FAIRCHILD SEMICONDUCTOR®

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FAN5645 LED-Blinker Evaluation Kit

Features

- Records blink patterns and plays back
- Powered from the USB port used to load the blinking pattern.
- Includes a Li-Ion battery, recharged when connected to the USB port, capable to power a portable LED blinker application.
- Single wire digital controls the LED ON and OFF time of 3 independent blinking cycles
- Resistor programmable LED current
- High side constant current driver topology
  - 20mA max output current
  - 40 mV typ. dropout at 20mA
- Only 33uA quiescent current
- Standard 1.8V logic
- Short Circuit Protection (SCP)
- Under Voltage Lock Out Protection (UVLO)
- Thermal Shutdown Protection (TSD)

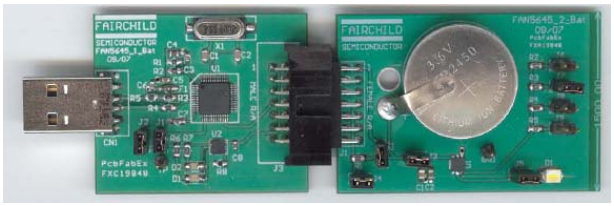

Figure 1: FAN5645MP_Bat Evaluation Board

Description

The **FAN5645 Evaluation Board** is a set of two interconnectable circuits including an USB to single–wire interface, a battery charger and the FAN5645 in a 6-pin MLP package, powered from a 120mAh Li-Ion battery, recharged via the USB port . An external resistor sets the LED output current level. The USB interface includes an USB-plug connector for easy connection to a PC port. A "dashboard" program is provided on an installation CD to set the LED blinking patterns using a friendly Graphic User Interface.

The FAN5645 evaluation board, a set of two completely assembled and tested surface mount boards, provides easy probe access points to all inputs and outputs so that the electrical characteristics and waveforms can be easily measured.

Kit Contents

- FAN5645_1_Bat USB to Single Wire Interface
- FAN5645_2_Bat LED Blinker, powered by an internal, rechargeable battery
- Software Installation CD

PC System Requirements

A PC or Laptop running Windows 2000 or Windows XP with an available USB port connection. USB 2.0 is required for the FAN5645 to run from USB-power.

Set-up and Installation Procedure

1. Insert the CD-ROM. If the installation program does not run automatically, run Setup.exe, which is in the root directory of the CD-ROM.
   If you choose to run the program after installation, and before completing step #2 below, you will get an error message.
2. Interconnect the two USB connector into a USB 2.0 port of the PC. Windows should then find the device and attempt to install the driver. The D1 LED should turn ON, indicating the battery charging in progress. In some cases both D2 and D1 may turn ON, indicating a precharge status for a completely discharged battery . If only board 1 is plugged into the USB port , the two LEDs installed on it turn ON and OFF alternatively waiting to detect the battery.
3. Run the software: “FAN5645 LED Blinker Control Panel" and program the desired blinking pattern using the the GUI.
4. If the on board LI-Ion battery was discharged, keep the two boards interconnected and plugged into the USB port until the battery is fully charged, event indicated by the second green LED 2 turning ON, while LED1 turns OFF .
5. Once the battery is charged, the two boards interconnected may be unplugged from the USB port and even disconnected each other, to use only the small board with the FAN5645 and the battery in a portable application. Depending upon the average current consumed by the blinking LED, a fully charged battery may last more than 100 hours until a new recharge cycle from the USB port is needed.

Power Options

To Power the FAN5645 from the USB bus:

Connect board-1and board-2 plugging J3_1 into J1_2, the pair of 14 pins connector headers.

J1_1, J2_1, J2_2 , J3_2, J4_2, J5_2 and one of the J6_2 to J9_2 should be closed.

This is the default configuration, when the eval board is shipped.

To use the on board rechargeable battery for a LED blinker portable application :

After the battery is charged and the blinking pattern programmed, the board 1 may be disconnected from the board 2 .The FAN5645_2_Bat will continue to blink with the previously loaded pattern, until the battery descharges. The battery is recharged automatically as soon as the board 2 through board 1, is plugged into an active USB port.

Table 1.Measurement settings (X = OPEN for external power; CLOSED for on board battery power)

Measurement	Jumper settings			Description
	J3_2	J5_2	J4_2	
Apply External Single Wire Signal	X	CLOSED	OPEN	Apply control signal to low-side pin of jumper J4_2.
Output LED Current	X	OPEN	CLOSED	Apply ammeter to pins 1 and 2 of jumper J5_2. Adjust LED current by selecting resistors R2 to R5 via J6_2 to J9_2 on the evaluation board.
Supply Current	X	OPEN	CLOSED	Apply ammeter to pins 1 and 2 of jumper J3.
Efficiency	X	OPEN	CLOSED	Measure output current at pins 1 and 2 of jumper J5_2. Measure output voltage at left side pin of jumper J5_2. Measure input voltage at right side pin of J3_2 and Input current between pins 1 and 2 of jumper J3_2.

Table 2: Jumper Functions

Name	Description
J1_1	When closed, the single wire signal magnitude is between 0 and VCC=the voltage supplied by the USB port. When OPEN, an external lower voltage may be applied instead of VCC, to reduce the magnitude of the CONTROL signal
J2_1	When closed, VCC is applied also to the USB battery charger IC input
J2_2	When closed, connects the rechargeable battery to the chager output
J3_2	Allows for the measurement of the FAN5645 supply current
J4_2	Allows applying an external single wire signal to the CONTROL input of the FAN5645
J5_2	Alows the LED current measurement
J6_2, J7_2, J8_2, J9_2	Allows to change the white LED current

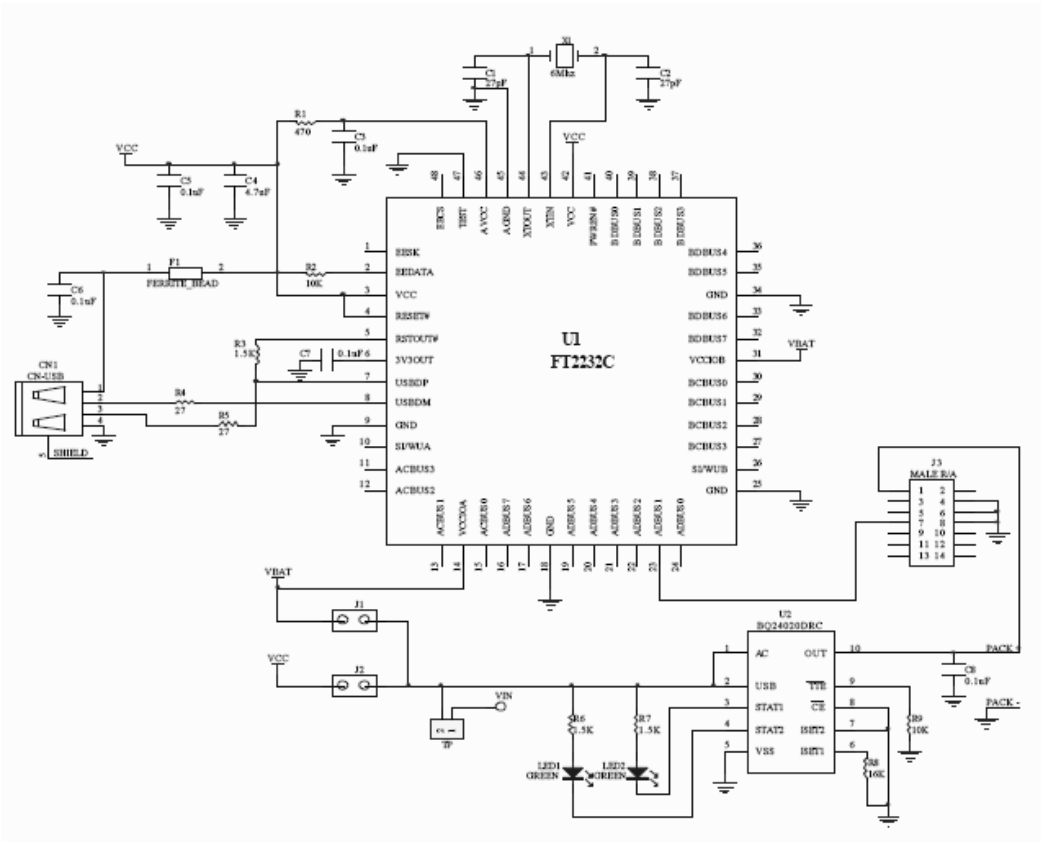

Figure 2: FAN5645_1_Bat Schematic

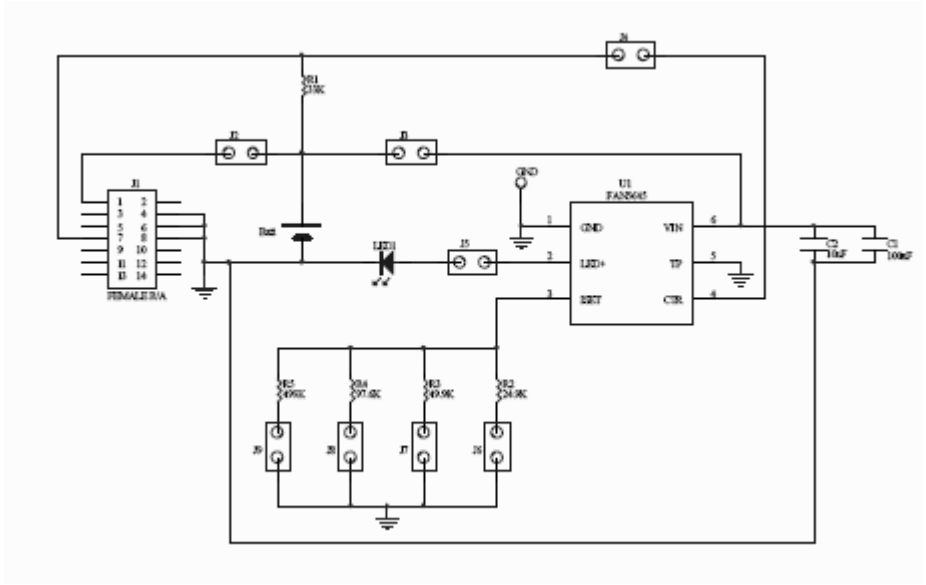

Figure 3: FAN5645_2_Bat Schematic

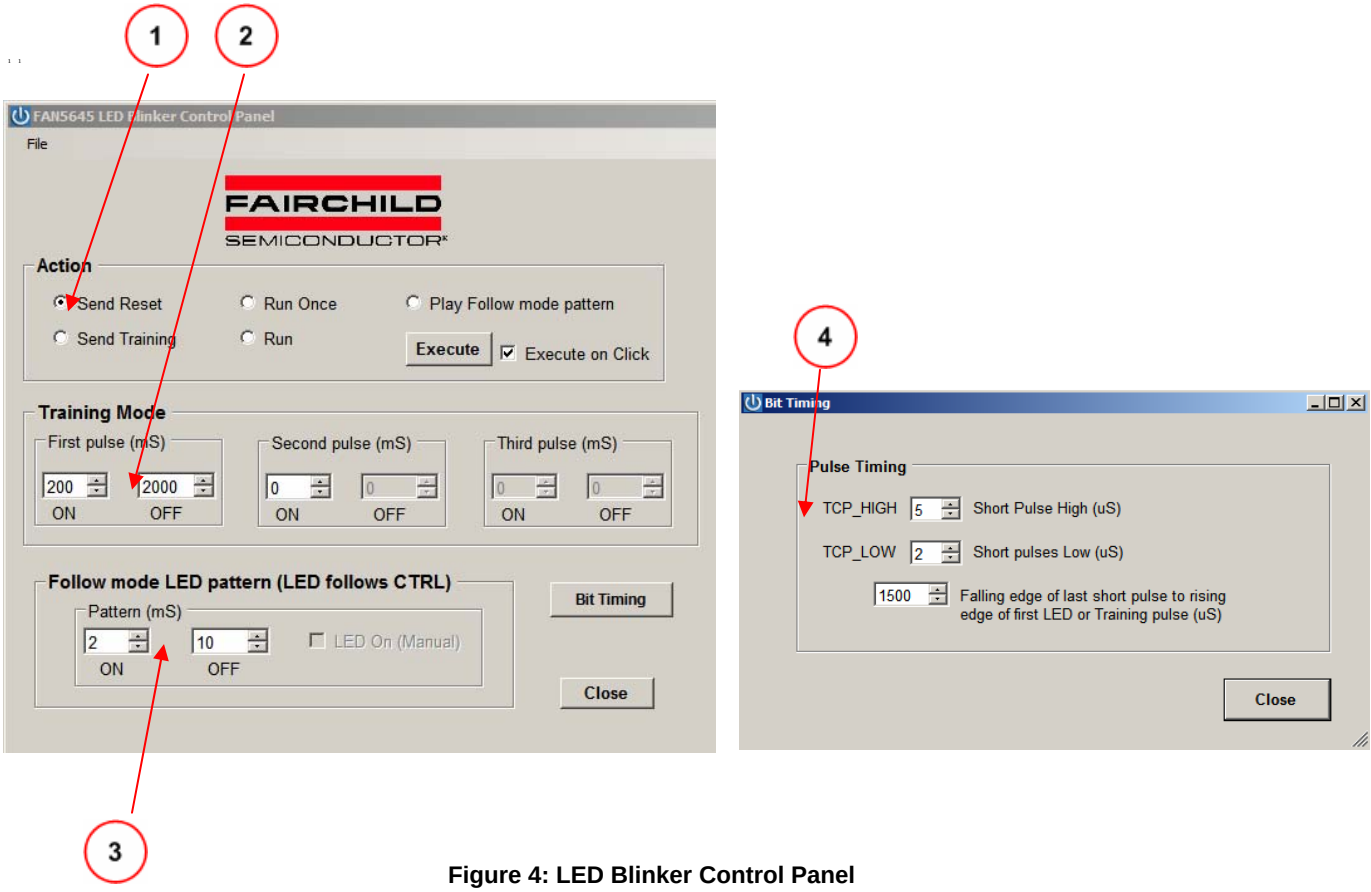

Figure 4: LED Blinker Control Panel

TABLE3.Software Functionality (see datasheet for timing diagrams)

Control Panel Area	Control		Description	
1	**Send Reset**		Sends a reset command and clears the training registers.	
	Send Training		Sends a pattern as defined in the "Training Mode" box.	
	Run Once		Play back training mode pattern once.	
	Run		Raises the CTRL line. Plays training mode pattern. If FAN5645 was not trained, turns on LED.	
	Play Follow Mode Pattern		First sends reset, then raises and lowers the CTRL line as defined in the "Follow mode LED pattern" box. To manually control the LED, toggle the "LED on" box. Click "Play Follow mode pattern" again to return to running pattern after manual control. Click any other button to exit follow mode.	
	Execute on Click		When checked, the sequence is sent as soon as a button is clicked. When unchecked, the sequence is sent using the "Execute" button.	
2	**First Pulse**		Define first pulse's LED on and off times.	ON (1- 255 ms) OFF (10 - 2550 ms)
	Second Pulse (optional)		Define second pulse's LED on and off times.	
	Third Pulse (optional)		Define third pulse's LED on and off times.	
3	**Pattern of Follow Mode**		Set up the toggle rate of CTRL line.	ON (2 - 255 µs) OFF (10 - 2550 µs)
4	**Bit Timing**	**TCP_HIGH**	Width of CTRL pulse when HIGH.	1 - 100 µs
		TCP_LOW	Width of CTRL pulse when LOW.	
		Falling edge of last short pulse to rising edge of first LED or Training pulse.		10 - 10000 µs

Figure 5: Software Functionality

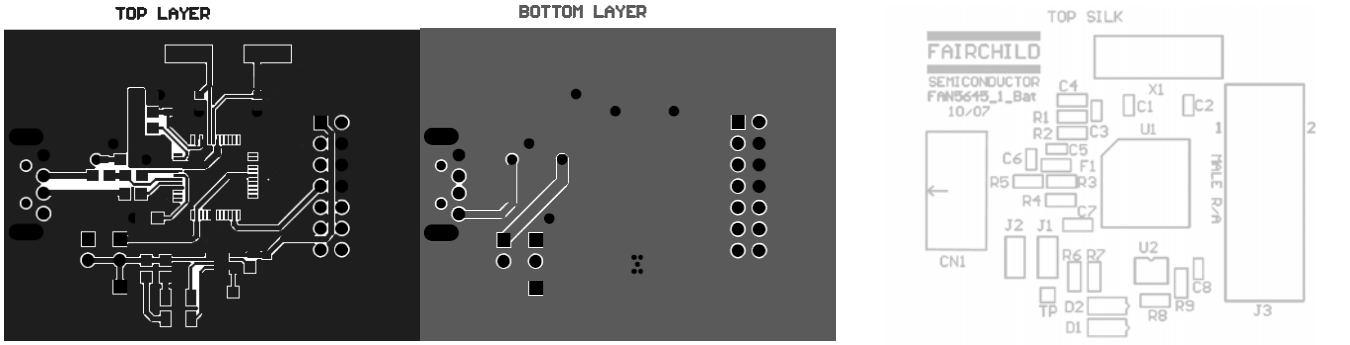

Figure 6: FAN5645_1 PCB Layout

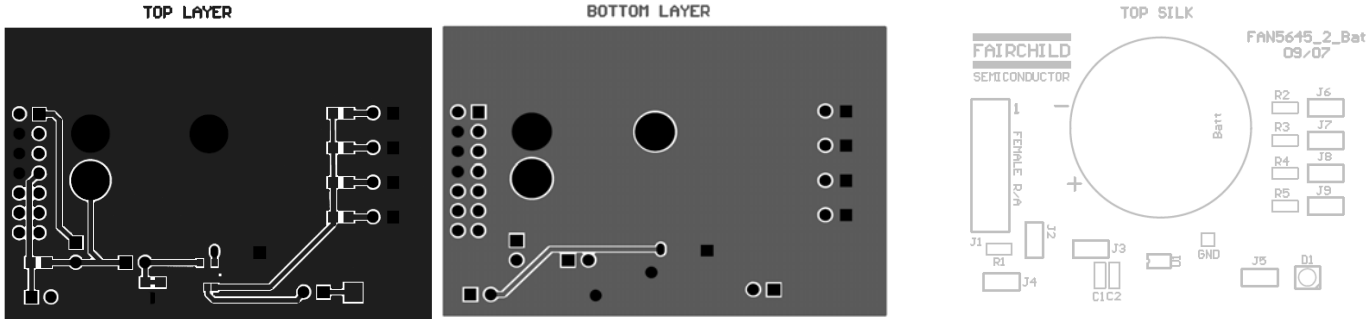

Figure 7: FAN5645_2 PCB Layout

TABLE 4 : FAN5645_1 Bill Of Materials

Description	Qty	Ref	Vendor	Part Number
Connector, USB plug, 4POS RT ANG PCB	1	CN1	Digi-Key	WM17117
Ferrite Bead, MI0805K110R-10	1	F1	Steward	MI0805K110R-10
IC, USB Interface , FTDI2232C	1	U1	FTDI	FT2232C
IC Li-Ion Battery Charger	1	U2	TI	BQ24020
Crystal, 6Mhz., Surface Mount	1	X1	Fox	FOXSDLF/060-20
Capacitor 0.1uF, 10%, 16VDC, X7R, 0603	5	C3,C5,C6, C7, C8,	Panasonic	ECJ-1VB1C104K
Capacitor 4.7uF, 20%, 6.3VDC, X5R, 0805	1	C4	Panasonic Taiyo Yuden TDK	ECJ-2FBOJ475M JMK212BJ475MG C2012X5R0J475M
Capacitor 27pF, 10%, 50VDC, NPO, 0603	2	C1, C2	Any	
LED Green	2	LED1, LED2	Any	
Connector Male, .025" Square contact post, 2	5	J1, J2	AMP	103239-2
Resistor 27 Ohm, 5%, 1206	2	R4, R5	Any	
Resistor 470 Ohm, 1%, 0805	1	R1	Any	
Resistor 10 K, 1%, 0805	2	R2,R9	Any	
Resistor 1.5 K, 5%, 0805	3	R3,R6,R7	Any	
Connector Male, .025" Square contact post, 1	1	TP	AMP	103239-1
Resistor 16K, 1%, 0805	1	R8	Any	
Connector 14 pin male R/A	1	J3	Digi-Key	A33181-ND

TABLE 5 : FAN5645_2 Bill Of Materials

Description	Qty	Ref	Vendor	Part Number
IC, LED Blinker FAN5645 w Single Wire Interface	1	U1	Fairchild	FAN5645MPX
Capacitor 0.1uF, 10%, 16VDC, X7R, 0603	1	C1	Panasonic	ECJ-1VB1C104K
Capacitor 10uF, 10%, 6.3V, X5R, 0805	1	Cin	Murata	GRM21BR60J106ME19L
LED Super Bright Miniature White	1	LED1	Harvatek	HT-T169TW
Connector Male, .025" Square contact post, 2	8	J2, J3, J4, J5, J6 ,J7, J8, J9	AMP	103239-2
Connector Male, .025" Square contact post, 1	1	GND	AMP	103239-1
Resistor 33K, 1%, 0805	1	R1	Any	
Resistor 24.9 K, 1%, 0805	1	R2	Any	
Resistor 49.9 K, 1%, 0805	1	R3	Any	
Resistor 97.6K, 1%, 0805	1	R4	Any	
Resistor 499 K, 1%, 0805	1	R5	Any	
Li ion Battery, 3.6V 120mAh 24d x 5t mm	1	Bat	AA Portable Power	LIR2450
Connector 14 pin female R/A	1	J1	Digi-Key	S5521-ND