

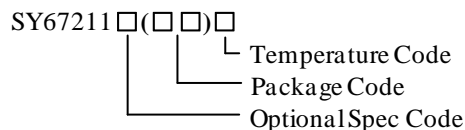


### General Description

The SY67211 is a dual H-bridge motor driver solution for DC brush motors, bipolar stepper motors, solenoids, or other inductive loads. The highly integrated H-bridge driver block consists of two H-bridges with internal logic control, gate driver, over current protection and charge pump circuit.

The SY67211 provides complete protection functions with a fault output pin for over current protection, short circuit protection and thermal shutdown. A low-power standby mode is also provided. The device is packaged in a 10-pin SSOP package.

### Ordering Information



Ordering Number	Package type	Note
SY67211FHC	SSOP10	

### Features

- Power Supply Voltage Range from 2.5V to 16V
- Maximum Drive Current of 800mA RMS Current for Each H-bridge
- Dual H-bridge Motor Driver
- Internal Over Current Protection, Short Circuit Protection, Under Voltage Lockout and Thermal Shutdown
- Low-power Standby Mode
- SSOP10 Package

### Applications

- Refrigerators
- Stepper Motors

### Typical Application

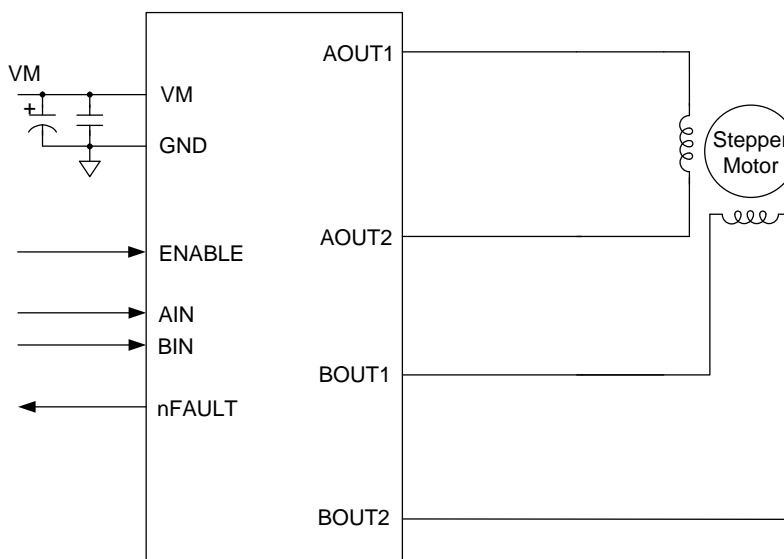
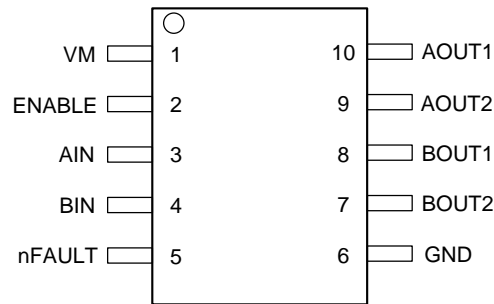


Figure.1 Typical Application Circuit

## Pinout (top view)



(SSOP10)

Top Mark: **BXG**xyz (device code: BXG, x=year code, y=week code, z=lot number code)

Pin Name	Pin Number	Pin Description
VM	1	Motor power supply pin. Decouple this pin to GND pin with at least 100nF ceramic capacitor and sufficient electrical capacitor.
ENABLE	2	Internal logic enable pin. High level voltage enables the IC, and low level voltage disables the logic, the IC will enter standby mode.
AIN	3	Bridge A input pin. Control the state of bridge A. This pin has an internal pull-down resistor.
BIN	4	Bridge B input pin. Control the state of bridge B. This pin has an internal pull-down resistor.
nFAULT	5	Fault state output pin. Logic low if fault is detected.
GND	6	Device ground pin.
BOUT2	7	Bridge B output 2 pin. Connect this pin to motor winding.
BOUT1	8	Bridge B output 1 pin. Connect this pin to motor winding.
AOUT2	9	Bridge A output 2 pin. Connect this pin to motor winding.
AOUT1	10	Bridge A output 1 pin. Connect this pin to motor winding.

## Block Diagram

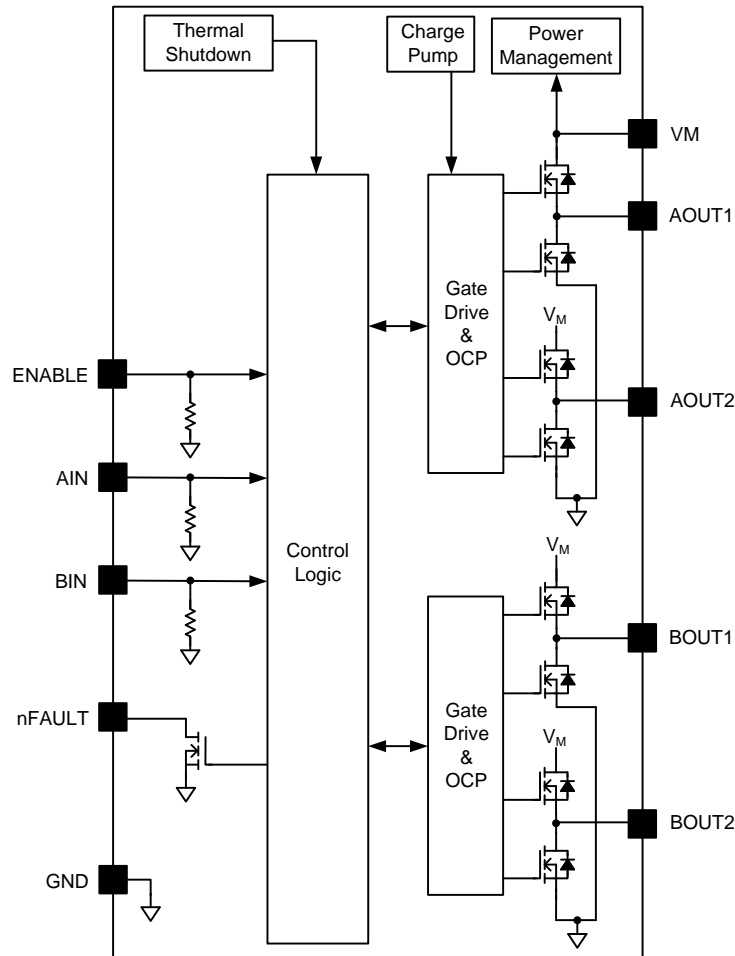


Figure.2 Block Diagram

### Absolute Maximum Ratings (Note 1)

VM, xOUT1, xOUT2, nFAULT	-----	-0.3V to 20V
AIN, BIN, ENABLE	-----	-0.3V to 20V
Junction Temperature (T <sub>J</sub> )	-----	-40°C to 150°C
Storage Temperature	-----	-65°C to 150°C
SSOP10 Package Thermal Resistance		
θ <sub>JA</sub> (Note 2)	-----	107°C/W
θ <sub>JTOP</sub> (Note 2)	-----	27°C/W

### Recommended Operating Conditions (Note 3)

VM, xOUT1, xOUT2, nFAULT	-----	2.5V to 16V
AIN, BIN, ENABLE	-----	-0.1V to 5V
H-Bridge Output RMS Current (Note3)	-----	less than 800mA
Junction Temperature Range	-----	-40°C to 125°C
Ambient Temperature Range	-----	-40°C to 85°C

## Electrical Characteristics

(T<sub>A</sub> = 25°C, V<sub>M</sub>=12V, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Power Supply</b>						
V <sub>M</sub> Operating Supply Current	I <sub>VM</sub>	V <sub>M</sub> =12V, AIN=BIN=L, ENABLE=H		3	4	mA
V <sub>M</sub> Standby Mode Current	I <sub>VMS</sub>	V <sub>M</sub> =12V, ENABLE=L			0.1	μA
V <sub>M</sub> Under Voltage Lockout Voltage	V <sub>UVLO_RISE</sub>	V <sub>M</sub> rising		2.3		V
	V <sub>UVLO_FALL</sub>	V <sub>M</sub> falling		2.2		V
<b>Logic Level Input</b>						
Input Low Voltage	V <sub>IL</sub>	ENABLE, AIN, BIN			0.7	V
Input High Voltage	V <sub>IH</sub>	ENABLE, AIN, BIN	1.8			V
Input Low Current	I <sub>IL</sub>	V <sub>IN</sub> =0V			1	μA
Input High Current	I <sub>IH</sub>	V <sub>IN</sub> =5V		75	100	μA
Input Deglitch Time	t <sub>DEG</sub>	(Note 4)	400			ns
<b>nFAULT Output (Open-drain Output)</b>						
Output Low Voltage	V <sub>OL</sub>	I <sub>O</sub> =5mA			0.5	V
Output High Leakage Current	I <sub>OH</sub>	V <sub>O</sub> =3.3V			1	μA
<b>H-bridge MOSFETs</b>						
High Side MOSFETs On Resistance	R <sub>DS(ON)</sub>			310	370	mΩ
Low Side MOSFETs On Resistance				330	430	
Off-State Leakage Current	I <sub>OFF</sub>	V <sub>M</sub> =12V, V <sub>OUT</sub> =0V, T <sub>J</sub> =25°C	-1		1	μA
<b>Motor Driver</b>						
Rise Time	t <sub>R</sub>	V <sub>M</sub> =12V, 16Ω to GND, 10% to 90%		250		ns
Fall Time	t <sub>F</sub>	V <sub>M</sub> , (Note 4)		200		ns
Propagation Delay IN <sub>x</sub> to OUT <sub>x</sub>	t <sub>PROP</sub>	V <sub>M</sub> =12V, (Note 4)	0.5			μs
<b>Protection</b>						
Output Over Current Limit	I <sub>OCP</sub>		0.8	1.1	1.4	A
Over Current Retry Time	t <sub>OCPR</sub>	(Note 4)		30		ms
Over Current Regulate Time	t <sub>REG</sub>	(Note 4)		100		μs
Thermal Shutdown Temperature	T <sub>SD</sub>	(Note 4)		160		°C
Thermal Shutdown Hysteresis	T <sub>HYS</sub>	(Note 4)		20		°C
<b>Standby Mode</b>						
Startup Time	t <sub>WAKE</sub>	ENABLE high to H-bridge on (Note 4)			100	μs

**Note 1:** Stresses beyond the above “Absolute Maximum Ratings” may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

**Note 2:** θ<sub>JA</sub>, θ<sub>JTOP</sub> are measured in the natural convection at T<sub>A</sub> = 25°C on a high effective four-layer thermal conductivity test board of JESD51-2 thermal measurement standard.

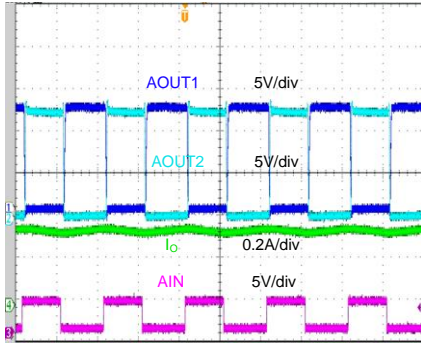
**Note 3:** Power dissipation and thermal limits must be observed.

**Note 4:** Guaranteed by design and sample tested at bench.

## Typical Performance Characteristics

### Forward

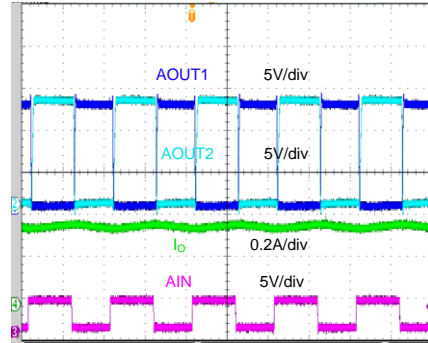
Operation Waveform  
(VM=12V I<sub>o</sub>=300mA AIN=PWM)



Time (10µs/div)

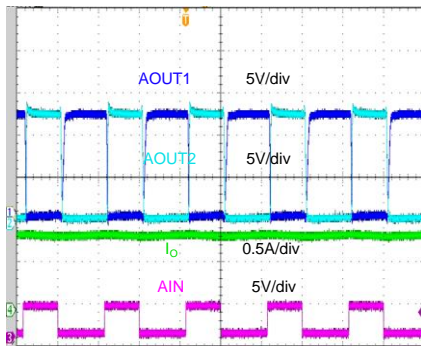
### Reverse

Operation Waveform  
(VM=12V I<sub>o</sub>=300mA AIN=PWM)



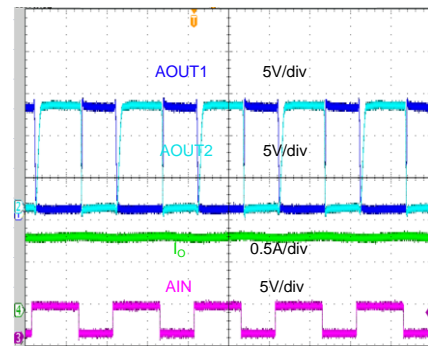
Time (10µs/div)

Operation Waveform  
(VM=12V I<sub>o</sub>=800mA AIN=PWM)



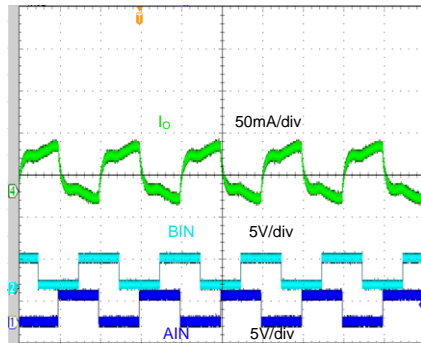
Time (10µs/div)

Operation Waveform  
(VM=12V I<sub>o</sub>=800mA AIN=PWM)



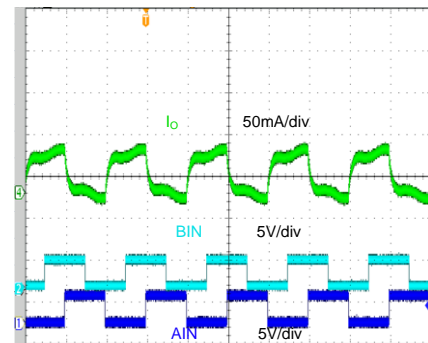
Time (10µs/div)

Operation Waveform  
(VM=12V AIN=PWM BIN=PWM)



Time (10ms/div)

Operation Waveform  
(VM=12V AIN=PWM BIN=PWM)



Time (10ms/div)

## Functional Description

### H-bridge Driving Control

The Bridge is controlled by a PWM input interface, the following table shows the control logic of the device:

Table 1 Control Logic

ENABLE	AIN	BIN	AOUT1	AOUT2	BOUT1	BOUT2	Function
0			OFF	OFF	OFF	OFF	Standby Mode
1	0		H	L			Channel A Forward
1	1		L	H			Channel A Reverse
1		0			H	L	Channel B Forward
1		1			L	H	Channel B Reverse

### Standby Mode

Driving the ENABLE pin low will put the device into a low power standby state. In this state, the H-bridges will be disabled, all internal logic will be reset, and all internal clocks will be stopped. All inputs will be ignored until ENABLE returns high. When returning from standby mode, some time needs to pass before the motor driver becoming fully operational.

### Protection Circuits

The device is fully protected against under voltage, over current and thermal shutdown.

#### Under Voltage Lockout (UVLO)

If at any time the voltage on the VM pin falls below the under voltage lockout threshold voltage, all the circuitry in the device will be disabled, and all internal logic will be reset. Operation will resume when VM rises above the UVLO threshold.

### Over Current Protection (OCP)

An analog current limit circuit on each FET limits the current through the FET. If this analog current limit persists for longer than the OCP regulation time, all FETs in the H-bridge will be disabled and the nFAULT pin will be driven low. The driver will be re-enabled after the OCP retry period ( $t_{OCPR}$ ) has passed, nFAULT becomes high again at this time. If the fault condition is still present, the cycle will repeat. If the fault is no longer present, the normal operation will resume. Please note that only the H-bridge in which the OCP is detected will be disabled while the other bridge will function normally.

### Thermal Shut Down (TSD)

If the die temperature exceeds the safe limits, all MOSFETs in both H-bridges are disabled. Once the die temperature is reduced to a safe level, the operation will automatically resume.

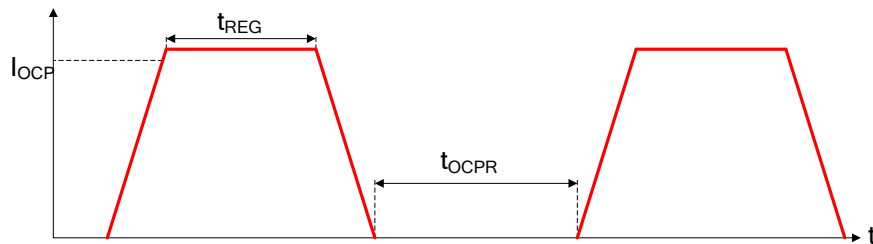
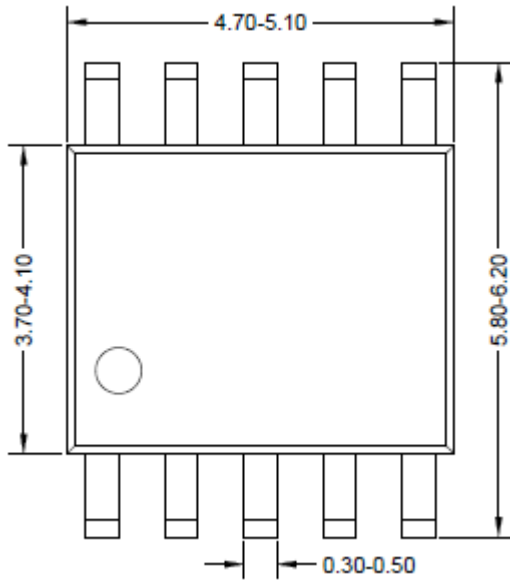
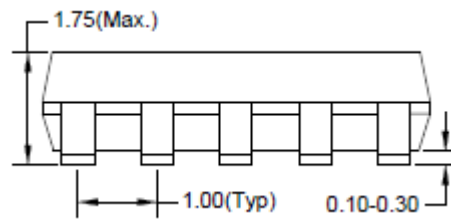


Figure.3 OCP Waveform

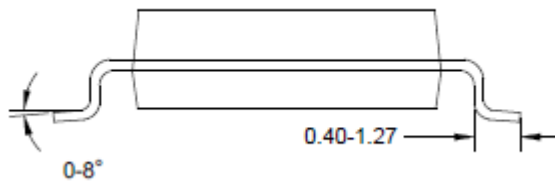
**SSOP10 Package Outline Drawing**



**Top view**



**Front view**

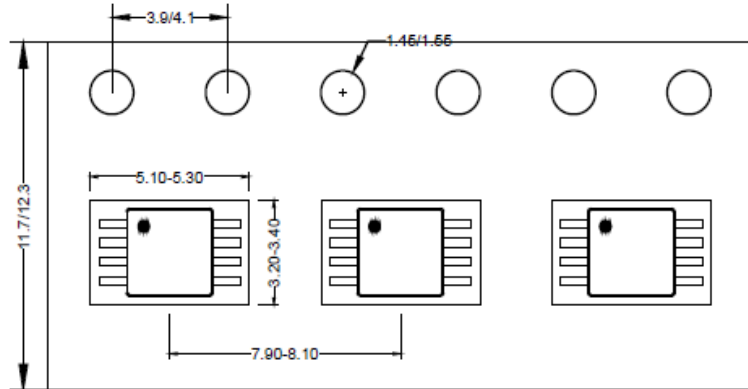


**Side view**

**Notes: All dimension in millimeter and exclude mold flash & metal burr.**

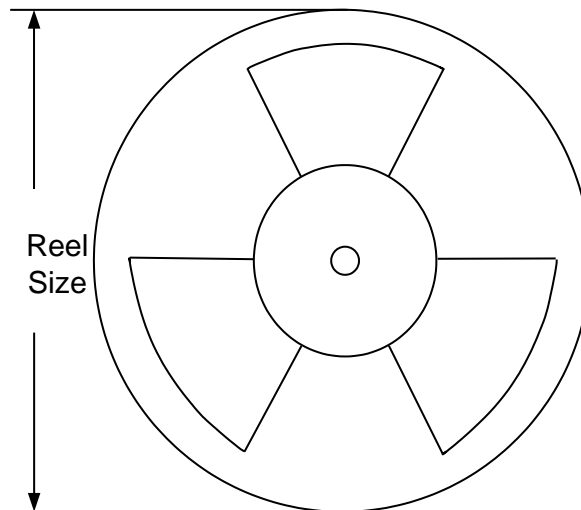
## Taping & Reel Specification

### 1. Taping orientation



Feeding direction →

### 2. Carrier Tape & Reel specification for packages



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel
SSOP10	12	8	13"	400	400	2500

### 3. Others: NA



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