User's Manual

ISL78219EV1Z

User's Manual: Evaluation Board

Automotive

Rev.0.00 Mar 2018

1. Overview

The ISL78219 is a high frequency, high efficiency current mode control non-synchronous step-up voltage regulator operated at a constant PWM switching frequency. It has an internal 4.0A, 120mΩ low-side MOSFET and can deliver high output current and efficiency over 90%. The selectable 640kHz and 1.22MHz switching frequency provides faster transient response, and allows the use of a smaller inductor. An external compensation pin gives the user flexibility in setting frequency compensation, allowing the use of low ESR small ceramic output capacitors.

The ISL78219EV1Z is an evaluation board for evaluating the ISL78219 step-up voltage regulator. The board is set up to operate with an input voltage from 2.3V to 5.5V and provide an output voltage of 12.0V with a maximum output current of 1.2A.

The ISL78219EV1Z evaluation board provides a jumper that allows users to select either the 620kHz or 1.2MHz frequency and to enable or disable the regulator.

1.1 Key Features

- A complete evaluation platform for the ISL78219
- Jumper selectable switching frequency and enable
- Proven evaluation board layout
- Pb-Free (RoHS compliant)

1.2 Specifications

This board has been configured and optimized for the following operating conditions:

- Input voltage: 2.3V to 5.5V
- Output voltage: 12V

1.3 Ordering Information

Part Number	Description
ISL78219EV1Z	Evaluation board for ISL78219

1.4 Related Literature

For a full list of related documents, visit our website

- ISL78219 product page

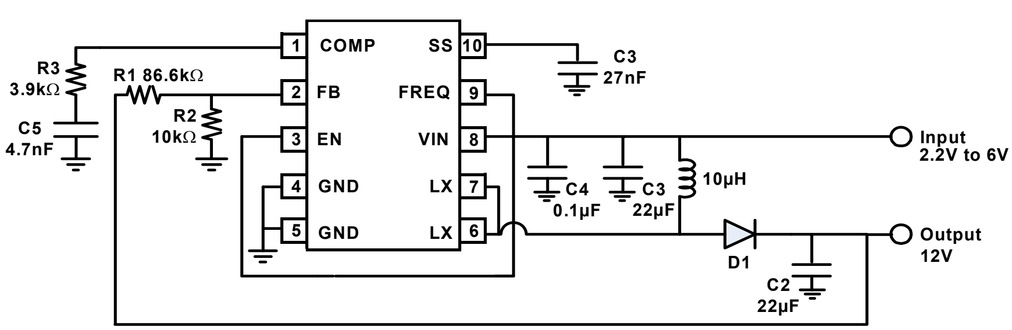

Figure 1. ISL78219EV1Z Block Diagram

2. Functional Description

2.1 Equipment Needed

The following instruments will be needed to perform testing:

- Variable voltage power supplies, with at least 4A current capable
- DC Electronic Load (E-Load)
- Digital multimeter
- Oscilloscope
- 20AWG and 18AWG wires

2.2 Operating Range

The output voltage has been set by the feedback resistor pair to be 12V. Changes can be made to that pair to reach other voltages. Refer to Table 1 for examples. If higher output voltages are desired, the output capacitors on the evaluation board will need to be changed to have a higher voltage rating.

2.3 Quick Start Guide

(1) Connect the power supply to J1 supply connector. Watch out for power and ground pins. Set power supply voltage between 2.3V and 5V, and current limit at 3.8A.

(2) Connect the E-load to J2 output connector. The positive input of the E-load should be connected to the V_{OUT} header. Set E-load current. The load current should not exceed the maximum output current in Table 1.

(3) J3 Pins 1 and 3 (labeled FREQ) select which frequency the ISL78219 switches at. Shorting Pins 1 and 3 sets the frequency to 1.25MHz, while opening Pins 1 and 3 sets the frequency to 620kHz.

(4) J3 Pins 2 and 4 (labeled EN) control the chip's enable signal. Shorting Pins 2 and 4 enables the device, while opening Pins 2 and 4 disables the device.

(5) Make sure all the connections on the evaluation board are correct, then turn on the power supply and follow the E-load. The part should start to operate.

2.4 Maximum Output Current

The MOSFET current limit is typically 4.0A and assured to 3.8A. This restricts the maximum output current that the ISL78219 can drive. With the selected TDK inductor, Table 1 shows I_{OUT} values for a 1.2MHz switching frequency with an output voltage of 12V at different input voltages.

Table 1. Typical Maximum I_{OUT} Values with R_2 = 100k and V_{OUT} = 12V

V_{IN} (V)	I_{IN} (mA)	R_1 (kΩ)	I_{OMAX} (mA)
3.0	2900	866	500
4.0	3520	866	900
4.5	3520	866	1080
5.0	3540	866	1240

Different output voltages can be achieved by changing the R_2 resistor value. Equation 1 shows how to calculate the new R_2 value.

(EQ. 1) $$V_{OUT} = V_{FB} \times \left(1 + \frac{R_1}{R_2}\right)$$

Table 2. Typical R_2 Values with R_2 = 100k for some V_{OUT}

V_{OUT} (V)	V_{FB} (V)	R_2 (kΩ)	R_1 (kΩ)
5	1.24	100	309
9	1.24	100	619
12	1.24	100	866

3. PCB Layout Guidelines

Figures 4 to 8 show the evaluation board PCB layout. The following key techniques to consider when laying out the board are:

- Keep the FB resistor divider network away from the noisy high current path of the inductor
- Connect a high frequency decoupling capacitor to V_{IN}
- Keep the SS capacitor and compensation network away from the noisy high current path of the inductor

3.1 ISL78219EV1Z Evaluation Board

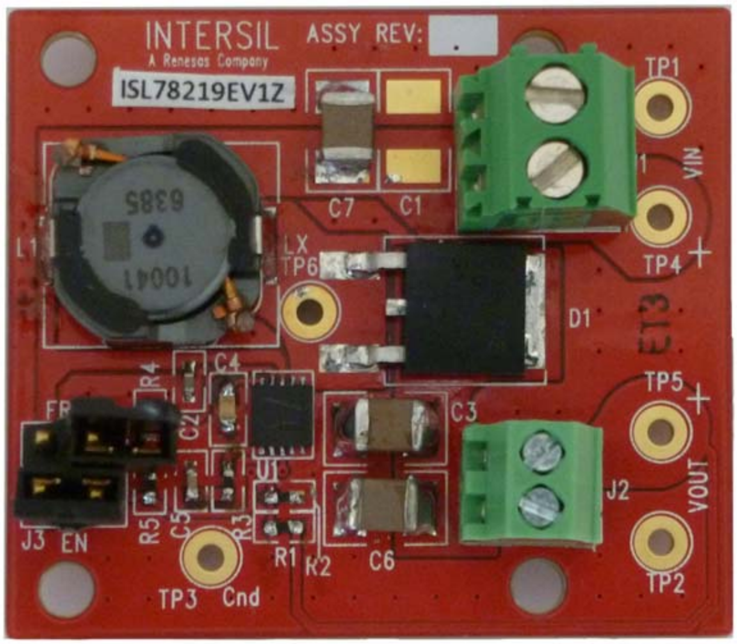

Figure 2. ISL78219EV1Z Evaluation Board (Top)

3.2 ISL78219EV1Z Circuit Schematic

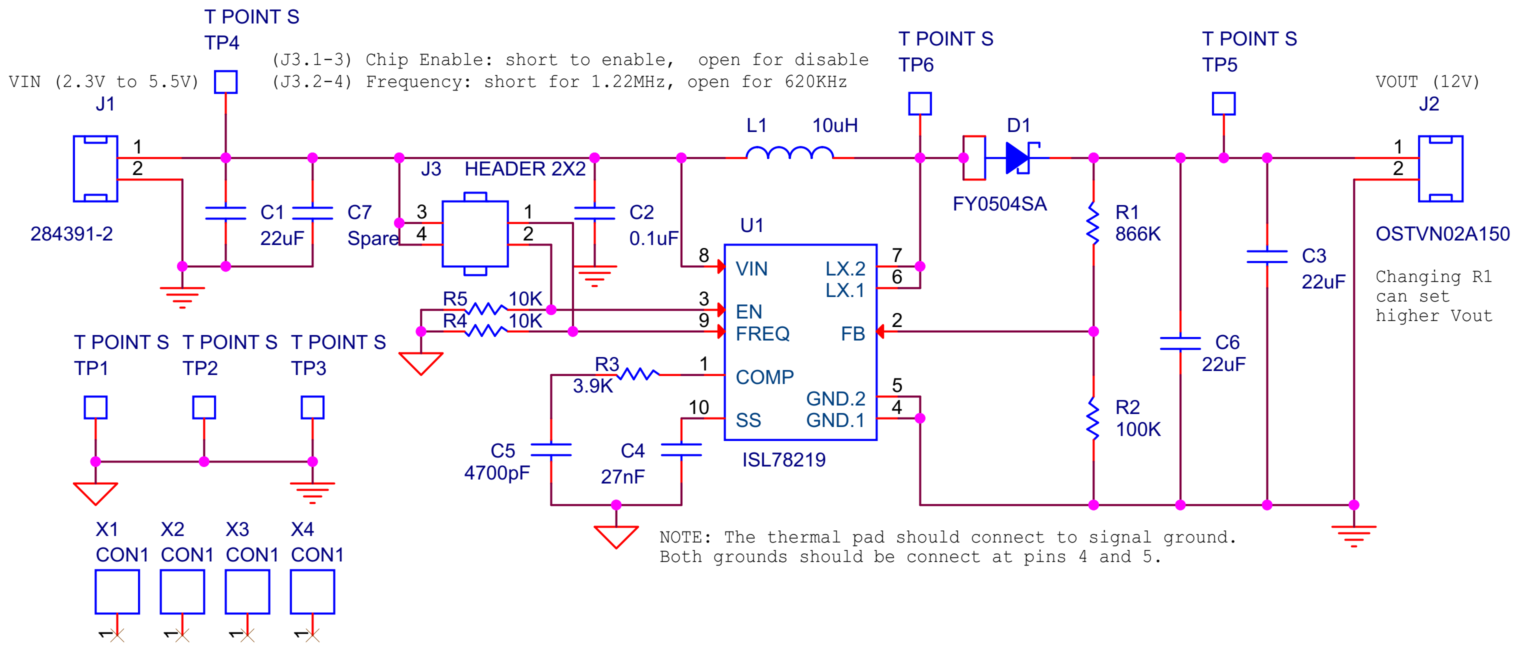

Figure 3. Schematic

3.3 Bill of Materials

Table 3. ISL78219EV1Z Bill of Materials (BOM)

Qty	Reference Designator	Part Description	PCB Footprint	Manufacturer	Manufacturer Part Number
1	C4	CAP CER 0.027µF 50V X7R	0603	AVX Corp.	06035C273K4T2A
1	C5	CAP CER 4700PF 50V X7R	0402	TDK	CGA2B2X7R1H472K050BA
1	C2	CAP CER 0.1µF 16V X7R	0402	TDK	CGA2B1X7R1C104K050BC
1	R1	866kΩ ±1% 0.1W, 1/10W Chip Resistor Automotive AEC-Q200 Thick Film	0402	Panasonic Electronics	ERJ-2RKF8863X
	R3	100kΩ ±1% 0.1W, 1/10W Chip Resistor Automotive AEC-Q200 Thick Film	0402	Panasonic Electronics	ERJ-2RKF1003X
2	R4, R5	10kΩ ±1% 0.1W, 1/10W Chip Resistor Automotive AEC-Q200 Thick Film	0402	Panasonic Electronics	ERJ-2RKF1002X
1	R3	3.9kΩ ±1% 0.1W, 1/10W Chip Resistor Automotive AEC-Q200 Thick Film	0402	Panasonic Electronics	ERJ-2RKF3901X
3	C1, C3, C6	CAP CER 22µF 16V X5R 1206	1210	Murata Electronics	GRM31CR61C226KE15L
1	L1	10µH Shielded Wire wound Inductor 5.8A 20.4mΩ	CLF10060	TDK	CLF10060NID-100M-D
1	U1	Boost Converter IC	TDFN-10	Renesas	ISL78219
0	C7	CAP (Not populated)	1210		
1	J2	2 Positions Wire to Board Terminal Block Horizontal with Board	0.100" (2.54mm) Through Hole	On Shore Technology	OSTVN02A150
1	D1	DIODE SCHOTTKY 40V, 5A	DPAK	Fairchild	FYD0504SATM
1	J3	Header 2x2 100mil pitch	Header 2x2		
2		Shunt Block			
1	J1	2 Position Wire to Board Terminal Block Horizontal	0.138” (3.5mm) Through-Hole	TE Connectivity AMP Connectors	284391-2

3.4 Board Layout

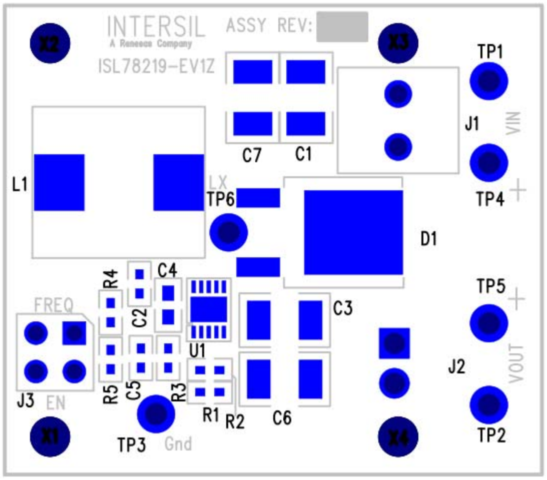

Figure 4. Top Layer Silk Screen

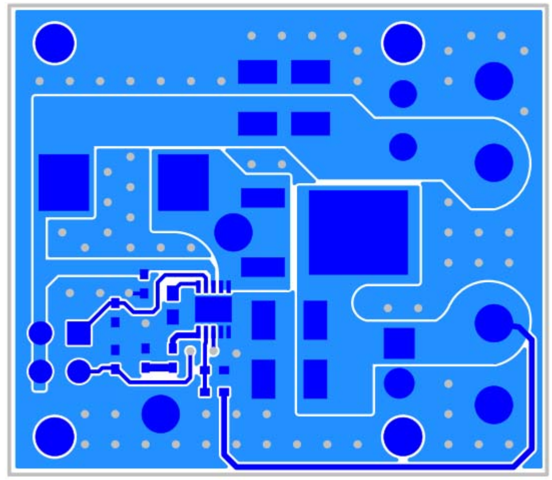

Figure 5. Top Layer

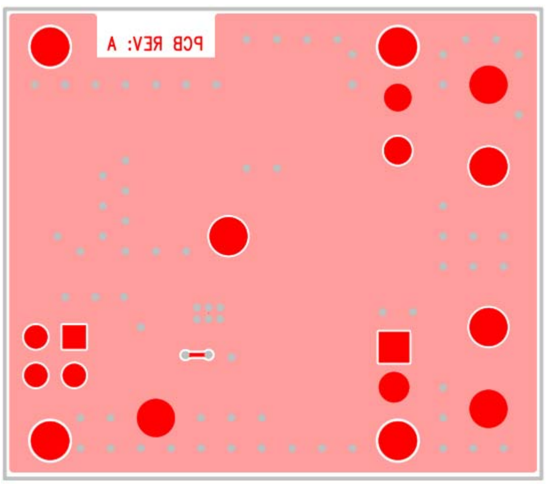

Figure 6. Bottom Layer

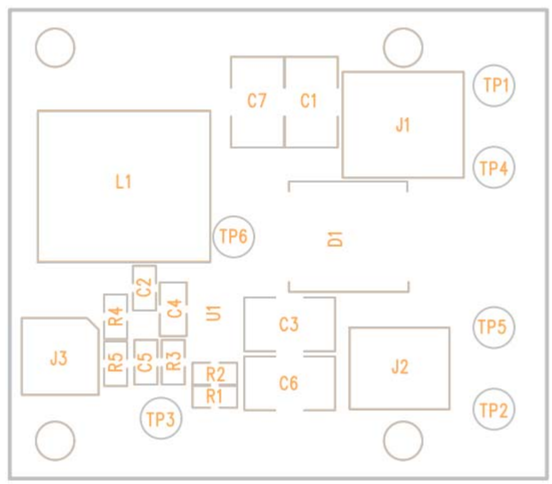

Figure 7. Bottom Layer Silkscreen

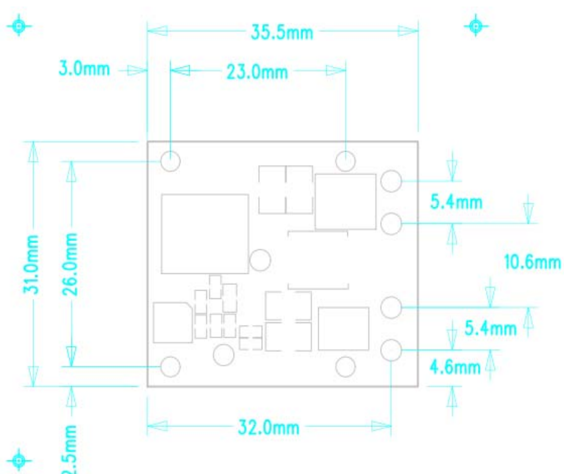

Figure 8. Eval Board Mechanical Dimension

4. Typical Performance Curve

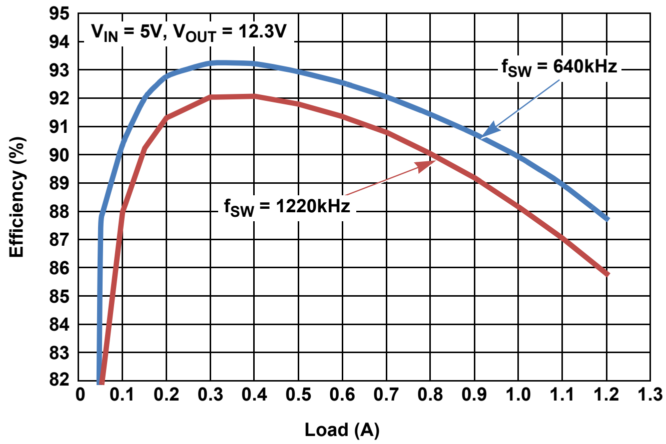

Figure 9. V_{OUT} = 12.3V Efficiency

5. Revision History

Rev.	Date	Description
0.00	Mar 12, 2018	Initial release

SALES OFFICES Renesas Electronics Corporation http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

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