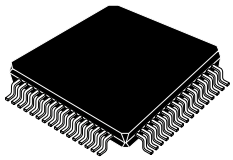
L9781

Data brief

Automotive multiple valve pre-driver for diesel and gasoline direct injection



LQFP64

Product status link
L9781

Product summary		
Order code	Package	Packing
L9781	LQFP64 (10x10 mm)	Tray
L9781TR		Tape and reel

Features

- AEC-Q100 qualified
- 1 x DC/DC converter controller for VTank voltage generation (up to 80 V):
  - 1 x low-side push-pull type N-channel MOSFET pre-driver
  - 1 x current sensing block for current limitation
  - 1 x voltage comparator with hysteresis for VTank voltage sensing
- 2 x driving channel controllers each made up of:
  - 1 x high-side push-pull type VTank N-channel MOSFET pre-driver
  - 1 x high-side push-pull type VBat N-channel MOSFET pre-driver
  - 2 x low-side push-pull type N-channel MOSFET pre-driver
  - 1 x differential amplifier with programmable gain for current sensing & peak current detection
  - 1 x digital-to-analog converter for peak current threshold setting
  - 1 x HW protection and diagnosis block for full load protection from accidental external short circuits
- 1 x additional peak and hold controller:
  - 1 x high-side push-pull type VBat N-channel MOSFET pre-driver
  - 1 x low-side push-pull type N-channel MOSFET pre-driver
  - 1 x differential amplifier with programmable gain for current sensing and peak current detection
  - 1 x digital-to-analog converter for peak current threshold setting
  - 1 x HW protection and diagnosis block for full load protection from accidental external short circuits
- 1 x 32 bit SPI interface (up to 8 MHz)
  - IC general control
  - Programmable parameters setting
  - Diagnosis and hardware protection management

Description

The L9781 is a multi valve pre-driver capable of driving 11 external N-channel logic level MOSFETs, controlling up to 5 inductive loads through peak and hold current control and one DC/DC step-up converter, providing full protection against accidental faults on the external hardware. The load peak and hold current control (together with the diagnosis) is done by the internal configurable Finite State Machines (FSMs) needing only the start of actuation commands from the main microcontroller.

1 Pin description

Figure 1. **Pin connection (top view)**

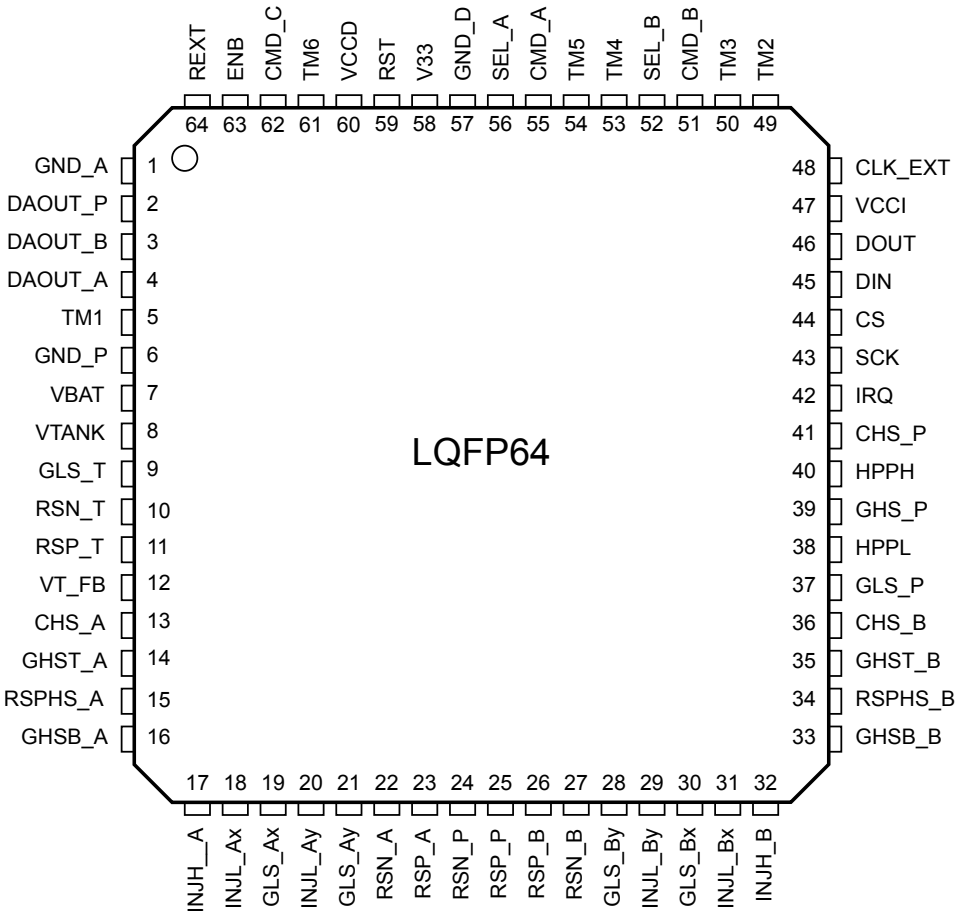


Table 1. **Pins function**

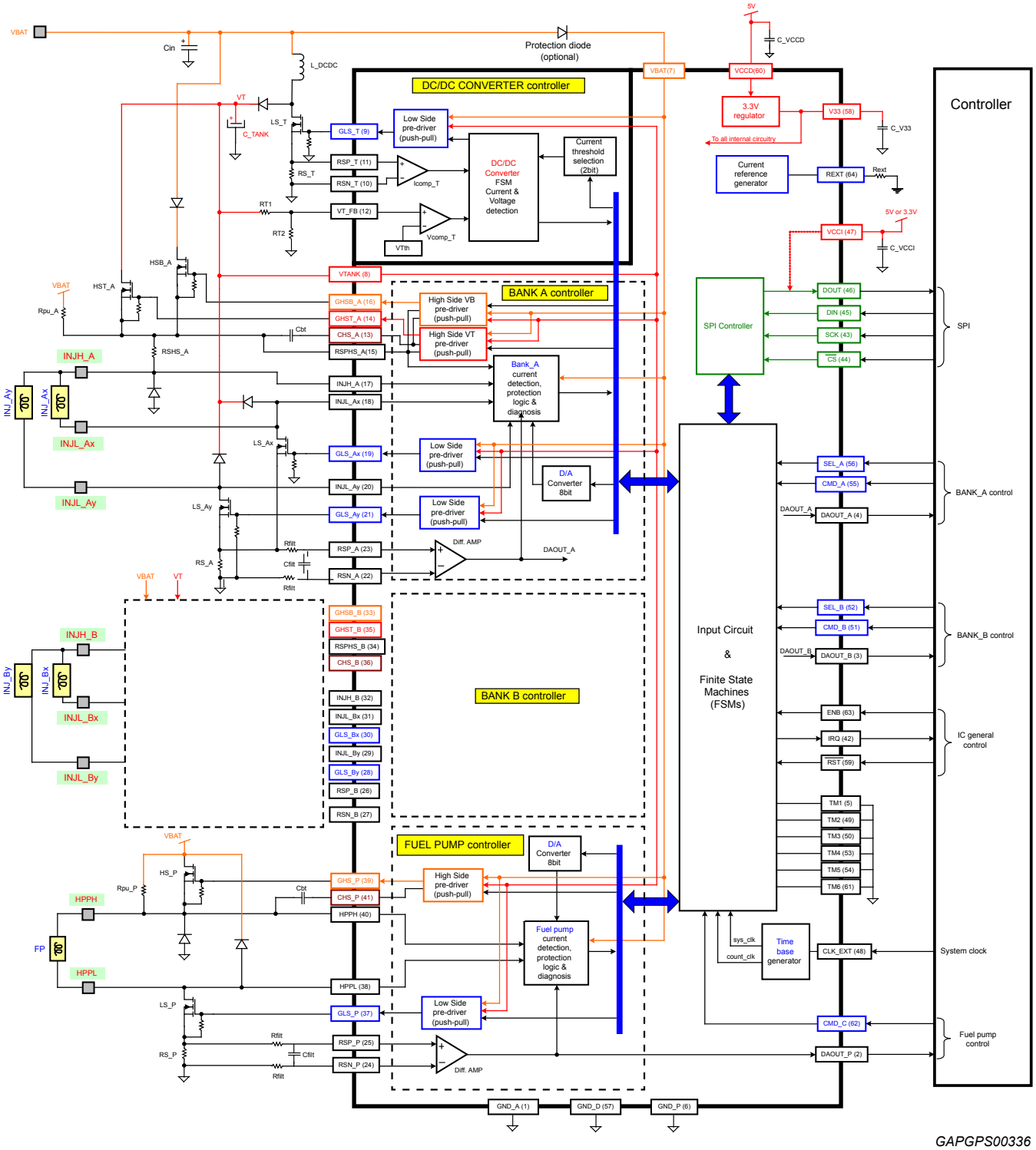
Pin #	Name	Function	Type	Note
1	GND_A	Analog ground connection	Supply	-
2	DAOUT_P	Fuel pump current feedback output	Analog OUT	-
3	DAOUT_B	Bank B current feedback output	Analog OUT	-
4	DAOUT_A	Bank A current feedback output	Analog OUT	-
5	TM1	Test mode	Digital IN	Internal pull-down Force to GND
6	GND_P	Power ground connection	Supply	-
7	VBAT	Direct Vbat power supply	Supply	-
8	VTANK	VTank power supply	Supply	-
9	GLS_T	Pre-driver output for DC/DC converter power N-channel MOSFET	Analog OUT	-
10	RSN_T	DC/DC converter negative reference for current sensing amplifier	Analog IN	-

Pin #	Name	Function	Type	Note
11	RSP_T	DC/DC converter current positive sense	Analog IN	-
12	VT_FB	VTank voltage feedback	Analog IN	-
13	CHS_A	VTank and Vbat high-sides bank A bootstrap capacitor	Supply	-
14	GHST_A	Pre-Driver output for VTank high-side bank A power N-channel MOSFET	Analog OUT	Push-pull type
15	RSPHS_A	Bank A positive node of high-side current shunt	Analog IN	-
16	GHSB_A	Pre-Driver output for Vbat high-side bank A power N-channel MOSFET	Analog OUT	Push-pull type
17	INJH_A	Bank A of injectors high-side voltage feedback	Analog IN	-
18	INJL_Ax	Bank A INJx low-side voltage feedback	Analog IN	-
19	GLS_Ax	Pre-Driver output for low-side bank A INJx power N-channel MOSFET	Analog OUT	Push-pull type
20	INJL_Ay	Bank A INJy low-side voltage feedback	Analog IN	-
21	GLS_Ay	Pre-Driver output for low-side bank A INJy power N-channel MOSFET	Analog OUT	Push-pull type
22	RSN_A	Bank A negative reference for current sensing amplifier	Analog IN	-
23	RSP_A	Bank A current positive sense	Analog IN	-
24	RSN_P	Fuel pump negative reference for current sensing amplifier	Analog IN	-
25	RSP_P	Fuel pump current positive sense	Analog IN	-
26	RSP_B	Bank B current positive sense	Analog IN	-
27	RSN_B	Bank B negative reference for current sensing amplifier	Analog IN	-
28	GLS_By	Pre-Driver output for low-Side bank B INJy power N-channel MOSFET	Analog OUT	Push-pull type
29	INJL_By	Bank B INJy low-side voltage feedback	Analog IN	-
30	GLS_Bx	Pre-Driver output for low-side bank B INJx power N-channel MOSFET	Analog OUT	Push-pull type
31	INJL_Bx	Bank B INJx low-side voltage feedback	Analog IN	-
32	INJH_B	Bank B of injectors high side voltage feedback	Analog IN	-
33	GHSB_B	Pre-Driver output for Vbat high-side bank B power N-channel MOSFET	Analog OUT	Push-pull type
34	RSPHS_B	Bank B positive node of high-side current shunt	Analog IN	-
35	GHST_B	Pre-Driver output for VTank high-side bank B power N-channel MOSFET	Analog OUT	Push-pull type
36	CHS_B	VTank and Vbat high-sides bank B bootstrap capacitor	Supply	-
37	GLS_P	Pre-driver output for low-side fuel pump N-channel MOSFET	Analog OUT	Push-pull type
38	HPPL	Fuel pump low-side voltage feedback	Analog IN	-
39	GHS_P	Pre-driver output for high-side fuel pump N-channel MOSFET	Analog OUT	Push-pull type
40	HPPH	Fuel pump high-side voltage feedback	Analog IN	-
41	CHS_P	Fuel pump high-side bootstrap capacitor	Supply	-
42	IRQ	Interrupt request output	Digital OUT	Open drain
43	SCK	SPI clock input	Digital IN	Internal pull-up
44	CS	SPI chip select input	Digital IN	Internal pull-up
45	DIN	SPI data input	Digital IN	-

Pin #	Name	Function	Type	Note
46	DOUT	SPI data output	Digital OUT	-
47	VCCI	5 V or 3.3 V microcontroller interface power supply input	Supply	-
48	CLK_EXT	External clock source	Clock	Internal pull-down
49	TM2	Test mode	Digital IN	Internal pull-down Force to GND
50	TM3	Test mode	Digital IN	Internal pull-down Force to GND
51	CMD_B	Actuation command input for Bank B	Digital IN	Internal pull-down
52	SEL_B	Bank B INJx / INJy selection	Digital IN	Internal pull-down
53	TM4	Test mode	Digital IN	Internal pull-down Force to GND
54	TM5	Test mode	Digital IN	Internal pull-down Force to GND
55	CMD_A	Actuation command input for Bank A	Digital IN	Internal pull-down
56	SEL_A	Bank A INJx / INJy selection	Digital IN	Internal pull-down
57	GND_D	Digital ground connection	Supply	-
58	V33	Internal 3,3V voltage regulator output	Supply	External capacitor
59	RST	Asynchronous system reset input	Digital IN	Internal pull-down
60	VCCD	5 V logic power supply input	Supply	External capacitor
61	TM6	Test mode	Digital IN	Internal pull-down Force to GND
62	CMD_C	Actuation command input for fp controller	Digital IN	Internal pull-down
63	ENB	Common enable input for pre-driver stage	Digital IN	Internal pull-down
64	REXT	Bias current reference generator	Analog IN	External resistor

2 Block diagram

Figure 2. **Block diagram**



GAPGPS00336

3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

3.1 LQFP64 (10x10 mm) package information

Figure 3. LQFP64 (10x10 mm) package outline

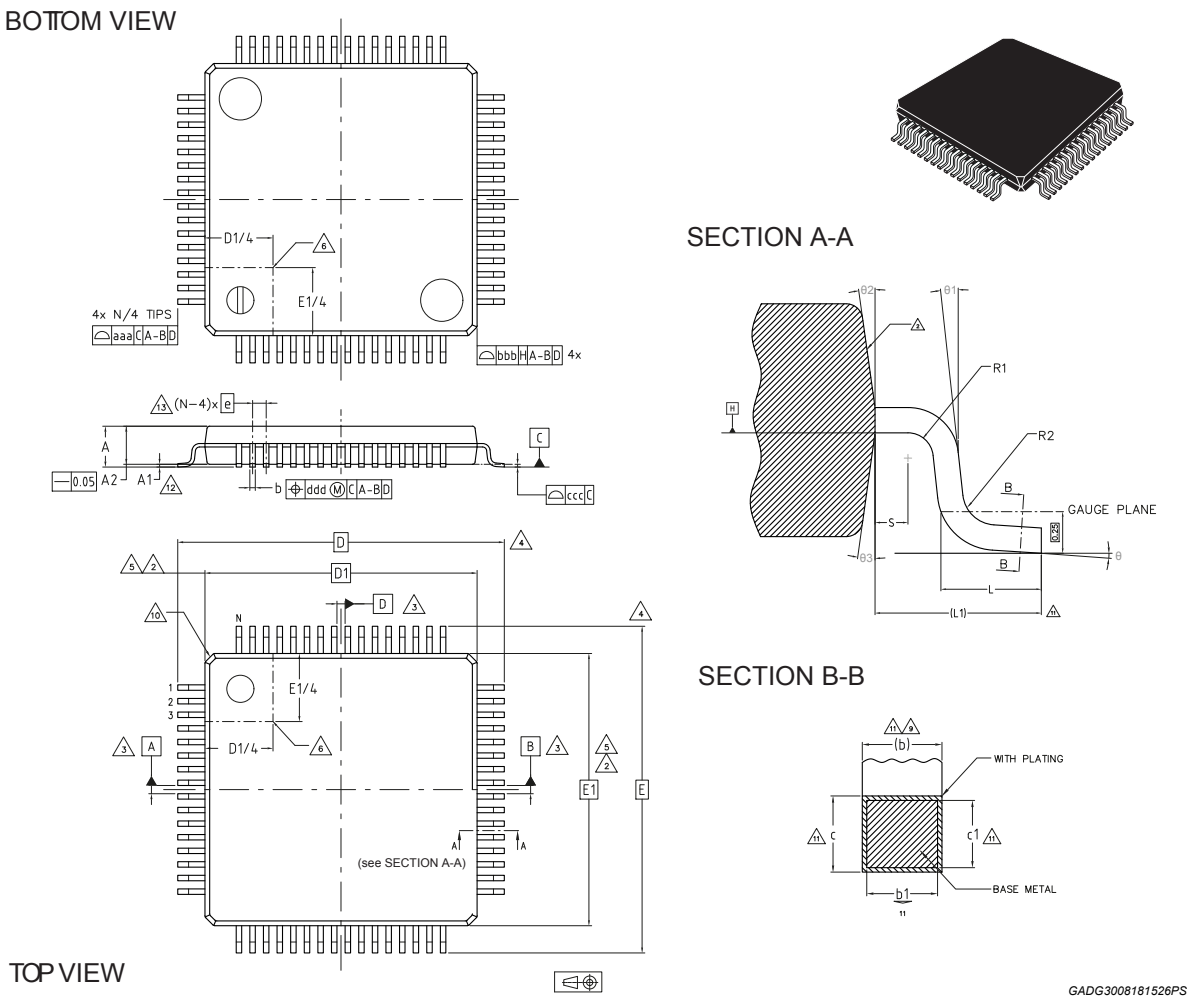


Table 2. LQFP64 (10x10 mm) package mechanical data (dimensions in mm)

Symbol	Min.	Typ.	Max.	Note
ϴ	0°	3.5°	7°	
ϴ1	0°	-	-	
ϴ2	10°	12°	14°	
ϴ3	10°	12°	14°	
A	-	-	1.60	

Symbol	Min.	Typ.	Max.	Note
A1	0.05	-	0.15	12
A2	1.35	1.40	1.45	
b	0.17	0.22	0.27	9, 11
b1	0.17	0.20	0.23	11
c	0.09	-	0.20	11
c1	0.09	-	0.16	11
D		12.00 BSC		4
D1		10.00 BSC		2, 5
e		0.50 BSC		
E		12.00 BSC		4
E1		10.00 BSC		2, 5
L	0.45	0.60	0.75	
L1		1.00 REF		
N		64		13
R1	0.08	-	-	
R2	0.08	-	0.20	
S	0.20	-	-	
Tolerance of form and position				
aaa		0.20		1, 7
bbb		0.20		
ccc		0.08		
ddd		0.08		

Notes

1. Dimensioning and tolerancing schemes conform to ASME Y14.5M-1994.
2. The Top package body size may be smaller than the bottom package size up to 0.15 mm.
3. Datum A-B and D to be determined at datum plane H.
4. To be determined at seating datum plane C.
5. Dimensions D1 and E1 do not include mold flash or protrusions. Allowable mold flash or protrusions is “0.25 mm” per side. D1 and E1 are Maximum plastic body size dimensions including mold mismatch.
6. Details of pin 1 identifier are optional but must be located within the zone indicated.
7. All Dimensions are in millimeters.
8. No intrusion allowed inwards the leads.
9. Dimension “b” does not include dambar protrusion. Allowable dambar protrusion shall not cause the lead width to exceed the maximum “b” dimension by more than 0.08 mm. Dambar cannot be located on the lower radius or the foot. Minimum space between protrusion and an adjacent lead is 0.07 mm for 0.4 mm and 0.5 mm pitch packages.
10. Exact shape of each corner is optional.
11. These dimensions apply to the flat section of the lead between 0.10 mm and 0.25 mm from the lead tip.
12. A1 is defined as the distance from the seating plane to the lowest point on the package body.
13. “N” is the number of terminal positions for the specified body size.

Revision history

Table 3. **Document revision history**

Date	Version	Changes
05-Sep-2018	1	Initial release.

Contents

LifeElectronics
Живое партнерство

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