International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 4 Issue 8 ǁ August. 2016 ǁ PP. 25-29

Design of Automotive Electronics Hall IgniterBased on SCM

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Summary: There are a lot of cars of Hall ignition system in China's auto market and there are also a lot of demands for Hall ignition system in laboratory .But there is no Hall ignition coil driveunit which are self-contained and portable in common market.Hall ignition coil drive unit consists ofthe Hall voltage signal generating module and the ignition module .The Hall voltage signal generating module generates a voltage signal, and transmits it to the ignition module for spark ignition. The system is based on 51 microcontroller as the core of the ignition coil drive unit, including thepower supply section, the smallest single-chip system section, a display section, to achieve ignition. The Keil C51 software functional modules and programming methods are introduced, a basic ignition control, dwell angle control, the engine stop switch off protection the primary current limit and engine speed output programming are analyzed, and debugging were conducted on the PCB ofSCM. Lastly the production of a solid model of the host cell circuit is completed.
Keywords: SCM Automotive Hall ignition electronic ignition system

I. PREFACE

As most major contemporary car travel tools, its power indicators are increasingly being everyone's attention. The ignition system is closely related to dynamic. Ignition coil to the ignition of a direct impact on the system performance thereby affecting the power of the engine, fuel economy and emissions. Hall ignition system has many advantages. A large number of Hall ignition coil car now exists on the Chinese car market, but also have a need for laboratory Hall-type ignition system, so this study design Hall ignition coil drive.

1 Hall Auto Electronic ignition coil drive and working principle

Hall electronic ignition coil drive ships by the ignition signal generator, Hall electronic ignition, ignition coil, ignition switch, battery, spark plugs and other components.

Hall works electronic ignition coil drive unit: ignition pulse signal generator, high-power switching transistors after the pre-processing circuit Hall electronic ignition, the control power switching transistor is turned on or off, so that ignition coil primary current on and off in a timely manner to achieve engine ignition. When the electronic ignition pulse signal Hall voltage input causes the power transistor is turned on, the primary circuit of the ignition coil ignition energy savings; but enter the Hall of electronic ignition pulse signal so that when the transistor is turned off, the ignition coil from the primary circuit, secondary It will produce high pressure, high-voltage wires and distributor through the high pressure to the cylinder spark plug ignition.

II. SYSTEM DESIGN

By the microcontroller simulated car ignition signal, and outputs a high level, so that high-power switching transistors is the wizard, while controlling the conduction time (closed angle to achieve size control), so that the primary coil is energized ignition energy savings, speed sensor crankshaft speed in the transmission of information at the same time sent a crank angle turned information, use this information to control each cylinder firing order of the engine, the installation of the current sensor for detecting current in the primary coil in the junction of the primary coil when the primary coil current is too large, high-power switching transistor controlled by the microcontroller to prevent overcurrent burned coil. By the time of writing the control program, when the microcontroller over a set time not received a Hall sensor signal transmitted it can be that the car has to stop. A microcontroller output low, the power switching transistor is turned off, play park protection.

III. SYSTEM HARDWARE CIRCUIT DESIGN

Hardware circuitry comprises means subsystems and ignition signal generating subsystems. Signal generating means subsystem consists of the smallest single-chip system STC89C52RC, 1602 LCD display and power supply and other components.

Function for system

Module consists of a Hall sensor, a power transistor, liquid crystal displays and other 1602. In this paper,

the hardware circuit design using Aultim Designer.

3.1 host unit circuit

Signal generator subsystem by STC89C52RC smallest single-chip system, the power supply 1602 LCD and other components. It is the core part of the device, the power adapter into the 220V household AC + 5V DC power supply stable. The circuit shown in Figure 1

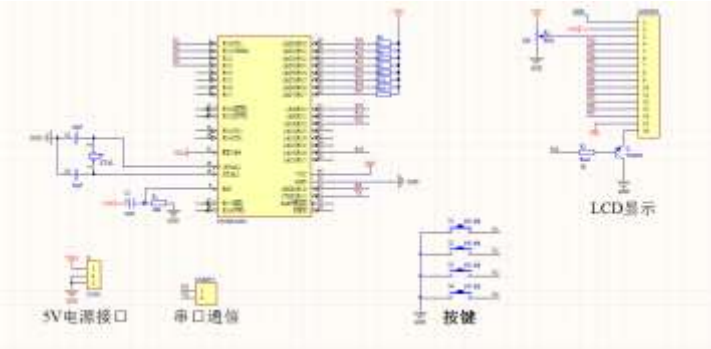

Figure 1 Host unit circuit

3.2 Reset Circuit

There are two general microcontroller reset, power-on reset and reset button. Typically designed power-on reset mode. Reset circuit shown in Figure 2.

Action reset circuit

SCM system in operation, if subjected to environmental interference occurs program running, press the reset button inside the program automatically executed from the beginning. At boot and reset buttons are pressed. To reset the microcontroller 51 needs only the first 9-pin RST (Reset) Reset pin is connected to a high sustained 2US, the microcontroller can implement a reset operation.

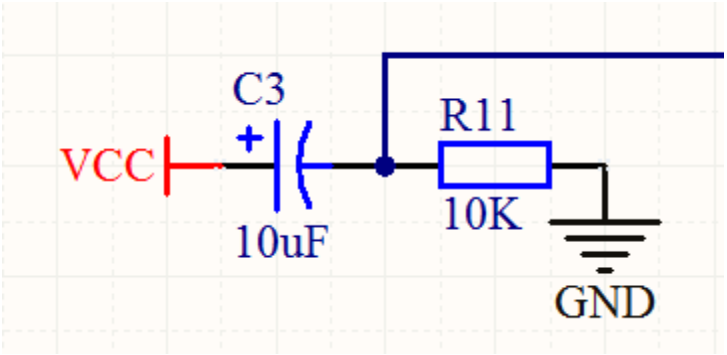

Figure 2 reset circuit

3.3 primary current limiting circuit

Primary current limiting circuit, when the ignition coil primary current increases to a certain limit value, the potential rises to R3 to make transistor Q2 so that the base potential of the power transistor Q1 is decreased, which reduces the base current, the collector current subject to certain restrictions. Primary current increases, the higher the potential of R3, the deeper the transistor Q2 is turned on, so that the base current of the power transistor Q1 drop more, limiting the role of the primary current is greater.

3.4 1602 LCD display circuit

In order to display a signal and the engine speed, the use of 1602 as a single-chip LCD display output. Figure 3 is a 1602 LCD circuits and physical map.

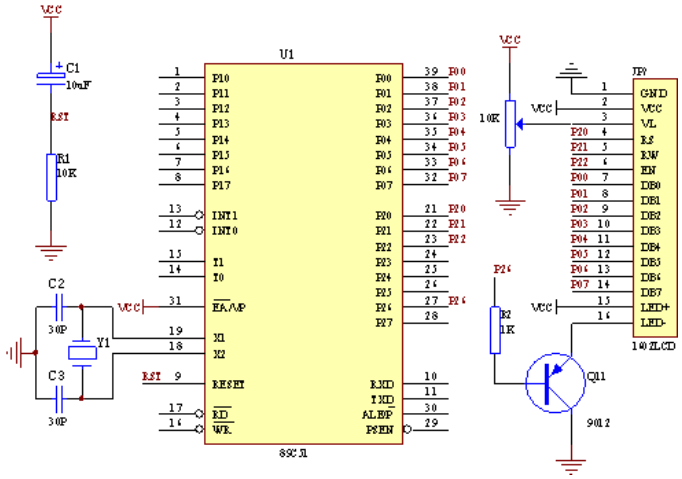

Figure 31602 LCD monitor circuit

IV. SYSTEM DESIGN AND DEBUG SOFTWARE PROGRAMS

This design uses C-based software as STC80C52RC Keil C51 microcontroller programming software Programming. Keil C51 MCU software is one of the many excellent software application development, set to edit, compile and simulation in one, support the C programming language.

4.1 Design of the main program

The main features of this design can be achieved as follows

4. 1.1 basic ignition control

When the microcontroller receives the Hall sensor sends a positive pulse, high-power single-chip implementation of the control circuit so that the transistor is turned on and off, on and off of the primary coil is energized high voltage induced in the secondary coil, the distributor according to the firing order each cylinder spark plug, spark plug arcing.

4. 1.2 Closed angle control

On the basis of the basic ignition control, the microcontroller is programmed to control the primary coil conduction time to realize when the vehicle speed is different, the primary coil conduction time remains constant, thereby controlling the ignition energy of each spark plug remained the same.

4. 1.3The engine is stopped off protection

MCU by detecting the Hall sensor signals transmitted to determine whether the engine is running, if the microcontroller detects that the engine has stopped, the control circuit so that power transistor is turned off, preventing the primary coil long supply.

4. 1.4 primary current limit

On the design of high-power transistors, a negative feedback circuit to prevent current through the primary coil is too large.

4. 1.5 Engine speed output

MCU receives the Hall sensor signals coming at the same time, calculate the number per second received signal to calculate engine revolutions per minute and 1602 data to the LCD display. Comprehensive analysis of the above functions, the main program design process shown in Figure 9. In order to reduce programming time, the main program is modular in design, system implementation that is based on the function of the main program into the ignition control module and speed display module, separately for each sub-module programming, After commissioning is complete, all the children module integrated into a complete program of the main program.

4.2 ignition control module

/ * ------ ------ Interrupt handler * /

voidjishu () interrupt 0

{Int0_flag + +;}

/ * ------ * ------ Timer /

4.3 speed display module

```
voidwrite_com (uchar com) / / write command
{Lc
drs = 0;
P0 = com;
delay_ms (5);
lcden = 1;
delay_ms (5);
lcden = 0;
} V
oidwrite_data (uchar date) / / write data
{Lc
drs = 1;
P0 = date;
..... / / Parts omitted (supra)
} V
oidinit () / / initialization
{Lc
den = 0;
write_com (0x38);
write_com (0x0c);
write_com (0x06);
write_com (0x01);
}
```

4.4 The main program

```
void main ()
{
EA = 0;
IT0 = 0;
EX0 = 1;
TMOD = 0x02;
TH0 = 0x06;
TL0 = 0x06;
EA = 1;
ET0 = 1;
TR0 = 1;
p2_1 = 0;
init ();
write_com (0x80);
..... / / Parts omitted
}
```

4.5 The main program debugging

The main program after repeated compilation, to ensure accuracy after the microcontroller development board debug. After the hardware testing, software testing, integration testing, the Hall ignition coil drive unit is operating normally, the basic realization of the expected results.

V. CONCLUSION

Hall by electronic ignition overall analysis and design, complete microcontroller based hardware design, including the host unit circuit, reset circuit, the primary current limiting circuit, power supply circuit and the LCD display circuit 1602, and an electronic ignition Hall the main function of the use Keil C language functions for each program, and integrated into the main program, pass in the microcontroller development board debugging, results showed: automotive Hall ignition reasonably practicable hardware circuit design, software programs correctly, effective, stable and reliable commissioning, through the microcontroller to achieve a better basic

ignition control automotive electronic ignition Hall of closed angle control, engine stall power protection, the primary current limit and engine speed output.

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