

# DK40 Datasheet & Hardware manual

Version 2

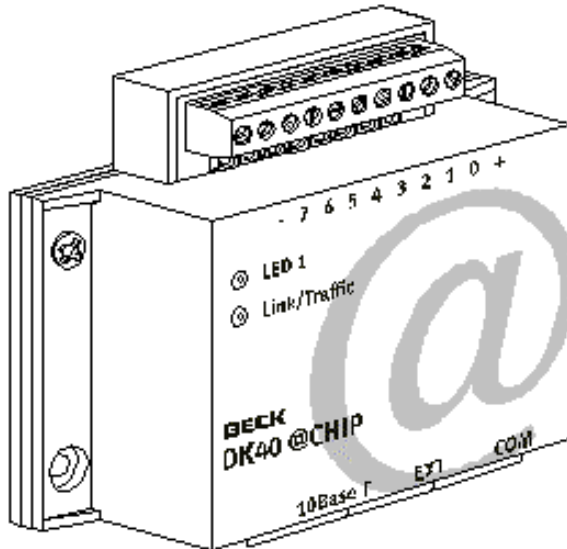
IPC@CHIP DK40 Evaluation module



## Table of contents

Table of contents .....	2
Basic description .....	3
Characteristics .....	3
Dimensions .....	4
Internal layout .....	4
Electrical features .....	5
Inputs .....	5
Outputs .....	5
Interface description .....	6
EXT & COM serial interfaces .....	6
Ethernet interface .....	7
Digital I/O .....	7
External wiring sample: .....	9
Traffic LED .....	9
LED 1 .....	9
DK40 Schematic .....	10

## Basic description



The DK40 evaluation module is an @CHIP<sup>®</sup> component, designed for easy commissioning of the IPC@CHIP SC12. It contains all the required components to create an initial link between the @CHIP SC12 and its environment. Serial data can be transferred between the two interfaces via an external level converter (use SM14 for RS232 or SM35 for RS485). It is possible to set up a direct network connection with the aid of an Ethernet hub, using a twisted pair cable connection (RJ45 for 10BaseT) enabling TCP/IP access over the Ethernet. The 8 digital I/O terminals can be

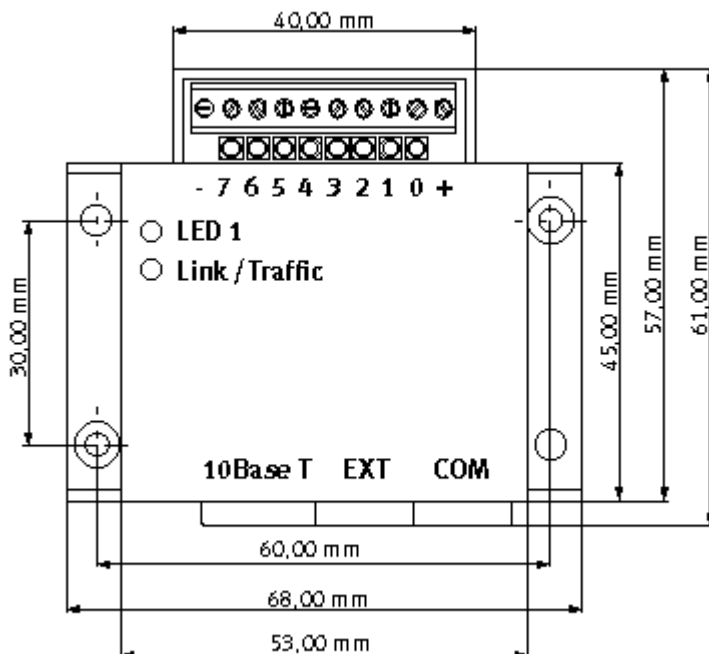
individually configured as inputs or readable outputs. Each bit has a monitoring Light Emitting Diode [LED] that indicates the current status of the bit. On top of the module are two additional LEDs, one is indicating the status of the network connection and the other is programmable. The power is supplied to the module externally from a 15V to 30 V DC voltage source. The power consumption of the combined units, (DK40 and SC12) use approximately 2 Watts.

Note: A complete library of example programs, hardware applications and circuit diagrams are available on this web site. <http://www.bcl.de>

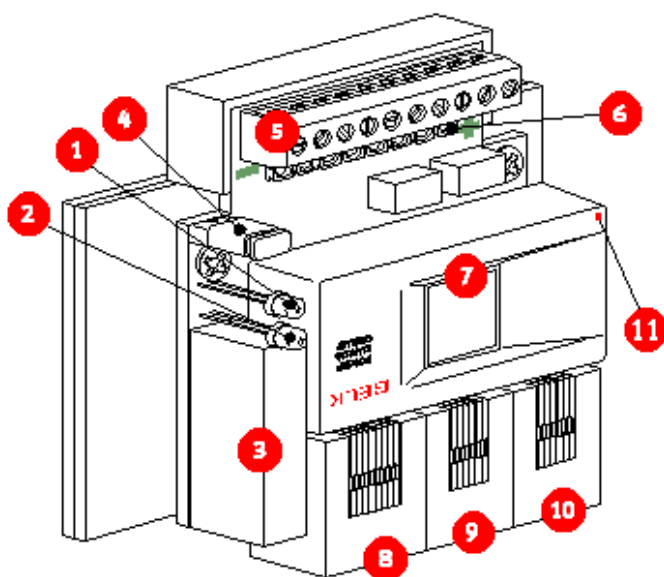
## Characteristics

- 8 digital in/outputs 15V...30V DC with status LEDs
- 2 serial interfaces TTL; (SM14 for RS232 and SM35 for RS485)
- 1 network interface 10Base T
- 1 free programmable LED
- 1 link/traffic LED
- Internal voltage converter +15V...30V DC - > 5 V DC

## Dimensions



## Internal layout



Detail "B"

1. Free programmable user LED
  2. Combined link/traffic/reset LED
  3. Network transformer for Ethernet
  4. Jumper JP1
  5. Socket strip with screw terminal for voltage supply and combined inputs/outputs
  6. Control LEDs for combined inputs/outputs
  7. IPC@CHIP SC12
  8. Twisted pair network connection for Ethernet
  9. EXT interface (serial, TTL)
  10. COM interface (serial, TTL)
  11. Orientation Insertion Dot \*
- Please refer to "Detail B"

## Electrical features

Supply voltage: +15V...+30V DC

- Power consumption: 2,2 watts max. including @CHIP

**Warning:** Using a power supply that produces a voltage overshoot over 30 Volt at power on can easily damage the DK40.

**Warning:** The DK40 is an evaluation board for the IPC@CHIP SC12. It is not an industrial controller with CE qualifications.

## Inputs

- Input voltage +15V...+30V DC, however below supply voltage.
- Input current at 24V DC: typ. 2,5 mA / 15V: typ 1,6mA
- Max. sampling rate: up to 10 kHz, depending on the software

## Outputs

- Level = Power supply [Vcc] - 2V DC, positive switching, no protection
- Max. continuous output current at 15V:

Number of outputs conducting simultaneously	Current per output (mA)
3	230
4	150
5	120
6	100
7	90
8	60

- Not short circuit protected
- Integrated freewheeling diode
- Status LED per channel
- Switching frequency: up to 10 kHz, depending on the software
- Output 7 programmable as timer or frequency generator
- 1 programmable LED

## Interface description

### EXT & COM serial interfaces

Hardware-Handshaking with RTS/CTS

RS232 protocol with TTL-levels, for RS232-level (PC connection) use the SM14 interface module.

The interfaces may also be used as RS485 with the SM35 module or as RS422 with the SM34 module.

COM-Interface default function:

Terminal interface, 19200 Baud, 8 data bits, no parity, 1 stop bit and no handshake.

EXT interface default function:

BIOS update interface (BIOS update speed is 115k Baud)

The EXT interface can also be used as a terminal interface with default settings:

19200 Baud, 8 data bits, no parity, 1 stop bit and no handshake.

### Pin assignment of the two RJ-12 connectors

- 1 +5V (max. 20mA)
- 2 GND
- 3 TXD
- 4 RXD (with 10k pull-up resistor to +5V for fault clearance)
- 5 CTS
- 6 RTS

- Full-Duplex Operation
- 7-bit or 8-bit
- Odd, even, or no parity
- Error detection
  - Parity errors
  - Framing errors
  - Overrun errors
  - Break character recognition
- Hardware handshaking
  - Clear-to-send (CTS)
  - Ready-to-send (RTS)

Max. baud rate: 1250Kbit/s

## Ethernet interface

LAN interface, 10 BaseT, 10 Mbit/s

### Pin assignment of the RJ45 connector:

- 1 TX+
- 2 TX-
- 3 RX+
- 4 n.c.
- 5 n.c.
- 6 RX-
- 7 n.c.
- 8 n.c.

## Digital I/O

The input and output pins (screw terminal) can be accessed at I/O address 600 hex. Each I/O line is programmable as either an output or an input. The outputs are not short circuit protected. The maximum sample rate is around 10kHz, depending on the application software.

The screw terminal 7 can be configured as timer out (hardware timer0) or as PIO 13 (programmable I/O).

The LED's show the state of the I/O pins  
(LED light: output is HIGH, LED dark: output is LOW)

Here are examples of how to manipulate the I/O (only the seven lower bits / screw terminal) from the command line:

Switch on port bits 0..3, switch off port bits 4..7:

```
ALE 1      enable the ALE function
PCS 6      enable the PCS6 function
OB 600 0F  write hex-byte 0F to I/O address 600 hex
```

Get input state of the I/O port:

```
ALE 1      enable the ALE function
PCS 6      enable the PCS6 function
IB 600     read I/O address 600 hex and print to STDIO (standard i/o = command line)
```

The programmable LED (LED1 on the top of the DK40 housing) and the port bit 8 of the screw terminal can be accessed at the command line with the PIO commands

```
PIO 13 4    ; screw terminal bit 8 on
PIO 13 5    ; screw terminal bit 8 off
PIO 3 4     ; LED1 off
PIO 3 5     ; LED1 on
```

The outputs are open collector high-side driver. This means, a low output deactivates the output driver, a high output sources current.

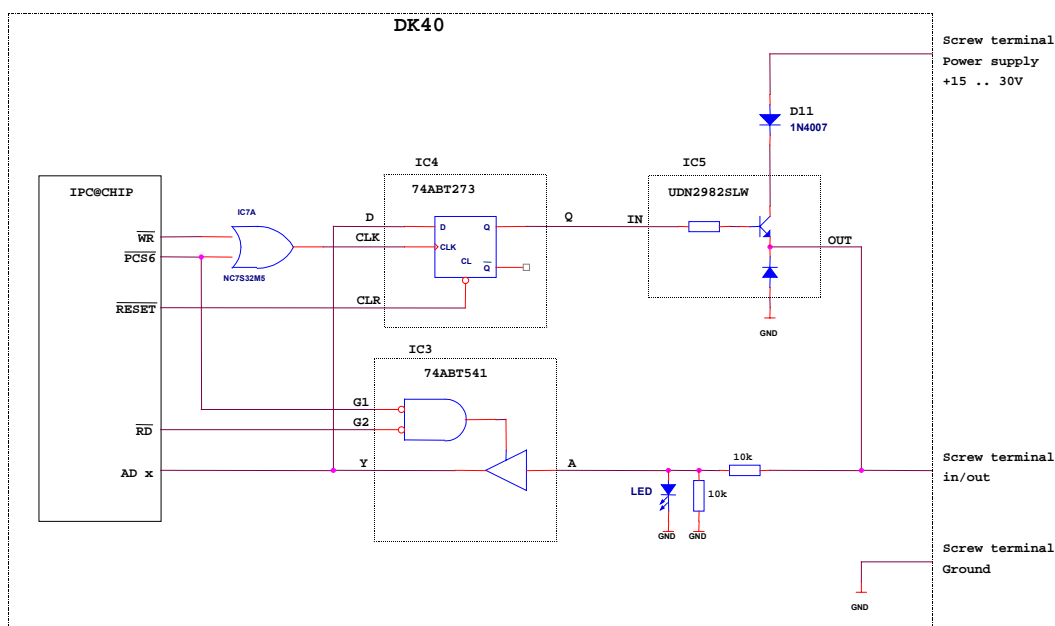
The output drivers have built in clamp diodes to eliminate small induced currents. For more powerful inductive loads, an external clamp diode (i.e. 1N4007) is necessary.

To use an input, the output driver of this line must be switch off (low output). The DK40 has a 20k Ohm pull-down resistor at each I/O line (screw terminal)

**Attention:**

To avoid damage, the I/O line voltage must never be higher than the DK40 supply voltage.

Simplified diagram of the DK40 I/O port (one I/O pin):



Loading voltage / current at the I/O pins:

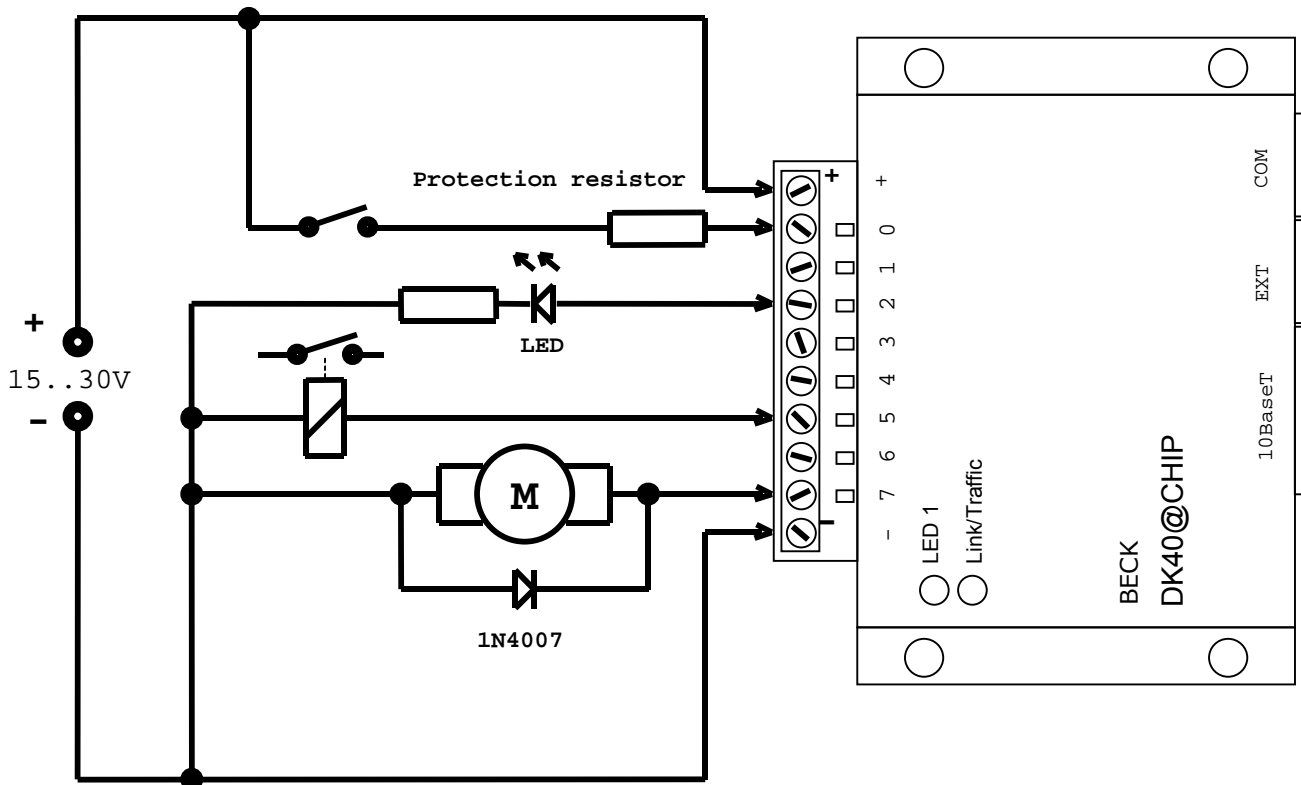
24V = 2,5mA

15V = 1,6mA

Internal clamp diode of the UDN2982SLW:  $I_F=350\text{mA}$ . Test Conditions: 1,5V (typ.) 2,0V (max.)



## External wiring sample:



The protection resistor is optional and protects the DK40 from damage due to a wrong connection.

(Example values: 1k5 at 15V / 2k4 at 24V / 3k3 at 30V Supply voltage)

Please note that light bulbs, inductive loads like motors or capacitive loads take more current at the moment they switch on.

A clamp diode is built in for small inductive loads. Add a stronger clamp diode (i.e. 1N4007) when you connect bigger inductive loads to the DK40.

## Traffic LED

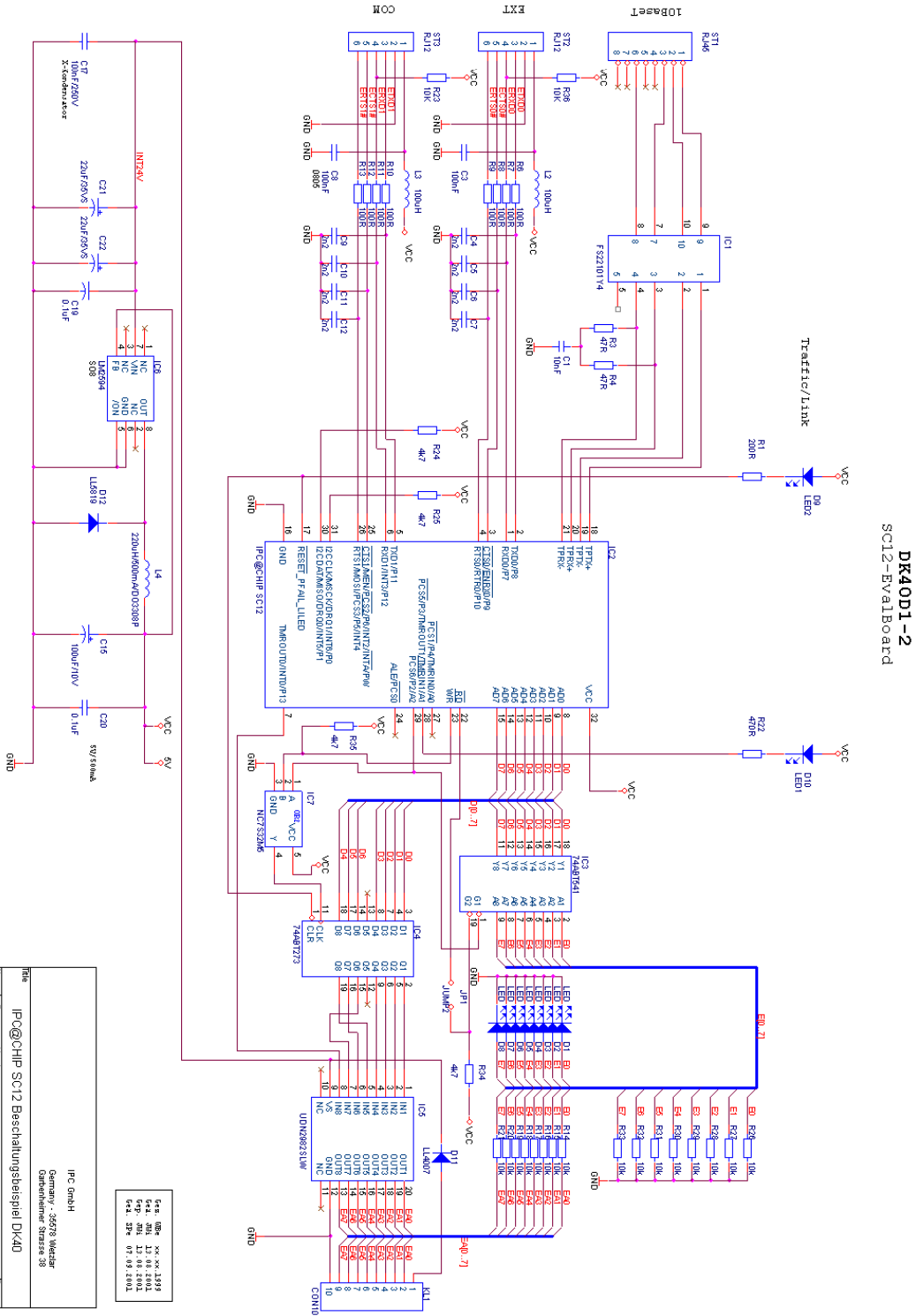
This LED is for visual monitoring of the Ethernet.

With no Ethernet connection, the LED is off. The LED blinks (dims) according to the traffic on the Ethernet, with no traffic, the LED lights continuously.

## LED 1

LED1 is programmable through pio pin 3 or timer 1.

# DK40 Schematic



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IPC@CHIP SC12 Beschaltungsbeispiel DK40	
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