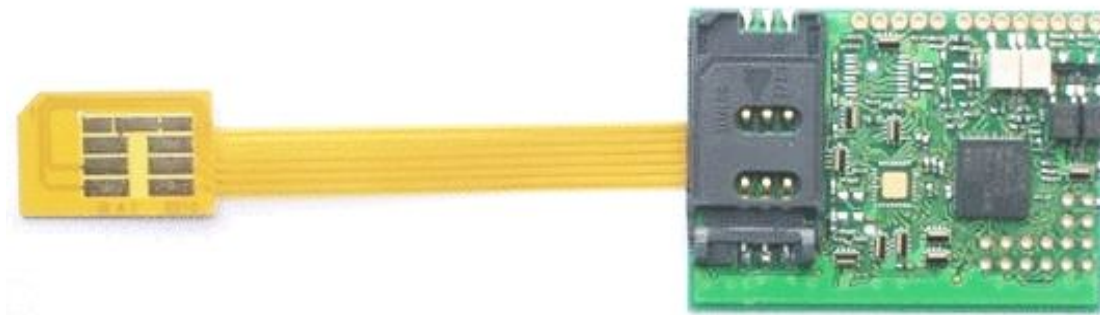


1. Overview

Turbo Lite 2 is an open and price sensitive solution for remote control, measurement and security GSM applications. Working with any SIM Toolkit enabled mobile phone (all mobile phones produced since 1999) it is ideal to use with abandoned or recycled mobile phones for SMS home automation, alarm systems and remote data gathering.

Turbo Lite 2 follows on from original **Turbo Lite** with new 2+2 opto-isolated inputs/outputs and **Turbo Adapter** compatible ports including SPI and I2C interfaces.

Turbo Lite 2 can be connected to **Turbo Programmer** and used for application debugging and SIM – Mobile Equipment communication tracing.



Top view

2. Features

- 2+2 opto-isolated I/O
- Turbo Lite compatible 13 digital I/O, 4 of them usable as ADC inputs
- Turbo Adapter compatible ports, SPI, I2C interfaces
- SIM Toolkit based, compatible with any SIM Toolkit enabled GSM mobile phone or module
- Comes with preinstalled open source Pager v2 application for SMS control and measurement
- Easy to load applications with mobile phone data cable
- Allows application debugging and SIM-ME communication tracing
- Upgradable with freely available firmware
- Open, free and well documented application development
- Open source and free development tool chain



Bottom view

3. Software

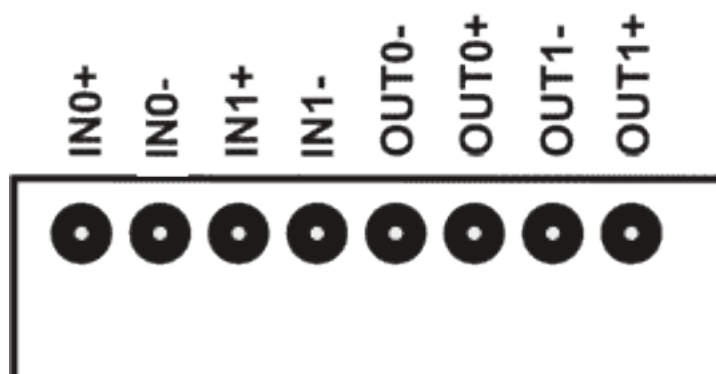
Turbo Lite 2 is software (both application and firmware) compatible with family of **Turbo SIM Toolkit Adapter** products produced by **BLADOX**. The preinstalled **Pager v2** application is a ready-to-use, flexible and easy to configure SMS remote measurement and control pager.

Applications can be loaded and removed via data cable with AT commands for SMS handling.

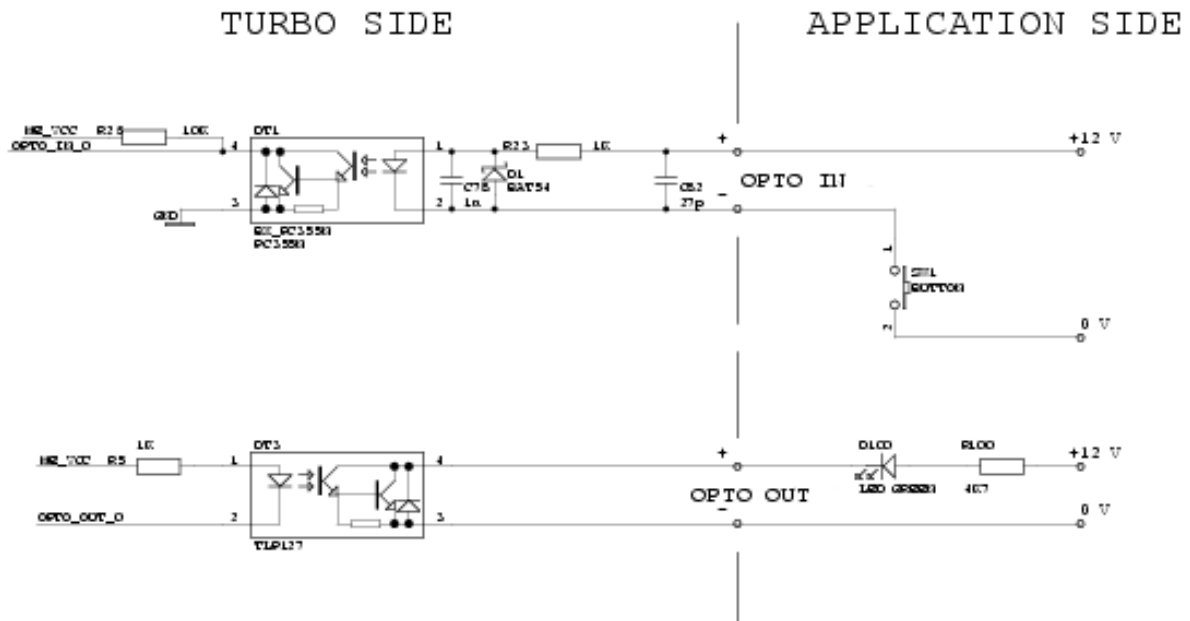
The firmware (kernel) can be upgraded by bootloader procedure with the help of **Turbo Programmer**.

4. Electrical Characteristics

Turbo Lite 2 opto-isolated inputs and outputs



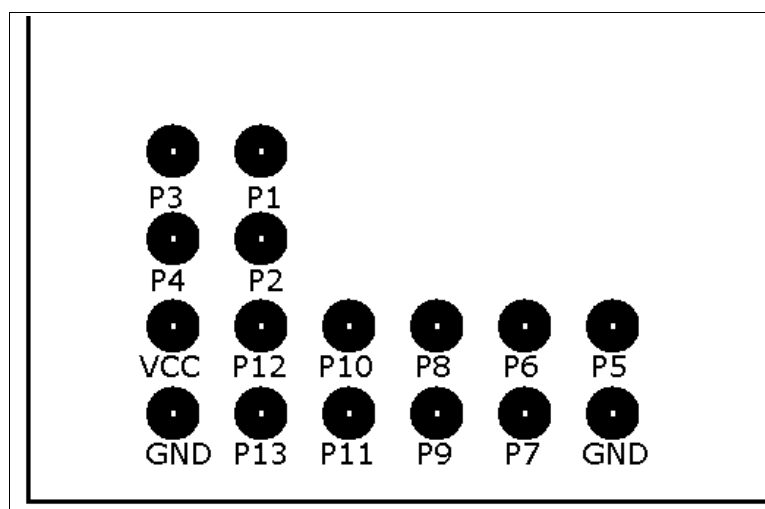
Internal design and example of opto-isolated I/O usage



Input optocouplers used are **PC355N**, U_{max} 24V.
 Output optocouplers user are **TLP127**, U_{max} 24V, I_{max} 60mA.

Warning. Maximum current of the output optocouplers is 60mA – depending on usage, it may be necessary to use protection resistor to prevent higher current.

Turbo Lite compatible ports



Ports are directly connected to microcontroller Atmega128; datasheet with electrical parameters regarding MCU is available from www.atmel.com

Turbo Lite Pin	ATmega128 Pin	Function
P1	PF2	ANALOG I / DIGITAL I/O
P2	PF5	ANALOG I / DIGITAL I/O
P3	PF3	ANALOG I / DIGITAL I/O
P4	PF6	ANALOG I / DIGITAL I/O
P5	PG1	DIGITAL I/O
P6	PC2	DIGITAL I/O
P7	PC1	DIGITAL I/O
P8	PC6	DIGITAL I/O
P9	PC4	DIGITAL I/O
P10	PA7	DIGITAL I/O
P11	PC7	DIGITAL I/O
P12	PA4	DIGITAL I/O
P13	PA6	DIGITAL I/O

I_{max} of one port is 10mA, overall current should not be higher than 50mA – limitation depends on mobile phone used.

VCC pin voltage also depends on mobile equipment used, typically 3V +/-10%.

Turbo Adapter compatible ports



Pin Description

Turbo Adapter Pin	ATmega128 Pin	Function
1	NC	NC
2	GND	0V
3	RESET#	ISP RESET# signal
4	VCC	ME power source
5	GND	0V
6	CLK	Clock signal
7	GND	0V
8	NC	NC
9	NC	NC
10	NC	NC
11	NC	NC

Turbo Adapter Pin	ATmega128 Pin	Function
12	NC	NC
13	NC	NC
14	NC	NC
15	GND	0V
16	MISO	SPI MISO
17	MOSI	SPI MOSI
18	SCK	ISP SCK
19	GND	0V
20	SS#	Debug Chipselect
21	PD0	GPIO/(INT0/SCL) optional Interrupt input/TWI bus Clock signal
22	PD1	GPIO/(INT1/SDA) optional Interrupt input/TWI bus Data signal
23	GND	0V
24	PF0	GPIO/ADC0 optional analog input for A/D converter
25	PF1	GPIO/ADC1 optional analog input for A/D converter
26	GND	0V
27	PG1	GPIO/RD# optional external SRAM
28	PG0	GPIO/WR# optional external SRAM
29	PC0	GPIO/A8 optional external SRAM
30	PC1	GPIO/A9 optional external SRAM
31	PC2	GPIO/A10 optional external SRAM
32	PC3	GPIO/A11 optional external SRAM
33	PC4	GPIO/A12 optional external SRAM
34	PC5	GPIO/A13 optional external SRAM
35	PC6	GPIO/A14 optional external SRAM
36	PC7	GPIO/A15 optional external SRAM
37	PG2	GPIO/ALE optional external SRAM
38	GND	0V
39	PA7	GPIO/AD7 optional external SRAM
40	PA6	GPIO/AD6 optional external SRAM
41	PA5	GPIO/AD5 optional external SRAM
42	PA4	GPIO/AD4 optional external SRAM
43	PA3	GPIO/AD3 optional external SRAM
44	PA2	GPIO/AD2 optional external SRAM
45	PA1	GPIO/AD1 optional external SRAM
46	PA0	GPIO/AD0 optional external SRAM
47	GND	0V
48	PDO	ISP MISO signal

Turbo Adapter Pin	ATmega128 Pin	Function
49	PDI	ISP MOSI signal
50	GND	0V