

## APIX Touch-Screen Kit

The APIX Touch-Screen Kit is designed to demonstrate the combined transmission of video, data and power supply using only one small-size STP-cable. The kit offers a DVI-D and TTL RGB video input, a standard RS232 connector and a single 5V power supply, to connect and control a 800x480 TFT touch-screen display over a standard STP cable across distances of up to 15m.

### Features:

- Supports DVI-D and digital RGB video
- 800x480 Touch-Screen display
- RS232 Interface for touch-screen control
- Up to 15m distance
- Power over APIX for single +5V power supply

### Applications:

- Remote Touch Screens
- Industrial Control Displays
- Machine Control Systems
- Embedded PCs with Touch Screens
- Remote Industrial Displays
- Medical Displays
- Reference Systems

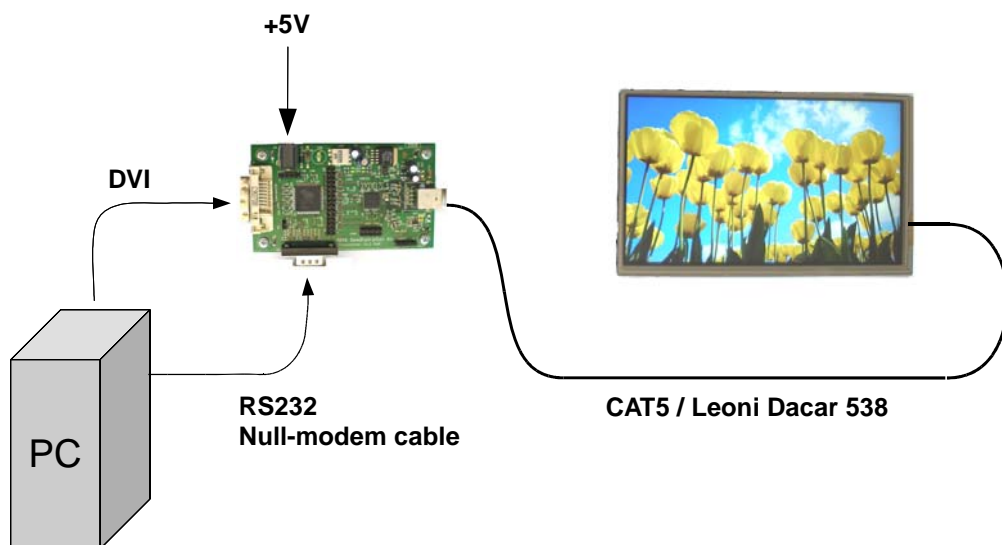


Figure 1: APIX Touch-Screen Kit Overview

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## 1.0 Overview

The APIX Touch-Screen Kit demonstrates the implementation of a remote display application, sending video, full-duplex data communication and power supply over one shielded twisted pair cable (STP) over a distance of up to 15 meters. The kit consists of a transmitter board (ADK TX), collecting video data from either a standard DVI-D port or via parallel RGB TTL video, and a display unit, comprising of an adapter board, the touch-controller and backlight controller. The video data, together with the full duplex datacommunication for the touch-screen information, are transmitted over 2 pairs of wires. In addition, the complete display unit is powered over the APIX data lines (Power over APIX), eliminating the need of additional cabling to the display.

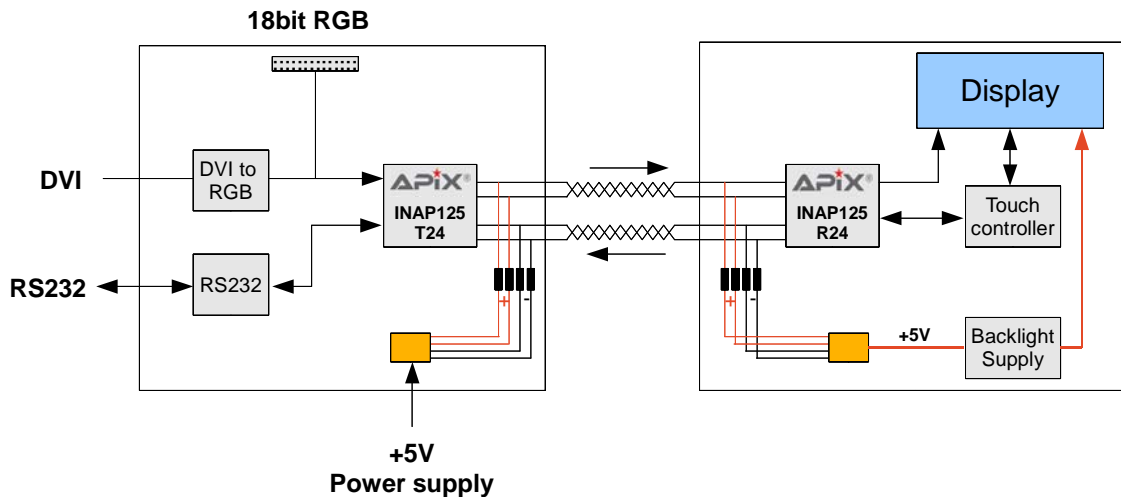


Figure 1-2: Touch Screen Kit block diagram

The touch controller translates the touch information into a UART protocol, transmitted over the APIX link to the transmitter board, on which it is brought to the RS232 connector. The kit comes with specific touch-screen drivers, interpreting the touch-screen information and offering several features for calibration and monitor options.

The ADK TX Transmitter board includes a DVI DDC EEPROM, offering the PC the correct resolution of the display of 800x480, which allows to directly drive the kit at any DVI port without the need of specific drivers.

The kit is available in two options, offering either the RJ45 connector or the Rosenberger HSD connector.

Ordering Code	Description
APIX_TSK_RJ	Touch-Screen Kit with RJ45 Connectors and 10 meters CAT5 cable
APIX_TSK_HSD	Touch-Screen Kit with Rosenberger HSD connector and 5 meters Leoni Dacar 538 cable

Table 1-1: Ordering Information

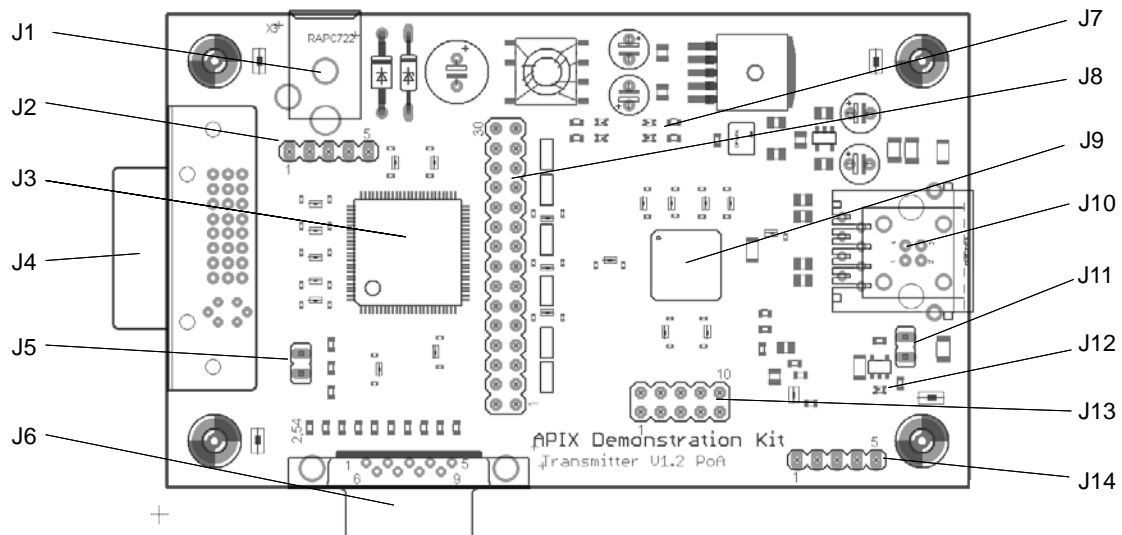
### Kit contents :

- One Transmitter board ADK Tx
- One Display Unit
- DVI Connection cable
- RS232 Null-modem cable
- 5V AC/DC supply
- Apix Touch-Screen Kit CD containing
  - TSK User Manual (this document)
  - Driver Software
  - Application Notes
  - Datasheets
  - Schematics & Gerber files

## 2.0 Hardware Description

### 2.1 APIX Touch-Screen Kit Transmitter ADK\_TX

#### 2.1.1 Connectors and interfaces



**Figure 3: Connectors and interfaces**

Item	Name	Description
J1	X3	Power Plug for 5V power supply
J2	CON3	Programming adapter for DDC proxy EEPROM
J3	IC2	DVI-D receiver
J4	X4	DVI input connector
J5	JP1	jumper to tri-state parallel DVI outputs
J6	X5	SUB-D9 connectr for UART interfacing
J7	LED1-4	LEDs for status signaling
J8	CON1	connector for APIX parallel video input data interface
J9	IC1	APIX Transmitter INAP125T24
J10	X1	Rosenberger HSD / RJ45 Connector <sup>a</sup>
J11	JP9	Board reset jumper

**Table 2: Connectors and interfaces**

Item	Name	Description
J12	LED5	Board reset status LED
J13	CON2	Connector for APIX sideband data interface
J14	CON4	Programming adapter for INAP125T24 configuration EEPROM

**Table 2: Connectors and interfaces**

a. Please see Section 1.0 for different board options

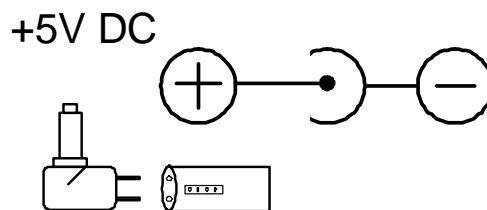
## 2.1.2 Pin assignments

### 2.1.2.1 J4 - DVI Connector (DVI-D video input)

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	TMDSTMDS Data2-	9	TMDS Data1-	17	TMDS Data0-
2	TMDS Data2+	10	TMDS Data1+	18	TMDS Data0+
3	TMDS Data2 Shield	11	TMDS Data1 Shield	19	TMDS Data0 Shield
4	N.C.	12	N.C.	20	N.C.
5	N.C.	13	N.C.	21	N.C.
6	DDC Clock	14	+5V Power	22	TMDS Clock Shield
7	DDC Data	15	GND	23	TMDS Clock+
8	N.C.	16	Hot Plug Detect	24	TMDS Clock-

**Table 3: ADLTX - DVI input Connector pin assignment**

### 2.1.2.2 J1 – power supply connector



**Figure 4: J1 - Power plug pin assignment**

2.1.2.3 J6 - Sub-D9 RS232/UART connector

Pin	Signal Assignment	Pin	Signal Assignment
1	GND	6	N.C.
2	RXD	7	N.C.
3	TXD	8	N.C.
4	N.C.	9	N.C.
5	N.C.		

Table 4: J6 - Sub-D9 RS232/UART connector pin assignment

2.1.2.4 J2 - Programming adapter for DDC proxy EEPROM

Pin	Signal Assignment	Pin	Signal Assignment
1	DDC_SCL	4	GND
2	DDC_SDA	5	+3V3
3	reserved		

Table 5: J2 Programming adapter for DDC proxy EEPROM

2.1.2.5 J8 - connector for APIX pixel and control data input

Pin	Signal Assignment	Pin	Signal Assignment
1	GND	2	GND
3	PX_DATA17	4	PX_DATA16
5	PX_DATA14	6	PX_DATA12
7	PX_DATA11	8	PX_DATA9
9	GND	10	GND
11	PX_DATA8	12	PX_DATA7
13	PX_DATA6	14	PX_DATA5
15	PX_DATA4	16	PX_DATA3
17	PX_DATA2	18	PX_DATA1
19	GND	20	GND
21	PX_DATA0	22	PX_DATA10
23	PX_DATA15	24	PX_DATA13

Table 6: J8 - connector for APIX pixel and control data input

Pin	Signal Assignment	Pin	Signal Assignment
25	PX_CLK	26	PX_CTRL2
27	PX_CTRL1	28	PX_CTRL0
29	GND	30	GND

Table 6: J8 - connector for APIX pixel and control data input

2.1.2.6 J13 - connector for APIX sideband interface

Pin	Signal Assignment	Pin	Signal Assignment
1	GND	2	SBDOWN_DATA[0]
3	GND	4	SBUP_DATA[0]
5	GND	6	SBUP_CLK
7	GND	8	SBUP_DATA[1]
9	GND	10	SBDOWN_DATA[1]

Table 7: J13 - connector for APIX sideband interface

2.1.2.7 J10 - RJ45 connector

Pin	Signal Assignment	Pin	Signal Assignment
1	APIX SDOUT+	5	DDC Data (optional)
2	APIX SDOUT-	6	GND from power supply
3	+5V from power supply	7	APIX SDIN+
4	DDC Clock (optional)	8	APIX SDIN-

Table 8: J10 - RJ45 connector

2.1.2.8 J10 - Rosenberger HSD connector

Pin	Signal Assignment	Pin	Signal Assignment
1	APIX SDOUT-	3	APIX SDOUT+
2	APIX SDIN+	4	APIX SDIN-

Table 9: J10 - Rosenberger HSD connector

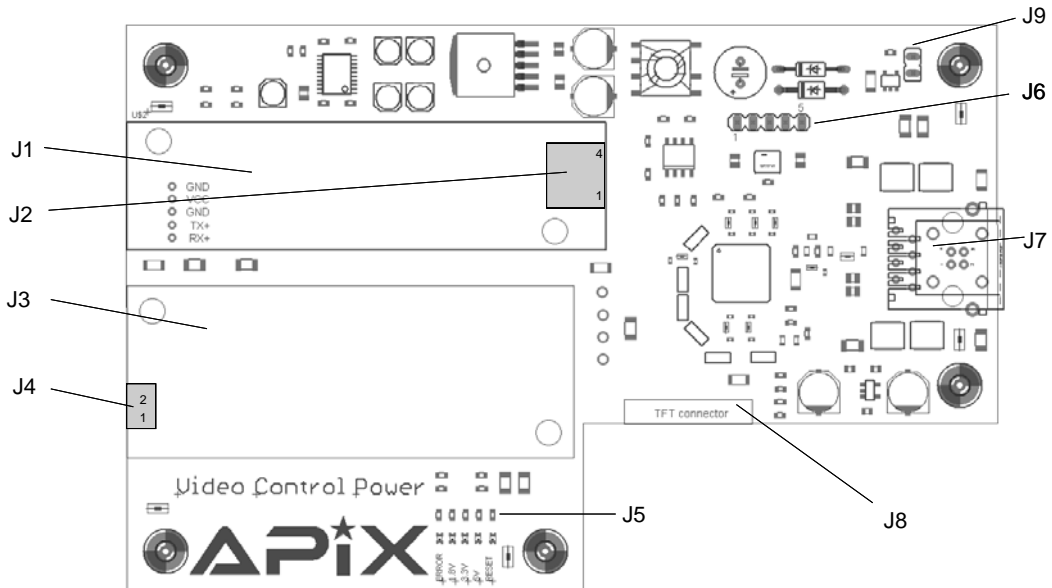
**2.1.2.9 J14 - Programming adapter for INAP125R24 configuration EEPROM**

Pin	Signal Assignment	Pin	Signal Assignment
1	M_CLK	4	GND
2	M_DIDO	5	VCCIO
3	M_CS		

**Table 10: J12 - Programming adapter for INAP125R24 configuration EEPROM**

## 2.2 APIX Touch-Screen Kit Display Unit

### 2.2.1 Connectors and Interfaces



**Figure 5: TSK Receiver Board Top view**

Item	Name	Description
J1	U\$2	Touch-Controller Board
J2		Connector for 4 wire Touch Flat Cable from Display (at Touch-Controller Board)
J3	U\$4	Backlight Supply Board
J4		Connector to TFT Backlight (at Backlight-Supply Board)
J5	LED1-5	LED Status signaling
J6	U\$3	Programming adapter for INAP125R24 configuration EEPROM
J7	X1/2	Rosenberger HSD / RJ45 Connector
J8	IC1	Connector for 18-bit RGB FFC Cable
J9	JP9	Board reset jumper

**Table 2-11: Connectors and interfaces**

## 2.2.2 Pin assignments

### 2.2.2.1 J2 - Connector for 4 wire Touch Flat Cable from Display

Pin	Signal Assignment	Pin	Signal Assignment
1	Y-	3	Y+
2	X-	4	X+

### 2.2.2.2 J4 - Connector for TFT Backlight

Pin	Signal Assignment	Pin	Signal Assignment
1	GND	2	POWER

### 2.2.2.3 J6 - Programming adapter for INAP125R24 configuration EEPROM

Pin	Signal Assignment	Pin	Signal Assignment
1	M_CLK	4	GND
2	M_DIDO	5	VCCIO
3	M_CS		

Table 12: J12 - Programming adapter for INAP125R24 configuration EEPROM

### 2.2.2.4 J7 - RJ45 connector

Pin	Signal Assignment	Pin	Signal Assignment
1	APIX SDIN+	5	DDC Data (optional)
2	APIX SDIN-	6	GND from power supply
3	+5V from power supply	7	APIX SDOUT+
4	DDC Clock (optional)	8	APIX SDOUT-

Table 13: J7 - RJ45 connector

### 2.2.2.5 J7 - Rosenberger HSD connector

Pin	Signal Assignment	Pin	Signal Assignment
1	APIX SDOUT-	3	APIX SDOUT+
2	APIX SDIN+	4	APIX SDIN-

Table 14: J7 - Rosenberger HSD connector

2.2.2.6 J8 - Connector for 18-bit RGB FFC Cable

Pin	Signal Assignment	Pin	Signal Assignment
1	CLK	2	HSYNC
3	VSYNC	4	GND
5	R0	6	R1
7	R2	8	R3
9	R4	10	R5
11	GND	12	G0
13	G1	14	G2
15	G3	16	G4
17	G5	18	GND
19	B0	20	B1
21	B2	22	B3
23	B4	24	B5
25	GND	26	DE
27	+3.3V TFT Supply	28	+3.3V TFT Supply
29	R/L Display Control	30	U/D Display Control

Table 15: J8 - Connector for 18-bit RGB FFC Cable

### 3.0 Getting Started

#### 3.1 Power Supply

The APIX Touch-Screen Kit comprises two units. The transmitting side consists of the standard ADK transmitter board with DVI and UART connection. The receiving side consists of the TSK receiver board and the PM070WT3 color TFT LCD module. Both units are powered by a single +5V supply connected to the ADK transmitter board.

The complete receiving unit is supplied via „Power over APIX“, using the differential datalines to also transmit the 5V supply voltage. The power supply is coupled onto the high speed lines using 4.7  $\mu$ H inductors as illustrated in Figure 6.

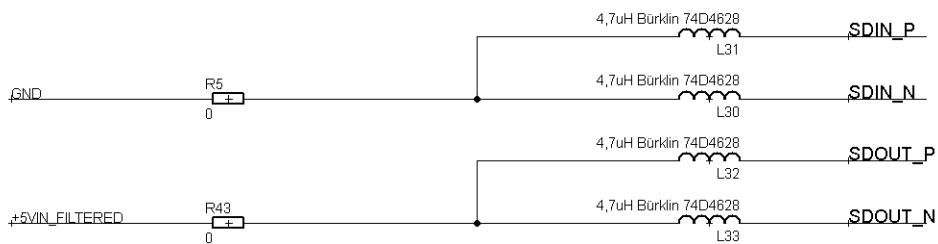


Figure 6: Power over APIX circuitry

#### 3.2 Using DVI source (default)

The ADK Tx board provides a DDC proxy at the DVI input connector. This allows to use the TSK kit with every standard PC or laptop. The proxy EEPROM contains EDID data defining the required resolution of 800x480.

It is required to plug in all connections prior powering up the kit to ensure correct initialization.

1. Connect the TX and RX boards with the included LEONI Dacar 538 or CAT5 cable.
2. Connect the DVI source to the ADK TX board
3. Connect a PC Comport to the ADK TX RS232 connector with the included Null-modem cable
4. Connect the +5V power supply
5. Power up PC / Laptop

#### 3.3 Using parallel RGB video data (optional)

The parallel outputs of the DVI receiver on the ADK TX board can be set to tristate via Jumper J5. Parallel video data can be fed into the APIX transmitter via connector J8.

#### 3.4 Touch screen operation

The APIX TSK provides an UART RS232 interface to be connected to the PC/Laptop carrying the touch-screen information. The transmission of the bi-directional UART data is performed using APIX side band capabilities.

The touch screen operation requires the installation of drivers available at the TSK CDROM.

### 3.5 Status signaling LED's

Both the ADKTX and ADKRX boards feature several LEDs. These LEDs make it easy to identify the status of the boards' power supplies and the link synchronization.

LED	Status
LED 1	+3V3 power ok
LED 2	+5V power ok
LED 3	+1V8 power ok
LED 4	APIX upstream error
LED 5	board reset active

Table 16: ADKTX - Status signaling LED's

LED	Status
LED 1	+5V power ok
LED 2	+3V3 power ok
LED 3	+1V8 power ok
LED 4	video / transmission error
LED 5	board reset active

Table 17: TSK RX - Status signaling LED's

### 4.0 Characteristics

Parameter	min	typ	max	
Supply voltage	4.75	5.0	5.25	V
Current consumption ADK TX/RX		1.5		A

Table 18: DC Characteristics

The TTL pixel bus handles 3.3V LVCMOS signals.

## 5.0 Mechanical Dimensions

All dimensions in millimeter

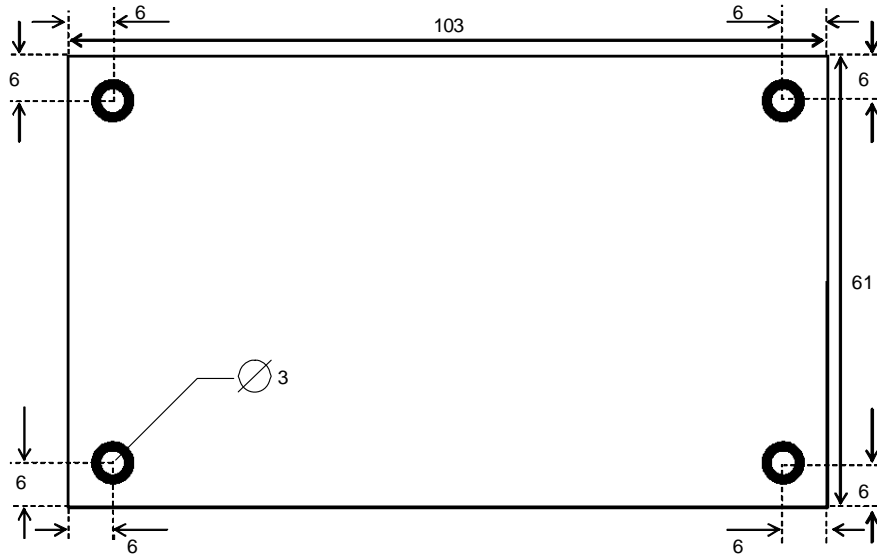


Figure 5-7: ADK TX dimensions

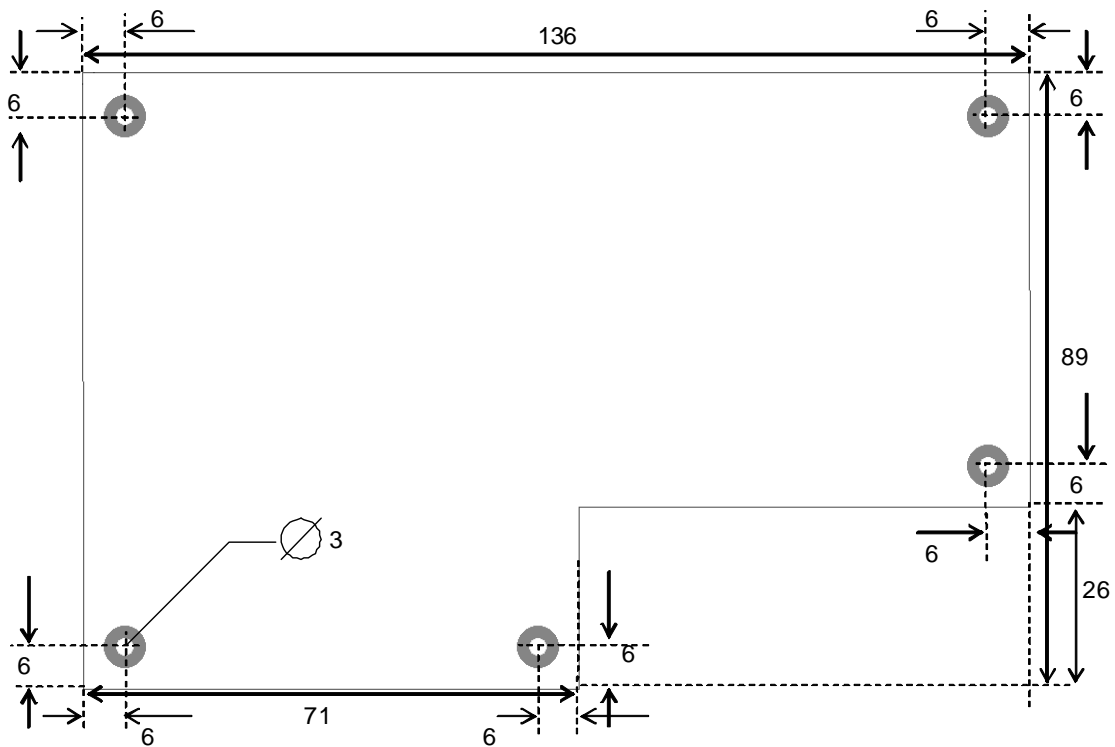


Figure 5-8: TSK RX Board Dimensions

## 6.0 References

- [1] – AN101 - Using APIX Sideband interfaces Application Note, Inova Semiconductors


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