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ESD TVS MOS LDO Diode Sensor DC-DC

Product Specification

Domestic Part Number	AP1511B
Overseas Part Number	AP1511B
Equivalent Part Number	AP1511B



FEATURES

- 1.8V 输入电平
- 低饱和电压 (0.73V@300mA,VDD=5V)
- 低待机电流 (<10uA)
- 操作电压 2.5V 至 5.5V
- 只需单一输入即可控制

APPLICATIONS

- IR-Cut Removable (ICR)专用驱动 IC.

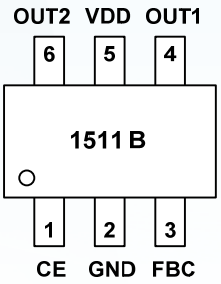
DESCRIPTION

AP1511 是一款专为 IR-Cut Removable (ICR)设计的驱动 IC 用来开关红外线滤光片. AP1511 具有一个低饱和电压双向的 H-bridge 驱动电路. 内建保护二极管疏通 ICR 所产生的反馈电流, 以及防止 ESD 的破坏.

AP1511 内的双向 H-bridge 驱动电路其内阻小于 3 奥姆, 所以 ICR 模块所需的电流决定于其线圈的阻抗. 以工作电源 5 伏特为例, 当 ICR 内部线圈流过 300mA 电流时, AP1511 内的 H-bridge 驱动电路会产生 0.73V 的压降.

AP1511 以单线控制并且提供单步操作(One-Shot)的功 能.

PIN CONFIGURATION



SOT23-6

Pin #	Mnemonic	I/O	Description
1	ENB	I	Low-active enable
	CE	I	External capacitor
2	GND	-	Ground
3	FBC	I	Forward/Backward control
4	OUT1	O	Driver output 1
5	VDD	-	Power supply
6	OUT2	O	Driver output 2

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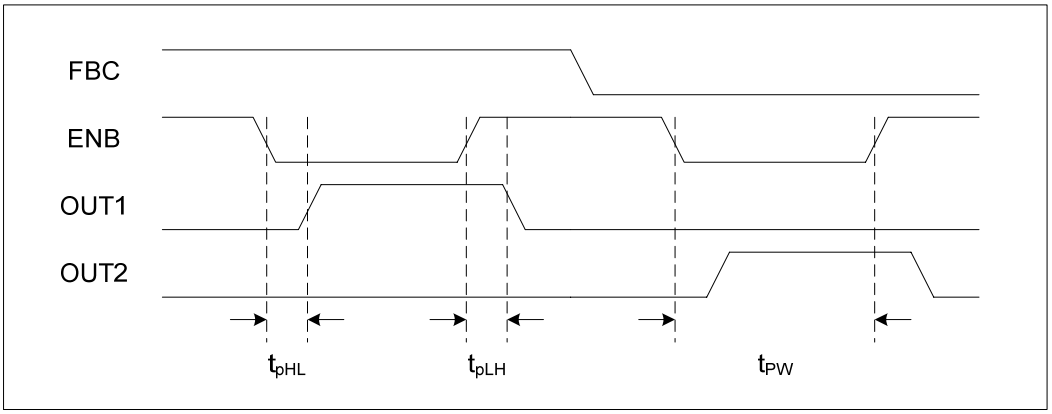
Absolute Maximum Ratings (unless otherwise specified, Temperature=25℃)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{DD}	5.5	V
Input Voltage	V_{IN}	V_{DD}+0.4V	V
Output Current (Continue)	I_{OUT}	500	mA
(Pulse, 50% duty)		600	mA
Operating Temperature Range	T_{OPR}	-40~125	℃
Storage Temperature Range	T_{STO}	-65~150	℃

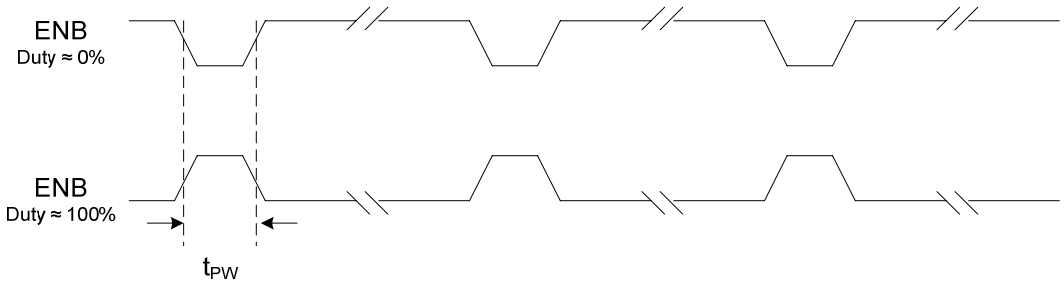
Electrical Characteristics (unless otherwise specified, Temperature=25℃ & V_{DD}=5.0V)

Characteristic	Sym.	Condition	Limit			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{DD}	-	2.5	5.0	5.5	V
Supply Current	I_{STB}	Steady state or standby state	-	-	10	μA
	I_{DD}	Transit state	0.8	1	1.2	mA
Driver input control ENB/FBC						
Input High “H”	V_{IH}	-	1.6	-	V_{DD}+0.4	V
Input High “L”	V_{IL}	-	-0.4	-	0.2*V_{DD}	V
Driver output OUT1/OUT2						
Output Voltage (upper + lower)	V_{OUT1}	I_{OUT} = 200 mA	-	0.42	-	V
	V_{OUT2}	I_{OUT} = 300 mA	-	0.73	-	V
	V_{OUT3}	I_{OUT} = 400 mA	-	1.03	-	V
Rise transition time	T_R	From 0.1*VDD to 0.9*VDD	-	2.5	5	ns
Fall transition time	T_F	From 0.9*VDD to 0.1*VDD	-	3.5	7	ns

Characteristic	Sym.	Condition	Limit			Unit
Propagation Delay Time						
ENB → OUT1 / 2 (“L” to “H”)	t_{pLH}	VDD = 5V, Load = 18	-	13	16	ns
ENB → OUT1 / 2 (“H” to “L”)	t_{pHL}		-	36	43	ns
Pulse Width of ENB	t_{PW}		100	-	-	ns
Maximum frequency of ENB	f_{MAX}		-	-	5	MHz



Propagation delay time between ENB and OUT1/2



PWM waveform for ENB

Typical Application (AP1511)

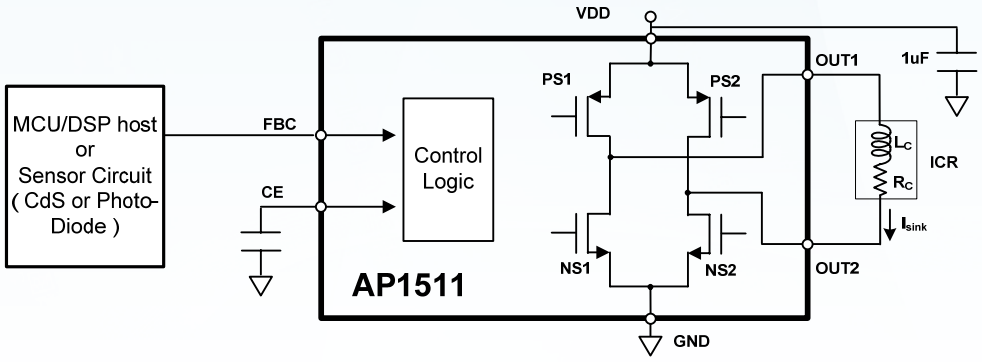
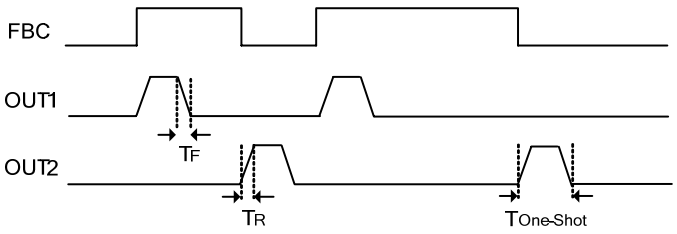


Figure 2. Typical application circuit of AP1511

Truth Table and Diagram of Controls

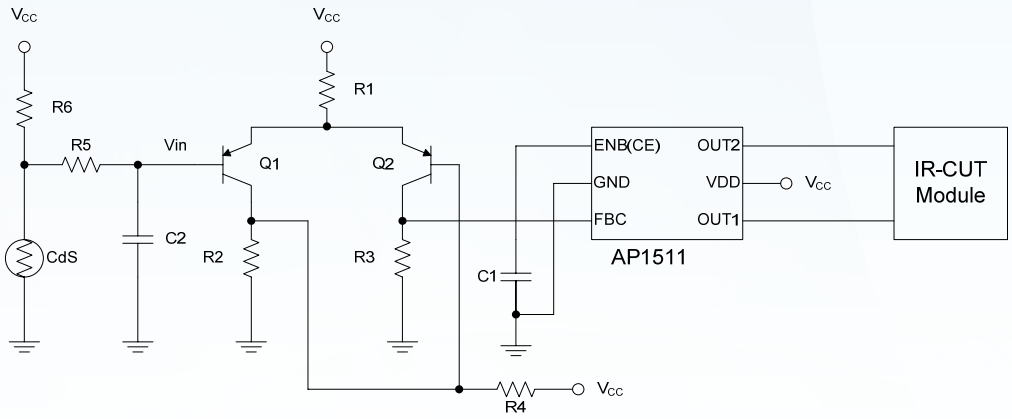
Input	Output	
FBC	OUT1	OUT2
⌐	∩	___
⌙	___	∪



$T_{One\text{-}Shot}$ 的长度是由接在 CE 管脚上的外部电容所决定. 其关系式为

$T_{one\text{-}Shot} = 1.3 \times 10^6 \times C_{CE}$ (second)

当外部电容容值固定时, IC 温度每上升 1℃, $T_{one\text{-}Shot}$ 会减少 0.2 %. 事实上一般的电容容值也会随温度变化, 25℃时电容值为最大, 偏离 25℃后电容值会减小. 因此建议将 $T_{one\text{-}Shot}$ 设定为 ICR 所需时间的两倍, 使得在任意温度下皆可以正常动作.

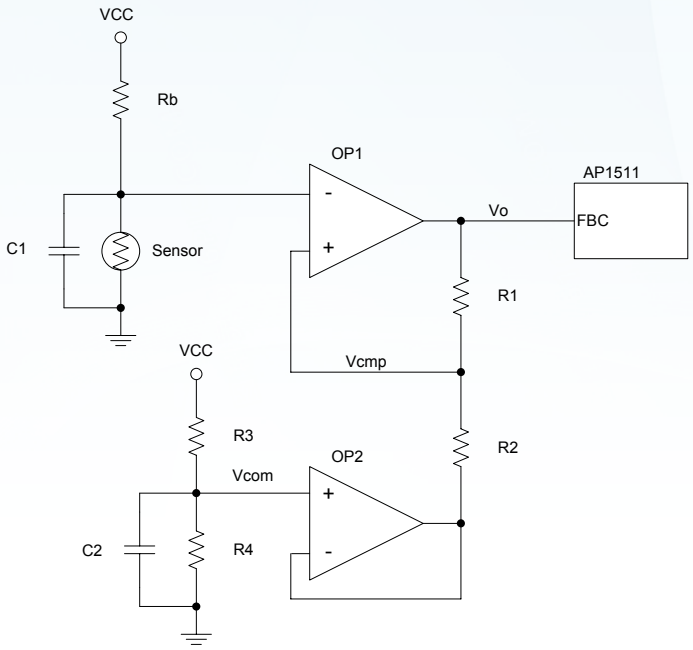


上图为一个AP1511的应用线路图. 光敏电阻CdS R5与R6组成光感测电路, 其输出接至延迟电路R5以及C2. Vin的电压大小即为目前的环境亮度. 史密特触发电路 (Q1, Q2 and R1~R4) 用来判断目前为白天或是晚上并且控制AP1511 FBC管脚的方向. 这样ICR模块中红外线绿光片的位置就会根据环境的亮度来做变动.

延迟电路的作用是为了确保亮度信号稳定, 不会因为环境亮度瞬间改变所干扰. 当 R5 = 200k 以及 C2 = 22uF 时延迟时间约为 3 秒. 所以当环境亮度变化后必须超过 3 秒, AP1511 才会动作, 否则将视为干扰 AP1511 不会动作.

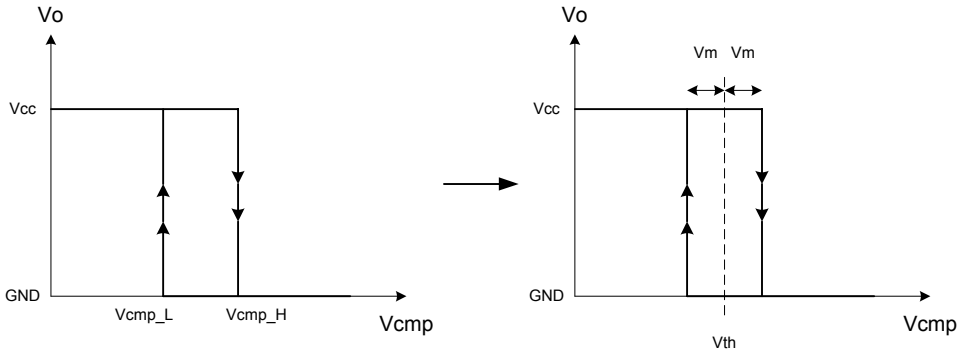
史密特触发电路利用两个临界电压(V_{IH} 与 V_{IL})来得到较好的噪声容忍度以避免环境干扰. 当 Vin 低于 V_{IL} 时, 史密特触发电路将送出低电平至 FBC 管脚. 当 Vin 高于 V_{IH} 时, 史密特触发电路将送出高电平至 FBC 管脚. Vin 电压如果介于 V_{IH} 与 V_{IL} 时, 史密特触发电路输出电平不会改变. 此一特性可以提高噪声容忍度并且消除干扰.

临界电压可以由 R1~R4 电阻阻值来决定. 可以利用所提供的应用程序 “Schmitt Trigger Calculator”来做计算.



$$Vcmp_H = \frac{R2}{R1+R2}Vcc + \frac{R1}{R1+R2}Vcom \qquad (Vo = Vcc)$$

$$Vcmp_L = \frac{R2}{R1+R2}\cdot 0 + \frac{R1}{R1+R2}Vcom = \frac{R1}{R1+R2}Vcom \qquad (Vo = GND)$$

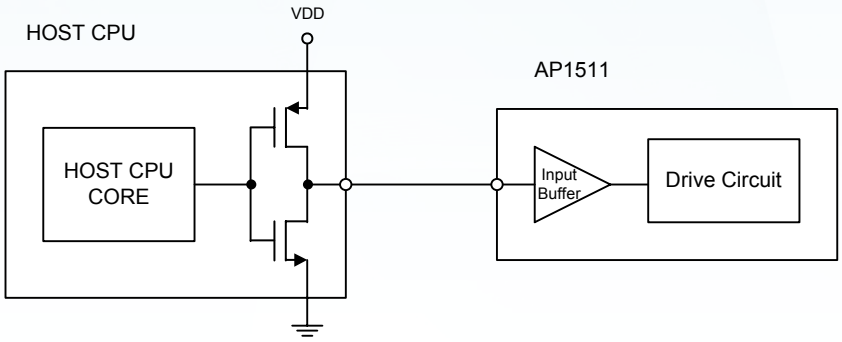


$$Vth = (Vcmp_H + Vcmp_L)/2 = \frac{R2}{2(R1+R2)}Vcc + \frac{R1}{R1+R2}Vcom$$

$$Vm = (Vcmp_H - Vcmp_L)/2 = \frac{R2}{2(R1+R2)}Vcc$$

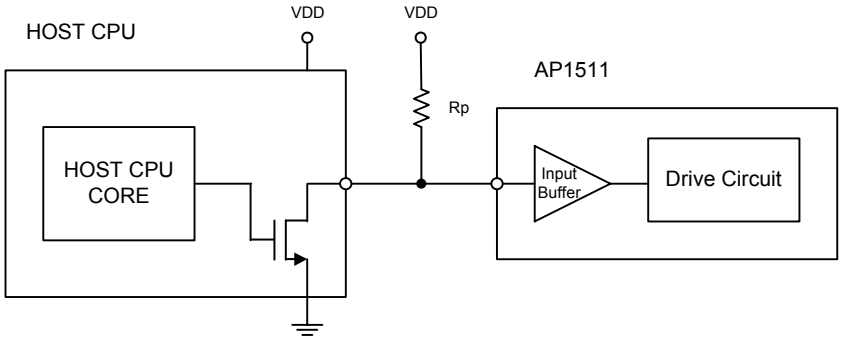
上列公式说明 OPAMP 组成之史密特触发电路的 Vth 以及 Vm 如何计算，其电压值可以由 R1 与 R2 决定. 当输入讯号高于 Vcmp_H 或低于 Vcmp_L 时，史密特触发电路的输出会改变. 此一特性可以提高噪声容忍度并且消除干扰.

AP1511 的 ENB 与 FBC 管脚为高阻抗输入，没有内含提升电阻. 大部分的情况下，AP1511 由 MCU 或 HOST CPU 的 GPIO 所控制. GPIO 有两种形式三态输出(tri-states output)与开汲极输出(open-drain output).



HOST CPU with tri-state output buffer

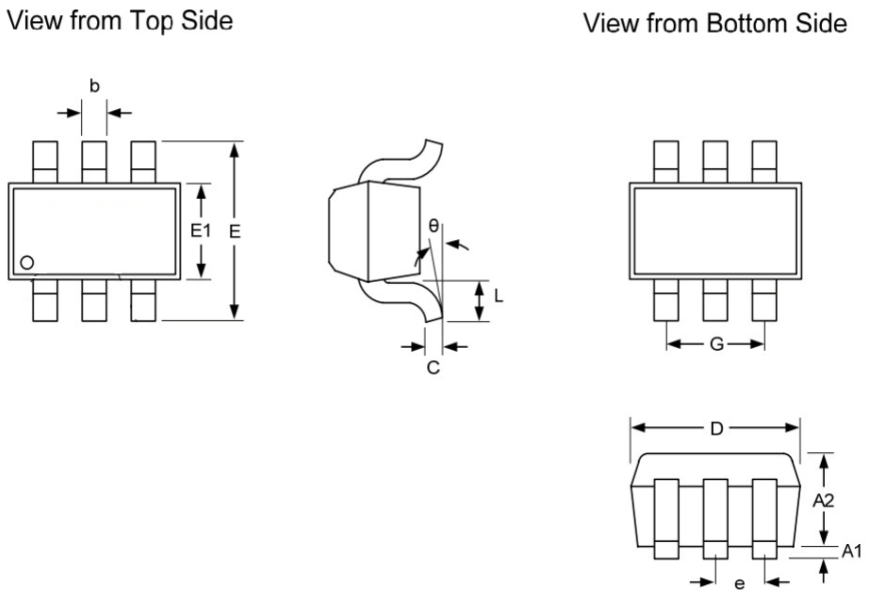
因为 tri-state output 可以送出高电平 VDD 与低电平 GND. 所以此一种 GPIO 直接接到 AP1511 的 ENB 与 FBC 管脚即可.



Host CPU with open-drain output buffer

若是 open-drain output 其只能输出低电平 GND，所以必须在 GPIO 上加一个提升电阻 Rp 来产生高电平 VDD. 此一提升电阻 Rp 的阻值约在数百 k 即可. 较小的提升电阻可以得到较快得上升时间，但是当 GPIO 输出低电平时会较耗电.

OUTLINE DIMENSION (SOT23-6)



SYMBOLS	DIMENSION (MM)			DIMENSION (MIL)		
	MIN	NOM	MAX	MIN	NOM	MAX
A1	0.02	0.05	0.1	0.80	2.00	4.00
A2	1.00	1.10	1.30	40.0	44.0	52.0
b	0.35	0.38	0.45	14.0	15.0	18.0
C	0.10	0.15	0.20	4.0	6.0	8.0
D	2.90	3.00	3.10	116	120	124
E	2.70	2.80	3.00	108	112	120
E1	1.50	1.60	1.70	60.0	64.0	68.0
e		0.95			38	
G		1.90			76	
L	0.35	0.40	0.55	14.0	16.0	22.0
θ	0°	8°	-	0°	8°	-

ORDERING INFORMATION

Order Code	Package	Baseqty	Deliverymode
AP1511B	SOT23-6	3000	Tape and reel

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