M81707FP

HIGH VOLTAGE HALF BRIDGE DRIVER

DESCRIPTION

M81707FP is high voltage Power MOSFET and IGBT module driver for half bridge applications.

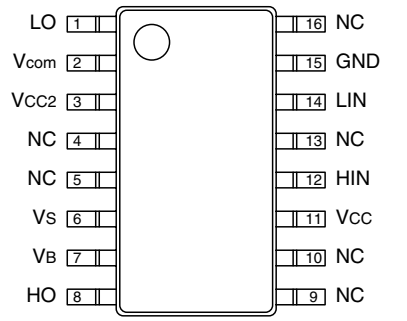
FEATURES

- FLOATING SUPPLY VOLTAGE 600V
- OUTPUT CURRENT ..... ±100mA
- UNDERVOLTAGE LOCKOUT
- SOP-16 PACKAGE

APPLICATIONS

IGBT/MOSFET driver

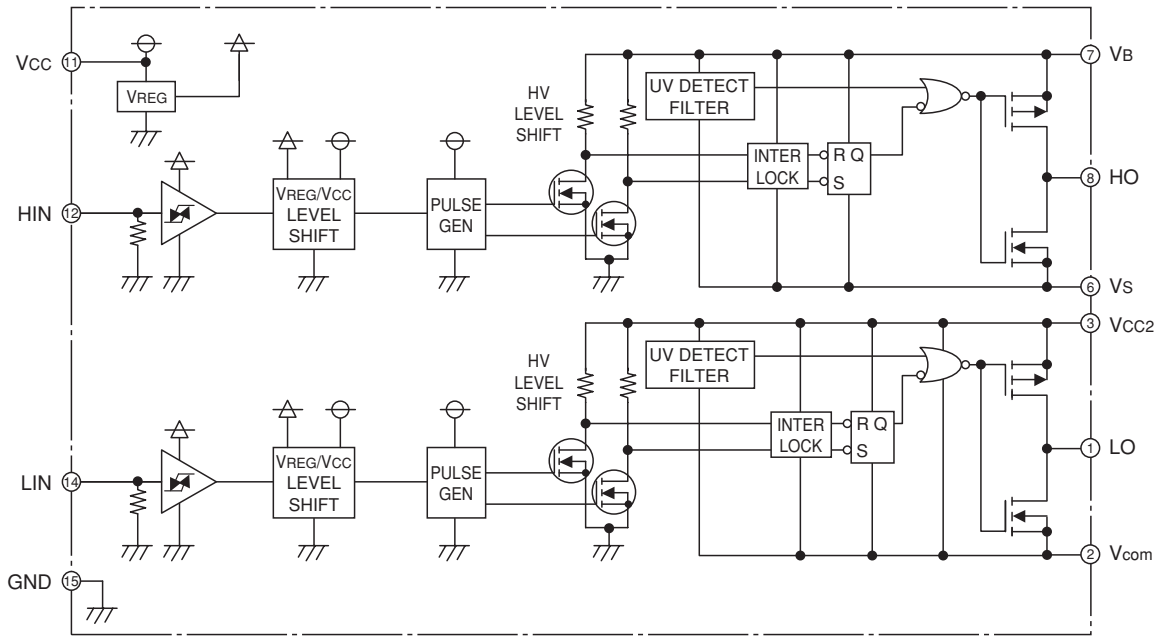
PIN CONFIGURATION (TOP VIEW)



NC:NO CONNECTION

Outline:16P2N

BLOCK DIAGRAM



MITSUBISHI ELECTRIC

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

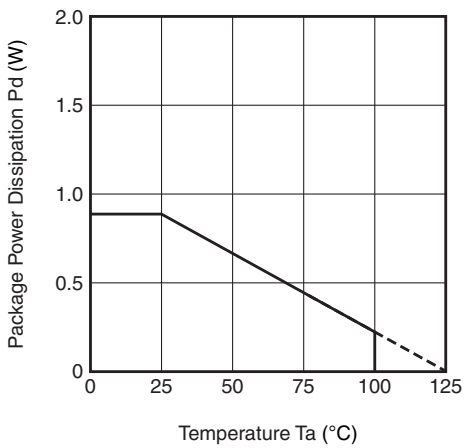
Symbol	Parameter	Test conditions	Ratings	Unit
V_B	High Side Floating Supply Absolute Voltage		–0.5 ~ 624	V
V_S	High Side Floating Supply Offset Voltage		V_B–24 ~ V_B+0.5	V
V_{BS}	High Side Floating Supply Voltage	$V_{BS} = V_B–V_S$	–0.5 ~ 24	V
V_{HO}	High Side Output Voltage		V_S–0.5 ~ V_B+0.5	V
V_{CC2}	Low Side Floating Supply Absolute Voltage		–0.5 ~ 624	V
V_{com}	Output Standard Voltage		V_{CC2}–24 ~ V_{CC2}+0.5	V
V_{CC2com}	Low Side Floating Supply Voltage	$V_{CC2com} = V_{CC2}–V_{com}$	–0.5 ~ 24	V
V_{CC}	Low Side Fixed Supply Voltage		–0.5 ~ 24	V
V_{LO}	Low Side Output Voltage		V_{com}–0.5 ~ V_{CC2}+0.5	V
V_{IN}	Logic Input Voltage	HIN, LIN	–0.5 ~ V_{CC}+0.5	V
dVs/dt	Allowable Offset Voltage Transient		±50	V/ns
Pd	Package Power Dissipation	Ta = 25°C, On Board	0.89	W
$K\theta$	Linear Derating Factor	Ta > 25°C, On Board	8.9	mW/°C
Rth(j-c)	Junction-Case Thermal Resistance		45	°C/W
Tj	Junction Temperature		–40 ~ 125	°C
Topr	Operation Temperature		–40 ~ 100	°C
Tstg	Storage Temperature		–55 ~ 125	°C
TL	Solder Heat Resistance	Pb Free	255:10s, max 260	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
V_B	High Side Floating Supply Absolute Voltage		V_S+10	—	V_S+20	V
V_S	High Side Floating Supply Offset Voltage	V_B > 10V	–5	—	500	V
V_{BS}	High Side Floating Supply Voltage	$V_{BS} = V_B–V_S$	10	—	20	V
V_{HO}	High Side Output Voltage		V_S	—	V_B	V
V_{CC2}	Low Side Floating Supply Absolute Voltage		V_{com}+10	—	V_{com}+20	V
V_{com}	Output Standard Voltage	V_{CC2} > 10V	–5	—	500	V
V_{CC2com}	Low Side Floating Supply Voltage	$V_{CC2com} = V_{CC2}–V_{com}$	10	—	20	V
V_{CC}	Low Side Fixed Supply Voltage		10	—	20	V
V_{LO}	Low Side Output Voltage		V_{com}	—	V_{CC2}	V
V_{IN}	Logic Input Voltage	HIN, LIN	0	—	V_{CC}	V

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

THERMAL DERATING FACTOR CHARACTERISTIC (MAXIMUM RATING)



ELECTRICAL CHARACTERISTICS (Ta = 25°C, V_{CC} = V_{CC2com} (= V_{CC2}–V_{com}) = V_{BS} (= V_B–V_S) = 15V, V_S = V_{com} = 0V, unless otherwise specified)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.*	Max.	
I_{FS}	Floating Supply Leakage Current	V_B = V_S = 600V	—	—	1.0	μA
I_{Fcom}	V_{com} Floating Supply Leakage Current	V_{CC2} = V_{com} = 600V	—	—	1.0	μA
I_{BS}	V_{BS} Standby Current	HIN = LIN = 0V	—	0.18	0.4	mA
I_{CC}	V_{CC} Standby Current	HIN = LIN = 0V	—	0.30	0.6	mA
I_{CC2}	V_{CC2} Standby Current	HIN = LIN = 0V	—	0.18	0.4	mA
I_{BSH}	V_{BS} Standby Current H	HIN = 5V	—	0.25	0.5	mA
I_{CCH}	V_{CC} Standby Current H	HIN = 5V	—	0.37	0.75	mA
I_{CC2H}	V_{CC2} Standby Current H	HIN = 5V	—	0.18	0.4	mA
I_{BSL}	V_{BS} Standby Current L	LIN = 5V	—	0.18	0.4	mA
I_{CCL}	V_{CC} Standby Current L	LIN = 5V	—	0.37	0.75	mA
I_{CC2L}	V_{CC2} Standby Current L	LIN = 5V	—	0.25	0.5	mA
V_{OH}	High Level Output Voltage	I_O = 0A, LO, HO	14.9	—	—	V
V_{OL}	Low Level Output Voltage	I_O = 0A, LO, HO	—	—	0.1	V
V_{IH}	High Level Input Threshold Voltage	HIN, LIN	2.0	3.0	4.0	V
V_{IL}	Low Level Input Threshold Voltage	HIN, LIN	0.6	1.5	2.5	V
V_{INh}	Input Hysteresis Voltage	V_{INh} = V_{IH}–V_{IL}	1.0	1.5	2.0	V
I_{IH5}	High Level Input Bias Current 5	V_{IN} = 5V	—	25	75	μA
I_{IH15}	High Level Input Bias Current 15	V_{IN} = 15V	—	75	150	μA
I_{IL}	Low Level Input Bias Current	V_{IN} = 0V	—	—	1.0	μA
V_{BSuvr}	V_{BS} Supply UV Reset Voltage		7.5	8.6	9.7	V
V_{BSuvh}	V_{BS} Supply UV Hysteresis Voltage		0.1	0.4	0.7	V
t_{VBSuv}	V_{BS} Supply UV Filter Time		—	7.5	—	μs
V_{CCuvr}	V_{CC} Supply UV Reset Voltage		7.5	8.6	9.7	V
V_{CCuvh}	V_{CC} Supply UV Hysteresis Voltage		0.1	0.4	0.7	V
t_{VCCuv}	V_{CC} Supply UV Filter Time		—	7.5	—	μs
I_{OH}	Output High Level Short Circuit Pulsed Current	V_O = 0V, V_{IN} = 5V, PW < 10μs	–60	–100	–140	mA
I_{OL}	Output Low Level Short Circuit Pulsed Current	V_O = 15V, V_{IN} = 0V, PW < 10μs	60	100	140	mA
R_{OH}	Output High Level On Resistance	I_O = –20mA, R_{OH} = (V_{OH}–V_O)/I_O	—	35	70	Ω
R_{OL}	Output Low Level On Resistance	I_O = 20mA, R_{OL} = V_O/I_O	—	50	100	Ω
$t_{dLH(HO)}$	High Side Turn-On Propagation Delay	CL = 200pF between HO-V_S	85	110	135	ns
$t_{dHL(HO)}$	High Side Turn-Off Propagation Delay	CL = 200pF between HO-V_S	100	130	160	ns
t_{rH}	High Side Turn-On Rise Time	CL = 200pF between HO-V_S	15	30	70	ns
t_{fH}	High Side Turn-Off Fall Time	CL = 200pF between HO-V_S	20	45	90	ns
$t_{dLH(LO)}$	Low Side Turn-On Propagation Delay	CL = 200pF between LO-V_{com}	85	110	135	ns
$t_{dHL(LO)}$	Low Side Turn-Off Propagation Delay	CL = 200pF between LO-V_{com}	100	130	160	ns
t_{rL}	Low Side Turn-On Rise Time	CL = 200pF between LO-V_{com}	15	30	70	ns
t_{fL}	Low Side Turn-Off Fall Time	CL = 200pF between LO-V_{com}	20	45	90	ns
Δt_{dLH}	Delay Matching, High Side and Low Side Turn-On	$\lvert t_{dLH(HO)} - t_{dLH(LO)} \rvert$	—	—	15	ns
Δt_{dHL}	Delay Matching, High Side and Low Side Turn-Off	$\lvert t_{dHL(HO)} - t_{dHL(LO)} \rvert$	—	—	15	ns
VOPW	Output Pulse Width	V_{IN} : PW = 200ns	200	220	240	ns

* Typ. is not specified.

FUNCTION TABLE (X: H or L)

HIN	LIN	V_{BS} UV	V_{CC2com} 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	H	H	LO = HO = High
X	L	L	H	L	L	HO = Low, V_{BS} UV tripped
X	H	L	H	L	H	LO = High, V_{BS} UV tripped
L	X	H	L	L	L	LO = Low, V_{CC2com} UV tripped
H	X	H	L	H	L	HO = High, V_{CC2com} UV tripped

Note : "L" state of V_{BS} UV, V_{CC2com} UV means that UV trip voltage.

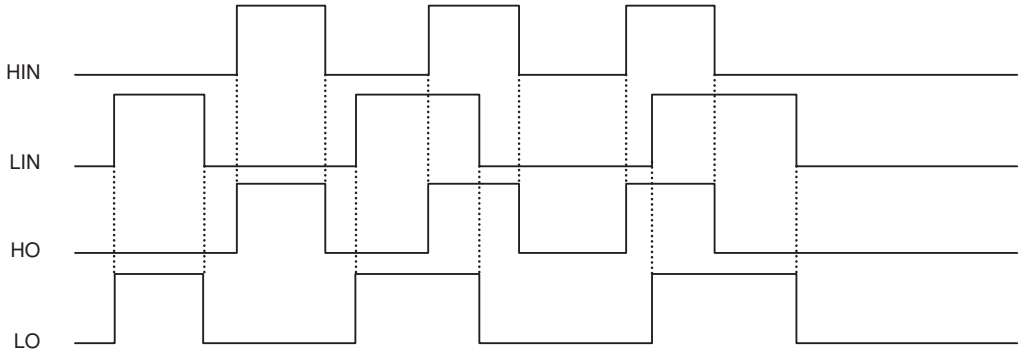
In the case of both input signals (HIN and LIN) are "H", output signals (HO and LO) become "H".

TIMING DIAGRAM

1.Input/Output Timing Diagram

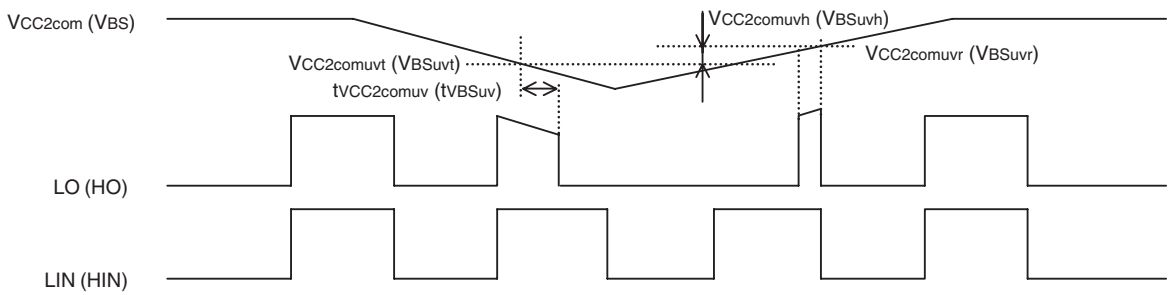
HIGH ACTIVE (When input signal (HIN or LIN) is "H", then output signal (HO or LO) is "H".)

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



2.V_{CC2com} (V_{BS}) Supply Under Voltage Lockout Timing Diagram

When Supply Voltage keeps lower UV Trip Voltage(***$_{uvt}$ = ***$_{uvr}$–***$_{uvh}$) for Supply UV Filter Time, output signal becomes "L". And then, when Supply Voltage is higher than UV Reset Voltage, output becomes normal.



3.Allowable Supply Voltage Transient

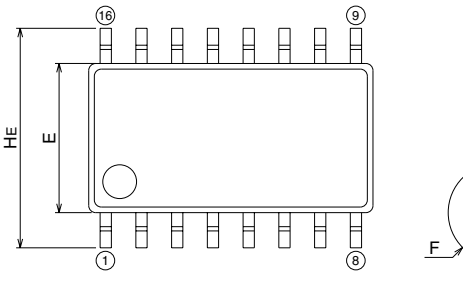
It is recommended that supplying V_{CC} firstly and supplying V_{CC2com} secondly and supplying V_{BS} at last. In the case of shutting off supply voltage, shutting off V_{BS} Supply Voltage firstly. Secondly, shutting off V_{CC2com} Supply Voltage. And last, shutting off V_{CC} Supply Voltage.

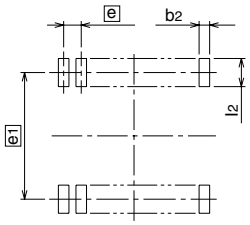
At the time of starting V_{CC2com} and V_{BS}, power supply should be increased slowly. If it is increased rapidly, output signal (HO or LO) may be “H”.

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
A_1	0	0.1	0.2
A_2	–	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	–
H_E	7.5	7.8	8.1
L	0.4	0.6	0.8
L_1	–	1.25	–
Z	–	0.605	–
Z_1	–	–	0.755
x	–	–	0.25
y	–	–	0.1
θ	0°	–	8°
b_2	–	0.76	–
e1	–	7.62	–
l_2	1.27	–	–