UM1843
User manual

EVAL-L9958

Introduction

The EVAL-L9958 is the evaluation board designed to provide the user a platform to evaluate the motor driver for DC motors L9958.

The board offers all the inputs and outputs capabilities necessary to configure the device and to monitor diagnostic functionalities. A lot of test points allow to evaluate and monitor the signals and the HW status of the device.

The EVAL-L9958 can be plugged in the discovery kit developed for the SPC56 microcontroller lines as SPC560P-DISP, SPC563M-DISP and SPC564A-DISP.

Thanks to the limited number of input signals and the SPI communication, the EVAL-L9958 can be connected to a SPC560D-DIS and SPC560B-DIS, as well as to a generic microcontroller or a control board by a very simple adaptor.

The L9958 is an SPI controlled H-Bridge, designed for the control of DC and stepper motors in safety critical applications and under extreme environmental conditions.

The output of the H-Bridge is protected against over temperature, short circuits and has an under voltage lockout for all the supply voltages. The device is able to detect the open-load condition in ON condition, for the widest application ranges.

The current regulation can be programmed by SPI from 2.5 A to 8.6 A (typical value) in 4 steps. The accuracy is very high: ±10% on all temp range (with ext external reference resistor with 1% accuracy).

The current limitation threshold decreases linearly by temperature over 165°C; thermal warning bit is set by SPI (diagnostic function).

The H-Bridge contains integrated free-wheel diodes. To traduce the power dissipation in case of free-wheeling condition, the low side transistor is switched on in parallel of its diode.

L9958 is available in three power packages, for maximum flexibility; the device in EVAL-L9958 is in Power-SO 20 package.

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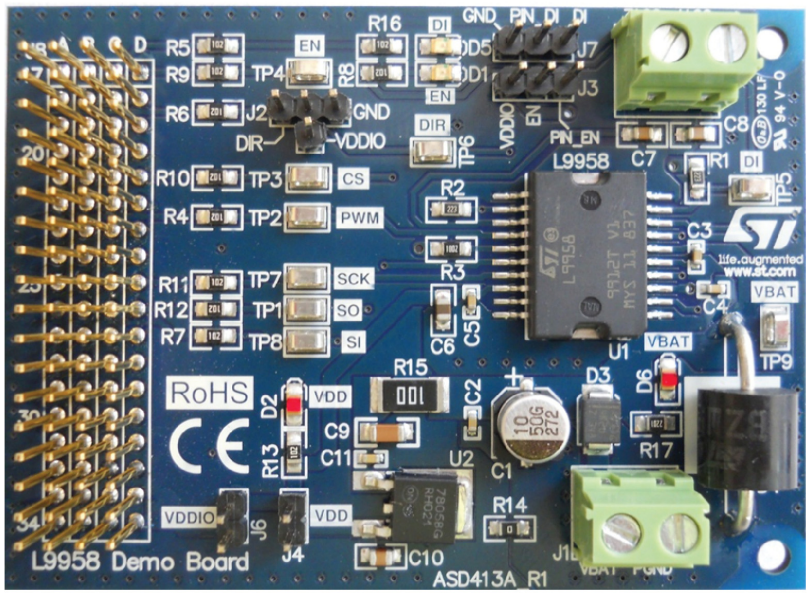
1 EVAL-L9958: Board description

1.1 Board description

Figure 1 shows the top side of the EVAL-L9958 evaluation board.

Figure 1. EVAL-L9958 evaluation board - top side



The evaluation board size is 78 mm x 57 mm; the PCB is made by using FR4 glass epoxy support with 2 copper layers.

The PCB and all components assembled in the evaluation board meet requirements of the applicable RoHS directives.

1.2 Input connector and test point

The EVAL-L9958 needs a very limited number of signals: EN, DI, DIR and PWM. The bidirectional communication with a microcontroller by the SPI interface allows the L9958 configuration, diagnosis and identification.

The SPI interface, the digital supply voltage(a) and the control signals are connected to the microcontroller connector (4x18 pins, 0.1”).

The microcontroller connector (J8) is fully compatible with the SPC56 discovery boards(b).

a. V_{DDIO}, the supply voltage for SPI,

b. SPD560P-DISP, SPC563M-DISP, SPC564A-DISP, SPC56L-Discovery

Thanks to the characteristic of this connector (male pins on top side and female on bottom side), it is very easy to connect the EVAL-L9958 to the generic microcontroller evaluation board without soldering wires or to design and assemble a simple adapter.

Figure 2. Top side – Connectors

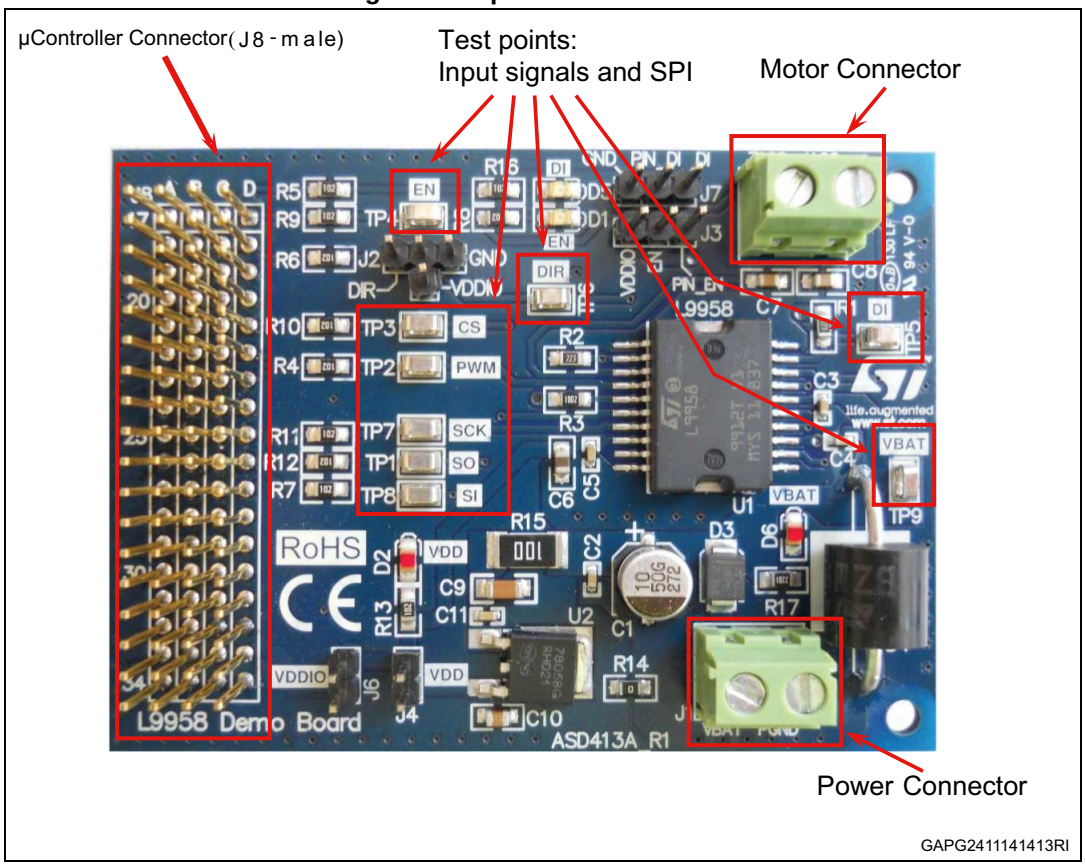


Figure 3. Bottom side – Input Connector

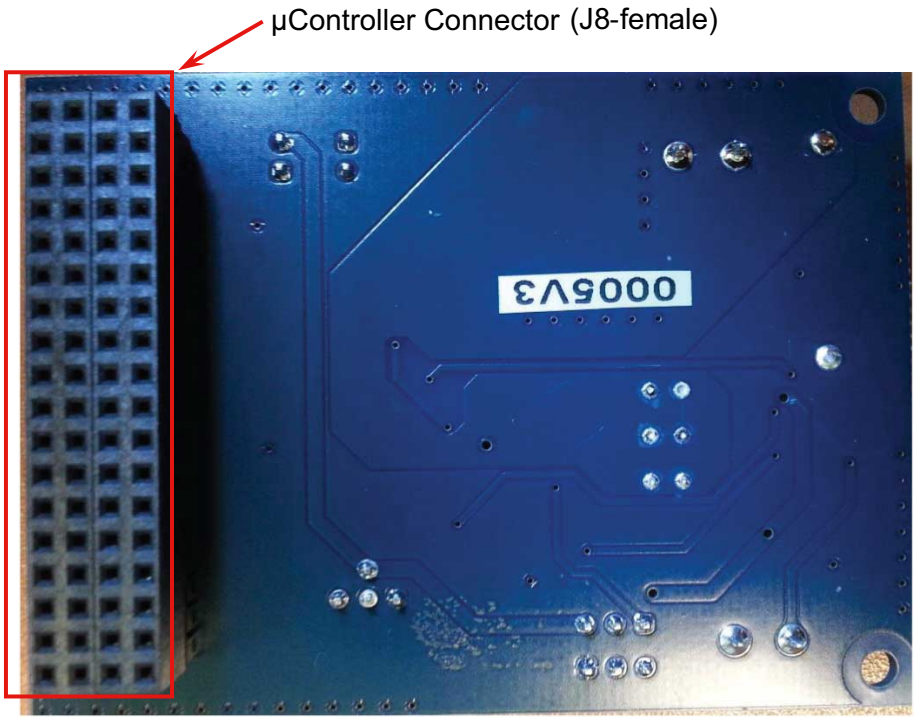


Table 1. Microcontroller connector (J8) – Pin description

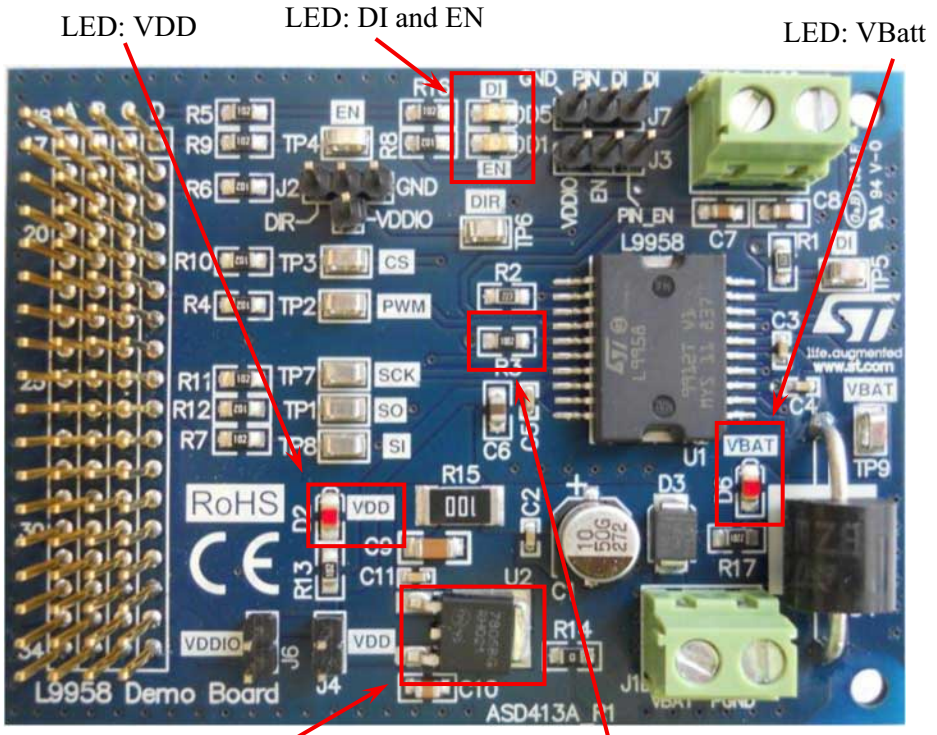
Pin name	Description
A22	PWM input signal
C17	DI input signal
C18	DIR input signal
C26	SI input signal
D17	EN input signal
D18	CS - SPI
D25	SCK - SPI
D18	SO - SPI
C33	VDDIO
A34	GND

Two terminal blocs are used to connect the wires from the battery (DC source) and the motor; the operating battery supply voltage is 4.0 ÷ 28 V_{DC}.

1.3 LEDs and Rext

Four LEDs show the status of the VDD, Bat and the level of the signals DI and EN; their position is depicted in *Figure 4*.
In the same figure is highlighted the position of the Rext (External Reference Resistor): R4=10 kΩ.

Figure 4. Top side – LEDs and Rest Rext (external reference resistor)



1.4 Jumpers

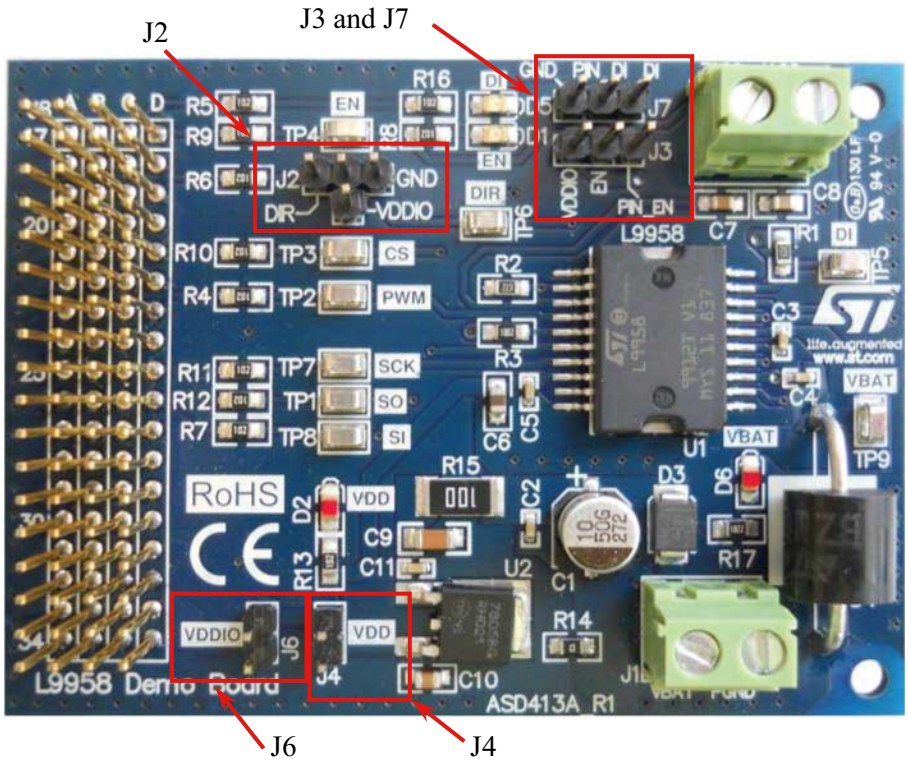
Many jumper allow to the user a large HW configuration flexibility (see *Figure 5*). In 1 the description of each jumper.

Numerous jumpers are present allowing the user to monitor all control signal as well as the SPI interface.

Table 2. Jumpers: description and default configuration

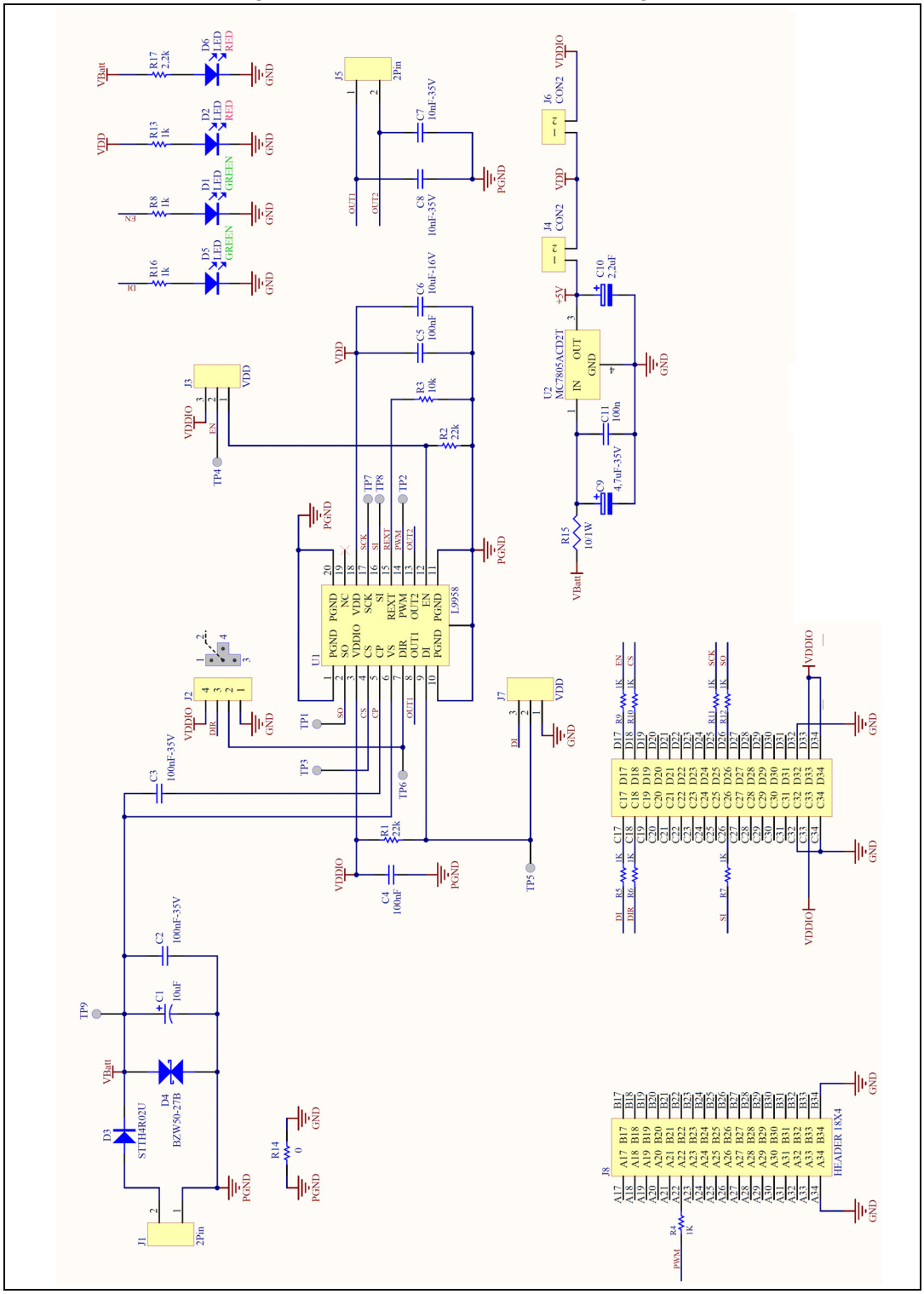
Jamper name	Descriptio	Default config
J2	DIR setting (from uC, VDDIO, GND or external source)	2-3 (µController)
J3	EN Setting (from uC, GND or external source)	1-2 (µController)
J4	VDD setting (from internal regulator or VDDIO)	ON (+5V)
J6	VDD setting: (from VDDIO or external source)	OFF

Figure 5. Top side – LEDs and Rest Rext (external reference resistor)



2 Schematic diagram

Figure 6. EVAL-L9958 - Schematic diagram



3 PCB layout

Figure 7. PCB Layout - Top side

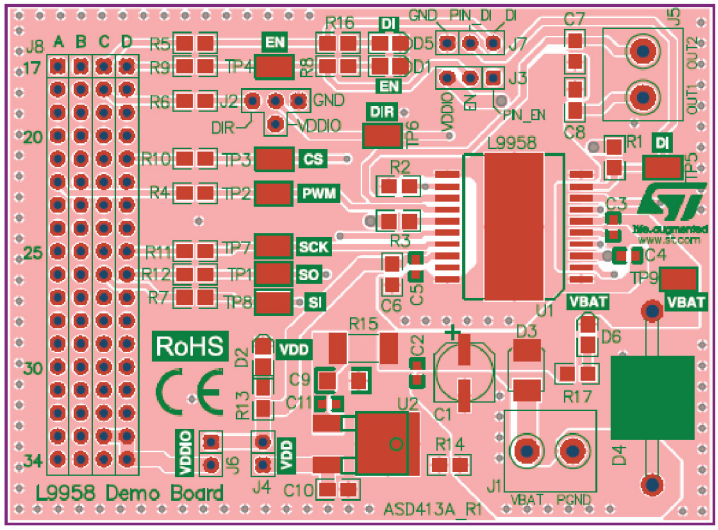
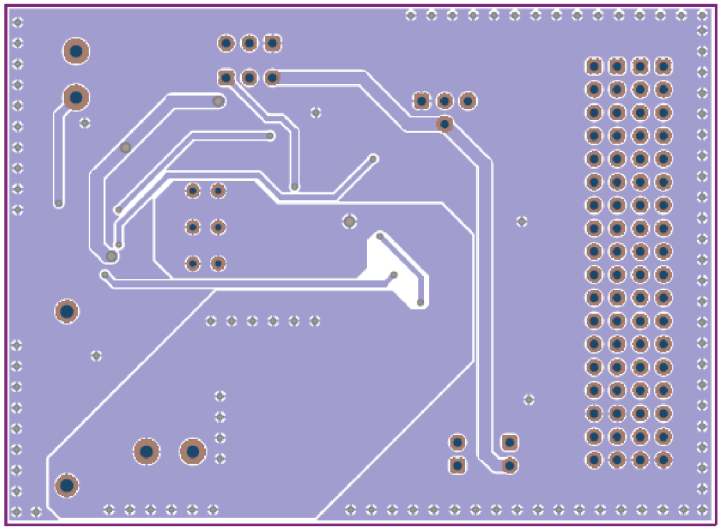


Figure 8. PCB Layout - Bottom side



4 L9958: block diagram and pinout

Figure 9. L9958 block diagram

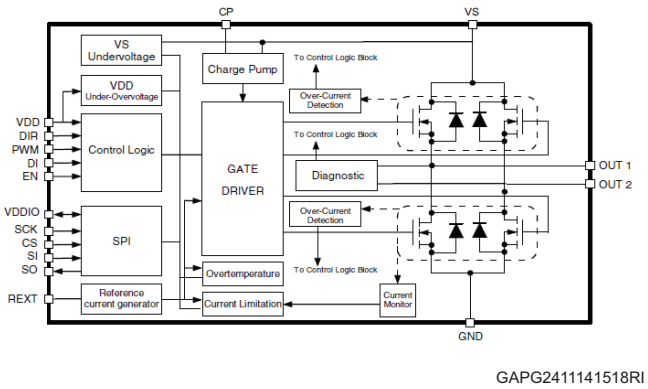


Figure 10. L9958 (Power-SO 20 package) - pinout

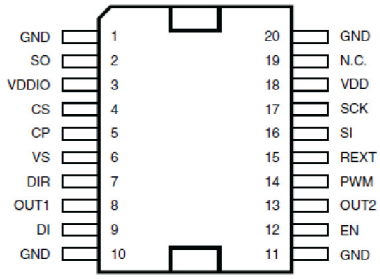


Table 3. L9958 (Power-SO 20 package) - pinout

Pin	Pin Name	Description
1	GND	Ground
2	SO	Serial Out
3	VDDIO	Supply voltage SPI
4	CS	Chip Select
5	CP	Charge Pump
6	VS	Supply Voltage
7	DIR	Direction Input
8	OUT1	Output 1
9	DI	Disable
10	GND	Ground
11	GND	Ground

Table 3. L9958 (Power-SO 20 package) - pinout (continued)

Pin	Pin Name	Description
12	EN	Enable
13	OUT2	Output 2
14	PWM	PWM input
15	REXT	External Reference Resistor
16	SI	Serial In
17	SCK	Serial Clock
18	VDD	Supply Voltage
19	N.C.	Not Connected (To be connected toi GND on the PCB
20	GND	Ground

Appendix A General handling precautions

The following precautions are recommended when using the EVAL-L9958 evaluation board:

- Do not modify or manipulate the board and the device when the board is powered and/or connected to the microcontroller or to a control board.
- Do not supply the board with a DC source higher than the device maximum voltage
- Any equipment or tool used for any manipulation of the semiconductor devices or board modification should be connected to ground to avoid ESD.
- The connectors and cables must be plugged and removed when the board is not supplied.
- Antistatic tools are recommended.

Revision history

Table 4. Document revision history

Date	Revision	Changes
25-Nov-2014	1	Initial release.