UM2263
User manual

EVAL-L9177A demo board hardware

Introduction

The EVAL-L9177A is an Evaluation Board designed to evaluate L9177A, a smart power device designed by STMicroelectronics in advanced BCD technology.

L9177 is able to drive all the relevant loads used in one/two cylinder powertrain applications (Injectors, Relay, stepper motor, tachometer, etc.), to interface with Variable Reluctance Sensors and Hall sensors, to monitor diagnostic functionalities and to interact with the main networks present in powertrain environment (K-Line).

All channels are protected against short circuit and over-temperature condition.

The board can be connected to the SPC563M-DISP, the Discovery+ board developed for the SPC563M64L.

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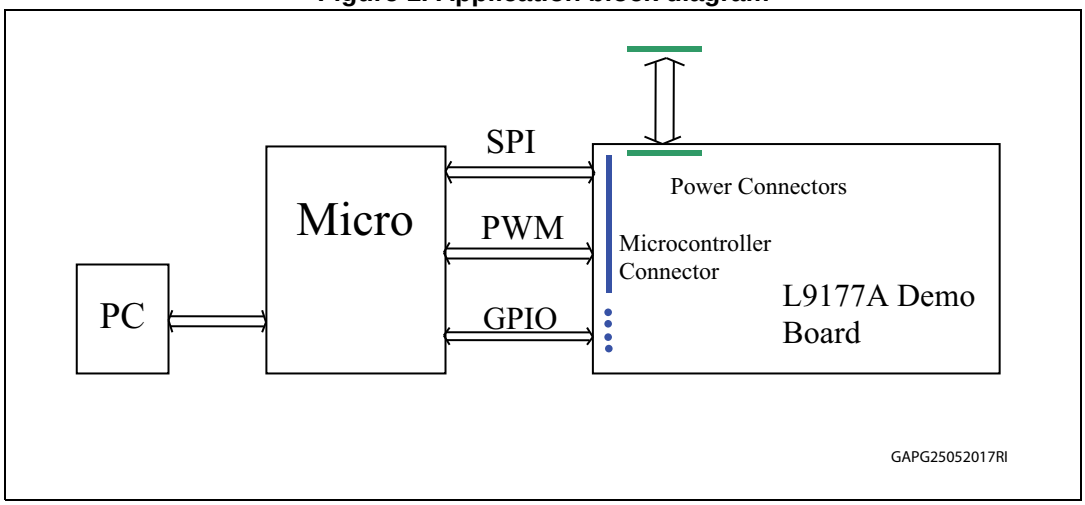
1 Hardware description

The EVAL-L9177A-SPI board provides maximum flexibility, access to all pins to simplify the evaluation and debug phase.

1.1 Block diagram

Figure 1. Application block diagram

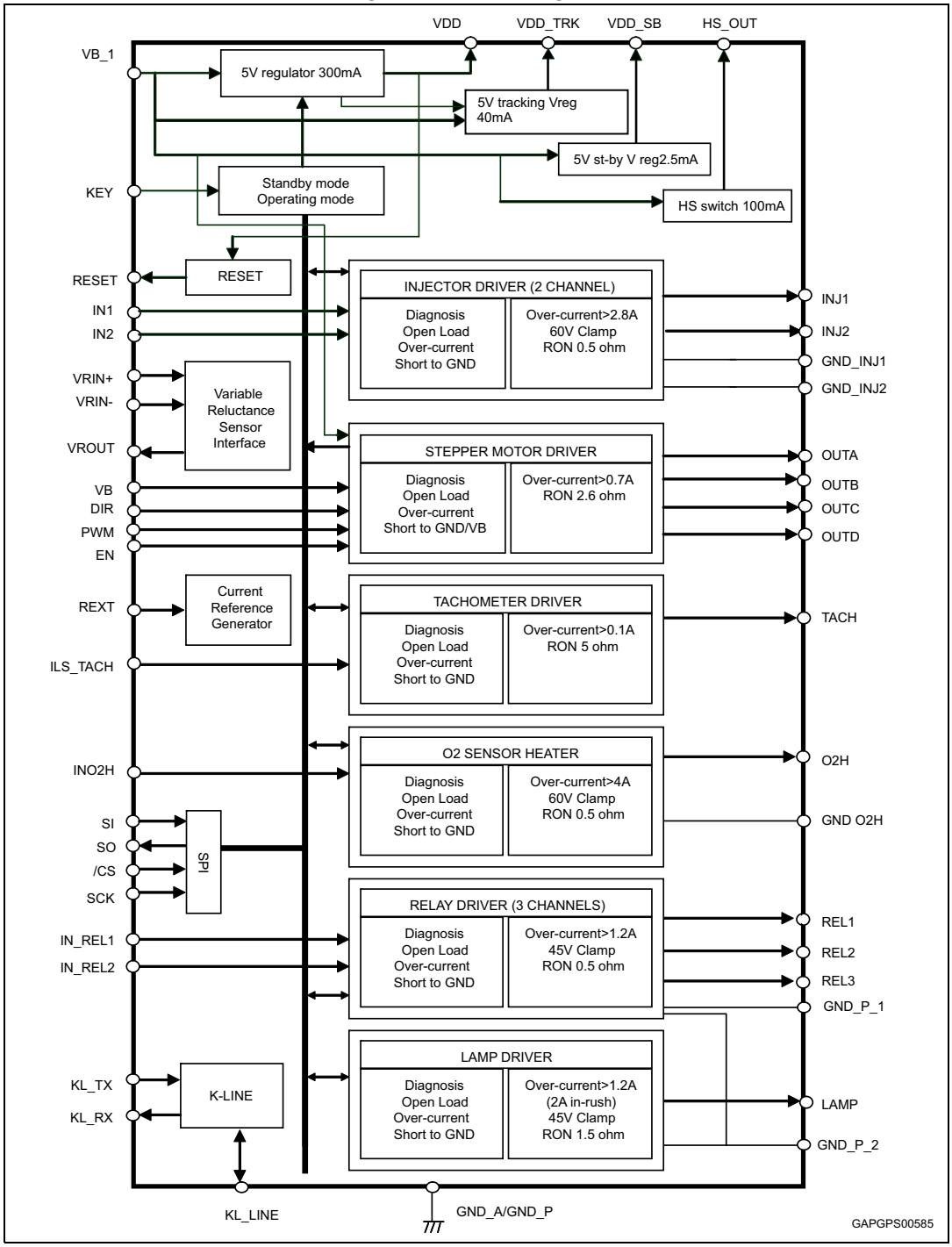


1.2 Microcontroller

- Standard APG connector 4 x 36.
- PWM output
- Configuration and diagnostic via SPI
- Possibility to easily connect the board to other microcontroller boards through a wire adaptor.

2 Block diagram

Figure 2. Block diagram



3 L9177A pinout and pin description

Figure 3. L9177A pinout

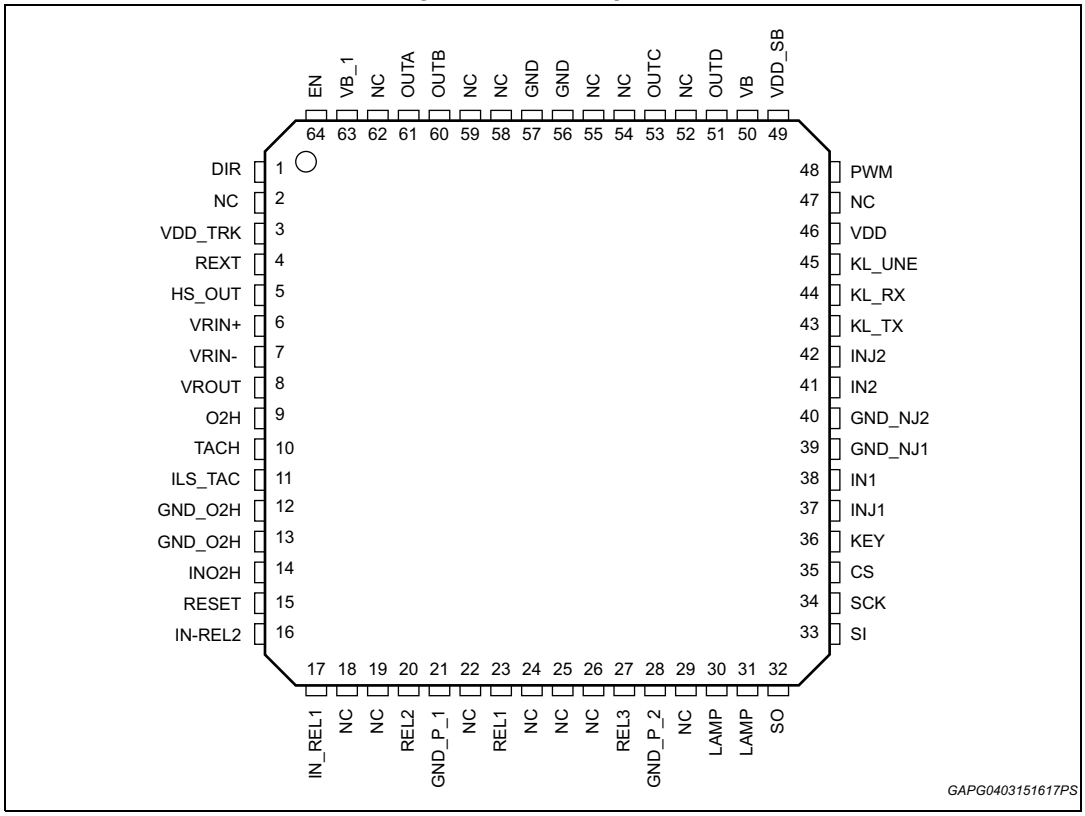


Table 1. L9177A pin descriptions

Pin Number	Pin Name	Description	Class	I/O Type
1	DIR	Logic Input to set stepper motor direction	Signal	I
2	NC	Not connected	-	-
3	VDD_TRK	Tracking voltage regulator output	PWR	O
4	REXT	External Resistor for precision current reference	Signal	I
5	HS_OUT	High Side Switch output	PWR	O
6	VRIN+	VRS positive differential input	Signal	I
7	VRIN-	VRS negative differential input	Signal	I
8	VROUT	VRS output	Signal	O
9	O2H	O2 sensor Heater output	PWR	O
10	TACH	Tachometer driver output	PWR	O
11	ILS_TACH	Tachometer driver input	Signal	I

Table 1. L9177A pin descriptions (continued)

Pin Number	Pin Name	Description	Class	I/O Type
12	GND_O2H	O2 sensor heater ground	PWR	GND
13	NC	Not connected	-	-
14	INO2H	O2 sensor Heater input	Signal	I
15	RESET	Reset signal to the micro	Signal	O
16	IN_REL2	Relay 2 parallel control input	Signal	I
17	IN_REL1	Relay 1 parallel control input	Signal	I
18	NC	Not connected	-	-
19	NC	Not connected	-	-
20	REL2	Relay 2 driver output	PWR	O
21	GND_P_1	Power ground relay 1-2	PWR	GND
22	NC	Not connected	-	-
23	REL1	Relay 1 driver output	PWR	O
24	NC	Not connected	-	-
25	NC	Not connected	-	-
26	NC	Not connected	-	-
27	REL3	Relay 3 driver output	PWR	O
28	GND_P_2	Power ground for lamp	PWR	GND
29	NC	Not connected	-	-
30	LAMP	Lamp driver output	PWR	O
31	LAMP	Lamp driver output	PWR	O
32	SO	SPI data out	Signal	O
33	Si	SPI data in	Signal	I
34	SCK	SPI clock in	Signal	I
35	CS	SPI Chip Select	Signal	I
36	KEY	Key signal	Signal	I
37	INJ1	Injector1 driver output	PWR	O
38	IN1	Injector1 driver input command	Signal	I
39	GND_INJ1	Injector1 ground	PWR	GND
40	GND_INJ2	Injector2 ground	PWR	GND
41	IN2	Injector2 driver input command	Signal	I
42	INJ2	Injector2 driver output	PWR	O
43	KL_TX	K-Line TX digital IN	Signal	I
44	KL_RX	K-Line RX digital OUT	Signal	O
45	KL_Line	K-Line	PWR	I/O

Table 1. L9177A pin descriptions (continued)

Pin Number	Pin Name	Description	Class	I/O Type
46	VDD	5V voltage regulator output	PWR	O
47	NC	Not connected	-	-
48	PWM	Logic input for stepper motor	Signal	I
49	VDD_SB	5V Standby voltage regulator output	PWR	O
50	VB	Battery line to bridge 2	PWR	I
51	OUTD	Output bridge 2	PWR	O
52	NC	Not connected	-	-
53	OUTC	Output bridge 2	PWR	O
54	NC	Not connected	-	-
55	NC	Not connected	-	-
56	GND	Analog and power ground	PWR	GND
57	GND	Analog and power ground	PWR	GND
58	NC	Not connected	-	-
59	NC	Not connected	-	-
60	OUTB	Output bridge 1	PWR	O
61	OUTA	Output bridge 1	PWR	O
62	NC	Not connected	-	-
63	VB_1	Battery line bridge1	PWR	I
64	EN	Logic input to enable stepper motor	Signal	I

3.1 Board layout

Figure 4. Board front layout

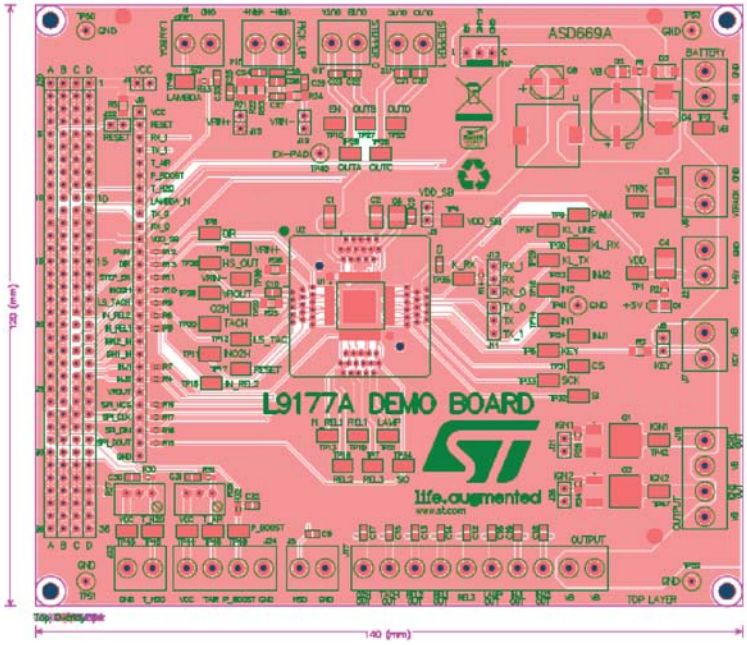


Figure 5. Board back layout

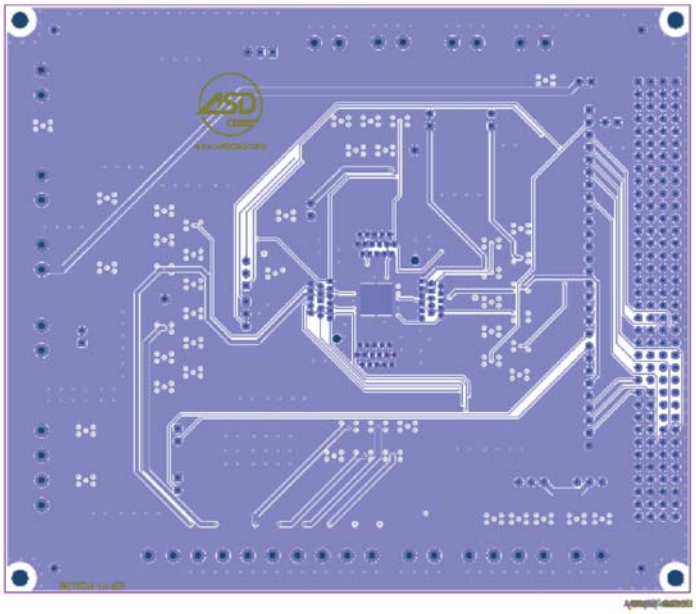
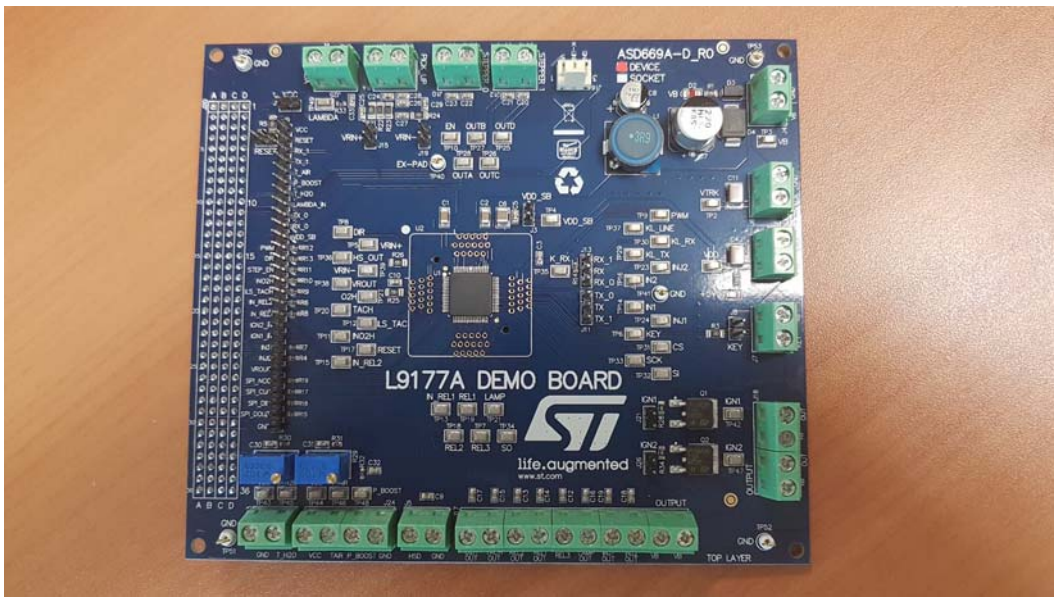
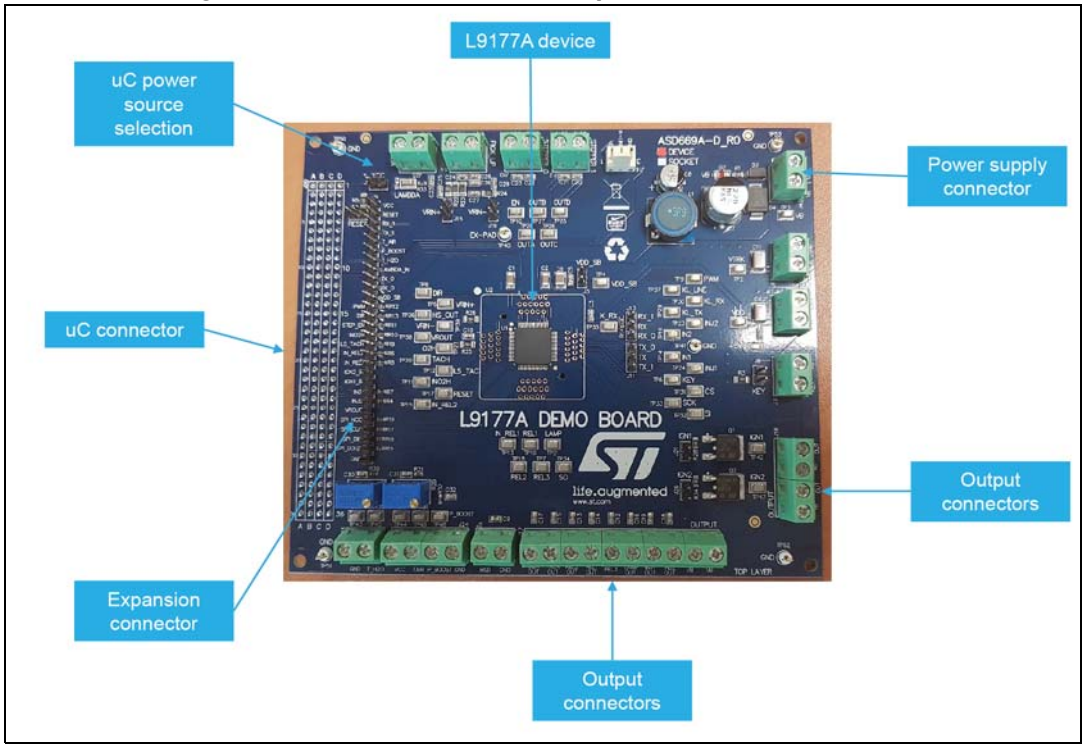


Figure 6. Board front view



4 Evaluation board main components and connectors

Figure 7. Motherboard main components and connectors



5 Jumpers & connectors

5.1 Motherboard jumpers & connectors

Table 2. Motherboard jumpers and connectors

Name	Description	Type
J1	Microcontroller V_{CC} selector	Jumper: ON: Microcontroller is supplied by L9177A VCC regulator OFF: Microcontroller is externally supplied
J2	+5 V V_{CC} output	Screw connector: 1: +5V 2: GND
J3	VDD standby connector	Jumper: ON: VDD standby is connect to microcontroller OFF: VDD standby is disconnect by microcontroller
J4	Main Power supply connector	Screw connector: 1: +VB 2: GND
J5	High-side driver output connector	Screw connector: 1: HS_OUT 2: GND
J6	5 V tracking regulator output	Screw connector: 1: +5 V traking 2: GND
J7	External key connector	Screw connector: 1: VB 2: Key in
J8	External key selector	Jumper: ON: The external key is disabled and the key input of L9177A is HIGH OFF: The external key is enabled
J9	Expansion connector	Please see *Figure 9*
J10	Stepper motor output	Screw connector: 1: OUT A 2: OUT B

Table 2. Motherboard jumpers and connectors (continued)

Name	Description	Type
J11	Serial interface TX selector for k-line	3 way jumper: 1-2: serial 0 2-3: serial 1
J12	Stepper motor output	Screw connector: 1: OUT C 2: OUT D
J13	Serial interface RX selector for k-line	3 way jumper: 1-2: serial 0 2-3: serial 1
J14	VRS differential input	Screw connector: 1: VRS+ 2: VRS-
J15	VRIN+ external network enable	Jumper: ON: network connected OFF: network disconnected
J16	K-Line connector	Strip: 1: VB 2: KL_LINE 3: GND
J17	Output connector	Screw connector: 1: VB 2: VB 3: INJ2_OUT 4: INJ1_OUT 5: LAMP_OUT 6: REL3 7: REL1_OUT 8: REL2_OUT 9: TACH_OUT 10: O2H_OUT
J18	Igntition output connector	1: IGN1_OUT 2:VB 3: IGN2_OU 4: VB
J19	VRIN- external network enable	Jumper: ON: network connected OFF: network disconnected
J20	Microcontroller connector	See *Figure 8*

Table 2. Motherboard jumpers and connectors (continued)

Name	Description	Type
J21	IGBT1 driver enable	Jumper: ON: IGN1 connected to IGBT OFF: IGN1 disconnected to IGBT
J22	Reset connector	Jumper: ON: L9177A reset connected to uc Reset input OFF: L9177A reset disconnected to uc Reset input
J23	Water temperature sensor input	Screw connector: 1: pull-up output 2: GND
J24	Boost pressure and temperature sensor input	Screw connector: 1: VCC 2: pull-up output (temperature sensor) 3: Pressure sensor input 4: GND
J25	Narrow band Lambda sensor input	Screw connector: 1: Lamda sensor input 2: GND
J26	IGBT2 driver enable	Jumper: ON: IGN2 connected to IGBT OFF: IGN2 disconnected to IGBT

Figure 8. Microcontroller connector

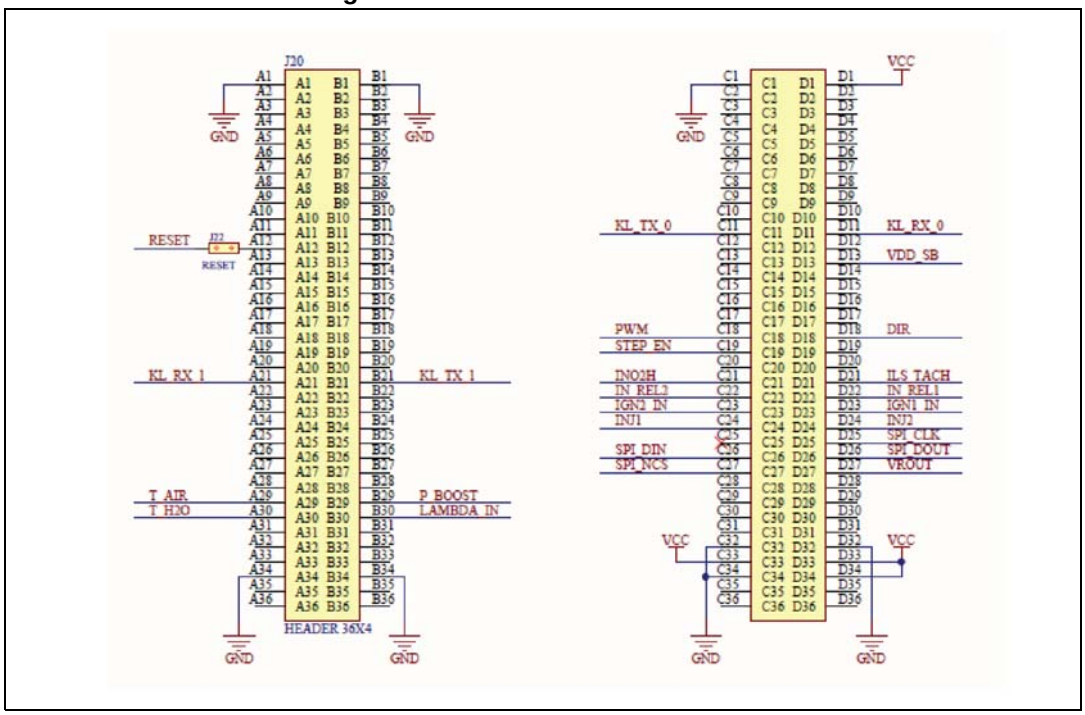
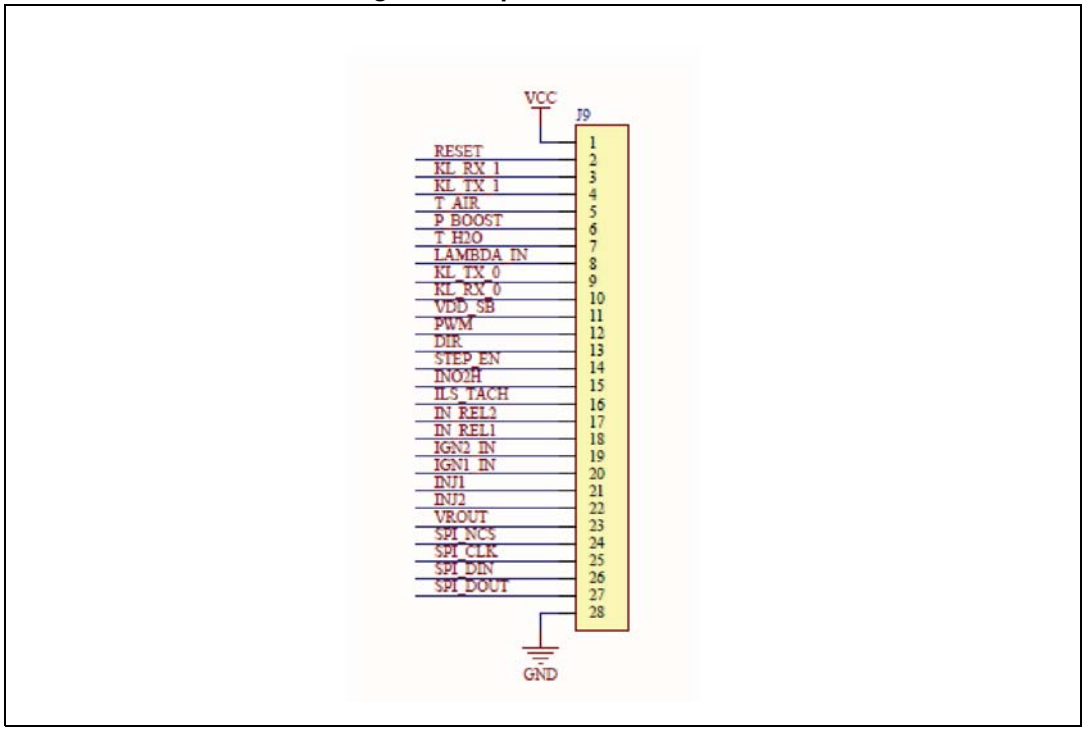


Figure 9. Expansion connector



6 Functional description

6.1 Default Jumper setting

Table 3. Configuration jumpers

Name	Description	Configuration
J1	Microcontroller VCC selector	ON
J3	VDD standby connector	OFF
J8	External key selector	ON
J11	Serial interface TX selector for k-line	2-3
J13	Serial interface RX selector for k-line	2-3
J15	VRIN+ external network enable	ON
J19	VRIN- external network enable	ON
J21	IGBT1 driver enable	ON
J22	Reset connector	OFF
J26	IGBT2 driver enable	ON

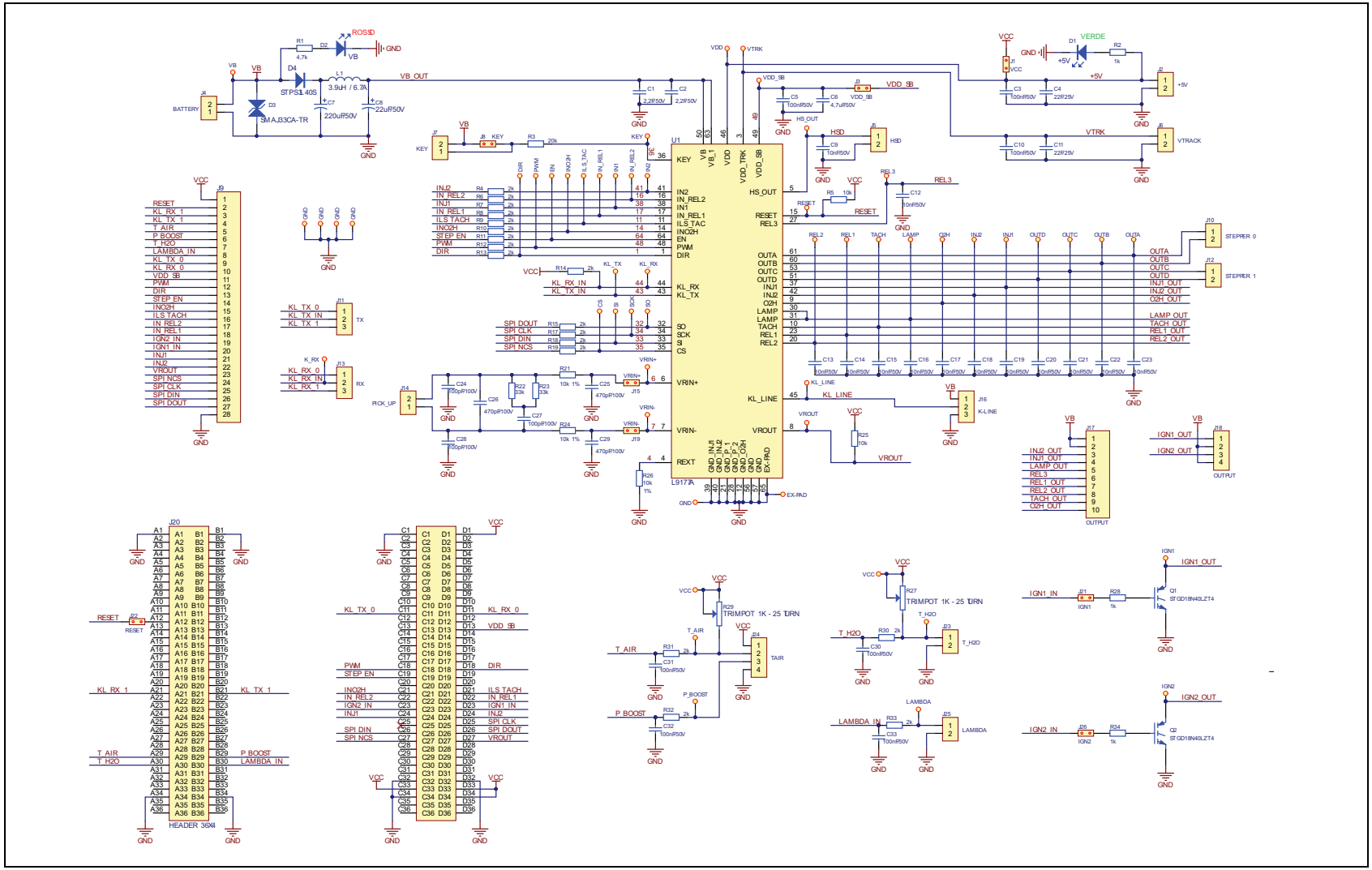
6.2 Getting started

6.2.1 Start up

1. Configure all the jumper according to table
2. Connect a Power supply to J4 respecting the right polarity
3. Configure the power supply to 13.5 V and limit the current to 1A
4. Switch on the power supply
5. For further information connect uC and follow the related documentation to check the internal register status of L9177A

Appendix A L9177A evaluation board schematic

Figure 10. L9177A evaluation board schematic



Revision history

Table 4. Document revision history

Date	Revision	Changes
18-Jul-2017	1	Initial release.