

### HVIC Half-Bridge Driver

#### Description:

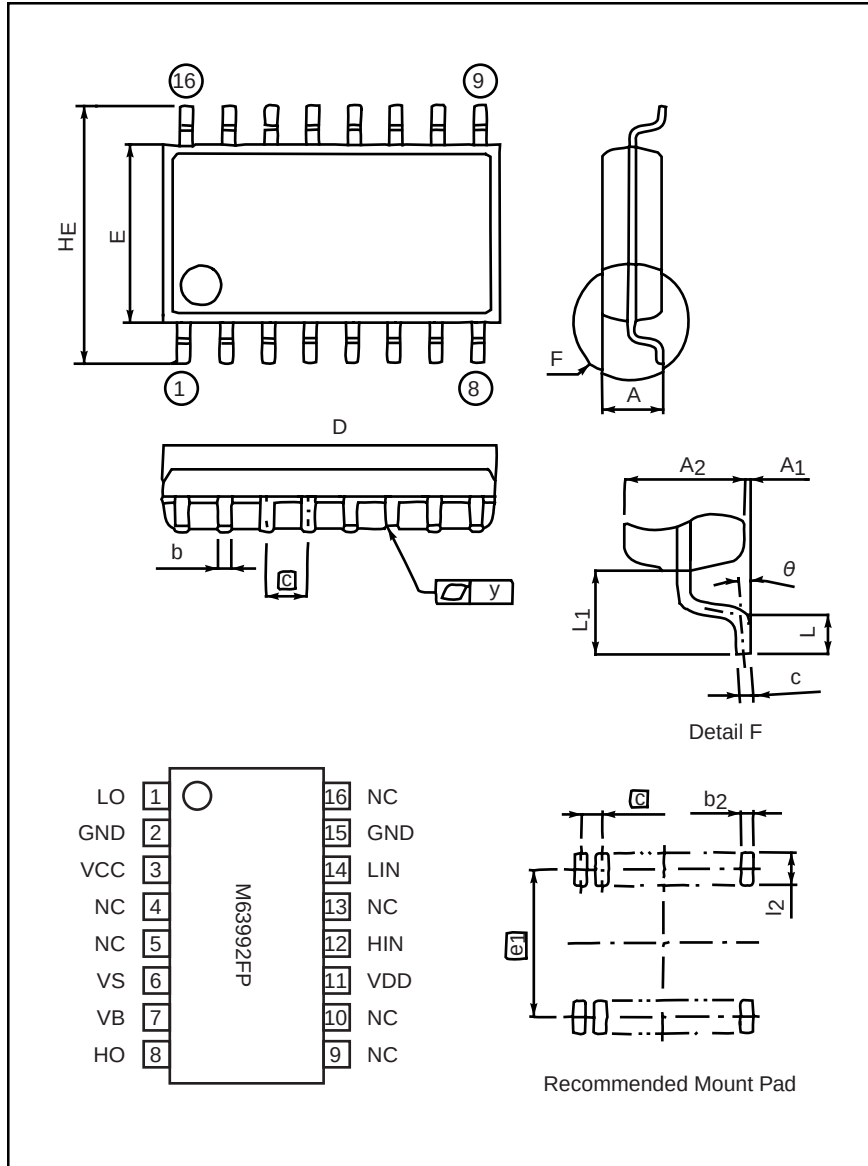
M63991FP is a high voltage, Power MOSFET/IGBT module driver for half-bridge applications.

#### Features:

- ☐ 600V Floating Supply Voltage
- ☐  $\pm 500\text{mA}$  Output Current
- ☐ Half-Bridge Driver
- ☐ SOP-16 Package

#### Application:

- ☐ Appliances
- ☐ Air Conditioners
- ☐ AC Servo Motors
- ☐ General Purpose Power Supplies



Outline Drawing and Pin Diagram

| Dimensions     | Inches            | Millimeters    |
|----------------|-------------------|----------------|
| A              | 0.08 Max.         | 2.1 Max.       |
| A <sub>1</sub> | 0.004±0.004/0     | 0.1±0.1/0      |
| A <sub>2</sub> | 0.07              | 1.8            |
| b              | 0.02+0.004/-0.002 | 0.4+0.1/-0.05  |
| c              | 0.01+0.002/-0.008 | 0.2+0.05/-0.02 |
| [C]            | 0.05              | 1.27           |
| D              | 0.4±0.004         | 10.1±0.1       |
| E              | 0.21±0.004        | 5.3±0.1        |

| Dimensions     | Inches     | Millimeters |
|----------------|------------|-------------|
| H <sub>E</sub> | 0.31±0.01  | 7.8±0.3     |
| L              | 0.02±0.01  | 0.6±0.2     |
| L <sub>1</sub> | 0.05       | 1.25        |
| [e1]           | 0.31       | 7.62        |
| y              | 0.004 Max. | 0.1 Max.    |
| θ              | 0° – 8°    | 0° – 8°     |
| b <sub>2</sub> | 0.03       | 0.76        |
| l <sub>2</sub> | 0.05 Min.  | 1.27 Min.   |



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### Absolute Maximum Ratings, $T_a = 25^\circ\text{C}$ unless otherwise specified

| Ratings                                   | Symbol     | Test Conditions                     | M63991FP                   | Units                |
|-------------------------------------------|------------|-------------------------------------|----------------------------|----------------------|
| High Side Floating Supply Voltage         | $V_B$      |                                     | -0.5 ~ 624                 | Volts                |
| High Side Floating Supply Offset Voltage  | $V_S$      |                                     | $V_B - 24/+0.5$            | Volts                |
| High Side Output Voltage                  | $V_{HO}$   |                                     | $V_S - 0.5 \sim V_B + 0.5$ | Volts                |
| Low Side Fixed Supply Voltage             | $V_{CC}$   |                                     | -0.5 ~ 24                  | Volts                |
| Low Side Output Voltage                   | $V_{LO}$   |                                     | -0.5 ~ $V_{CC} + 0.5$      | Volts                |
| Logic Supply Voltage                      | $V_{DD}$   |                                     | -0.5 ~ 7                   | Volts                |
| Logic Input Voltage                       | $V_{IN}$   | $H_{IN}, L_{IN}$                    | -0.5 ~ $V_{DD} + 0.5$      | Volts                |
| Allowable Offset Supply Voltage Transient | $dV_S/dt$  |                                     | $\pm 50$                   | V/ns                 |
| Package Power Dissipation                 | $P_t$      | $T_a = 25^\circ\text{C}$ , On Board | 1.1                        | W                    |
| Linear Derating Factor                    | $K_\theta$ | $T_a > 25^\circ\text{C}$ , On Board | -11                        | mW/ $^\circ\text{C}$ |
| Junction Temperature                      | $T_j$      |                                     | -20 ~ 125                  | $^\circ\text{C}$     |
| Operation Temperature                     | $T_{opr}$  |                                     | -20 ~ 75                   | $^\circ\text{C}$     |
| Storage Temperature                       | $T_{stg}$  |                                     | -40 ~ 125                  | $^\circ\text{C}$     |

### Recommended Operating Conditions

| Parameter                                | Symbol   | Test Conditions  | Min.         | Typ. | Max.       | Units |
|------------------------------------------|----------|------------------|--------------|------|------------|-------|
| High Side Floating Supply Voltage        | $V_B$    |                  | $V_S + 13.5$ | —    | $V_S + 20$ | Volts |
| High Side Floating Supply Offset Voltage | $V_S$    |                  | -5           | —    | 500        | Volts |
| Low Side Fixed Supply Voltage            | $V_{CC}$ |                  | 13.5         | —    | 20         | Volts |
| Logic Supply Voltage                     | $V_{DD}$ |                  | 4.5          | —    | 5.5        | Volts |
| Logic Input Voltage                      | $V_{IN}$ | $H_{IN}, L_{IN}$ | 0            | —    | $V_{DD}$   | Volts |

### Function Table

| $H_{IN}$ | $L_{IN}$ | $V_{BS} U_V$ | $V_{CC} U_V$ | 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            | L  | L  | LO = OFF, HO = OFF, $L_{IN} = H_{IN} = H$ Simultaneously |
| X        | L        | L            | H            | L  | L  | LO = OFF, HO = OFF, $V_{BS} U_V$ Tripped                 |
| X        | H        | L            | H            | L  | H  | LO = ON, HO = OFF, $V_{BS} U_V$ Tripped                  |
| L        | X        | H            | L            | L* | L  | LO = OFF, HO = OFF, $V_{CC} U_V$ Tripped                 |
| H        | X        | H            | L            | H* | L  | LO = OFF, HO = ON, $V_{CC} U_V$ Tripped                  |

\* Note: "L" state of  $V_{BS} U_V$  and  $V_{CC} U_V$  means that supply is below trip level.

If  $V_{CC}$  becomes less than  $U_V$  trip, HO state will not change.

If  $V_{CC}$  becomes less than  $U_V$ ,  $H_{IN}$  state will not transfer to HO.

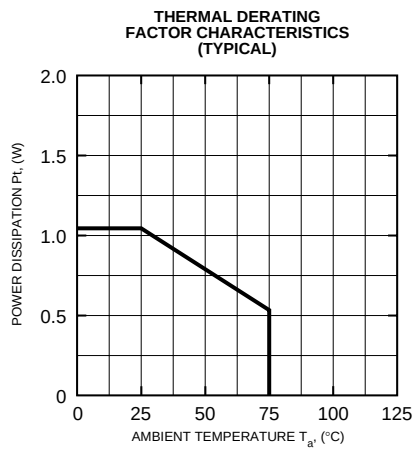
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**Electrical Characteristics,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = V_{BS} = 15\text{V}$ ,  $V_{DD} = 5\text{V}$  unless otherwise specified**

| Parameter                                       | Symbol               | Test Conditions                                                   | Min. | Typ.* | Max. | Units         |
|-------------------------------------------------|----------------------|-------------------------------------------------------------------|------|-------|------|---------------|
| Floating Supply Leakage Current                 | $I_{FS}$             | $V_B = V_S = 600\text{V}$                                         | —    | —     | 10   | $\mu\text{A}$ |
| $V_{BS}$ Standby Current                        | $I_{BS}$             |                                                                   | 0.2  | 0.5   | 1.0  | $\text{mA}$   |
| $V_{CC}$ Standby Current                        | $I_{CC}$             |                                                                   | 0.2  | 0.5   | 1.0  | $\text{mA}$   |
| $V_{DD}$ Standby Current                        | $I_{DD}$             |                                                                   | —    | —     | 100  | $\mu\text{A}$ |
| High Level Output Voltage                       | $V_{OH}$             | $I_O = 0\text{A}$ , LO, HO                                        | 13.8 | 14.4  | —    | Volts         |
| Low Level Output Voltage                        | $V_{OL}$             | $I_O = 0\text{A}$ , LO, HO                                        | —    | —     | 0.1  | Volts         |
| High Level Input Threshold Voltage              | $V_{IH}$             | $H_{IN}$ , $L_{IN}$                                               | 2.1  | 3.0   | 4.0  | Volts         |
| Low Level Input Threshold Voltage               | $V_{IL}$             | $H_{IN}$ , $L_{IN}$                                               | 0.6  | 1.5   | 1.9  | Volts         |
| High Level Input Bias Current                   | $I_{IH}$             | $V_{IN} = 5\text{V}$                                              | —    | 25    | 75   | $\mu\text{A}$ |
| Low Level Input Bias Current                    | $I_{IL}$             | $V_{IN} = 0\text{V}$                                              | —    | —     | 1.0  | $\mu\text{A}$ |
| $V_{BS}$ Supply UV Trip Voltage                 | $V_{BSUVT}$          |                                                                   | 9.5  | 10.5  | 11.5 | Volts         |
| $V_{BS}$ Supply UV Reset Voltage                | $V_{BSUVR}$          |                                                                   | 10.0 | 11.0  | 12.0 | Volts         |
| $V_{BS}$ Supply Filter Time                     | $t_{VBSUV}$          |                                                                   | —    | 7.5   | —    | $\mu\text{s}$ |
| $V_{CC}$ Supply UV Trip Voltage                 | $V_{CCUVT}$          |                                                                   | 9.5  | 10.5  | 11.5 | Volts         |
| $V_{CC}$ Supply UVReset Voltage                 | $V_{CCUVR}$          |                                                                   | 10.0 | 11.0  | 12.0 | Volts         |
| $V_{CC}$ Supply Filter Time                     | $t_{VCCUV}$          |                                                                   | —    | 7.5   | —    | $\mu\text{s}$ |
| Output High Level Short Circuit Pulsed Current  | $I_{OH}$             | $V_O = 0\text{V}$ , $V_{IN} = 5\text{V}$ , $PW < 10 \mu\text{s}$  | —    | -0.5  | —    | A             |
| Output Low Level Short Circuit Pulsed Current   | $I_{OL}$             | $V_O = 15\text{V}$ , $V_{IN} = 0\text{V}$ , $PW < 10 \mu\text{s}$ | —    | 0.5   | —    | A             |
| Output High Level On Resistance                 | $R_{OH}$             | $I_O = -200\text{mA}$ , $R_{OH} = (V_{OH} - V_O) / I_O$           | —    | 40    | —    | $\Omega$      |
| Output Low Level On Resistance                  | $R_{OL}$             | $I_O = 200\text{mA}$ , $R_{OL} = V_O / I_O$                       | —    | 20    | —    | $\Omega$      |
| High Side Turn-On Propagation Delay             | $t_{dLH}(\text{HO})$ | $CL = 1000\text{pF}$ between HO to $V_S$                          | 250  | 300   | 350  | ns            |
| High Side Turn-Off Propagation Delay            | $t_{dHL}(\text{HO})$ |                                                                   | 230  | 280   | 330  | ns            |
| High Side Turn-On Rise Time                     | $t_r(\text{HO})$     |                                                                   | —    | 80    | —    | ns            |
| High Side Turn-Off Fall Time                    | $t_f(\text{HO})$     |                                                                   | —    | 60    | —    | ns            |
| Low Side Turn-On Propagation Delay              | $t_{dLH}(\text{LO})$ | $CL = 1000\text{pF}$ between LO to GND                            | 250  | 300   | 350  | ns            |
| Low Side Turn-Off Propagation Delay             | $t_{dHL}(\text{LO})$ |                                                                   | 230  | 280   | 330  | ns            |
| Low Side Turn-On Rise Time                      | $t_r(\text{LO})$     |                                                                   | —    | 80    | —    | ns            |
| Low Side Turn-Off Fall Time                     | $t_f(\text{LO})$     |                                                                   | —    | 60    | —    | ns            |
| Delay Matching, High Side and Low Side Turn-On  | $t_{dMon}$           | $t_{dLH}(\text{HO}) - t_{dLH}(\text{LO})$                         | —    | —     | 30   | ns            |
| Delay Matching, High Side and Low Side Turn-Off | $t_{dMoff}$          | $t_{dHL}(\text{HO}) - t_{dHL}(\text{LO})$                         | —    | —     | 30   | ns            |

\* The typical values are those measured under ambient temperature ( $T_a$ ) of  $25^\circ\text{C}$ .  
There is no guarantee that these values are obtained under any conditions.

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**BLOCK DIAGRAM**

