Appendices

Appendix: A

Code to generate PWM

```
#include <avr/io.h>

#include <avr/interrupt.h>


// Define PWM frequency and duty cycle parameters

#define PWM_FREQUENCY   53100  // Desired PWM frequency in Hz

#define PWM_DUTY_CYCLE  50    // Desired duty cycle in percentage (e.g., 50% for
a square wave)


void setup_PWM() {

    // Set OC0 (Output Compare) pin (PD6) as an output

    DDRD |= (1 << PD6);


    // Set Fast PWM mode with non-inverted output

    TCCR0 |= (1 << WGM00) | (1 << WGM01) | (1 << COM01) | (1 << CS00);


    // Calculate and set the PWM prescaler value for the desired frequency

    uint16_t prescaler_value = (F_CPU / (2 * PWM_FREQUENCY)) - 1;

    OCR0 = (uint8_t)(prescaler_value);


    // Calculate and set the initial duty cycle

    uint8_t duty_cycle = (uint8_t)(((uint16_t)PWM_DUTY_CYCLE * 255) / 100);

    OCR0 = duty_cycle;
```

```
    // Enable global interrupts
    sei();
}

int main() {
    // Initialize the PWM configuration
    setup_PWM();

    // Your main application code here

    while (1) {
        // Your main code loop
    }

    return 0;
}
```

Appendix: B

Microcontroller ATmega32A:

- High-performance, Low-power AVR® 8-bit Microcontroller Peripheral Features
- Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes
- One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
- I/O and Packages
- 32 Programmable I/O Lines

Operating Voltages:

- 2.7 - 5.5V for ATmega32ASpeed Grades
- 0 - 16 MHz for ATmega32A

Power Consumption at 1 MHz, 3V, 25°C for ATmega32A:

- Active: 0.6 mA
- Idle Mode: 0.2 mA

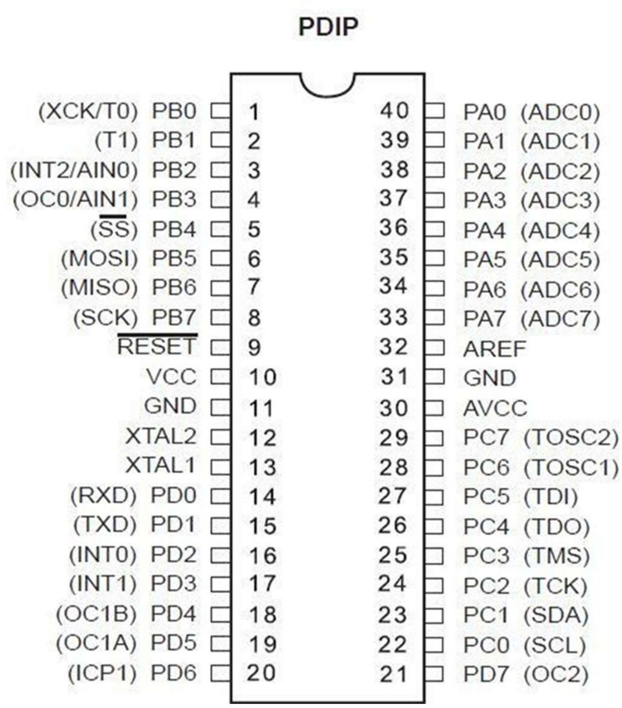

Figure 0-1 Pinout of AT32A.

Appendix: C

Opto-isolator circuit:

To isolate microcontroller from power circuit and convert microcontroller signal from itsreference ground to sub-module reference ground high speed opto-isolator 6N137 is used. It is capable of isolating pulses of dead time in nano-seconds. For 2 signals coming from microcontroller 2 opto-isolators are used. Circuit diagram of opto- isolator is given in Figure 0-2.

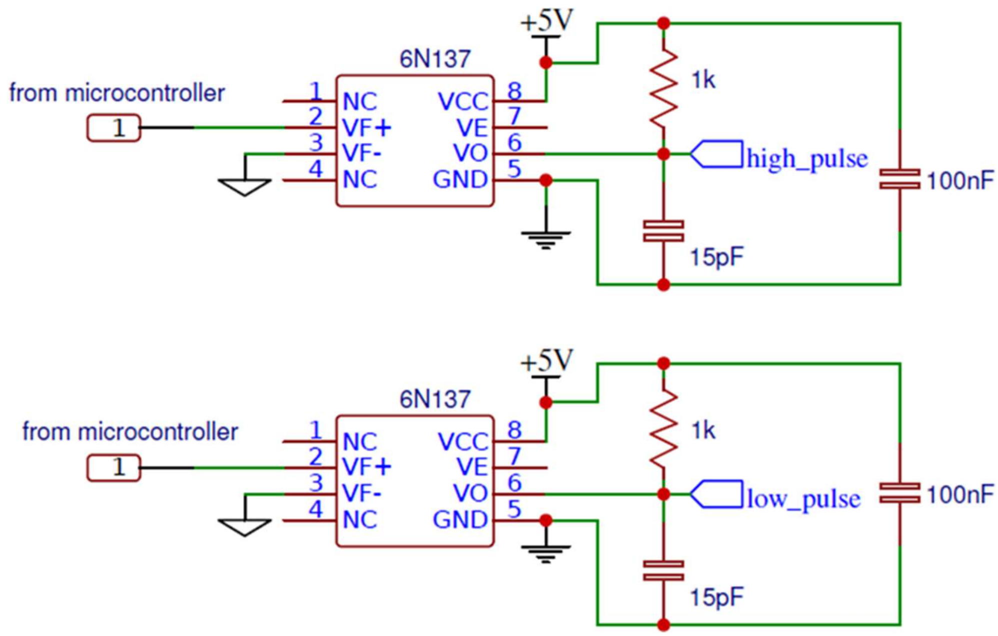

Figure 0-2 Opto-isolator circuit.

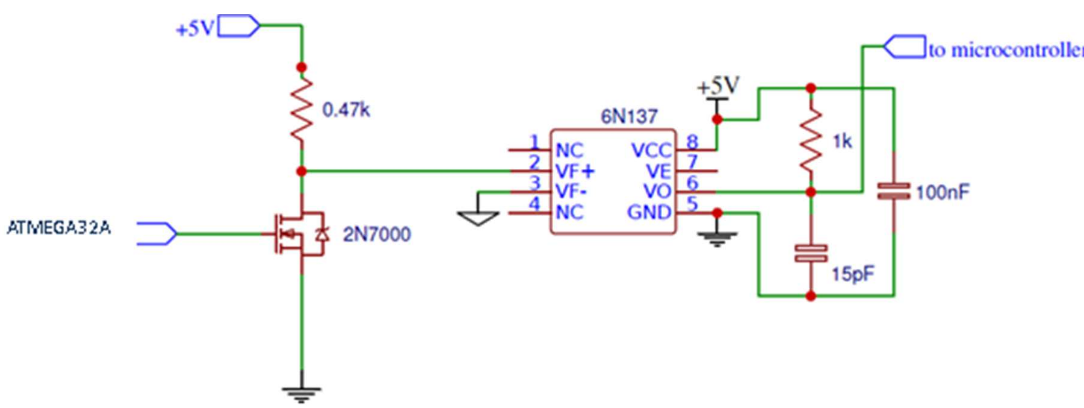

Figure 0-3 Opto-coupler circuit.

Appendix: D

MOSFET driver circuit:

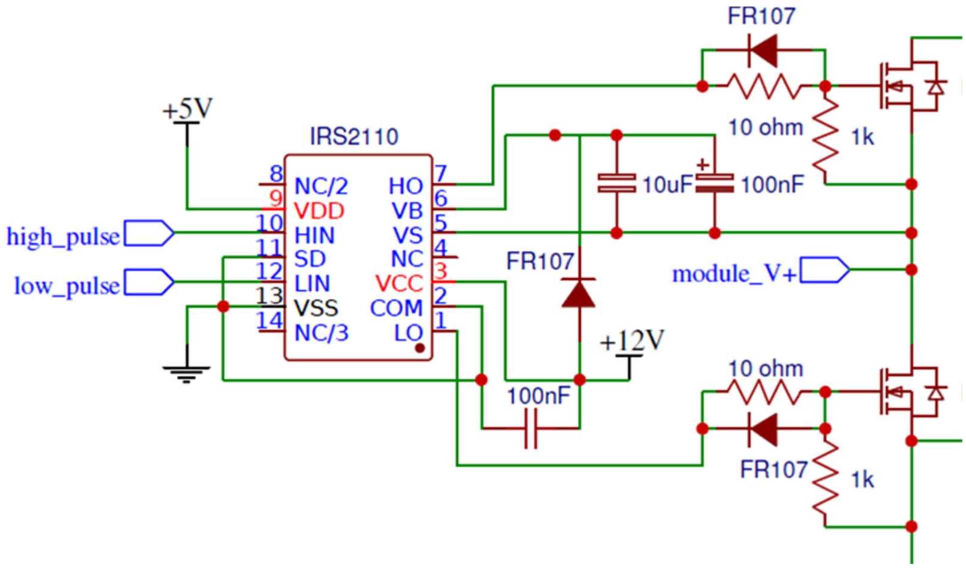

Figure 0-4 Circuit diagram of MOSFET driver circuit of sub-module.

IRS2110 is selected as MOSFET driver because it can be worked up to 500 volts which is well above maximum voltage of this project. Ceramic capacitors of 10uF, 25volt in parallel with 100nF are used as boot-strap capacitor. Resistor of 10 ohm, ¼ watt is used as gate resistor. An ultrafast diode UF4007 is connected in parallel with gate resistor for fast MOSFET turnoff process. 1k resistor is used as gate-to-source resistor for prevention of accidental turn on of MOSFET.

IRF460 MOSFETs are selected because they are rated up to 500 volts. IRF460 can withstandall supply voltage when by any chance all the supply voltage appears across it.

Appendix: E

Level-shift or current gain circuit:

The microcontroller drives 4 opto-couplers IC. For safety purpose of microcontroller chip, a level shifter or current gain circuit consists of signal level MOSFET is connected between each microcontroller pin and opto-coupler IC. 2N7000 is used as signal level MOSFET. This circuit converts 3 volts signal into 5 volts signal and provides necessary current to drive opto- couplers.

Circuit diagram for level shifter/ current gain circuit is as shown in Figure 0-5.

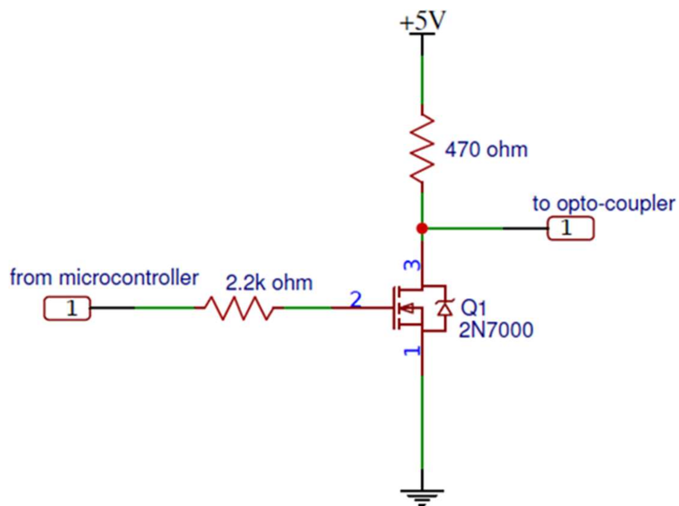

Figure 0-5 Circuit diagram for level shifter/ current gain circuit.

Appendix: F

Schematic diagram of wireless power transfer:

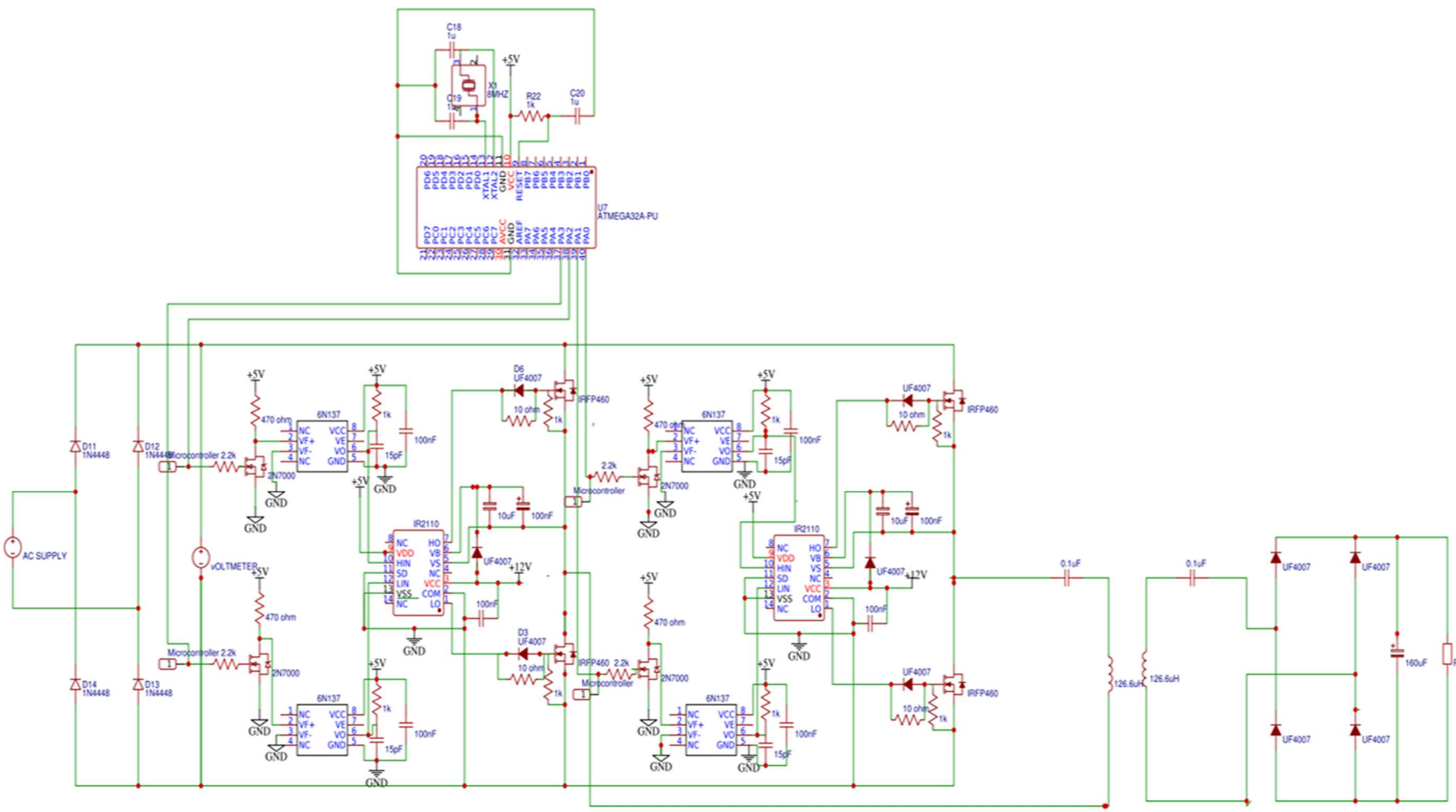

Figure 0-6 Schematic diagram of resonant inductive power transfer.