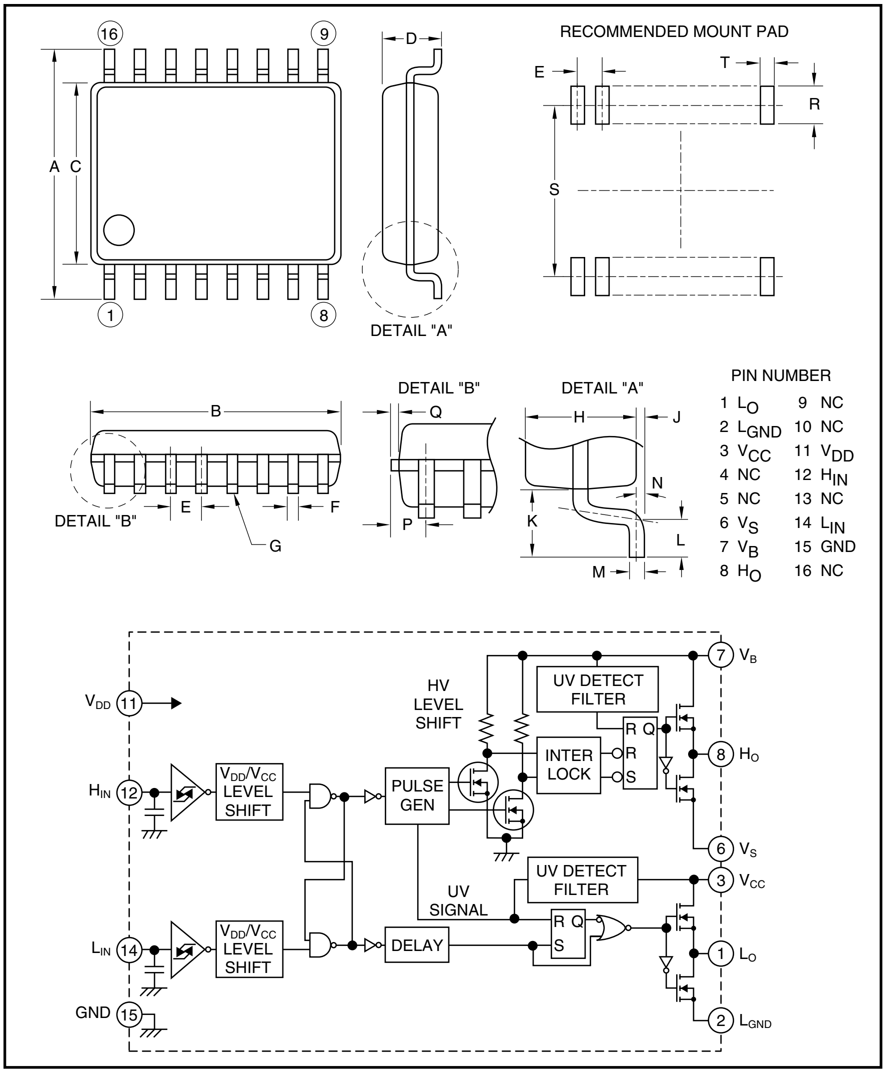
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

# HVIC

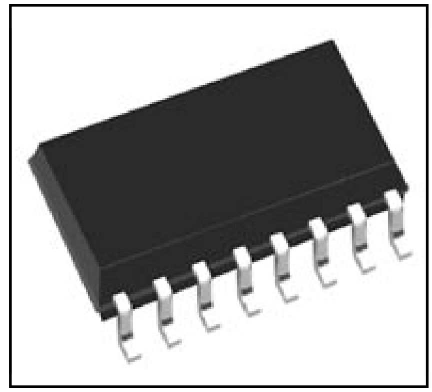
## *High Voltage Integrated Circuit*
## *600 Volts/±2 Amperes*




**Outline Drawing and Circuit Diagram**

| Dimensions | Inches | Millimeters |
|---|---|---|
| A | 0.31±0.01 | 7.8±0.3 |
| B | 0.41±0.004 | 10.1±0.1 |
| C | 0.21±0.004 | 5.3±0.1 |
| D | 0.12 | 2.10 |
| E | 0.05 | 1.27 |
| F | 0.02±0.002 | 0.4±0.05 |
| G | 0.004 | 0.1 |
| H | 0.07 | 1.8 |
| J | 0.01±0.004 | 0.1±0.1 |

| Dimensions | Inches | Millimeters |
|---|---|---|
| K | 0.05 | 1.25 |
| L | 0.024±0.008 | 0.6±0.2 |
| M | 0.1±0.002 | 0.2±0.05 |
| N | 4°±4° | 4°±4° |
| P | 0.03 Max. | 0.755 Max. |
| Q | 0.006 | 0.15 |
| R | 0.05 Min. | Min. 1.27 |
| S | 0.30 | 7.62 |
| T | 0.029 | 0.76 |



### Description:
M81701FP is a high voltage Power MOSFET and IGBT module driver for half-bridge applications.

### Features:
- ☐ Floating Supply Voltage
- ☐ Output Current
- ☐ Half-Bridge Driver
- ☐ SOP-16

### Applications:
- ☐ HID
- ☐ PDP
- ☐ MOSFET Driver
- ☐ IGBT Driver
- ☐ Inverter Module Control

### Ordering Information:
M81701FP is a ±2 Ampere, 600 Volt HVIC, High Voltage Integrated Circuit

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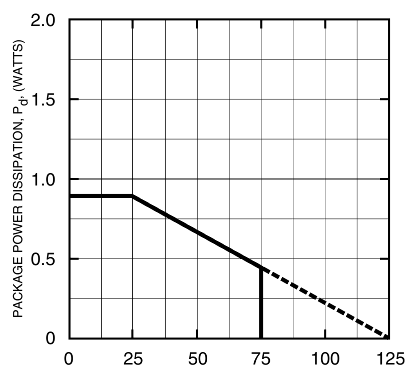
## Absolute Maximum Ratings, $T_a$ = 25°C unless otherwise specified

| Characteristics | Symbol | M81701FP | Units |
|---|---|---|---|
| High Side Floating Supply Absolute Voltage | $V_B$ | -0.5 ~ 624 | Volts |
| High Side Floating Supply Offset Voltage | $V_S$ | -0.5 ~ 600 | Volts |
| High Side Floating Supply Voltage ($V_{BS} = V_B – V_S$) | $V_{BS}$ | -0.5 ~ 24 | Volts |
| Allowable Offset Supply Voltage Minus Serge ($P_W$ < 1μs) | $-V_S$ | -5 | Volts |
| High Side Output Voltage | $V_{HO}$ | $V_S$ – 0.5 ~ $V_B$ + 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 ~ 24 | Volts |
| Logic Input Voltage ($H_{IN}$, $L_{IN}$) | $V_{IN}$ | -0.5 ~ $V_{DD}$ + 0.5 | Volts |
| Low Side Return Offset Voltage ($V_{CC} – L_{GND}$ < 24V) | $L_{GND}$ | -5 ~ $V_{CC}$ + 0.5 | Volts |
| Allowable Offset Supply Voltage Transient | $d_{VS}/dt$ | ±50 | V/ns |
| Package Power Dissipation ($T_a$ = 25°C, On Board) | $P_d$ | 0.88 | Watts |
| Linear Derating Factor ($T_a$ > 25°C, On Board) | $K\theta$ | -8.8 | mW/°C |
| Junction to Case Thermal Resistance | $R_{th(j-c)}$ | 50 | °C/W |
| Junction Temperature | $T_j$ | -20 ~ 125 | °C |
| Operation Temperature | $T_{opr}$ | -20 ~ 75 | °C |
| Storage Temperature | $T_{stg}$ | -40 ~ 125 | °C |

## Recommended Operating Conditions

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| High Side Floating Supply Absolute Voltage | $V_B$ | | $V_S$ + 10 | — | $V_S$ + 20 | Volts |
| High Side Floating Supply Offset Voltage | $V_S$ | | 0 | — | 500 | Volts |
| High Side Floating Supply Voltage | $V_{BS}$ | $V_{BS} = V_B – V_S$ | 10 | — | 20 | Volts |
| Low Side Fixed Supply Voltage | $V_{CC}$ | | 10 | — | 20 | Volts |
| Logic Supply Voltage | $V_{DD}$ | | 5 | — | 20 | Volts |
| Logic Input Voltage | $V_{IN}$ | $H_{IN}$, $L_{IN}$ | 0 | — | $V_{DD}$ | Volts |
| Low Side Return Offset Voltage | $L_{GND}$ | | -5 | — | 5 | Volts |

THERMAL DERATING FACTOR
CHARACTERISTICS



## Electrical Characteristics

**$T_a$ = 25°C, $V_{CC}$ = $V_{BS}$ (= $V_B$ – $V_S$) = $V_{DD}$ = 15V, $L_{GND}$ = 0V unless otherwise specified**

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Floating Supply Leakage Current | $I_{FS}$ | $V_B$ = $V_S$ = 600V | — | — | 1 | µA |
| $V_{BS}$ Standby Current | $I_{BS}$ | | — | 0.4 | 0.7 | mA |
| $V_{CC}$ Standby Current | $I_{CC}$ | | — | 0.75 | 1.5 | mA |
| $V_{DD}$ Standby Current | $I_{DD}$ | | — | — | 10 | µA |
| High Level Output Voltage | $V_{OH}$ | $I_O$ = 0A, $L_O$, $H_O$ | 13.8 | 14.4 | — | Volts |
| Low Level Output Voltage | $V_{OL}$ | $I_O$ = 0A, $L_O$, $H_O$ | — | — | 0.1 | Volts |
| High Level Input Threshold Voltage | $V_{IH15}$ | $H_{IN}$, $L_{IN}$ | — | 8.4 | 9.5 | Volts |
| Low Level Input Threshold Voltage | $V_{IL15}$ | $H_{IN}$, $L_{IN}$ | 6.0 | 6.8 | — | Volts |
| High Level Input Threshold Voltage | $V_{IH5}$ | $H_{IN}$, $L_{IN}$ ($V_{DD}$ = 5V) | — | 3.1 | 4.1 | volts |
| Low Level Input Threshold Voltage | $V_{IL5}$ | $H_{IN}$, $L_{IN}$ ($V_{DD}$ = 5V) | 1.4 | 2.4 | — | Volts |
| High Level Input Bias Current | $I_{IH}$ | $V_{IN}$ = 15V | — | 75 | 150 | µA |
| Low Level Input Bias Current | $I_{IL}$ | $V_{IN}$ = 0V | — | — | 1.0 | µA |
| $V_{BS}$ Supply UV Reset Voltage | $V_{BSuvr}$ | | 7.5 | 8.6 | 9.7 | Volts |
| $V_{BS}$ Supply UV Hysteresis Voltage | $V_{BSuvh}$ | | 0.1 | 0.4 | 0.7 | Volts |
| $V_{BS}$ Supply UV Filter Time | $t_{VBSuv}$ | | — | 10 | — | µs |
| $V_{CC}$ Supply UV Reset Voltage | $V_{CCuvr}$ | | 7.5 | 8.6 | 9.7 | Volts |
| $V_{CC}$ Supply UV Hysteresis Voltage | $V_{CCuvh}$ | | 0.1 | 0.4 | 0.7 | Volts |
| $V_{CC}$ Supply UV Filter Time | $t_{VCCuv}$ | | — | 10 | — | µs |
| Output High Level Short Circuit Pulsed Current | $I_{OH}$ | $V_O$ = 0V, $V_{IN}$ = 15V, $P_W$ < 10µs | — | -2.5 | — | Amperes |
| Output Low Level Short Circuit Pulsed Current | $I_{OL}$ | $V_O$ = 15V, $V_{IN}$ = 0V, $P_W$ < 10µs | — | 2.5 | — | Amperes |
| Output High Level ON Resistance | $R_{OH}$ | $I_O$ = -200mA, $R_{OH}$ = ($V_{OH}$ – $V_O$)/$I_O$ | — | 10 | 13 | Ω |
| Output Low Level ON Resistance | $R_{OL}$ | $I_O$ = 200mA, $R_{OL}$ = $V_O$ /$I_O$ | — | 2.5 | 3 | Ω |
| High Side Turn-On Propagation Delay | $t_{dLH(HO)}$ | $C_L$ = 1000pF between $H_O$ – $V_S$ | — | — | 350 | ns |
| High Side Turn-Off Propagation Delay | $t_{dHL(HO)}$ | $C_L$ = 1000pF between $H_O$ – $V_S$ | — | — | 330 | ns |
| High Side Turn-On Rise Time | $t_{rH}$ | $C_L$ = 1000pF between $H_O$ – $V_S$ | — | — | 60 | ns |
| High Side Turn-Off Fall Time | $t_{fH}$ | $C_L$ = 1000pF between $H_O$ – VS | — | — | 30 | ns |
| Low Side Turn-On Propagation Delay | $t_{dLH(LO)}$ | $C_L$ = 1000pf between $L_O$ – GND | — | — | 350 | ns |
| Low Side Turn-Off Propagation Delay | $t_{dHL(LO)}$ | $C_L$ = 1000pf between $L_O$ – GND | — | — | 330 | ns |
| Low Side Turn-On Rise Time | $t_{rL}$ | $C_L$ = 1000pf between $L_O$ – GND | — | — | 60 | ns |
| Low Side Turn-Off Rise Time | $t_{fL}$ | $C_L$ = 1000pf between $L_O$ – GND | — | — | 30 | ns |
| Delay Matching, High Side and Low Side Turn-On | $\Delta t_{dLH}$ | $\lvert t_{dLH(HO)} - t_{dLH(LO)} \rvert$ | — | — | 30 | ns |
| Delay Matching, High Side and Low Side Turn-Off | $\Delta t_{dHL}$ | $\lvert t_{dHL(HO)} - t_{dHL(LO)} \rvert$ | — | — | 30 | ns |

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FUNCTION TABLE (X: H or L)

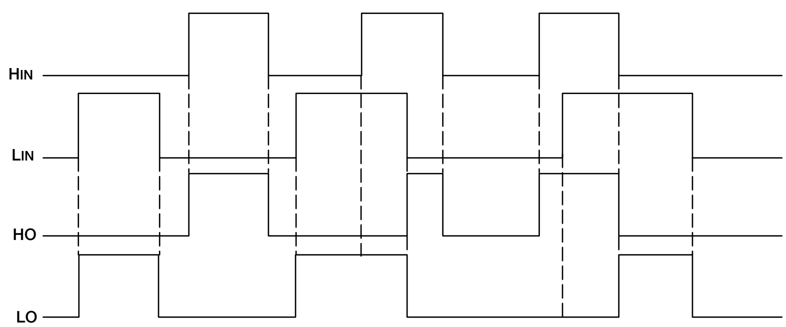
| $H_{IN}$ | $L_{IN}$ | $V_{BS}$ UV | $V_{CC}$ UV | HO | LO | Behavioral State |
|---|---|---|---|---|---|---|
| L | L | H | H | L | L | LO = OFF, HO = OFF |
| L | H | H | H | L | H | LO = ON, HO = OFF |
| H | L | H | H | H | L | LO = OFF, HO = ON |
| H | H | H | H | * | * | |
| X | L | L | H | L | L | LO = OFF, HO = OFF, $V_{BS}$ UV tripped |
| X | H | L | H | L | H | LO = ON, HO = OFF, $V_{BS}$ UV tripped |
| L | X | H | L | L | L | LO = OFF, HO = OFF, $V_{CC}$ UV tripped |
| H | X | H | L | L | L | LO = OFF, HO = OFF, $V_{CC}$ UV tripped |

Note : “L” state of $V_{BS}$ UV and $V_{CC}$ UV means that UV trip voltage.
* If both input signals are “H”, refer to TIMING DIAGRAM.

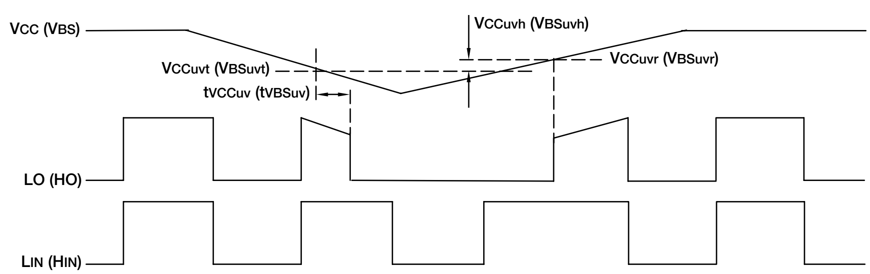
TIMING DIAGRAM

1. Input/Output Timing Diagram

   When input signal ($H_{IN}$ or $L_{IN}$) is “H”, then output signal (HO or LO) is “H”. In the case of both input signals ($H_{IN}$ and $L_{IN}$) are “H”, first coming input signal ($H_{IN}$ or $L_{IN}$) “H” is only accepted. Corresponding this signal, output signal (HO or LO) becomes “H”. Corresponding the other signal ($L_{IN}$ or $H_{IN}$), output signal (LO or HO) keeps “L”.




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




3. Allowable Supply Voltage Transient

   Allowable high side floating supply voltage ($V_{BS}$) transient or low side fixed supply voltage ($V_{CC}$) transient are below 50V/μs. In case $V_{BS}$ or $V_{CC}$ are started more than 50V/μs, output signal (HO or LO) may be “H”.