

Team Shireto

Make the future



BLDC MOTOR CONTROLLER

-By Power Electronics Team

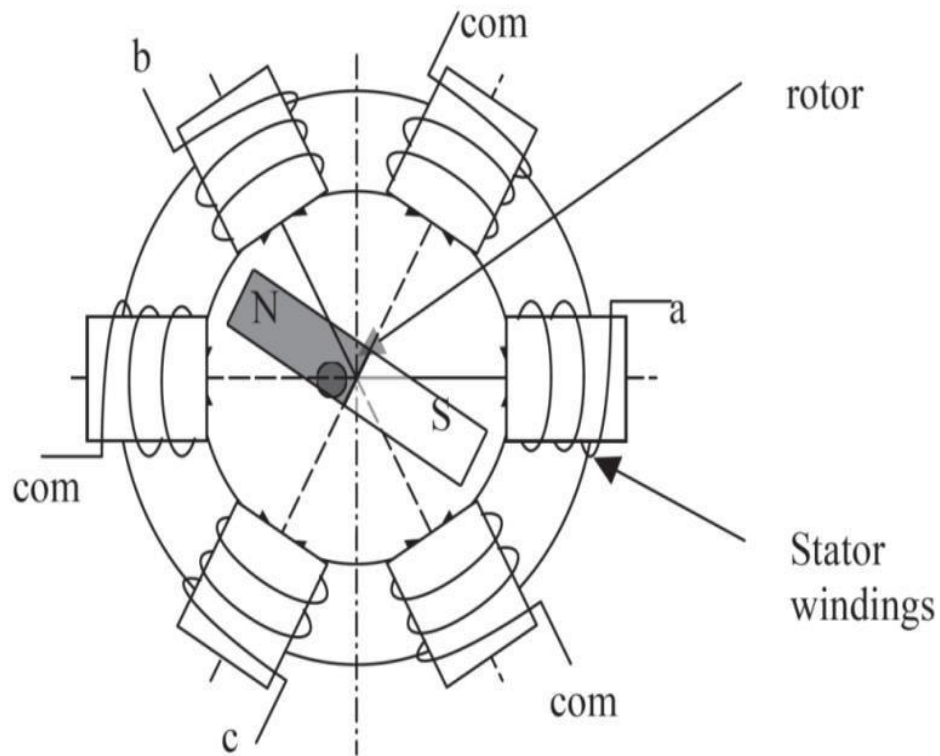
BLDC Motor

- Brushless DC motor
- Durable and efficient
- Higher torque-to-weight ratio
- Popular in EV industry.

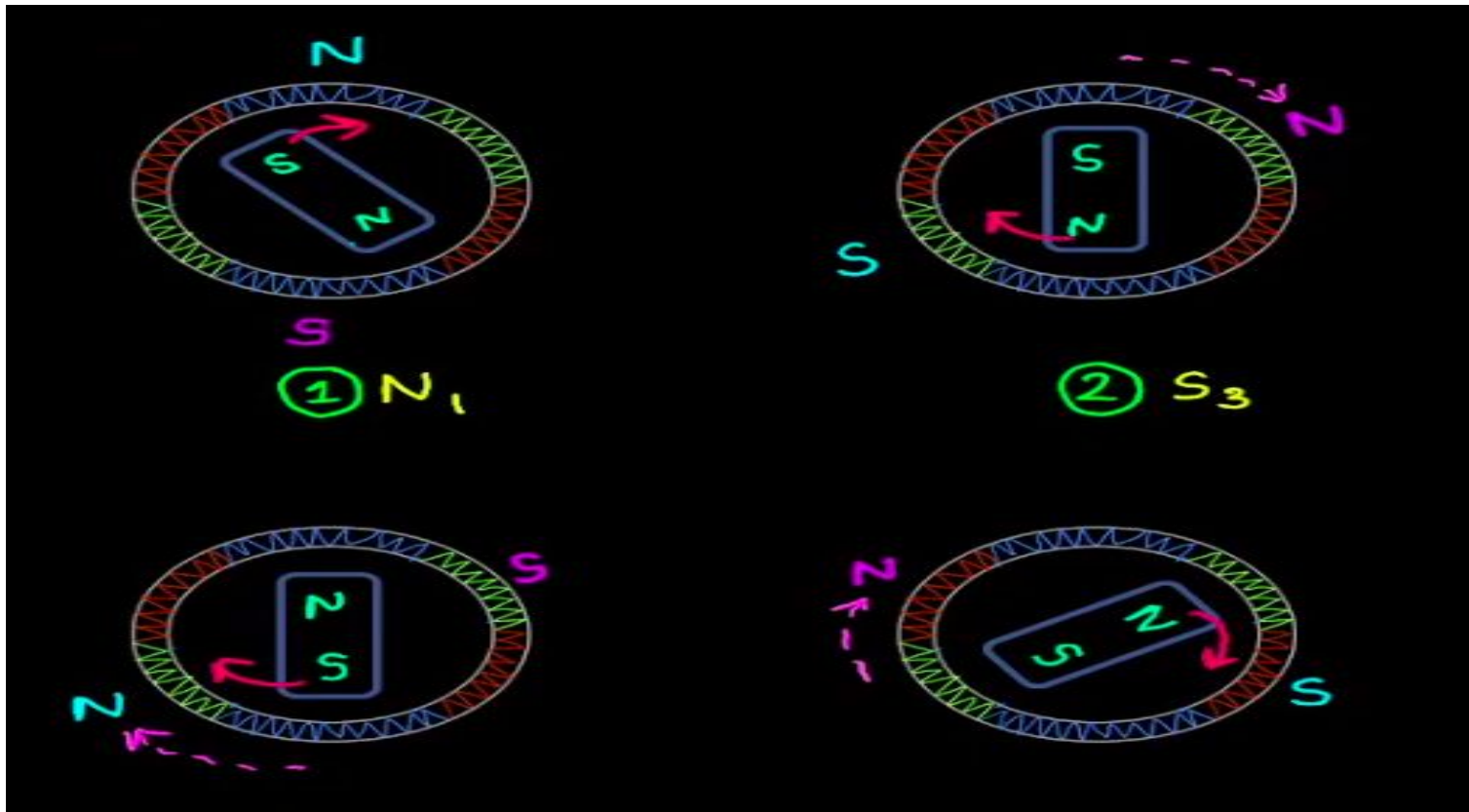


Working of BLDC Motor-[1]

- Permanent magnets are on rotor
- Electromagnets are on stator
- Rotating magnetic is generated
- that rotates rotor



Working of BLDC Motor-[2]



Generating Rotating Magnetic Field

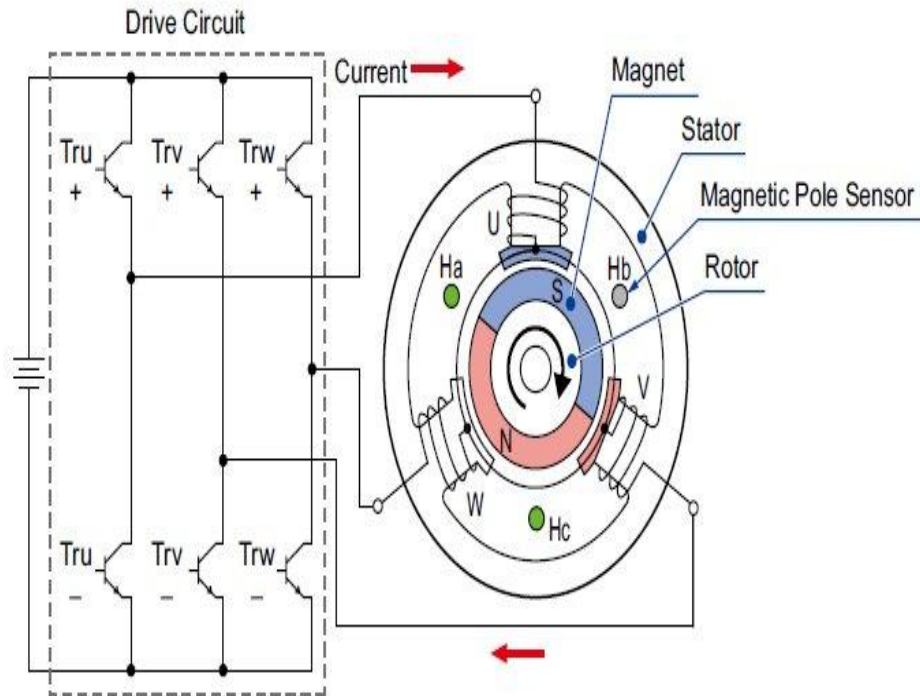
MOTOR ROTATION: CW
(As Viewed Facing Shaft End)

Electrical Degrees	H1	H2	H3	PH A	PH B	PH C
0°	0	1	0	HI	LO	X
60°	0	1	1	HI	X	LO
120°	0	0	1	X	HI	LO
180°	1	0	1	LO	HI	X
240°	1	0	0	LO	X	HI
300°	1	1	0	X	LO	HI
360°						

MOTOR ROTATION: CCW
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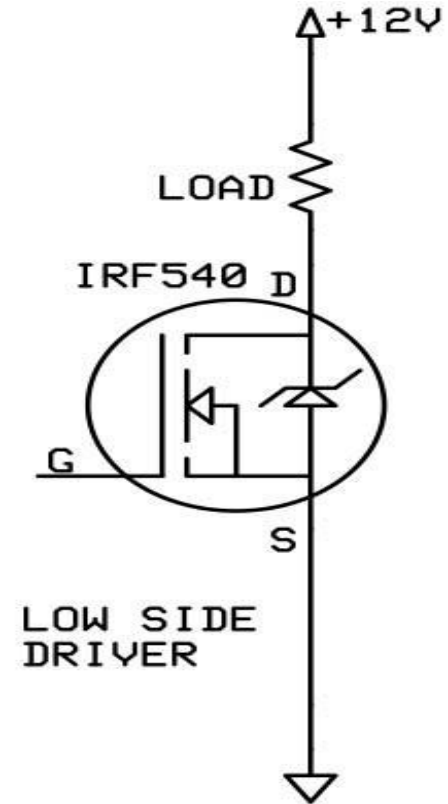
Key: **HI** Turn on source side **1** High voltage
LO Turn on sink side **0** Low voltage
X Both off



LOW SIDE SWITCHING

Source of mosfet is directly connected to ground.

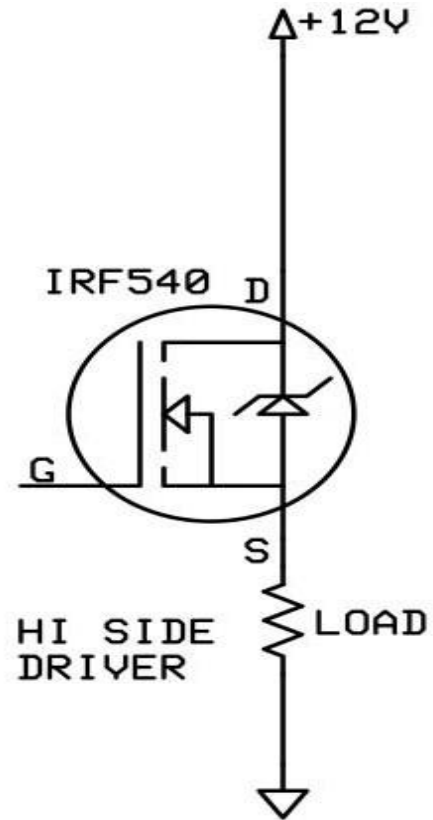
- $V_{gs} > V_{th}$
- $V_g - V_s > V_{th}$
- $V_g - 0 > 4$;for irf3205
- $V_g > 4$



HIGH SIDE SWITCHING

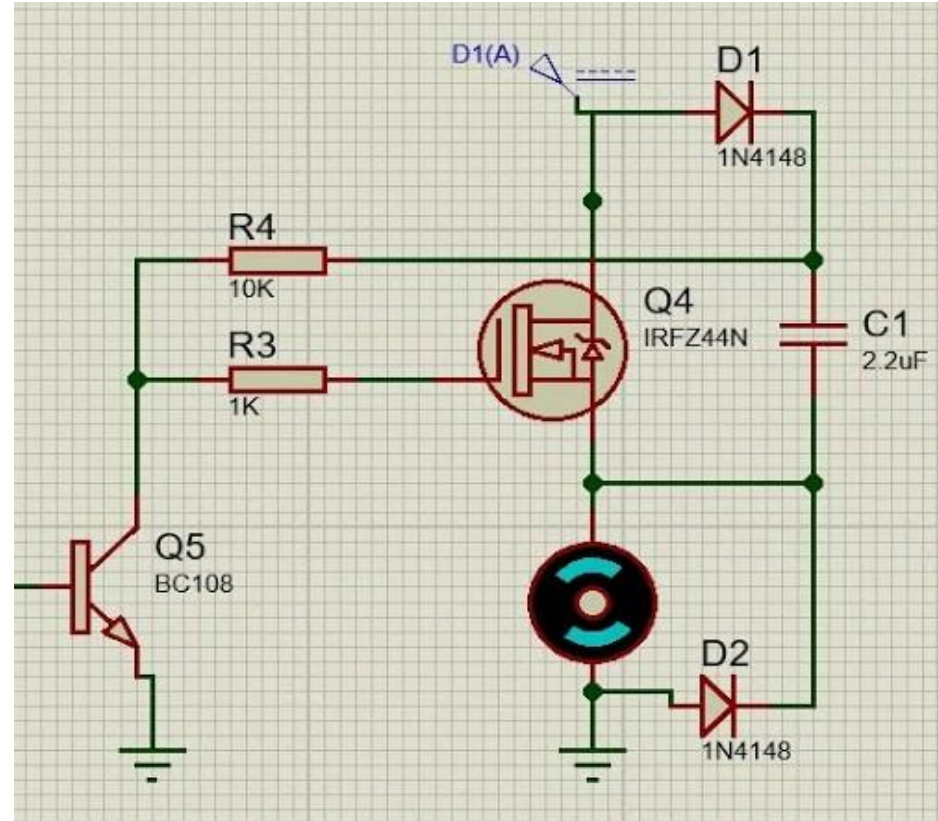
Load is connected at the source side.

- $V_s = (V_{cc} \cdot R_I) / (R_I + R_{ds})$
- As R_{ds} is very small. $V_s = V_{cc}$
- Now, $V_{gs} > V_{th}$
- $V_g - V_s > V_{th}$
- $V_g - 12 > 4$;for irf3205
- $V_g > 16$



Bootstrapping

- when n-channel mosfet is used for high side switching.
- only adds one diode and one capacitor in the circuit.
- Increases gate voltage w.r.t load voltage.



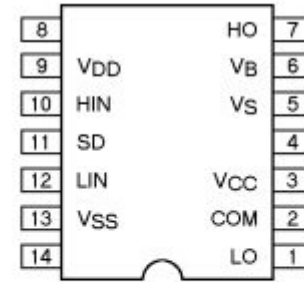
GATE DRIVERS

Why we need gate drivers

- Current drawn by mosfet during turn on.
- Discharge by gate capacitances during turn off.
- Ease of bootstrapping.

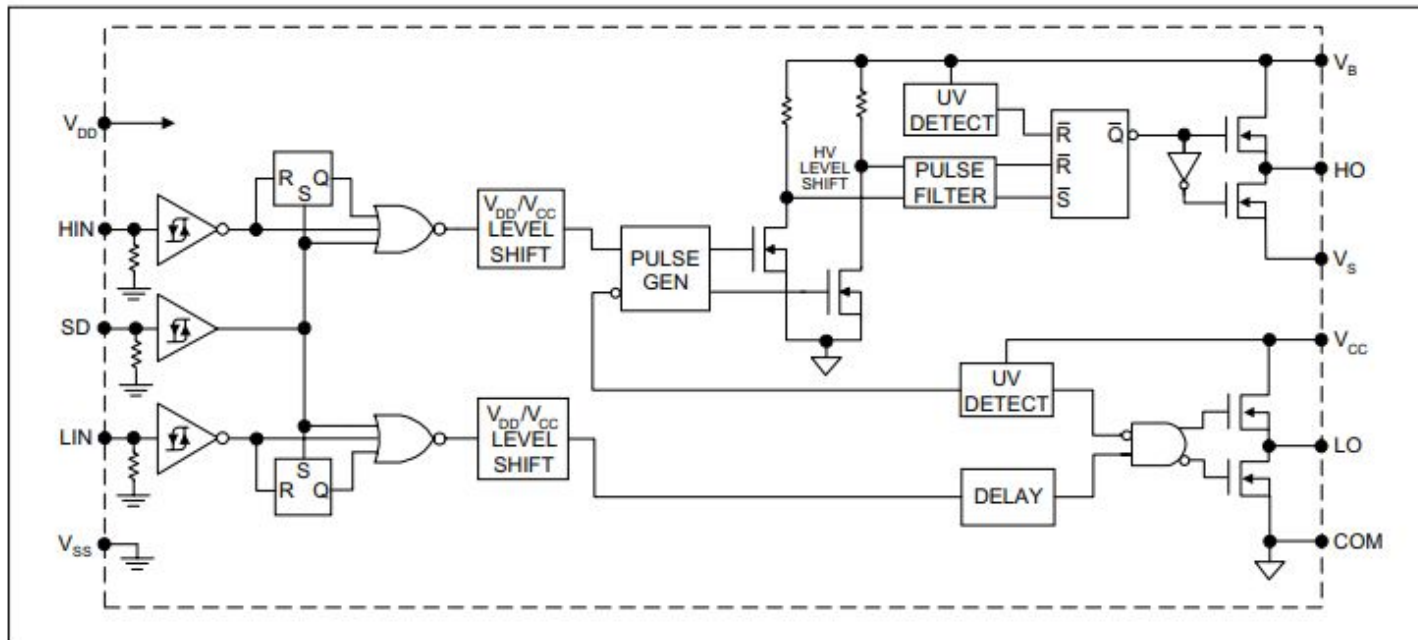
IR2110

- 14 Pin DIP IC.
- Half bridge drivers i.e can drive high side and low side.
- Can bootstrap.
- Widely used in inverters.



14 Lead PDIP
IR2110/IR2113

IR2110



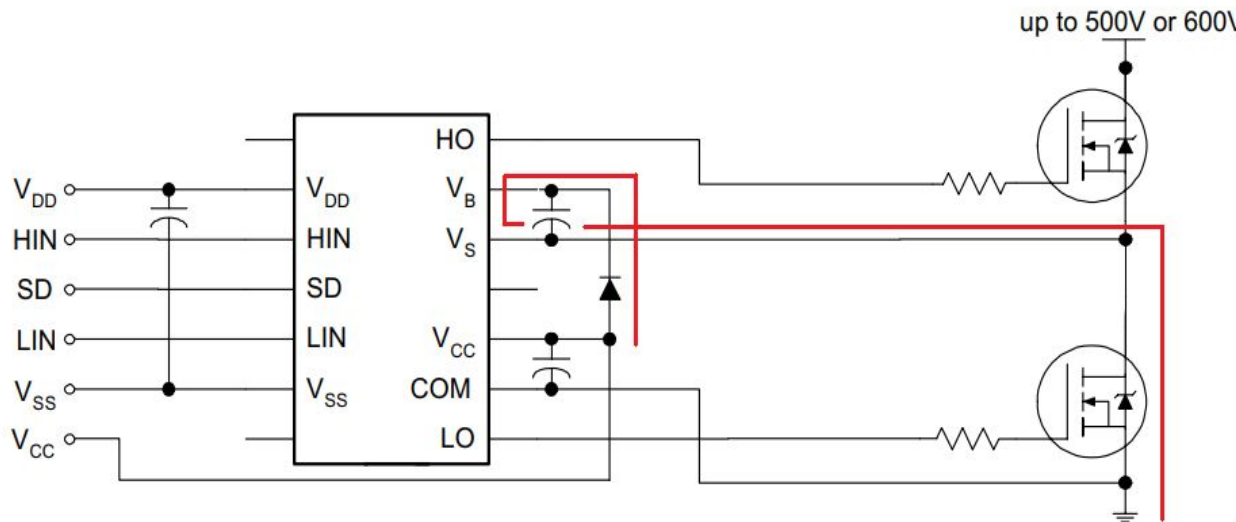
IR2110

Features

- Schmitt trigger
- UV detection
- Two Independent totem pole configuration for high side and low side.

IR2110(Bootstrapping)

- Low side on
- Boot cap charges
- Low side off
- Boot cap discharges



[illegible]

