

# 2 Arduino - Dual Channel - Triple AND Gate (Perfect Pulse Driver)

By: Chris Bake

**Arduino Code:** <https://bitbucket.org/cbake6807/dualtripleseq/src/master/>

## Parts List

1. **External Signal Generator:** 0-5Vppk output.
2. **Power Supply:** ATX is ideal, providing +5V REG and +12V REG.
3. **2N7000 Signal MOSFETs:** Quantity 6.
4. **IRFP460 or Similar Power N-channel MOSFET:** Quantity 2.
5. **56Ω 1/8W Resistors:** Quantity 10.
6. **100Ω 1/2W Resistors:** Quantity 2.
7. **4.7kΩ Resistors:** Quantity 2.
8. **2N3906 PNP General Purpose Transistor:** Quantity 2 (can be substituted with any general PNP transistor).
9. **IR2110PB Gate Driver Chip 14-pin:** Quantity 2.
10. **Arduino Nano (or similar):** Quantity 2 (must support hardware PCNT).
11. **Rotary Encoder:** Quantity 1.

## Software Requirements

- **Arduino IDE:** Ensure it is installed and updated to the latest version.
- **Encoder Library:** Install via the Arduino Library Manager.

## Arduino Setup

Pulse Counter Arduino

### 1. Upload Script

- Open the Arduino IDE.
- Connect the first Arduino (PulseCounter) to your PC.
- Open `PulseCounter.ino` from the provided file.
- Upload the script to the Arduino.

### 2. Connect the Encoder

- Connect the encoder's VCC to the Arduino's 5V pin.
- Connect the encoder's GND to the Arduino's GND pin.
- Connect the encoder's CLK and DT pins to two digital pins on the Arduino D2 and D3.
- Connect the encoder's Button pin to D5.

### 3. Verify Encoder Output

- Open the Serial Monitor in the Arduino IDE.
- Rotate the encoder and check the output to confirm it is functioning correctly.

## Adding a Pushbutton for Sync Mode Toggle

To add a pushbutton to the Sequencer Arduino for toggling the sync mode, follow these instructions:

### Parts Required

- **Pushbutton:** Quantity 1
- **10kΩ Resistor:** Quantity 1
- **Connecting Wires**

### Hardware Connections

#### 1. Connect the Pushbutton

- Connect one terminal of the pushbutton to the Arduino's 5V pin.
- Connect the other terminal of the pushbutton to digital pin 4 on the Arduino.

#### 2. Add a Pull-Down Resistor

- Connect a 10kΩ resistor between digital pin 4 and GND. This ensures that the pin reads LOW when the button is not pressed.

### Summary of Connections

- **Pushbutton Terminal 1** → Arduino 5V
- **Pushbutton Terminal 2** → Arduino Pin 4
- **10kΩ Resistor** → Arduino Pin 4 and GND

## Sequencer Arduino

### 1. Upload Script

- Disconnect the PulseCounter Arduino and connect the second Arduino (Sequencer) to your PC.
- Open `Sequencer.ino` from the provided file.

- Upload the script to the Arduino.

# Pin Mapping and Connections

## Connecting the Two Arduinos

- **PulseCounter Arduino to Sequencer Arduino**
  - PulseCounter D5 (Input) ← Signal Generator
  - PulseCounter D9 (Output) → Sequencer D2 (Input)
- **Sequencer Arduino Outputs**
  - Sequencer D9 (Output) → Input to the first AND gate tree
  - Sequencer D10 (Output) → Input to the second AND gate tree

Note: The schematic shows the outputs merged due to limitations, but there should be dual outputs from the sequencer, each connecting to a separate AND gate tree.

- **Shared Connections**
  - Both Arduinos' GND pins should be connected together to ensure a common ground.

# Gate Driver Chip Connections

## IR2110PB Gate Driver Chip

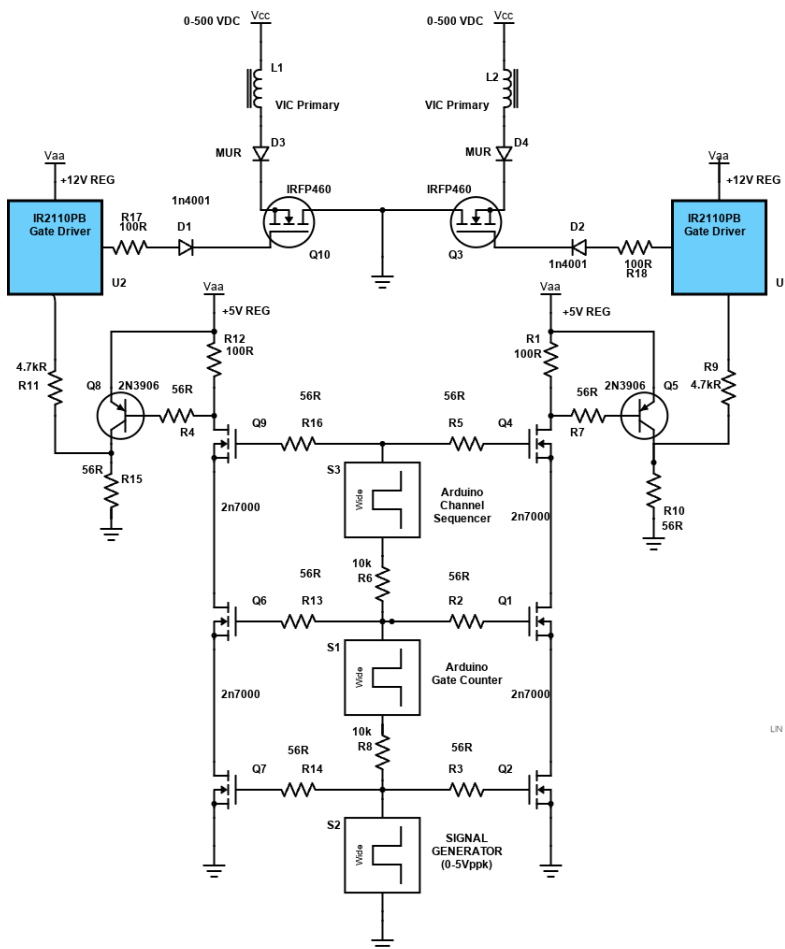
1. **Power Connections**
  - VCC (Pin 3) → +12V REG
  - VSS (Pin 12) → GND
2. **Input Connections**
  - LIN (Pin 11) → Arduino PWM pin (as per script)
  - HIN (Pin 10) → Arduino PWM pin (as per script)
3. **Output Connections**
  - LO (Pin 1) → Gate of the IRFP460 MOSFET
  - HO (Pin 7) → Gate of the second IRFP460 MOSFET
  - VS (Pin 6) → Source of the high-side MOSFET
4. **Bootstrap Capacitor**
  - Connect a 0.1 $\mu$ F capacitor between VB (Pin 8) and VS (Pin 6).
5. **Other Components**
  - D2: Place a 1N4001 diode between VB (anode) and VCC (cathode).
  - R2: Connect a 10 $\Omega$  resistor between LO and the gate of the MOSFET.

# Schematic Overview

Refer to the schematic image to visualize these connections. The IR2110PB gate driver chips control the IRFP460 MOSFETs, enabling high-power switching of the VIC (Voltage Intensifier Circuit) primaries.

## Additional Notes

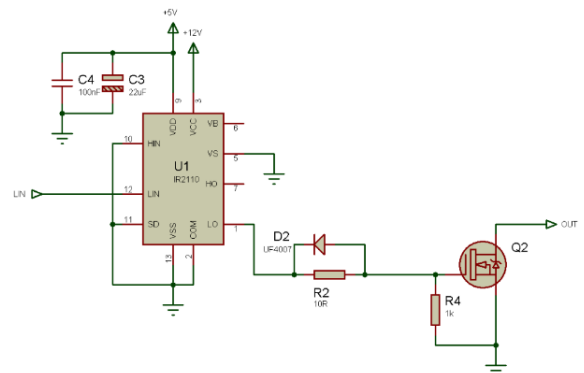
- **Resistor Tolerances:** The resistors can have a large tolerance. The  $56\Omega$  value is selected to preserve signal clarity. Any value  $\leq 220\Omega$  should be acceptable.
- **Merged Outputs:** The Arduino Channel Sequencer has 2 outputs shown merged due to Scheme-It limitations.



Perfect Pulse - Triple AND Gate Sequencer - Dual Gate Driver

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Arduino code required. See Gate Driver below for additional chip connections.



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