AXIOMTEK

AX92351-32CH

16-CH Isolated DI and 16-CH Isolated DO PCI Express Card with Digital Filter

AX92351-64CH

32-CH Isolated DI and 32-CH Isolated DO PCI Express Card with Digital Filter

User's Manual

RoHS

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ESD Precautions

The boards have integrated circuits sensitive to static electricity. To avoid damaging chipsets from electrostatic discharge, observe the following precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.

- Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This will help to discharge any static electricity on a human body.

- When handling boards and components, wear a grounding wrist strap available from most electronic component stores.

Trademarks Acknowledgments

Table of Contents

Section 1
Introduction

This section contains general information and detailed specifications of the AX92351 digital I/O card, including the following sections:

- General Description
- Features
- Specifications
- Dimensions

1.1 General Description

The AX92351 is a 16/32-ch isolated DI and 16/32-ch isolated DO card. It comes with DI channels that support both sink and source input types for maximum application flexibility. The AX92351 card also integrates digital filter and I/O interrupt (smart interrupt) functions, making it specifically suitable for factory automation, Industrial ON/OFF control and switch status sensing.

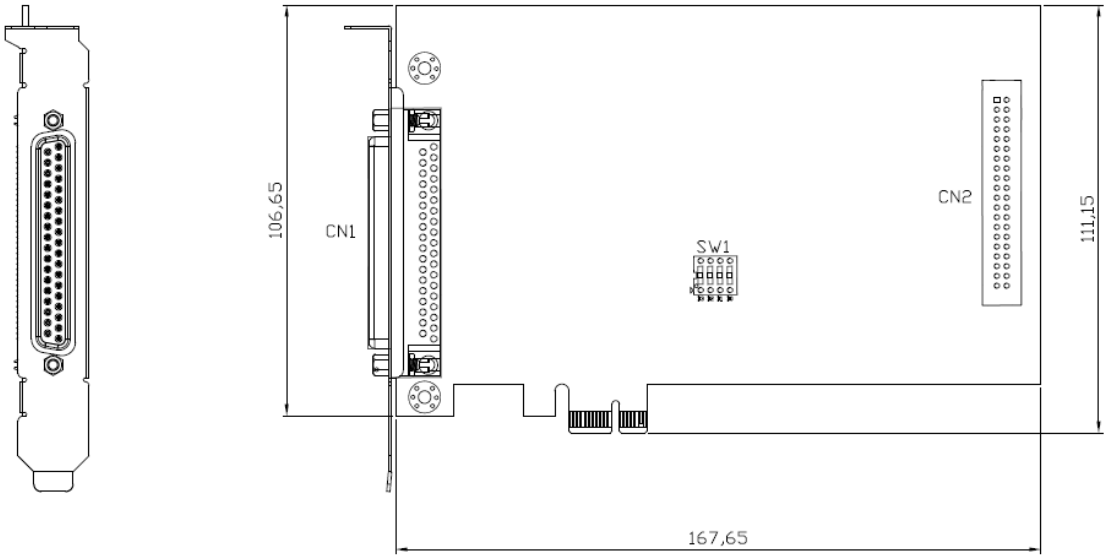
1.2 Features

- **16/32-ch isolated digital input (sink and source)**
- **16/32-ch isolated digital output (sink and source, OCP and output status read back)**
- **Interrupt capability (smart interrupt)**
- **Digital filter function**
- **Supports board ID**

1.3 Specifications

- **Isolated digital input**
  - Number of channels: 16/32
  - Input type: Sink or source; dry or wet contact
  - Input voltage: on (logic 1): 10~30VDC, off (logic 0): 0~3VDC
  - Impedance: 7.5kΩ
  - Response speed: 4KHz
  - Digital filter: 16 stages per DI channel; each channel can be set independently
- **Isolated digital output**
  - Number of channels: 16/32
  - Output type: Sink or source, open collector
  - Supply voltage: Max. 30VDC
  - Max. voltage drop: 3.5VDC @100mA
  - DO Max. load current: 100 mA/+30 VDC for all channels @ 100% duty
  - Response speed: 4KHz
  - Over current protection: Yes
- **Smart Interrupt**
  - Sources: Provides two interrupt sources from Interrupt 0 (DI: CH 0-4) and 1 (DI: CH 8-12)
- **General specifications**
  - Bus type: PCI Express x1
  - I/O connector: D-sub 37-pin female connector and 40-pin box header (AX92351-64CH only)
  - Isolation voltage: 2KV
  - Power requirement: 625mA @ +3.3V (Max.), 66mA @ +12V (Max.)
  - Dimensions: W 168 mm x D 107 mm
  - Board ID: Yes, 4-bit
  - Operating temperature: 0°C ~ +60°C (0°F ~ +140°F)
  - Storage temperature: -20°C ~ +80°C (-4°F ~+176°F)
  - Operating Humidity: 5 ~ 95% RH, non-condensing
- **OS support**
  - Windows® 7, Windows® 10 (32/64-bit) and Interval zero real-time OS (64-bit)
  - Software compatibility: C#, C/C++, Visual Basic

1.4 Dimensions



Component Side

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Section 2
Connectors

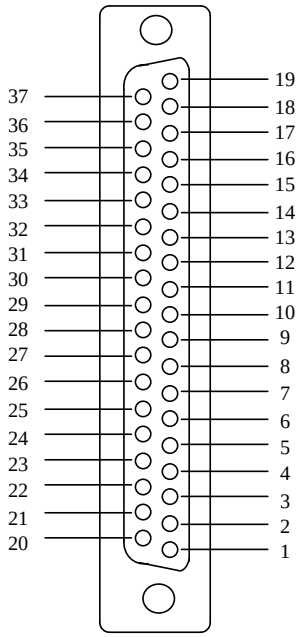
2.1 Connectors

Connectors connect the board with other parts of the system. Loose or improper connection might cause malfunctions. Make sure all connectors are properly and firmly connected.
The following table lists the function of each connector on the AX92351 card.

Connectors	Label
CN1	2.1.1
CN2	2.1.2
SW1	2.1.3

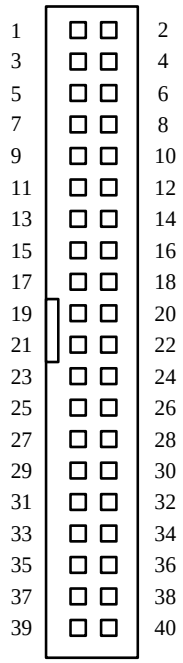
2.1.1 37-Pin Female I/O Connector (CN 1)

Pin	Description	Pin	Description
1	DI COM 0	20	DO COM 0
2	DI 0	21	DO 0
3	DI 1	22	DO 1
4	DI 2	23	DO 2
5	DI 3	24	DO 3
6	DI 4	25	DO 4
7	DI 5	26	DO 5
8	DI 6	27	DO 6
9	DI 7	28	DO 7
10	DI 8	29	DO 8
11	DI 9	30	DO 9
12	DI 10	31	DO 10
13	DI 11	32	DO 11
14	DI 12	33	DO 12
15	DI 13	34	DO 13
16	DI 14	35	DO 14
17	DI 15	36	DO 15
18	DI COM 1	37	DO COM 1
19	DI GND 0		



2.1.2 40-pin box header (CN 2), AX92351-64CH only

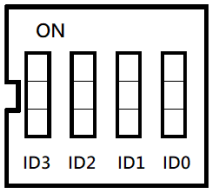
Pin	Description	Pin	Description
1	DI COM 2	2	DO COM 2
3	DI 16	4	DO 16
5	DI 17	6	DO 17
7	DI 18	8	DO 18
9	DI 19	10	DO 19
11	DI 20	12	DO 20
13	DI 21	14	DO 21
15	DI 22	16	DO 22
17	DI 23	18	DO 23
19	DI 24	20	DO 24
21	DI 25	22	DO 25
23	DI 26	24	DO 26
25	DI 27	26	DO 27
27	DI 28	28	DO 28
29	DI 29	30	DO 29
31	DI 30	32	DO 30
33	DI 31	34	DO 31
35	DI COM 3	36	DO COM 3
37	DI GND 1	38	NC
39	NC	40	NC



2.1.3 Board ID (SW1)

Default board ID setting is 0 (0x0000).

ID3	ID2	ID1	ID0	Board ID
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15



Note: On: 1, Off: 0

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Section 3
I/O Connection

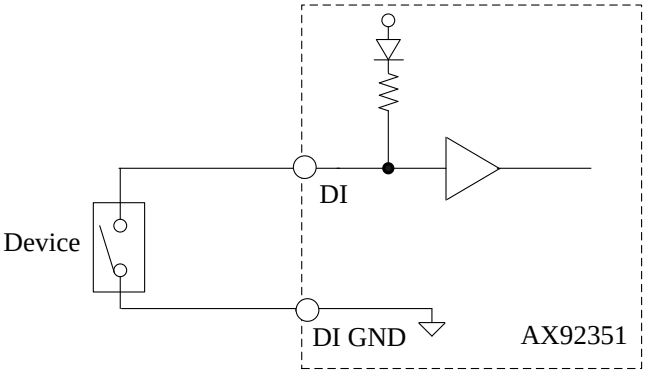
3.1 I/O Connection

Refer to this section to connect any cables between the AX92351 card and other devices. Each of the following I/O figures illustrates their respective connection on the AX92351.

3.1.1 Isolated Digital Input

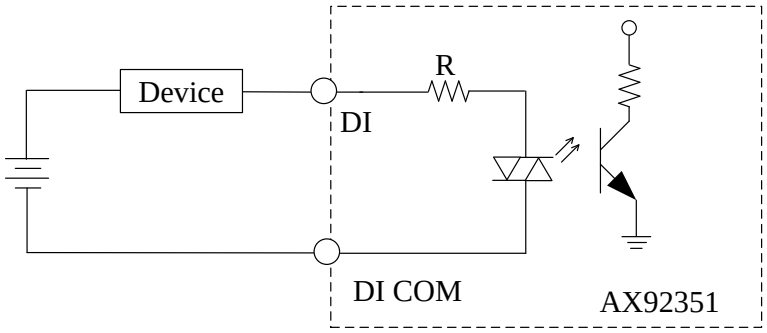
The figures show how to connect between an external input source and the AX92351.

Dry contact: DI0~15 correspond to DI GND 0; DI16~31 correspond to DI GND 1.

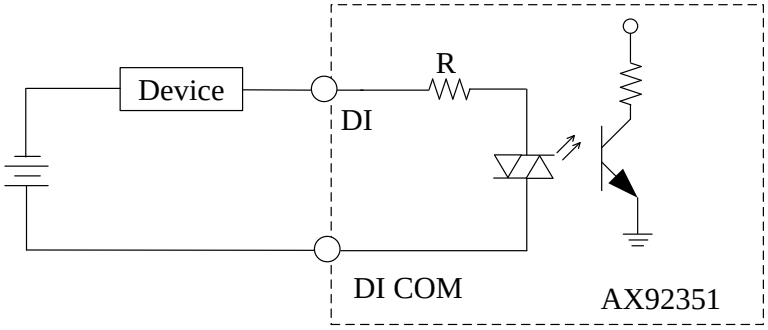


Wet contact:
Wet Contact: 8 channels are a group. DI 0 ~ 7 correspond to DI COM 0, DI 8~15 correspond to DI COM 1, DI 16~23 correspond to DI COM 2, and DI 24~31 correspond to DI COM 3. Each of the isolated digital input channels accepts 0~30 VDC in both sink and source types.

DI sink type:



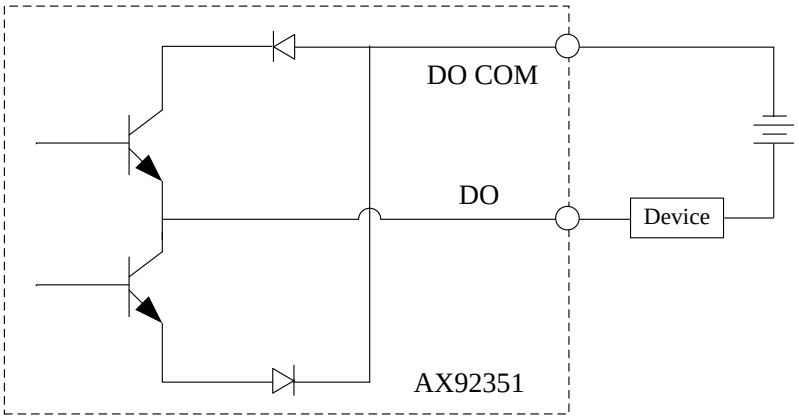
DI source type:



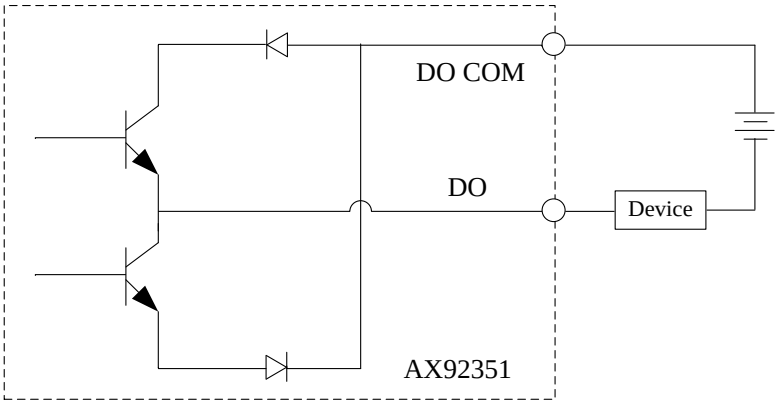
3.1.2 Isolated Digital Output

The figures show how to connect between an output channel and the AX92351.
If an external voltage with maximum 30 VDC is applied to an isolated output channel, the current will flow from the external voltage source to the card.
8 channels are a group. DO 0 ~ 7 correspond to DO COM 0, DO 8~15 correspond to DO COM 1, DO 16~23 correspond to DO COM 2, and DO 24~31 correspond to DO COM 3.

Sink type:



Source type:



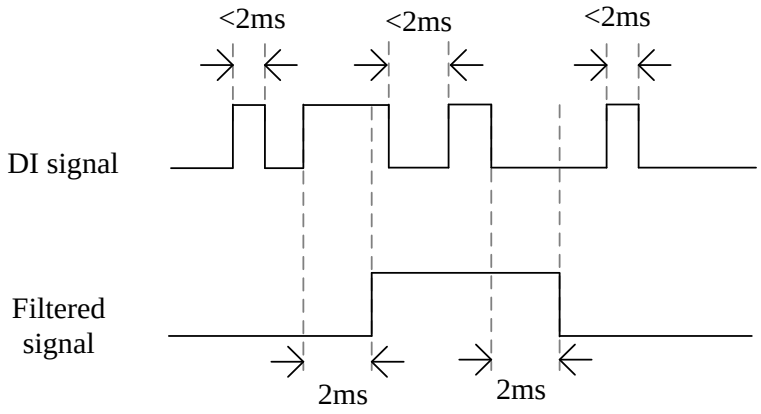
Section 4
Operation

4.1 Operation

This section describes the detailed operation of the AX92351 card.

4.1.1 Digital Filter Time

The AX92351 card's digital input supports digital filter time function to help filter out noise that can affect the accuracy of the pulse count. The digital filter defines the pulse time width for high/low signals. Signals with time width less than the defined value will be filtered out. Each digital input channel has 16 filter stages and each stage can be set independently with a specific filter time.
Below is a diagram illustrating the case of the digital filter set with a time width of 2 milliseconds:



The table of the digital filter is presented as below.

Setting Data	Digital Filter Time	Setting Data	Digital Filter Time	Setting Data	Digital Filter Time	Setting Data	Digital Filter Time
0	function disable	4	700 μs	8	3ms	12	7ms
1	100 μs	5	900 μs	9	4ms	13	8ms
2	300 μs	6	1ms	10	5ms	14	9ms
3	500 μs	7	2ms	11	6ms	15	10ms

4.1.2 Smart Interrupt

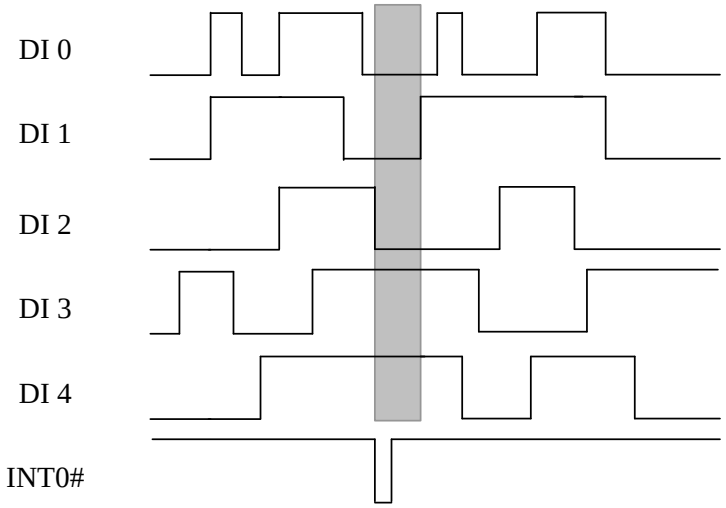
The AX92351 can be configured to send two independent interrupt signals (INT0, INT1) to the host PC.

The user can define a single DI signal or a combination of two to five DI signals as the trigger condition for the AX92351 to generate an interrupt signal. Once the AX92351 simultaneously receives all of the defined DI signals, it will generate an interrupt signal. This function defined as smart interrupt.

- Any combination of defined DI0, DI1, DI2, DI3 and DI4 signals will generate an INT0 interrupt signal.
- Any combination of defined DI8, DI9, DI10, DI11 and DI12 signals will generate an INT1 interrupt signal.

For example, the user can simply set the AX92351 to send an INT0 interrupt signal as it receives a high DI0 source signal, or, as in the case below, defines five DI source signals as the trigger conditions to generate an INT0 interrupt signal:

1. When the AX92351 simultaneously receives “low” signals from DI0, DI1 and DI2 and “high” signals from DI3 and DI4, it will send an interrupt signal to notify the PC, as illustrated in the following figure:



The source signals meet the defined conditions and trigger the AX92351 to send an INT0 interrupt signal.

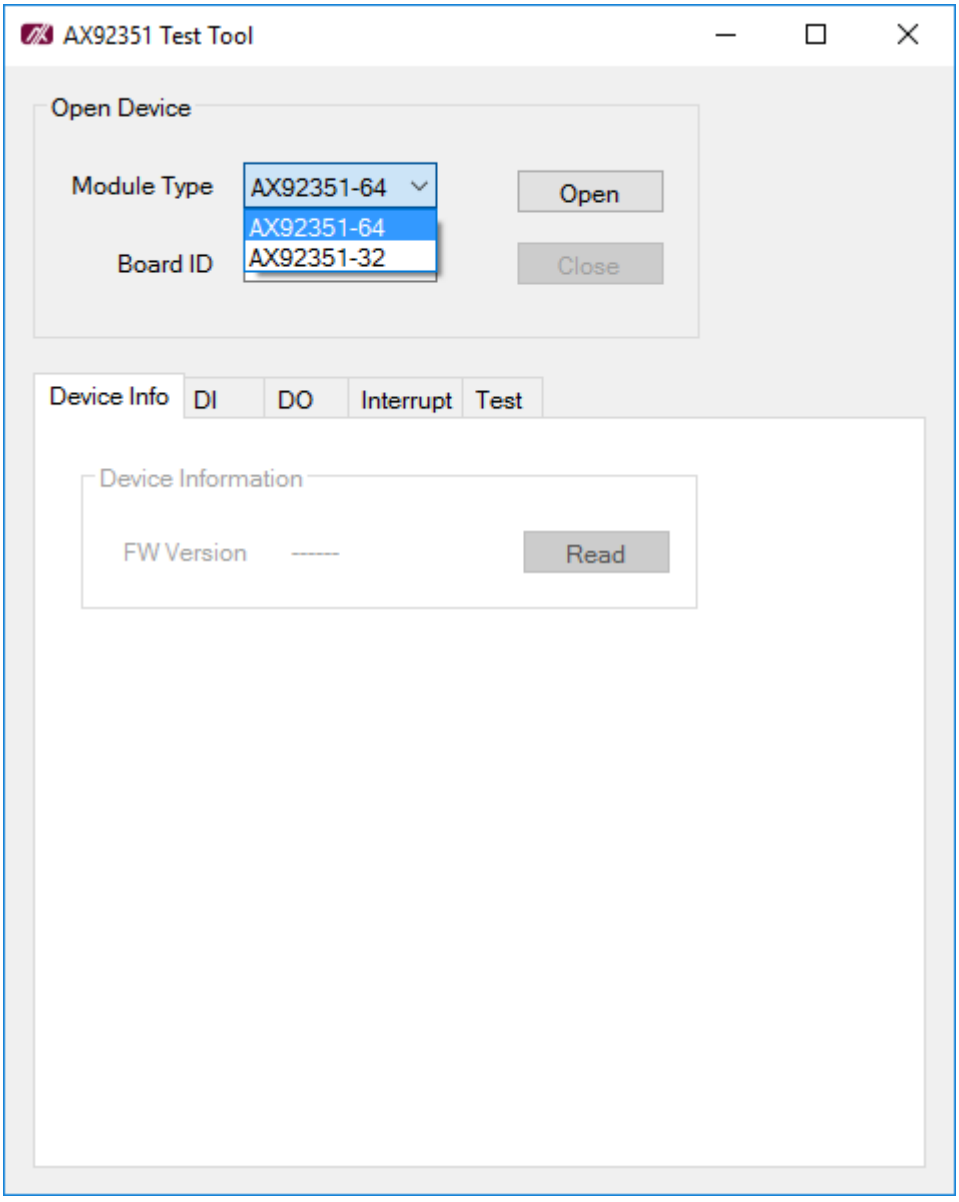
Section 5
Test Tool

5.1 Test Tool

We provide a test tool to help you to verify AX92351 module easily. The below sections will descript the detail features of AX92351.

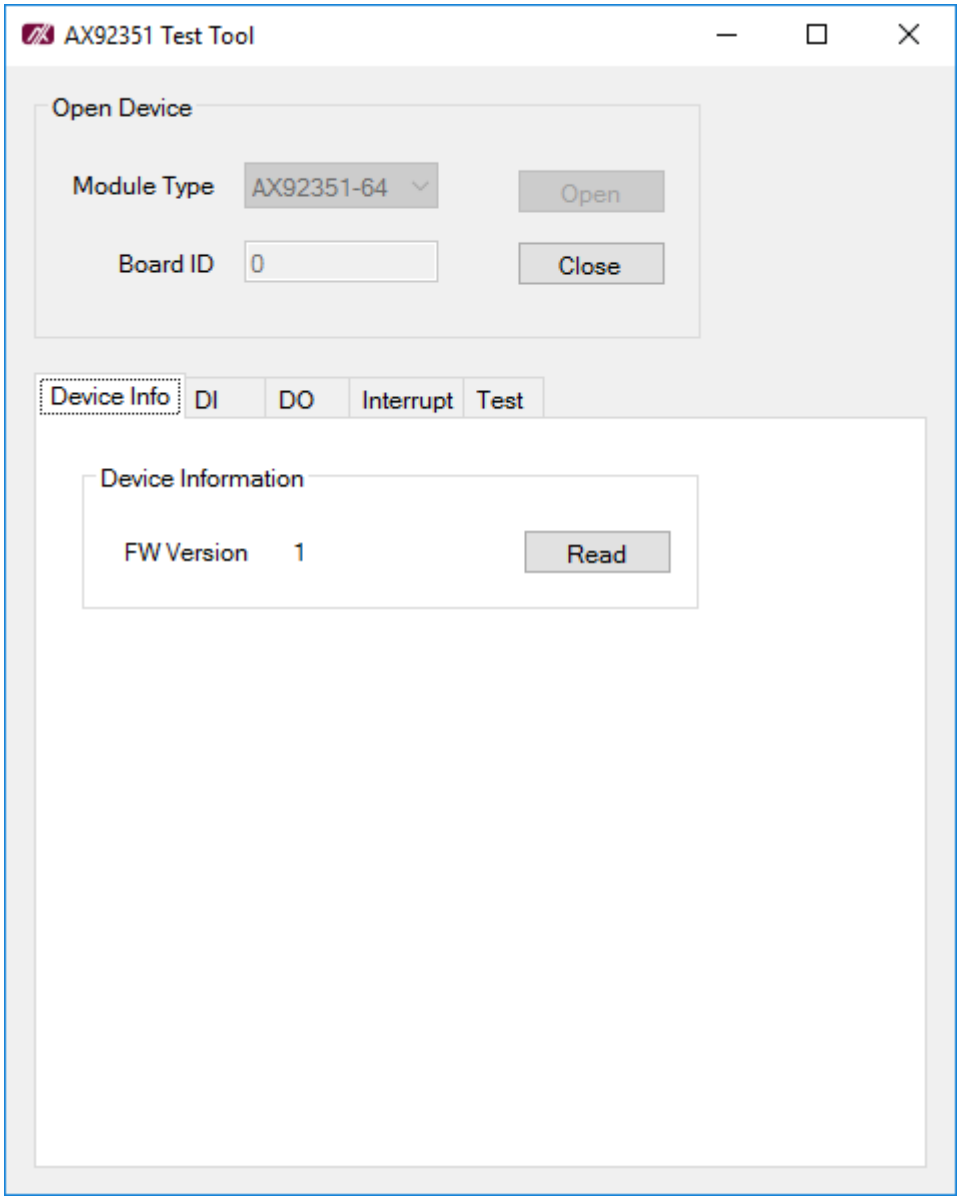
5.1.1 Open Device

Open device with board ID. (Default value is 0)



5.1.2 Device information

This page shows the information of the module.



5.1.3 DI

This page provides the function of digital input.

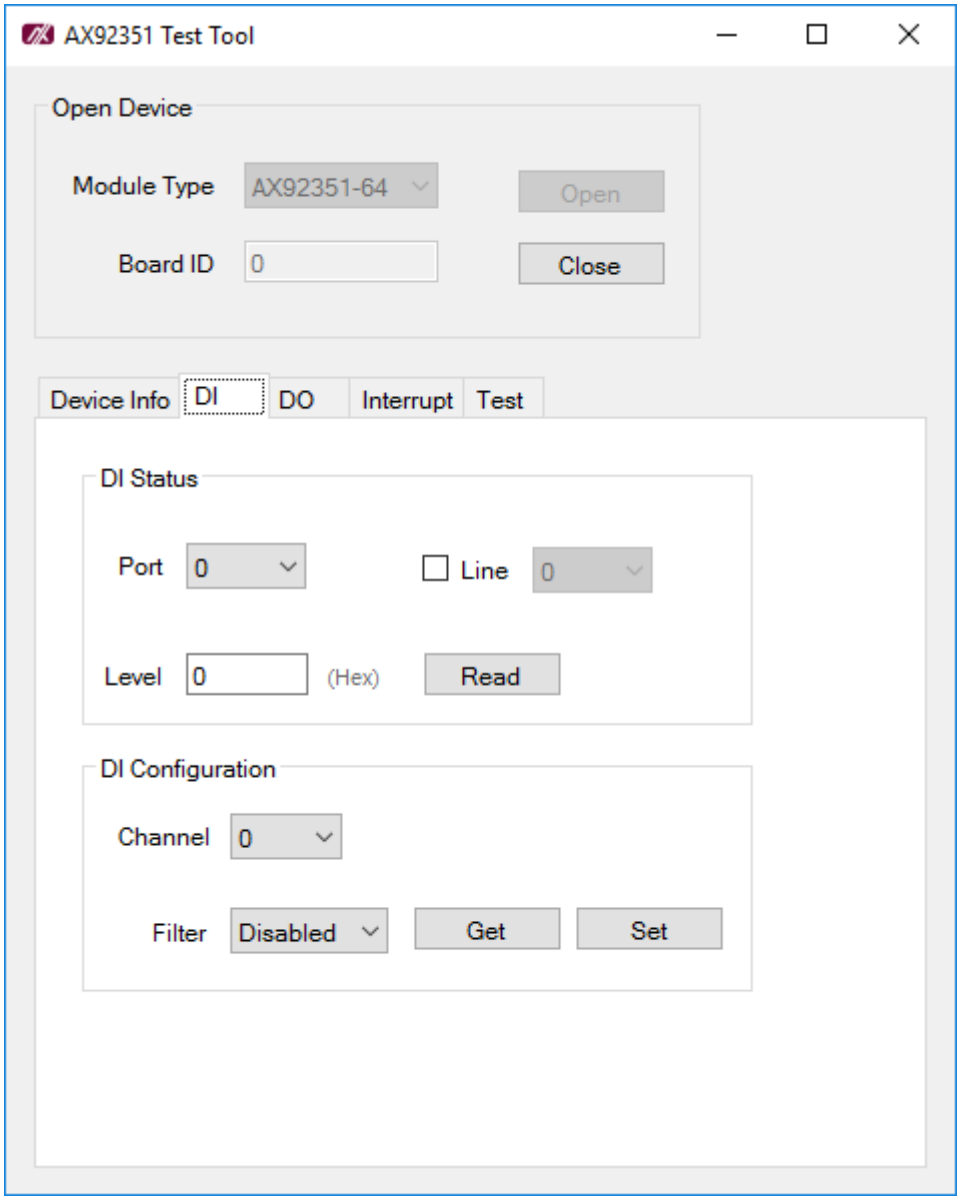
Port number
Each port indicates 8 channel DI.

Port0: DI[0-7]
Port1: DI[8-15]
Port2: DI[16-23]
Port3: DI[24-31]

Line number
The line number indicates the channel number of the selected port.

(Port0, Line7) = DI[7]
(Port1, Line2) = DI[10]

Filter
The de-bounce time of the digital input.

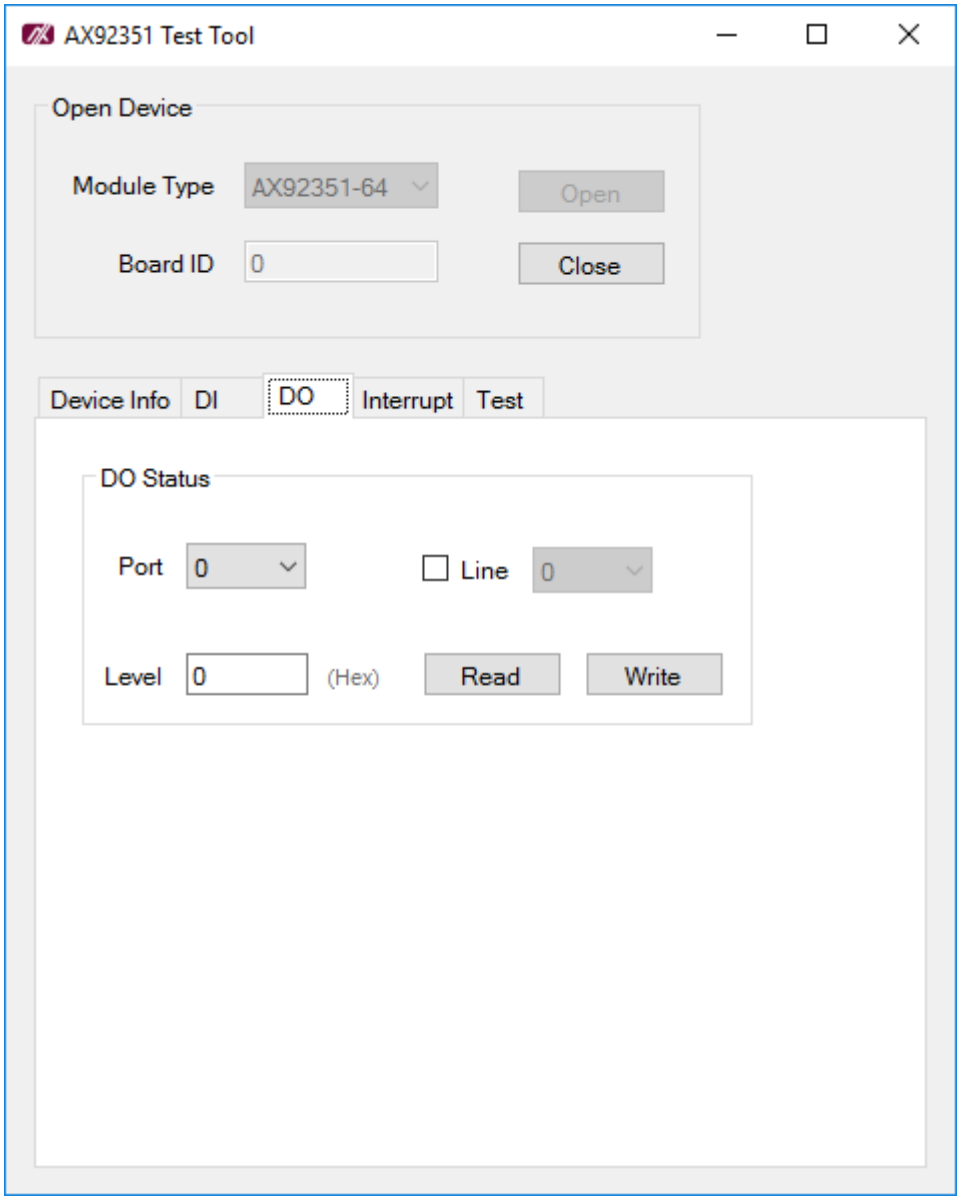

AX92351 Test Tool
Open Device
Module Type
AX92351-64
Open
Board ID
0
Close
Device Info
DI
DO
Interrupt
Test
DI Status
Port
0
Line
0
Level
0
(Hex)
Read
DI Configuration
Channel
0
Filter
Disabled
Get
Set

5.1.4 DO

This page provides the function of digital output.

Port number
Each port indicates 8 channel DO.

Line number
The line number indicates the channel number of the selected port.

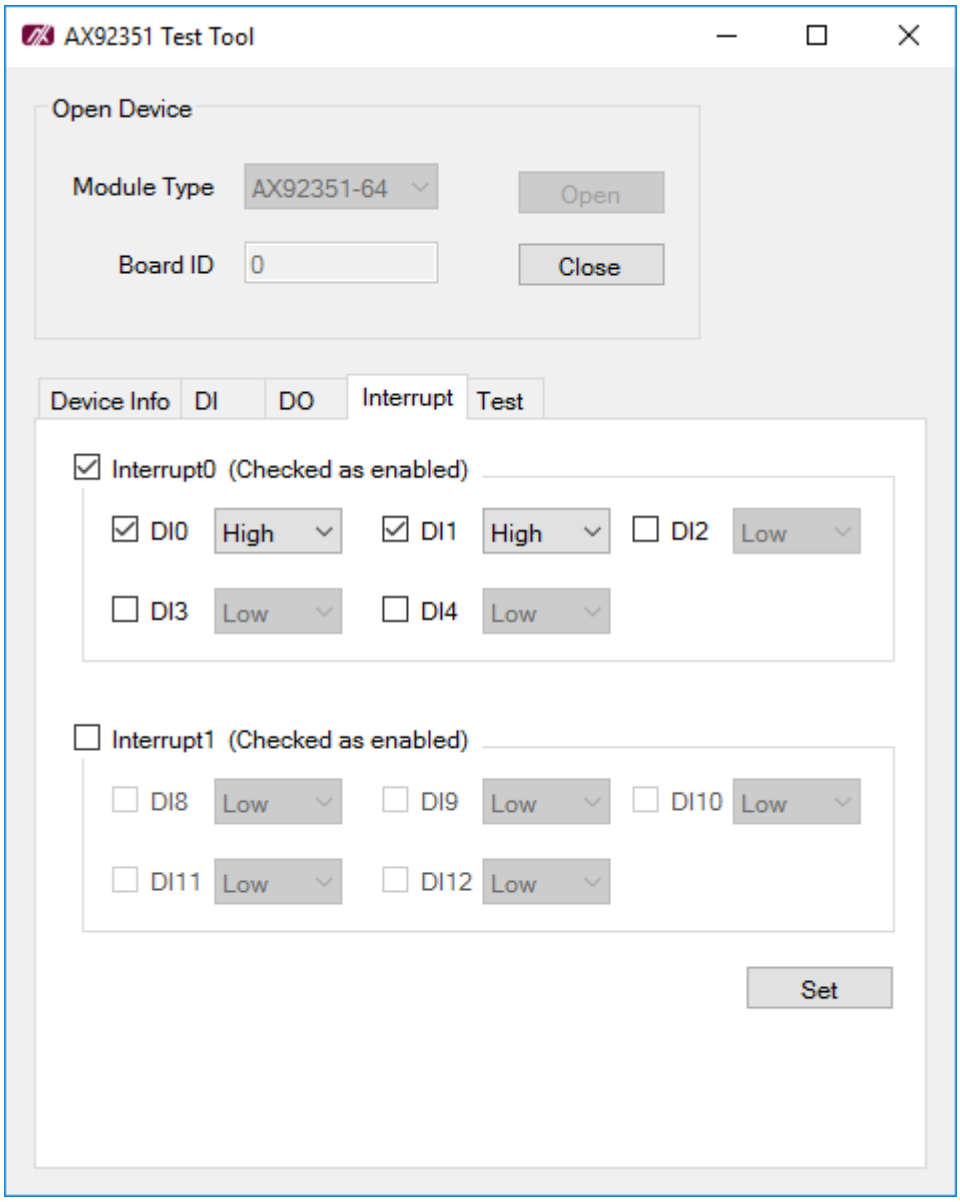


5.1.5 Interrupt

This page provides the settings of the interrupt.

Enable interrupt
1. Check the box of interrupt and select the source from DI channels.
2. Click “Set” button to activate

Disable interrupt
1. Uncheck the box of interrupt .
2. Click “Set” button to activate



5.1.6 Test

This page provides the simple loopback test for DIO.
Loopback DO[0-31] to DI[0-31]