

<HVIC>

M81747FP

600V HIGH VOLTAGE HALF BRIDGE DRIVER

DESCRIPTION

M81747FP is high voltage Power MOSFET and IGBT gate driver for half bridge applications.

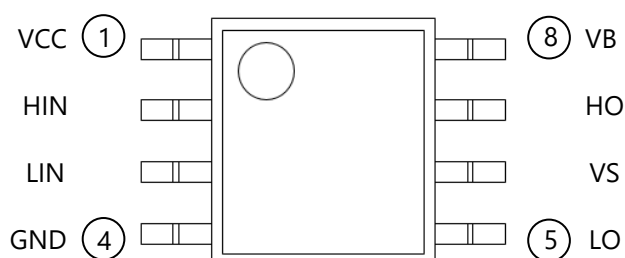
FEATURES

- Floating Supply Voltage 600V
- Output Current +200mA/-350mA
- Half Bridge Driver
- SOP-8 Package

APPLICATIONS

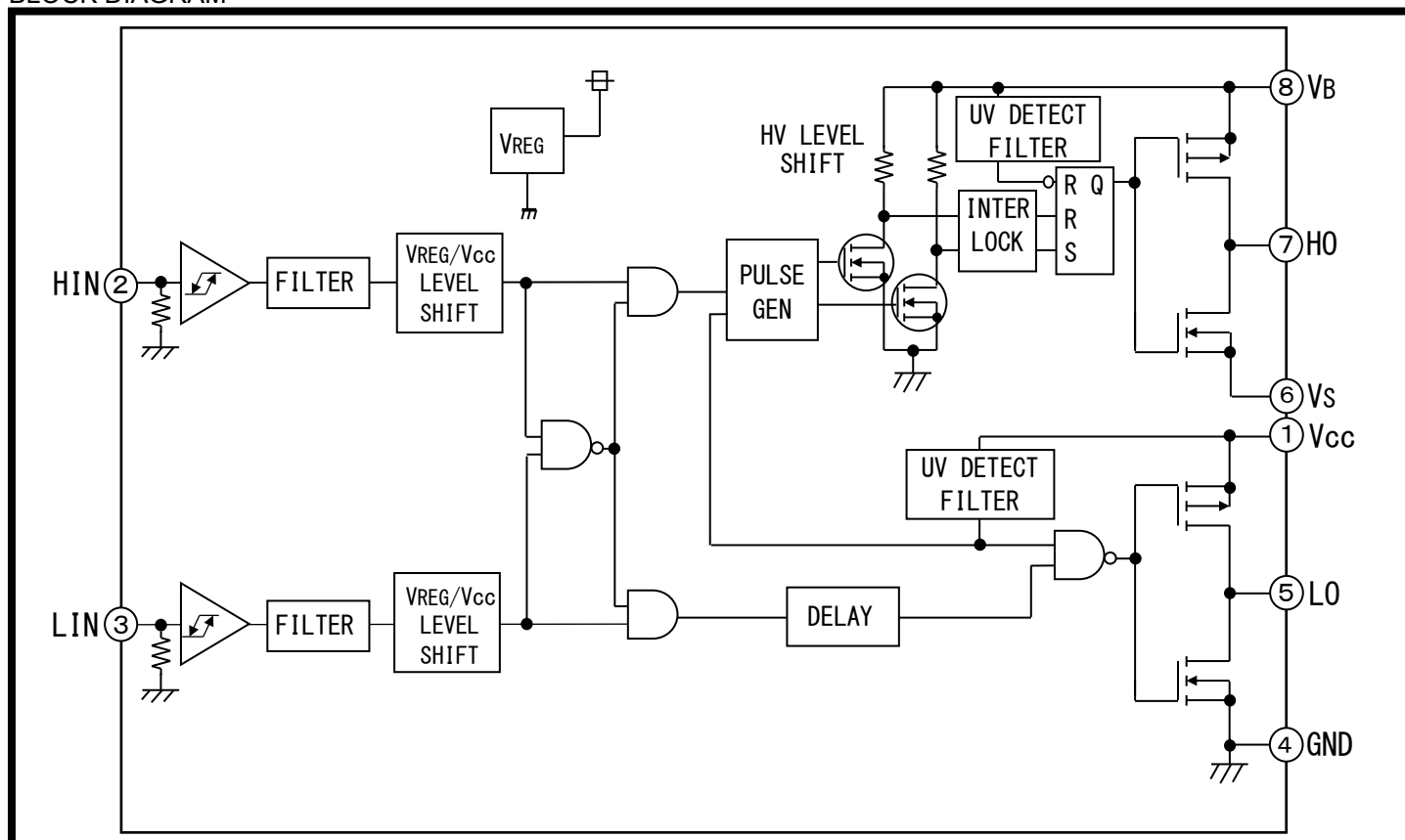
MOSFET and IGBT module driver.

PIN CONFIGURATION (TOP VIEW)



Outline: SOP8

BLOCK DIAGRAM



M81747FP

600V HIGH VOLTAGE HALF BRIDGE DRIVER

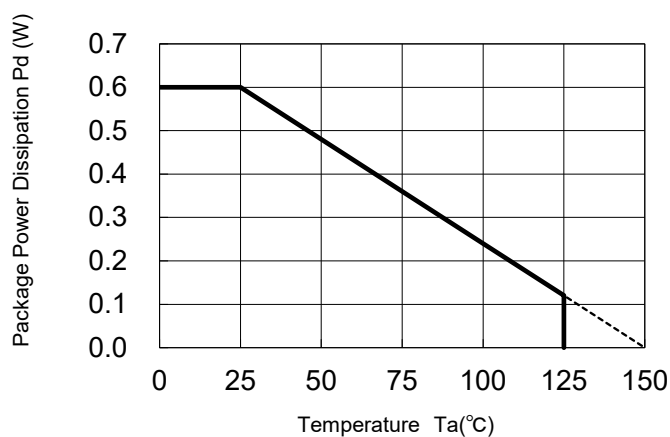
ABSOLUTE MAXIMUM RATINGS (Ta = 25°C unless otherwise specified)

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
Rth(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=25°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°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	0.6	1.0	mA
V _{OH}	High Level Output Voltage	I _O = -20mA, HO,LO Terminal	13.6	14.2	—	V
V _{OL}	Low Level Output Voltage	I _O = 20mA, HO,LO Terminal	—	0.3	0.6	V
V _{IH}	High Level Input Threshold Voltage *2	HIN,LIN Terminal	2.7	—	—	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	—	5	20	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 _{BSvrt}	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	—	μs
V _{CCuvr}	V _{CC} Supply UV Reset Voltage		8.0	8.9	9.8	V
V _{CCvrt}	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	—	μs
I _{OH}	Output High Level Short Circuit Pulsed Current	V _O = 0V, V _{IN} = 5V, PW < 10ms *4	120	200	—	mA
I _{OL}	Output Low Level Short Circuit Pulsed Current	V _O = 15V, V _{IN} = 0V, PW < 10ms *4	250	350	—	mA
R _{OH}	Output High Level On Resistance	I _O = -20mA, R _{OH} = (V _{CC} - V _{OH}) / I _O	—	40	70	Ω
R _{OL}	Output Low Level On Resistance	I _O = 20mA, R _{OL} = V _{OL} / I _O	—	15	30	Ω
t _{dLH} (HO)	High Side Turn-On Propagation Delay	CL = 1000pF between HO-V _S	—	450	650	ns
t _{dHL} (HO)	High Side Turn-Off Propagation Delay	CL = 1000pF between HO-V _S	—	450	650	ns
t _{rH}	High Side Turn-On Rise Time	CL = 1000pF between HO-V _S	—	130	220	ns
t _{fH}	High Side Turn-Off Fall Time	CL = 1000pF between HO-V _S	—	50	80	ns
t _{dLH} (LO)	Low Side Turn-On Propagation Delay	CL = 1000pF between LO-GND	—	450	650	ns
t _{dHL} (LO)	Low Side Turn-Off Propagation Delay	CL = 1000pF between LO-GND	—	450	650	ns
t _{rL}	Low Side Turn-On Rise Time	CL = 1000pF between LO-GND	—	130	220	ns
t _{fL}	Low Side Turn-Off Fall Time	CL = 1000pF between LO-GND	—	50	80	ns
Δt _{dLH}	Turn-On Propagation Delay Matching	t _{dLH} (HO) - t _{dLH} (LO)	—	0	30	ns
Δt _{dHL}	Turn-Off Propagation Delay Matching	t _{dHL} (HO) - t _{dHL} (LO)	—	0	30	ns
t _{inon}	Turn-On Input Filter Time	Convex Pulse, HIN,LIN Terminal	150	250	350	ns
		Concave Pulse, HIN,LIN Terminal	250	350	450	ns
t _{inoff}	Turn-Off Input Filter Time	Convex Pulse, HIN,LIN Terminal	150	250	350	ns
		Concave Pulse, HIN,LIN Terminal	250	350	450	ns
ΔPwIO	Differences at Pulse Width between Input and Output	Pw(OUT) - Pw(IN) , Convex Pulse	-40	0	100	ns

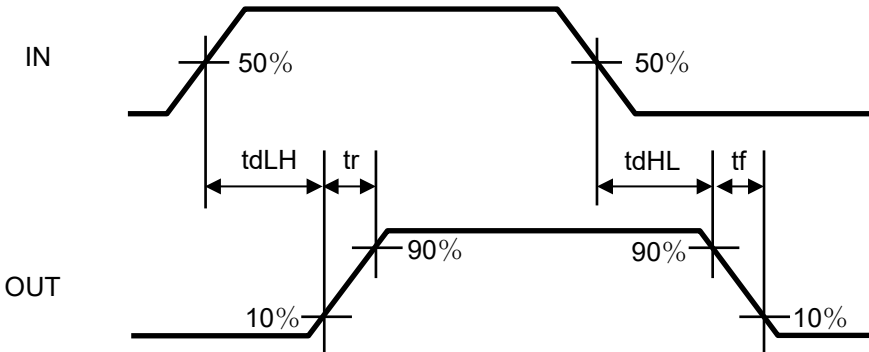
*1 Typ. is not specified.

*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.

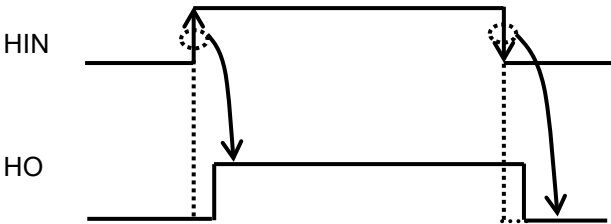
INPUT/OUTPUT TIMING DIAGRAM



FUNCTION TABLE (X:H or L)

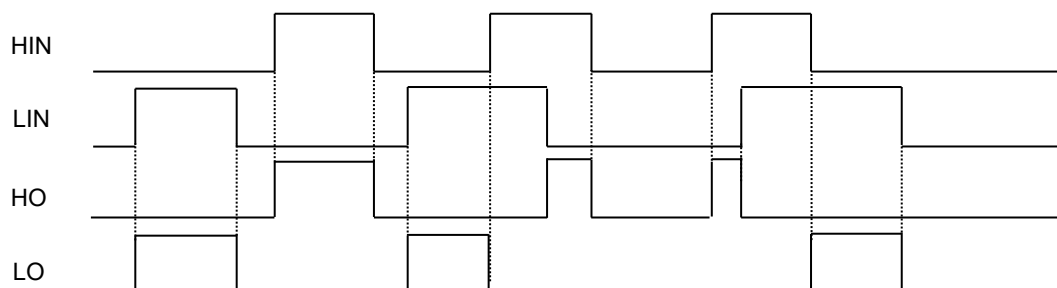
HIN	LIN	V _{BS} UV	V _{CC} UV	HO	LO	Behavioral state
H→L	L	H	H	L	L	HO = L, LO = L
H→L	H	H	H	L	H	LO = H
L→H	L	H	H	H	L	HO = H
L→H	H	H	H	L	L	HO = L, LO = L
X	L	L	H	L	L	HO = L when V _{BS} UV is detected
H→L	H	L	H	L	H	LO = H when V _{BS} UV is detected
L→H	H	L	H	L	L	HO = L, LO = L when V _{BS} UV is detected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

Note1 : “L” state of VBS UV, VCC UV means that VCC (VBS) 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 : X(HIN): L→H or H→L. X(LIN):H or L.
Note4 : Output Signal (HO) is triggered by the edge of input signal.

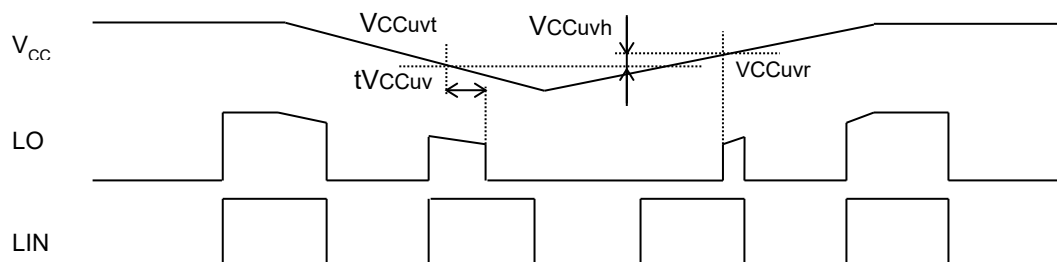


FUNCTION TIMING DIAGRAM**1. Input/Output Timing Diagram**

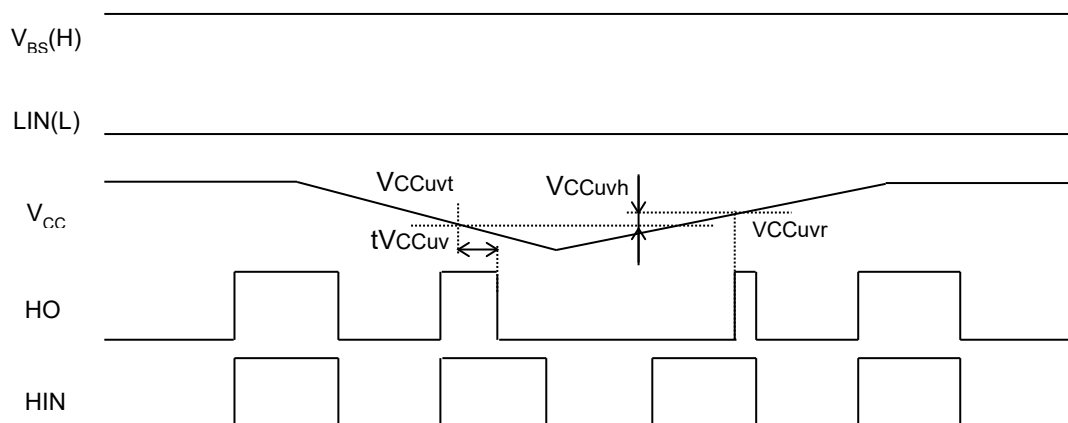
High Active, in the case of both input signals (HIN, LIN) are "H", output signals (HO, LO) become "L".

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

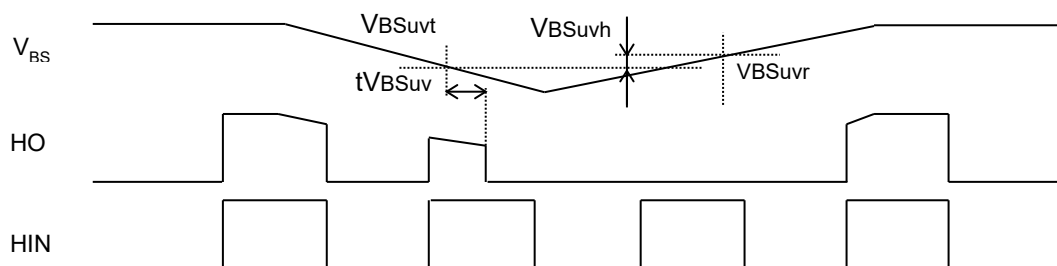
If V_{CC} supply voltage drops below UV trip voltage (V_{CCUVt}) for V_{CC} supply UV filter time, LO output signal is shut down. And then, if V_{CC} supply voltage rises over UV reset voltage, LO will return to the usual operation mode.



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.

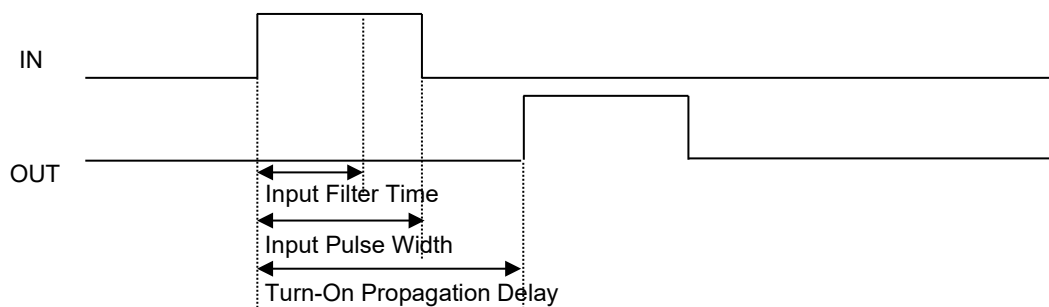


If VBS supply voltage drops below UV trip voltage (V_{BSuv}) for VBS supply UV filter time, HO output signal is shut down. And then, if VBS supply voltage rises over UV reset voltage, HO will respond to the next active HIN signal(L→H).

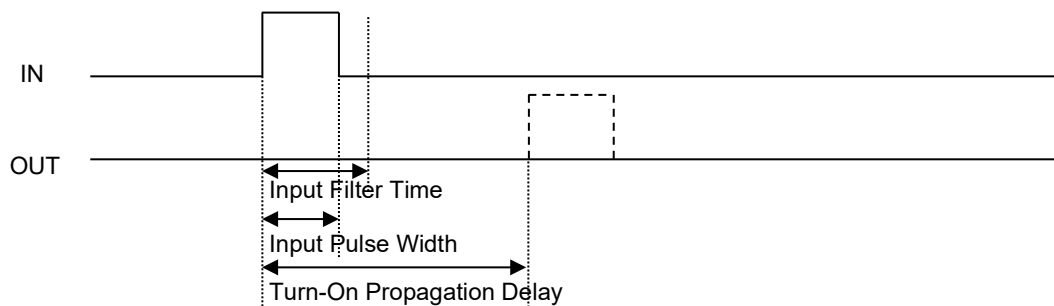


3. Input Filter Timing Diagram

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.



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 ($V_S + 10V < V_B$).

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) About the deadtime between HIN and LIN.

Due to input filter circuit, the pulse width of output maybe longer than the pulse width of input. In that case, please assure that the deadtime between HIN and LIN is over 300ns, or HO and LO maybe on at the same time (shut-through).

5) Processing between IC terminals

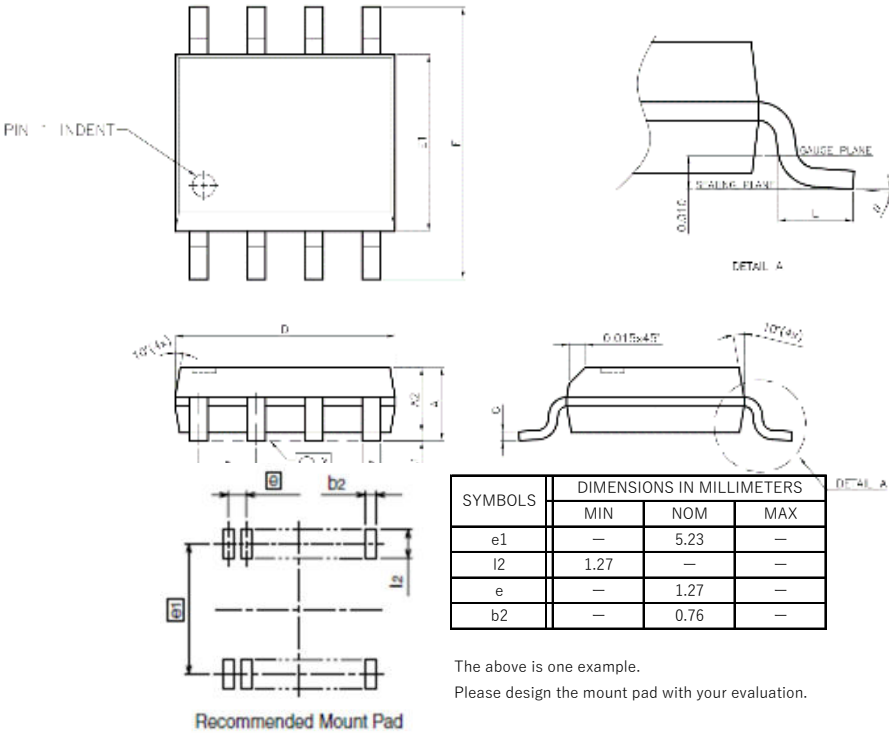
As for this product, the terminal of low voltage part and high voltage part are adjacent(The Fifth: LO, The Sixth: V_S).

Therefore, if insulation space distance of those terminals cannot be enough, please coat between those terminals.

ENVIRONMENTAL CONSCIOUSNESS

M81747FP 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	27 Feb. 2018	-	New
B	10 Apr. 2018	3	The test condition of parameter "Differences at Pulse Width between Input and Output" was corrected because of error.
C	4 Apr. 2019	1	"PRELIMINARY" was deleted. "This is not a final specification. Some parametric limits are subject to change." was deleted.
D	28 Apr. 2021	8 -	Add PACKAGE OUTLINE1,2 Update format.
E	10 Jan. 2023	8	Delete PACKAGE OUTLINE (Not recommended for new designs)

Important Notice

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