

KIT33887EKEVB Evaluation Board

Featuring the MC33887EK 5.0 A H-Bridge IC

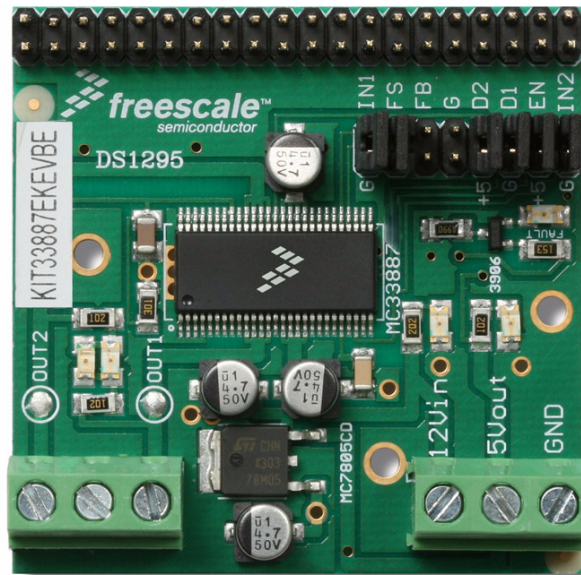


Figure 1. KIT33887EKEVB Evaluation Board

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1 Kit Contents/Packing List

- Assembled and tested evaluation board/module in anti-static bag.
- Warranty card

2 Jump Start

- Go to www.freescale.com/analogtools
- Locate your kit
- Review your Tool Summary Page
- Look for



Jump Start Your Design

- Download documents, software and other information

3 Important Notice

Freescale provides the enclosed product(s) under the following conditions:

This evaluation kit is intended for use of ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY. It is provided as a sample IC pre-soldered to a printed circuit board to make it easier to access inputs, outputs, and supply terminals. This evaluation board may be used with any development system or other source of I/O signals by simply connecting it to the host MCU or computer board via off-the-shelf cables. This evaluation board is not a Reference Design and is not intended to represent a final design recommendation for any particular application. Final device in an application will be heavily dependent on proper printed circuit board layout and heat sinking design as well as attention to supply filtering, transient suppression, and I/O signal quality.

The goods provided may not be complete in terms of required design, marketing, and or manufacturing related protective considerations, including product safety measures typically found in the end product incorporating the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. In order to minimize risks associated with the customers applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards. For any safety concerns, contact Freescale sales and technical support services.

Should this evaluation kit not meet the specifications indicated in the kit, it may be returned within 30 days from the date of delivery and will be replaced by a new kit.

Freescale reserves the right to make changes without further notice to any products herein. Freescale makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typical", must be validated for each customer application by customer's technical experts.

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4 Introduction

The KIT33887EKEVB evaluation kit features the MC33887 H-bridge power IC, which has a load current feedback function that is ideal for closed-loop DC motor control. The IC incorporates internal control logic, charge pump, gate drive, and low RDS(ON) MOSFET output circuitry.

5 Evaluation Board Features

- Closed loop control for DC motor
- Option to control load using pulse-width modulation
- The board accepts supply voltages ranging from 5V to 35V
- 5V regulator that sources up to 500mA through the 5Vout line
- Enable, disable, and input options set through jumpers on 2x8-pin header
- 40-pin ribbon cable can be connected to 2×20 pin header in support of various Metrowerks Development Systems
- LEDs report board status

6 MC33887 Device Features

The MC33887 IC is able to control inductive loads with continuous DC load currents up to 5.0 A, and with peak current active limiting between 5.2 A and 7.8 A. Output loads can be pulse width modulated (PWM) at frequencies up to 10 kHz. The load current feedback feature provides a proportional constant-current output (at 1/375th of the load current) suitable for monitoring by a microcontroller's A/D input. This feature facilitates the design of closed-loop torque/speed control as well as open load detection. Additional device features/characteristics include the following:

- Enhanced performance up to 40 V
- 120 mΩ R_{DS(ON)} typical H-Bridge MOSFETs
- TTL/CMOS-compatible inputs
- PWM frequencies up to 10 kHz
- Active current limiting (regulation)
- Fault status reporting
- Sleep mode with current draw ≤ 0.50 μA (inputs floating or set to match default logic states)

Freescale analog ICs are manufactured using the SMARTMOS process, a combinational BiCMOS manufacturing flow that integrates precision analog, power functions and dense CMOS logic together on a single cost-effective die.

7 Required Equipment

Minimum equipment required:

- DC Power supply
- Oscilloscope (preferably 4-channel) with current probe
- Digital multimeter
- Typical loads (e.g. DC motor)

8 Evaluation Board Configuration

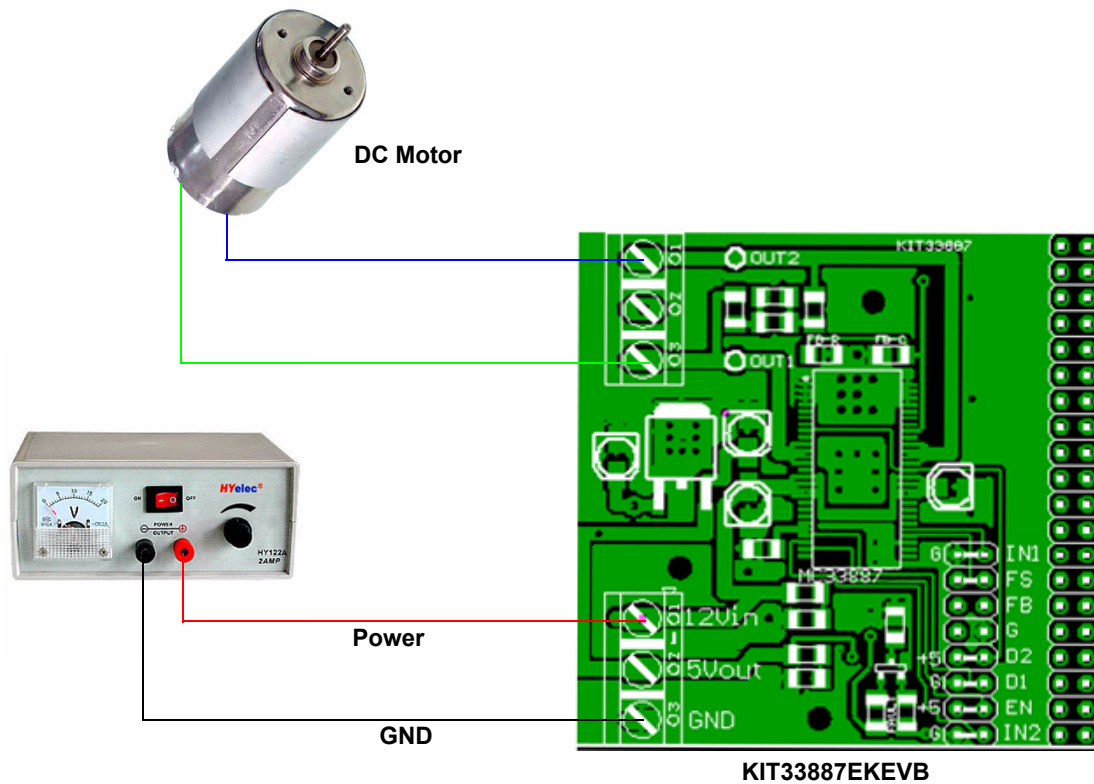


Figure 2. KIT33887EKEVB Board Setup

9 Setup and Using the Hardware

Warning: Always wear Safety Glasses when working around electronic modules and when soldering.

The EVB is provided to quickly evaluate features of the MC33887 device with a simple bench-top setup. In order to perform the demonstration examples, first set up the evaluation board hardware and software as follows:

1. Terminal blocks are provided for easy hook-up of power and loads. Strip wire about 0.25" before inserting into terminal block, then tighten down the screw until the wire is snug. Apply a voltage between 5V and 35V to the terminal labeled "12 Vin", and apply the ground return to the terminal labeled "GND". The board has a built-in 5V regulator, and up to 500mA may be drawn from the terminal labeled 5Vout, if desired.
2. Jumpers are provided at the I/O 2x8 pin header to provide quick set-up of the enable, disables, and inputs. Alternatively, an uncommitted 2x20 pin header is provided to which the I/O may be wire-wrapped in any desired pinout. This 2x20 pin header will then accept standard 40-pin flat ribbon cables to provide connection to various Metrowerks Development Systems.
3. To turn on a load in one direction, the inputs should be set as follows: D1 to ground, D2 to +5V, EN to +5V, IN1 to +5V (or left floating, as it has internal pull-ups to +5V), and IN2 to ground. To run current through the load in the opposite direction, reverse the logic states of IN1 and IN2. (Note: Logic One > 3.3V, Logic Zero <1.4V.)
4. To control the load via PWM, apply a PWM pulse train to either IN1 or IN2, while holding the other input at a steady-state logic level. Swapping the signals applied to IN1 and IN2 will provide control in the opposite direction.
5. A Fault Status indicating LED is included on the board, and can be connected to the Fault Status flag output by placing a jumper over the two pins opposite the FS label on the 2x8 pin header. By so doing, the FAULT LED will light whenever the IC encounters any of the following fault conditions: Over Temperature, Shorted Load, Under Voltage. The LED will remain lit until the IC's fault status flag is reset by one of the following means: toggling D1, toggling D2, toggling EN, or removing then reapplying power.

10 Schematic

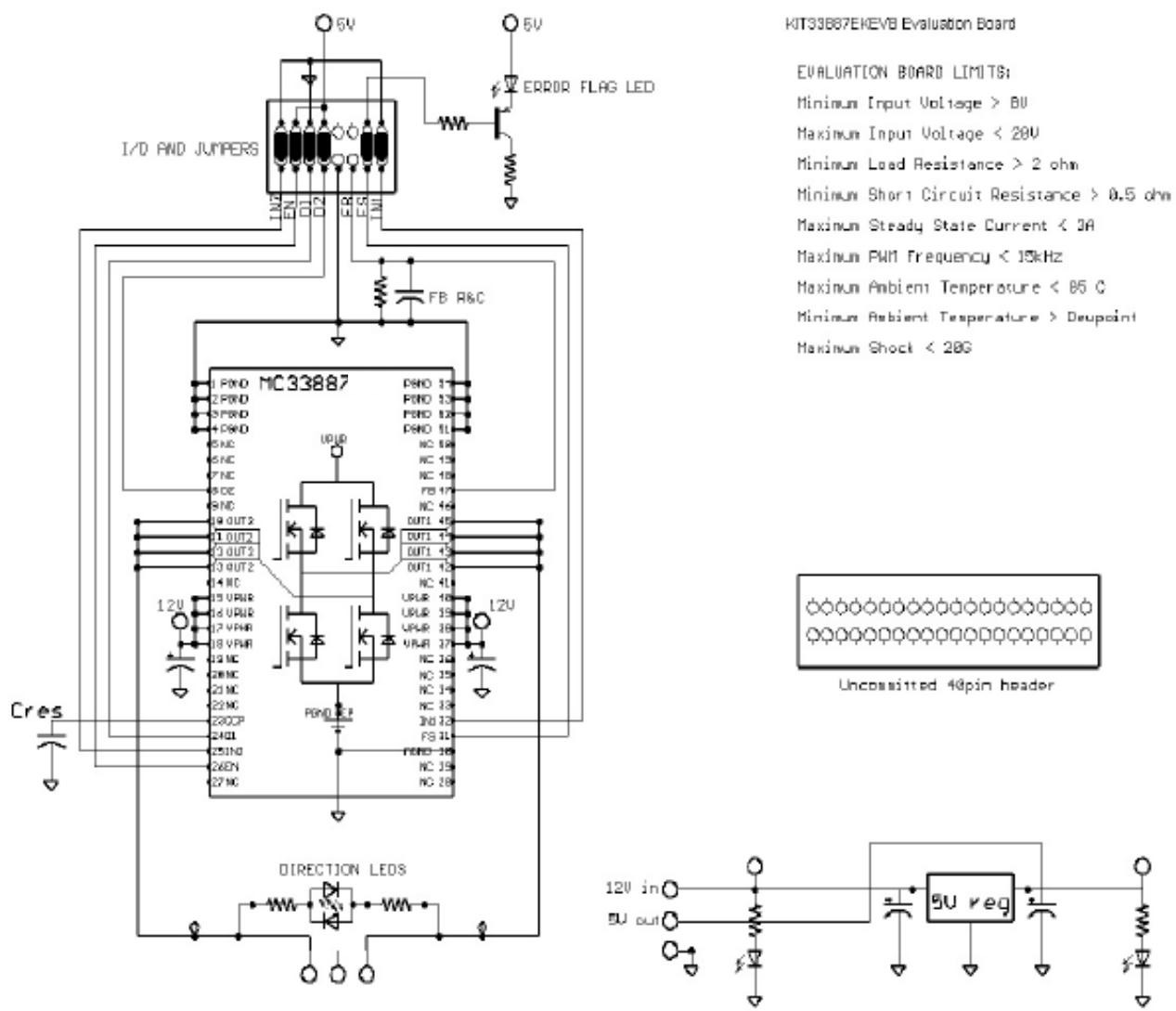
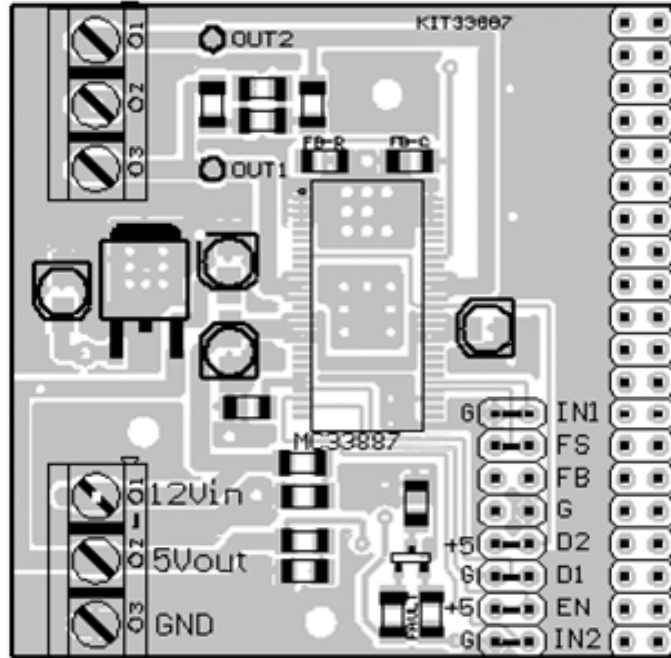


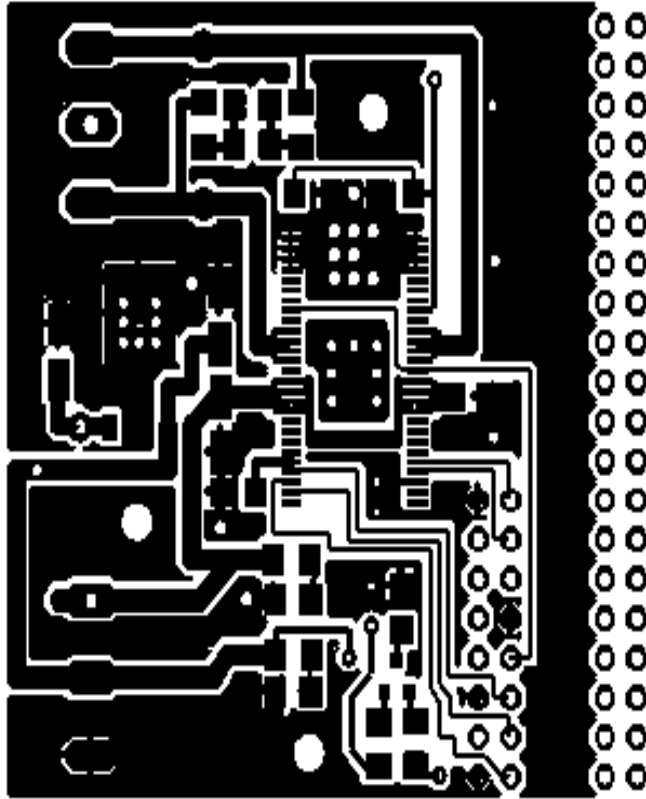
Figure 3. Evaluation Board Schematic

11 Board Layout

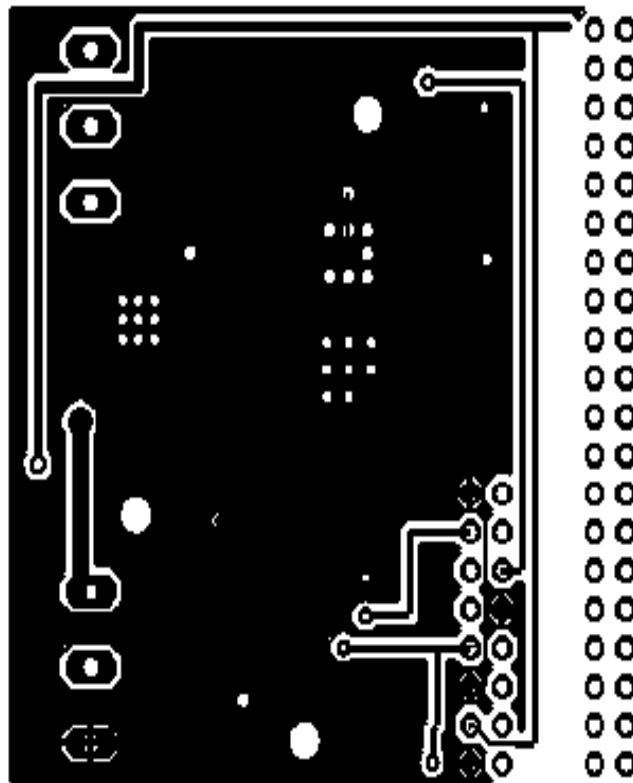
11.1 Assembly Layer Top



11.2 Top Layer Routing



11.3 Bottom Layer Routing



12 Bill of Material

Item	Qty	Schematic Label	Value	Description	Package
Integrated Circuits					
1	1	MC33887		Freescale MC33887EK	54-pin SOICW-EPVW
2	1	MC7805CD		MC7805DT 5VREG	DPAK
Capacitors					
3	1		1 μ F 50v	Capacitor	1206
4	4		5 μ F 50v	CPOL US153CLV-0405	0405
5	1		33nF 50v	C -USC1206	1206
LEDs					
6	1			GRN SMTLED	SMT
7	2			RED SMTLED	SMT
8	2			YEL SMTLED	SMT
Transistors					
9	1	3906		MMBT3906LT1 PNP SOT 23	SOT 23
Resistors					
21	3		1K Ohm	R -US_R1206	R1206
22	1		2K Ohm	R -US_R1206	R1206
23	1		15K Ohm	R -US_R1206	R1206
24	1		300 Ohm	R -US_R1206	R1206
25	1		500 Ohm	R -US_R1206	R1206
Connectors, Jumpers and Push Buttons					
30	2			AK300/3AK500/3A	
31	1			PINHD -2X8	
32	1			PINHD -2X20	
33	2			TP20r	

Notes: Freescale does not assume liability, endorse, or warrant components from external manufacturers that are referenced in circuit drawings or tables. While Freescale offers component recommendations in this configuration, it is the customer's responsibility to validate their application.

13 References

Following are URLs where you can obtain information on related Freescale products and application solutions:

Freescale.com Support Pages	URL
MC33887 Product Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC33887
Analog Home Page	http://www.freescale.com/analog
Automotive Home Page	http://www.freescale.com/automotive

13.1 Support

Visit www.freescale.com/support for a list of phone numbers within your region.

13.2 Warranty

Visit www.freescale.com/warranty for a list of phone numbers within your region.

14 Revision History

Revision	Date	Description of Changes
1.0	11/2008	<ul style="list-style-type: none"> • Initial Release
2.0	4/2013	<ul style="list-style-type: none"> • Update format