

**PRELIMINARY**  
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 Some parametric limits are subject to change.

MITSUBISHI SEMICONDUCTORS <HVIC>

# M81703FP

HIGH VOLTAGE HALF BRIDGE DRIVER

## DESCRIPTION

M81703FP is high voltage Power MOSFET and IGBT module driver for half bridge applications.

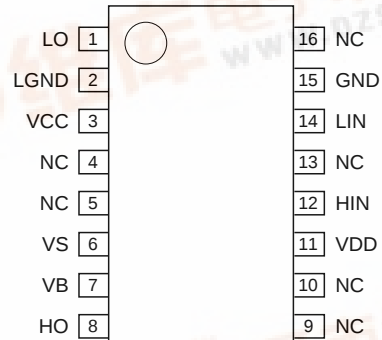
## FEATURES

- FLOATING SUPPLY VOLTAGE ..... 600V
- OUTPUT CURRENT ..... ±2A
- HALF BRIDGE DRIVER
- SOP-16

## APPLICATIONS

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

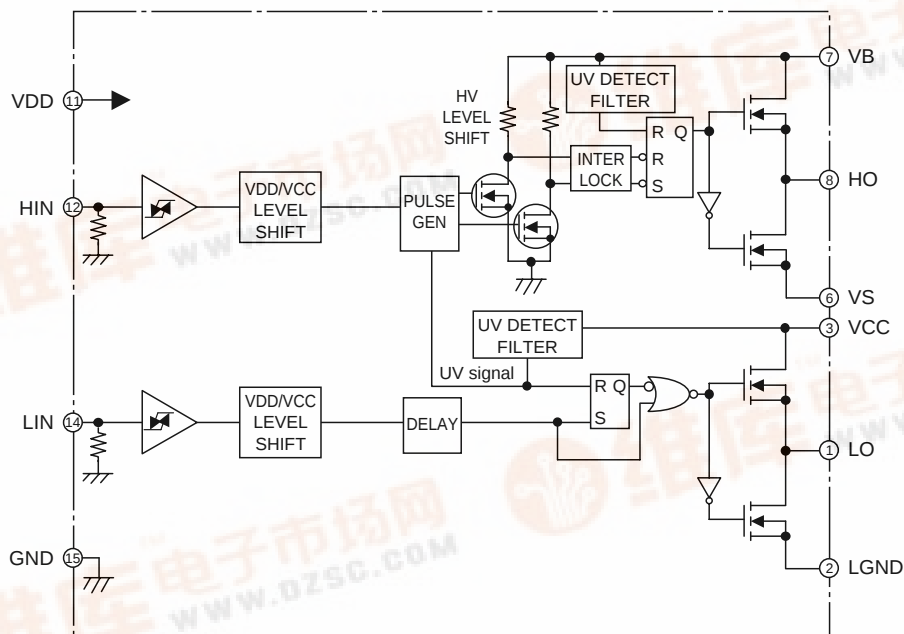
## PIN CONFIGURATION (TOP VIEW)



NC:NO CONNECTION

PACKAGE TYPE 16P2N

## BLOCK DIAGRAM



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## ABSOLUTE MAXIMUM RATINGS

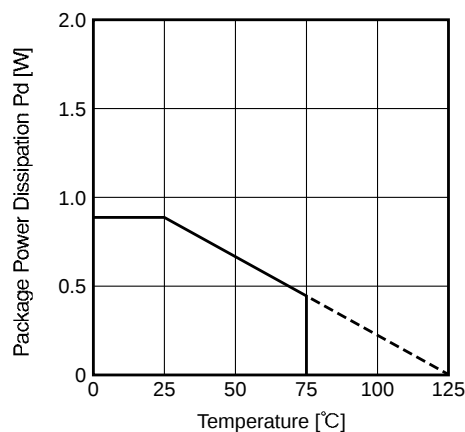
| Symbol   | Parameter                                   | Conditions          | Ratings         | Unit  |
|----------|---------------------------------------------|---------------------|-----------------|-------|
| VB       | High Side Floating Supply Absolute Voltage  |                     | -0.5 ~ 624      | V     |
| VS       | High Side Floating Supply Offset Voltage    |                     | -0.5 ~ 600      | V     |
| VBS      | High Side Floating Supply Voltage           | VBS = VB-VS         | -0.5 ~ 24       | V     |
| -VS      | Allowable Offset Supply Voltage minus surge | PW < 1μs            | -5              | V     |
| VHO      | High Side Output Voltage                    |                     | VS-0.5 ~ VB+0.5 | V     |
| VCC      | Low Side Fixed Supply Voltage               |                     | -0.5 ~ 24       | V     |
| VLO      | Low Side Output Voltage                     |                     | -0.5 ~ VCC+0.5  | V     |
| VDD      | Logic Supply Voltage                        |                     | -0.5 ~ 24       | V     |
| VIN      | Logic Input Voltage                         | HIN, LIN            | -0.5 ~ VDD+0.5  | V     |
| LGND     | Low Side Return Offset Voltage              | VCC-LGND < 24V      | -5 ~ VCC+0.5    | V     |
| dVS/dt   | Allowable Offset Supply Voltage Transient   |                     | ±50             | V/ns  |
| Pd       | Package Power Dissipation                   | Ta = 25°C, On Board | 0.88            | W     |
| Kθ       | Linear Derating Factor                      | Ta > 25°C, On Board | -8.8            | mW/°C |
| Rth(j-c) | Junction-Case Thermal Resistance            |                     | 50              | °C/W  |
| Tj       | Junction Temperature                        |                     | -20 ~ 125       | °C    |
| Topr     | Operation Temperature                       |                     | -20 ~ 75        | °C    |
| Tstg     | Storage Temperature                         |                     | -40 ~ 125       | °C    |

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter                                  | Test Conditions | Limits |      |       | Unit |
|--------|--------------------------------------------|-----------------|--------|------|-------|------|
|        |                                            |                 | Min.   | Typ. | Max.  |      |
| VB     | High Side Floating Supply Absolute Voltage |                 | VS+10  | —    | VS+20 | V    |
| VS     | High Side Floating Supply Offset Voltage   |                 | 0      | —    | 500   | V    |
| VBS    | High Side Floating Supply Voltage          | VBS = VB-VS     | 10     | —    | 20    | V    |
| VCC    | Low Side Fixed Supply Voltage              |                 | 10     | —    | 20    | V    |
| VDD    | Logic Supply Voltage                       |                 | 5      | —    | 20    | V    |
| VIN    | Logic Input Voltage                        | HIN, LIN        | 0      | —    | VDD   | V    |
| LGND   | Low Side Return Offset Voltage             |                 | -5     | —    | 5     | V    |

## PERFORMANCE CURVES

Thermal Derating Factor Characteristics



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**ELECTRICAL CHARACTERISTICS (Ta=25°C, VCC=VBS (=VB-VS)=VDD=15V, LGND=0V unless otherwise specified)**

| Symbol   | Parameter                                       | Test conditions            | Limits |      |      | Unit |
|----------|-------------------------------------------------|----------------------------|--------|------|------|------|
|          |                                                 |                            | Min.   | Typ. | Max. |      |
| IFS      | Floating Supply Leakage Current                 | VB=VS=600V                 | —      | —    | 1    | μA   |
| IBS      | VBS standby Current                             |                            | —      | 0.4  | 0.7  | mA   |
| ICC      | VCC standby Current                             |                            | —      | 0.75 | 1.5  | mA   |
| IDD      | VDD standby Current                             |                            | —      | —    | 10   | μA   |
| VOH      | High Level Output Voltage                       | IO=0A, LO, HO              | 13.8   | 14.4 | —    | V    |
| VOL      | Low Level Output Voltage                        | IO=0A, LO, HO              | —      | —    | 0.1  | V    |
| VIH15    | High Level Input Threshold Voltage              | HIN, LIN                   | —      | 8.4  | 9.5  | V    |
| VIL15    | Low Level Input Threshold Voltage               | HIN, LIN                   | 6.0    | 6.8  | —    | V    |
| VIH5     | High Level Input Threshold Voltage              | HIN, LIN (VDD=5V)          | —      | 3.1  | 4.1  | V    |
| VIL5     | Low Level Input Threshold Voltage               | HIN, LIN (VDD=5V)          | 1.4    | 2.4  | —    | V    |
| IIH      | High Level Input Bias Current                   | VIN=15V                    | —      | 75   | 150  | μA   |
| IIL      | Low Level Input Bias Current                    | VIN=0V                     | —      | —    | 1.0  | μA   |
| VBSuvr   | VBS Supply UV Reset Voltage                     |                            | 7.5    | 8.6  | 9.7  | V    |
| VBSuvh   | VBS Supply UV Hysteresis Voltage                |                            | 0.1    | 0.4  | 0.7  | V    |
| tVBSuv   | VBS Supply UV Filter Time                       |                            | —      | 10   | —    | μs   |
| VCCuvr   | VCC Supply UV Reset Voltage                     |                            | 7.5    | 8.6  | 9.7  | V    |
| VCCuvh   | VCC Supply UV Hysteresis Voltage                |                            | 0.1    | 0.4  | 0.7  | V    |
| tVCCuv   | VCC Supply UV Filter Time                       |                            | —      | 10   | —    | μs   |
| IOH      | Output High Level Short Circuit Pulsed Current  | VO=0V, VIN=15V, PW<10μs    | —      | -2.5 | —    | A    |
| IOL      | Output Low Level Short Circuit Pulsed Current   | VO=15V, VIN=0V, PW<10μs    | —      | 2.5  | —    | A    |
| ROH      | Output High Level On resistance                 | IO=-200mA, ROH=(VOH-VO)/IO | —      | 10   | 13   | Ω    |
| ROL      | Output Low Level On resistance                  | IO=200mA, ROL=VO/IO        | —      | 2.5  | 3    | Ω    |
| tdLH(HO) | High Side Turn-On Propagation Delay             | CL=1000pF between HO - VS  | —      | —    | 350  | ns   |
| tdHL(HO) | High Side Turn-Off Propagation Delay            | CL=1000pF between HO - VS  | —      | —    | 330  | ns   |
| trH      | High Side Turn-On Rise Time                     | CL=1000pF between HO - VS  | —      | —    | 60   | ns   |
| tfH      | High Side Turn-Off Fall Time                    | CL=1000pF between HO - VS  | —      | —    | 30   | ns   |
| tdLH(LO) | Low Side Turn-On Propagation Delay              | CL=1000pF between LO - GND | —      | —    | 350  | ns   |
| tdHL(LO) | Low Side Turn-Off Propagation Delay             | CL=1000pF between LO - GND | —      | —    | 330  | ns   |
| trL      | Low Side Turn-On Rise Time                      | CL=1000pF between LO - GND | —      | —    | 60   | ns   |
| tfL      | Low Side Turn-Off Fall Time                     | CL=1000pF between LO - GND | —      | —    | 30   | ns   |
| ΔtdLH    | Delay Matching, High Side and Low Side Turn-On  | tdLH(HO)-tdLH(LO)          | —      | —    | 30   | ns   |
| ΔtdHL    | Delay Matching, High Side and Low Side Turn-Off | tdHL(HO)-tdHL(LO)          | —      | —    | 30   | ns   |

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**FUNCTION TABLE (X: H or L)**

| HIN | LIN | VBS UV | VCC UV | HO | LO | Behavioral state                   |
|-----|-----|--------|--------|----|----|------------------------------------|
| L   | L   | H      | H      | L  | L  | LO = OFF, HO = OFF                 |
| L   | H   | H      | H      | L  | H  | LO = ON, HO = OFF                  |
| H   | L   | H      | H      | H  | L  | LO = OFF, HO = ON                  |
| H   | H   | H      | H      | H  | H  | LO = ON, HO = ON                   |
| X   | L   | L      | H      | L  | L  | LO = OFF, HO = OFF, VBS UV tripped |
| X   | H   | L      | H      | L  | H  | LO = ON, HO = OFF, VBS UV tripped  |
| L   | X   | H      | L      | L  | L  | LO = OFF, HO = OFF, VCC UV tripped |
| H   | X   | H      | L      | L  | L  | LO = OFF, HO = OFF, VCC UV tripped |

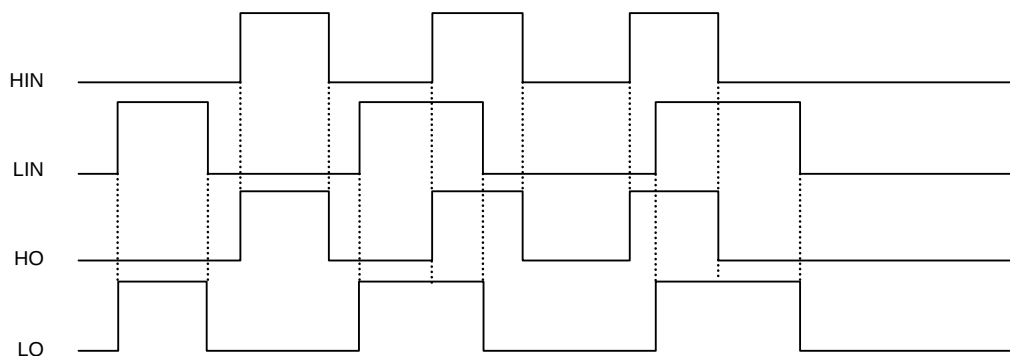
Note : "L" state of VBS UV and VCC UV means that UV trip voltage.

**TIMING DIAGRAM**

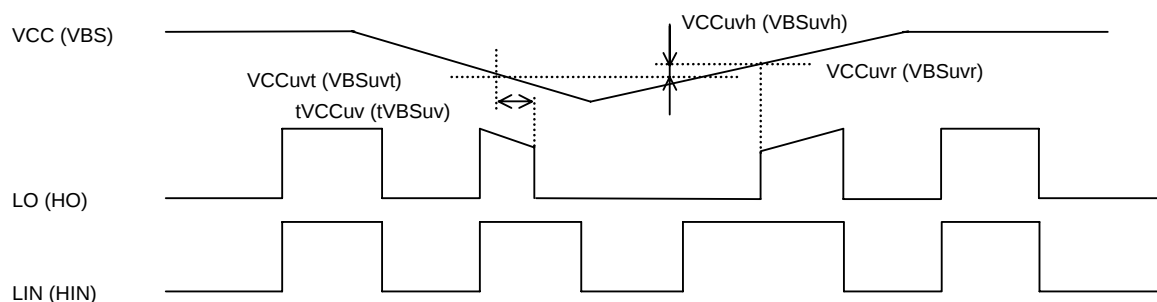
**1. Input/Output Timing Diagram**

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

Both input signals (HIN and LIN) are "H", then output signals (HO and LO) are "H".



**2. VCC (VBS) Supply Under Voltage Lockout Timing Diagram**



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### 3. Allowable supply voltage transient

Allowable high side floating supply voltage (VBS) transient or low side fixed supply voltage (VCC) transient are below  $50V/\mu s$ . In case VBS or VCC are started more than  $50V/\mu s$ , output signal (HO or LO) may be "H".

### PACKAGE OUTLINE

