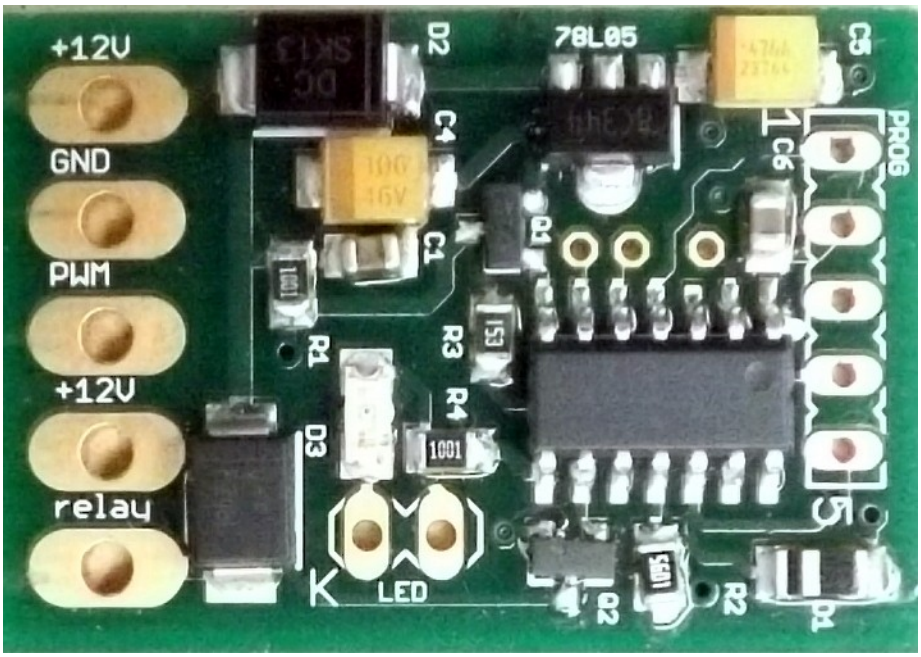
Simple EVSE

datasheet



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Introduction

EVSE stands for *electric vehicle supply equipment.* It is an element that supplies electric energy for the recharging of electric or plug-in vehicles.

Read me first

The EVSE board is supplied with default 16A settings. Please check the chapter "*Features"* for more information about further possibilities of changing maximum charging current. Simple EVSE board **does not** have any PP wire resistor detection.

Theory of operation

Pilot signal duty cycle provided by EVSE defines maximum charging capacity. The car can define several states by pulling the pilot signal down to certain voltage levels (3V, 6V, 9V). Based on this feedback EVSE will trigger the relay for the vehicle to charge or evaluate the state as an error (electricity will not be provided to the output socket/connector).

For more information please check:

- http://en.wikipedia.org/wiki/IEC_62196
- http://en.wikipedia.org/wiki/SAE_J1772
- https://github.com/kortas87/simple-evse/wiki (https://code.google.com/p/simple-evse/)

Compatibility

- Nissan Leaf *****
- Mitsubishi iMiev (Peugeon iOn, Citroen cZero)
- Opel Ampera
- eGolf
- Mitsubishi Outlander PHEV
- Citroen Berlingo Electrique
- and others

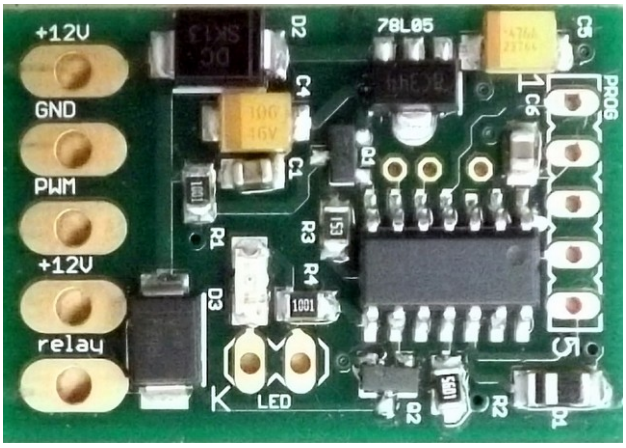
These vehicles are know not to be supported by Simple EVSE board (do not work or have problems). You should you EVSE Wallbox instead:

- ~~Fiat 500e,~~
- ~~VW eGolf 2016 and later~~
- ~~Tesla Model S~~

***** Nissan Leaf late 2014 versions and 2015 may show warning while charging – vehicle expects EVSE to disconnect also neutral wire, however it is only warning – does not affect charging speed

Board description

Parameters	
Dimension (without connectors)	33 x 23 x 4 mm
Supply voltage	12V DC
Power consumption	<1W
Relay	16A (32A with 32A kit)
Power supply	1W 12V AC / DC
Operating temperature	-20 to 80 °C
Protection index	IP00
Weight	20 g



Main and PROG pads

Simple EVSE board has 2 connectors / soldering pads. Bigger 5-pin header is used for pilot output, power supply and relay output. There is also PROG connector used for flashing new firmware (ICSP) and can be further used for adjusting EVSE current (see Features chapter). Two LED pads can be used for external LED connection, however it may require desoldering of the original LED onboard (it is needed for sure if high brightness LED is used).

Main connector pads	
pin	**description**
+12V	Power supply +12V
GND	Power supply GND and PE reference
PWM	Pilot signal output
+12V	Relay connection
relay	

PROG connector		
pin	**name**	**description**
1	V_{PP}	ICSP** / [marked by rectangle]
2	V_{DD}	5 V
3	GND	Ground
4	DAT	ICSP** /
5	CLK	ICSP** /

* reserved for future use

** firmware upgrade interface

Features

Current limitation with button

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Current limitation using 3 position switch

….

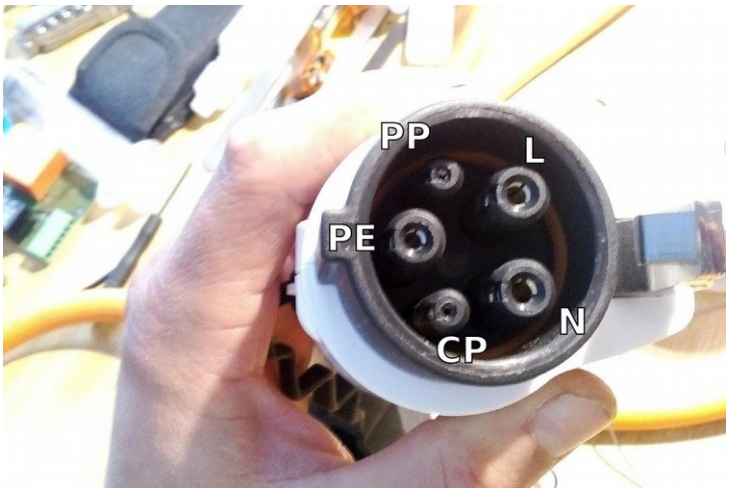
LED states description

LED blinks	**state**
2 – 3x fast in 1s	Simple EVSE board is running, PWM signal is generated
1x long in 1s	vehicle requested power, contactor is ON
20x fast in 1s	enter or leave current setting mode
1x each 0.5s	current setting mode – one more amper set

J1772 testing

Test cases are described in this chapter. After step by step analysis the problem can be usually easily identified and then fixed. Basically following problems can be discovered:

- relay failure
  → replace relay
- EVSE board failure
  → replace / repair board
- AC / DC converter failure
  → replace AC / DC
- wiring problem
  → correct wiring



J1772 pinout

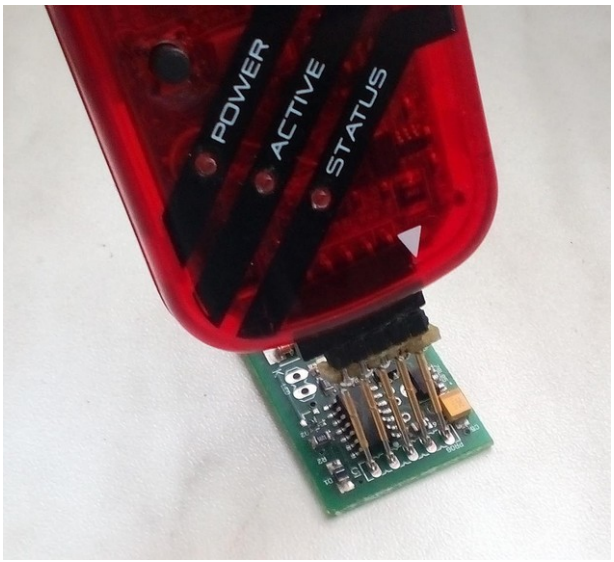
J1772 connector test

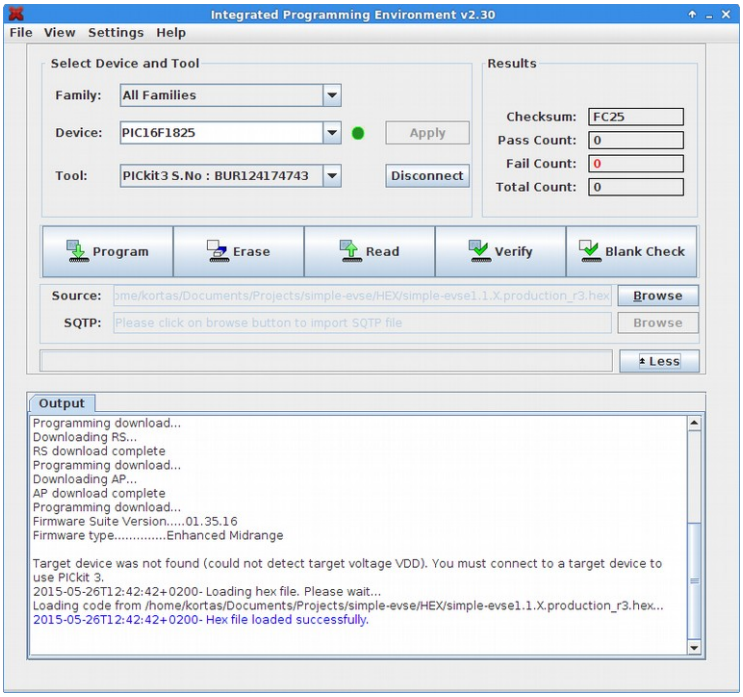
Test description	**Expected output (→ possible problem)**	**pass / fail**
Connector is not powered, measure voltage L to N	Relay must be disconnected, no 230V out (→ relay failure, always on)	
Measure resistance between PP and PE	Should be around 150 Ohm (→ improper wiring)	
Measure resistance between PP and PE while button is pressed	Should be around 480 Ohm (→ improper wiring)	
Connector is powered on	LED status = PWM signal is generated (→ malfunctioning AC/DC supply) (→ wrong LED wiring, board failure)	
Connector is powered on, short CP to PP	LED status = contactor is ON, check for 230V output (→ relay failure, always off) (→ PWM output is not properly connected) (→ board driver is broken)	
Connector is powered on, measure voltage CP to PE, with default 16A settings	Should be between 3 – 3.2V, this corresponds to at least 11.4V PWM (→ board driver is broken)	
Connector is powered on, measure frequency and duty cycle CP to PE	Should be ~1 kHz and duty cycle ~26.5% (→ board driver is broken)	
Each above-mentioned test is OK, but car still does not charge	Check the connector button if it does not get stuck when connected in to a car (→ adjust the microswitch lever stroke)	

Flashing new firmware

By flashing new firmware you could possibly upgrade the EVSE to support some future improvements or download custom firmware (usually custom current presets).

Microchip IPE utility + PICKit 3 hardware is required for this purpose. (https://microchip.wikidot.com/ipe:what-is-ipe)



Using PICKit3 to flash new software

1. install MPLAB X software (http://www.microchip.com/mplabx/)
2. enable advanced mode in settings and check “Power Target Circuit from Tool” in “Power” tab on the left
3. put device id “PIC16F1825” and connect to your PICKit
4. select HEX file and click “Program” the device