MITSUBISHI ELECTRIC

< HVIC >

M81729JFP

HIGH VOLTAGE HALF BRIDGE DRIVER FOR AUTOMOTIVE APPLICATIONS

DESCRIPTION

M81729JFP is high voltage Power MOSFET and IGBT gate driver for half bridge applications.

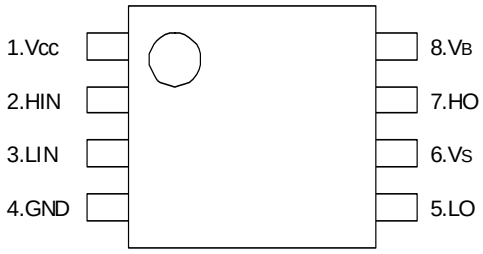
FEATURES

- Floating Supply Voltage ·····600V
- Output Current ·····+120mA/-250mA (min)
- Half Bridge Driver
- SOP-8 Package

APPLICATIONS

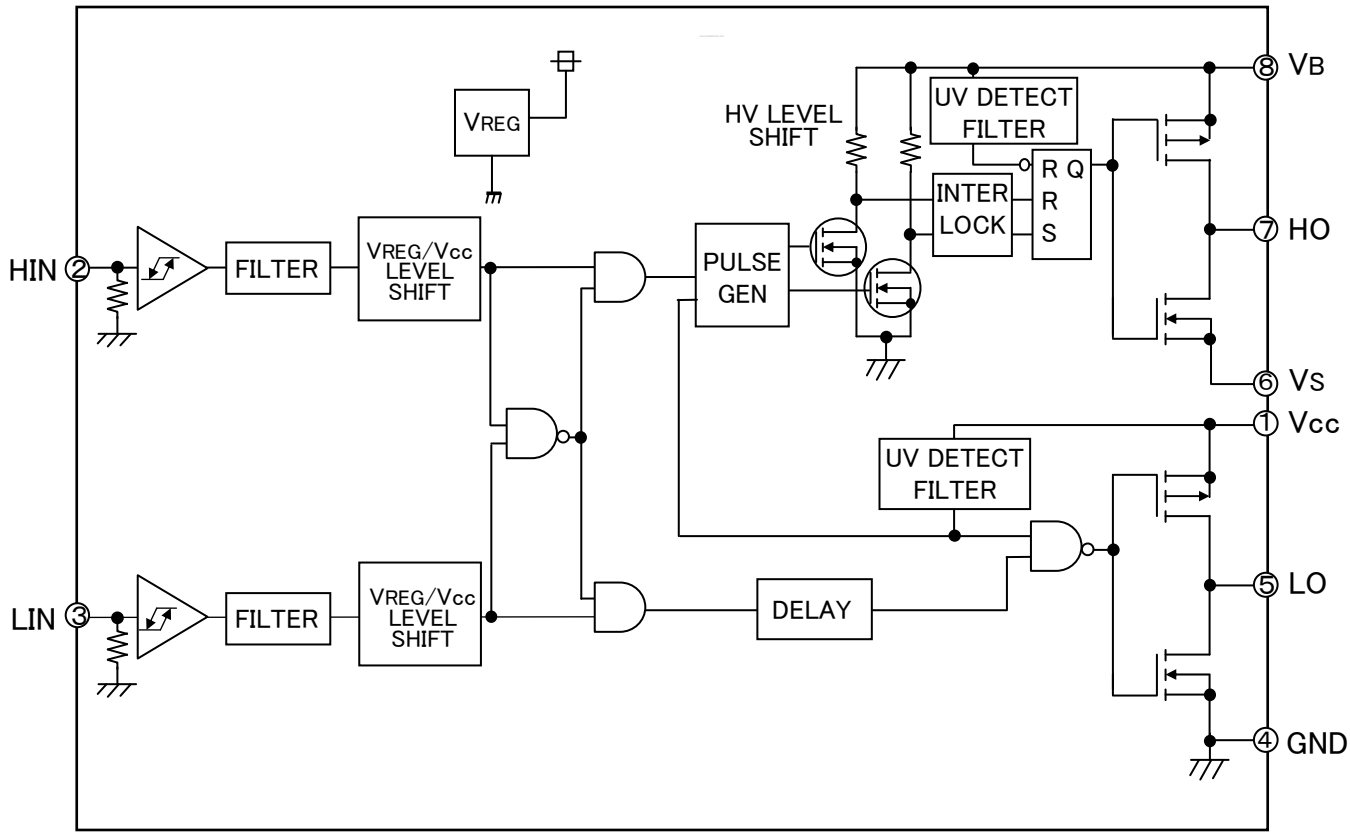
MOSFET and IGBT gate driver.

PIN CONFIGURATION (TOP VIEW)



Outline:8P2S

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	-0.5 ~ Vcc+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
Tj	Junction Temperature		-40 ~ +150 *	℃
Topr	Operation Temperature		-40 ~ +125	℃
Tstg	Storage Temperature		-40 ~ +150	℃
TL	Solder Heatproof	RoHS Correspondence	255:10s,max 260	℃

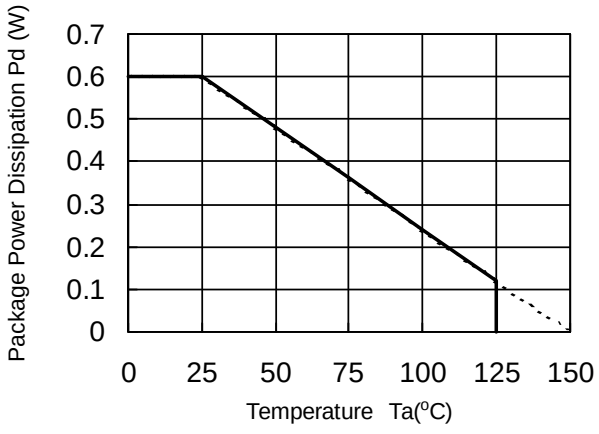
*When temperature exceeds 125 ℃, please make VS voltage less than 500V.

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	Tj≦ 125 ℃	0	—	550	V
		Tj> 125 ℃	0	—	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	0	—	7	V

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

THERMAL DERATING FACTOR CHARACTERISTIC (MAXIMUM RATING)



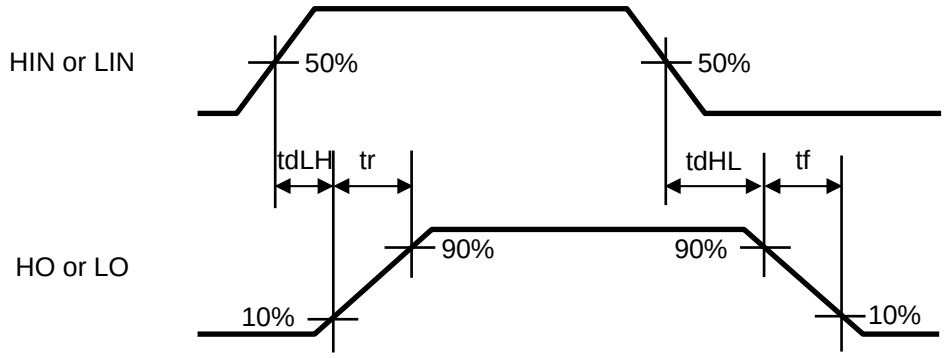
ELECTRICAL CHARACTERISTICS (Ta=-40~125°C, V_{CC}=V_{BS}(=V_B-V_S)=15V, unless otherwise specified)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.*	Max.	
I_{FS}	Floating Supply Leakage Current	V_B = V_S = 600V	—	—	1.0	μA
I_{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, LO, HO	13.6	14.2	—	V
V_{OL}	Low Level Output Voltage	I_O = 20mA, LO, HO	—	0.3	0.6	V
V_{IH}	High Level Input Threshold Voltage		2.7	—	—	V
V_{IL}	Low Level Input Threshold Voltage		—	—	0.8	V
I_{IH}	High Level Input Bias Current	V_{IN} = 5V	—	25	100	μA
I_{IL}	Low Level Input Bias Current	V_{IN} = 0V	—	—	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	—	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	—	μs
I_{OH}	Output High Level Short Circuit Pulsed Current	V_O = 0V, V_{IN} = 5V, PW < 10μs**	120	200	—	mA
I_{OL}	Output Low Level Short Circuit Pulsed Current	V_O = 15V, V_{IN} = 0V, PW < 10μs ** (Tj≦ 125 ℃)	250	350	—	mA
R_{OH}	Output High Level On Resistance	I_O = -20mA, R_{OH} = (V_{CC} – V_O)/ I_O	—	40	70	Ω
R_{OL}	Output Low Level On Resistance	I_O = 20mA, R_{OL} = V_O / I_O	—	15	30	Ω
$t_{dLH(HO)}$	High Side Turn-On Propagation Delay	CL = 1000pF between HO-V_S, 25 ℃	—	450	650	ns
		CL = 1000pF between HO-V_S	—	550	750	ns
$t_{dHL(HO)}$	High Side Turn-Off Propagation Delay	CL = 1000pF between HO-V_S, 25 ℃	—	450	650	ns
		CL = 1000pF between HO-V_S	—	550	750	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, 25 ℃	—	450	650	ns
		CL = 1000pF between LO-GND	—	550	750	ns
$t_{dHL(LO)}$	Low Side Turn-Off Propagation Delay	CL = 1000pF between LO-GND, 25 ℃	—	450	650	ns
		CL = 1000pF between LO-GND	—	550	750	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	$\lvert t_{dLH(HO)}-t_{dLH(LO)} \rvert$, 25 ℃	—	0	30	ns
		$\lvert t_{dLH(HO)}-t_{dLH(LO)} \rvert$	—	0	40	ns
Δt_{dHL}	Turn-Off Propagation Delay Matching	$\lvert t_{dHL(HO)}-t_{dHL(LO)} \rvert$, 25 ℃	—	0	30	ns
		$\lvert t_{dHL(HO)}-t_{dHL(LO)} \rvert$	—	0	40	ns
tinon	On Input Filter Time	Convex Pulse	150	250	350	ns
		Concave Pulse	250	350	450	ns
tinoff	Off Input Filter Time	Convex Pulse	150	250	350	ns
		Concave Pulse	250	350	450	ns
$\Delta P_W IO$	Difference of Input Pulse Width and Output Pulse Width	$\lvert P_{W(IN)}-P_{W(OUT)} \rvert$	—	—	100	ns

*Typ. is not specified.

**The short circuit pulse cannot be entered continuously.

TIMING REQUIREMENT (INPUT FUREQUENCY : 200kHz（duty50%）or less)



FUNCTION TABLE （X：H or L）

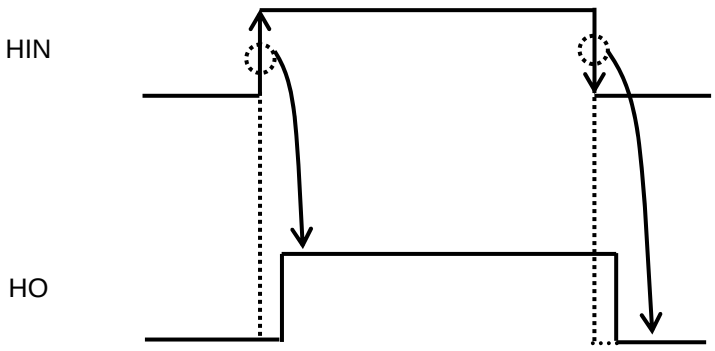
HIN	LIN	V_{BS} UV	V_{CC} UV	HO	LO	Behavioral state
H → L	L	H	H	L	L	LO = HO = LOW
H → L	H	H	H	L	H	LO = HIGH
L → H	L	H	H	H	L	HO = HIGH
L → H	H	H	H	L	L	LO = HO = LOW
X	L	L	H	L	L	HO = LOW , V_{BS} UV tripped
X	H	L	H	L	H	LO = HIGH , V_{BS} UV tripped
H → L	X	H	L	L	L	LO = LOW , V_{CC} UV tripped
L → H	X	H	L	L	L	HO = LO = LOW , V_{CC} UV tripped

Note1 :"L" state of V_{BS} UV, V_{CC} UV neans that UV trip voltage.

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

3. X(HIN):L→H or H→L. X(LIN):H or L.

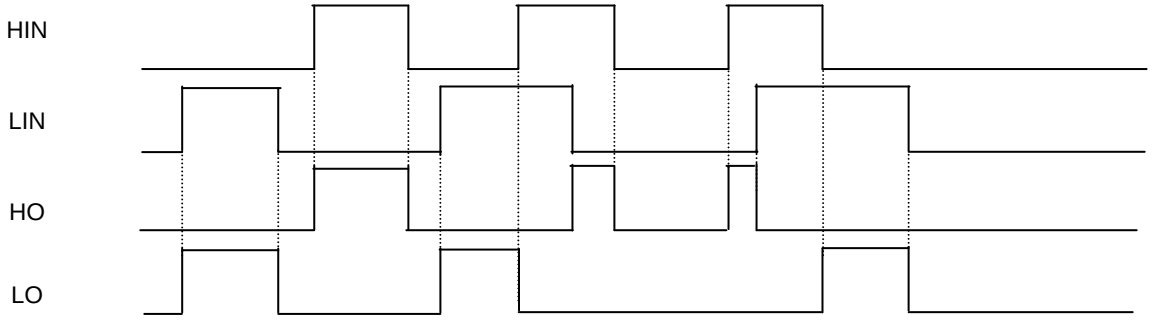
4. Output signal (HO) is triggered by the edge of input signal.



TIMING DIAGRAM

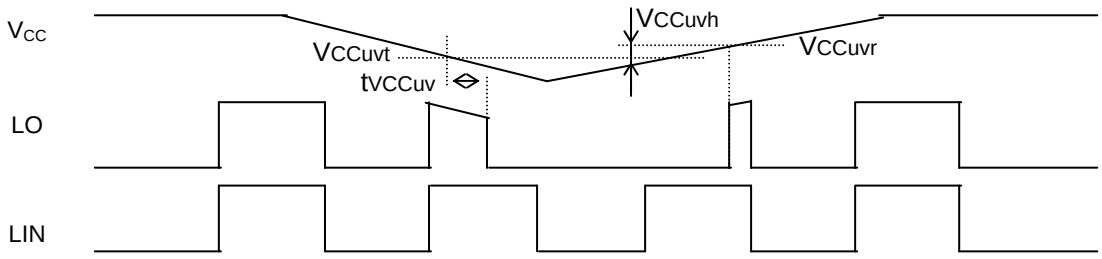
1. Input/Output Timing Diagram

HIGN ACTHVE (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 “L”.

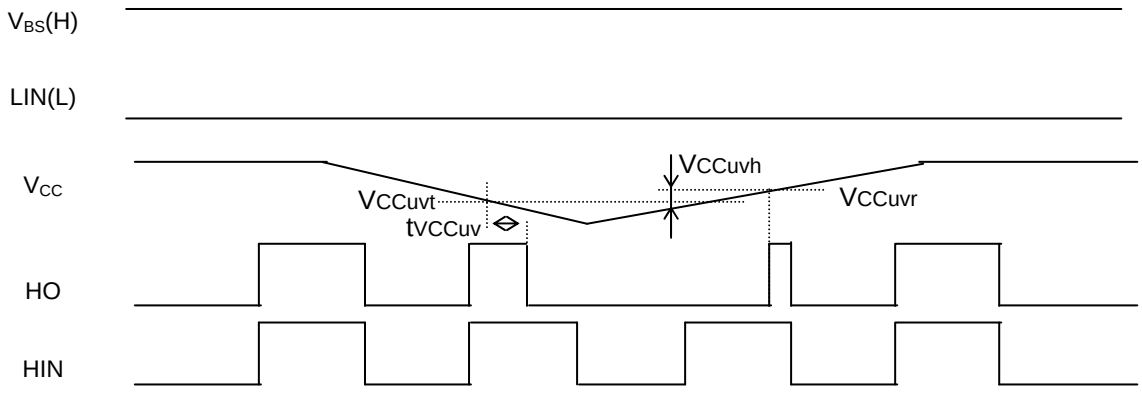


2. V_{CC} (V_{BS}) Supply Under Voltage Lockout Timing Diagram

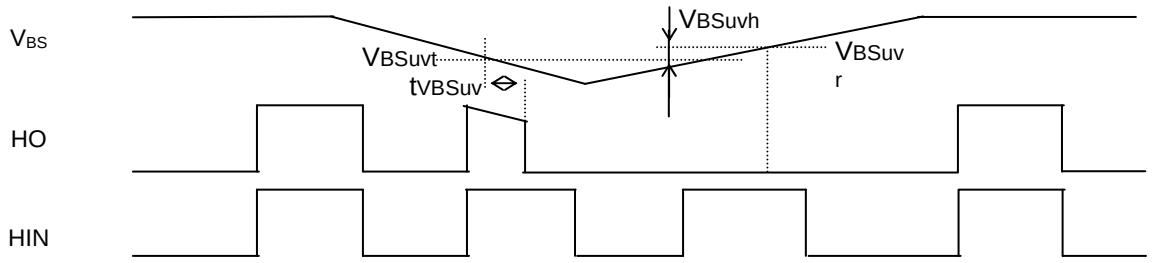
If V_{CC} Supply voltage drops below UV trip voltage（$V_{CCuvt} = V_{CCuvr} - V_{CCuvh}$）for V_{CC} supply UV filter time, output signal LO becomes “L”. As soon as V_{CC} supply voltage rises over UV reset voltage, output signal LO becomes “H” it input signal is “H”.



If V_{CC} Supply voltage drops below UV trip voltage（$V_{CCuvt} = V_{CCuvr} - V_{CCuvh}$）for V_{CC} supply UV filter time, output signal HO becomes “L”. As soon as V_{CC} supply voltage rises over UV reset voltage, output signal HO becomes “H” it input signal is “H”.



If V_{BS} Supply voltage drops below UV trip voltage（$V_{BSuvt} = V_{BSuvr} - V_{BSuvh}$）for V_{BS} supply UV filter time, output signal HO becomes “L”. As soon as V_{BS} supply voltage rises over UV reset voltage, output signal HO becomes “H” at following “H” edge of input signal.



3. 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} firstlyand 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.

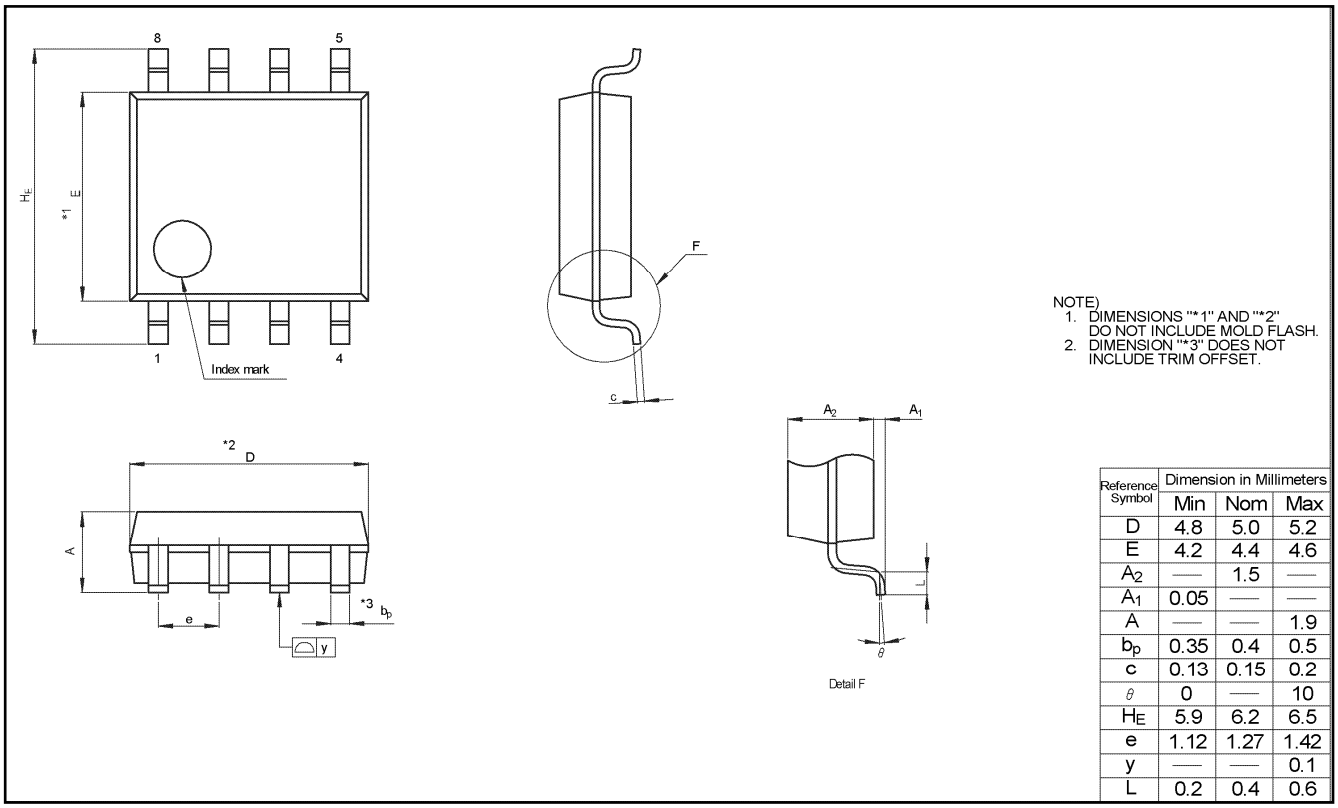
3) V_B supply voltage
Please use V_B supply voltage within RECOMMENDED OPERATING CONDITIONS (V_S+10V < V_B < V_S +20V : V_S Min = 0V).
When V_B supply voltage is used on the other conditions, output signal HO may be malfunction.
Please evaluate carefully about V_B supply voltage in your application systems.

4) dV/dt of V_S supply voltage
Please rises or falls V_S supply voltage by less than 6KV/μs. If it rises or falls rapidly, output signal HO may be malfunction.

5) Narrow pulse input dead time of HIN and LIN
Please set up “H” input dead time of HIN and LIN more than 300ns.

6) Processing between IC terminals
As for this product, the terminal of low voltage part and high voltage part is very clear (The Fifth: LO, The Sixth: V_S).
Therefore, pin insulation space distance should be taken enough.

PACKAGE OUTLINE



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

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	4.8	5.0	5.2
E	4.2	4.4	4.6
A_2	—	1.5	—
A_1	0.05	—	—
A	—	—	1.9
b_p	0.35	0.4	0.5
c	0.13	0.15	0.2
θ	0	—	10
H_E	5.9	6.2	6.5
e	1.12	1.27	1.42
y	—	—	0.1
L	0.2	0.4	0.6

Main Revision for this Edition

No.	Date	Revision	
		Pages	Points
A	2012.03.27	-	New

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