DESCRIPTION

The SS6208 integrates a single Phase MOSFET driver, high side MOSFET and low side MOSFET into a 3mm*3mm 8-pins DFN package. The SS6208 integrated solution greatly reduces the package parasitic effect and board space compared to a discrete component solution.

The driver and MOSFETs have been optimized for half-bridge applications. With a wide operating voltage range, the driver voltage of high or low side MOSFET gate can be optimized for the best efficiency. Internal adaptive non-overlap circuit further reduces switching losses by preventing simultaneous conduction of both MOSFETs.

The UVLO circuits prevent malfunction when VCC is lower than the specified threshold voltage. PIN EN designed for standby mode can be used to enable chip into low quiescent current state and get long battery life time.

APPLICATIONS

- Wireless charger for 5W to 20W systems
- Half-bridge application
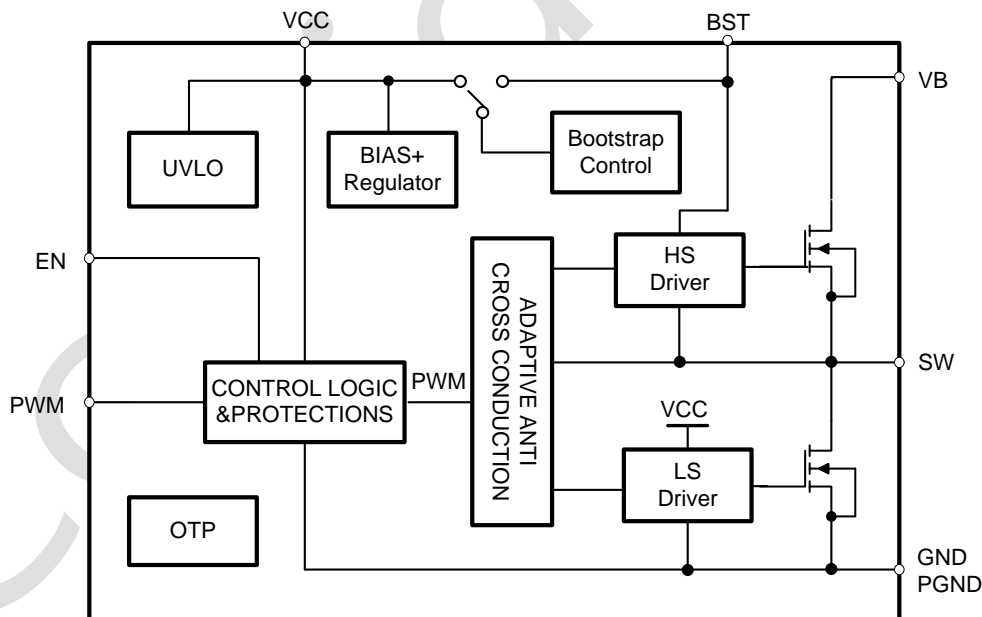
FEATURES

- Max Rated Continuous Current 4A, Peak 8A
- Bootstrapped High-Side Drive
- High/Low Side MOSFET integrated
- High-Frequency Operation (Up to 1MHz)
- PWM Input Compatible of 3.3V and 5V
- Internal Bootstrap Diode
- Under Voltage Lockout
- Internal Thermal Shutdown
- Adaptive shoot through protection
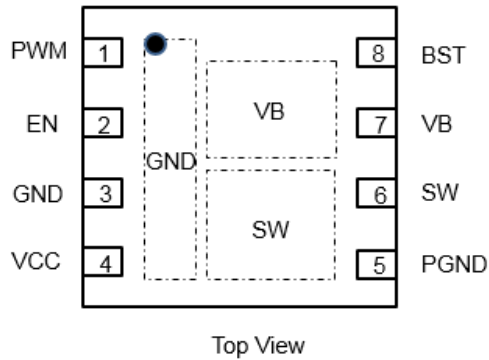- Small package：DFN3*3, 8pins
- These are Pb-Free Devices

BLOCK DIAGRAM

APPLICATION CIRCUIT
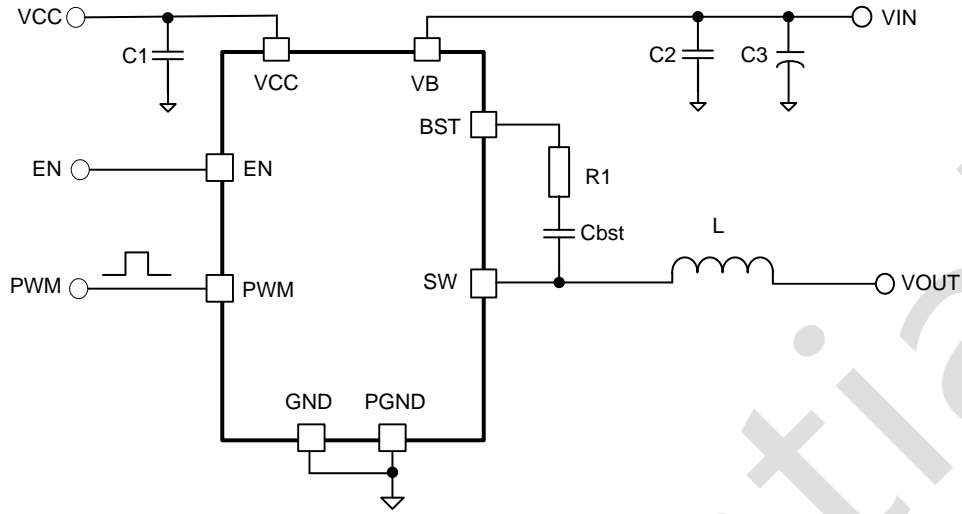
TRUTH TABLE

EN	PWM	SW
L	-	L
H	L	L
H	H	H

PIN CONFIGURATION

Top View

PIN DESCRIPTION

Pin Name	Description	Pin No.
PWM	PWM drive logic	1
EN	Logic input for standby mode control	2
GND	Control signal ground	3, Exposed-pad1
VCC	Logic and low-side gate drivers power supply voltage	4
PGND	Power ground	5
SW	Switch node output	6, Exposed-pad2
VB	Input voltage	7, Exposed-pad3
BST	Bootstrap voltage	8

ORDER INFORMATION

Valid Part Number	Package Type	Top Code
SS6208	8 Pins, DFN, 3*3mil	SS6208

ABSOLUTE MAXIMUM RATINGS

Stresses exceeding the absolute maximum ratings may damage the device or make the function abnormal. All the voltage parameters are absolute voltages referenced to IC PGND unless otherwise stated in the table.

Parameter	Symbol	Min.	Max.	Units
Logic & low-side supply voltage	VCC	-0.3	6.5	V
Power Input voltage	VB	-0.3	13	
Bootstrap voltage	BST	-0.3V	20V	
Switch node output	SW	-	V_B+0.3	
Logic input voltage	PWM	-0.3	6.5	
Output Enable	EN	-0.3	6.5	
Thermal resistance, junction to ambient [1]	Rth$_{JA}$	-	TBD	°C /W
Operating Junction temperature	T$_J$	-40	+150	°C
Storage temperature	T$_S$	-40	+150	°C
Soldering lead temperature (duration 10s)	TL	-	260	°C

Note1: Rth$_{JA}$ are only guaranteed by design.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Units
Logic & low-side supply voltage	VCC	3.3	-	5.5	V
Power Input voltage	VB	3.3	-	12	
Logic input voltage	PWM/EN	0	-	5	
Operating Junction temperature	T$_J$	-30	-	+85	°C

ELECTRICAL CHARACTERISTICS

VCC=VB=5V, Ambient temperature T_A=25°C, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
VCC Power Supply						
Quiescent VCC supply current in standby mode	I_{QVCC1}			110		µA
VCC supply under-voltage positive going threshold	V_{CCUV+}	-	2.0	2.2	2.6	V
VCC supply under-voltage lockout hysteresis	V_{CCHYS}	-	-	0.2	-	V
PWM Input						
PWM input voltage high	V_{IH}	-	2.5	-	-	V
PWM input voltage low	V_{IL}	-	-	-	0.8	V
Output disable hysteresis	V_{PWMHYS}	-	-	300	-	mV
EN Input						
Output disable input voltage high	V_{IH}	-	2.5	-	-	V
Output disable input voltage low	V_{IL}	-	-	-	0.8	V
Output disable hysteresis	V_{ENHYS}	-	-	300	-	mV
Thermal Shutdown						
Thermal shutdown temperature	-	-	-	170	-	°C
Thermal shutdown hysteresis	-	-	-	25	-	°C
Driver						
High side resistance	R_{DSH}	BST-SW=5V, Ids=1A	-	-	-	mΩ
Low side resistance	R_{DSL}	VCC=5V, Ids=1A	-	-	-	mΩ

APPLICATIONINFORMATION

Theory of Operation
The SS6208 is an integrated driver and MOSFET module for half-bridge application. A single PWM input signal is all that is required to properly drive the high−side and low−side MOSFETs.

Low-Side Driver and MOSFET
The low-side driver is integrated to drive a ground−referenced low R_{DS}(on) N-Channel MOSFET. The voltage rail for the low-side driver is internally connected to VCC and PGND.

High−Side Driver and MOSFET
The high−side driver is integrated to drive a floating low R_{DS}(on) N-channel MOSFET. The gate voltage for the high side driver is developed by a bootstrap circuit referenced to Switch Node (SW) pin.

The bootstrap circuit is comprised of the internal diode and an external bootstrap capacitor. When the SS6208 is starting up, the SW pin is at ground, so the bootstrap capacitor will charge up to VCC through the bootstrap diode. When the PWM input goes high, the high−side driver will begin to turn on the high−side MOSFET using the stored charge of the bootstrap capacitor. As the high-side MOSFET turns on, the SW pin will rise.

The bootstrap capacitor is recharged when the switch node goes low during the next cycle.

Safety Timer and Overlap Protection Circuit
It is very important that MOSFETs in a half-bridge application do not both conduct at the same time. Excessive shoot-through or cross conduction can damage the MOSFETs, and even a small amount of cross conduction will cause a decrease in the power conversion efficiency.

The SS6208 prevents cross conduction by monitoring the status of the MOSFETs and applying the appropriate amount of "dead−time" or the time between the turn off of one MOSFET and the turn on of the other MOSFET.

When the PWM input pin goes high, the gate of the low-side MOSFET will go low after a propagation delay. The time it takes for the low-side MOSFET to turn off is dependent on the total charge on the low-side MOSFET gate. The SS6208 monitors the gate voltage of both MOSFETs and the switch node voltage to determine the conduction status of the MOSFETs. Once the low-side MOSFET is turned off an internal timer will delay the turn on of the high-side MOSFET.

Likewise, when the PWM input pin goes low, the gate of the high-side MOSFET will go low after the propagation delay. The time to turn off the high-side MOSFET is dependent on the total gate charge of the high-side MOSFET. A timer will be triggered once the high-side MOSFET has stopped conducting, to delay the turn on of the low-side MOSFET.

Thermal Shutdown
If the driver temperature exceeds 170°C, the part will enter thermal shutdown and turn off both MOSFETs. Once the temperature falls below 150°C, the part will resume normal operation.

Power Supply Decoupling
The SS6208 can source and sink relatively large current to the gate pins of the MOSFETs. In order to maintain a constant and stable supply voltage (VCC) a low ESR capacitor should be placed near the power and ground pins. A 1uF to 4.7uF multilayer ceramic capacitor (MLCC) is usually sufficient.

Bootstrap Circuit
The bootstrap circuit uses a charge storage capacitor (C_{BST}). The bootstrap capacitor must have a voltage rating that is able to withstand twice the maximum supply voltage. A minimum 16V rating is recommended. A bootstrap capacitance greater than 680nF and a minimum 16V rating are recommended. A good quality ceramic capacitor should be used.

PACKAGE INFORMATION

8PINS, DFNWB3X3-8L-NB(P0.65T0.75)

DFNWB3×3-8L-NB(P0.65T0.75) PACKAGE OUTLINE DIMENSIONS

TOP VIEW

BOTTOM VIEW

SIDE VIEW
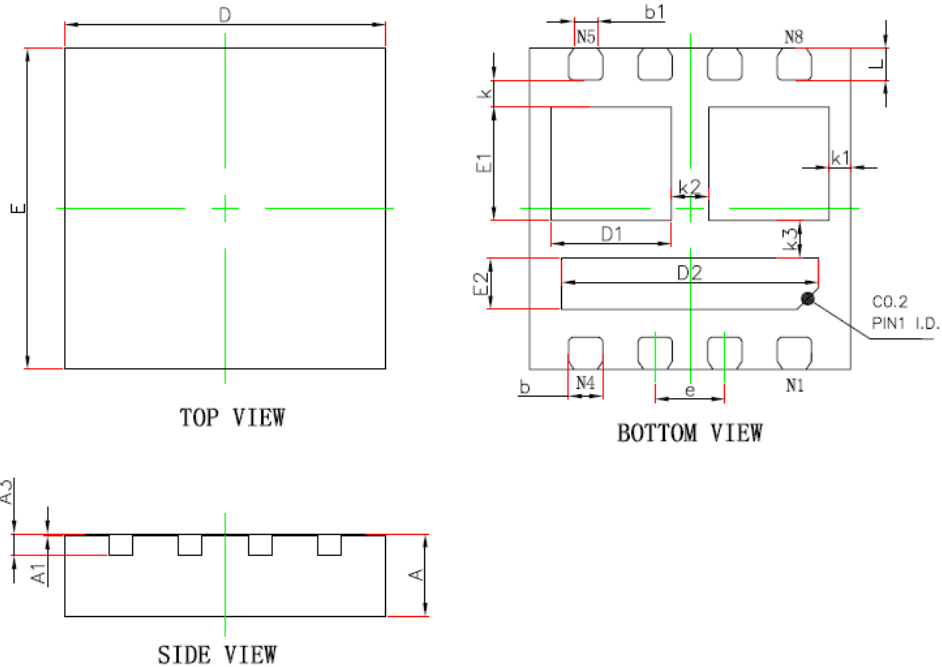
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
D1	1.025	1.225	0.040	0.048
E1	0.960	1.160	0.038	0.046
D2	2.300	2.500	0.091	0.098
E2	0.380	0.580	0.015	0.023
b	0.270	0.370	0.011	0.015
b1	0.220REF.		0.009REF.	
e	0.650BSC.		0.026BSC.	
k	0.260REF.		0.010REF.	
k1	0.200REF.		0.008REF.	
k2	0.350REF.		0.014REF.	
k3	0.350REF.		0.014REF.	
L	0.250	0.350	0.010	0.014

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