iqmaxrefdes23 Documentation

Release 1.1

IQ2 Development GmbH

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CHAPTER 1

Introduction

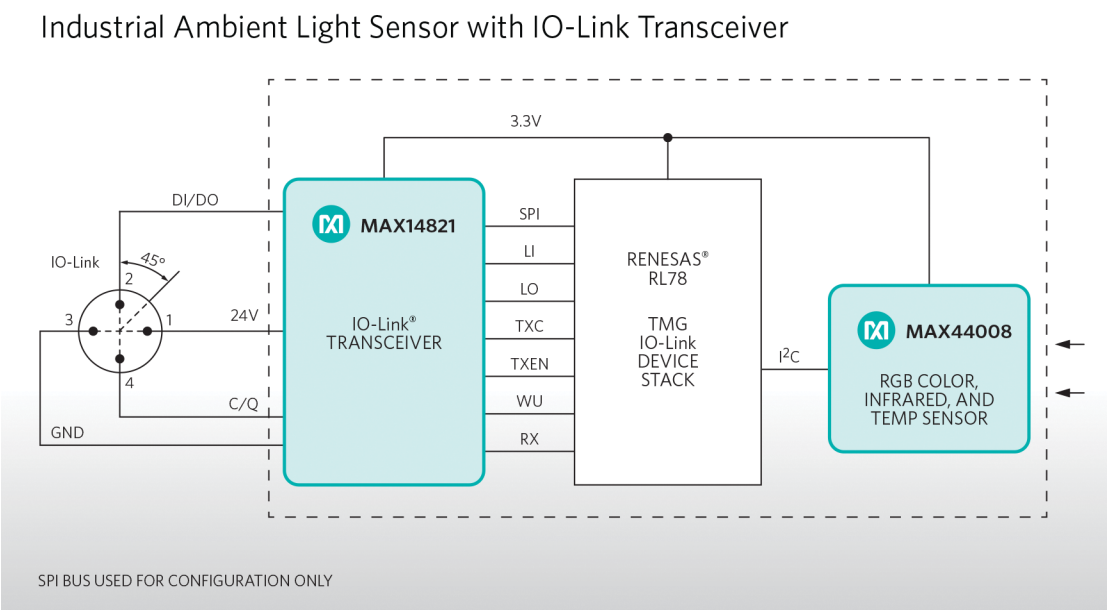
Maxim's Santa Cruz (MAXREFDES23#) reference design is the world's smallest IO-Link® light sensor compliant with IEC 61131-9. The entire design fits onto a 6.5mm x 25mm printed circuit board (PCB).

1.1 Board Specification



Item	Specification
Oscillator Frequency	18.432 MHz
Microcontroller	Renesas RL78/G1A (R5F10E8EALA)
DC Power	24 V via M12 Connector
LEDs	• Power indicator: Green x1 • IO-Link indicator: Amber x1 • Digital output indicator: Red x1
IO-link Connector	Male M12 4-pole A-coded
IO-Link PHY	Maxim MAX14821EWA+
Sensor	Maxim MAX44008EDT+

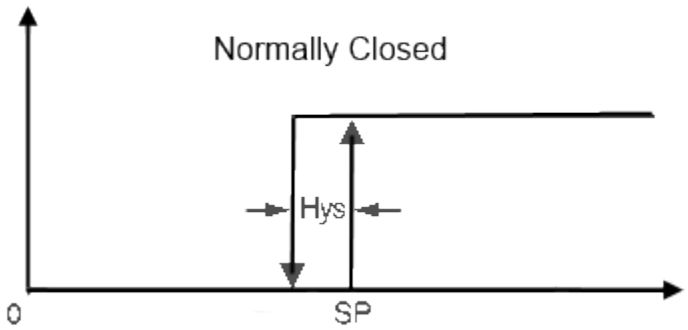
1.2 Project Goal



The purpose of this project is by giving the user a strong basis to start develop production-ready IO-Link® application based on Maxim Integrated IO-Link device transceiver (MAX14821), a Renesas ultra-low-power, 16-bit microcontroller (RL78) and iqStack® IO-Link Device Stack.

Sensor Logic

In iqmaxrefdes23 have been implemented simple switch-point hysteresis logic and additionally can be configured as normally closed or normally opened.



By default light switch-point settings (255 is the maximal value):

What	SP (Level)	Hysteresis	Mode
Light intensity	128 (0x80)	16 (0x10)	Normally closed
Darkness control	16 (0x10)	4 (0x04)	Normally opened

Note: When a device is in IO-Link OPERATE mode, light intensity switch-point flag indicated on digital output channel (red LED).

CHAPTER 3

IO-Link Application

iqmaxrefdes23 communicates with an IO-Link Master on COM3 transmission rate (230,4 kbit/s).

Note: When a device is switched to IO-Link SIO mode, sensors chip is switched to shutdown mode, microcontroller fall into HALT and restarting operation upon wake-up interrupt signal.

3.1 Process Data In

1. Byte (MSB): Light intensity (from 0 to 255).
2. Byte (LSB): [.....F - light intensity switch-point flag (1bit)].

3.2 Process Data Out

Be absent.

3.3 Commands

Can be run by IO-Link Index 0x0002:

Value	Description
128 (0x80)	Device Reset
160 (0xA0)	Tech-in light intensity switch-point level

3.4 Parameters

IO-Link index	Mode	Description	Default value
16 (0x0010)	read-only	Vendor Name	Renesas Electronics Europe GmbH
17 (0x0011)	read-only	Vendor Text	Major supplier of semiconductor solutions
18 (0x0012)	read-only	Product Name	Santa Cruz (MAXREFDES23#)
19 (0x0013)	read-only	Product ID	MAXREFDES23
20 (0x0014)	read-only	Product Text	IO-Link Light Sensor
23 (0x0017)	read-only	Firmware Revision	v1.1
256 (0x0100)	read/write	Ambient light switch-point level	128 (0x80)
257 (0x0101)	read/write	Ambient light switch-point hysteresis	16 (0x10)
258 (0x0102)	read/write	MAX44008EDT+ sensors chip sensivity	1 (0x01)
259 (0x0103)	read-only	MAX44008EDT+ sensors chip temperature	unknown

3.5 Events

Event code	Description
0x1800	Occurred when a light intensity is very low, see *Sensor Logic*

CHAPTER 4

Installation Details

There are two ways to experiment with MAXREFDES23#:

- Upload Firmware HEX-file, connect a device to IO-Link Master and play around.
- Clone the source code from Bitbucket repository, go throw and try to debug.

4.1 Firmware

Firmware HEX-file, IODDs data and this document in PDF format can be downloaded from the Bitbucket repository absolutely free without registration.

To upload HEX-file into MAXREFDES23 have to get Renesas E1 emulator and also Renesas Flash Programmer.

4.2 Source Code

The project source code can be cloned from the Bitbucket repository freely without registration.

Download a trial version of IAR RL78 Embedded Workbench IDE in order to compile it and also take a look for Renesas Application Leading Tool (Applilet).

Also the Renesas E1 emulator and Renesas Flash Programmer needed to start debug session with a device.

CHAPTER 5

Troubleshooting

If during power-on self-test (POST) hardware fails were occurred, then the main sensor application will not started and instead a first appeared hardware fail number was blinked on digital output red-indicator channel continuously.

Blinks Count	Fail Description
1	Renesas RL78 Illegal memory access (a firmware error, contact with developers)
2	Renesas RL78 RAM parity check (a firmware error, contact with developers)
3	Renesas RL78 Illegal instruction (a firmware error, contact with developers)
4	Maxim MAX14821EWA+ selfcheck (try to restart the device)
5	Maxim MAX44008EDT+ selfcheck (try to restart the device)

CHAPTER 6

License

All source files with the correspondent header notes are the subject to the IQ² Development GmbH terms and conditions defined in file `Allgemeine Vertragsbedingungen.pdf`.

For any other details please contact with us.