EP30-PPIO64

I/O expansion module

Technical Documentation

The expansion module EP30-PPIO64 expandes a system using a multitasking computer of the BASIC-Tiger™ family with 64 inputs and outputs. The module provides six 8-bit I/O ports and one 16-bit I/O port. Each bit of each 8 bit port can be set to input or output separately. With the 16-bit port you get a synchronous read and write access to all 16 bit.

The I/O module is to be connected to an 8-bit data bus and an address bus. An individual address can be assigned to the module so that you can connect up to 16 modules to your system. From the programmers view the external I/O ports can be accessed as easy as the internal I/O ports, due to the XPORT system.

The EP30-PPIO64 is powered from a single 5V DC supply. The I/Os are 5V tolerant and operate at LVTTL voltage levels (3.3V).
The maximum current at low or high output state is more than 20 mA, as long as the total output current does not exceed 200 mA.

Features:

- six 8-bit I/O ports, each bit can be set to input or output mode separately
- one 16-bit I/O port, all bits can be written and read synchonously
- selectable base address
- easy programming with Tiger-BASIC XPORT system
- 5V DC power supply voltage
- LVTTL compatible inputs and outputs

Content

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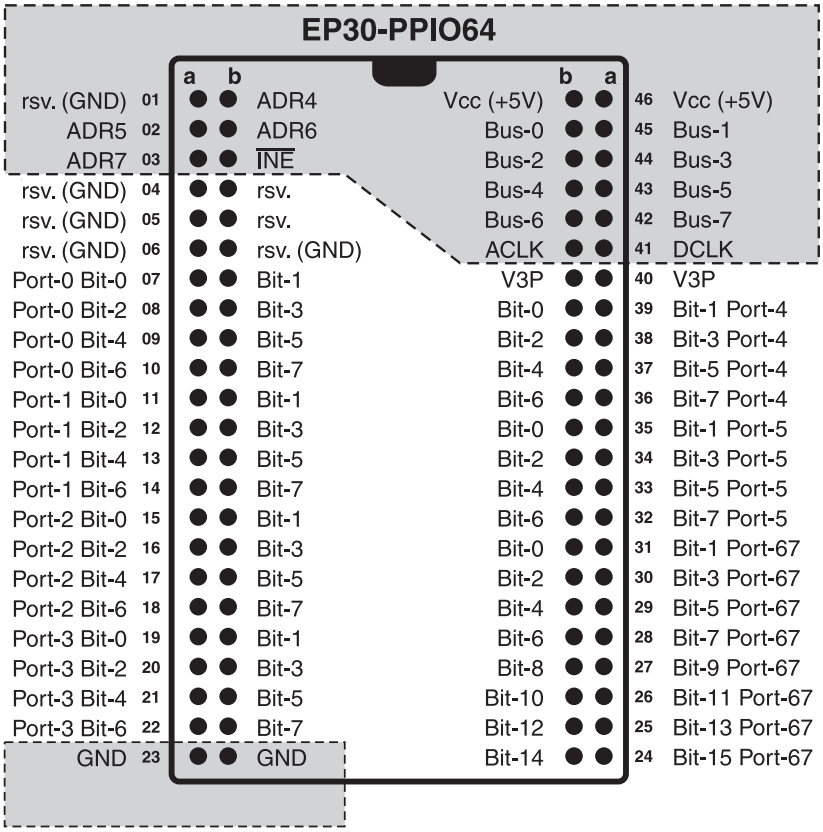

Pin description:

Designation	Function [1]	Description
GND	PWR	system ground
Vcc	PWR	power supply (+5V)
V3P	PWR	output of the internal 3.3V voltage regulator
Bus-0...Bus7	I/O	multiplexed data and address bus
DCLK	I	data clock (rising edge)
ACLK	I	address clock (rising edge)
INE	I	input enable (low active)
ADRx	I	selectable base address
Port-x Bit-y	I/O	bit y of port x
Rsv.	I	reserved, connect reserved pins to GND!

[1] PWR - power; I - input; O - output; I/O - input or output

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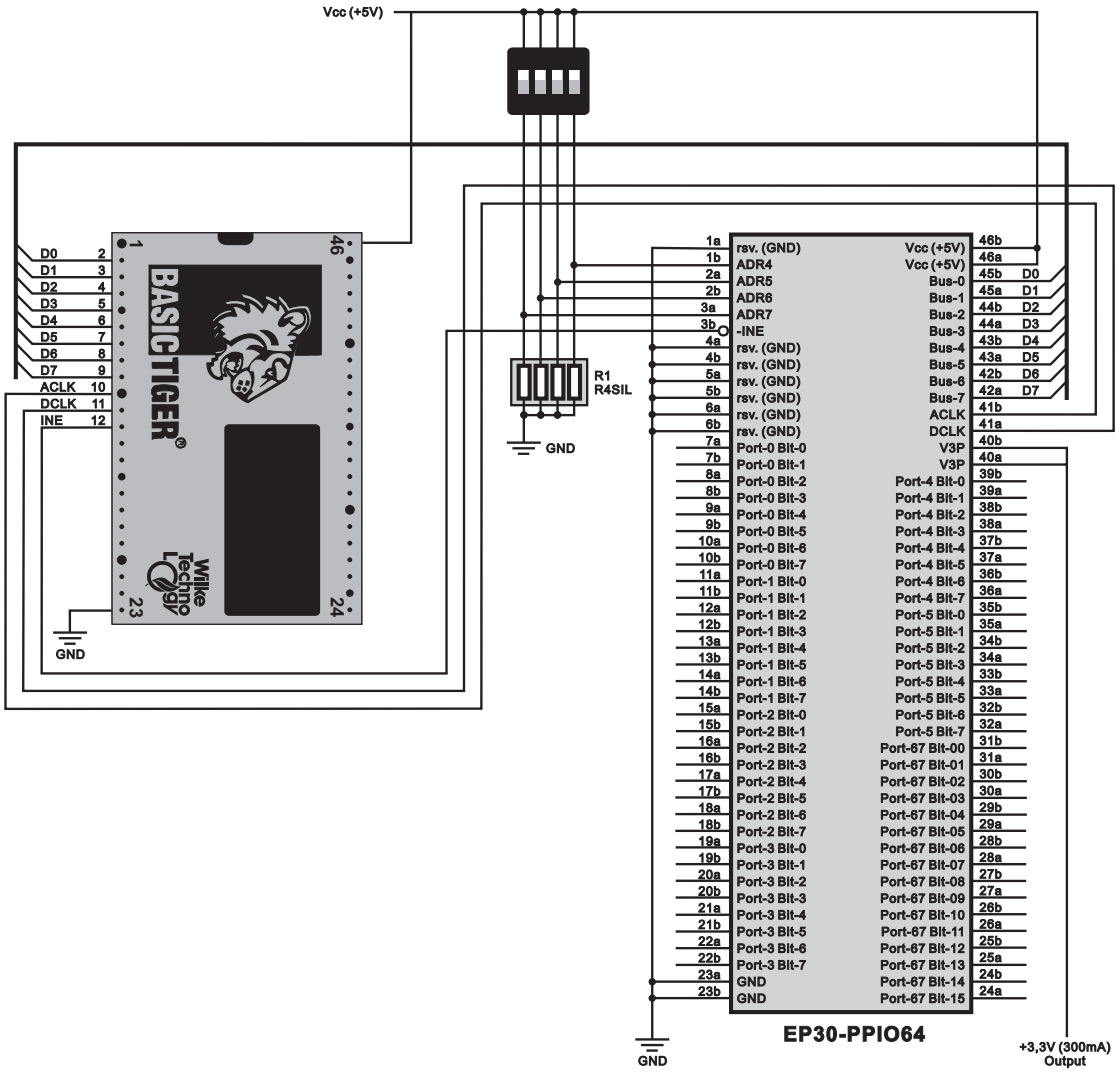
Connection to BASIC-Tiger™:

The following schematic shows the connection between the EP30-PPIO64 module and the BASIC-Tiger™. The data and control lines can be connected to other pins of the BASIC-Tiger™. Please look at the documentation of the XSETUP instruction in the "Programming manual" or in the online help of your Tiger-BASIC system.
You can select the base address of the EP30-PPIO64 module with the DIP switches.



Selection of base address:

The EP30-PPIO64 module needs 15 consecutive addresses of the XPORT system. The lowest address is called base address. You can define any base address which is divisible by 16, by connecting ADR7...ADR4 to low oder high voltage level:

base addr.	ADR7	ADR6	ADR5	ADR4
00h	low	low	low	low
10h	low	low	low	high
20h	low	low	high	low
30h	low	low	high	high
40h	low	high	low	low
50h	low	high	low	high
60h	low	high	high	low
70h	low	high	high	high
80h	high	low	low	low
90h	high	low	low	high
A0h	high	low	high	low
B0h	high	low	high	high
C0h	high	high	low	low
D0h	high	high	low	high
E0h	high	high	high	low
F0h	high	high	high	high

Programming:

The EP30-PPIO module is accessed by the XPORT I/O expansion system. Please take notice of the documentation of the instructions XSETUP, XIN und XOUT in the Tiger-BASIC online help.

8 bit ports: (Port0...Port5)

The EP30-PPIO64 has one data and one control register for each 8 bit port. The address of the port register is port number plus base address. The address of the control register is port number plus base address plus 8.

	data register	**control register**
port 0	base address + 00h	base address + 08h
port 1	base address + 01h	base address + 09h
port 2	base address + 02h	base address + 0Ah
port 3	base address + 03h	base address + 0Bh
port 4	base address + 04h	base address + 0Ch
port 5	base address + 05h	base address + 0Dh

Switching between input and output of an 8 bit port

Each bit of every 8 bit port can be switched to input or output mode separately. After power up all bits are switched to input mode.
To switch a bit of an 8 bit port to output mode, the bit of the control register must be set to 0. Setting the bit of the control register to 1 will switch the bit of the port to the high impedance input mode.
The instruction

XOUT (baseaddress + portnumber + 8, 11111000b)

switches bits 0, 1 and 2 of the port selected with portnumber to output mode and the other bits to input mode.
Note that the control register is a write only register. You will get undefined results by reading the register with a XIN instruction.

Reading 8 bit ports

With the XIN instruction you can read the logic states of all bits of an 8 bit port:

value = XIN (baseaddress + portnumber)

The bits of the variable 'value' will be set to 1 if high level voltage is applied to the portbit or 0 if low level voltage is applied.

Setting or resetting bits of 8 bit ports

With the XOUT instruction you can set the bits that are switched to output mode to high or low voltage level. A set bit will switch the portbit to high level, a 0 to low level. Bits that are switched to input mode will remain in high impedance state.
Example:

XOUT (baseaddress + portnumber + 8, 11000000b)
XOUT (baseaddress + portnumber, 11110000b)

The first instruction will set the bits 0 to 5 of the port 'portnumber' to output mode and the bits 6 and 7 to input mode. The second instruction sets the bits 0 to 3 to low level and the bits 4 and 5 to high level. The bits 6 and 7 remain in high input state because they are set to input mode.

16 bit port: (Port67)

The EP30-PPIO module has two data and one control register for the 16 bit port. The addresses of the data registers are 6 + base address and 7 + base address. The address of the control register is 0Eh + base address.

	data register	control register
port 6	base address + 06h	base address + 0Eh
port 7	base address + 07h	-

Switching between input and output of the 16 bit port

At Port67 all 16 bits can be set simultaneously to input or output mode. After power on all bits are set to input mode.
To switch the 16 bit port to output mode, the bit 0 of the control register must be set to 0. Setting the bit 0 of the control register to 1 will switch the port to the high impedance input mode.
The instruction

```
XOUT (baseaddress + 0Eh, 00000000b)
```

switches all bits of Port67 to output mode.
The instruction

```
XOUT (baseaddress + 0Eh, 00000001b)
```

switches all bits of Port67 to input mode.
Note that the control register is a write only register. You will get undefined results by reading the register with a XIN instruction.

Reading the 16 bit port

As the Port67 has a 16 bit input buffer, all 16 bits of the port can be read simultaneously. The logic states of all 16 bits are transfered into the input buffer by changing bit 1 of the control register from 1 to 0. You can read the low byte of the read buffer by reading port 6 and the high byte by reading port 7.
Example:

```
XOUT (baseaddress + 0Eh, 11b)          ' switch Port67 to input mode and
                                       ' set bit 1 of the control register
XOUT (baseaddress + 0Eh, 01b)          ' clear bit 1 of the control register
                                       ' now all logic states of Port67 are buffered
low = XIN (baseaddress + 06h)          ' read low byte
high = XIN (baseaddress + 07h)         ' read high byte
value = low + 256 * high
```

Setting or resetting bits of the 16 bit port

As the Port67 has a 16 bit output buffer, all 16 bits of the port can be set simultaniously. The low byte of the buffer is written with a XOUT instruction to port 6, the high byte with a XOUT instruction to port 7. The voltage level of the port bits are switched to the value of the write buffer by changing bit 1 of the control register from 0 to 1.
Example:

```
XOUT (baseaddress + 06h, lowByte)      ' set low byte of buffer
XOUT (baseaddress + 07h, highByte)     ' set high byte of buffer
XOUT (baseaddress + 0Eh, 00b)          ' switch Port67 to output mode
XOUT (baseaddress + 0Eh, 10b)          ' set bit 1 of control register
                                       ' now the outputs will be set to buffered state
```

Absolute maximum ratings (beyond which permanent damage may cccur)

supply voltage VCC	5.5V
input voltage on any input pin	5.5V
maximum current per output pin	100mA
operating temperature	min. 0°C max. 50°C
total current of all outputs including V3P	200mA
reserved pins must be connected to GND	

Specifications

Parameter	Conditions	Value
supply voltage		5V DC +-5%
supply current	all IOs switched to input mode	typ.: 10mA max.: 50mA
input low voltage		0V...0,8V
input high voltage		2,0V...5.5V
output high current output low current	Voh=2.4V Vol=0.4V	20mA 20mA

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Dimensions