

# M81709FP

## HIGH VOLTAGE HALF BRIDGE DRIVER

### DESCRIPTION

M81709FP is high voltage Power MOSFET and IGBT module driver for half bridge applications.

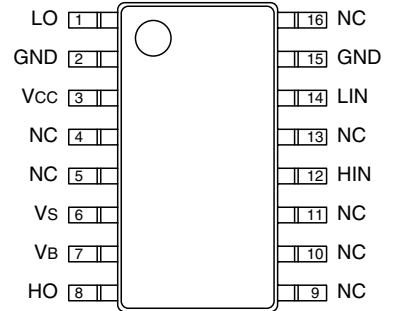
### FEATURES

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

### APPLICATIONS

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

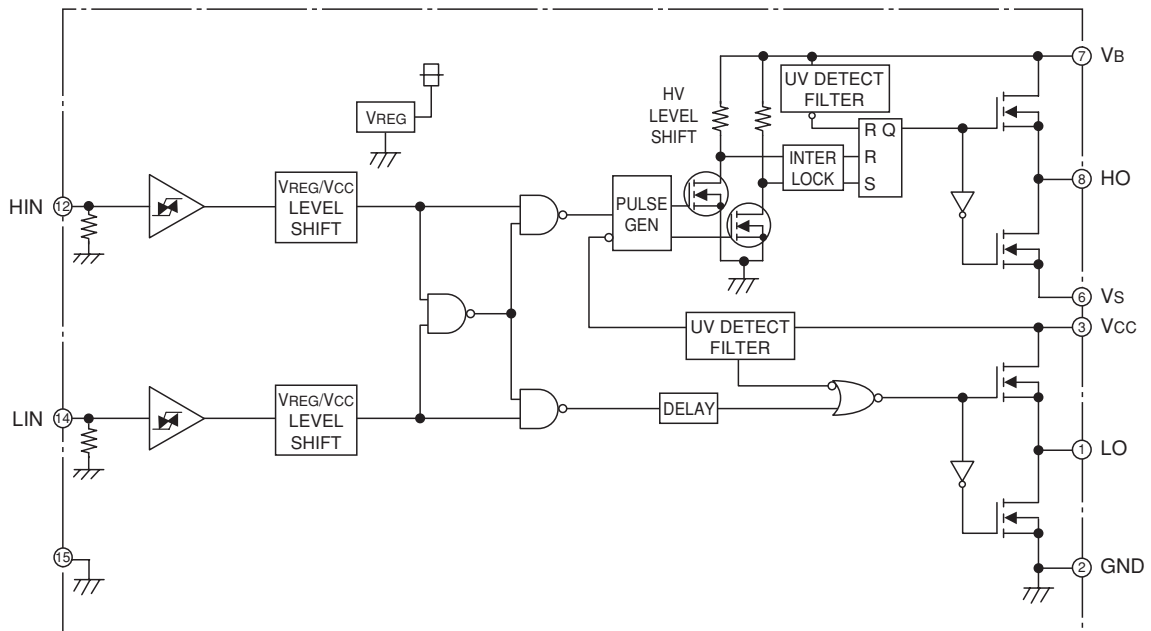
### PIN CONFIGURATION (TOP VIEW)



NC:NO CONNECTION

Outline:16P2N

### BLOCK DIAGRAM



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

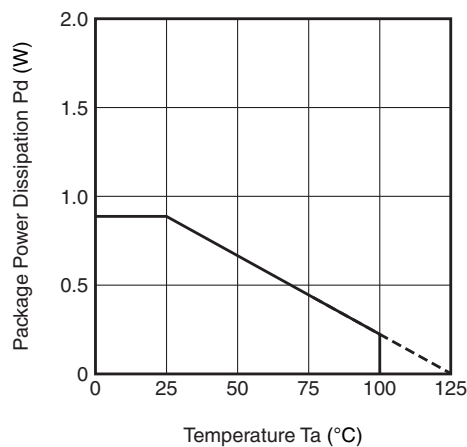
Symbol	Parameter	Test conditions	Ratings	Unit
V <sub>B</sub>	High Side Floating Supply Absolute Voltage		-0.5 ~ 624	V
V <sub>S</sub>	High Side Floating Supply Offset Voltage		V <sub>B</sub> -24 ~ V <sub>B</sub> +0.5	V
V <sub>BS</sub>	High Side Floating Supply Voltage	V <sub>BS</sub> = V <sub>B</sub> -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
dV <sub>S</sub> /dt	Allowable Offset Voltage Transient		±50	V/ns
P <sub>d</sub>	Package Power Dissipation	Ta = 25°C, On Board	0.90	W
K $\theta$	Linear Derating Factor	Ta > 25°C, On Board	9.0	mW/°C
R <sub>th(j-c)</sub>	Junction-Case Thermal Resistance		50	°C/W
T <sub>j</sub>	Junction Temperature		-20 ~ 125	°C
T <sub>opr</sub>	Operation Temperature		-20 ~ 100	°C
T <sub>stg</sub>	Storage Temperature		-40 ~ 125	°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	V <sub>B</sub> > 10V	-5	—	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, Vcc = Vbs (= VB-Vs) = 15V, unless otherwise specified)**

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.*	Max.	
IFS	Floating Supply Leakage Current	VB = VS = 600V	—	—	1.0	μA
IBS	Vbs Standby Current	HIN = LIN = 0V	—	0.2	0.5	mA
ICC	Vcc Standby Current	HIN = LIN = 0V	0.2	0.5	1.0	mA
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
VIH	High Level Input Threshold Voltage	HIN, LIN	2.1	3.0	4.0	V
VIL	Low Level Input Threshold Voltage	HIN, LIN	0.6	1.5	2.0	V
IiH	High Level Input Bias Current	VIN = 5V	—	25	75	μA
IiL	Low Level Input Bias Current	VIN = 0V	—	—	1.0	μA
VBSuvr	Vbs Supply UV Reset Voltage		8.0	8.9	9.8	V
VBSuvh	Vbs Supply UV Hysteresis Voltage		0.3	0.7	—	V
tVBSuv	Vbs Supply UV Filter Time		—	7.5	—	μs
VCCuvr	Vcc Supply UV Reset Voltage		8.0	8.9	9.8	V
VCCuvh	Vcc Supply UV Hysteresis Voltage		0.3	0.7	—	V
tVCCuv	Vcc Supply UV Filter Time		—	7.5	—	μs
IOH	Output High Level Short Circuit Pulsed Current	VO = 0V, VIN = 5V, 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	3.0	Ω
tdLH(HO)	High Side Turn-On Propagation Delay	CL = 1000pF between HO-Vs	100	135	170	ns
tdHL(HO)	High Side Turn-Off Propagation Delay	CL = 1000pF between HO-Vs	100	135	170	ns
trH	High Side Turn-On Rise Time	CL = 1000pF between HO-Vs	—	20	35	ns
tfH	High Side Turn-Off Fall Time	CL = 1000pF between HO-Vs	—	15	25	ns
tdLH(LO)	Low Side Turn-On Propagation Delay	CL = 1000pF between LO-GND	100	135	170	ns
tdHL(LO)	Low Side Turn-Off Propagation Delay	CL = 1000pF between LO-GND	100	135	170	ns
trL	Low Side Turn-On Rise Time	CL = 1000pF between LO-GND	—	20	35	ns
tfL	Low Side Turn-Off Fall Time	CL = 1000pF between LO-GND	—	15	25	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

\* Typ. is not specified.

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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 = HO = Low
L	H	H	H	L	H	LO = High
H	L	H	H	H	L	HO = High
H	H	H	H	L	L	LO = HO = Low
X	L	L	H	L	L	HO = Low, Vbs UV tripped
X	H	L	H	L	H	LO = High, Vbs UV tripped
L	X	H	L	L	L	LO = Low, Vcc UV tripped
H	X	H	L	L	L	HO = LO = Low, Vcc UV tripped

Note : "L" state of Vbs UV, Vcc UV means that UV trip voltage.

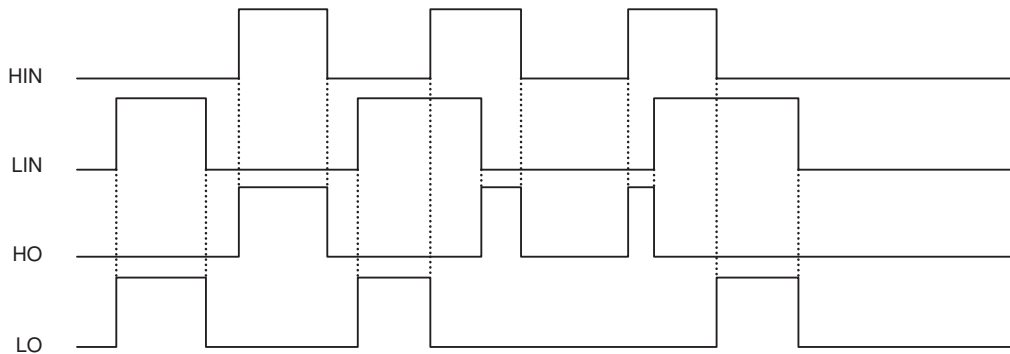
In the case of both input signals (HIN and LIN) are "H", output signals (HO and LO) become "L".

### TIMING DIAGRAM

#### 1. Input/Output Timing Diagram

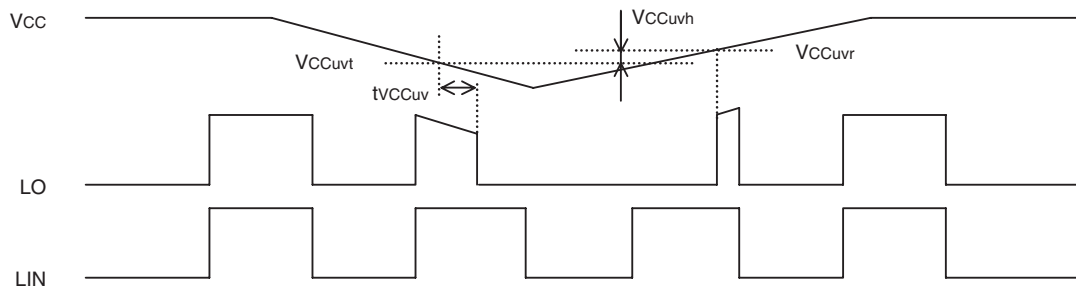
HIGH ACTIVE (When input signal (HIN or LIN) is "H", then output signal (HO or LO) is "H".)

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

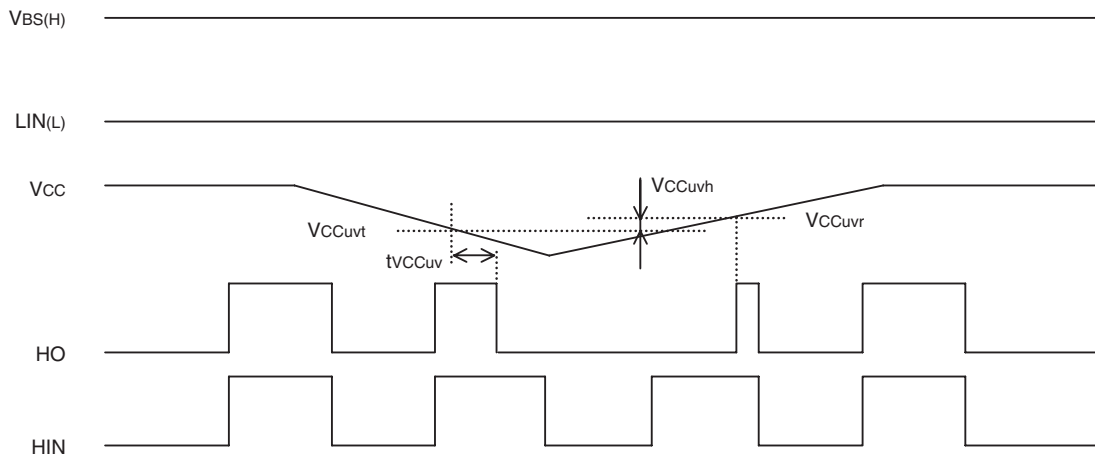


2.Vcc (Vbs) Supply Under Voltage Lockout Timing Diagram

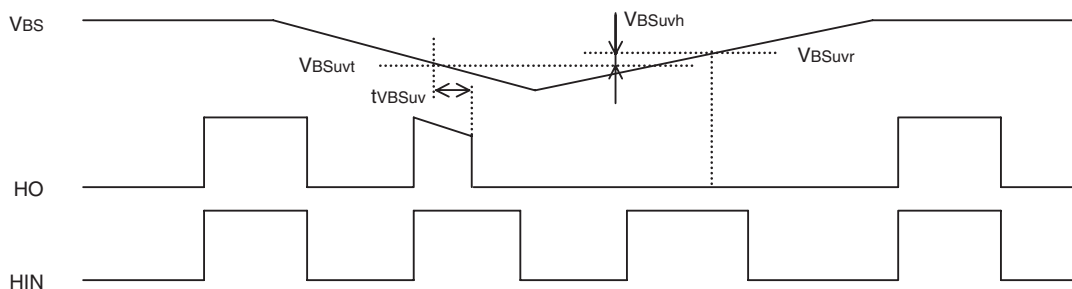
When Vcc Supply Voltage keeps lower UV Trip Voltage ( $V_{CCUVt} = V_{CCUvr} - V_{CCUvh}$ ) for Vcc Supply UV Filter Time, output signal becomes "L". And then, when Vcc Supply Voltage is higher than UV Reset Voltage, output signal LO becomes "H".



When Vcc Supply Voltage keeps lower UV Trip Voltage ( $V_{CCUVt} = V_{CCUvr} - V_{CCUvh}$ ) for Vcc Supply UV Filter Time, output signal becomes "L". And then, when Vcc Supply Voltage is higher than UV Reset Voltage, input signal (LIN) is L; output signal HO becomes "H".



When Vbs Supply Voltage keeps lower UV Trip Voltage ( $V_{BSUvt} = V_{BSUvr} - V_{BSUvh}$ ) for Vbs Supply UV Filter Time, output signal becomes "L". And then, Vbs Supply Voltage is higher than UV Reset Voltage, output signal HO keeps "L" until next input signal HIN is "H".



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### 3. Allowable Supply Voltage Transient

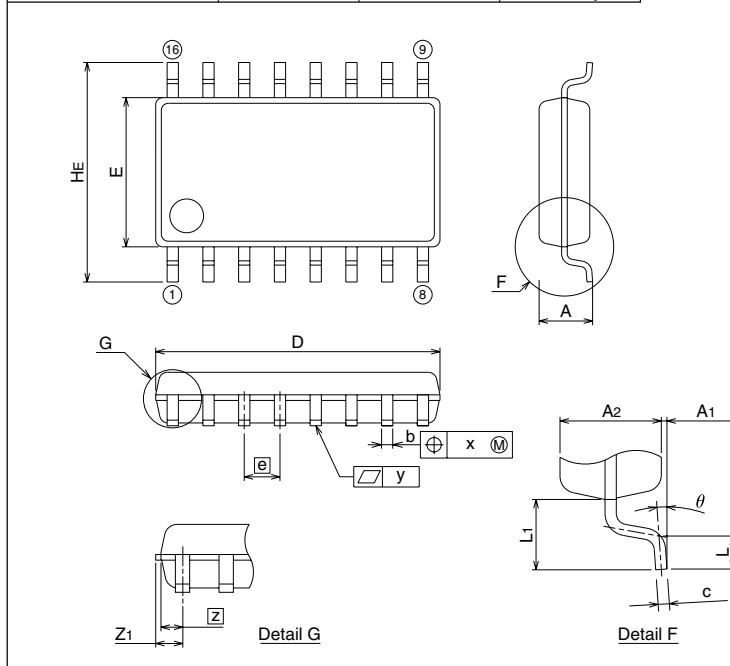
It is recommended that supplying VCC firstly and supplying VBS secondly. In the case of shutting off supply voltage, shutting off VBS firstly and shutting off VCC secondly. At the time of starting VCC and VBS, power supply should be increased slowly. If it is increased rapidly, output signal (HO or LO) may be "H".

### PACKAGE OUTLINE

#### 16P2N-A

Plastic 16pin 300mil SOP

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SOP16-P-300-1.27	-	0.2	Cu Alloy



Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	-	-	2.1
A1	0	0.1	0.2
A2	-	1.8	-
b	0.35	0.4	0.5
c	0.18	0.2	0.25
D	10.0	10.1	10.2
E	5.2	5.3	5.4
e	-	1.27	-
HE	7.5	7.8	8.1
L	0.4	0.6	0.8
L1	-	1.25	-
Z	-	0.605	-
Z1	-	-	0.755
x	-	-	0.25
y	-	-	0.1
θ	0°	-	8°
b2	-	0.76	-
e1	-	7.62	-
l2	1.27	-	-