Multiple Flash Trigger Electronics
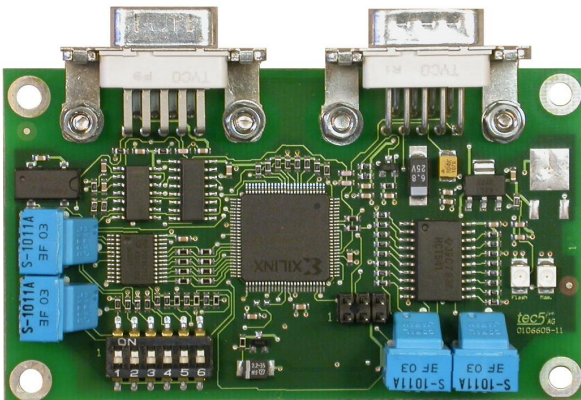
BEK-flash

Product-ID: 0106605.11
Document: ds_BEK-flash_110e.doc

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General

The electronics module BEK-flash is used to provide single or multiple drive signals for flash lamp electronics from a single TTL input pulse. Used with tec5 Operating Electronics for photodiode arrays and spectral sensors, controlling the number of flashes in a series within an integration period allows to change the light level and results in an improvement of the signal-to-noise ratio by averaging multiple flashes.

The module's output circuitry (polarity, signal level) is designed for flash controllers with opto coupler input (i.e. Perkin Elmer Optoelectronics flash lamp units).

In <u>Manual Control Mode (MCM)</u>, the number of flash pulses generated by a single input trigger pulse and the time interval between consecutive flash pulses in a pulse series is adjusted manually by onboard hex rotary switches.

In <u>Remote Control Mode (RCM)</u>, the number of flash pulses in a series can be programmed via I2C bus (no read back). The time interval is adjusted manually by the onboard hex rotary switches but can be read via I2C bus.

Module Versions

BEK-flash is available in three versions:
<u>Version 'Standard' (/STD)</u>
 Full functionality, $5V_{DC}$ power supply from the Interface Electronics
<u>Version '12…24VDC' (/12-24)</u>
 Full functionality, with voltage regulator IC for supply voltages >8 V_{DC} (for typically 12 V_{DC} or 24 V_{DC})
<u>Version 'Signal Driver only' (/D)</u>
 PCB is equipped with flash output signal driver electronics only (signal conversion from TTL/CMOS to current output for opto coupler control)

Features / Specifications

|	
Connectors	9 pin DSUB, socket type (from IE) 9 pin DSUB, pin type (to flash lamp)
Supply voltage	Standard: $5V_{DC}$ (from IE) optional: 12…24 V_{DC}
Supply Current	Approx. 30 mA idle, max. 70 mA
Flash control output	Voltage max. 4.2V Current max. 20 mA Pulse duration < 20 us
Flash trigger input	TTL/CMOS compatible, triggering on negative slope
Series flash rate	Set manually by two hex rotary switches from 1 ms to 1000 ms (see table 2)
Series flash number	Set manually by two hex rotary switches in MCM or programmed via I2C in RCM, range 1 to 255 (see table 1)
I2C bus interface	I2C slave address of 16-bit I/O expander PCF8575 selectable between 40_{HEX} and $4E_{HEX}$ (even values) by three DIP switches

<u>Environmental conditions</u>

Temperature range operating:	0 °C ... 60 °C
Temperature range storage:	-40 °C ... +70 °C
Humidity (@25°C, non condensing):	10 % ... 90 %

I2C bus control

For Remote Control Mode selection, DIP switch 'Remote Control Mode' (SW300 switch 6) has to be switched to the 'on' position. In this mode it is possible to program the number of flash pulses and read back the time interval value given by the hex rotary switches via I2C bus communication.
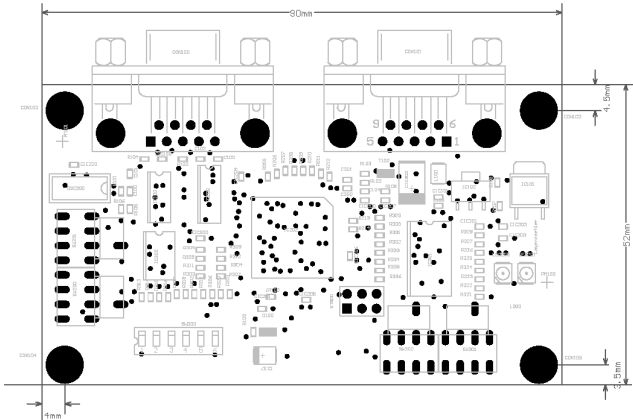
View of the circuit board
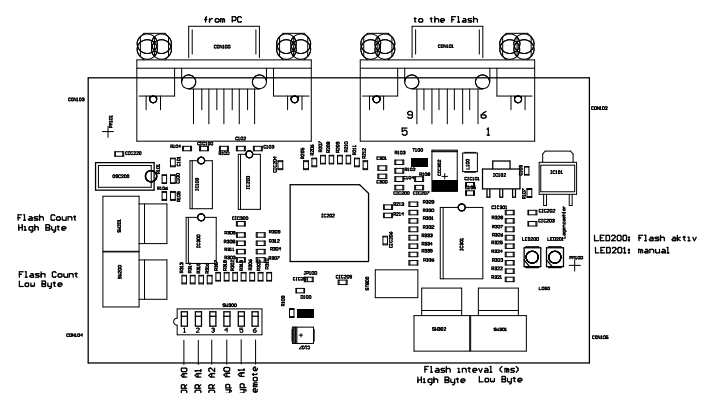
LEDs

LED1 is lit in Manual Control Mode.
LED2 flashes with every output trigger pulse.

Mechanical Interfaces

PCB Dimensions:
90 x 65 x 20 [mm] (l x w x h) with DSUB connectors

Interface Connections

CON100 format: DSUB 9 pin, socket contacts

Pin	Input / Output	Signal name	Comment
1	Bidirect.	I2C_Data (IE DI1)	I2C data signal
2		(IE VCC_FLASH)	Not used
3		(IE #EXT_TRIG)	Not used
4	Bidirect.	I2C_Clock (IE DI2)	I2C clock signal
5	Input	FLASH	Flash Trigger Input
6	PowerIn	+5V	Power Supply
7		(IE DO1)	Not used
8		(IE DO2)	Not used
9	Power	GND	Ground

CON101 format: DSUB 9 pin, pin contacts

Pin	Input / Output	Signal name	Comment
1		(IE DI1)	Not used
2		(IE VCC_FLASH)	Not used
3		(IE #EXT_TRIG)	Not used
4		(IE DI2)	Not used
5	Output	FLASH	Flash Trigger Output
6	PowerOut	+5V	Power Supply
7		(IE DO1)	Not used
8		(IE DO2)	Not used
9	Power	GND	Ground

Notes:
IE = Interface Electronics, all signals except signal 'FLASH' are directly forwarded from CON100 to CON101

Settings

Table 1: Flash Series Number of Pulses Setting

HEX Rotary Switch SW201 (High byte)	HEX Rotary Switch SW200 (Low byte)	Resulting Number of Flash Pulses
0	0	1 (*)
0	1	2
… and so on, number flashes = hex number +1		
F	D	254
F	E	255
F	F	Not allowed

Notes:
(*) In position '1 (single) flash pulse' the input trigger signal is transferred to the output without any delay wheras in all other settings the first flash pulse is delayed by 0.56 ms (after the falling slope of the input trigger).

Table 2: Flash Series Interval Setting

HEX Rotary Switch SW302 (High byte)	HEX Rotary Switch SW301 (Low byte)	Resulting Interval Time [ms]
0	0	1
0	1	2
… and so on, interval time [ms] = hex number +1 …		
F	8	249
F	9	250
F	A	300
… and so on in 100 ms steps …		
F	D	600
F	E	800
F	F	1000

Table 3: I2C Address, Device Type, Remote Enable

DIP Switch SW300 Bit	Signal	Default setting
1	I2C Slave Address bit A0	Off (1)
2	I2C Slave Address bit A1	Off (1)
3	I2C Slave Address bit A2	Off (1)
4	Device Type bit 0	On (0)
5	Device Type bit 1	On (0)
6	Remote Control Mode = on	On (0)

Notes:
Device Type information can be read back via I2C
Default settings: I2C slave address $4E_{HEX}$, Device Type = 0, Remote control mode active

Table 4: Pinout I2C 16 bit I/O port

I/O port bit	Input / Output	Signal	Comment
0	Input	1	Fix pattern (*)
1	Input	0	Fix pattern (*)
2	Input	0	Fix pattern (*)
3	Input	Device Type bit 0	SW300/switch 4 (**)
4	Input	Device Type bit 1	SW300/switch 5 (**)
5	Output	Number Flash Pulses #Write Control	Low = write Number Flash Pulses, High=read Time Interval
6	Input	Remote Control Mode	SW300/switch 6
7	(Input)	Not used	Pulled high
10…17	Bidirect.	8 bit data bus	8 bit data bus

(*) tec5 internal device family code (3 bits = 001_{BIN} fixed)
(**) tec5 internal device type code (2 bit = 00_{BIN}, adjustable)

User Information

General

The information in this data sheet has been checked carefully. However, no responsibility is assumed for inaccuracies. tec5 reserves the right to make changes to any portion of this document without notice.

Each product is tested carefully before being shipped. If, however, problems should occur while initial operation or during later operation, please first check your specific settings and correct installation (connectors).

Warranty

The warranty period for this product is 12 months. The warranty begins on the day of delivery. Within the warranty period, tec5 will repair free of charge any faulty functioning of the product resulting from faulty design or defective material. All other claims are excluded, in particular consequential damage.

Handling

The electronics is partly constructed in CMOS technology and is thus sensitive against electrostatic discharge. Take appropriate precautions whenever handling the component. Please switch off the power before connecting or disconnecting the product.