MITSUBISHI ELECTRIC

<HVIC>

M81767FP

600V HIGH VOLTAGE HALF BRIDGE DRIVER

DESCRIPTION

M81767FP is high voltage Power MOSFET and IGBT gate driver for half bridge applications.

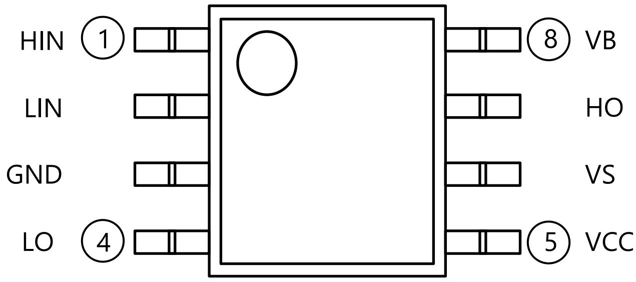
FEATURES

- Floating Supply Voltage ····· 600V
- Output Current ········ ···· ±3.5A(Typ.)
- Half Bridge Driver
- SOP-8 Package

APPLICATIONS

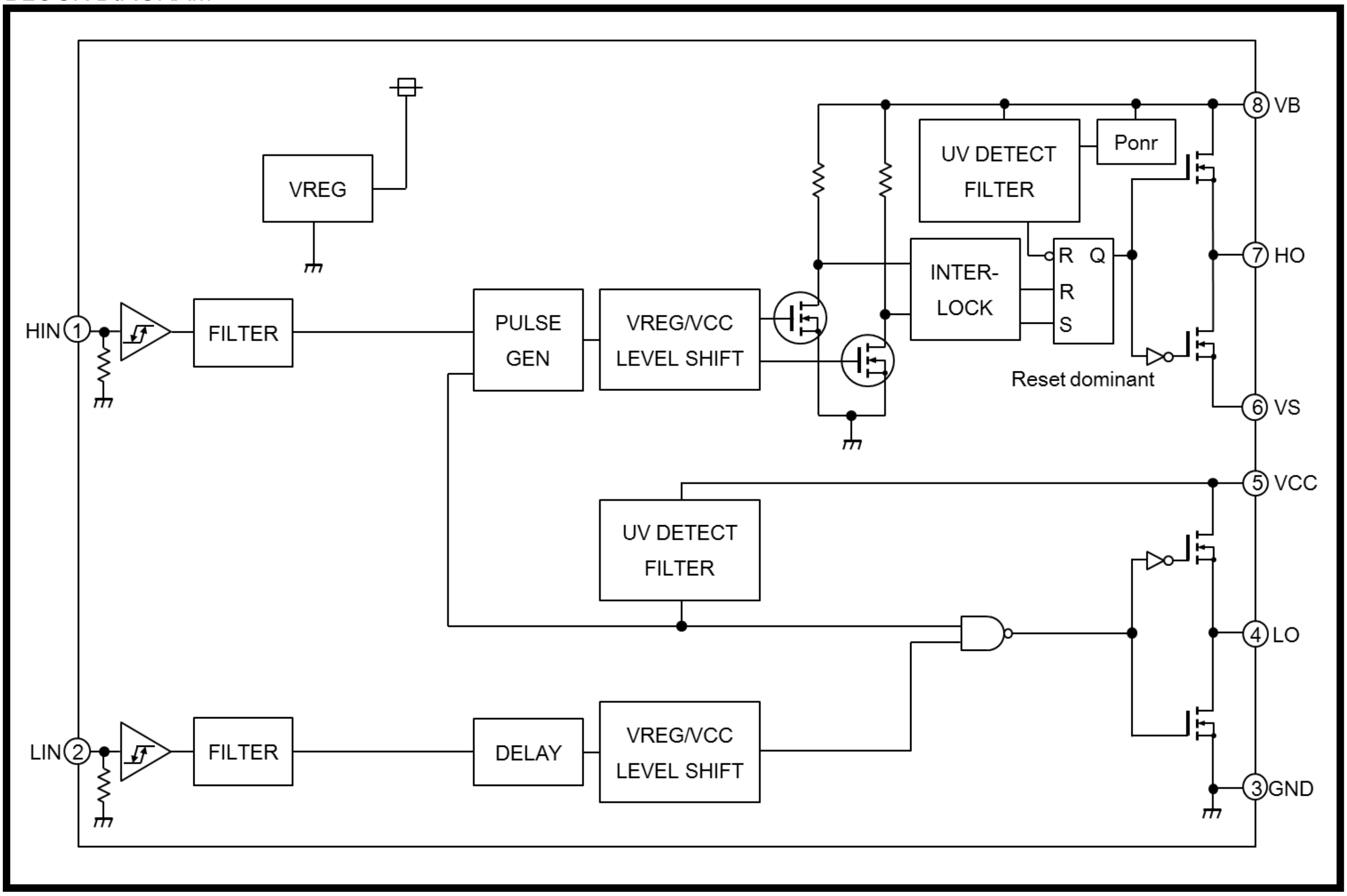
MOSFET and IGBT module driver.

PIN CONFIGURATION (TOP VIEW)



Outline:SOP8

BLOCK DIAGRAM



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

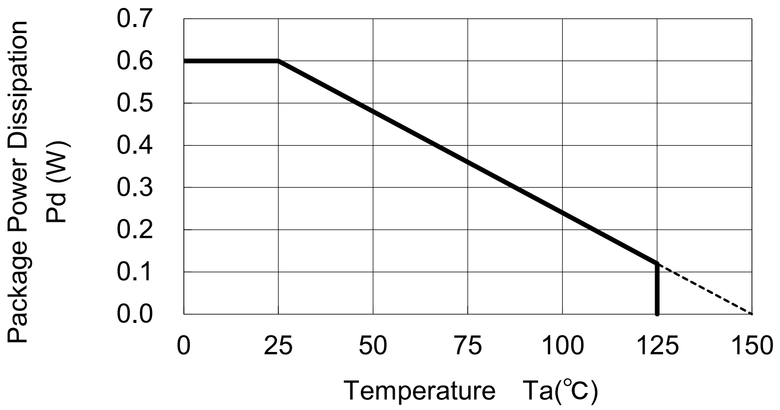
Symbol	Parameter	Test conditions	Ratings	Unit
V_B	High Side Floating Supply Absolute Voltage		- 0.5 ~ 624	V
V_S	High Side Floating Supply Offset Voltage		V_B - 24 ~ V_B + 0.5	V
V_{BS}	High Side Floating Supply Voltage	$V_{BS} = V_B - V_S$	- 0.5 ~ 24	V
V_{HO}	High Side Output Voltage		V_S - 0.5 ~ V_B + 0.5	V
V_{CC}	Low Side Fixed Supply Voltage		- 0.5 ~ 24	V
V_{LO}	Low Side Output Voltage		- 0.5 ~ Vcc + 0.5	V
V_{IN}	Logic Input Voltage	HIN,LIN Terminal	- 0.5 ~ Vcc + 0.5	V
Pd	Package Power Dissipation	Ta = 25°C ,On Board	0.6	W
$K\theta$	Linear Derating Factor	Ta > 25°C ,On Board	4.8	mW/°C
Rth(j-c)	Junction-Case Thermal Resistance		50	°C/W
Tj	Junction Temperature		- 40 ~ 150	°C
Topr	Operation Temperature		- 40 ~ 125	°C
Tstg	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)

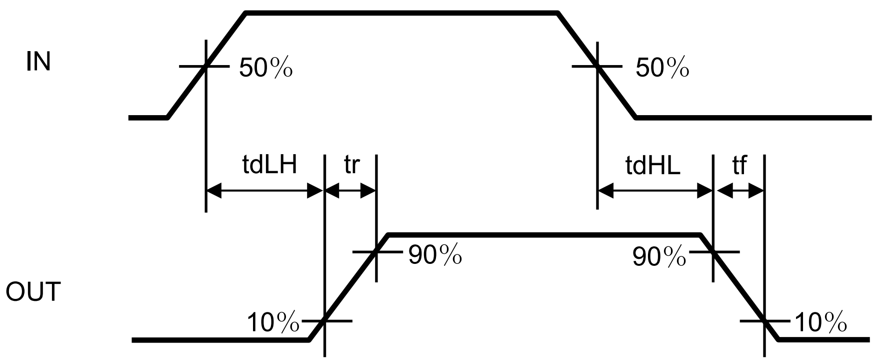


ELECTRICAL CHARACTERISTICS (Ta=25℃, VCC=VBS (=VB–VS)=15V, unless otherwise specified)

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	uA
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	$I_O = 0mA$	13.8	14.4	—	V
V_{OL}	Low Level Output Voltage	$I_O = 0mA$	—	—	0.1	V
V_{IH}	High Level Input Threshold Voltage *3	HIN,LIN Terminal	—	—	4.0	V
V_{IL}	Low Level Input Threshold Voltage *4	HIN,LIN Terminal	0.8	—	—	V
I_{IH}	High Level Input Bias Current	$V_{IN} = 5V$, HIN,LIN Terminal	—	17	40	uA
I_{IL}	Low Level Input Bias Current	$V_{IN} = 0V$, HIN,LIN Terminal	—	—	1	uA
V_{BSuvr}	V_{BS} Supply UV Reset Voltage		8.0	8.9	9.8	V
V_{BSuvh}	V_{BS} Supply UV Hysteresis Voltage		0.3	0.7	—	V
t_{VBSuv}	V_{BS} Supply UV Filter Time		—	7.5	—	us
V_{CCuvr}	V_{CC} Supply UV Reset Voltage		8.0	8.9	9.8	V
V_{CCuvh}	V_{CC} Supply UV Hysteresis Voltage		0.3	0.7	—	V
t_{VCCuv}	V_{CC} Supply UV Filter Time		—	7.5	—	us
VPonr	Power On Reset Voltage		—	—	6.0*2	V
tPonr(FIL)	Power On Reset Filter Time		300*2	—	—	ns
I_{OH}	Output High Level Short Circuit Pulsed Current	$V_O = 0V$, $V_{IN} = 5V$, PW < 10us *5	2.3	3.5	—	A
I_{OL}	Output Low Level Short Circuit Pulsed Current	$V_O = 15V$, $V_{IN} = 0V$, PW < 10us *5	2.3	3.5	—	A
R_{OH}	Output High Level On Resistance	$I_O = -200mA$, $R_{OH} = (V_{OH} - V_O) / I_O$	—	10	20	Ω
R_{OL}	Output Low Level On Resistance	$I_O = 200mA$, $R_{OL} = V_{OL} / I_O$	—	1.3	3	Ω
t_{dLH}(HO)	High Side Turn-On Propagation Delay	CL = 1000pF between HO - V_S	—	340	480	ns
t_{dHL}(HO)	High Side Turn-Off Propagation Delay	CL = 1000pF between HO - V_S	—	340	480	ns
t_{rH}	High Side Turn-On Rise Time	CL = 1000pF between HO - V_S	—	—	45	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	—	340	480	ns
t_{dHL}(LO)	Low Side Turn-Off Propagation Delay	CL = 1000pF between LO - GND	—	340	480	ns
t_{rL}	Low Side Turn-On Rise Time	CL = 1000pF between LO - GND	—	—	45	ns
t_{fL}	Low Side Turn-Off Fall Time	CL = 1000pF between LO - GND	—	—	35	ns
⊿tdLH	Turn-On Propagation Delay Matching	|tdLH(HO) - tdLH(LO)|	—	0	30	ns
⊿tdHL	Turn-Off Propagation Delay Matching	|tdHL(HO) - tdHL(LO)|	—	0	30	ns
IN(FIL)	Input Filter Time	Convex Pulse, HIN,LIN	—	100	—	ns
		Concave Pulse, HIN,LIN	—	100	—	ns

*1 Typ. is not specified.
*2 High Side Circuit Only.
*3 Please set High level input voltage more than the minimum value of limits.
*4 Please set Low level input voltage less than the maximum value of limits.
*5 The short circuit pulse cannot be continuously.

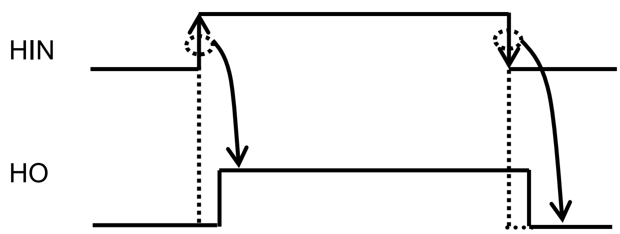
INPUT/OUTPUT TIMING DIAGRAM



FUNCTION TABLE (X:H or L)

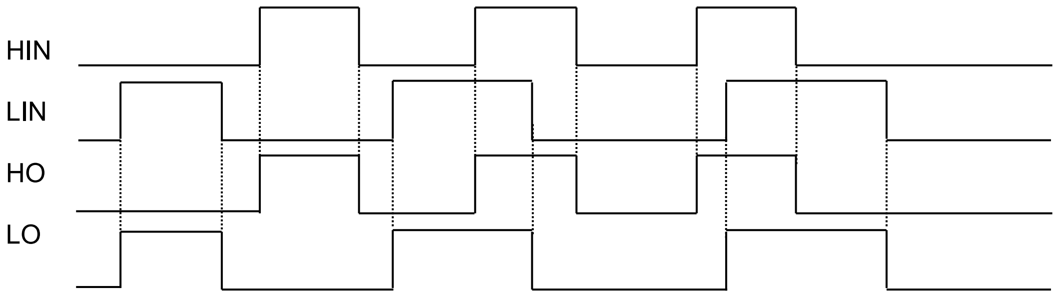
HIN	LIN	V_{BS}UV	V_{CC}UV	HO	LO	Behavioral state
H→L	L	H	H	L	L	HO = L, LO = L
H→L	H	H	H	L	H	LO = H
L→H	L	H	H	H	L	HO = H
L→H	H	H	H	H	H	HO = H, LO = H
H→L	L	L	H	L	L	LO=L, HO = L when V_{BS}UV is detected
H→L	H	L	H	L	H	LO=H, HO = L when V_{BS}UV is detected
L→H	L	L	H	L	L	LO=L, HO = L when V_{BS}UV is detected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

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 "H".
Note3 : Output Signal (HO) is triggered by the edge of input signal.

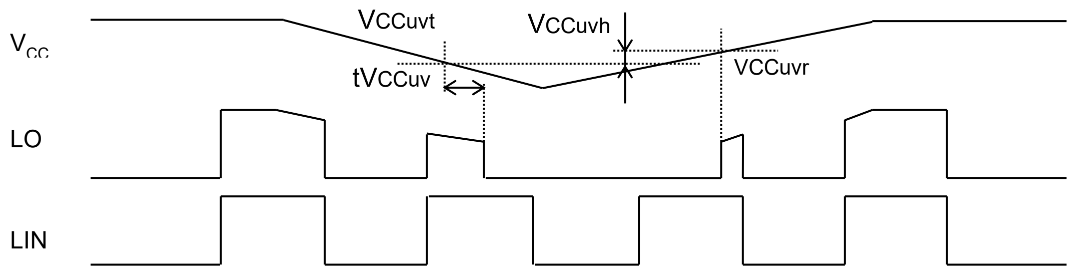


FUNCTION TIMING DIAGRAM

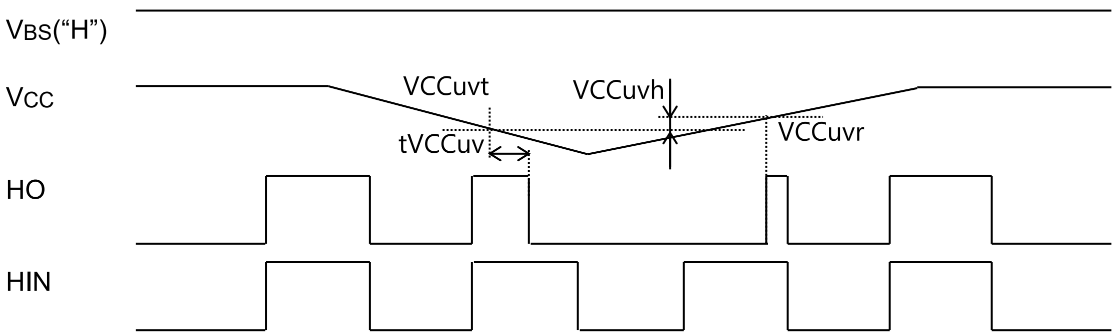
1. Input/Output Timing Diagram
   High Active.



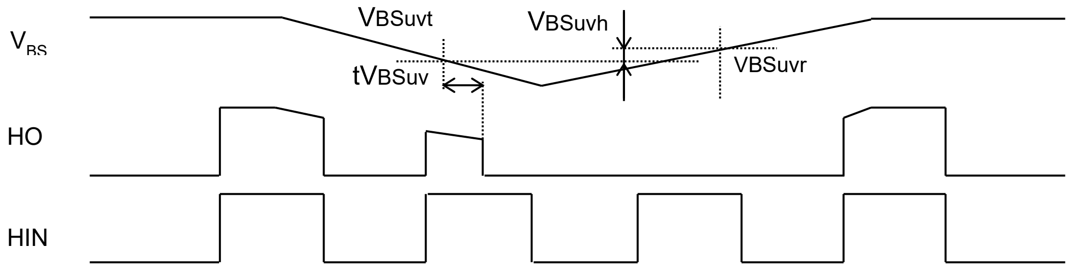
2. V_{CC} (V_{BS}) Supply Under Voltage (UV) Lockout Timing Diagram
   If V_{CC} supply voltage drops below UV trip voltage ($V_{CC}uvt$) for V_{CC} supply UV filter time, LO output signal is shut down. And then, if V_{CC} supply voltage rises over UV reset voltage, LO will return to the usual operation mode.



If V_{CC} supply voltage drops below UV trip voltage ($V_{CC}uvt$) 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.

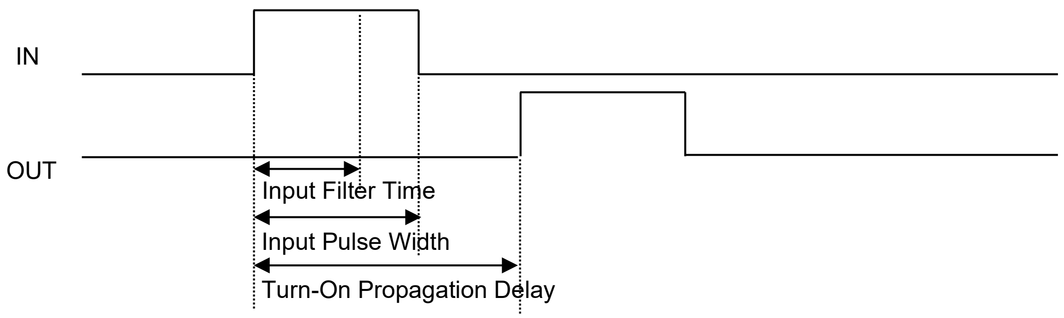


If V_{BS} supply voltage drops below UV trip voltage ($V_{BS}uvt$) for V_{BS} supply UV filter time, HO output signal is shut down. And then, if V_{BS} supply voltage rises over UV reset voltage, HO will respond to the next active HIN signal(L→H).

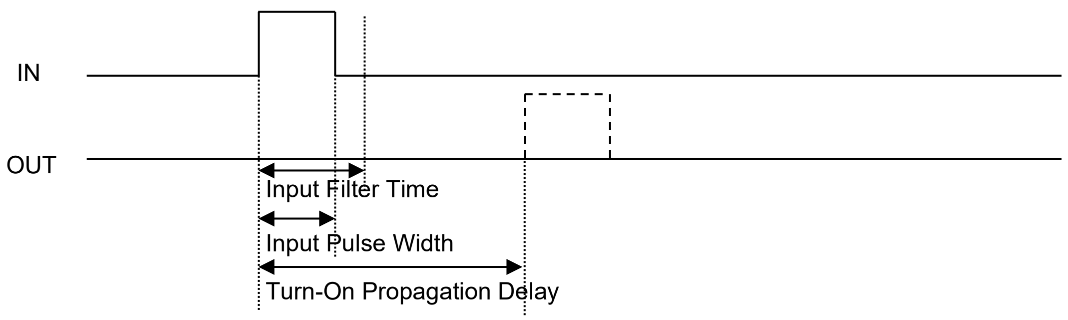


3. Input Filter Timing Diagram

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 form 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 VCC and VBS, 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.

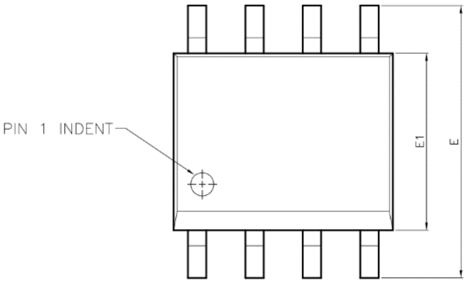
3) V_B supply voltage
Please use V_B supply voltage within RECOMMENDED OPERATING CONDITIONS
(V_S +10V < V_B < V_S + 20V : V_S = 0V minimum)
If V_B supply voltage is used on the other conditions, output signal HO may be malfunction.
Please evaluate carefully about V_B supply voltage in your application systems.

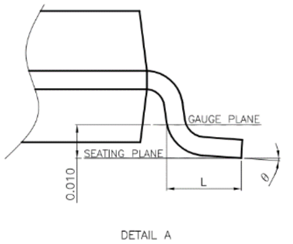
4) Inter-terminal processing
In this product, the terminal of the low voltage part and the high voltage part are adjacent (No.5:V_{CC}, No.6:V_S).
There may be cases where there is insufficient insulation clearance distance between the pins.
Please use such as coating between the terminals.

ENVIRONMENTAL CONSCIOUSNESS

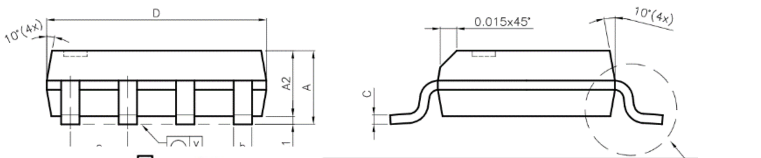
M81767FP is compliant with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive 2011/65/EU+(EU)2015/863.

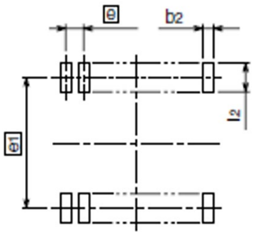
PACKAGE OUTLINE1





SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.47	1.60	1.73
A1	0.10	——	0.25
A2	——	1.45	——
b	0.33	0.41	0.51
C	0.19	0.20	0.25
D	4.80	4.85	4.95
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	——	1.27	——
L	0.40	0.71	1.27
y	——	——	0.076
θ	0°	——	8°





Recommended Mount Pad

SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
e1	—	5.23	—
l2	1.27	—	—
e	—	1.27	—
b2	—	0.76	—

The above is one example.
Please design the mount pad with your evaluation.

Main Revision for this Edition

Rev.	Date	Revision	
		Pages	Points
A	1 Mar. 2018	-	New
B	20 Mar. 2018	3	To correct mistakes,we modified “Turn-On Input Filter Time” and “Turn-Off Input Filter Time” it ems to “Input filter time” items.
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)

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