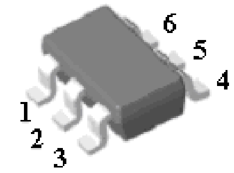
D6211A/B
IR Filter Switch Driver

General Description

D6211 is an IR filter switch driver IC designed for switching IR filter in IR-Cut Removable (ICR) of IP CAM. With appropriate input controls, D6211 functions as a one-channel, low saturation, bi-directional H-bridge driver. Built-in protection diode circuit can minimize the disturbance caused by the feedback current when the ICR is shut down, or when ESD impulse occurs.



SOT-23-6L

The typical impedance of the current switches in D6211 shown in Fig. 1 is less than 3 ohms. The current driven through the actuator is then determined by the impedance of the ICR. For example, with 5.0V power supply, the current through the actuator is around 300mA with 0.73V output voltage drop.

Two types of D6211 (Ver. A & Ver. B) are offered to support single-wire control, dual-wire control and single-wire one-shot control modes as shown in Fig.Typical Application Circuit.

D6211 is offered in SOT-23-6L package.

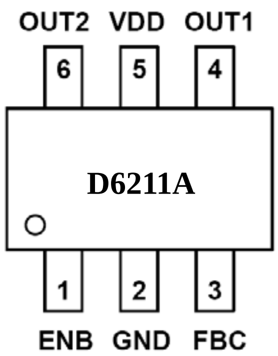
Features

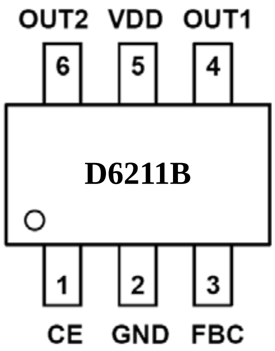
- 1.8V input driving pulse
- Low saturation voltage (0.73V@300mA,VDD=5V)
- Low standby current (<10uA)
- 2.5V to 5.5V operating voltage range
- Only one control input and Built-in non-overlap circuit to avoid the MOSFET damage caused by the fast output voltage transient

Applications

- IR filter switch driver for IR-Cut Removable (ICR) of IP CAM.

Pin Configuration





Pin Description

Pin No.	Symbol	I/O	Description
1	ENB/CE	I	Low-active enable/ 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

Absolute Maximum Ratings（Tamb=25℃）

Parameter Name	Symbol	Rating	Unit
Supply Voltage	V_{DD}	5.5	V
Input Voltage	V_{IN}	V_{DD}+0.4V	V
Output Current	I_{OUT}	500	mA
Operating Temperature Range	Topr	-40～+125	℃
Storage Temperature Range	Tstg	-65～+50	℃

Recommended Operating Conditions

Parameter Name	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{DD}	2.5	5.0	5.5	V

Electrical Characteristics (T_A=25℃, VDD=5.0V unless otherwise noted)

Parameter Name	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Current	$I_{STB(A)}$	Steady state or standby state version A			20	µA
	$I_{STB(B)}$	Steady state or standby state version B			10	
	I_{DD}	Transit State	0.8	1.0	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*V_{DD} to 0.9* V_{DD}		2.5	5.0	ns
Fall Transition Time	T_F	From 0.9* V_{DD} to 0.1* V_{DD}		3.5	7.0	ns
Propagation Delay Time						
ENB → OUT1 / 2 (“L” to “H”)	t_{PLH}	V_{DD} = 5V, Load=18Ω		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	T_{MAX}				5	MHz

Application Summary

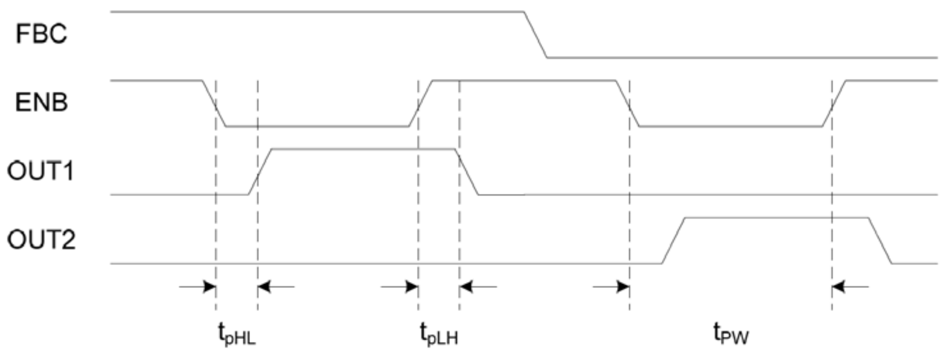


Fig. Propagation delay time between ENB and OUT1/2

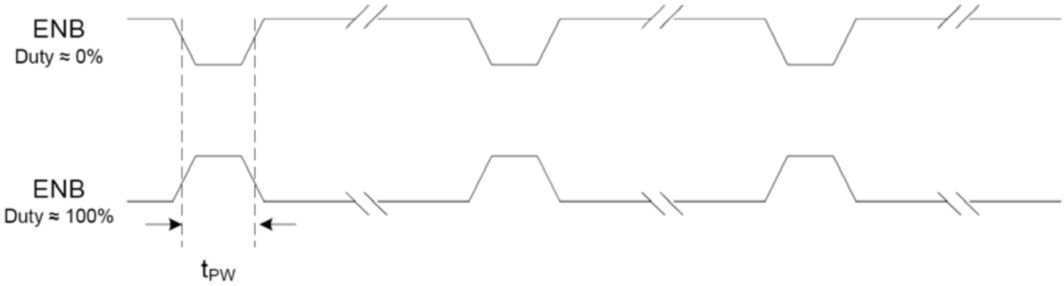
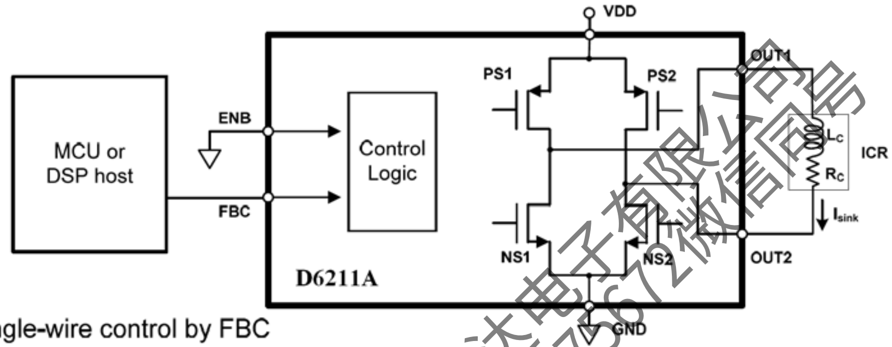
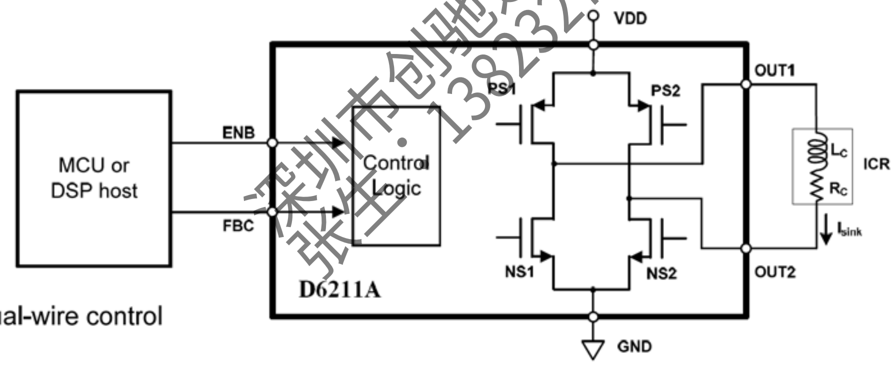


Fig. PWM waveform for ENB

Typical Application

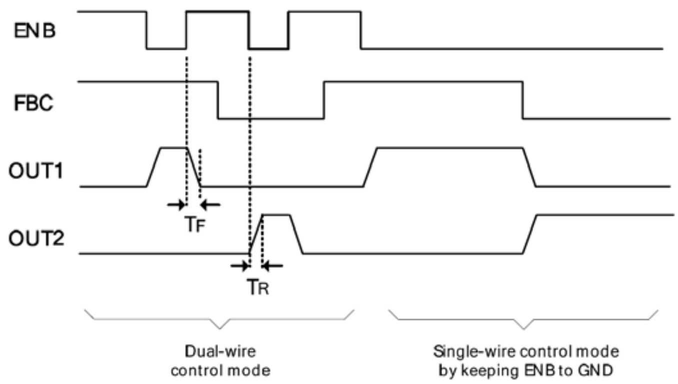


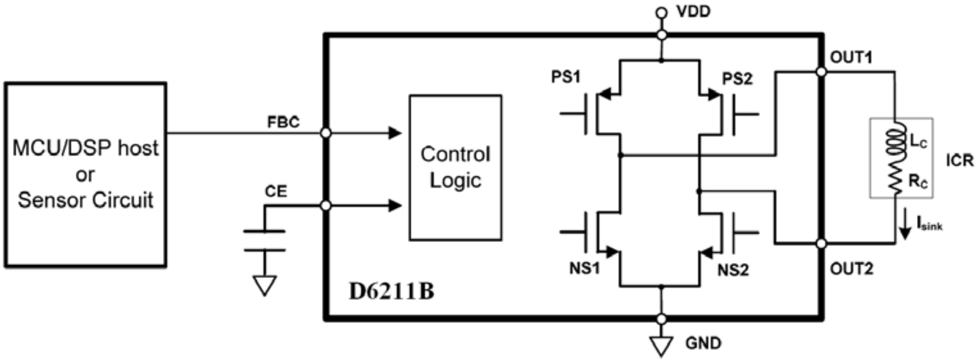
(a) Single-wire control by FBC

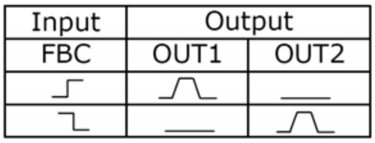


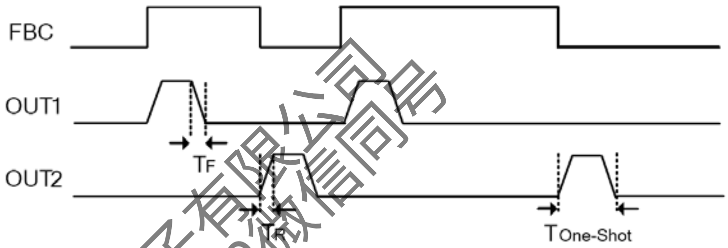
(b) Dual-wire control

Input		Output	
ENB	FBC	OUT1	OUT2
H	X	L	L
L	H	H	L
L	L	L	H







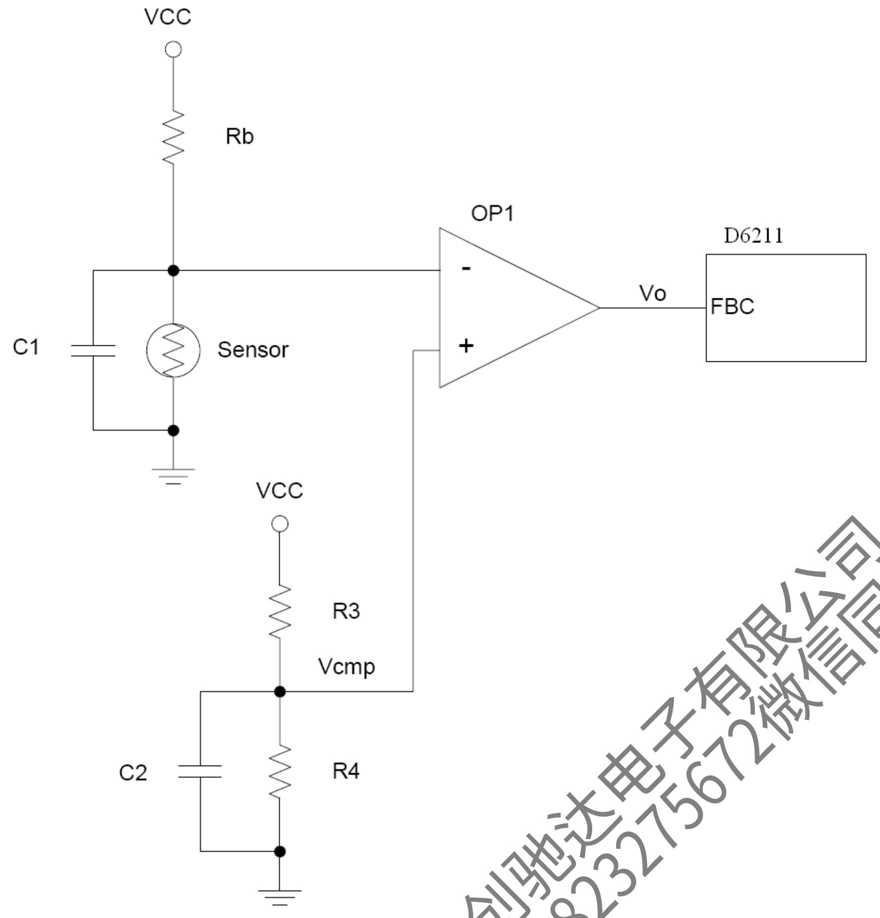


The period of $T_{One\text{-}Shot}$ is determined by the external capacitor connected on CE pin. It can be estimated from the equation.

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

The time of one-shot would decrease 0.2 %/℃ by temperature increase with the constant capacitance of C_{CE}. In fact, the capacitance of a real capacitor is affected by temperature change and has its maximum value at 25℃. It is suggested to set the time of one-shot more than twice time that the ICR-module needs.

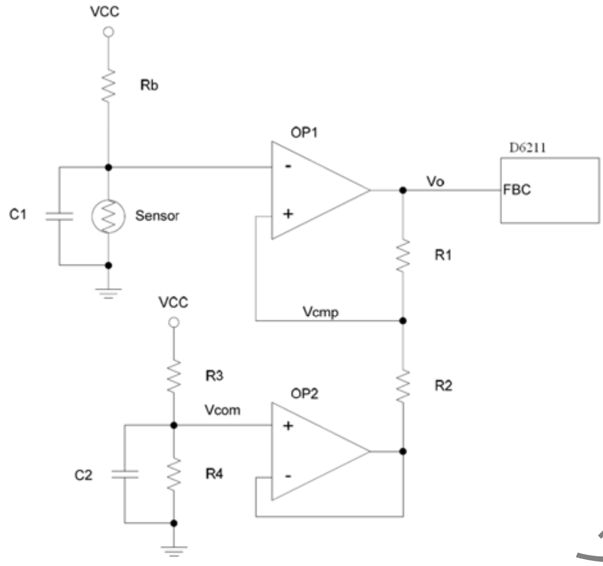
The environment illumination can be detected by a photo sensor that is like CdS photo resistors or photodiodes. By using a comparator to decide day or night to control the direction of the FBC pin of D6211. Thus the IR lens position of the IR-cut module is according to the environment illumination. But a simple comparator circuit doesn’t have any noise tolerance and there is too much glitch single due to the environment influence. A simple comparator circuit for a photo sensor is shown below. The resistor Rb is a bias resistor to generate the bias voltage for the photo sensor. The threshold voltage Vcmp that is decided by the resistors R3 and R4 is compared with the voltage of the photo sensor. The output direction of D6211 is according to the result of the comparator (OP1).



The circuit is changed from a comparator to a schmitt trigger to solve the low noise tolerance issue. The offset voltage (Vcom) is generated by the resistors R3 and R4 and buffered by the buffer (OP2). The threshold voltage (Vcmp) can be expressed as

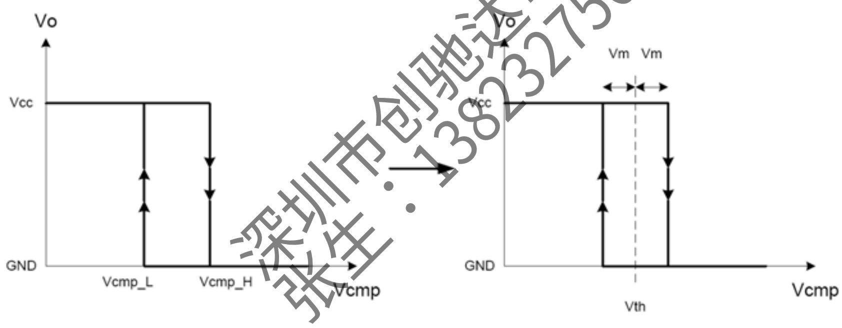
$$Vcmp = \frac{R2}{R1+R2}(Vo - Vcom) + Vcom = \frac{R2}{R1+R2}Vo + \frac{R1}{R1+R2}Vcom$$

Take the LMV358 for example, it is a rail-to-rail output operation amplifier. The output swing of LMV358 can be up to Vcc and down to GND. The high and low threshold voltage are expressed as



$$Vcmp\_H = \frac{R2}{R1+R2}Vcc + \frac{R1}{R1+R2}Vcom$$ (Vo = Vcc)

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



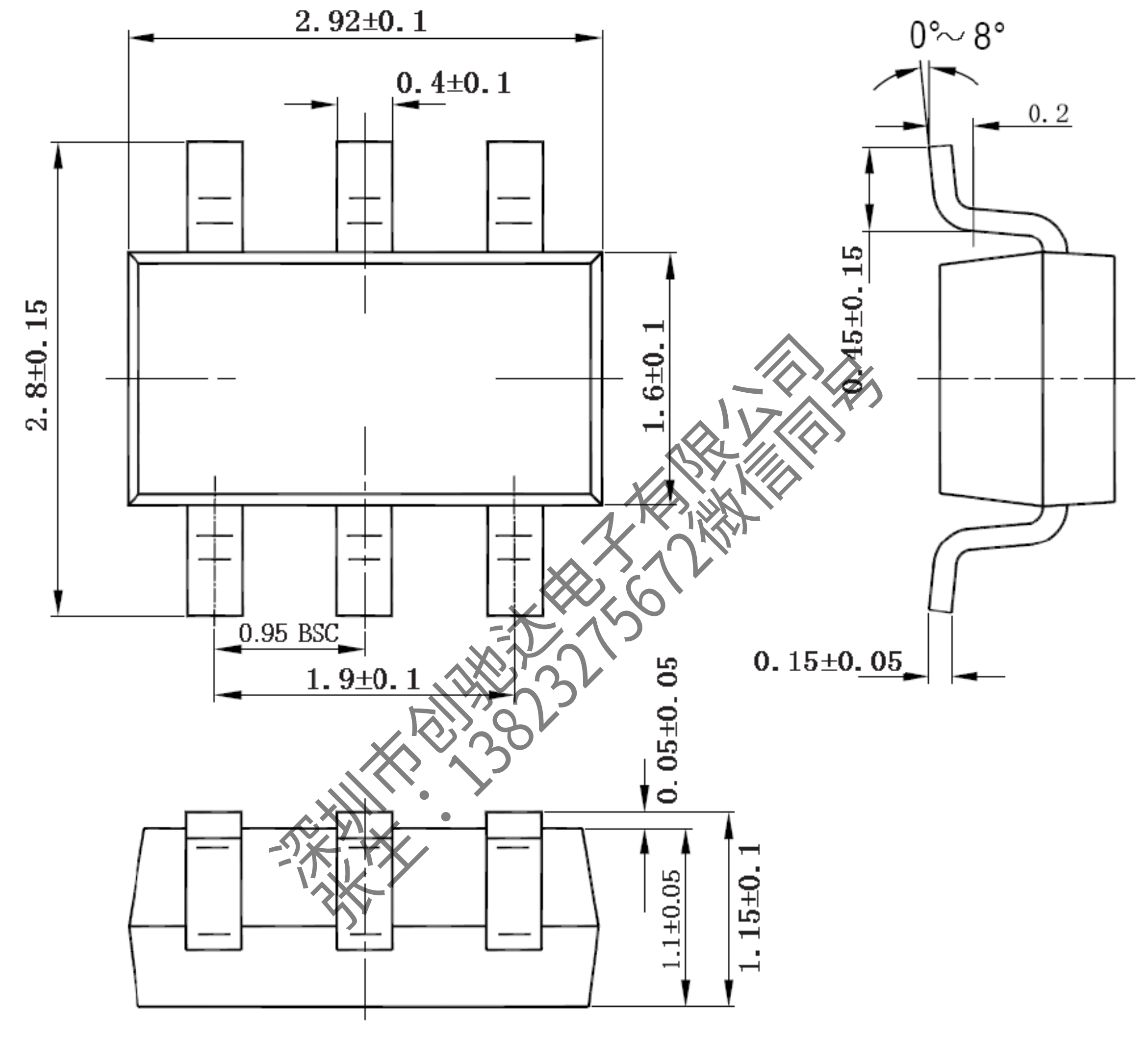
$$Vth = (Vcmp\_H + Vcmp\_L)/2 = \frac{R2}{2(R1+R2)}Vcc + \frac{R1}{R1+R2}Vcom$$

$$Vm = (Vcmp\_H - Vcmp\_L)/2 = \frac{R2}{2(R1+R2)}Vcc$$

The new threshold voltage Vth and the noise margin Vm are shown above. These voltages can be got by choosing the properly resistance of R1 and R2. The output of the schmitt trigger is changed when the variation of the photo sensor voltage is greater than 2 · Vm. This circuit has a great noise tolerance to avoid the disturbance of the environment influence.

Outline Dimensions

SOT-23-6L	Unit:mm



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