

<HVIC>

M81767JFP

600V HIGH VOLTAGE HALF BRIDGE DRIVER (for Automotive)

DESCRIPTION

M81767JFP is high voltage Power MOSFET and IGBT gate driver for half bridge applications.

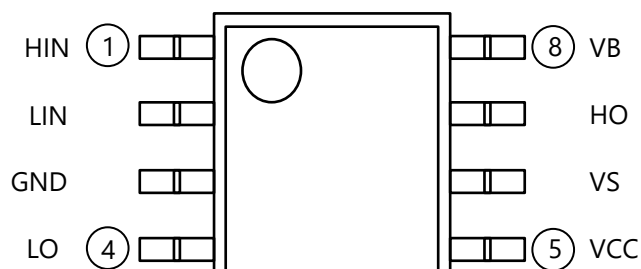
FEATURES

- Floating Supply Voltage 600V
- Output Current $\pm 3.5\text{A(Typ.)}$
- Half Bridge Driver
- SOP-8 Package

APPLICATIONS

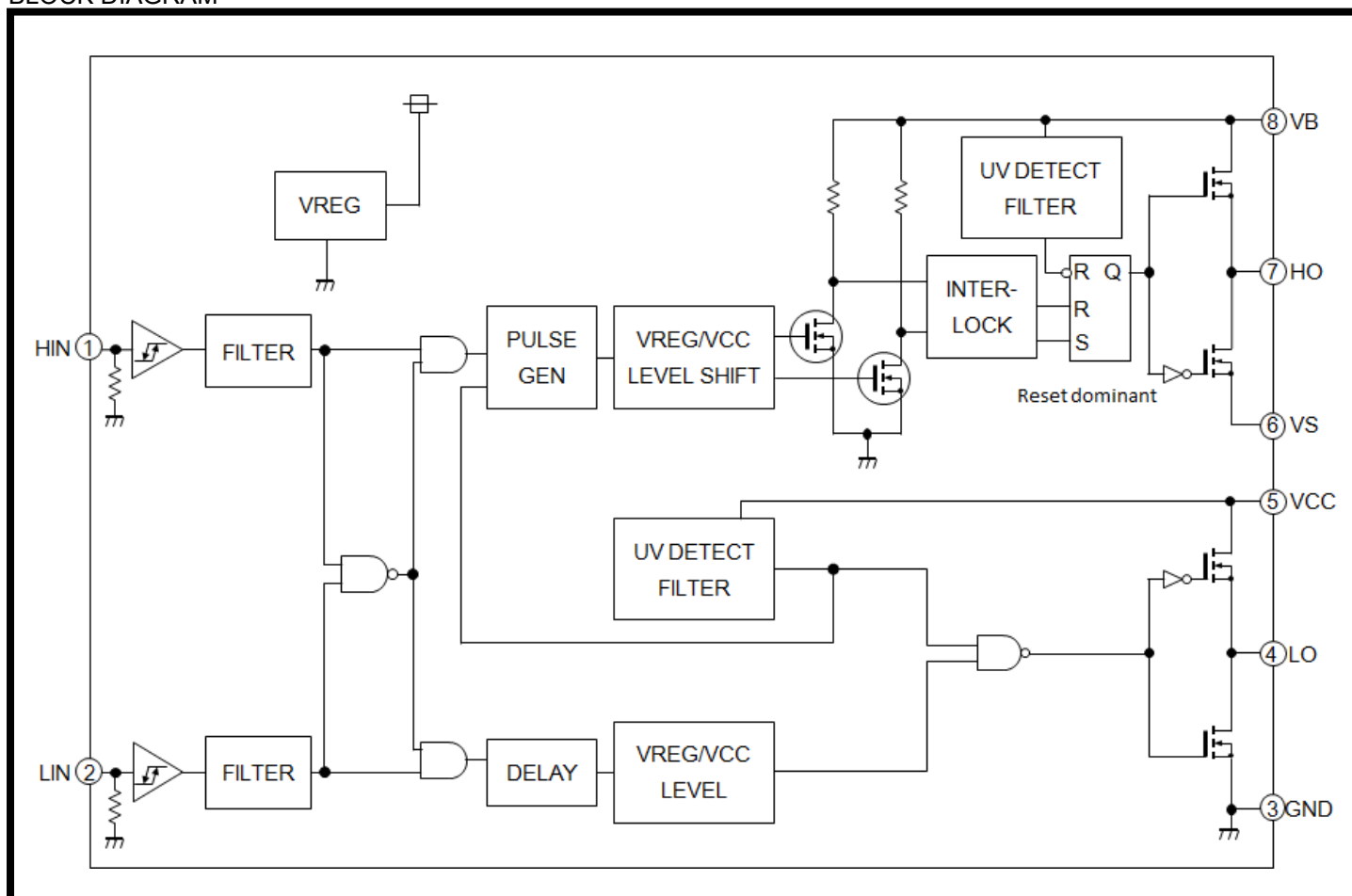
MOSFET and IGBT module driver.

PIN CONFIGURATION (TOP VIEW)



Outline: SOP8

BLOCK DIAGRAM



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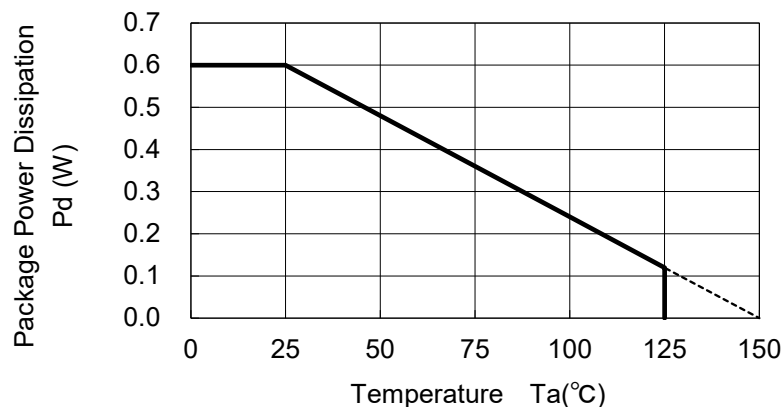
ABSOLUTE MAXIMUM RATINGS (Ta = 25°C unless otherwise specified)

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 _{CC}	Low Side Fixed Supply Voltage		- 0.5 ~ 24	V
V _{LO}	Low Side Output Voltage		- 0.5 ~ V _{CC} + 0.5	V
V _{IN}	Logic Input Voltage	HIN,LIN Terminal	- 0.5 ~ V _{CC} + 0.5	V
P _d	Package Power Dissipation	Ta = 25°C ,On Board	0.6	W
Kθ	Linear Derating Factor	Ta > 25°C ,On Board	4.8	mW/°C
R _{th(j-c)}	Junction-Case Thermal Resistance		50	°C/W
T _j	Junction Temperature		- 40 ~ 150	°C
T _{opr}	Operation Temperature		- 40 ~ 125	°C
T _{stg}	Storage Temperature	On Board	- 40 ~ 150	°C
TL	Solder Reflow Condition	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 _{CC}	Low Side Fixed Supply Voltage		10	—	20	V
V _{LO}	Low Side Output Voltage		0	—	V _{CC}	V
V _{IN}	Logic Input Voltage	HIN,LIN Terminal	0	—	7	V

Note : For proper operation, the device should be used within the recommended conditions

THERMAL DERATING FACTOR CHARACTERISTIC (MAXIMUM RATING)

ELECTRICAL CHARACTERISTICS (Ta=-40~125°C, VCC=VBS (=VB-VS)=15V, unless otherwise specified)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.*1	Max.	
I_{FS}	Floating Supply Leakage Current	$V_B = V_S = 600V, 25^\circ C$	—	—	1.0	μA
I_{BS}	V_{BS} Standby Current	$HIN = LIN = 0V$	—	0.2	0.5	mA
I_{CC}	V_{CC} Standby Current	$HIN = LIN = 0V$	0.2	0.7	1.2	mA
V_{OH}	High Level Output Voltage	$I_O = 0mA$	13.8	14.4	—	V
V_{OL}	Low Level Output Voltage	$I_O = 0mA$	—	—	0.1	V
V_{IH}	High Level Input Threshold Voltage *2	HIN, LIN Terminal	4.0	—	—	V
V_{IL}	Low Level Input Threshold Voltage *3	HIN, LIN Terminal	—	—	0.8	V
I_{IH}	High Level Input Bias Current	$V_{IN} = 5V, HIN, LIN$ Terminal	25	50	100	μA
I_{IL}	Low Level Input Bias Current	$V_{IN} = 0V, HIN, LIN$ Terminal	—	—	2	μA
V_{BSuvr}	V_{BS} Supply UV Reset Voltage		8.0	8.9	9.8	V
V_{BSuvt}	V_{BS} Supply UV Trip Voltage		7.4	8.2	9.0	V
V_{BSuvh}	V_{BS} Supply UV Hysteresis Voltage		0.5	0.7	—	V
t_{VBSuv}	V_{BS} Supply UV Filter Time		—	7.5	15	μs
V_{CCuvr}	V_{CC} Supply UV Reset Voltage		8.0	8.9	9.8	V
V_{CCuvt}	V_{CC} Supply UV Trip Voltage		7.4	8.2	9.0	V
V_{CCuvh}	V_{CC} Supply UV Hysteresis Voltage		0.5	0.7	—	V
t_{VCCuv}	V_{CC} Supply UV Filter Time		—	7.5	15	μs
I_{OH}	Output High Level Short Circuit Pulsed Current	$V_O = 0V, V_{IN} = 5V, PW < 10\mu s$ *4	2.3	3.5	—	A
I_{OL}	Output Low Level Short Circuit Pulsed Current	$V_O = 15V, V_{IN} = 0V, PW < 10\mu s$ *4	2.3	3.5	—	A
R_{OH}	Output High Level On Resistance	$I_O = -20mA, R_{OH} = (V_{OH} - V_O) / I_O$	—	70	140	Ω
R_{OL}	Output Low Level On Resistance	$I_O = 20mA, R_{OL} = V_{OL} / I_O$	—	1	3	Ω
$t_{dLH}(HO)$	High Side Turn-On Propagation Delay	CL = 1000pF between HO - V_S	—	430	820	ns
$t_{dHL}(HO)$	High Side Turn-Off Propagation Delay	CL = 1000pF between HO - V_S	—	430	820	ns
t_{rH}	High Side Turn-On Rise Time	CL = 1000pF between HO - V_S	—	—	60	ns
t_{fH}	High Side Turn-Off Fall Time	CL = 1000pF between HO - V_S	—	—	35	ns
$t_{dLH}(LO)$	Low Side Turn-On Propagation Delay	CL = 1000pF between LO - GND	—	430	820	ns
$t_{dHL}(LO)$	Low Side Turn-Off Propagation Delay	CL = 1000pF between LO - GND	—	430	820	ns
t_{rL}	Low Side Turn-On Rise Time	CL = 1000pF between LO - GND	—	—	60	ns
t_{fL}	Low Side Turn-Off Fall Time	CL = 1000pF between LO - GND	—	—	35	ns
Δt_{dLH}	Turn-On Propagation Delay Matching	$ t_{dLH}(HO) - t_{dLH}(LO) $	—	0	90	ns
Δt_{dHL}	Turn-Off Propagation Delay Matching	$ t_{dHL}(HO) - t_{dHL}(LO) $	—	0	90	ns
tinon	Turn-On Input Filter Time	Convex Pulse, HIN, LIN Terminal	100	200	400	ns
		Concave Pulse, HIN, LIN Terminal	100	200	400	ns
tinoff	Turn-Off Input Filter Time	Convex Pulse, HIN, LIN Terminal	100	200	400	ns
		Concave Pulse, HIN, LIN Terminal	100	200	400	ns
$\Delta PwIO(HO)$	High Side Differences at Pulse Width between Input and Output	$ Pw(HIN) - Pw(HO) $	—	—	150	ns
$\Delta PwIO(LO)$	Low Side Differences at Pulse Width between Input and Output	$ Pw(LIN) - Pw(LO) $	—	—	100	ns

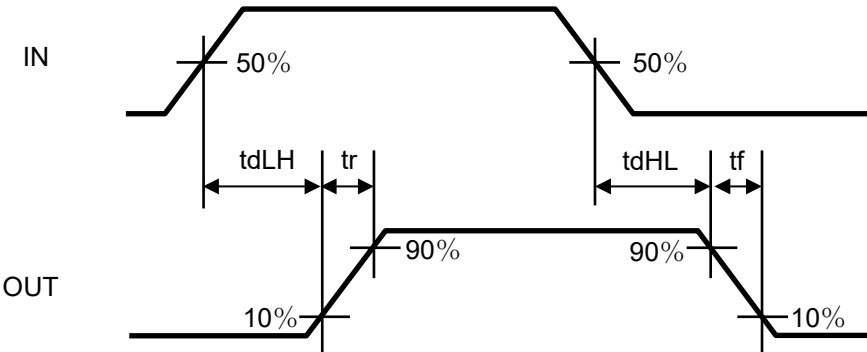
*1 Typ. is not specified.

*2 Please set High level input voltage more than the minimum value of limits.

*3 Please set Low level input voltage less than the maximum value of limits.

*4 The short circuit pulse cannot be continuously.

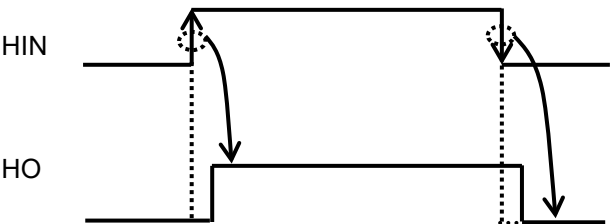
INPUT/OUTPUT TIMING DIAGRAM



FUNCTION TABLE (X:H or L)

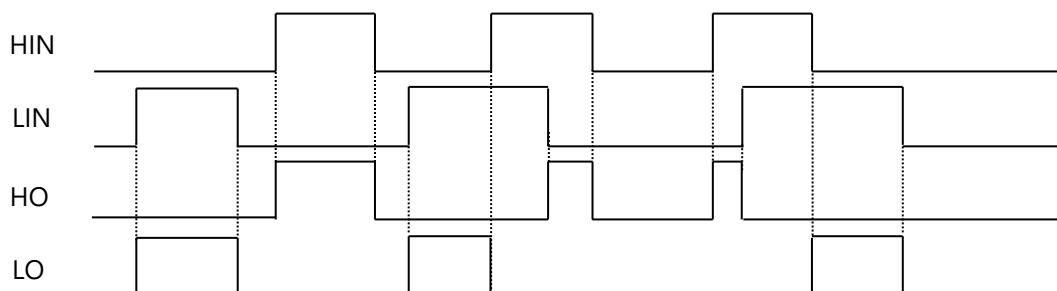
HIN	LIN	V _{BS} UV	V _{CC} UV	HO	LO	Behavioral state
H→L	L	H	H	L	L	HO = L, LO = L
H→L	H	H	H	L	H	LO = H
L→H	L	H	H	H	L	HO = H
L→H	H	H	H	L	L	HO = L, LO = L
X	L	L	H	L	L	LO = L, HO = L when V _{BS} UV is detected
H→L	H	L	H	L	H	LO = H, HO = L when V _{BS} UV is detected
L→H	L	L	H	L	L	LO = L, HO = L when V _{BS} UV is detected
H→L	X	H	L	L	L	LO = L when V _{CC} UV is detected
L→H	X	H	L	L	L	HO = L, LO = L when V _{CC} UV is detected
H→L	L	H	H	L	L	HO = L, LO = L

Note1 : “L” state of V_{BS} UV, V_{CC} UV means that V_{CC} (V_{BS}) Supply become under UV trip voltage.
Note2 : In the case of both input signals (HIN and LIN) are “H”, output signals (HO and LO) become “L”.
Note3 : Output Signal (HO) is triggered by the edge of input signal.

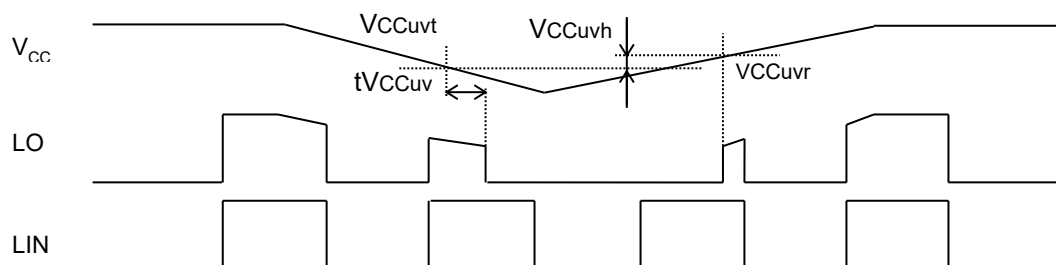


FUNCTION TIMING DIAGRAM**1. Input/Output Timing Diagram**

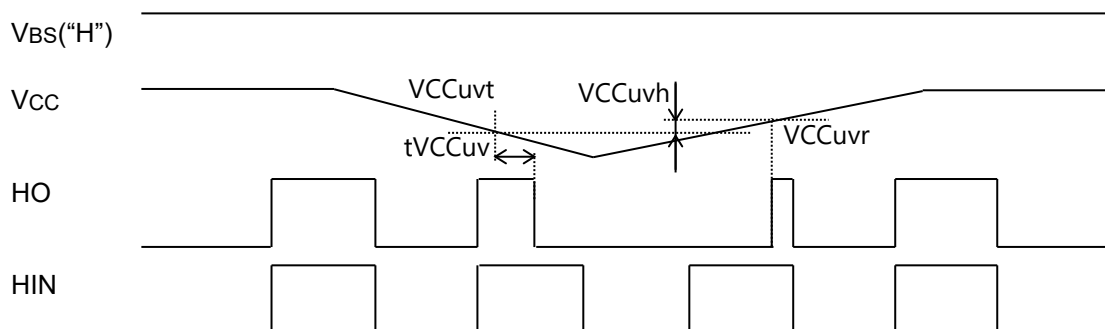
High Active.

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

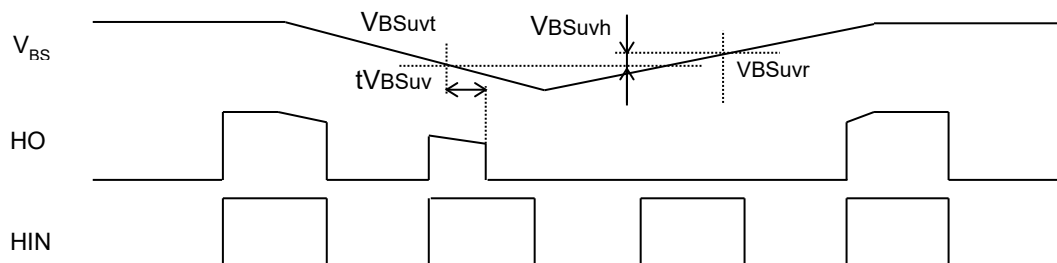
If V_{CC} supply voltage drops below UV trip voltage (V_{CCUVt}) for V_{CC} supply UV filter time, LO output signal is shut down. And then, if V_{CC} supply voltage rises over UV reset voltage, LO will return to the usual operation mode.



If V_{CC} supply voltage drops below UV trip voltage (V_{CCUVt}) for V_{CC} supply UV filter time, HO output signal is shut down. And then, if V_{CC} supply voltage rises over UV reset voltage, HO will return to the usual operation mode.

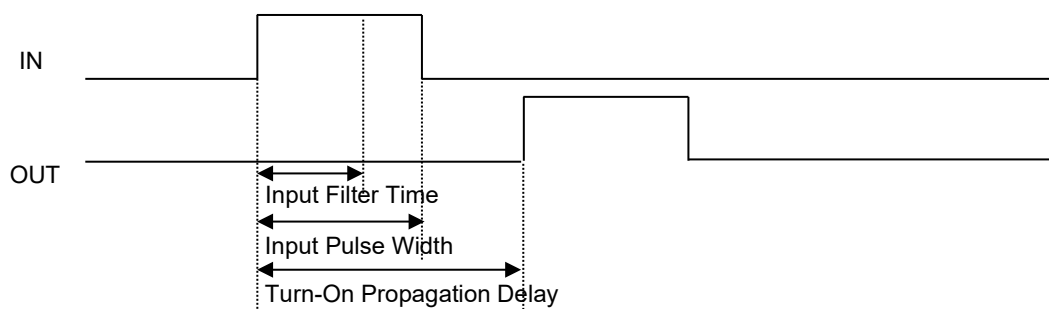


If V_{BS} supply voltage drops below UV trip voltage (V_{BSuvt}) for V_{BS} supply UV filter time, HO output signal is shut down. And then, if V_{BS} supply voltage rises over UV reset voltage, HO will respond to the next active HIN signal(L→H).

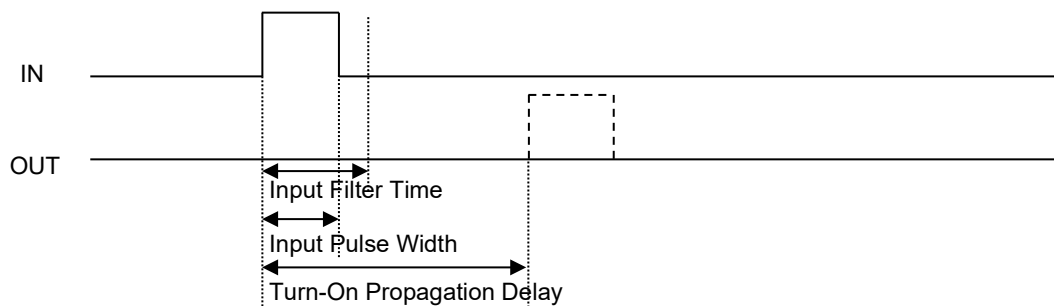


3. Input Filter Timing Diagram

If the pulse that is longer than Input Filter Time has been entered, it will output a signal corresponding to the input after Turn-On Propagation Delay from rising edge or falling edge of the input signal.



If the pulse that is shorter than Input Filter Time has been entered, output will hold the state by the input filter protection.



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NOTES

1) Allowable supply voltage transient

It is recommended to supply V_{CC} firstly and supply V_{BS} secondly. In the case of 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.

2) Supply voltage start up or restart after shut down

If V_{CC} supply is less than 10V(outside of RECOMMENDED OPERATING CONDITIONS), there is some possibility that output does not change in response to input.

Please evaluate carefully about supply start up or restart after shut down in your application systems.

3) V_B supply voltage

Please use V_B supply voltage within RECOMMENDED OPERATING CONDITIONS

($V_S + 10V < V_B < V_S + 20V$: $V_S = 0V$ minimum)

If V_B supply voltage is used on the other conditions, output signal HO may be malfunction.

Please evaluate carefully about V_B supply voltage in your application systems.

4) Inter-terminal processing

In this product, the terminal of the low voltage part and the high voltage part are adjacent (No.5: V_{CC} , No.6: V_S).

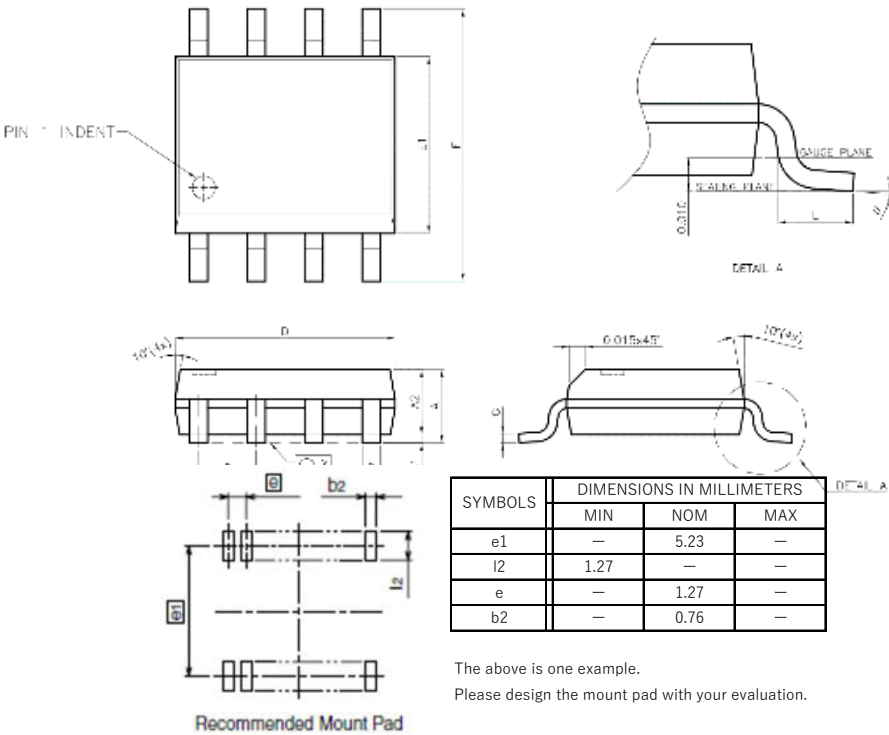
There may be cases where there is insufficient insulation clearance distance between the pins.

Please use such as coating between the terminals.

ENVIRONMENTAL CONSCIOUSNESS

M81767JFP is compliant with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive 2011/65/EU+(EU)2015/863.

PACKAGE OUTLINE



Main Revision for this Edition

Rev.	Date	Revision	
		Pages	Points
A	18 Mar. 2017	-	New
B	20 Mar. 2018	1	PIN CONFIGURATION(TOP VIEW) • Outline was changed from SOP8 to 8P2S
		2	ABSOLUTE MAXIMUM RATINGS • Operation Temperature was changed from (-40 ~ 105°C) to (-40 ~ 125°C) RECOMMENDED OPERATING CONDITIONS • Ambient Temperature was deleted THERMAL DERATING FACTOR CHARACTERISTIC(MAXIMUM RATING) • Figure was changed in accordance with the change of Operation Temperature
		3	ELECTRICAL CHARACTERISTICS • Ta unless otherwise specified was changed from (-40 ~ 105°C) to (-40 ~ 125°C) • V _{CC} Standby Current was changed from (0.2 / 0.6 / 1.2) to (0.2 / 0.7 / 1.2) • V _{BS} Supply UV Filter Time was changed from (- / 7.5 / -) to (- / 7.5 / 15) • V _{CC} Supply UV Filter Time was changed from (- / 7.5 / -) to (- / 7.5 / 15) • High Side Turn-On Propagation Delay was changed from (- / 500 / 820) to (- / 430 / 820) • High Side Turn-Off Propagation Delay was changed from (- / 500 / 820) to (- / 430 / 820) • Low Side Turn-On Propagation Delay was changed from (- / 500 / 820) to (- / 430 / 820) • Low Side Turn-Off Propagation Delay was changed from (- / 500 / 820) to (- / 430 / 820) • Differences at Pulse Width between Input and Output was deleted • High Side Differences at Pulse Width between Input and Output was added • Low Side Differences at Pulse Width between Input and Output was added
		4	FUNCTION TABLE • Table was changed in accordance with the changes of function
		5	FUNCTION TIMING DIAGRAM • 1.Input/Output Timing Diagram was changed
		7	PACKAGE OUTLINE • Figure was changed from SOP8 to 8P2S
C	28 Apr. 2021	8 -	Add PACKAGE OUTLINE1,2 Update format.
D	11 Nov. 2021	1	Change BLOCK DIAGRAM
E	23 Dec. 2021	5	Change 「1. Input/Output Timing Diagram」
F	10 Jan. 2023	8	Delete PACKAGE OUTLINE (Not recommended for new designs)

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