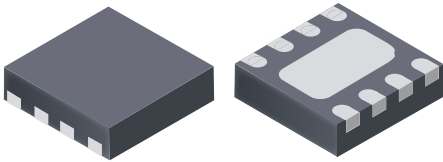


Dual Half Bridge Motor Driver

FEATURES AND BENEFITS

- Low $R_{DS(on)}$ outputs
- Standby mode with zero current drain
- Small 2×2 DFN package
- Crossover Current protection
- Thermal Shutdown protection

PACKAGE: 8-contact DFN with Exposed Thermal Pad (suffix EE)



Not to scale

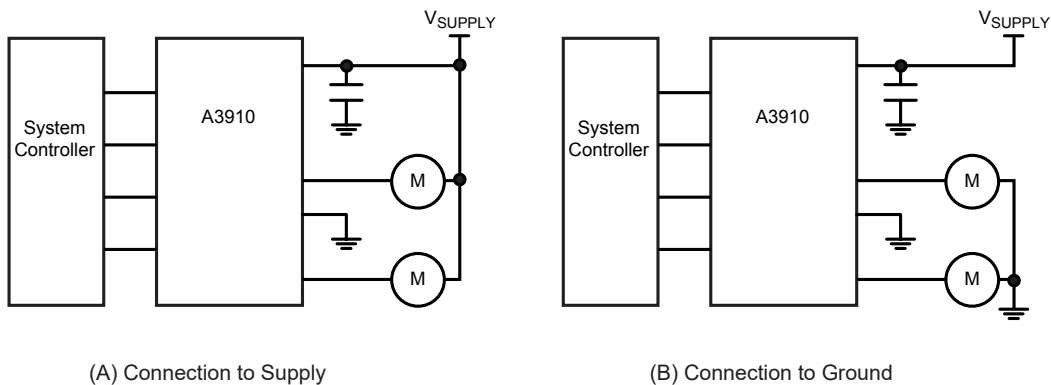
DESCRIPTION

The A3910 is a dual half bridge motor driver, designed for low cost, low voltage battery operated power applications. The outputs are rated for operation up to 500 mA.

Direct control of high- and low-side drivers is implemented to allow either high-side or low-side PWM. The motor can be connected to either supply or GND. Using a MOS switch results in improved braking action for the motor, compared to implementation with simple clamp diode.

The A3910 is supplied in a $2 \text{ mm} \times 2 \text{ mm}$ 8-contact DFN package (EE) with exposed thermal pad. The package is lead (Pb) free, with 100% matte tin leadframe plating.

Typical Application Diagram



Selection Guide

| Part Number | Packing* | Package |
|--------------|----------------------------|----------------------------------------|
| A3910EEETR-T | 3000 pieces per 7-in. reel | 8-contact DFN with exposed thermal pad |

*Contact Allegro™ for additional packing options.

Absolute Maximum Ratings*

| Characteristic | Symbol | Notes | Rating | Unit |
|-------------------------------|--------------|---------------------|----------------------|------|
| Supply Voltage | V_{BB} | | -0.3 to 5.5 | V |
| Logic Input Voltage Range | V_{IN} | | -0.3 to 6 | V |
| Output Current | I_{OUT} | | 500 | mA |
| Output Voltage | V_{OUT} | | -0.3 to $V_{BB} + 1$ | V |
| Operating Ambient Temperature | T_A | E temperature range | -40 to 85 | °C |
| Maximum Junction Temperature | $T_{J(max)}$ | | 150 | °C |
| Storage Temperature | T_{stg} | | -55 to 150 | °C |

Thermal Characteristics may require derating at maximum conditions, see application information

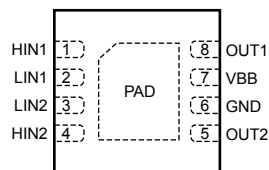
| Characteristic | Symbol | Test Conditions* | Value | Unit |
|----------------------------|-----------------|--------------------------------------------------------------------------|-------|------|
| Package Thermal Resistance | $R_{\theta JA}$ | On 4-layer PCB based on JEDEC standard | 49 | °C/W |
| | | On 2-layer PCB based with 0.23 in. ² exposed copper each side | 92 | °C/W |

*Additional thermal information available on the Allegro website.

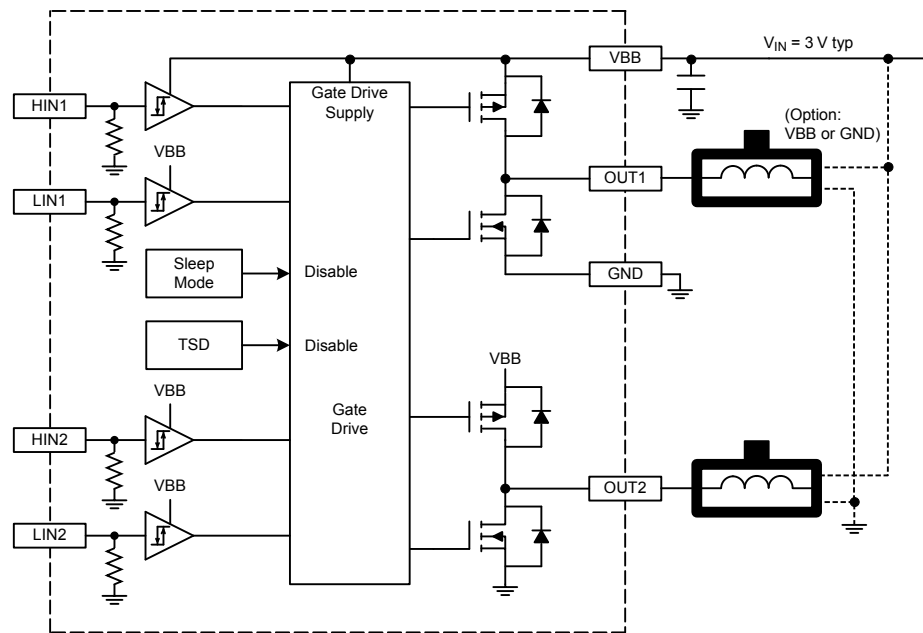
Terminal List Table

| Number | Name | Function |
|--------|------|----------------|
| 1 | HIN1 | Logic input |
| 2 | LIN1 | Logic input |
| 3 | LIN2 | Logic input |
| 4 | HIN2 | Logic input |
| 5 | OUT2 | Motor terminal |
| 6 | GND | Ground |
| 7 | VBB | Input Supply |
| 8 | OUT1 | Motor terminal |

Pin-out Diagram



Functional Block Diagram



ELECTRICAL CHARACTERISTICS* Valid at $T_A = 25^\circ\text{C}$; unless otherwise specified

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|--------------|------------------------------------------------------------|------------|------|------|------------------|
| VBB Supply Range | V_{BB} | | 2.5 | – | 5.5 | V |
| VBB Supply Current | I_{BB} | Both bridges, PWM = 50 kHz | – | 0.3 | 1 | mA |
| | | Sleep mode (HIN1=HIN2=LIN1=LIN2=0V) | – | <1 | 1 | μA |
| Output Driver On-Resistance | $R_{DS(on)}$ | Source driver, $I = 400\text{ mA}$, $V_{BB} = 3\text{ V}$ | – | 1.1 | 1.4 | Ω |
| | | Source driver, $I = 400\text{ mA}$, $V_{BB} = 5\text{ V}$ | – | 0.8 | 1 | Ω |
| | | Sink driver, $I = 400\text{ mA}$, $V_{BB} = 3\text{ V}$ | – | 0.5 | 0.65 | Ω |
| | | Sink driver, $I = 400\text{ mA}$, $V_{BB} = 5\text{ V}$ | – | 0.4 | 0.52 | Ω |
| Input Logic Low Level | V_{IL} | | – | – | 0.5 | V |
| Input Logic High Level | V_{IH} | | $V_{BB}/2$ | – | – | V |
| Input Hysteresis | V_{HYS} | | 50 | 150 | 300 | mV |
| Logic Input Current | I_{IN} | $V_{IN} = 3.3\text{ V}$ (Pulldown = 100 k Ω) | – | 33 | 50 | μA |
| Thermal Shutdown Temperature | T_{JTSD} | Temperature increasing | – | 165 | – | $^\circ\text{C}$ |
| Thermal Shutdown Hysteresis | ΔT_J | Recovery = $T_{JTSD} - \Delta T_J$ | – | 15 | – | $^\circ\text{C}$ |

*Specified limits are tested at a single temperature and assured over operating temperature range by design and characterization.

Logic Table

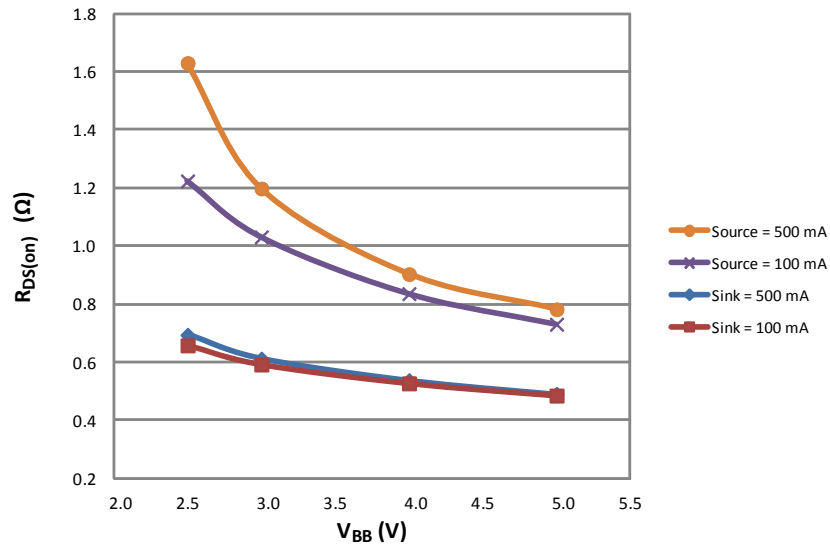
| HINx | LINx | OUTx | Function Motor to Supply | Function Motor to GND |
|------|------|-------------------|-----------------------------|-----------------------------|
| 0 | 0 | Hi-Z ¹ | Coast (Sleep ²) | Coast (Sleep ²) |
| 1 | 0 | High | Brake | Drive |
| 0 | 1 | Low | Drive | Brake |
| 1 | 1 | Hi-Z ¹ | Coast | Coast |

¹Hi-Z is high impedance.

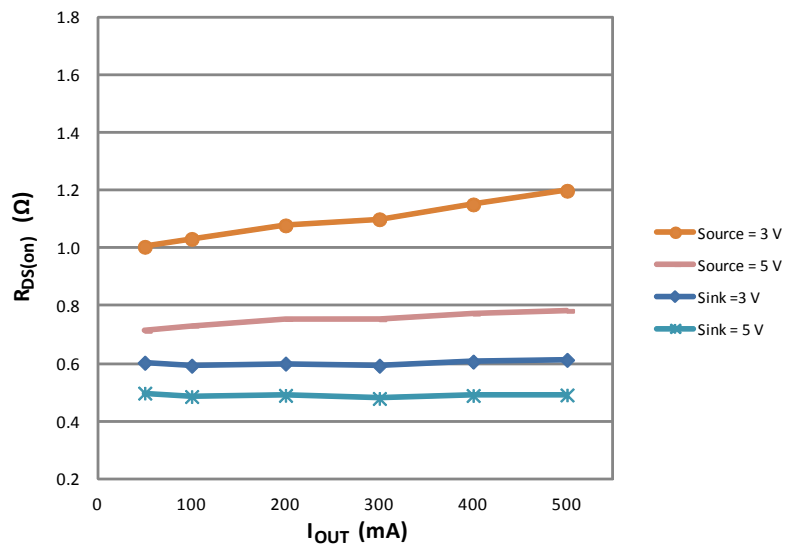
²Sleep mode activated by all four inputs <100 mV.

Characteristic Performance

Output On-Resistance versus Load Supply Voltage



Output On-Resistance versus Output Current



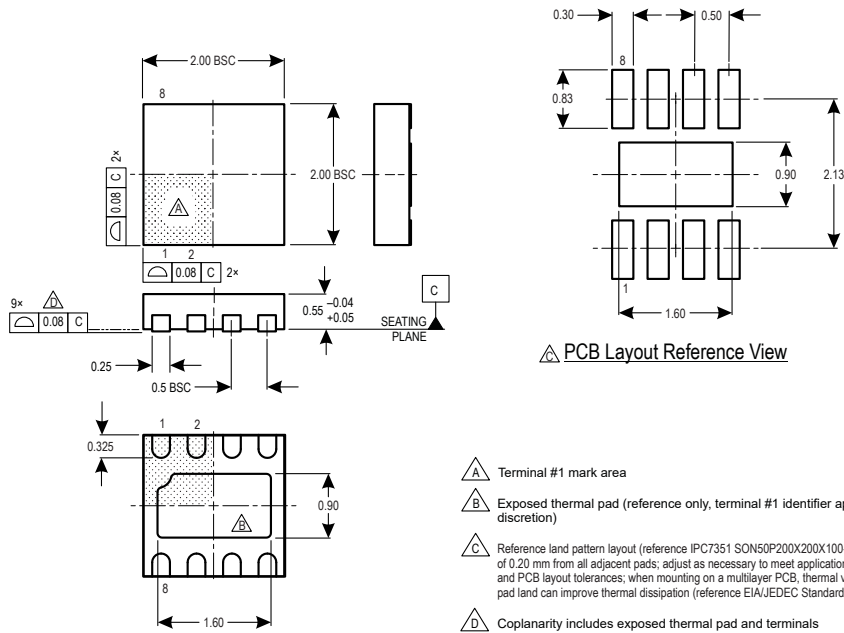
Package EE, 8-Contact DFN with Exposed Thermal Pad

For Reference Only – Not for Tooling Use

(Reference DWG-0000369)

NOT TO SCALE

All dimensions nominal unless otherwise stated – Dimensions in millimeters
Exact case and lead configuration at supplier discretion within limits shown



Revision History

| Number | Date | Description |
|--------|----------------|------------------------------------------|
| 1 | July 23, 2013 | Update Selection Guide |
| 2 | April 10, 2019 | Minor editorial updates |
| 3 | April 30, 2021 | Updated Package Outline Drawing (page 6) |

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