Ethernet Module EM03

Parallel - V1.1

Technical Documentation

Ethernet for every embedded system

A small module makes it possible: the ethernet module EM03 connects microcomputer, single-chip processors and single-board computers simply with ethernet.

The native intelligence of the on-board processor handles all necessary operations and considerably reduces the load on the actual control. At last, a powerful ethernet utilisation in a microprocessor application is possible, which is also simple to integrate.

Easy to use program examples and Starter Kits - complete ready to go systems - mean a quick start and guarantee short development periods.

With its slight dimensions of 3.9 x 2.8 x 1.0 cm, weight of 19 grams and 28 pin Dip-type module-casing there is ample room for the module. The chip connects to a 5V DC energy source and its interface is compatible with 3V / 5V.

The ethernet module is available in two models: with a serial interface (1.200 to 38.400 Bd ASYNC) 3V / 5V gage (EM01) or with an 8-bit parallel interface (EM03).

The EM03 ethernet module connects to a 10 MBit Ethernet through a RJ45 connector with filter and is fully compatible to todays 10/100 MBit Ethernet networks.

Application Areas:

- Factory automatisation
- Data transfer via Ethernet
- Embedded Web Server or Client applications
- Connection to Internet via standard TCP/IP Router

Protocols:

The EM01 / EM03 Ethernet adapter handles all-ready locally these communication levels:

- ARP
- IP
- TCP
- DHCP
- DNS
- UDP
- SNTP

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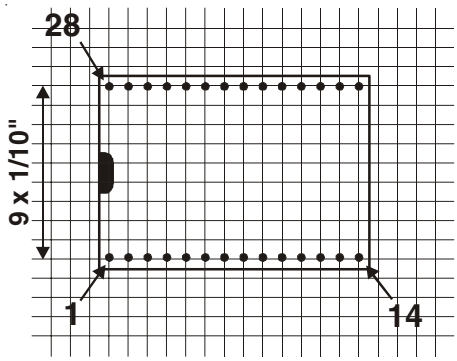
Pin-Definition

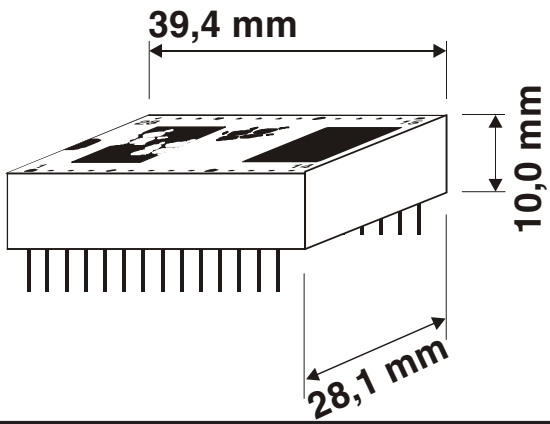
Name	Pin	Type	Description
VCC	28	PWR	+5V dc Supply
GND	14	PWR	0V Supply
/Reset	13	IN	Reset Input low active
D0...D7	5...12	IN/OUT	Data lines, connect to L60...L67 of BASIC -Tiger
T_Aclk	15	IN	BASIC-Tigers XPort Address Clock
T_Dclk	16	IN	BASIC-Tigers XPort Data Clock
/T_INE	25	IN	BASIC-Tigers XPort Input Enable SIgnal (low active)
RX_P	17	IN	Ethernet Receive Line - positve pole
RX_M	18	IN	Ethernet Receive Line - negative pole
TX_M	19	OUT	Ethernet Transmit Line - negative pole
TX_P	20	OUT	Ethernet Transmit Line - positve pole
DATA	22	OUT	output for data LED, high active
CONNECT	23	OUT	output for connect LED, high active

The other Pins are reserved for further functions. Do not connect the reserved Pins

Case Dimension

ca. 39,4 x 28,1 x 10,0mm
ca. 19g
28-Pin





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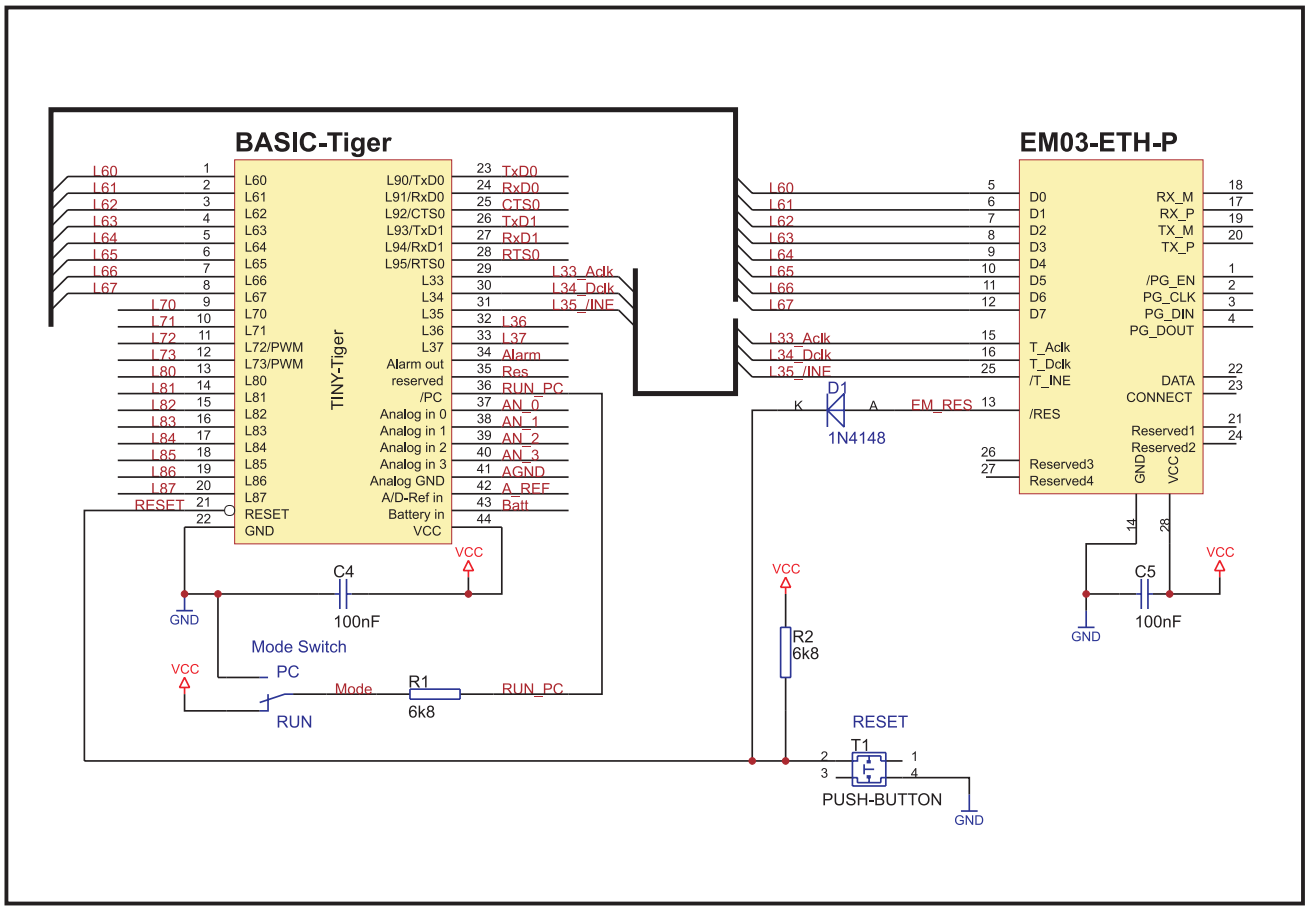
Conection to TINY-Tiger™ or BASIC-Tiger™

Connect the module EM03-ETH-P to the XPORT of your TINY-Tiger™ or BASIC-Tiger™, as shown below. The data signals D0 to D7 are directly connected to the signals L60 to L67 of the BASIC-Tiger™, T_Aclk is connected to L33, T_Dclk is connected to L34 and T_Aclk is connected to L35.

To send data to the EM03-ETH-P you just put out the bytes with a „XOUT"-instruction at XPORT address F0 hex. The ethernet module stores the values in the internal write buffer, until they are processed. At XPORT address F1 and F2 hex you can read out the number of free bytes in the write buffer. (F1: low byte, F2: high byte)

Data bytes to be read from the BASIC-Tiger™, are stored in a second buffer of the ethernet module called read buffer. You can read out the data bytes reading at XPORT address F0. At XPORT address F3 hex and F4 hex you can read out the number of bytes in the read buffer. (F3: low byte, F4: high byte) Each buffer can store at maximum 511 bytes.



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Description of Businterface

The EM03 is controlled by a multiplexed 8-bit data- and addressbus and three control signals.

To access any of the registers or FiFo buffers of the EM03 module the adress of the register or buffer must be written to D0...D7. The address will be latched by an active signal T_Aclk (high active). After latching the address, the data can be written to or read from the selected register or buffer.

To write Data to the FiFo buffer, write the value to the data bus D0...D7, then set T_Dclk active (high active). To write multiple bytes to the FiFo you must latch the address of the buffer only once.

To read Data from a register or FiFo buffer, release the signals D0...D7, then set /T_INE active (low active). With an active /T_INE signal the EM03 writes the value of the adressed register or buffer to the data bus D0...D7. To read multiple bytes from the FiFo you must latch the address of the buffer only once.

Addresses of Registers and Buffers

Address	Register / Buffer
F0 hex	FiFo read and write buffer of the EM module. Bytes written to this address are stored in the write buffer until they are processed or transfered by the EM module. Bytes to be transfered from the EM module to the user are stored in the read buffer until they are read.
F1 hex	low byte of number of free bytes in write buffer read the low byte first and then read the high byte
F2 hex	high byte of number of free bytes in the write buffer read the low byte first and then read the high byte
F3 hex	low byte of number of bytes in the read buffer read the low byte first and then read the high byte
F4 hex	high byte of number of bytes in the read buffer read the low byte first and then read the high byte

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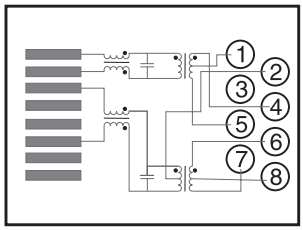
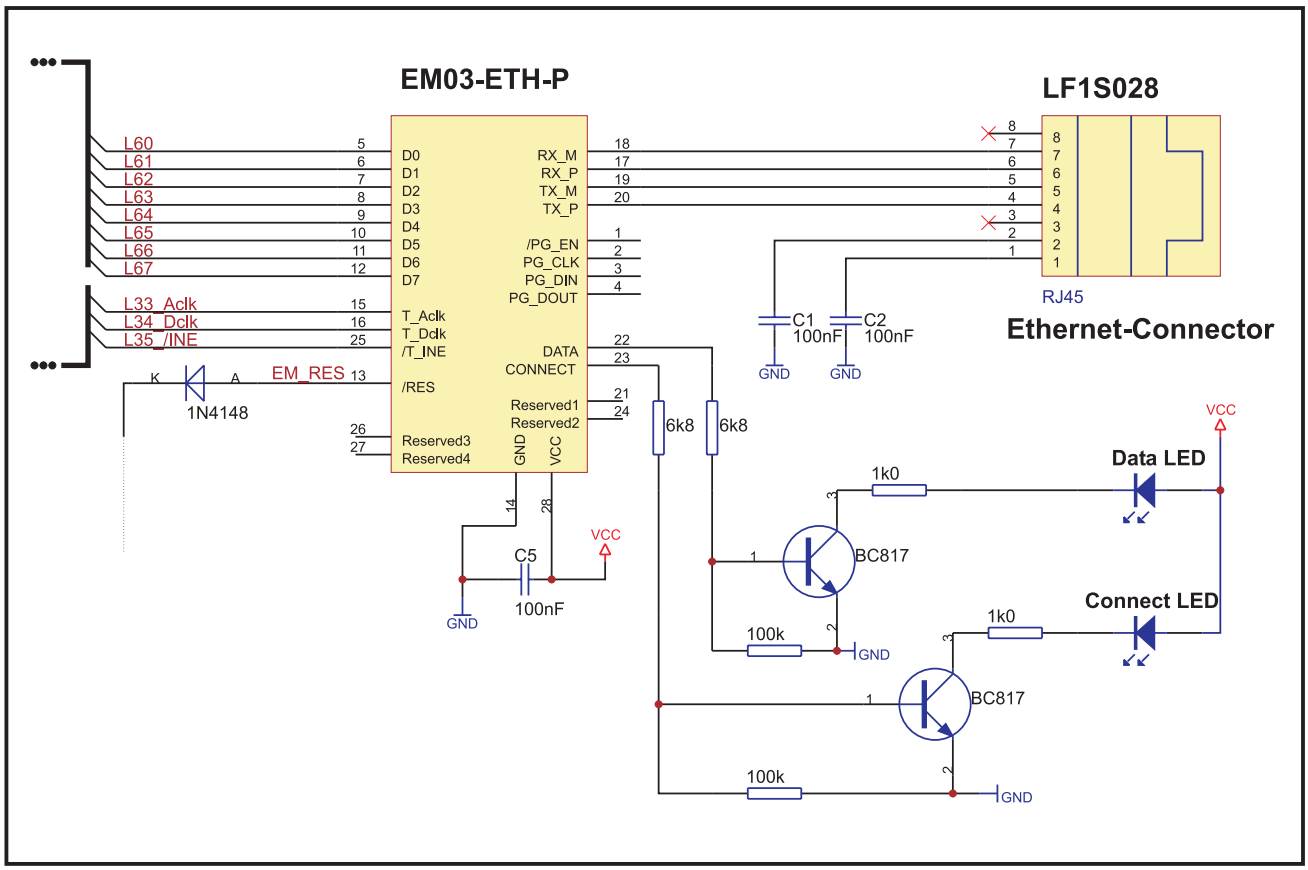
Connection to Ethenet

To connect the EM03-ETH-P to the ethernet, use a connector with integrated 10 BASE T magnetics and filter like the connector LF1S028 from Bothhand. This part is used in Wilke products and is available as spare part through Wilke.

Alternatively you can use the HFJ11-S114E connector from HALO Electronics INC.

Ethernet Connector LF1S028





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Absolute maximum ratings (beyond which permanent damage may occur)

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
Do not connect the reserved Pins	

DC Specifications

Parameter	Conditions	Value
Supply current		typ.: 135mA max.: 350mA
Input low voltage Input low voltage (/RESET)		1.0V max. 0.9V max.
Input high voltage Input high voltage (/RESET)		1.8V...5.5V 2.25V...5.5V
Output high current Output low current	Voh=2.4V Vol=0.4V	11mA (min.) 9mA
Input leakage current Input leakage current	logic value does change state logic value does not change	-80µA...80µA -1µA...1µA
Input leakage current for /RESET		-60µA...335µA

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AC Specifications

writing data to Ethernet module

Name	description	time
t_{av}	adress valid to rising edge of T_Aclk	> 0ns
t_{a}	minimum length of T_Aclk signal	125ns
t_{wdv}	data valid to rising edge of T_Dclk	> 0ns
t_{wd}	minimum length of T_Dclk signal	175ns
t_{wa}	falling edge of T_Dclk to rising edge of T_Aclk	> 100ns
t_{wnd}	falling edge of T_Dclk to rising edge of T_Dclk	> 100ns

reading data from Ethernet module

Name	description	time
t_{av}	adress valid to rising edge of T_Aclk	> 0ns
t_{a}	minimum length of T_Aclk signal	125ns
t_{rdv}	falling edge of /T_INE to data valid	< 20ns
t_{rd}	minimum length of /T_INE signal	175ns
t_{rp}	rising edge of /T_INE to high impedance state of data signals	< 20ns
t_{ra}	rising edge of /T_INE to rising edge of T_Aclk	> 100ns
t_{rfd}	rising edge of /T_INE to falling edge of /T_INE	> 100ns

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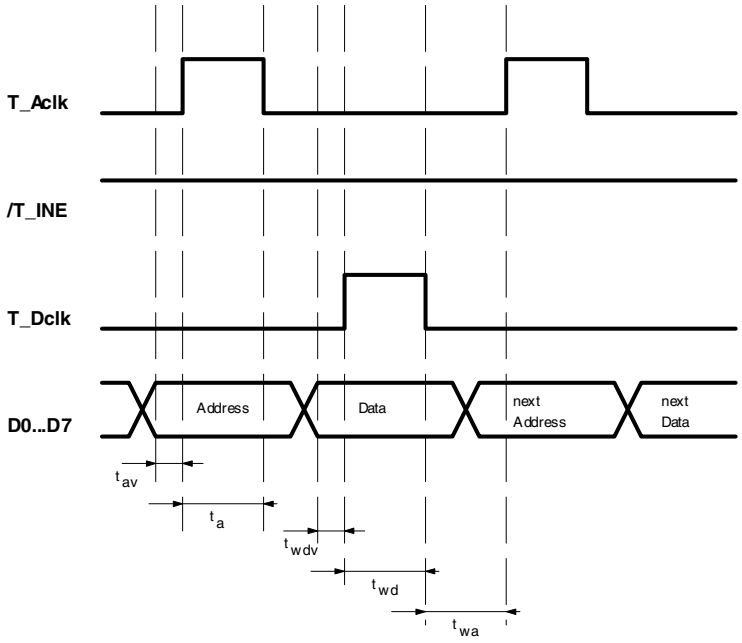
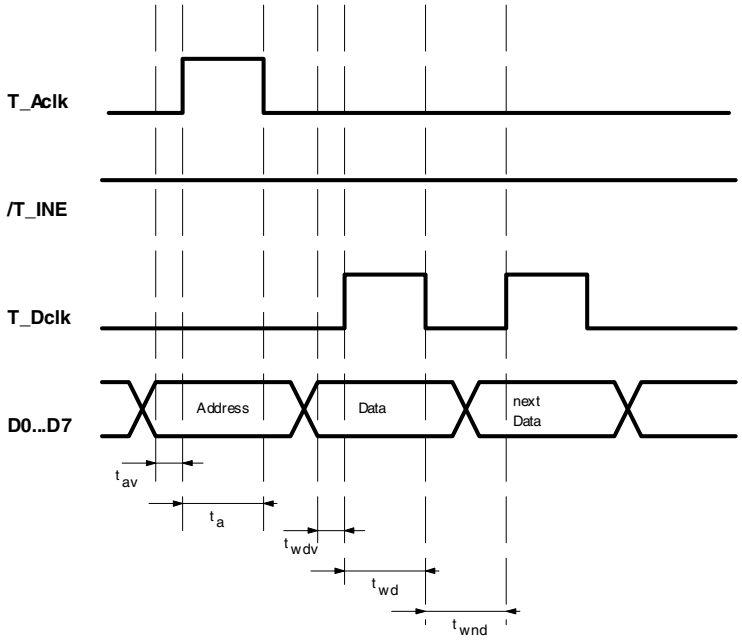
Timing Diagrams

writing data to EM module (normal mode)



writing data to EM module (burst mode)



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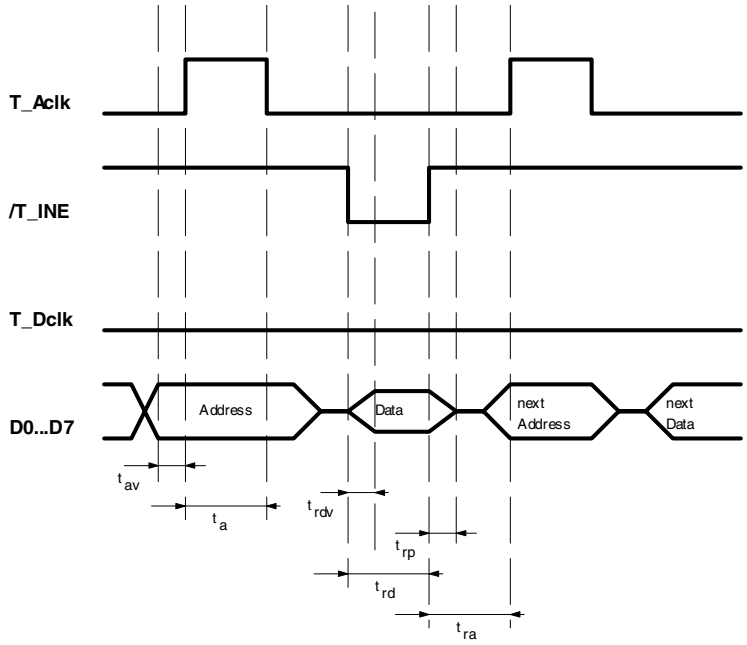
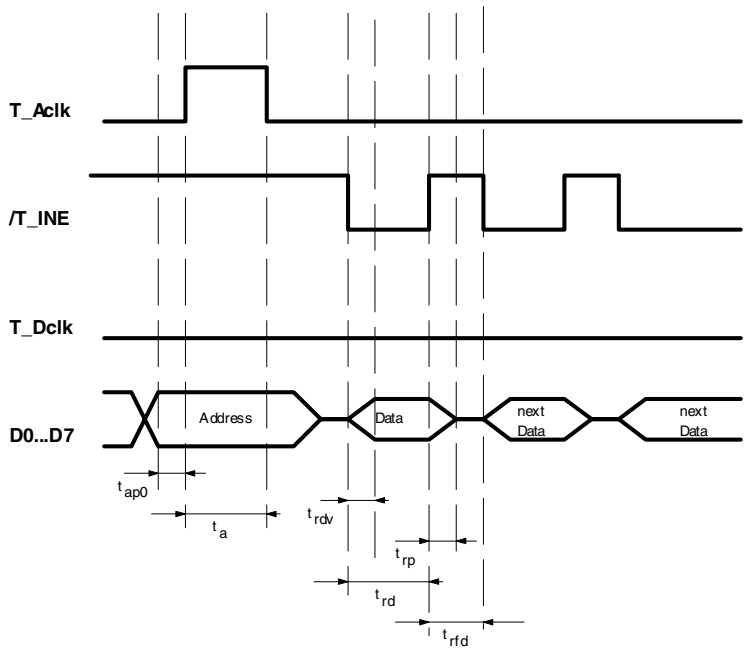
Timing Diagrams

reading data from EM module (normal mode)



reading data from EM module (burst mode)



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Revision Table

Dokument	Adapter Version	Changes
V001	1.0	-
V002	1.1	module revision:signals for data and connect LED added
V003	1.1	timing diagrams and AC specifications added
V004	1.1	protocols UDP and SNTP added on page 1