MITSUBISHI ELECTRIC

<HVIC>

M81764FP

Single Low-side Driver with Over-current Detection

DESCRIPTION
M81764FP is MOSFET and IGBT module 1input / 1output (Single) driver.

FEATURES
● Supply voltage………………………………24V(max)
● Output current………………………………-0.8A/+1.75A(typ.)
● Single low-side driver (IN→OUT)
● Over-current detection and output shutdown(CIN)
● Under-voltage lockout
● Failure Output(FO) terminal which can output Fault signals
   to communicate with controllers
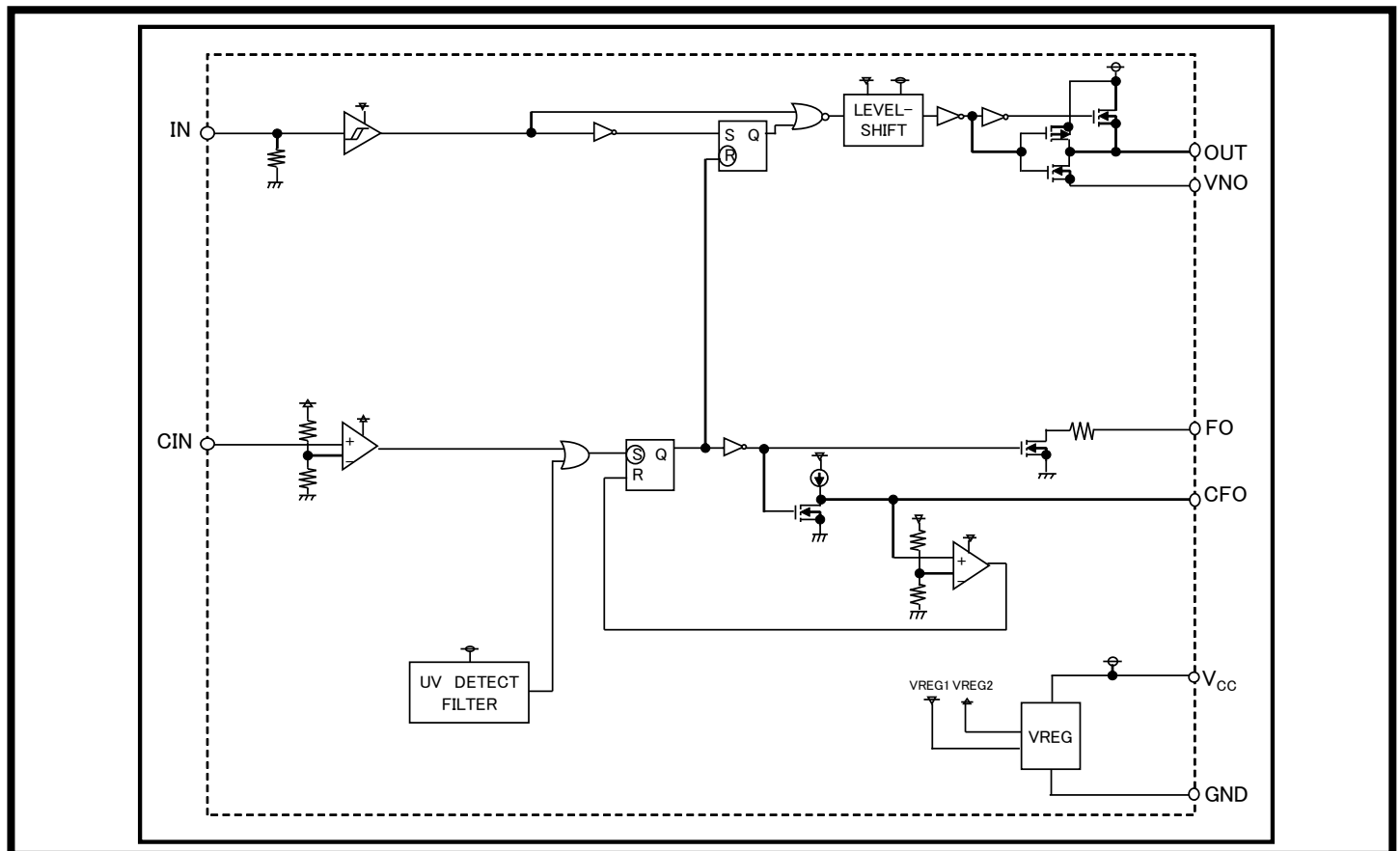● Capacitor with a Failure-Output pulse width timer function(CFO)
● SOP-8 PACKAGE

APPLICATIONS
MOSFET and IGBT module 1input / 1output (Single) driver

PIN CONFIGURATION (TOP VIEW)

CIN	①	⑧ VNO
CFO		OUT
FO		GND
IN	④	⑤ VCC

Outline:SOP8
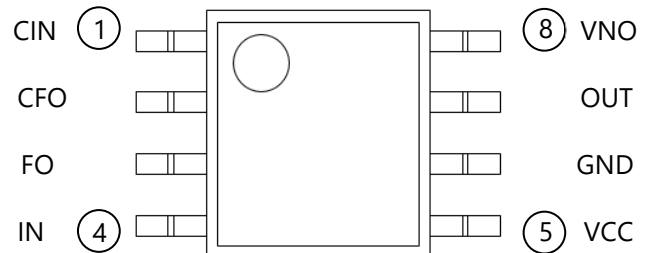
BLOCK DIAGRAM

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

Symbol	Parameter	Test conditions	Ratings	Unit
V_{CC}	Fixed Supply Voltage		-0.5~24	V
V_{NO}	Driver Return Voltage	VNO terminal	-5.0~V_{CC}+0.5	V
V_{OUT}	Output Voltage	OUT terminal	V_{NO}-0.5~V_{CC}	V
I_{OUT}	Output Current	V_{CC}=15V,Gate resistor=0Ω,typ	-0.8/1.75	A
V_{IN}	Input Voltage	IN terminal	-0.5~V_{CC} +0.5	V
V_{CIN}	CIN Input Voltage	CIN terminal	-0.5~V_{CC} +0.5	V
V_{FO}	FO Output Voltage	FO terminal	-0.5~V_{CC} +0.5	V
I_{FO}	FO Output Current	FO terminal	1.0	mA
P_D	Package Power Dissipation	Ta=25°C, Our Standard Board	0.55	W
K_θ	Linear Derating Factor	Ta>25°C, Our Standard Board	-5.5	mW/°C
Tj	Junction Temperature		-40~125	°C
Topr	Operation Temperature		-40~100	°C
Tstg	Storage Temperature		-40~150	°C
TL	Soldering Temperature(Reflow)	Pb-free applied	255:10s,max260	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	Fixed Supply Voltage		13.5	15.0	16.5	V
V_{NO}	Drive Return Voltage	VNO terminal	-5.0	0.0	5.0	V
V_{IN}	Input Voltage	IN terminal	0	-	V_{CC}	V
V_{CIN}	CIN Input Voltage	CIN terminal	0.0	-	5.5	V

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

THERMAL DERATING FACTOR CHARACTERISTIC (MAXIMUM RATING)

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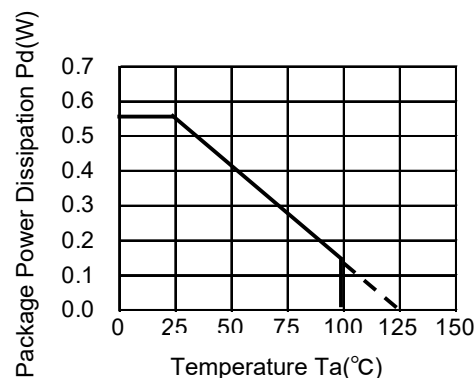
ELECTRICAL CHARACTERISTICS (Ta=25℃,V_{CC}=15V, VNO=GND=0V unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.*	Max.	Unit
I_{CC}	V_{CC} Standby Current	V_{IN}=0V	-	0.70	1.70	mA
V_{NO_1}	VNO Current1	V_{NO}=－5V	-7.0	-5.0	-3.0	mA
V_{NO_2}	VNO Current2	V_{NO}=VCC	-	0.0	-	uA
V_{INH}	High Level Input Threshold Voltage	V_{OUT}=L→H	-	2.10	2.60	V
V_{INh}	Input Hysteresis Voltage	$V_{INh}=V_{IH}－V_{IL}$(Low Level Input Threshold Voltage)	0.35	0.80	-	V
IIN	Input Pulldown Current	IN=5V	0.24	0.33	0.50	mA
V_{CCuvr}	V_{CC} Supply UV Reset Voltage	FO=L→H	11.20	11.90	12.70	V
V_{CCuvh}	V_{CC} Supply UV Hysteresis Voltage	$V_{CCuvh}=V_{CCuvr}－V_{CCuvt}$($V_{CC}$ Supply UV Trip Voltage)	-	0.5	-	V
t_{VCCuv}	V_{CC} Supply UV Filter Time	V_{CC}=15V→10V	-	10	-	us
V_{CIN}	CIN Trip Voltage	FO=H→L	0.40	0.50	0.60	V
t_{CIN_1}	CIN Propagation Delay	From V_{CIN}=0V→1V to FO=H→L	-	410	500	ns
t_{CIN_2}	CIN Filter time	CIN pulse width : From V_{CIN}=0V→1V→0V to FO=H→L	80	180	240	ns
t_{wFOP}	FO Pulse Output Width	CFO=1000pF	75	110	180	us
V_{CFH}	CFO Threshold Voltage	FO=L→H	2.4	2.7	3.0	V
I_{CFO}	CFO Source Current	V_{CFO}=0V	-40	-25	-15	uA
V_{FOH}	FO High Level Output Voltage	V_{CIN}=0V,FO=10kΩ to V_{CC}	14.5	15.0	-	V
V_{FOL}	FO Low Level Output Voltage	V_{CIN}=1V,I_{FO}=1mA	-	-	0.95	V
I_{FO}	FO Leak Current	V_{CIN}=0V,V_{FO}=V_{CC}	-	-	1.0	uA
V_{OUTL}	Low Level Output Voltage	I_O=0mA	-	0.00	0.10	V
V_{OUTH}	High Level Output Voltage	I_O=0mA	14.5	15.0	-	V
tdLH	Turn-On Propagation Delay	From V_{IN}=L→H to V_{OUT}=L→H (OUT=1000pF)	-	100	300	ns
tdHL	Turn-Off Propagation Delay	From V_{IN}=H→L to V_{OUT}=H→L (OUT=1000pF)	-	100	300	ns
tr	Turn-On Rise-Time	OUT=1000pF	-	-	150	ns
tf	Turn-Off Fall-Time	OUT=1000pF	-	-	75	ns

* Typ is not specified

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Function Table

IN	UV[*1]	CIN[*2]	OUT	FO	Note
L	H	L	L	H	OUT=L,FO=H
H	H	L	H	H	OUT=H,FO=H(HIGH ACTIVE)
X	L	X	L	L	OUT=L,FO=L (Under-Voltage Protection will shutdown input signals until FO return to high level.)
X	H	H	L	L	OUT=L,FO=L (Over-Current Protection will shutdown input signals until FO return to high level.)

*1:UV "L" state is Under Voltage Protection.
*2:CIN "H" state is Over-Current Protection.

TIMING DIAGRAM
1.Input/Output Action
HIGH ACTIVE(When input signal(IN) is "H" ,then output signal(OUT) is "H")

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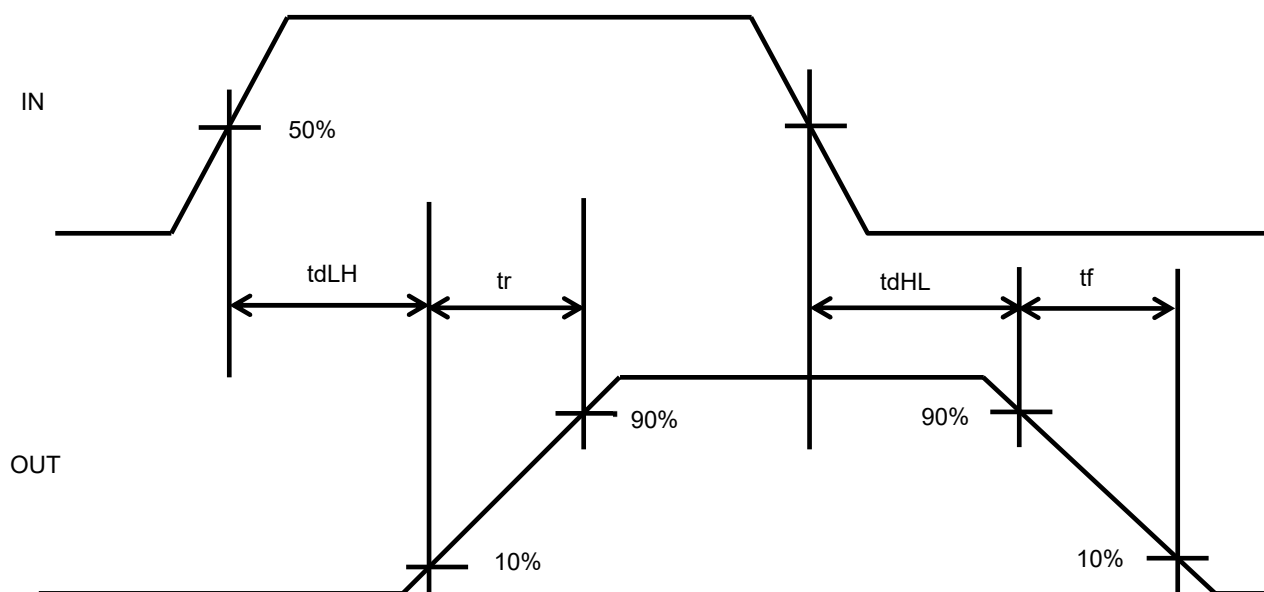
2.Under-Voltage Protection

When V_{CC} Supply Voltage keeps lower UV Trip Voltage for V_{CC} Supply UV Filter Time,
FO signal becomes "L" and output signal becomes "L".
And then, when V_{CC} Supply Voltage is higher than UV Reset Voltage and longer than FO Pulse Output Width,
FO signal becomes "H" and output signal keeps "L" until next input signal IN is "H".
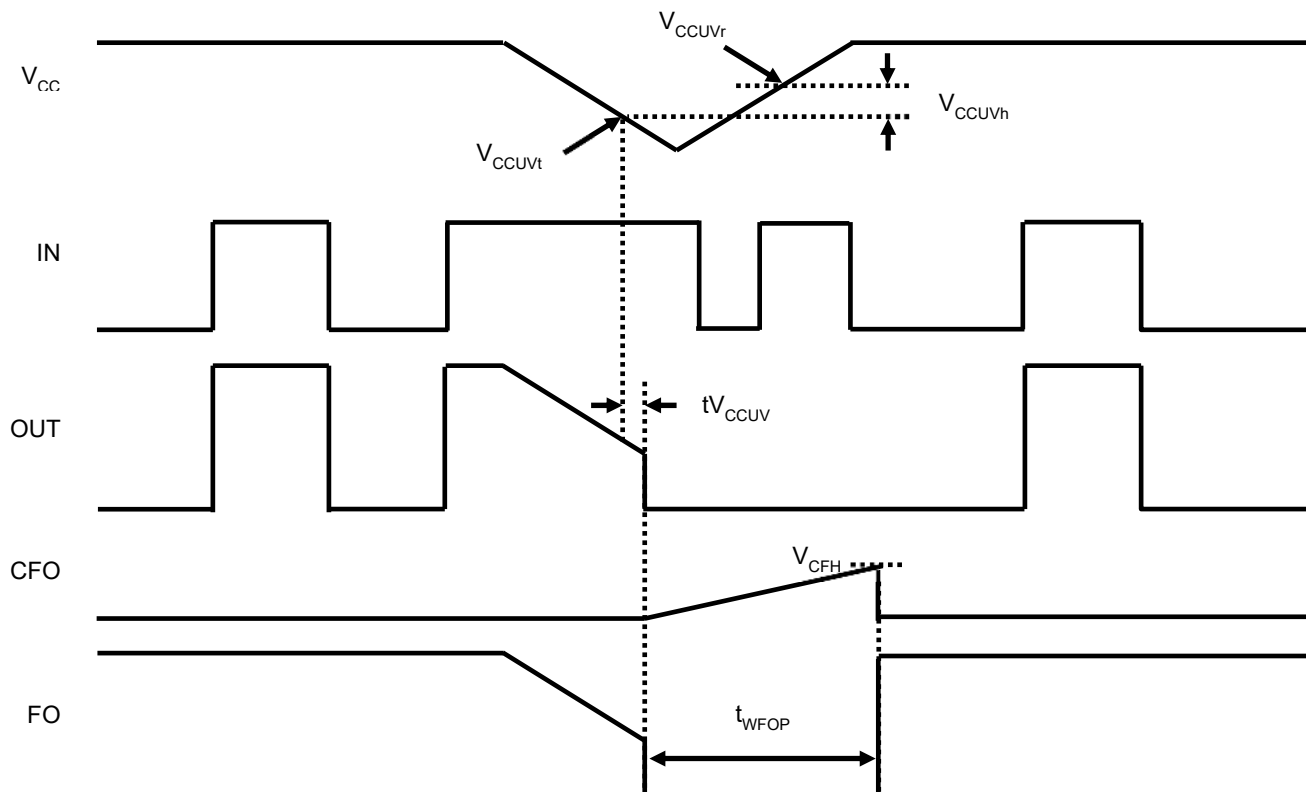
※ Once FO enters Under Voltage Protection mode, FO keeps "L" until FO Pulse Output Width period is over and
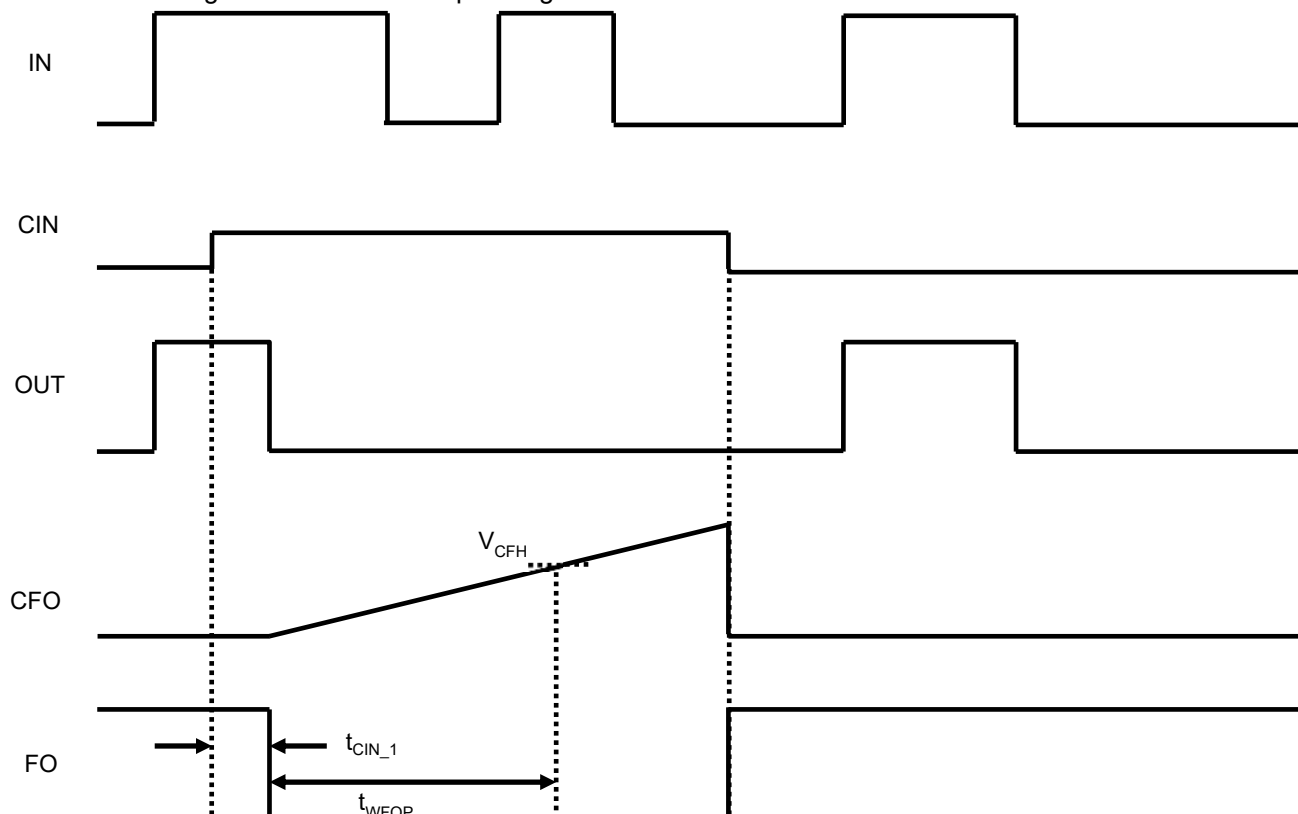V_{CC} Supply Voltage higher than UV Reset Voltage.

5
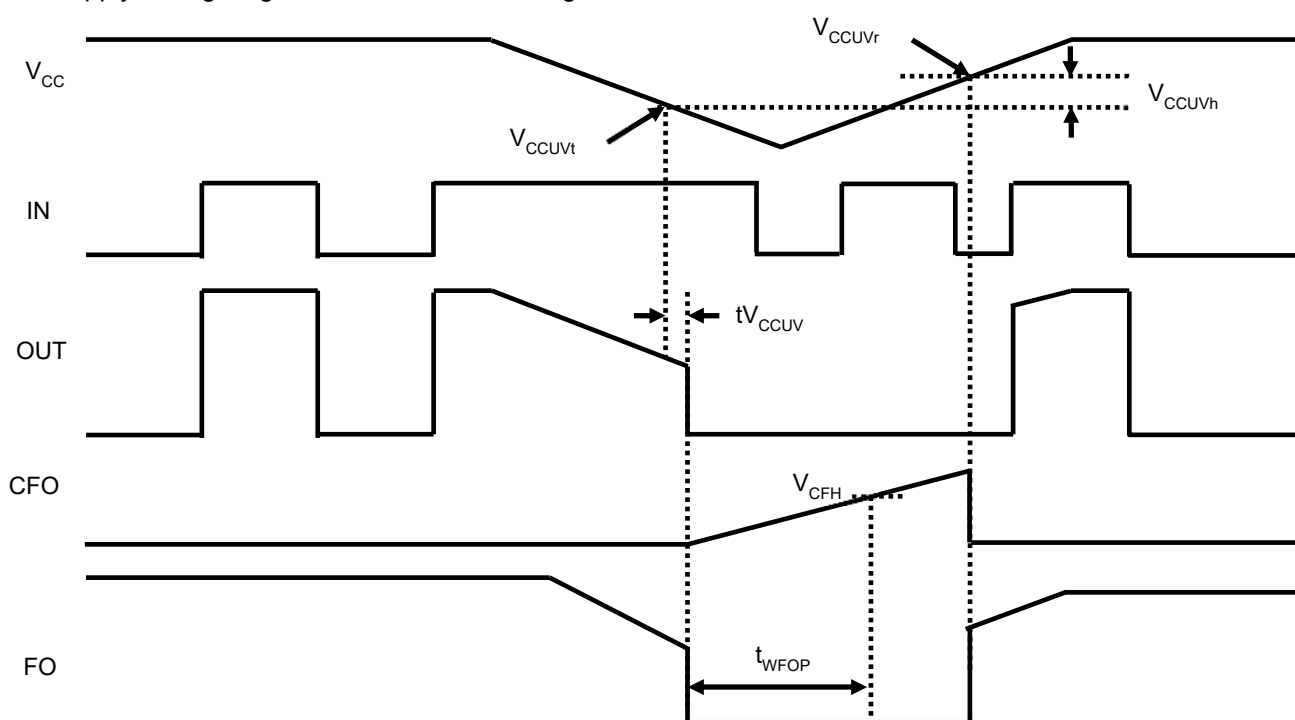
3.Over-Current Protection

When CIN terminal Voltage keeps higher CIN Trip Voltage for CIN Filter time,
FO signal becomes "L" and output signal becomes "L".
And then, when CIN terminal Voltage is lower than CIN Trip Voltage and longer than FO Pulse Output Width,
FO signal becomes "H" and output signal keeps "L" until next input signal IN is "H".

IN

Pulse width > t_{CIN_2} Pulse width < t_{CIN_2}

CIN

OUT

V_{CFH}

CFO

FO t_{CIN_1}

t_{WFOP}
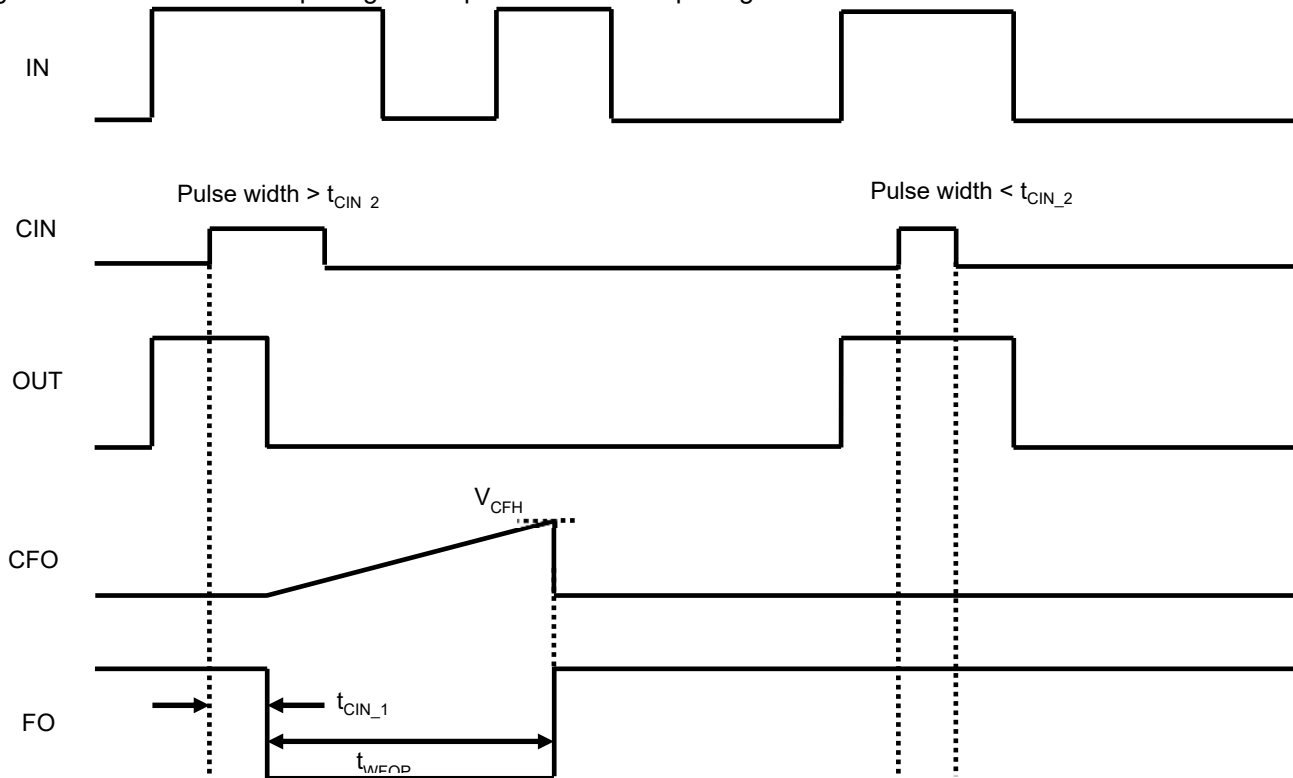
※ Once FO enters Over-Current Protection mode, FO keeps "L" until FO Pulse Output Width period is over and CIN terminal Voltage lower than CIN Trip Voltage.

IN

CIN

OUT

V_{CFH}

CFO

FO t_{CIN_1}

t_{WFOP}

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ENVIRONMENTAL CONSCIOUSNESS

M81764FP 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
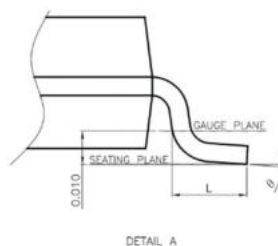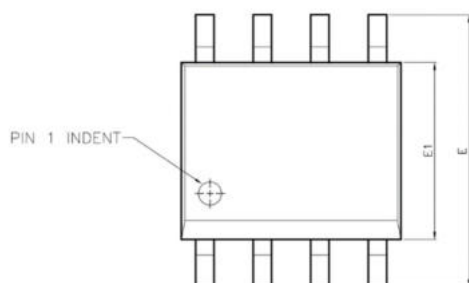
SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.47	1.60	1.73
A1	0.10	——	0.25
A2	——	1.45	——
b	0.33	0.41	0.51
C	0.19	0.20	0.25
D	4.80	4.85	4.95
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	——	1.27	——
L	0.40	0.71	1.27
y	——	——	0.076
θ	0°	——	8°

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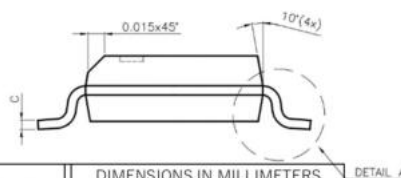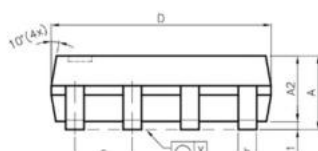
SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
e1	—	5.23	—
l2	1.27	—	—
e	—	1.27	—
b2	—	0.76	—

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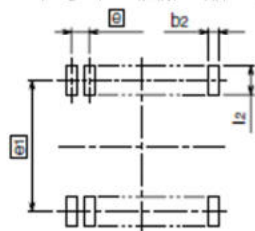
The above is one example.
Please design the mount pad with your evaluation.

Recommended Mount Pad

Main Revision for this Edition

Rev.	Date	Revision	
		Pages	Points
A	29 Jan. 2015	-	New Edition.
B	5 Feb. 2015	1	FEATURES revised description. "Single low side driver (IN→OUT) " "Over-current detection and output shutdown (CIN) "
C	8 Jan. 2016	-	"PRELIMINARY" was deleted. "Notice : This is not a final specification. Some parametric limits are subject to change." was deleted.
		1	FEATURES revised description. "Supply voltage………………………………24V(max)
		5	"TIMING CHART was changed.
D	19 Apr. 2016	2	"Operation Temperature " was changed to "-30℃～100℃"
E	25 Apr. 2016	2	"Junction Temperature " was changed to "-30℃～125℃"
F	28 Apr. 2021	7	Add PACKAGE OUTLINE1,2
		-	Update format.
G	10 Jan. 2023	7	Delete PACKAGE OUTLINE (Not recommended for new designs)
H	01 Feb. 2024	2	Deleted "On Board" in Storage Temp. "Junction Temperature " was changed to "-40℃～125℃" "Operation Temperature " was changed to "-40℃～100℃"
		3	The test conditions for VCC UV Reset was "VCCuvt : VCC Supply UV Trip Voltage".

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