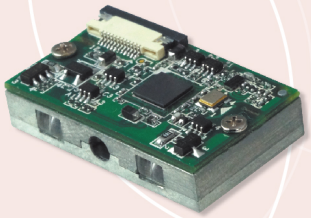
ZEBEX
www.zebex.com



User's Manual

Micro Linear Image Scan Engine

Revision History

Changes to the original manual are listed below:

Version	Date	Description of Version
1.0	2015/12/25	Initial release

Important Notice

No warranty of any kind is made in regard to this material, including, but not limited to, implied warranties of merchantability or fitness for a particular purpose. We are not liable for any errors contained herein or incidental or consequential damages in connection with furnishing, performance or use of this material.

No part of this document may be reproduced, transmitted, stored in a retrieval system, transcribed, or translated into any language or computer language in any form or by any means electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without express written consent and authorization.

We reserve the right to make changes in product design without reservation and without notification. The material in this guide is for information only and is subject to change without notice.

All trademarks mentioned herein, registered or otherwise, are the properties of their various respective owners.

For CE-countries

This scanner is in conformity with CE standards. Please note that an approved, CE-marked power supply unit should be used in order to maintain CE conformance.

Guidance for Printing

1. This manual is in A5 size. Please double check your printer setting before printing it out.
2. When printing barcodes for programming, the use of a high-resolution laser printer is strongly suggested for the best scan result.

Table of Contents

Introduction

The Micro CCD Scan Engine is the thinnest and one of the most powerful scan engines in the world. Measuring just 4.5 mm thin, with an exceptional 300 scans per second performance and reliable decidability, it packs more features and functionality in only half the size compared to similar scan engines in its class. The micro thin size and potent design makes integration possible for the smallest portable applications and wearable devices.

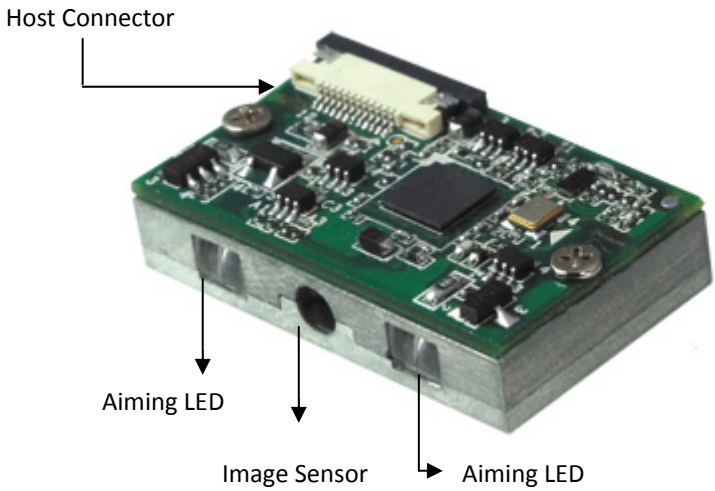
The scan engine is equipped with a hardware decoder and supports standard serial, USB interface and USB virtual COM port. In most cases, the miniature scan engine can be easily integrated without modifying existing hardware platform.

It is designed for effortless integration into most data capture applications, such as barcode scanners, handheld computers, data collectors, medical instruments, kiosks, vending machines and many other devices.

The scanner includes key features as,

- Ultra small size
- Outstanding scanning performance
- Advanced image capture technology
- Multi-interface communication

Overview



Components

Description	Function
Host Connector	Used to connect to the host
Aiming LED	Produce easy to see scan line
Image Sensor	CCD aperture

Scanner Operation

Precautions

To ensure the scanner reaches its best performance, the following points need to be noticed when mounting the scanner:

a. Do not place the scanner under direct sunlight or any other bright light source illuminating.

b. When placing the barcode label, one must be careful not to over tilt, skew and/or pitch the barcode (Refer to figure 1)

c. Do not place the device at specula reflection position. The LED light of the scanner reflects directly back on the scanner if it is placed at specula reflection position. As to the nature of CCD sensor, it will not be able to read any barcodes.

d. The barcode label must be placed within the effective depth of field (D.O.F.) since it is the effective reading distance for the barcode from the scanner. For the best placing position, please refer to the Decode Depth of Field drawing. (Figure 2)

Maintaining the Scanner

Handling with care! The scan engines are electrostatic sensitive device; do not handle with bare hands. Store the engines away from dust and humidity places.

ESD

The scan engines are protected from ESD events that may occur in an ESD-controlled environment. Always exercise care when handling the module. Use grounding wrist straps and handle in a properly grounded work area.

Scan Angles

See the following illustrations for the effective barcode reading angles.

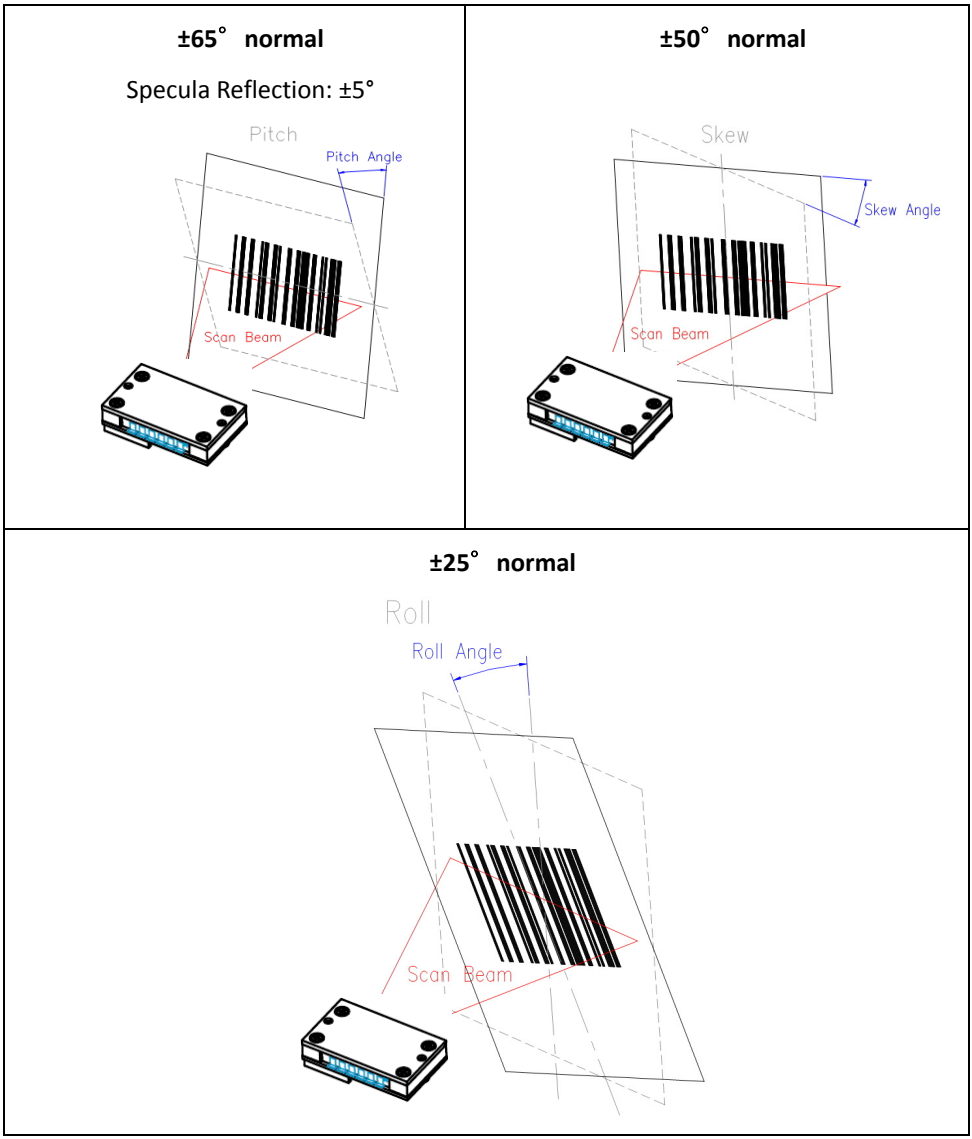


Figure 1: Skew, Pitch and Roll Angle Illustration

Scan Zone

The effective reading distance for the scanner is illustrated as below.

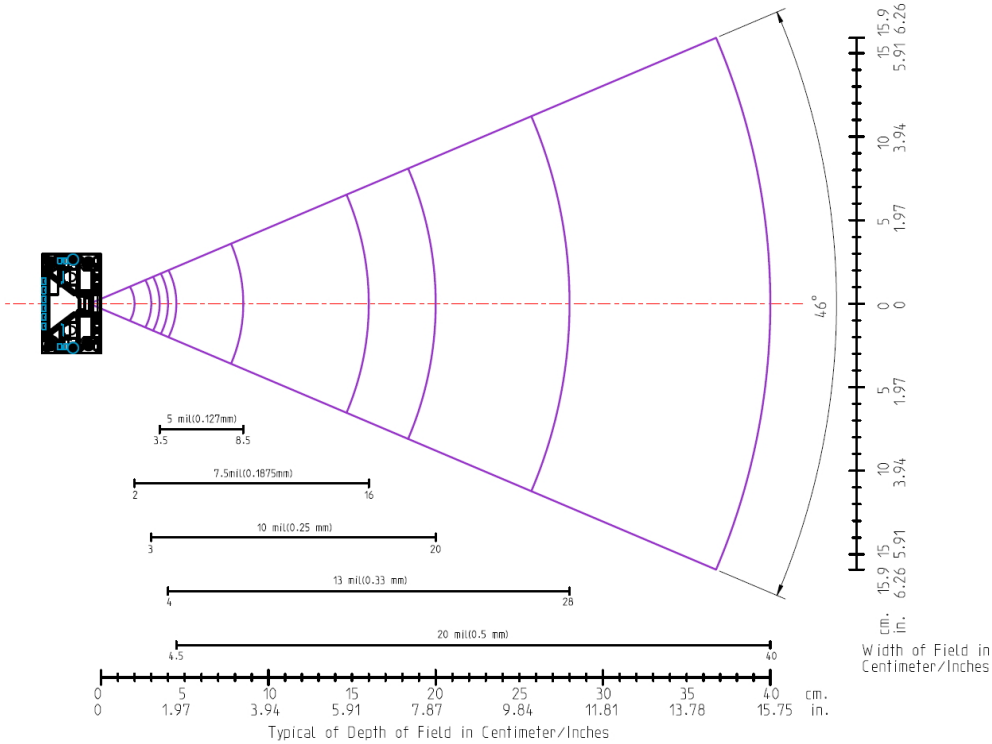


Figure 2: Scan Zone

Different quality and density of a barcode could effect its decode depth of field. Usually when a barcode has poor printing quality or high density, the depth of field would be shorter. It is highly suggested **not** place the barcode label at the extremes of depth of field as it is often easy to move out from the reading range.

Installation

FCC Cable

A flex strip cable is needed to connect the scan engine to your host terminal, and different decode mode uses different FFC cable.
Decoded mode scan engine: 12Pin ZIF Pin configured FFC cable

The following figure shows the FFC cable dimension and its pin-out configuration.

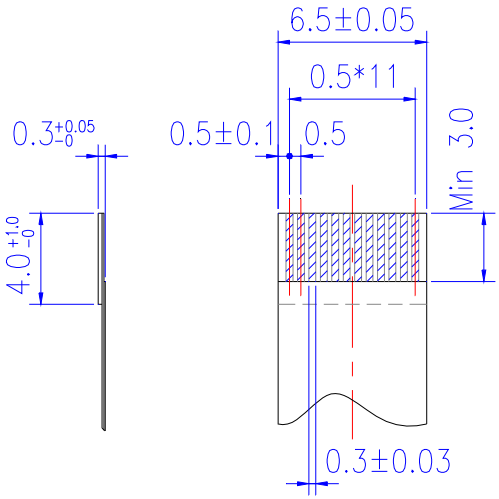
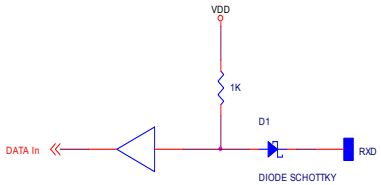
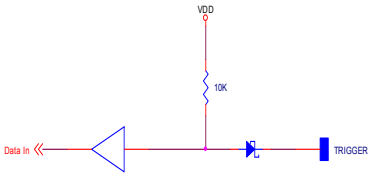
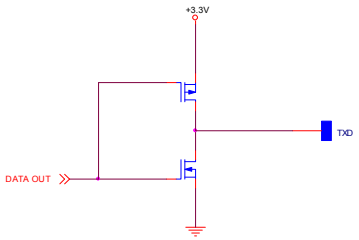
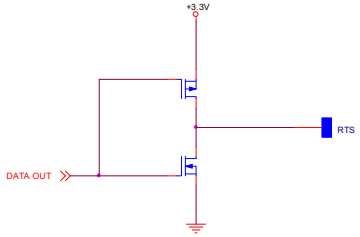
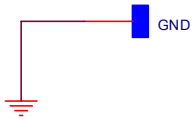
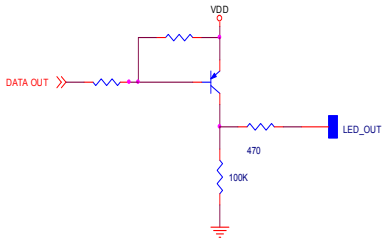


Figure 3: FCC Cable Dimension

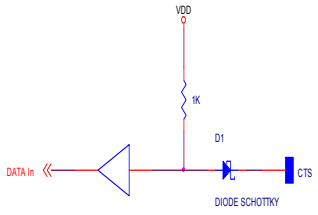
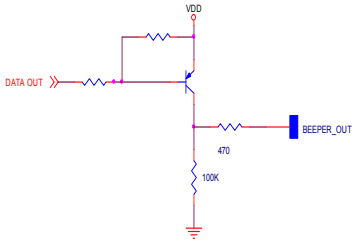
Decoded Scan: 12Pin ZIF Pin Configuration

			Control Status / Description	Electrical Equivalent
1	VDD	--	DC 3.3V Power Input	
2	RXD	Input	Receive data	
3	Trigger	Input	L = Start session H = Inactive Used to start decode session	
4	USB Power	--	USB power input	
5	TXD	Output	Transmit data	

~Decoded Scan: 12Pin ZIF Pin Configuration (Continued) ~

6	RTS	Output	Request to send control signal	
7	GND	--	System Ground	
8	USB+	Output	Positive differential data signal for the USB bus	
9	LED_OUT	Output	H=LED ON L=LED OFF Active low output used to indicate a valid barcode decode. Normally used as a control signal for a LED drive circuit. Control line can only source/sink 5 mA. (for 3.3V)	

~Decoded Scan: 12Pin ZIF Pin Configuration (Continued) ~

10	CTS	Input	Clear to send control signal	
11	BEEPER_OUT	Output	L=normal H=Active Pulse width modulated output used to control an external beeper Control line can only source/sink 5 mA.(for 3.3V)	
12	USB-	Output	Negative differential data signal for the USB bus.	

Window Instruction

The scan engine is designed to be implemented into a customized host device, and a window as a part of the housing design is required to protect the scan engine. The scan engine has to be designed and placed at a position where its exit window is away from direct reflected lights.

The design, position and material of the window will effect to the reading performance, and it may be critical for best reading performance.

Window Design and Position

Table below and Figure 4~6 show the minimum size of the window and best suggested position of the window along the horizontal and vertical axes.

The following points need to be noted when design:

- The windows must not block light reflected from barcode.
- The window must be positioned so that LED light reflected is not reflected back into the collection optics of the scan engine.
- The window must not block the outgoing light.
- The specified (height, width and angle) are minimum requirement and care must be exercised to allow for manufacturing tolerances.

Window Size and Position

Distance from engine at scan center line (mm)	5 (0.2")	10 (0.4")	15 (0.6")	20 (0.8")	25 (1")	30 (0")	35 (1.2")	40 (1.6")	45 (1.8")	50 (2")	55 (2.2)
Minimum window width(mm)	24	28	33	36	40	45	49	53	56	60	62
Minimum window Height(mm)	2.2	2.4	2.6	2.8	3.1	3.7	4.0	4.2	4.4	4.5	4.8
Minimum Window Tilt/Positive	32°	20°	15°	12°	11°	10°	10°	8°	8°	7°	7°
Minimum Window Tilt/Negative	27°	17°	13°	11°	10°	9°	9°	7°	7°	6°	6°

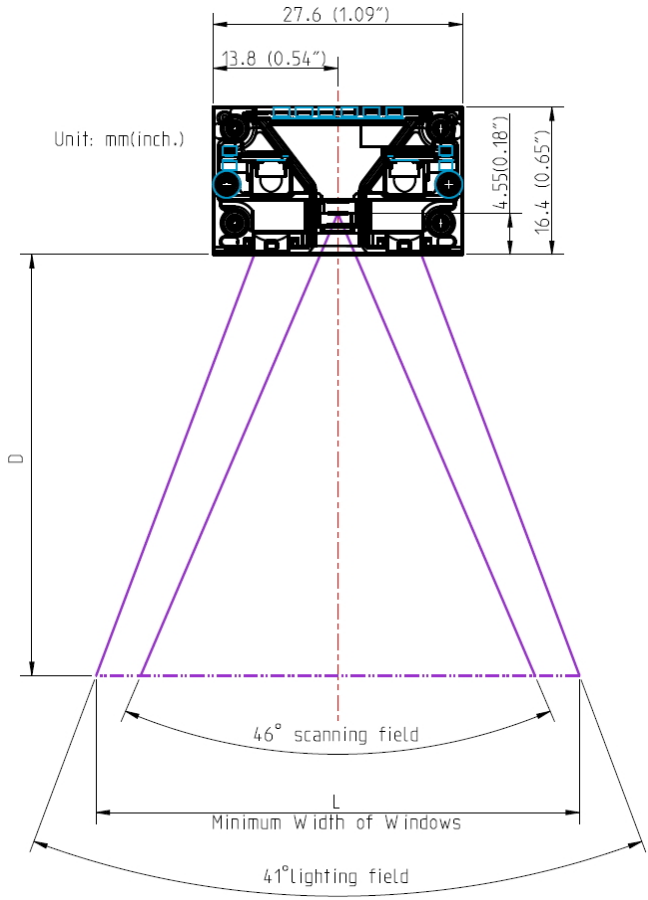


Figure 4: Scanning Field and Lighting Field

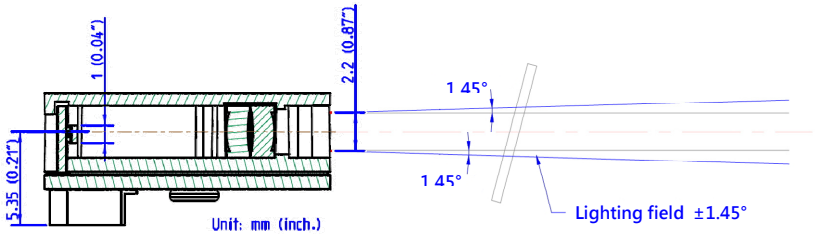


Figure 5: Clear Aperture Requirement

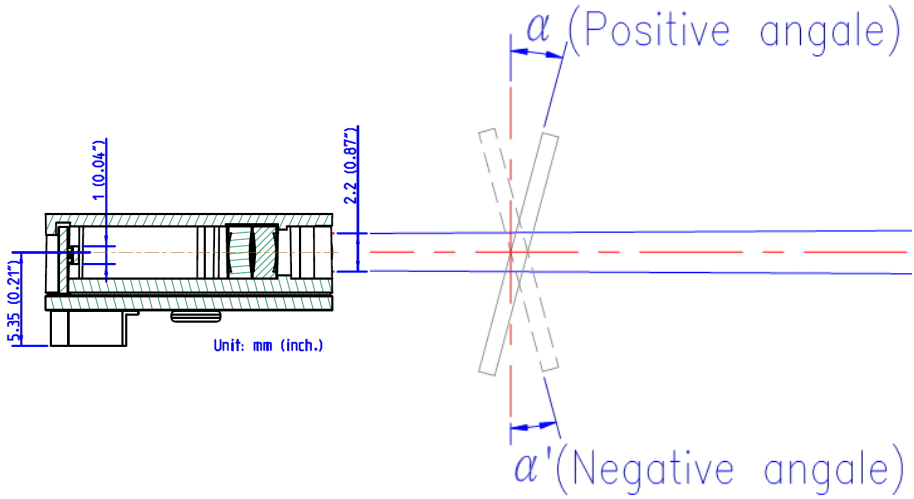


Figure 6: Window Tilt Angle Requirement

Window Material

The window material selected depends on the anticipated environment that the product is intended to be used. Appropriate window material includes glass or plastic, among the most commonly used window materials are:

PMMA (PolyMethylMethAcrylate)
PolyMethyl Methacrylate (PMMA) is an excellent material for exit windows at a low initial cost. This cell cast acrylic is a clear plastic that can be used as a shatterproof replacement for glass that maintains transparency for any thickness.

CR-39 (Columbia Resin 39)
CR-39 is an optically clear plastic, manufactured by cell casting, and is available with a thickness of between.031 to 1 inch. This material is scratch-resistant as well as resistant to acids, alkaline and organic solvents.

Coatings are not required with this material as the surface is strong enough to resist damage in most environments.

Chemically tempered float glass
Glass is also an optional exit window material, however the following issues should be considered when designing the exit window for the end product.

Tempered glass should receive the same care as annealed glass. Improper handling and installation can produce edge damage. Breakage can occur when edge-damaged tempered glass is subjected to a moderate thermal of mechanical stress. Full penetration of the compression layer can produce total fragmentation of tempered glass. Therefore, tempered glass cannot be cut or modified following heat treatment.

Window Color

Plastic is available in a wide range of colors. Exit windows can be colored if desired. The only requirement is the optical transmission in the spectral region between 600 nm and 650 nm, which should be a minimum of 85%.

Caution in Handling Window

Scratching of the window can reduce the scanning performance, and it is important to avoid scratches on windows. We suggest you either recess the window into the housing, or apply a hard-coat on window.

Mounting

In this section, we will introduce how to mount the scan engine into your design.

At the back of scan engine, there are two screw holes reserved for mounting (Figure 7), the scan engine can be fixed in any position and any angle without any degradation in performance. And to ensure the scanner reaches its best performance, the following points need to be noticed when mounting the scanner:

To avoid direct sunlight or any other bright light source illuminating.

When placing the barcode label, one must be careful not to over tilt, skew and/or pitch the barcode.

To avoid putting the scanner in specula reflection position, the CCD sensor will not sense the reading of any barcodes if the LED light reflects straight back.

The barcode must be placed within the effective depth of field (D.O.F.) area, the effective reading distance for the barcode from the scanner. Its theory is like a camera, if the object is placed within the focal range, and the image appears clearly. But if the object is outside the focal range, the image then is blurred. And different quality and density of barcodes could affect its D.O.F.; usually a lower piece or high density of barcode, its depth of field is shorter. It is suggested to avoid using depth of field extremes range, barcode is easily moved away from the reading range.

For best placing position, please refer to the Decode Depth of Field drawing (Figure 2).

Dimensions

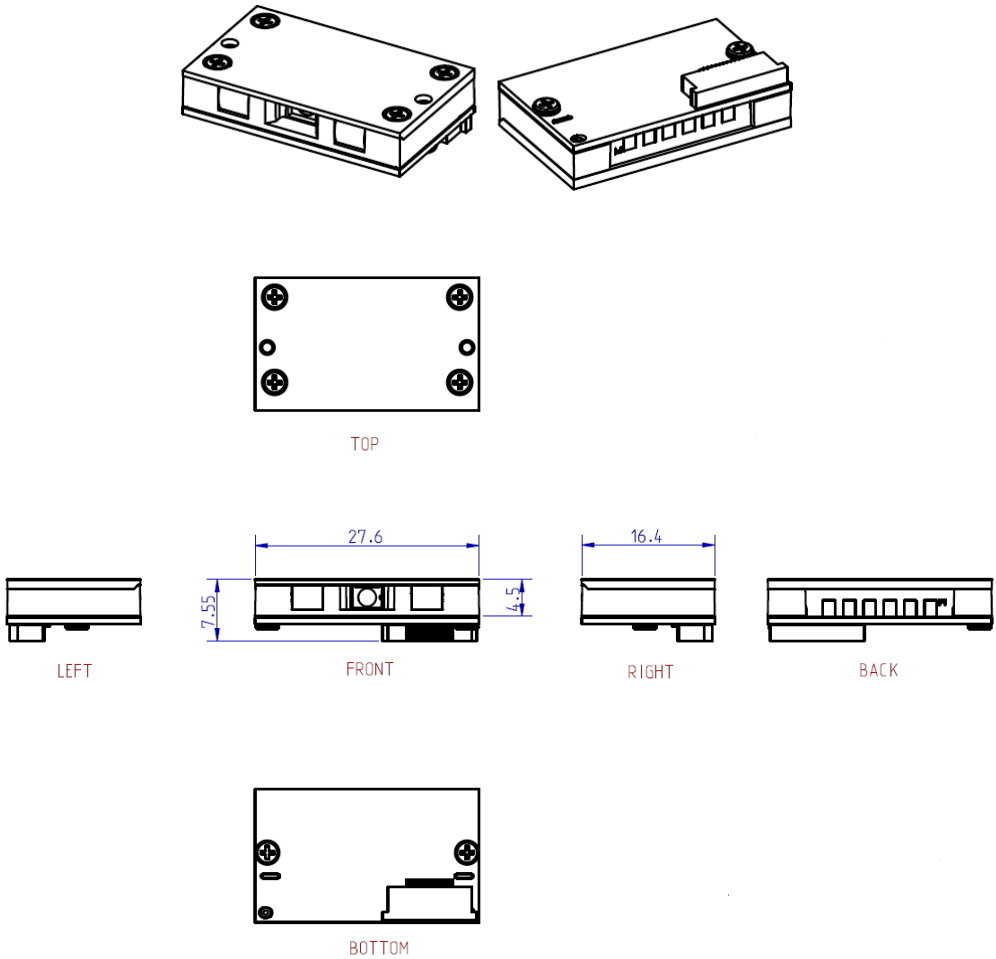


Figure 7: Outline Drawing

Technical Specification

Item	Description
Power Requirements Input Voltage Scan Current LED off Current Surge Current	 3.3 VDC ± 10% 87 mA typical 52 mA typical 116 mA
Optical Sensor Illumination Scan Angle	 Liner CCD 617nm visible LED 46°
Scanning Pitch Angle Skew Roll	 ±65° ±50° ±25°
Scan Rate	300 scans per second (typical)
Depth of Field	4cm~28cm (EAN-13 100%,PCS=90%) (DOF remains the same with ±1cm tolerance to the measurements)
Minimum Bar Width	0.1 mm
Shock	2000G

~Technical Specification Continued~

Vibration	Un-powered engine withstands a random vibration along each of the X, Y and Z axes for a period of one 10 min per axis, defined as follows: 20 to 80 Hz Ramp up to 0.04 G^2/Hz at the rate of 3dB/oct. 80 to 350 Hz 0.04 G^2/Hz 350 to 2000 Hz Ramp down at the rate of 3dB/oct.
Environmental Operating Temperature Storage Temperature Humidity	 0 ℃~ 50℃ (32° F~122° F) -20℃ ~ 60℃ (-4°F~140° F) 5% to 95% non-condensing
Physical dimensions Height Width Depth Weight	 7.55mm (4.5mm w/o PCBA) 27.6mm 16.4mm 8.4g
Connector	12 Lower contact ZIF connector
Interface	RS-232 (TTL level) HID USB USB-Virtual Com Port
Regulator Approval	According CE EN55022B,FCC Part 15 Class B,VCCI RoHS compliant
Symbologies	Code 39, Code 39 Full ASCII, Code 32, Code 128, UCC/EAN-128, Codabar, Code 11, Code 93,Standard 2 of 5, Industrial 2 of 5, Interleaved 2 of 5,, China Postal Code, IATA,UPC/EAN/JAN, UPC/EAN/JAN with Addendum Telepen, MSI/Plessey,GS1 DataBar (RSS) Linear, Linear-stacked

~Technical Specification Continued~

LED Reliability **Test Performed** **Condition** **Duration** **Simple Size** **Failures**	Steady state life test (SSLT) JESD22-A108 TA = 25°C IF = 30mA 1000h 45 Elec.= 0; Opt. = 0; Vis. = - Failure criteria: ● Electrical failures: Vf (If = 50mA) > 2,5V; ± 10% from initial value IR (Vr = 12V) > 10μA ● Optical failures: IV, Ie (If =50mA) absolute limit: ± 50% max. and |Δ%max - Δ%min| > 50%