

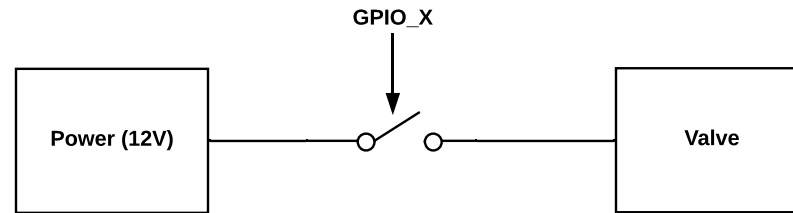
FOD8343D Optoisolator Circuit Design for Solenoid Valve

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High Level

GPIO_X	Valve
ON	ON
OFF	OFF

```
if(GPIO_X == ON){
    Valve = ON;
}
if(GPIO_X == OFF){
    Valve= OFF;
}
```



Low Level

GPIO Input From Pi
(5V)



R 330 Ω

Resistance value calculated with assumption that LED forward voltage is 0.7 volts, desired current is 13 mA, and GPIO output voltage from Pi is 5 volts.

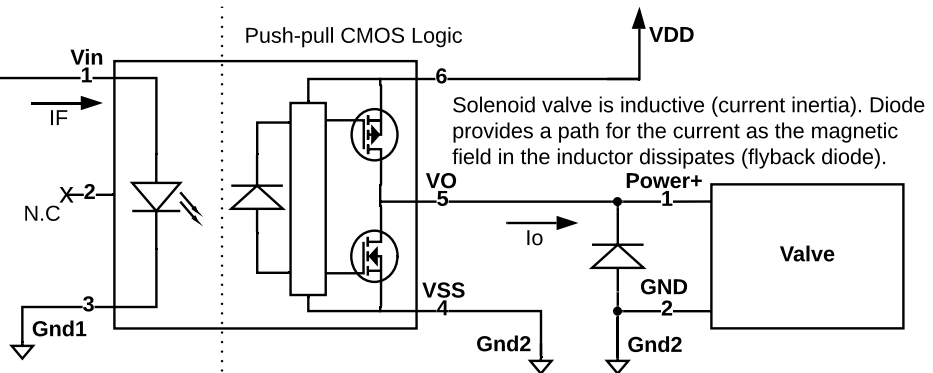
$$I_F = \frac{V_{GPIO} - V_{LED}}{R}$$

$$R = \frac{V_{GPIO} - V_{LED}}{I_F}$$

$$R = \frac{(5\text{ V}) - (0.7\text{ V})}{13\text{ mA}} \approx 330.8\ \Omega$$

Resistance value
calculation workflow

Gnd1 and Gnd2 references do not need to be at the same voltage
GPIO signal is electrically isolated from 12V power supply
Logic is not inverted, high at the input creates high at the output



Requirements for Operation.

For safe operation, I_o , VDD, and I_F , should not be close to their max/min values

$$\begin{cases} V_{GPIO} - Gnd1 = 5\text{ Volts} \\ V_{DD} - Gnd2 = 12\text{ Volts} \\ -0.5\text{ Volts} < V_{DD} < 35\text{ Volts} \\ 0\text{ A} < I_o < 4\text{ A} \\ 0\text{ A} < I_F < 25\text{ mA} \end{cases}$$

ON Semiconductor Datasheet Snippets for FOD8343D Optoisolator

Pin Configuration

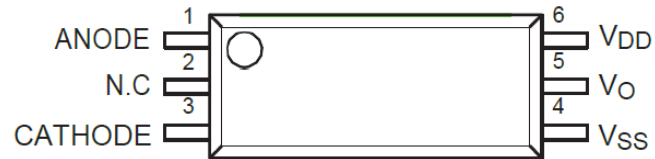


Figure 3. Pin Configuration

Functional Schematic

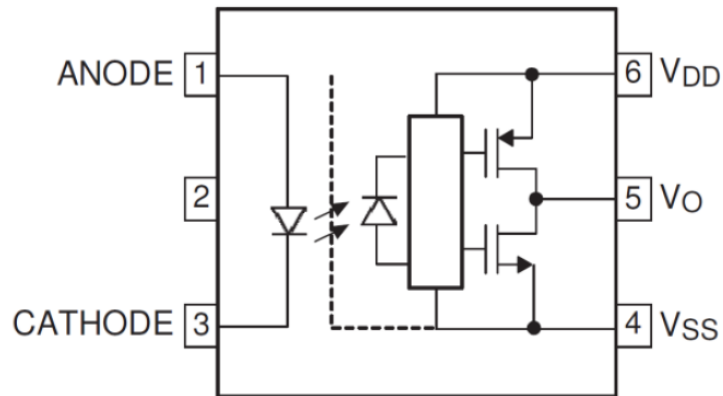


Figure 1. Schematic

Pin Definitions

Pin #	Name	Description
1	ANODE	LED Anode
2	N.C	Not Connection
3	CATHODE	LED Cathode
4	V _{SS}	Negative Supply Voltage
5	V _O	Output Voltage
6	V _{DD}	Positive Supply Voltage

Absolute Maximum Ratings (T_A = 25°C unless otherwise specified.)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Value	Unit
T _{STG}	Storage Temperature	-40 to +125	°C
T _{OPR}	Operating Temperature	-40 to +100	°C
T _J	Junction Temperature	-40 to +125	°C
T _{SOL}	Lead Solder Temperature (Refer to Reflow Temperature Profile)	260 for 10 sec	°C
I _{F(AVG)}	Average Input Current	25	mA
V _R	Reverse Input Voltage	5.0	V
I _{O(PEAK)}	Peak Output Current ⁽¹⁾	4	A
V _{DD}	Supply Voltage	-0.5 to 35	V
V _{O(PEAK)}	Peak Output Voltage	0 to V _{DD}	V
t _{R(IN)} , t _{F(IN)}	Input Signal Rise and Fall Time	250	ns
PD _I	Input Power Dissipation ⁽²⁾⁽⁴⁾	45	mW
PD _O	Output Power Dissipation ⁽³⁾⁽⁴⁾	500	mW

Notes:

1. Maximum pulse width = 10 µs
2. No derating required across operating temperature range.
3. Derate linearly from 25°C at a rate of 5.2mW/°C.
4. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. ON does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Min.	Max.	Unit
T _A	Ambient Operating Temperature	-40	+100	°C
V _{DD} – V _{SS}	Supply Voltage	10	30	V
I _{F(ON)}	Input Current (ON)	10	16	mA
V _{F(OFF)}	Input Voltage (OFF)	-3.0	0.8	V