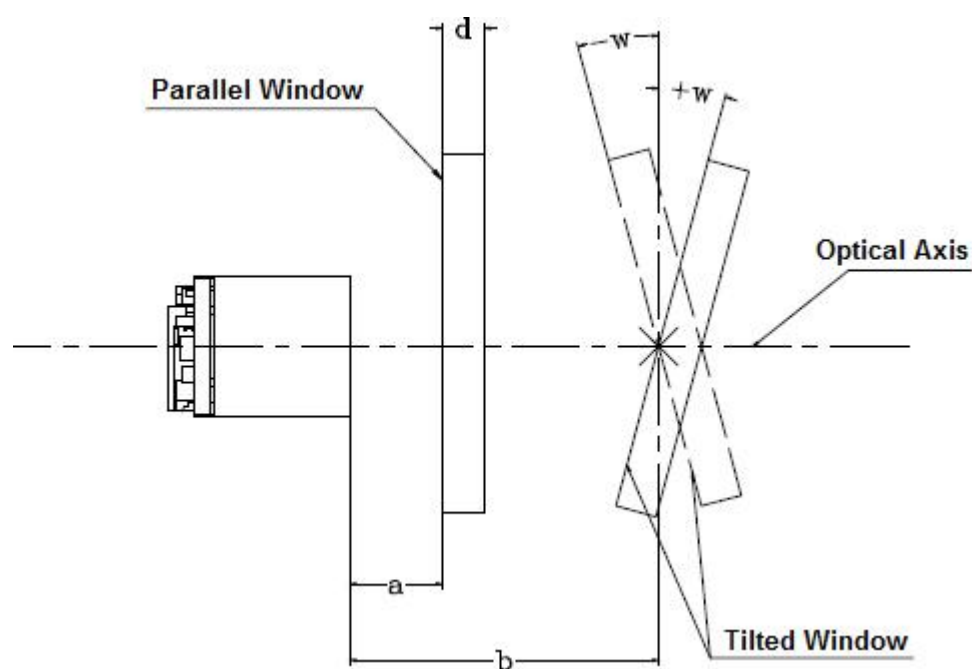
Figure 2-2

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 RT218. 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.

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.
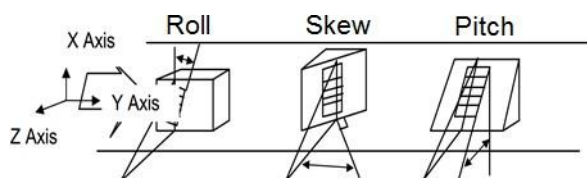
Figure 2-6

Ambient Light

The RT218 shows better performance with ambient light. However, high-frequency pulsed light can result in performance degradation.

Eye Safety

The RT218 comes with a laser aimer. 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 RT218 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-on 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) :≤100mV

DC Characteristics

Operating Voltage

Table 3-1

T=25°C

Parameter	Description	Typical	Unit
VDD	Input Voltage	3.3	V

Operating Current

Table 3-2

T=25°C   state=VDD 3.3V current unit: mA

Description	State	PEAK	RMS	Idle
Working Current	Trigger mode	360	160	25.5
	Sense mode	360	160	124.5

Interface Pinouts

The RT218's FPC comes out with 12pins to host.

12-pin definition of pinout of RT218:

PIN#	Signal Name	Signal type	Description
1	NC		Empty Pin
2	VDD	Power	3.3V power supply
3	GND	Power	GND
4	RX	Input	UART Receives, TTL level
5	TX	Output	UART Sends, TTL level
6	D-	Bi-directional Difference	USB_D- signal
7	D+	Bi-directional Difference	USB_D+ signal
8	NC		NC empty pin
9	BUZ	Output	Beeper Signal Outputs (High Level is Valid),Need External Drive
10	LED	Output	LED Signal Outputs (High Level is Valid) , Need External Drive
11	NC		NC empty pin
12	nTRIG	Input	Trigger Signal Inputs, Low Level is Valid

Note: please remember your device's TXD should be connected to RXD of RT218, and RXD to TXD.

EVK

The EVK is provided to help users to test and evaluate the RT218, which contains beeper & beeper driver circuit, LED & LED driver circuit, and trigger, TTL-232 to RS-232 converter, RS-232 or USB interfaces, reserved signal debugging interface, etc.

For Any Technical Support, please contact us at: support@rtscan.net

Thank you!