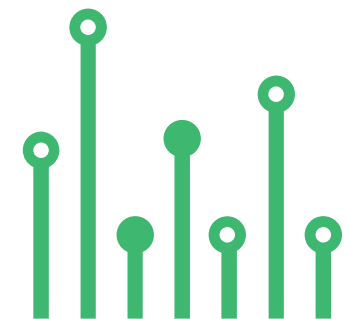


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Single-Channel Smart High-Side Power Switch with Programmable Current Limit



SKU: EL148212

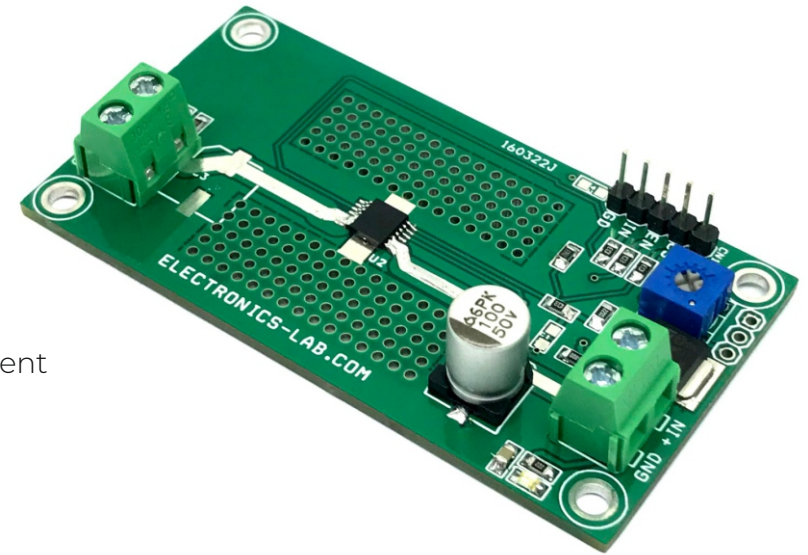
Single-Channel Smart High-Side Power Switch with Programmable Current Limit



This is a single-channel, fully-protected, high-side power switch with programmable current-limit. Full diagnostics and high-accuracy current-sense features enable intelligent control of the load. A programmable current-limit function greatly improves the reliability of the whole system. High-accuracy current sensing allows a better real-time monitoring effect and more-accurate diagnostics without further calibration. A current mirror is used to source $1/K$ of the load current, which is reflected as voltage on the CS pin.

FEATURES

- Operating voltage 5 to 37V (Limited Due to L317 Input Supply)
- Current Limit Adjustable 0.5A to 5Amps (PR1 Trimmer Potentiometer)
- Operating junction temperature: -40°C to 150°C
- Very-low standby current: $<1\ \mu\text{A}$
- Microcontroller input control: 3.3-V and 5-V logic compatible
- High-accuracy current sense – Analog current output as a ratio of the output current (3% at nominal load and 20% at light load)
- Programmable current limit with external Trimmer Potentiometer PR1
- High-accuracy current sense, $\pm 30\ \text{mA}$ at 1A, $\pm 4\ \text{mA}$ at 5 mA
- PCB Dimensions 73.50X39.05MM
- 4X3MM Mounting Holes



K is a constant value across the temperature and supply voltage. The current sensing function operates normally within a wide linear region from 0 to 4 V. The CS pin can also report a fault by pulling up the voltage of the Vs active drain and a source voltage clamp is built in to address switching off the energy of inductive loads, such as relays, solenoids, pumps, motors, and so forth. During the inductive switching-off cycle, both the energy of the power supply (EBAT) and the load (ELOAD) are dissipated on the high-side power switch itself. With the benefits of process technology and excellent IC layout, the TPS1H100BQ-Q1 device can achieve excellent power dissipation capacity. When a fault condition occurs, CS works as a diagnostics report pin. When an open load or short to battery occurs in the on-state, VCS almost equals 0. When the current limit, thermal shutdown/swing, open load, or short to battery in the off-state occurs, the voltage is pulled up to VCS.

The project can be used as a high-side power switch for a wide variety of resistive, inductive, and capacitive loads, including low-wattage bulbs, LEDs, relays, solenoids, and heaters. CL (Current Limit) resistor can be changed through PR1 Trimmer potentiometer. When PR1 is 0 Ohm there is no external current limit function and the internal current limit is active. This current limit value is around 0.5A.

Protection

- Short-circuit protection
- Overvoltage protection,
- Thermal shutdown/swing with self-recovery
- Loss of GND,
- loss of Vs protection– ESD protection

Diagnostic

- On/off state output open/short to battery detection
- Overload and short-to-ground detection and power limiting
- Thermal shutdown/swing diagnostic
- Current-sense analog diagnostic
- Diagnostic enable function for multiplexing of MCU analog or digital port

The TPS1H100-Q1 device is a fully protected high-side power switch, with integrated NMOS power FET and charge pump, targeted for the intelligent control of the variable kinds of resistive, inductive, and capacitive loads. Accurate current sense and programmable current limit features differentiate it from the market.

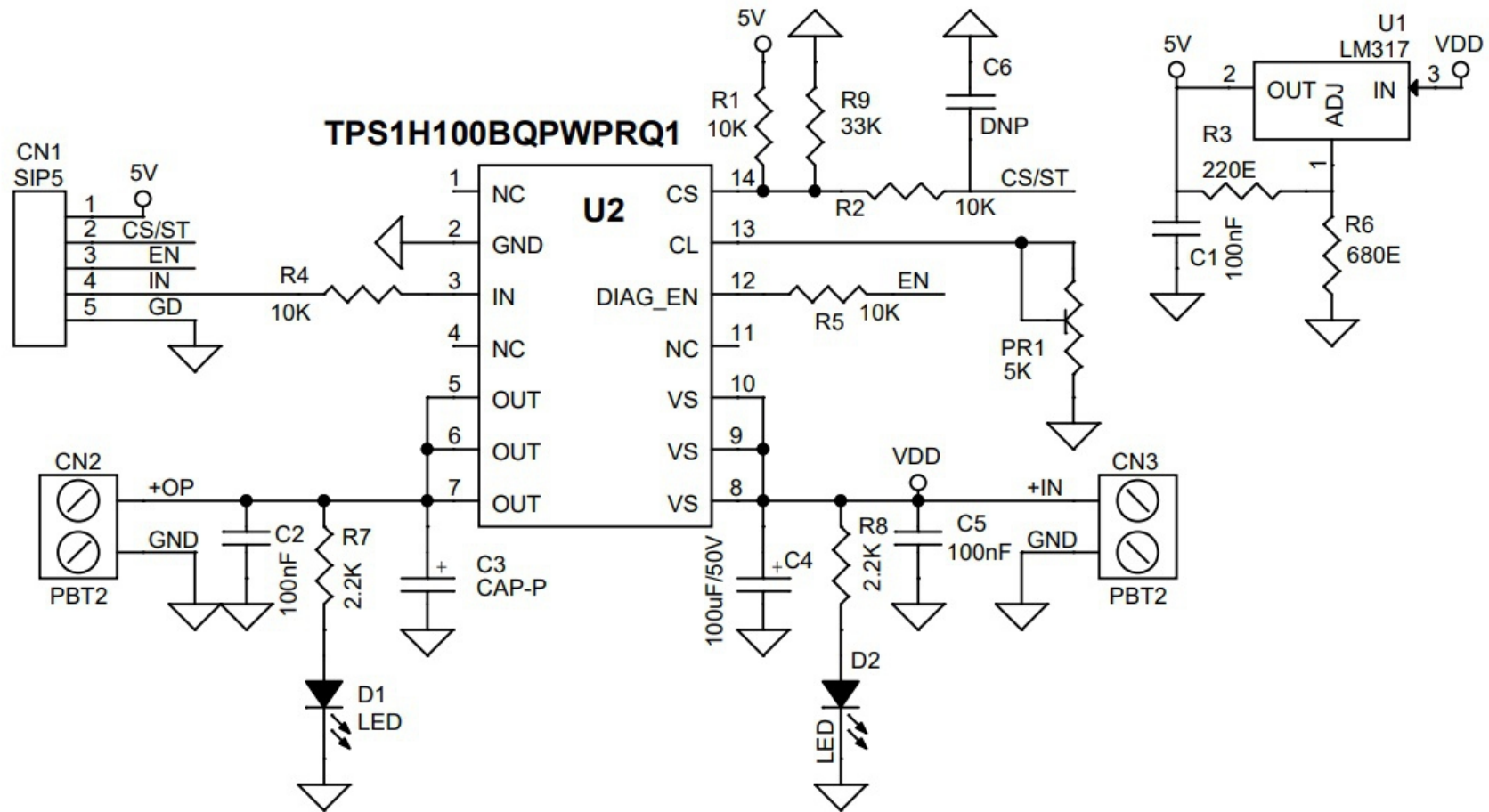
Accurate Current Sense

High-accuracy current sense signal allows better real-time monitoring of effects and more accurate diagnostics without further calibration. It provides the real-time output current monitoring. Accurate Current mirror is used to source $1/K$ of the load current, and reflected as $VCS=ICS \times RCS$. Voltage level at CS pin is maintained within limit of 0 to 4V for normal operations. Also, when a fault condition happens, it works as a diagnostics report pin. When an open load/short to battery event happens in on-state, VCS almost equals to 0. When a current limit, thermal shutdown/swing, open load/short to battery event in off-state happens, the voltage is clamped at VCS, H

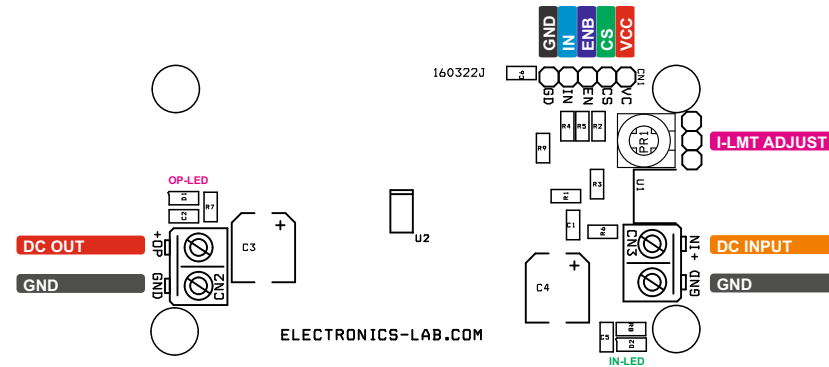
Applications

- High-side relay driver
- High-voltage power switch for submodule power supply
- Low-wattage lamp driver
- General resistive, inductive, and capacitive loads
- Replace electromechanical relays and fuses

Schematic



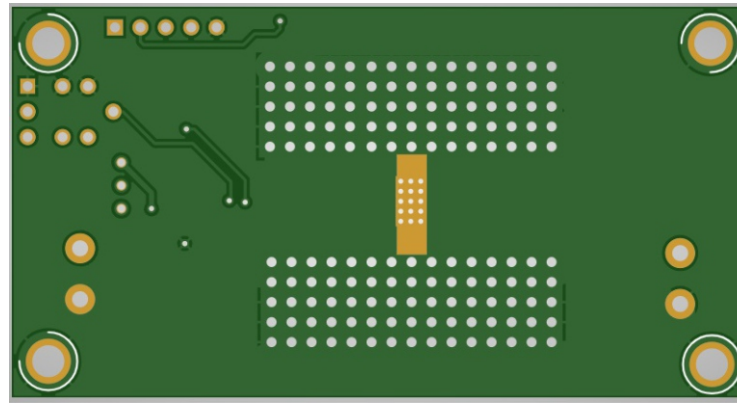
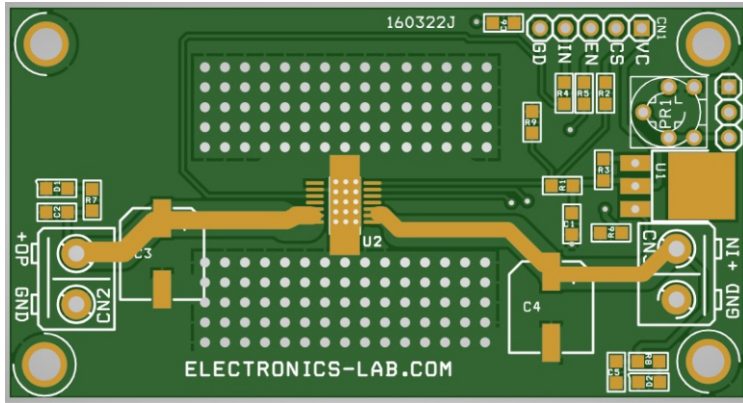
Connections



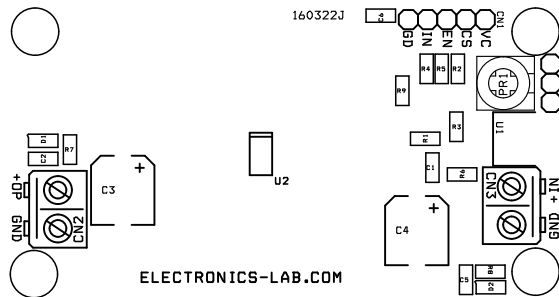
Connections

- CN1: Pin 1 = 5V DC Output, Pin 2 = CS, Pin 3 Enable, Pin 4 = Input, Pin 5 = GND
- CN2: Pin 1 = Voltage Output, Pin 2 = GND
- CN3: Pin 1 = Voltage Input, Pin 2 = GND
- D1: Output LED
- D2: Input LED
- PR1: Current Limit Trimmer Potentiometer

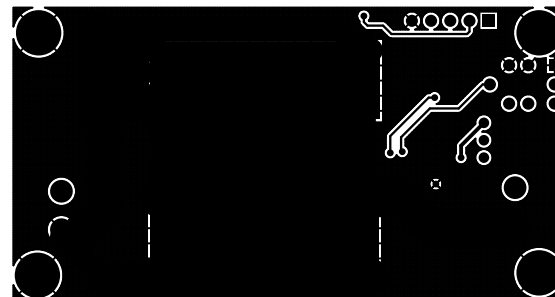
PCB



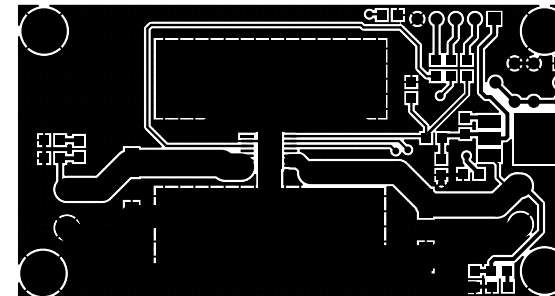
PCB GERBER
FILES
AVAILABLE



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 73.50X39.05MM

Parts List

BOM						
NO	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	5 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5318-ND
2	2	CN2,CN3	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
3	3	C1,C2,C5	100nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
4	2	C3,C6	DNP			
5	1	C4	100uF/50V ELEKTROLYTIC	NICHICON	DIGIKEY	493-2226-1-ND
6	1	R9	33K 1% MSD SIZE 0805	YAGEO/MURATA	DIGIKEY	
7	2	D1,D2	LED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
8	1	PR1	5K TRIMMER POT	BOURNS	DIGIKEY	3362P-502LF-ND
9	4	R1,R2,R4,R5	10K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
10	1	R3	220E 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
11	1	R6	680E 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
12	2	R7,R8	2.2K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
13	1	U1	LM317 DPAK	ST	DIGIKEY	497-1574-1-ND
14	1	U2	TPS1H100-Q1	TI	DIGIKEY	296-43246-1-ND



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