

# Test Board T5003

## Operation Manual

Version	Date	Description	Author
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# 1 General Safety Summary

When use this test board, please operate under this manual; and review the following safety precautions to avoid injury and prevent damage to devices and instruments.

- Do Not Operate in Wet, Hot, Explosive, or Dusty Atmosphere.
- High voltage circuit on T5003, the maximum voltage is 70V. Please take care, when it is turned on.
- Keep surface clean and dry.
- Prevent damage to test board from electrostatic discharge.

## 2 T5003 Features

With test board T5003 and INSTELENT Pattern Generator and Checker E5010, the BER and Eye Pattern characteristics of PIN-TIA, APD-TIA could be tested, and some parameters of components could be monitored and adjusted. Main features of T5003:

- Power: DC 9V
- Current: <200mA
- Rate: from 155Mbps to 3.2Gbps
- Support all test patterns from INSTELENT E5010
- Support multi footprints of PIN-TIA, APD-TIA
- Two test channels, every one can be turned on/off separately.
- Reverse high voltage circuit of APD, it can be turned on/off.
- Reverse high voltage of APD tunable from 11V to 70V
- Supply voltage of TIA, switch between 3.3V and 5V
- High sensitivity limiting amplifier, output threshold of TIA can be set from 5mV to 58mV, precision  $\pm 2\text{mV}$  (when <30mV)

## 3 T5003 Functions

### 3.1 T5003 Structure

The top view and bottom view of T5003 are shown in the figure 1 and figure 2.

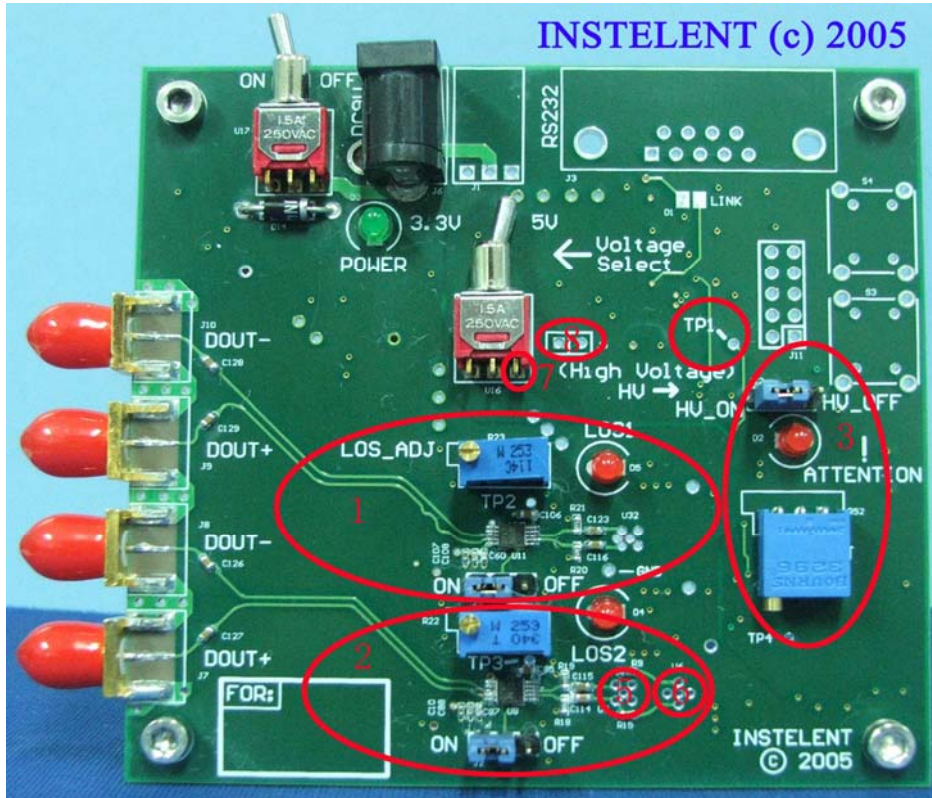


Figure 1: T5003 Top View

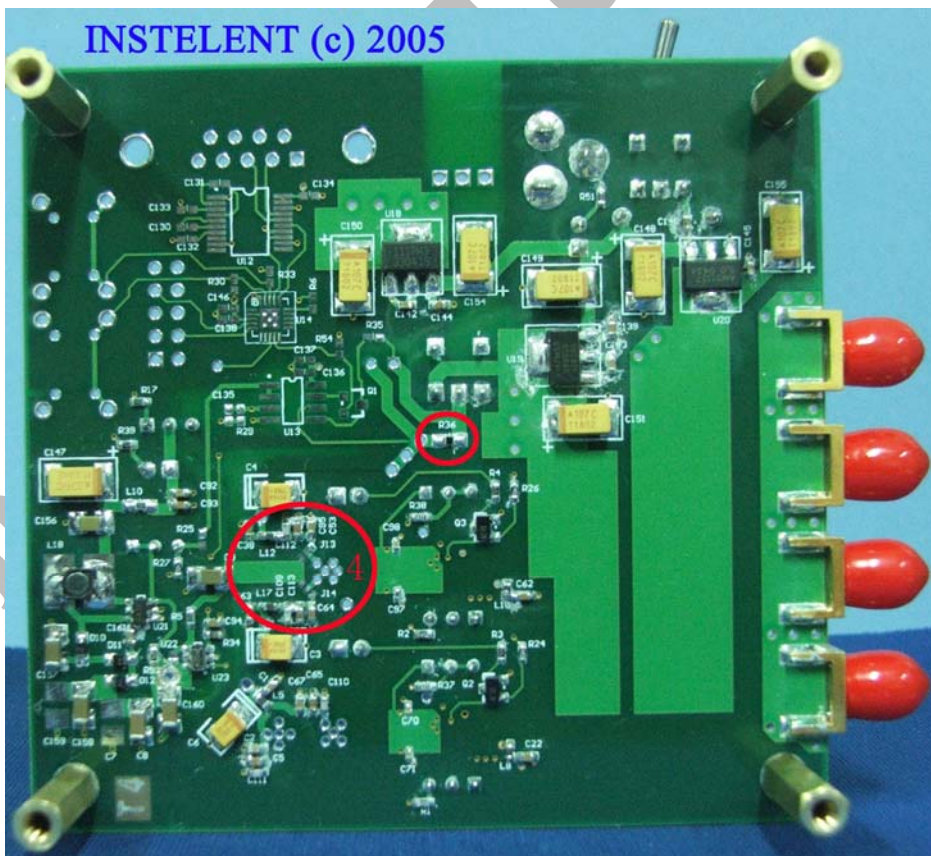


Figure 2: T5003 Bottom View

T5003 top view is shown in the figure 1. The top left corner is DC 9V input and power switch. When power is on, the indicator light POWER is on. Another switch is supply voltage 3.3V/5V for TIA.

Two test channels on T5003 are shown mark 1 and mark 2 in figure 1. Channel 1 is for 5-pin PIN-TIA and APD-TIA; channel 2 is for 4-pin PIN-TIA. Every channel can be turned on/off with jumper. The tunable resistor is for setting output threshold of TIA. Indicator light LOS1, LOS2 are for Rx\_LOS of channel 1, channel 2 separately. Refer 3.4 for detail.

Mark 3 in figure 1 is control section of APD high voltage circuit. Refer 3.5 for detail.

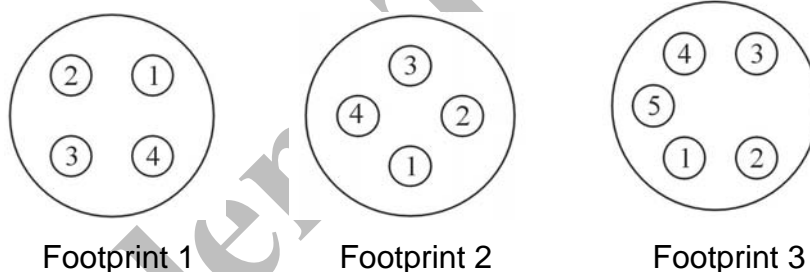
On the bottom left corner, there is a blank for engineer to record test information.

On T5003 bottom view, mark 4 shown in figure 2, is for different footprints. Refer 3.2 for detail.

### 3.2 Support Components

T5003 test board supports 4-pin PIN-TIA, 5-pin PIN-TIA and 5-pin APD-TIA. Different footprints are shown in the followed figures. **(Attention: TOP VIEW)**

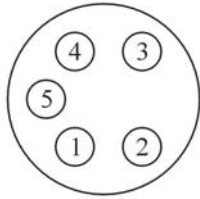
PIN-TIA: 4-pin PIN-TIA and 5-pin PIN-TIA



The definition of pins:

Pin	Footprint 1	Footprint 2	Footprint 3
1	VCC	DOUT	DOUT
2	$\overline{\text{DOUT}}$	VCC	VCC
3	DOUT	$\overline{\text{DOUT}}$	$V_{\text{PIN}}$
4	GND	GND	$\overline{\text{DOUT}}$
5	NC	NC	GND

## APD-TIA:



Support two different kinds of APD-TIA, the definition of pins:

Pin	Footprint 1	Footprint 2
1	DOUT	DOUT
2	$V_{APD}$	VCC
3	VCC	$V_{APD}$
4	$\overline{\text{DOUT}}$	$\overline{\text{DOUT}}$
5	GND	GND

Channel 1 on T5003 is for 5-pin components, including 5-pin PIN-TIA and APD-TIA. Different components and different footprints, there is a different connection on mark 4 in figure 2. Detail is shown in figure 3.

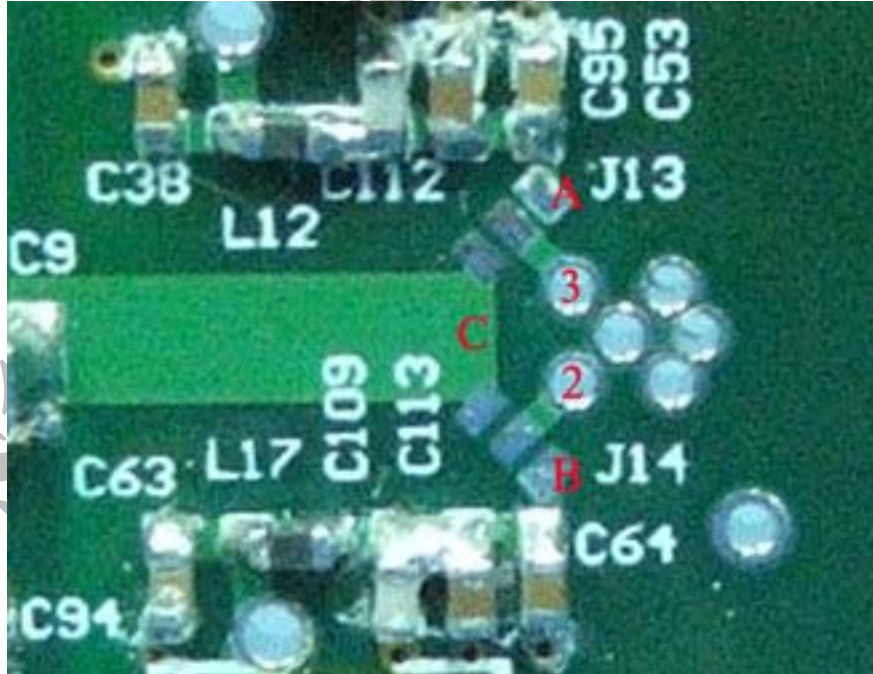


Figure 3 Different connection of channel 1

As shown in figure 3, A point and B point are 3.3V/5V output, C point is high voltage output. For 5-pin PIN-TIA, pin 2 connects to B point, and pin 3 connects to A point. For APD-TIA, for footprint 1, pin 2 connects to C point, and pin 3 connects to A point; for footprint 2, pin 2 connects to B point, and pin 3

connects to C point.

Channel 2 on T5003 is for 4-pin PIN-TIA. For two different footprints, mark 5 in figure 1 is socket for footprint 1; mark 6 in figure 1 is socket for footprint 2.

**Suggestion:** T5003 supports multi components. Please do not change the connection of channel 1 and socket position of channel 2 frequently. The test board may be damaged. One piece of test board should be dedicated to a kind of components, and the information can be written down in the blank field.

### 3.3 BER and Eye Pattern Test

For detailed solution, please refer Application Note: Optical component test with INSTALENT E5010 and T5003, APP\_Note for PIN&APD-TIA.pdf.

**Suggestion:** During BER and Eye Pattern test, the unused channel on T5003 should be turned off to avoid the effect of noise.

### 3.4 Set output threshold of TIA

There are tunable resistors in both channel 1 and channel 2. As shown mark 1 and mark 2 in figure 1. It is used for setting output threshold of TIA. The structure is shown in figure 4. AMP is high sensitivity limiting amplifier.

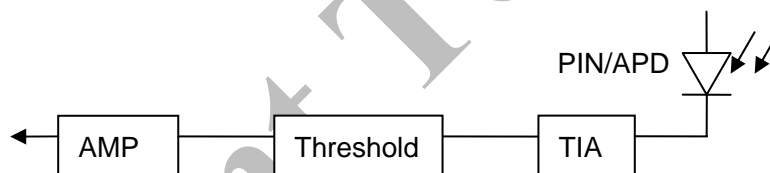
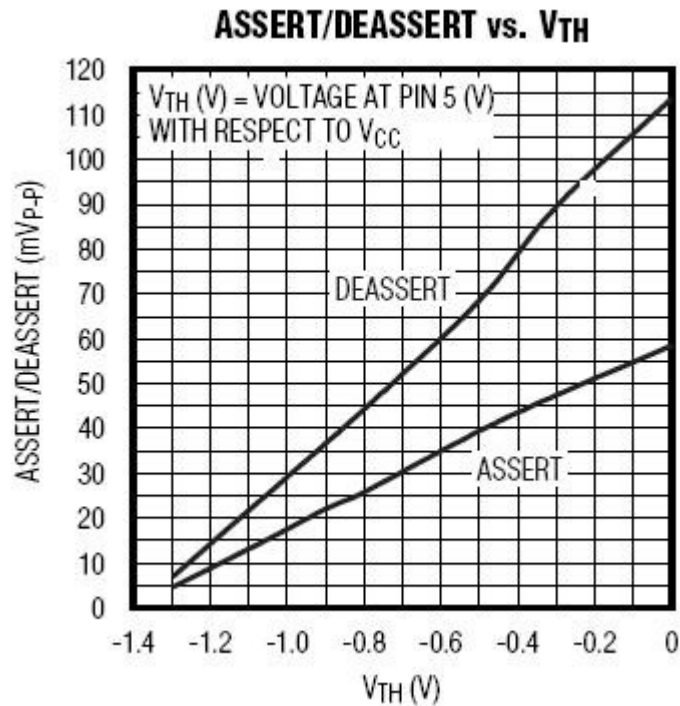


Figure 4 Output threshold of TIA

When output signal amplitude is less threshold, indicator light LOS is on, which indicates Rx\_LOS. Tune corresponding tunable resistor, the reference voltage is changed, and then the output threshold of TIA in channel 1 or channel 2 is different.

The relation between output threshold of TIA and reference voltage  $V_{TH}$  is shown in the followed figure.



During the test, put the anode of voltage meter on TP2 or TP3, cathode on the mark 7 in figure 1, then reference voltage of channel 1 or channel 2 is shown on the meter. Then the output threshold of TIA can be gotten from the ASSERT curve.

### 3.5 Set reverse high voltage of APD

When test APD-TIA on T5003, reverse high voltage of APD is tunable. The control section of high voltage circuit is shown mark 3 in figure 1.

The jumper is switch of high voltage circuit. Once it is turned on, the indicator light is on. The voltage value could be measured from C point to ground in figure 3 with voltage meter. The voltage is tunable through tunable resistor. The maximum is 70V. Please take care in operation.

Reverse high voltage could be tuned in digital way, refer 3.8.

### 3.6 Monitor current of APD

Through TP1, shown in figure 1, the current of APD could be monitored. Get the voltage of TP1 to ground with voltage meter, and then the current of APD is

$$I_{APD} = \frac{V_{TP1}}{10k\ \Omega} \times 10$$

T5003 has an option function to monitor the current of PIN, if you need this

function, please contact INSTELENT.

### 3.7 Monitor current of TIA through Ampere meter

T5003 has an interface to monitor the current of TIA. Please remove the resistor R36, shown in the figure 2. Then connect ampere meter to the position mark 8 in figure 1, the current value could be gotten.

The current could be monitor on PC, please refer 3.8.

### 3.8 Option functions

T5003 could be controlled by PC through RS232. Connecting PC and T5003, the current of PIN, APD, and TIA could be auto-monitored and recorded, and reverse high voltage of APD could be tuned in digital way.

The option functions need some expansion to T5003, and the driver software from INSTELENT is needed. So, if you need these functions, please contact INSTELENT.

## 4 Standard accessories

T5003 Test Board x 1

DC 9V Power x 1

0.8m RF cable with SMA male connector x 2

**Note: If you have any question, please contact INSTELENT.**

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