I/O Module EP22 Family

16 Channel A/D, OPTO-In, OPTO-Out, Key-Matrix

Data Sheet

Universal I/O expansion module for BASIC Tiger multitasking computer modules. The EP22 combines often used I/O channels from the analog and the digital world in a single module:

- Analog input
- Opto de-coupled digital input
- Opto de-coupled digital output
- Keyboard / switch matrix scan input

Data aquisition through the EP22 in combination with a BASIC-Tiger, TINY-Tiger or Econo-Tiger makes a powerful and still compact and low costing instrument. The EP22 offers software-programmable input ranges individual for each channel, bundling of various channels to channel groups, calibration and oversampling features for increased accuracy and resolution needs.

The EP22 is used in mobile equipment and industrial control application as

- production control equipment
- medical equipment
- alarm systems
- data loggers
- industrial machine control systems
- quality control systems ...

For further information, detailed literature and manuals in printed or downloadable formats visit:

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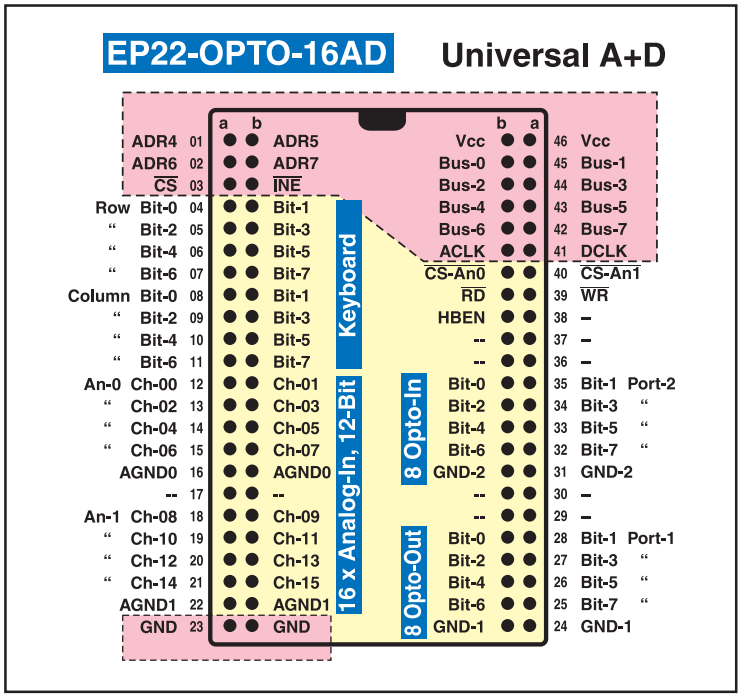

Features

A/D input:	**16 channel A/D, 12 Bit**
input range:	**for each channel individually programmable: 0...5V, 0...10V, +/-5V, +/-10V**
Keyboard:	**key / switch matrix: up to 8 x 8 keys**
8 x Opto In:	**5...50mA max, 1.3 $V_{typ.}$**
8 x Opto-Out:	**24V / 5 mA_{typ}, 40V / 50mA_{abs_max}**

General Specifications

Dimensions:	approx. 40.6 x 62.2 x 11.4 mm / 1.6 x 2.5 x 0,5“ 92-pin DIP type case pin to pin clearance 2.54 mm / 0.1“, outer row distance 35.56 mm / 1,4“ square pins 0.64 x 0.64 mm / 0.025 x 0.025“
Weight:	approx. 48g / 1.7 ounce
Operating temperature: Standard: Industrial: Expanded:	 0°C to +70°C -20°C to +85°C expanded ranges up to -55°C to 105°C on request
Power supply:	4.5V - 6.0V / 20 / 28 / 32 mA typ. (EP20 / EP21 / EP22)
I/O pins:	8 Data Bus + 3 Ctrl + 8 digital IN, 8 digial out 16 analog in, 8+8 key-matrix

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Analog Inputs

- Nr. of input channels:

  0 channels, Module EP20
  8 channels, Module EP21
  16 channels, Module EP22

- Resolution
  Effective Dynmic Resolution

  12 Bit
  14 Bit, 2 additional bits by range setting 5V, 10V and 20V swings

- Conversion Accuracy

	Standard	Industrial
Integral Nonlinearity:	± 1 LSB max.	± 0,5 LSB max.
Differential Nonlinearity:	± 1 LSB max.	± 1 LSB max.
Offset Error:		
Unipolar:	± 5 LSB max.	± 3 LSB max.
Bipolar:	± 10 LSB max.	± 5 LSB max.
Chan-to-Chan Offset:		
Unipolar:	± 0,1 LSB typ.	± 0,1 LSB typ.
Bipolar:	± 0,5 LSB typ.	± 0,5 LSB typ.
Gain Error:		
Unipolar:	± 10 LSB typ.	± 7 LSB typ.
Bipolar:	± 10 LSB typ.	± 7 LSB typ.
Gain Temperature Coeff:	5 ppm / °C typ.	3 ppm / °C typ.

- Dynamic specifications:

Signal to Noise + Distortion Ratio:	70 dB min.	69 dB min.
Total Harmonic Dis-tortion tortion up to 5th harmonic:	-85 dB typ. -78 dB max.	-85 dB typ. -78 dB max.
Spurious Free Dynamic Range:	80 dB min.	80 dB min.
Channel to Channel Crosstalk, 50 kHz, ±5V:	-86 dBtyp.	-86 dBtyp.

- Analog Input:

Track Hold Time:	3µs max.	3µs max.
Small Signal Bandwidth:	±10V range	5 MHz typ.
	±5V range	2,5 MHz typ.
	0-10V range	2,5 MHz typ.
	0-5V range	1,25 MHz typ.
Input Current:	±10V range	-1200 ... 720 µA max.
	±5V range	-600 ... 360 µA max.
	0-10V range	720 µA max.
	0-5V range	360 µA max.
Dynamic Input Res.	Unipolar	21 kΩ typ.
	Bipolar	16 kΩ typ.
Input Capacity	40 pF max.	40 pF max.

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Analog Inputs (cont.)

Aquisition time	< 25 µs
Input Ranges	For each input channel individually programmable input ranges: 0-5V 0-10V ±5V ±10V
Input Organisation	Each channel individually accessable. Any collection of channels can be handled as a channel group for near to synchronous data sampling.
Input Overvoltage Tolerance	±16,5V
Temperature Range	standard: 0° ... 70°C industrial: -40° ... 85°C expanded: -55° ... 105°C
Buffering	aquisition data fully buffered in Tiger computer module
Further Features	Further Data Aquisition functions with EP22 module + BASIC Tigers: ◆ Individual channel calibration curves in data FLASH ◆ Oversampling and window integration for noise reduction and increased resolution to 13 or 14 bit. ◆ Individual channel reading and up to 8 channel groups of up to 64 channels each. ◆ Power save mode

Digital In- / Outputs

		Testcondition
Min Input Voltage „High“	3.15V	(Vcc = 4.5V)
Max Input Voltage „Low“	1.80V	(Vcc = 6.0V)
Min Output Voltage „High“ (1 HC load)	4.4V	(Vcc = 4,5V)
Max Output Voltage „Low“ (1 HC load)	0.1V	(Vcc = 6,0V)

Digital OPTO Inputs

Input Type	LED
Input Current „High“ (read as Bit=1)	5 mA min. 50 mA max.
Input Voltage „High“ (read as Bit=1)	1.3 V max (@ I = 10 mA)
Input Current „Low“ (read as Bit=0)	< 10 µA
Input Capacitance	30 pF typ.
Reverse Voltage	5V max
Input Isolation to all other Ports	2500 Vrms min, 1 minute

Digital OPTO OC Outputs

Output Type	Open Collector
Output Current „Low“ (written Bit = 0)	0.1 µA max.
Output Voltage „Low“ (written Bit = 0)	80V abs. max.
Output Capacitance	10 pF typ.
Output Current „High“ (written Bit = 1)	5 mA min. 50 mA abs.max.
Output Voltage „High“ (written Bit = 1)	0.7V max (@ I = 8 mA)
Output Isolation to all other Ports	2500 Vrms min, 1 minute

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8 x 8 Key / Switch Matrix

◆ No of Rows	1 ... 8 non-used key positions are
◆ No of Columns	1 ... 8 software-masked-out - or ignored if applicable
◆ Type of Rows	Source
◆ Type of Columns	Drain
◆ Max. Key Resitance for „ON“ state	2 KΩ
◆ Min. Key Resitance for „OFF“ state	100 KΩ
◆ Max. Key Voltage	Vcc
◆ Max. Key Current	< 1mA
◆ Functions through driver LCD1	Scan frequency: 1000 Columns / sec
	Soft-Debounce: 32 ms typ. (through driver or application prog.)

Key Attributes, Auto Repeat, Shift, CTRL and other details:
➔ see device driver description and examples

ADR map of module

◆ Base-ADR by pin programming

ADR-Bit Inputs: A4, A5, A6, A7

◆ Possible Base-ADRs through Inputs: ADR4,5,6,7

00H -	ADR-Range: 00 ... 0F
10H -	ADR-Range: 10 ... 1F
20H -	ADR-Range: 20 ... 2F
30H -	ADR-Range: 30 ... 3F
40H -	ADR-Range: 40 ... 4F
50H -	ADR-Range: 50 ... 5F
60H -	ADR-Range: 60 ... 6F
70H -	ADR-Range: 70 ... 7F
80H -	ADR-Range: 80 ... 8F
90H -	ADR-Range: 90 ... 9F
A0H -	ADR-Range: A0 ... AF
B0H -	ADR-Range: B0 ... BF
C0H -	ADR-Range: C0 ... CF
D0H -	ADR-Range: D0 ... DF
E0H -	ADR-Range: E0 ... EF
F0H -	ADR-Range: F0 ... FF

◆ Base-ADR +0:	OPTO-Output Port
Base-ADR +1:	OPTO-Input Port
Base-ADR +2:	-
Base-ADR +3:	-
Base-ADR +4:	-
Base-ADR +5:	-
Base-ADR +6:	-
Base-ADR +7:	-
Base-ADR +8:	Column-0, Data-Bits 0...7 = Row 0 ... 7, Non-Pressed-Key = „1“
Base-ADR +9:	Column-1 „
Base-ADR +A:	Column-2 „
Base-ADR +B:	Column-3 „
Base-ADR +C:	Column-4 „
Base-ADR +D:	Column-5 „
Base-ADR +E:	Column-6 „
Base-ADR +F:	Column-7 „

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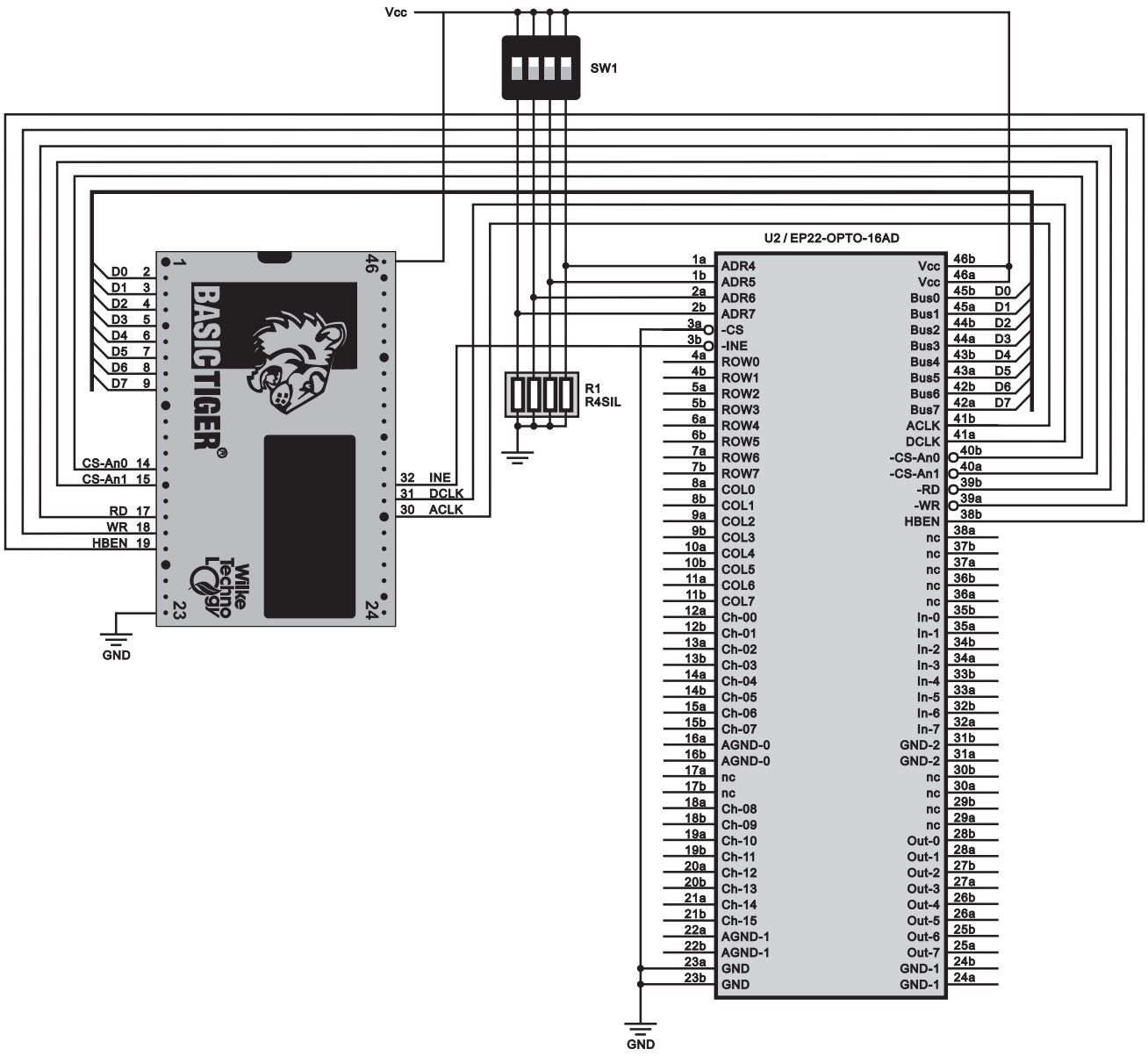
Connection diagram



Sample connection diagram for connecting a EP22 I/O module to a BASIC-Tiger module. The port addresses of the module start with 0 if all DIP switches are “OFF”, so the lowest possible base address is set.

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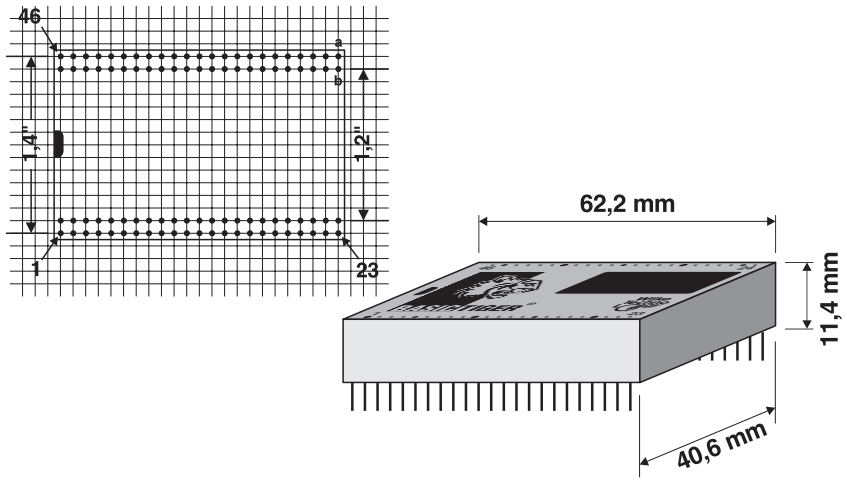
Remarks:

CS pin is recommended to be tied to GND.



Mechanical Data

EP22 Family Modules

Type	Analog In	Opto In	Opto Out	8x8 Matrix	Strd.	Indu.
EP20-OPTO	0	8	8	64 keys	✔	
EP21-OPTO-8AD	8	8	8	64 keys	✔	
EP22-OPTO-16AD	16	8	8	64 keys	✔	
EP20-OPTO-I	0	8	8	64 keys		✔
EP21-OPTO-8AD-I	8	8	8	64 keys		✔
EP22-OPTO-16AD-I	16	8	8	64 keys		✔

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