

# M81736FP

## HIGH VOLTAGE HALF BRIDGE DRIVER

### DESCRIPTION

M81736FP is high voltage Power MOSFET and IGBT module driver for half bridge applications.

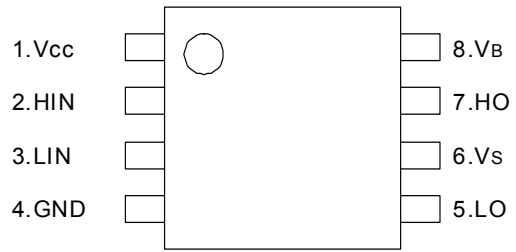
### FEATURES

- FLOATING SUPPLY VOLTAGE .....600V
- OUTPUT CURRENT .....+200mA/-350mA
- HALF BRIDGE DRIVER
- UNDERVOLTAGE LOCKOUT
- SOP-8 PACKAGE

### APPLICATIONS

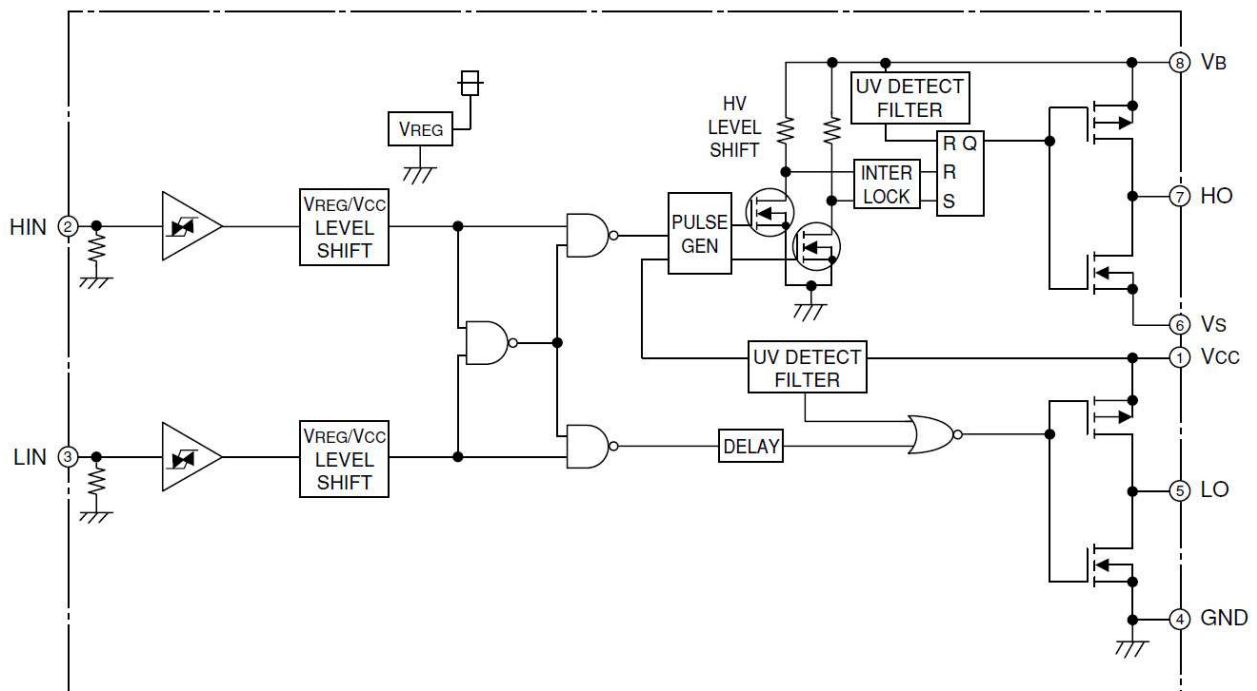
MOSFET and IGBT module inverter driver for PDP, HID lamp, refrigerator, air-conditioner, washing machine, AC servomotor and general purpose.

### PIN CONFIGURATION (TOP VIEW)



Outline:8P2S

### BLOCK DIAGRAM



**ABSOLUTE MAXIMUM RATINGS (Ta=25°C unless otherwise specified)**

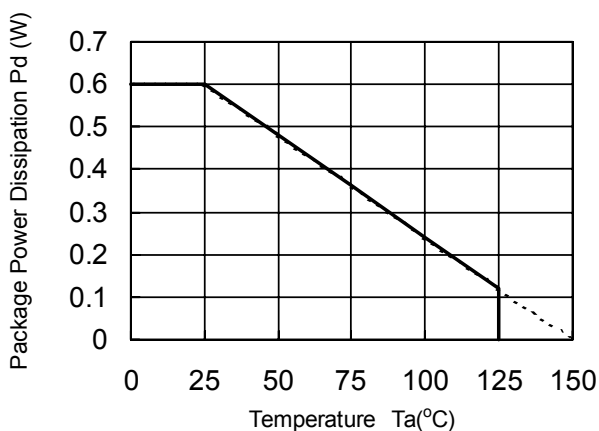
| Symbol           | Parameter                                  | Test conditions                                 | Ratings                                   | Unit  |
|------------------|--|---|---|-------|
| V <sub>B</sub>   | High Side Floating Supply Absolute Voltage |   | -0.5 ~ 624                                | V     |
| V <sub>S</sub>   | High Side Floating Supply Offset Voltage   |   | V <sub>B</sub> -24 ~ V <sub>B</sub> +0.5  | V     |
| V <sub>BS</sub>  | High Side Floating Supply Voltage          | V <sub>BS</sub> =V <sub>B</sub> -V <sub>S</sub> | -0.5 ~ 24                                 | V     |
| V <sub>HO</sub>  | High Side Output Voltage                   |   | V <sub>S</sub> -0.5 ~ V <sub>B</sub> +0.5 | V     |
| V <sub>CC</sub>  | Low Side Fixed Supply Voltage              |   | -0.5 ~ 24                                 | V     |
| V <sub>LO</sub>  | Low Side Output Voltage                    |   | -0.5 ~ V <sub>CC</sub> +0.5               | V     |
| V <sub>IN</sub>  | Logic Input Voltage                        | HIN, LIN  | -0.5 ~ V <sub>CC</sub> +0.5               | V     |
| P <sub>d</sub>   | Package Power Dissipation                  | Ta= 25 °C ,On Board                             | 0.6                                       | W     |
| Kθ               | Linear Derating Factor                     | Ta> 25 °C ,On Board                             | 4.8                                       | mW/°C |
| Rth(j-c)         | Junction-Case Thermal Resistance           |   | 50  | °C/W  |
| T <sub>J</sub>   | Junction Temperature                       |   | -40 ~ +150                                | °C    |
| T <sub>opr</sub> | Operation Temperature                      |   | -40 ~ +125                                | °C    |
| T <sub>stg</sub> | Storage Temperature                        |   | -40 ~ +150                                | °C    |
| TL               | Solder Heatproof                           | RoHS Correspondence                             | 255:10s,max 260                           | °C    |

**RECOMMENDED OPERATING CONDITIONS**

| Symbol          | Parameter                                  | Test conditions                                 | Limits             |      |                    | Unit |
|-----------------|--|---|--------------------|------|--------------------|------|
|                 |  |   | Min.               | Typ. | Max.               |      |
| V <sub>B</sub>  | High Side Floating Supply Absolute Voltage |   | V <sub>S</sub> +10 | —    | V <sub>S</sub> +20 | V    |
| V <sub>S</sub>  | High Side Floating Supply Offset Voltage   |   | 0                  | —    | 500                | V    |
| V <sub>BS</sub> | High Side Floating Supply Voltage          | V <sub>BS</sub> =V <sub>B</sub> -V <sub>S</sub> | 10                 | —    | 20                 | V    |
| V <sub>HO</sub> | High Side Output Voltage                   |   | V <sub>S</sub>     | —    | V <sub>B</sub>     | V    |
| V <sub>CC</sub> | Low Side Fixed Supply Voltage              |   | 10                 | —    | 20                 | V    |
| V <sub>LO</sub> | Low Side Output Voltage                    |   | 0                  | —    | V <sub>CC</sub>    | V    |
| V <sub>IN</sub> | Logic Input Voltage                        | HIN, LIN  | 0                  | —    | V <sub>CC</sub>    | V    |

\* For proper operation, the device should be used within the recommended conditions

**THERMAL DERATING FACTOR CHARACTERISTIC (MAXIMUM RATING)**

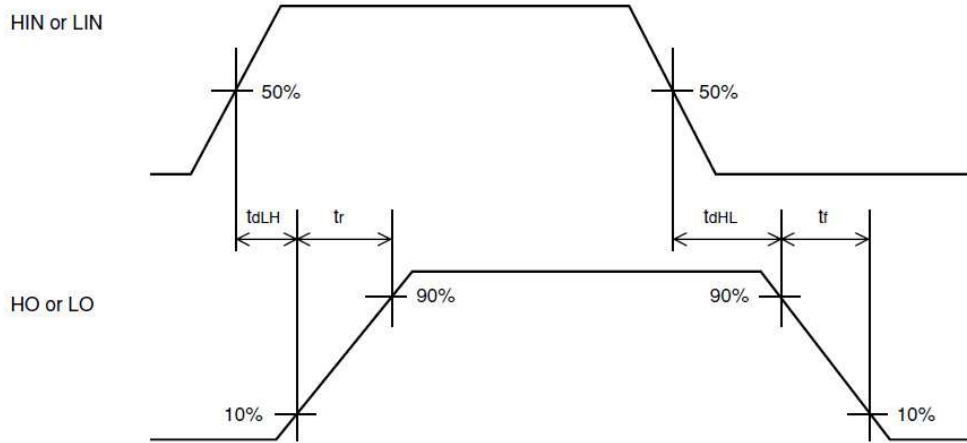


**ELECTRICAL CHARACTERISTICS (Ta=25°C, V<sub>CC</sub>=V<sub>BS</sub>(=V<sub>B</sub>-V<sub>S</sub>)=15V, unless otherwise specified)**

| Symbol               | Parameter                                       | Test conditions   | Limits |       |      | Unit |
|----------------------|---|---|--------|-------|------|------|
|                      |   |   | Min.   | Typ.* | Max. |      |
| I <sub>FS</sub>      | Floating Supply Leakage Current                 | V <sub>B</sub> = V <sub>S</sub> = 600V  | —      | —     | 1.0  | μA   |
| I <sub>BS</sub>      | V <sub>BS</sub> Standby Current                 | HIN = LIN = 0V  | —      | 0.2   | 0.5  | mA   |
| I <sub>CC</sub>      | V <sub>CC</sub> Standby Current                 | HIN = LIN = 0V  | 0.2    | 0.5   | 1.0  | mA   |
| V <sub>OH</sub>      | High Level Output Voltage                       | I <sub>O</sub> = -20mA, LO, HO  | 13.6   | 14.2  | —    | V    |
| V <sub>OL</sub>      | Low Level Output Voltage                        | I <sub>O</sub> = 20mA, LO, HO   | —      | 0.3   | 0.6  | V    |
| V <sub>IH</sub>      | High Level Input Threshold Voltage              | HIN, LIN  | 2.7    | —     | —    | V    |
| V <sub>IL</sub>      | Low Level Input Threshold Voltage               | HIN, LIN  | —      | —     | 0.8  | V    |
| I <sub>IH</sub>      | High Level Input Bias Current                   | V <sub>IN</sub> = 5V  | —      | 25    | 100  | μA   |
| I <sub>IL</sub>      | Low Level Input Bias Current                    | V <sub>IN</sub> = 0 V   | —      | —     | 2    | μA   |
| V <sub>BSuvr</sub>   | V <sub>BS</sub> Supply UV Reset Voltage         |   | 7.0    | 8.4   | 9.8  | V    |
| V <sub>BSuvt</sub>   | V <sub>BS</sub> Supply UV Trip Voltage          |   | 6.5    | 7.85  | 9.0  | V    |
| V <sub>BSuvh</sub>   | V <sub>BS</sub> Supply UV Hysteresis Voltage    |   | 0.3    | 0.55  | —    | V    |
| t <sub>VBSuv</sub>   | V <sub>BS</sub> Supply UV Filter Time           |   | —      | 7.5   | —    | μs   |
| V <sub>CCuvr</sub>   | V <sub>CC</sub> Supply UV Reset Voltage         |   | 7.0    | 8.4   | 9.8  | V    |
| V <sub>CCuvt</sub>   | V <sub>CC</sub> Supply UV Trip Voltage          |   | 6.5    | 7.85  | 9.0  | V    |
| V <sub>CCuvh</sub>   | V <sub>CC</sub> Supply UV Hysteresis Voltage    |   | 0.3    | 0.55  | —    | V    |
| t <sub>VCCuv</sub>   | V <sub>CC</sub> Supply UV Filter Time           |   | —      | 7.5   | —    | μs   |
| I <sub>OH</sub>      | Output High Level Short Circuit Pulsed Current  | V <sub>O</sub> = 0V, V <sub>IN</sub> = 5V, PW < 10μs  | 120    | 200   | —    | mA   |
| I <sub>OL</sub>      | Output Low Level Short Circuit Pulsed Current   | V <sub>O</sub> = 15V, V <sub>IN</sub> = 0V, PW < 10μs                                       | 250    | 350   | —    | mA   |
| R <sub>OH</sub>      | Output High Level On Resistance                 | I <sub>O</sub> = -20mA, R <sub>OH</sub> = (V <sub>CC</sub> -V <sub>O</sub> )/I <sub>O</sub> | —      | 40    | 70   | Ω    |
| R <sub>OL</sub>      | Output Low Level On Resistance                  | I <sub>O</sub> = 20mA, R <sub>OL</sub> = V <sub>O</sub> /I <sub>O</sub>                     | —      | 15    | 30   | Ω    |
| t <sub>dLH(HO)</sub> | High Side Turn-On Propagation Delay             | CL = 1000pF between HO-V <sub>S</sub>   | —      | 150   | 300  | ns   |
| t <sub>dHL(HO)</sub> | High Side Turn-Off Propagation Delay            | CL = 1000pF between HO-V <sub>S</sub>   | —      | 130   | 230  | ns   |
| t <sub>rH</sub>      | High Side Turn-On Rise Time                     | CL = 1000pF between HO-V <sub>S</sub>   | —      | 130   | 220  | ns   |
| t <sub>fH</sub>      | High Side Turn-Off Fall Time                    | CL = 1000pF between HO-V <sub>S</sub>   | —      | 50    | 80   | ns   |
| t <sub>dLH(LO)</sub> | Low Side Turn-On Propagation Delay              | CL = 1000pF between LO-GND  | —      | 150   | 300  | ns   |
| t <sub>dHL(LO)</sub> | Low Side Turn-Off Propagation Delay             | CL = 1000pF between LO-GND  | —      | 130   | 230  | ns   |
| t <sub>rL</sub>      | Low Side Turn-On Rise Time                      | CL = 1000pF between LO-GND  | —      | 130   | 220  | ns   |
| t <sub>fL</sub>      | Low Side Turn-Off Fall Time                     | CL = 1000pF between LO-GND  | —      | 50    | 80   | ns   |
| Δt <sub>dLH</sub>    | Delay Matching, High Side and Low Side Turn-On  | t <sub>dLH(HO)</sub> -t <sub>dLH(LO)</sub>  | —      | 0     | 30   | ns   |
| Δt <sub>dHL</sub>    | Delay Matching, High Side and Low Side Turn-Off | t <sub>dHL(HO)</sub> -t <sub>dHL(LO)</sub>  | —      | 0     | 30   | ns   |

\* Typ. is not specified.

TIMING REQUIREMENT



FUNCTION TABLE

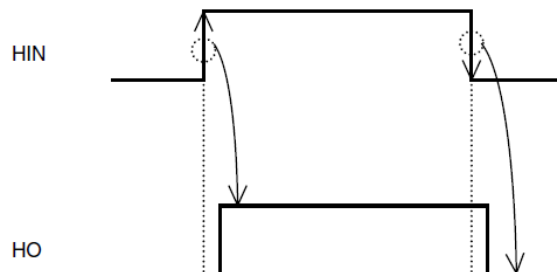
| HIN | LIN | V <sub>BS</sub> UV | V <sub>CC</sub> UV | HO | LO | Behavioral state                  |
|-----|-----|--------------------|--------------------|----|----|-----------------------------------|
| H→L | L   | H                  | H                  | L  | L  | LO = HO = Low                     |
| H→L | H   | H                  | H                  | L  | H  | LO = High                         |
| L→H | L   | H                  | H                  | H  | L  | HO = High                         |
| L→H | H   | H                  | H                  | L  | L  | LO = HO = Low                     |
| X   | L   | L                  | H                  | L  | L  | HO = Low, V <sub>BS</sub> UV      |
| X   | H   | L                  | H                  | L  | H  | LO = High, V <sub>BS</sub> UV     |
| H→L | X   | H                  | L                  | L  | L  | LO = Low, V <sub>CC</sub> UV      |
| L→H | X   | H                  | L                  | L  | L  | HO = LO = Low, V <sub>CC</sub> UV |

Note1 : "L" state of V<sub>BS</sub> UV, V<sub>CC</sub> UV means that UV trip voltage.

2 : In the case of both input signals (HIN and LIN) are "H", output signals (HO and LO) become "L".

3 : X (HIN) : L→H or H → L. X(LIN) : H or L.

4 : Output signal (HO) is triggered by the edge of input signal.

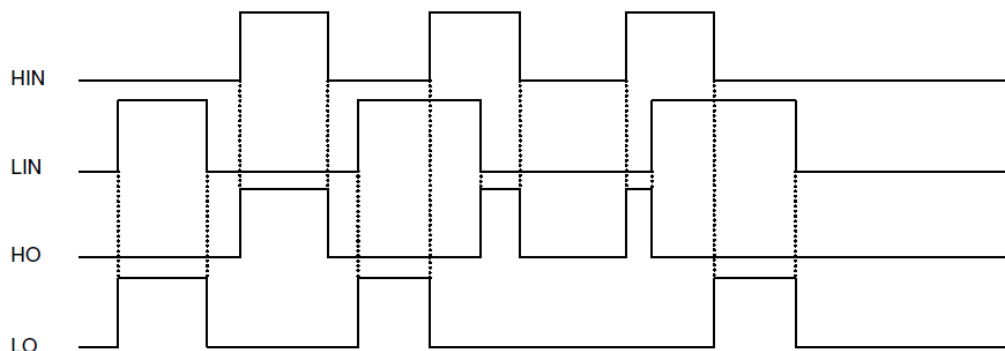


**TIMING DIAGRAM**

1. Input/Output Timing Diagram

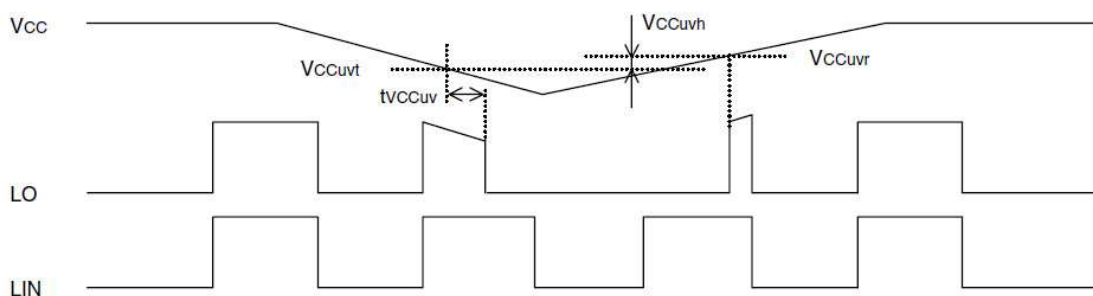
HIGH ACTIVE (When input signal (HIN or LIN) is "H", then output signal (HO or LO) is "H".)

In the case of both input signals (HIN and LIN) are "H", output signals (HO and LO) become "L".

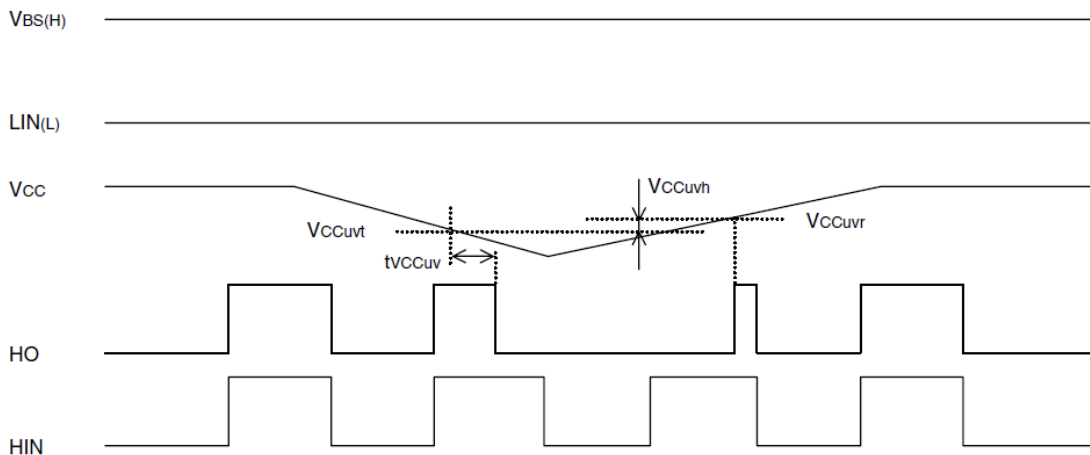


2.  $V_{CC}$  ( $V_{BS}$ ) Supply Under Voltage Lockout Timing Diagram

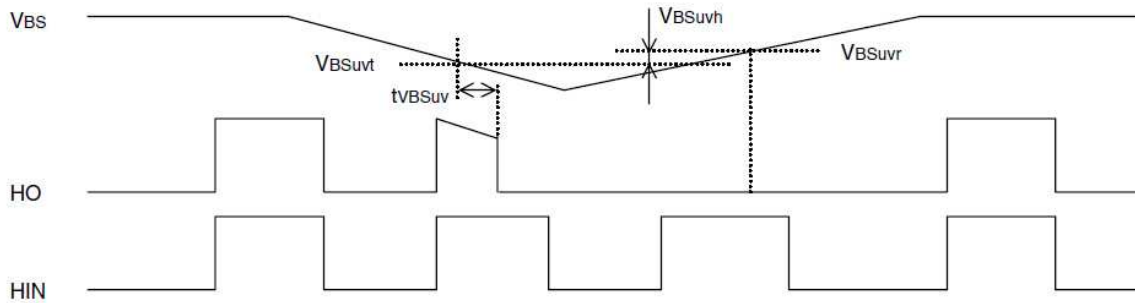
If  $V_{CC}$  supply voltage drops below UV trip voltage ( $V_{CCUVt} = V_{CCUVR} - V_{CCUvh}$ ) for  $V_{CC}$  supply UV filter time, output signal becomes "L". As soon as  $V_{CC}$  supply voltage rises over UV reset voltage, output signal LO becomes "H".



If  $V_{CC}$  supply voltage drops below UV trip voltage ( $V_{CCUVt} = V_{CCUVR} - V_{CCUvh}$ ) for  $V_{CC}$  supply UV filter time, output signal becomes "L". As soon as  $V_{CC}$  supply voltage rises over UV reset voltage, output signal HO becomes "H" if input signal is "H". ( $V_{CC} > V_{BS}$ )



If  $V_{BS}$  supply voltage drops below UV trip voltage ( $V_{BSuvt} = V_{BSuvr} - V_{BSuvh}$ ) for  $V_{BS}$  supply UV filter time, output signal becomes "L". As soon as  $V_{BS}$  supply voltage rises over UV reset voltage, output signal HO becomes "H" at following "H" edge of input signal.



**3. Allowable Supply Voltage Transient**

It is recommended to supply  $V_{CC}$  firstly and supply  $V_{BS}$  secondly. In the case of shutting off supply voltage, please shut off  $V_{BS}$  firstly and shut off  $V_{CC}$  secondly. When applying  $V_{CC}$  and  $V_{BS}$ , power supply should be applied slowly. If it rises rapidly, output signal (HO or LO) may be malfunction.

# M81736FP

## HIGH VOLTAGE HALF BRIDGE DRIVER

### Consideration

As for this product, the terminal of low voltage part and high-voltage part is very clear (The Fifth: LO, The Sixth: V<sub>S</sub>). Therefore, pin insulation space distance should be taken enough.

### PACKAGE OUTLINE

