

High and Low Side Driver

General Description

The PN7101 is a high voltage, high speed power MOSFET and IGBT driver based on P_SUB P_EPI process. The floating channel driver can be used to drive two N-channel power MOSFET or IGBT independently which operates up to 600 V. Logic inputs are compatible with standard CMOS or LSTTL output, down to 3.3V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. Propagation delays are matched to simplify use in high frequency applications.

Applications

- Small and medium-power motor driver
- Power MOSFET or IGBT driver

Features

- Fully operational to +600 V
- 3.3 V logic compatible
- dV/dt Immunity ± 50 V/ns
- Floating channel designed for bootstrap operation
- Gate drive supply range from 10 V to 20 V
- UVLO for low side channel
- Output Source / Sink Current Capability 300 mA / 600mA
- Independent Logic Inputs to Accommodate All Topologies
- -5V negative Vs ability
- Matched propagation delay for both channels
- Pin-to-Pin Compatible with Industry Standards
- 8-Lead PDIP or 8-Lead SOIC package

Pin Assignment & Typical Connection Circuit

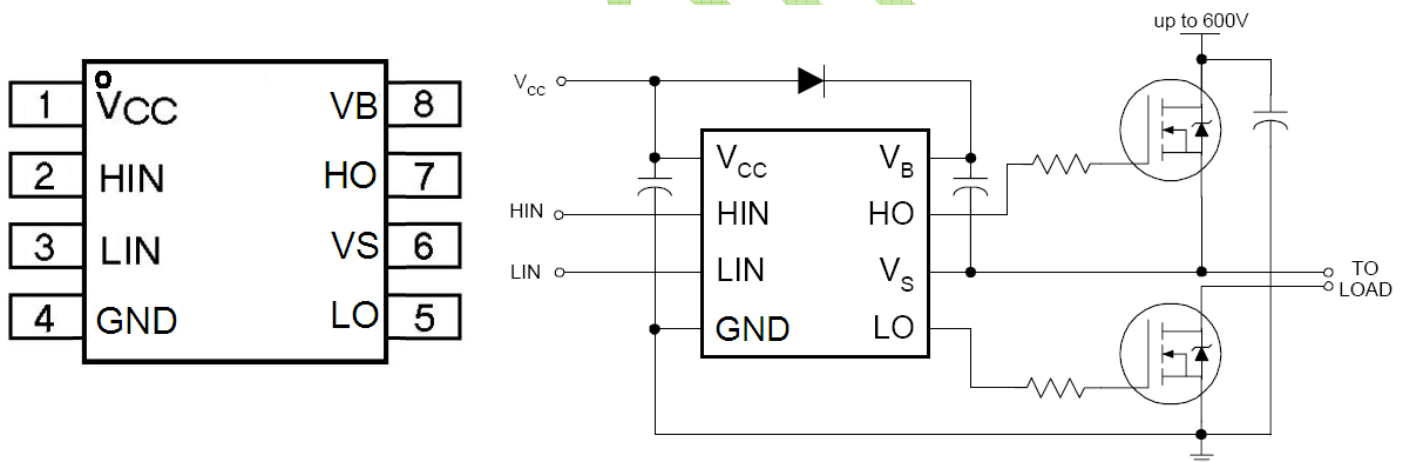


Figure 1. Pin Assignment and Typical Connection Circuit

Pin Description

| PIN NO. | PIN NAME | PIN FUNCTION |
|---------|----------|---|
| 1 | VCC | Low side and main power supply |
| 2 | HIN | Logic input for high side gate driver output (HO), in phase |
| 3 | LIN | Logic input for low side gate driver output (LO), in phase |
| 4 | GND | Ground |
| 5 | LO | Low side gate drive output, in phase with LIN |
| 6 | VS | High side floating supply return or bootstrap return |
| 7 | HO | High side gate drive output, in phase with HIN |
| 8 | VB | High side floating supply |

Functional Block Diagram

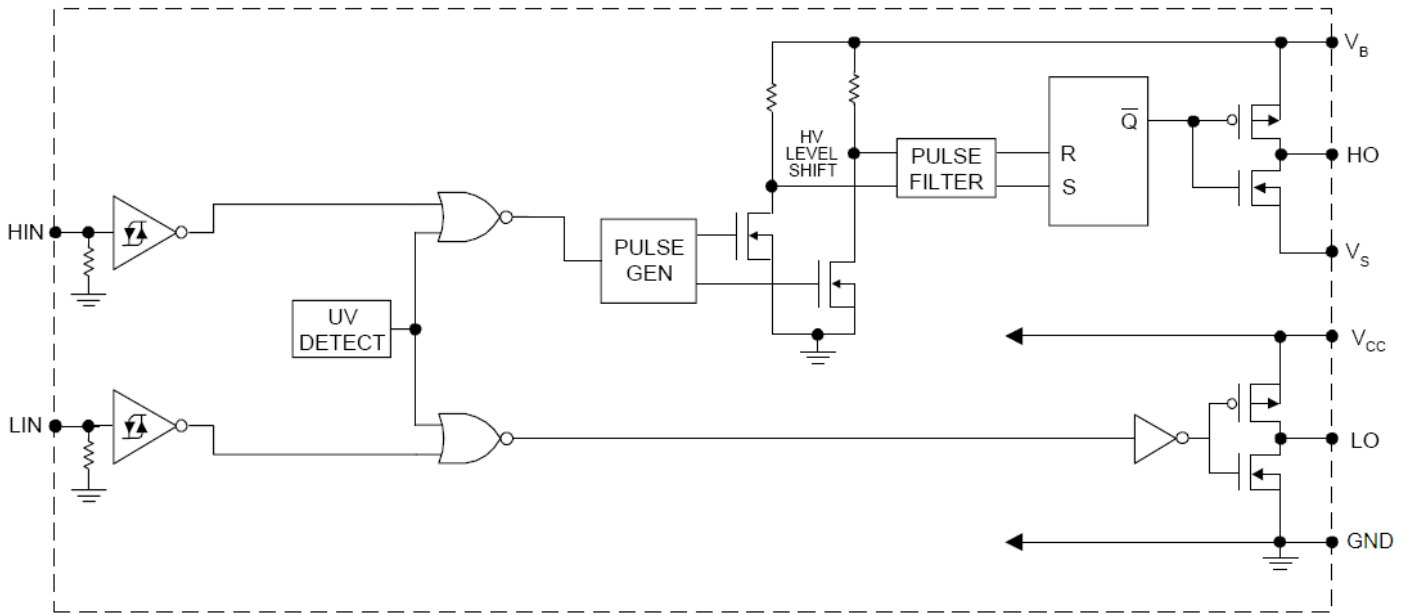


Figure2. Detailed Block Diagram

Logic Function and Timing Definition

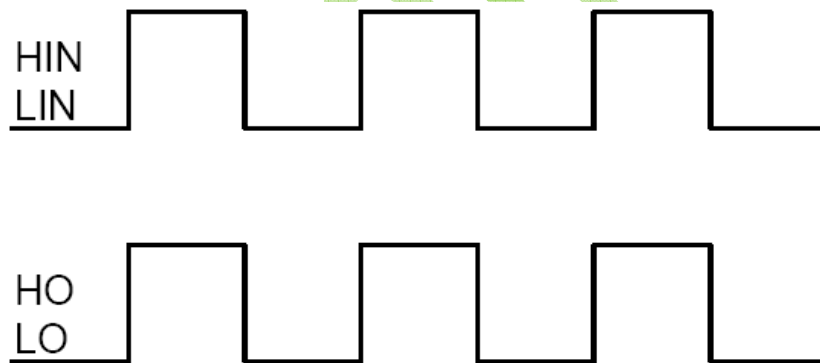


Figure3. Input and Output Timing

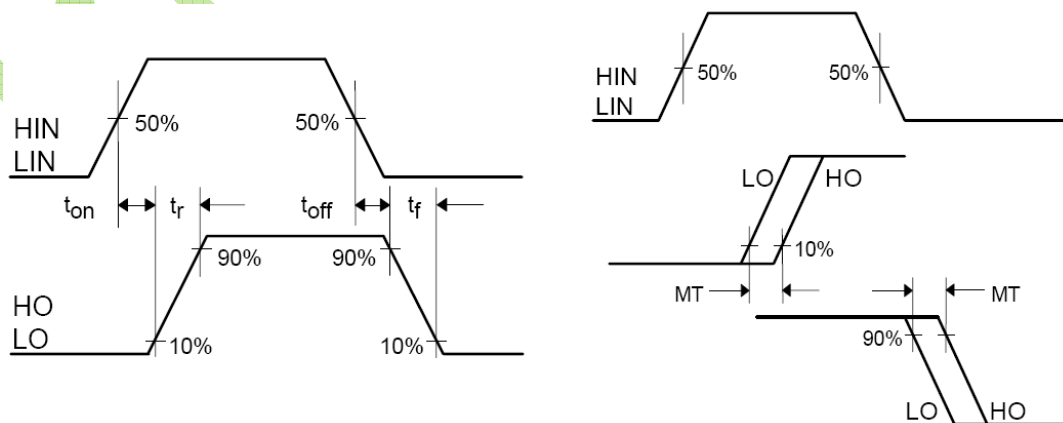


Figure4. Timing Waveform Definitions

Absolute Maximum Ratings ^[Note1]

| Symbol | Definition | MIN. | MAX. | Units |
|---------------------|---|-------------|-----------|-------|
| VB | High side floating supply | -0.3 | 625 | V |
| VS | High side floating supply return | VB - 25 | VB + 0.3 | |
| VHO | High side gate drive output | VS -0.3 | VB + 0.3 | |
| VCC | Low side and main power supply | -0.3 | 25 | |
| VLO | Low side gate drive output | -0.3 | VCC + 0.3 | |
| VIN | Logic input of HIN & LIN | -0.3 | VCC + 0.3 | |
| dV _S /dt | Allowable Offset Supply Voltage Transient | -- | 50 | V/ns |
| ESD | HMB Model | 2.5 | | kV |
| | Machine Model | 200 | | V |
| P _D | Package Power Dissipation @ TA ≤25°C | 8 Lead DIP | 1.0 | W |
| | | 8 Lead SOIC | 0.625 | |
| R _{qJA} | Thermal Resistance Junction to Ambient | 8 Lead DIP | 125 | °C |
| | | 8 Lead SOIC | 200 | /W |
| TJ | Junction Temperature | -- | 150 | °C |
| TS | Storage Temperature | -55 | 150 | |
| TL | Lead Temperature (Soldering, 10 seconds) | -- | 300 | |

Note 1: Exceeding these ratings may damage the device.

Recommended Operating Conditions

| Symbol | Definition | MIN. | MAX. | Units |
|--------|-------------------------------------|--------|--------|-------|
| VB | High side floating supply | VS +10 | VS +20 | V |
| VS | High side floating supply return | - | 600 | |
| VHO | High side gate drive output voltage | VS | VB | |
| VCC | Low side supply | 10 | 20 | |
| VLO | Low side gate drive output voltage | 0 | VCC | |
| VIN | Logic input voltage(HIN & LIN) | 0 | VCC | |
| TA | Ambient temperature | -40 | 125 | °C |

Dynamic Electrical Characteristics

VBIAS (VCC, VBS) = 15V, CL = 1000 pF and TA = 25°C unless otherwise specified.

| Symbol | Definition | TYP. | MAX. | Units |
|-------------------|--------------------------------------|------|------|-------|
| ton _H | High side turn-on propagation delay | 170 | 190 | ns |
| toff _H | High side turn-off propagation delay | 165 | 185 | |
| ton _L | Low side turn-on propagation delay | 160 | 180 | |
| toff _L | Low side turn-off propagation delay | 165 | 185 | |
| MT | Delay matching | 7 | 10 | |
| Tr | Turn-on rise time | 60 | 70 | |
| Tf | Turn-off fall time | 35 | 40 | |

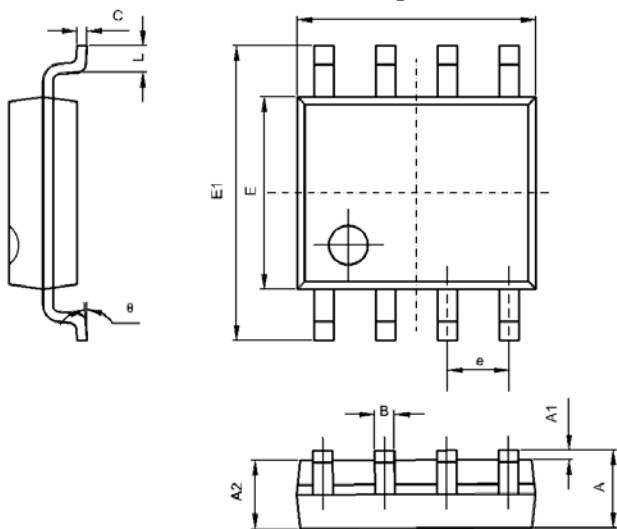
Static Electrical Characteristics

VBIAS (VCC, VBoot) = 15V, CL = 1000 pF and TA = 25°C unless otherwise specified.

| Symbol | Definition | MIN. | TYP. | MAX. | Units |
|------------------|---|------|------|------|-------|
| V _{IH} | Logic "1"(HIN & LIN) input voltage | 2.4 | - | - | V |
| V _{IL} | Logic "0" (HIN & LIN) input voltage | - | - | 1.0 | |
| V _{OH} | High level output voltage, V _{BIAS} - V _O | - | - | 0.3 | |
| V _{OL} | Low level output voltage, V _O | - | - | 0.3 | |
| I _{QCC} | Quiescent VCC supply current | - | 230 | 250 | uA |
| I _{QBS} | Quiescent VB supply current | - | 1 | 5 | |
| I _{LK} | Leakage current from Vs(600V) to GND | - | 0.10 | 0.20 | |
| I _{IN+} | Logic "1" input bias current | - | 6.2 | 10 | |
| I _{IN-} | Logic "0" input bias current | - | 0.00 | 0.1 | |
| VCCU+ | VCC supply UVLO threshold | - | 8.7 | - | |
| VCCU- | | - | 8.1 | - | |
| I _{O+} | Output high short circuit pulsed current [Note2] | - | 300 | - | mA |
| I _{O-} | Output low short circuit pulsed current [Note2] | - | 600 | - | |

Package Information

SOP-8 PACKAGE OUTLINE AND DIMENSIONS

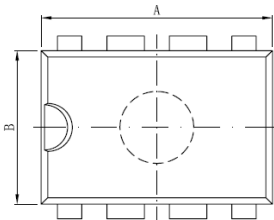
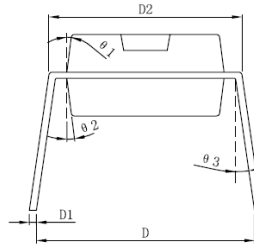
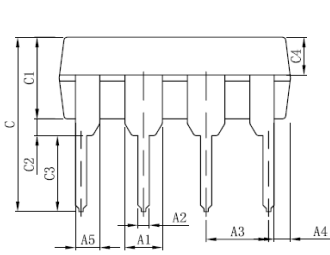


| SYMBOL | DIMENSION IN | | DIMENSION IN | |
|--------|--------------|-------|--------------|-------|
| | MILLIMETERS | | INCHES | |
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A | 0.100 | 0.250 | | 0.010 |
| A | 1.350 | 1.550 | 0.053 | 0.061 |
| B | 0.330 | 0.510 | 0.013 | 0.020 |
| C | 0.190 | 0.250 | 0.007 | 0.010 |
| D | 4.780 | 5.0 | 0.188 | 0.197 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E | 5.800 | 6.300 | 0.228 | 0.248 |
| e | 1.270 TYP | | 0.050 TYP | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0 | 8 | 0 | 8 |

PN7101

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DIP8 PACKAGE OUTLINE AND DIMENSIONS



| Size symbol | Min(mm) | | Max(min) | |
|----------------|---------|----------|------------|-----------|
| | Min(mm) | Max(min) | Min(mm) | Max(min) |
| A | 9.30 | 9.50 | C2 | 0.50 |
| A1 | 1.524 | | C3 | 3.3 |
| A2 | 0.39 | 0.53 | C4 | 1.57TYP |
| A3 | 2.54 | | D | 8.2 8.8 |
| A4 | 0.66TYP | | D1 | 0.2 0.35 |
| A5 | 0.99TYP | | D2 | 7.62 7.87 |
| B | 6.3 | 6.5 | $\theta 1$ | 8°TYP |
| C | 7.2 | | $\theta 2$ | 8°TYP |
| C1 | 3.3 | 3.5 | $\theta 3$ | 5°TYP |

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Preliminary