EG3112 Datasheet

Half-Bridge Driver

REV 1.0

Contents

EG3112 Datasheet V1.0

1. Features

- Floating high side driver in bootstrap operation to +600V
- Adapting 5V and 3.3V input voltage on all input pins
- Maximum switching frequency is up to 500KHZ
- Operation supply range is from 2.8V to 20V
- 1000mA source/1500mA sink output current capability
- Internal fixed dead time of 100nS
- Cross-conduction prevention logic
- High side output in phase with HIN input
- Low side output in phase with LIN input
- Minimal peripheral components
- Low quiescent current：5uA, suitable for battery application
- Package：SOP8

2. General Description

The EG3112 is a cost effective half-bridge driver IC designed for N-channel MOSFETs and IGBTs.

The EG3112 includes a combined logic inputs for low and high-side drives, fixed dead time to protect FETs , cross-conduction prevention logic, high voltage level shifter, noise filter enhanced immunity, and provide high current capability for external N-channel MOSFETs, application for brushless motor drives.

The bootstrap operation voltage of EG3112 is up to 600VDC, the operation voltage of Vcc is between 2.8V to 20V, and quiescent supply current is only 5uA. Build in simultaneous conduction lockout protection, and build in pull down resistors of 200K on all the input pins (HIN, LIN), when input pins are floating, the outputs of HO and LO are held to low, the structure of high current Darlington is used in output stage, the output current capability is up to 1000mA source and 1500mA sink, the EG3112 is available in a SOP8 package.

3. Applications

- Fast charging portable battery charger
- Brushless pump controller
- 600V synchronous Buck converter
- E-bike controller
- BLDC Motor driver
- Class D power amplifies

4. Device Information

4.1. Pin map

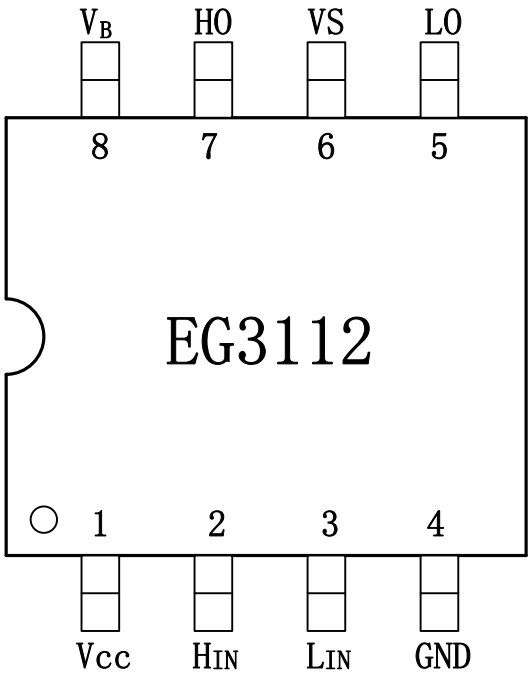


Figure 4-1. EG3112 pin map

4.2. Pin Functions

Designator	Name	I/O	Descriptions
1	Vcc	Power	Supply voltage
2	HIN	I	Logic input for high side gate driver output, in phase
3	LIN	I	Logic input for low side gate driver output, in phase
4	GND	GND	Ground
5	LO	O	Output gate driver for low side MOSFET
6	VS	O	High side bootstrap return
7	HO	O	Output gate driver for high side MOSFET
8	VB	Power	Bootstrap supply voltage

5. Block Diagram

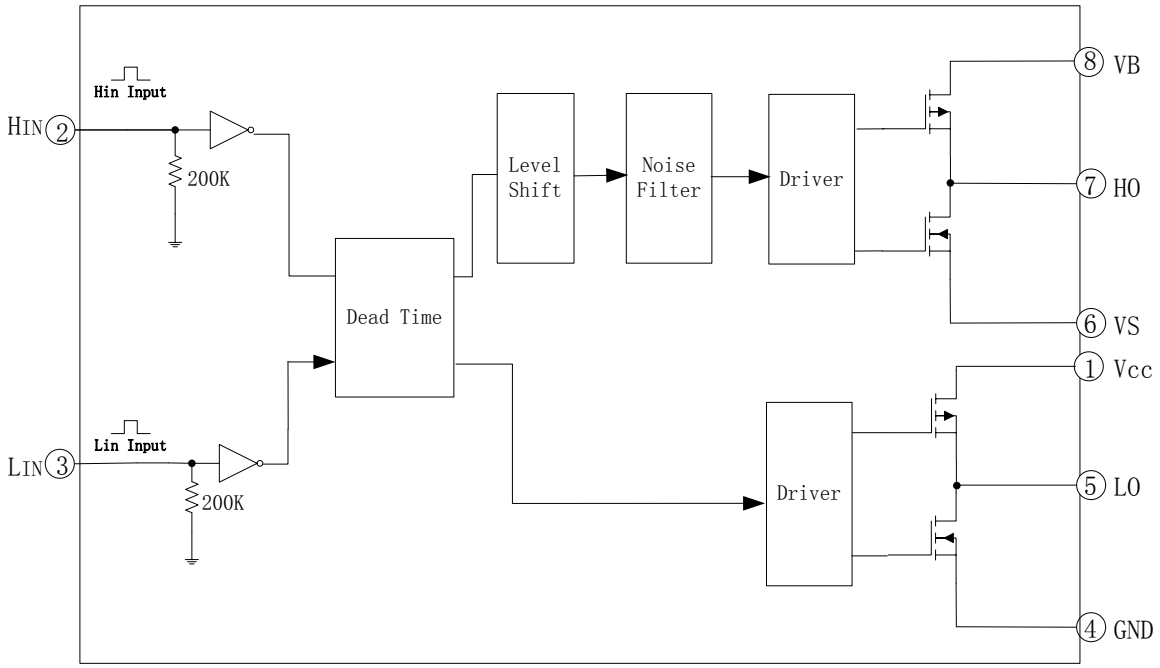


Fig 5-1. EG3112 block diagram

6. Application Schematics

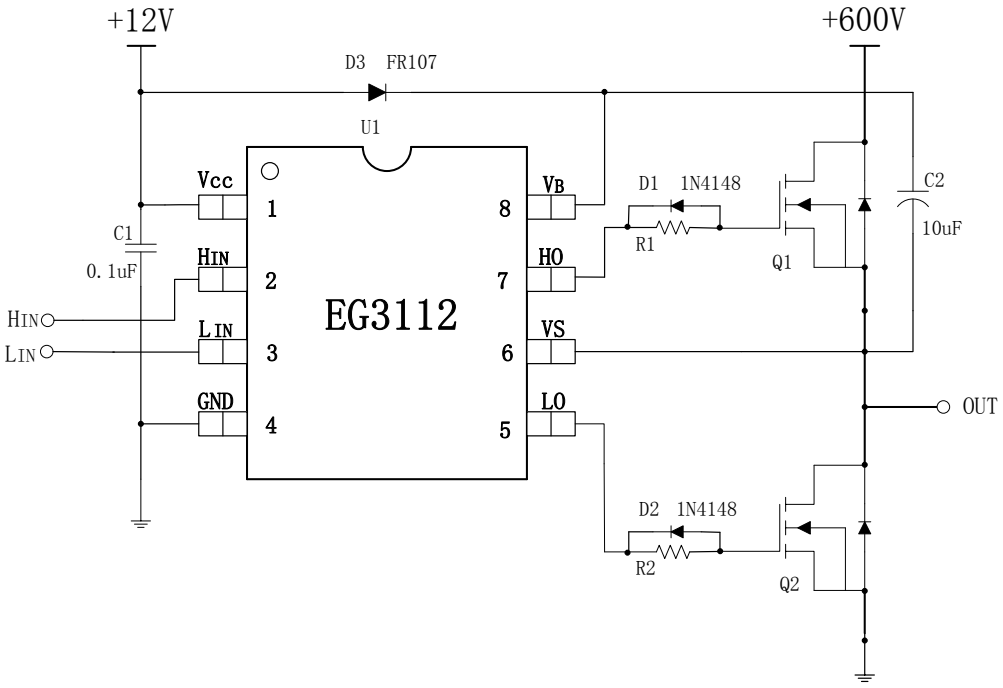


Fig 6-1. EG3112 typical application schematic

7. Electrical Characteristics

7.1 Absolute maximum ratings

TA=25℃ unless otherwise specified

Symbol	Parameter	Conditions	Min	Max	Unit
VB	Bootstrap supply	-	-0.3	600	V
VS	Bootstrap return	-	VB-20	VB+0.3	V
HO	High side drive output	-	VS-0.3	VB+0.3	V
LO	Low side drive output	-	-0.3	20	V
VCC	Supply voltage	-	-0.3	20	V
HIN	High side input	-	-0.3	20	V
LIN	Low side input	-	-0.3	20	V
TA	Ambient temperature	-	-45	125	℃
Tstr	Storage temperature	-	-55	150	℃
TL	Lead temperature	T=10S	-	300	℃

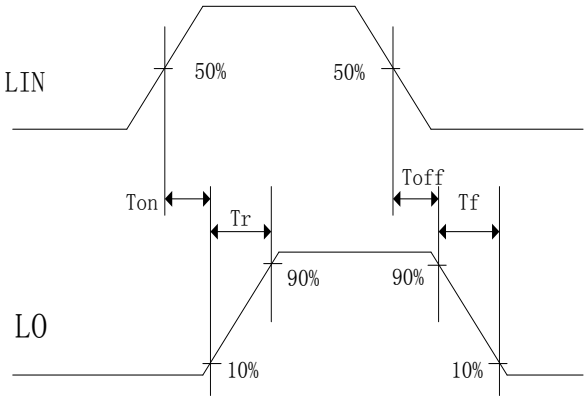
Note：Exceeding extreme conditions may permanently damage the chip. EG3112's reliability may be affected running at the extreme conditions for a long time.

7.2 Recommended operating conditions

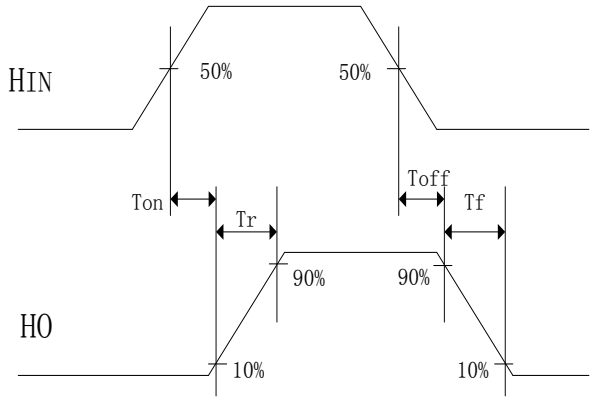
TA=25℃,Vcc=12V, CL=10nF,unless otherwise specified

Parameter	Symbol	Conditions	Min	TYP	Max	Unit
Supply voltage	Vcc	-	2.8	12	20	V
Quiescent current	Icc	All input pins is floating，Vcc=12V	-	-	5	uA
Logic “1” input voltage	Vin(H)	HIN & LIN	2.5	-	-	V
Logic “0” input voltage	Vin(L)	HIN & LIN	-0.3	0	1.0	V
Logic “1” input bias current	Iin(H)	Vin=5V	-	-	20	uA
Logic “0” input bias current	Iin(L)	Vin=0V	-20	-	-	uA
Switching time characteristics for LO						
Turn on propagation delay	Ton	See the Figure7-1	-	280	400	nS
Turn off propagation delay	Toff	See the Figure7-1	-	125	300	nS
Turn on rise time	Tr	See the Figure7-1	-	120	200	nS
Turn off fall time	Tf	See the Figure7-1	-	80	100	nS
Switching time characteristics for HO						
Turn on propagation delay	Ton	See the Figure7-2	-	250	400	nS
Turn off propagation delay	Toff	See the Figure7-2	-	180	400	nS
Turn on rise time	Tr	See the Figure7-2	-	120	200	nS
Turn off fall time	Tf	See the Figure7-2	-	80	100	nS
Dead time						
Dead time	DT	See the Figure7-3, and CL=0	50	100	300	nS
Drive Capability						
Output high short circuit pulsed current	IO+	Vo=0V,VIN=VIH PW≤10uS	0.8	1	-	A
Output low short circuit pulsed current	IO-	Vo=15V,VIN=VIL PW≤10uS	1.2	1.5	-	A

7.3 Timing Diagram



Figrue7-1. Switching time waveform definitions of LO



Figrue7-2. Switching time waveform definitions of HO

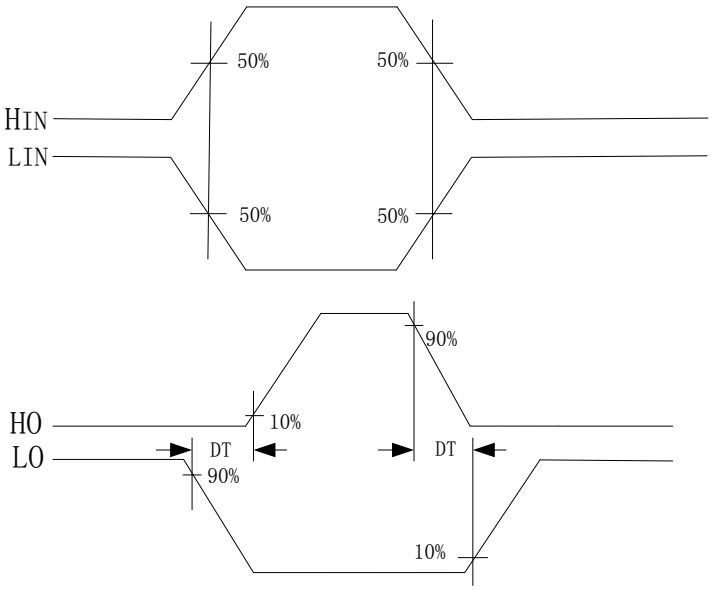


Figure7-3. Dead time waveform definitions

8. Function Description

8.1 Supply voltage

When choosing different type MOSFET, needs to choose different gate voltage supply, the recommended VCC operating voltage of EG3112 is between 10V to 15V for high threshold power MOSFET, for low threshold power MOSFET, the recommended VCC operating voltage is between 2.8V to 10V.

8.2 Input stage and Output stage

The EG3112 includes a combined logic inputs, dead time, under voltage lockout, high voltage level shifter, bootstrap circuit, high current Darlington output stage. the input pins of EG3112 features typical high threshold of 2.5V and typical low threshold of 1.0V,the input pins are conveniently drive with logic level PWM control signals from MCU controller device.

Each output stage in EG3112 is capable of supplying 1.0A peak source and 1.5A peak sink current, floating high side driver in bootstrap operation is up to 600VDC.

The EG3112 features excellent propagation delay between input and output. In low side driver, with 280nS turn on propagation delay is over LIN to LO, with 125ns turn off propagation delay is over LIN to LO. In high side driver, with 250ns turn on propagation delay is over HIN to HO, with 50ns turn off propagation delay is over HIN to HO.

Input/Output Logic Relationship as shown in Figure 8-2：

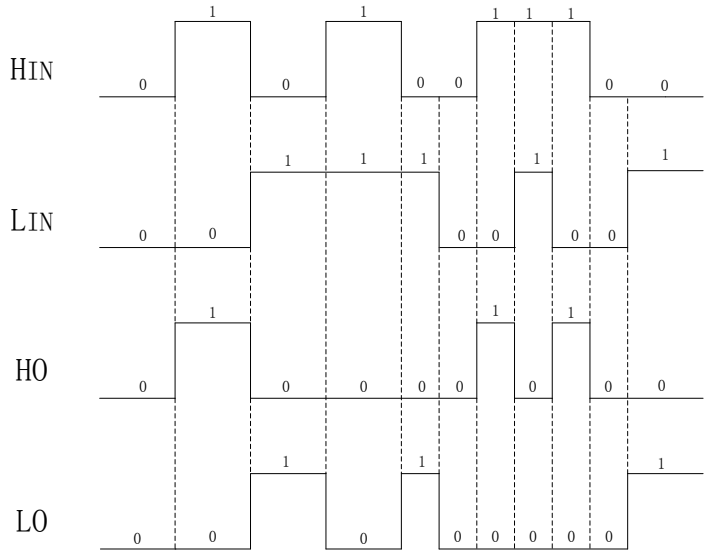


Figure 8-2. Input/Output logic relationship

Input/Output Logic Table：

Input		Output	
HIN(Pin4）	LIN（Pin3）	HO(Pin7）	LO（Pin5）
0	**0**	0	0
0	1	0	1
1	0	1	0
1	**1**	0	0

From above logic table view, Case A: when HIN goes high and LIN goes low, HO will output high to turn on high side MOSFET and LO will output low to turn off low side MOSFET. Case B: when HIN goes low and LIN goes high, HO will output low to turn off high side MOSFET and LO will output high to turn on low side MOSFET. Case C: when both of HIN and LIN are low or high at the same time, the interlock and dead time functions prevent both outputs from being turned on simultaneously.

8.3 Bootstrap

The EG3112 uses a bootstrap structure, which has the advantage of being simply and low cost. The Figure 8-3 will help to understand the operation of bootstrap circuit. The voltage at VCC forces current through the internal bootstrap diode or external bootstrap diode, bootstrap capacitor and low side MOSFET, which will charge the bootstrap capacitor to prepare it for driving the high side MOSFET.

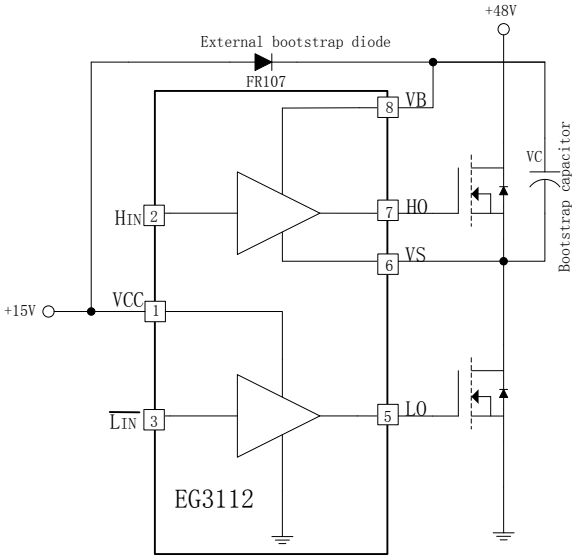


Figure 8-3. EG3112 Bootstrap circuit structure

9. Package Information

9.1 SOP8 Dimension