

# M81712FP

## HIGH VOLTAGE THREE PHASE BRIDGE DRIVER

### DESCRIPTION

M81712FP is high voltage Power MOSFET and IGBT module driver for THREE PHASE bridge applications.

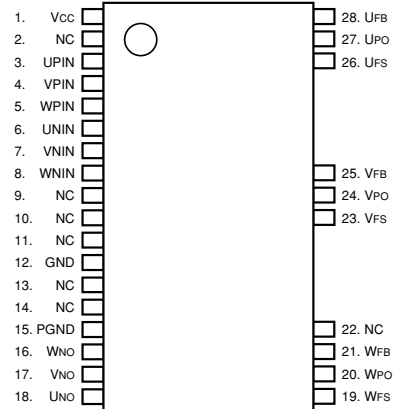
### FEATURES

- FLOATING SUPPLY VOLTAGE ..... 600V
- OUTPUT CURRENT ..... +200mA/-500mA (typ)
- THREE PHASE BRIDGE DRIVER
- 28Pin SSOP PACKAGE (Cut Pin Package)  
DISTANCE BETWEEN HIGHSIDE-PHASE : 3.4mm

### APPLICATIONS

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

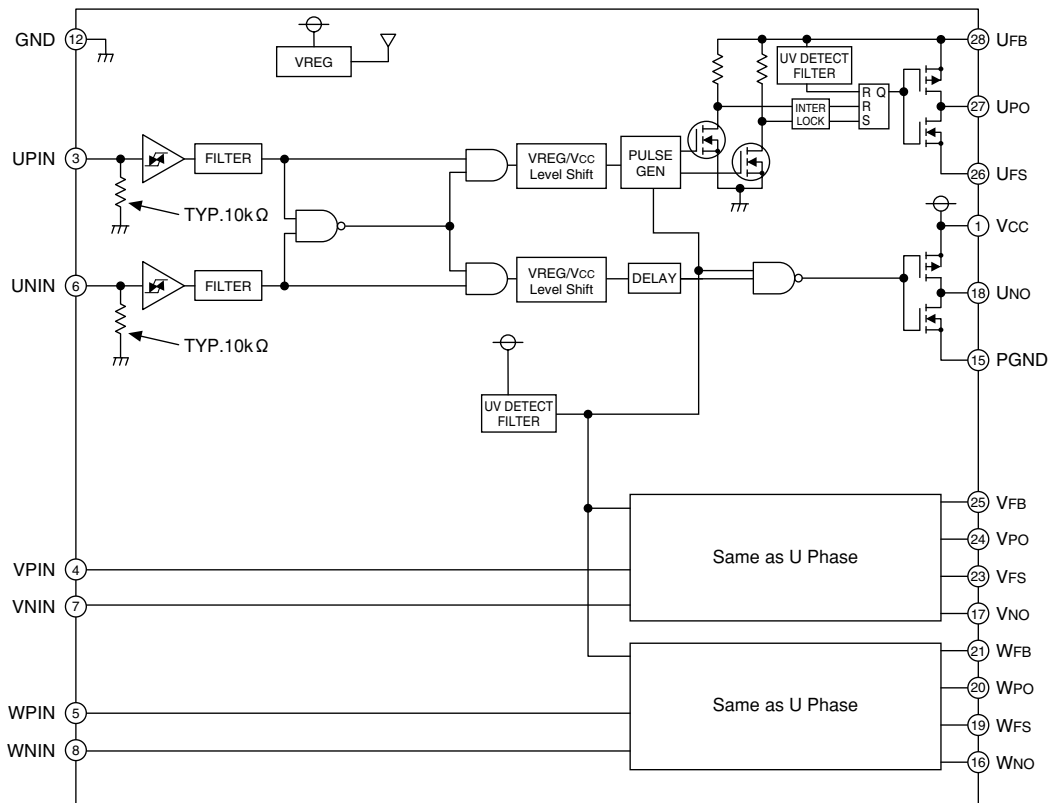
### PIN CONFIGURATION (TOP VIEW)



NC:NO CONNECTION

Outline 28X9R

### BLOCK DIAGRAM



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

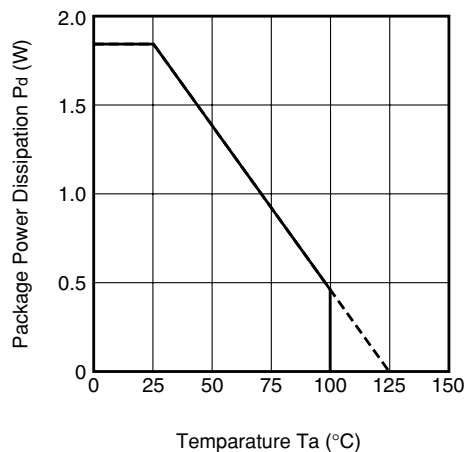
Symbol	Parameter	Conditions	Ratings	Unit
U,V,WFB	High Side Floating Supply Absolute Voltage		-0.5 ~ 624	V
U,V,WFS	High Side Floating Supply Offset Voltage		U,V,WFB-24 ~ U,V,WFB +0.5	V
VBS	High Side Floating Supply Voltage	VBS = *FB-*FS	-0.5~24	V
U,V,WPO	High Side Output Voltage		U,V,WFS-0.5 ~ U,V,WFB+0.5	V
VCC	Low Side Fixed Supply Voltage		-0.5~24	V
U,V,WNO	Low Side Output Voltage	*PIN, *NIN Terminal	-0.5~VCC+0.5	V
U,V,WIN	Logic Input Voltage		-0.5~VCC+0.5	V
dVS/dt	Allowable Offset Supply Voltage Transient	Ta = 25°C, On Board	±50	V/ns
PD	Package Power Dissipation	Ta > 25°C, On Board	1.84	W
Kθ	Linear Derating Factor		18.4	mW/°C
Rth(j-c)	Junction-Case Thermal Resistance		54.39	°C/W
Tj	Junction Temperature		-20 ~ 125	°C
Topr	Operation Temperature		-20 ~ 100	°C
Tstg	Storage Temperature		-40 ~ 125	°C

### RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
U,V,WFB	High Side Floating Supply Absolute Voltage		Vs+10	—	Vs+20	V
U,V,WFS	High Side Floating Supply Offset Voltage		0	—	500	V
VBS	High Side Floating Supply Voltage	VBS = *FB-*FS	10	—	20	V
VCC	Low Side Fixed Supply Voltage		10	—	20	V
VIN	Logic Input Voltage	*PIN, *NIN Terminal	0	—	5	V
VPND	Power GND		-5	—	5	V

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

### THERMAL DERATING FACTOR CHARACTERISTIC (MAXIMUM RATING)



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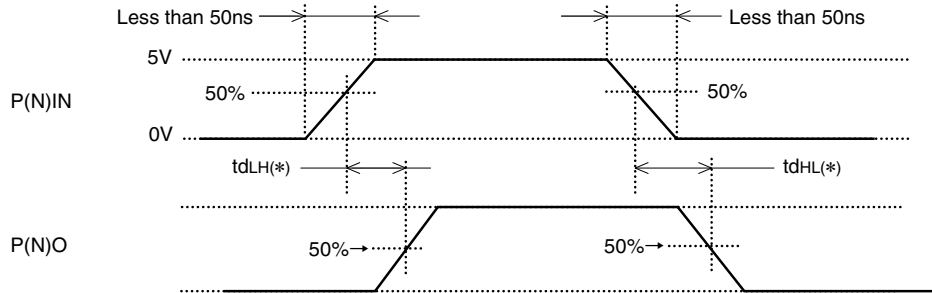
ELECTRICAL CHARACTERISTICS (Ta=25°C, Vcc=Vbs(=\*FB\*FS)=15V unless otherwise specified)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.*	Max.	
IFS	Floating Supply Leakage Current	V <sub>B</sub> = V <sub>S</sub> = 600V, 1 per phase	—	—	1.0	μA
I <sub>BS</sub>	V <sub>BS</sub> Standby Current	1 per phase	—	0.2	0.5	mA
I <sub>CC</sub>	V <sub>CC</sub> Standby Current		—	1.0	2.0	mA
V <sub>OH</sub>	High Level Output Voltage	I <sub>O</sub> = 0A, *NO, *PO	14.9	—	—	V
V <sub>OL</sub>	Low Level Output Voltage	I <sub>O</sub> = 0A, *NO, *PO	—	—	0.1	V
V <sub>IH</sub>	High Level Input Threshold Voltage	*PIN, *NIN	2.7	—	—	V
V <sub>IL</sub>	Low Level Input Threshold Voltage	*PIN, *NIN	—	—	0.8	V
I <sub>IH</sub>	High Level Input Bias Current	*PIN, *NIN = 5V	0.3	0.5	1.0	mA
I <sub>IL</sub>	Low Level Input Bias Current	*PIN, *NIN = 0V	—	0	—	μA
V <sub>BSuvr</sub>	V <sub>BS</sub> Supply UV Reset Voltage		7.5	8.5	9.5	V
V <sub>BSuvh</sub>	V <sub>BS</sub> Supply UV Hysteresis Voltage		0.2	0.5	0.8	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		7.5	8.5	9.5	V
V <sub>CCuvh</sub>	V <sub>CC</sub> Supply UV Hysteresis Voltage		0.2	0.5	0.8	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	*PO, *NO = 0V, *PIN, *NIN = 5V, PW < 10 μs	120	200	—	mA
I <sub>OL</sub>	Output Low Level Short Circuit Pulsed Current	*PO, *NO = 15V, *PIN, *NIN = 0V, PW < 10 μs	350	500	—	mA
R <sub>OH</sub>	Output High Level On Resistance	I <sub>O</sub> = 20mA, R <sub>OH</sub> = (V <sub>OH</sub> -V <sub>O</sub> ) /20mA	—	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> /20mA	—	15	30	Ω
tdLH(HO)	High Side Turn-On Propagation Delay	CL = 1000pF between *HO-*Vs Note.1	340	650	855	ns
tdHL(HO)	High Side Turn-Off Propagation Delay	CL = 1000pF between *HO-*Vs Note.1	340	650	855	ns
trH	High Side Turn-On Rise Time	CL = 1000pF between *HO-*Vs Note.2	20	130	220	ns
tfH	High Side Turn-Off Fall Time	CL = 1000pF between *HO-*Vs Note.2	—	50	75	ns
tdLH(LO)	Low Side Turn-On Propagation Delay	CL = 1000pF between *LO-PGND Note.1	340	650	855	ns
tdHL(LO)	Low Side Turn-Off Propagation Delay	CL = 1000pF between *LO-PGND Note.1	340	650	855	ns
trL	Low Side Turn-On Rise Time	CL = 1000pF between *LO-PGND Note.2	20	100	200	ns
tfL	Low Side Turn-Off Fall Time	CL = 1000pF between *LO-PGND Note.2	—	50	75	ns
ΔtdLH	Delay Matching, High Side and Low Side Turn-On	tdLH (*HO) -tdLH (*LO)	—	—	50	ns
ΔtdHL	Delay Matching, High Side and Low Side Turn-Off	tdHL (*HO) -tdHL (*LO)	—	—	50	ns
t <sub>filter</sub>	Input Filter Time	*PIN, *NIN : Convex Pulse	260	380	500	ns
		*PIN, *NIN : Concave Pulse	310	450	590	ns

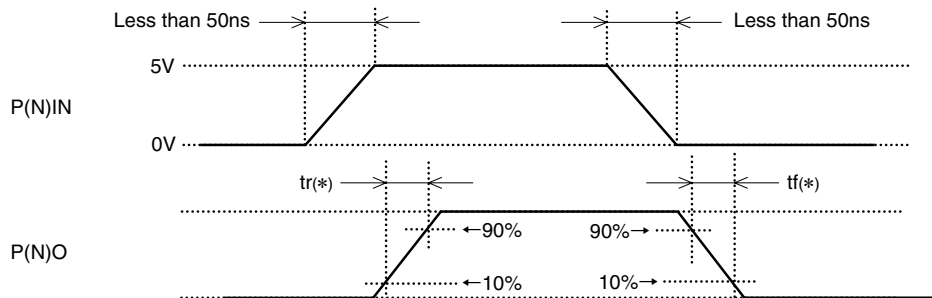
\* Typ. is not specified.

**HIGH VOLTAGE THREE PHASE BRIDGE DRIVER**

Note1 : Propagation Delay Timing (Output capacitor load CL = 1000pF).



Note2 : Output Rise/Fall Timing (Output capacitor load CL = 1000pF).



**FUNCTION TABLE**

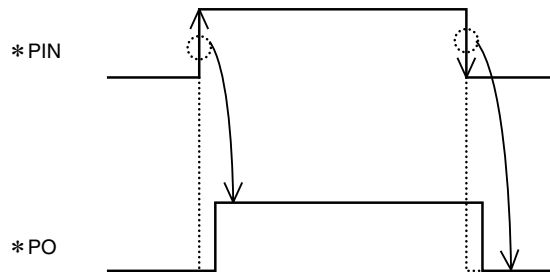
U,V,WPIN	U,V,WNIN	UV(VCC)	UV(VBS)	U,V,WPO	U,V,WNO	Behavioral state
H→L	L	H	H	L	L	*PO = L, *NO = L
H→L	H	H	H	L	H	*NO = H
L→H	L	H	H	H	L	*PO ON = H
L→H	H	X	H	L	L	*NO, *PO = L when *PIN, *NIN is "L" at the same time
X	L	H	L	L	L	*PO = L when Vbs UV tripped.
H→L	X	L	H	L	L	*NO = L when Vcc UV tripped.

Note1 : "L" state of Vbs UV, Vcc UV means that UV trip voltage.

2 : In the case of both input signals (\*PIN and \*NIN) are "H", output signals (\*PO and \*NO) become "L".

3 : X (\*PIN) : L→H or H→L X (\*NIN) : H or L.

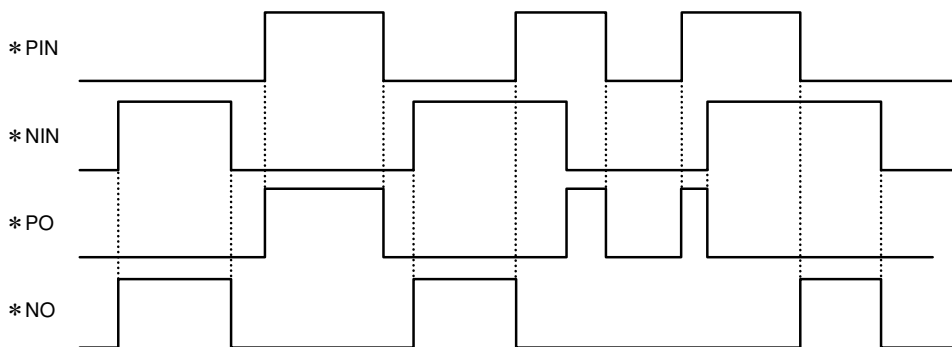
4 : Output Signal (\*Po) is triggered by the edge of input signal.



**TIMING DIAGRAM**

1. Input/Output Timing Diagram

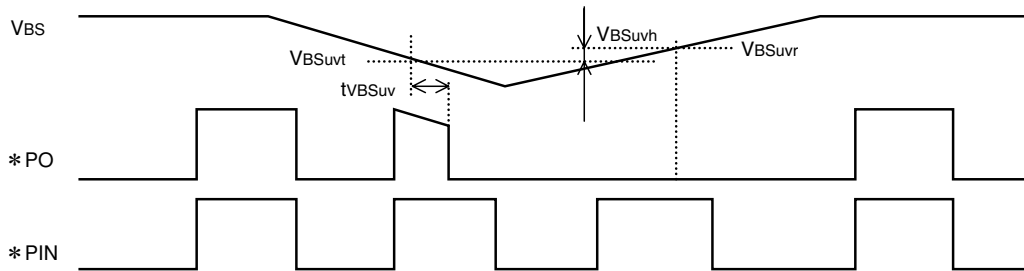
High Active, in the case of both input signals (\*PIN, \*NIN) are "H", output signals (\*PO, \*NO) become "L".



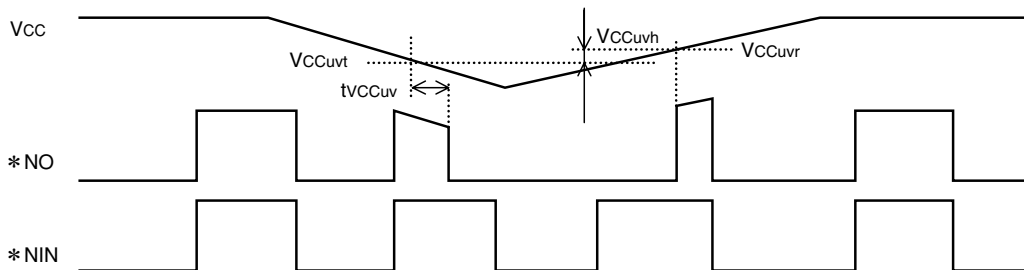
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2. V<sub>CC</sub> (V<sub>BS</sub>) Supply Under Voltage Lockout Timing Diagram

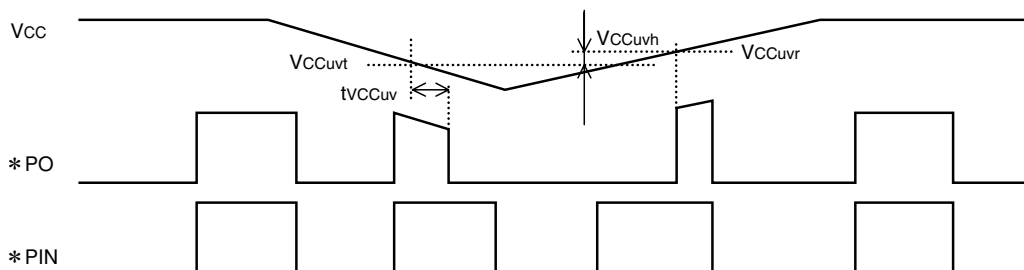
If V<sub>BS</sub> supply voltage drops below UV trip voltage (V<sub>BSuvt</sub>) for V<sub>BS</sub> supply UV filter time, output signal is shut down. As soon as V<sub>BS</sub> supply voltage rises over UV reset voltage, output signal \*PO becomes "H" at following edge of input signal.



If V<sub>CC</sub> supply voltage drops below UV trip voltage (V<sub>CCuvt</sub>) for V<sub>CC</sub> supply UV filter time, \*NO output signal is shut down. As soon as V<sub>CC</sub> supply voltage rises over UV reset voltage, output signal \*NO becomes "H" if \*NIN input signal is "H".



If V<sub>CC</sub> supply voltage drops below UV trip voltage (V<sub>CCuvt</sub>) for V<sub>CC</sub> supply UV filter time, \*PO output signal is shut down. As soon as V<sub>CC</sub> supply voltage rises over UV reset voltage, output signal \*PO becomes "H" if \*PIN input signal is "H".



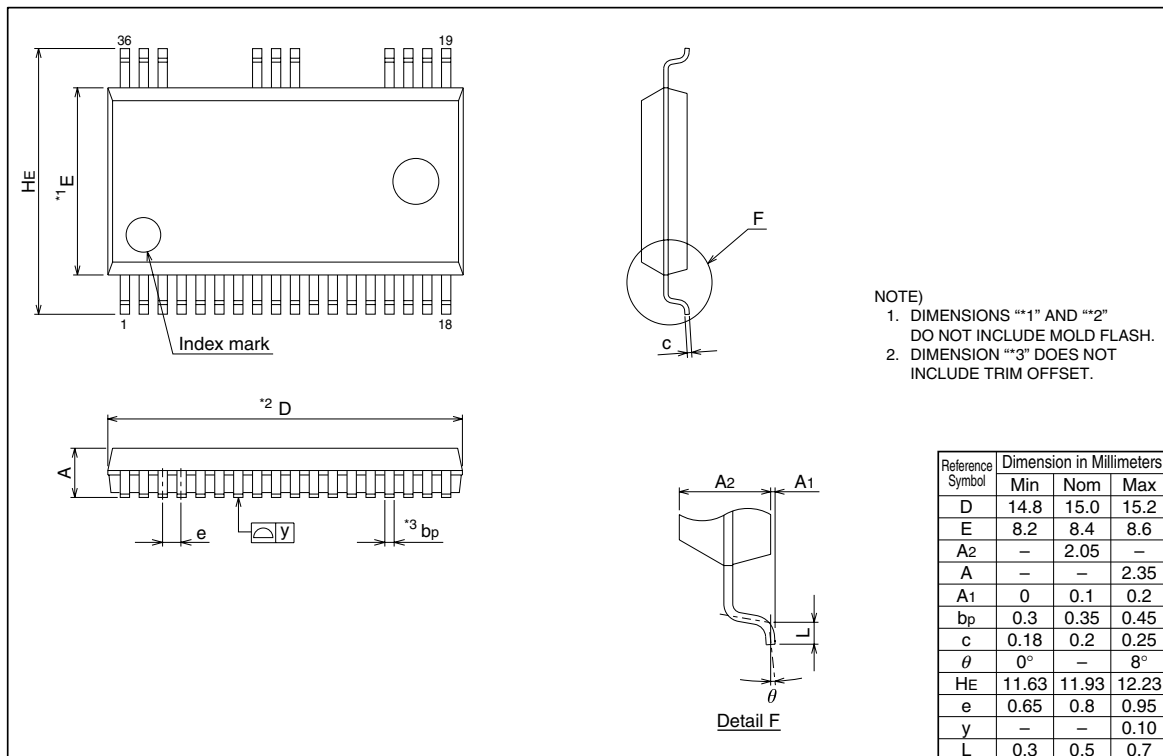
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### 3. Allowable Supply Voltage Transient

It is recommended to supply  $V_{CC}$  firstly and supply  $V_{BS}$  secondly. When 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.

### PACKAGE OUTLINE



NOTE)  
 1. DIMENSIONS \*\*1" AND \*\*2"  
 DO NOT INCLUDE MOLD FLASH.  
 2. DIMENSION \*\*3" DOES NOT  
 INCLUDE TRIM OFFSET.