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Spec No: 002-05122

Spec Title: AN205122 - F2MC-8FX Family MB95200 /210H Series One Phase Energy Meter Reference Solution

Replaced by: None

AN205122

F²MC-8FX Family MB95200 /210H Series One Phase Energy Meter Reference Solution

This application note describes about the Electronic single phase energy meter which is designed based on MB95F204K and special energy measurement chip ADE7755. With advantages of few components, simple construction, high reliability, low power and long service life, it can be used to measure the single phase AC active energy consumption at a frequency of 50Hz.

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1 Introduction

Electronic single phase energy meter is designed based on MB95F204K and special energy measurement chip ADE7755. With advantages of few components, simple construction, high reliability, low power and long service life, it can be used to measure the single phase AC active energy consumption at a frequency of 50Hz.

It can realize remote meter reading by RS485 communication or carrier wave communication. Register display can show the history of electricity consumption. The user can read and modify the parameter of the energy meter through IR communication with special equipment. When power off, the energy meter can store the necessary data from RAM to EEPROM.

This demo set supports features below:

- Energy consumption measurement
- Register display
- RS485 or Carrier wave communication
- IR communication

2 Demo Platform

Demo Platform of Energy Meter

2.1 Platform

Figure 1 shows the demo platform of electronic single phase energy meter. It can be used to measure the single phase AC active energy consumption at a frequency of 50Hz.

Figure 1. Demo Platform



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3 Features

Features of Energy Meter

3.1 Energy Consumption Measurement

The AD7755 is an electrical energy measurement IC with high accuracy. It is intended for use with two-wire distribution systems. The AD7755 supplies average real power information as the low frequency outputs to F1 and F2. These logic outputs may be used to directly drive electromechanical counter or interface to an MCU. The CF logic output provides instantaneous real power information.

3.2 Register Display

Register display is driven by the IOs to display the average real power information.

3.3 RS485 or Carrier Wave Communication

Use RS485 or carrier wave communication for remote meter reading.

3.4 IR Communication

Use IR handset to read or modify some parameters.

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4 Hardware

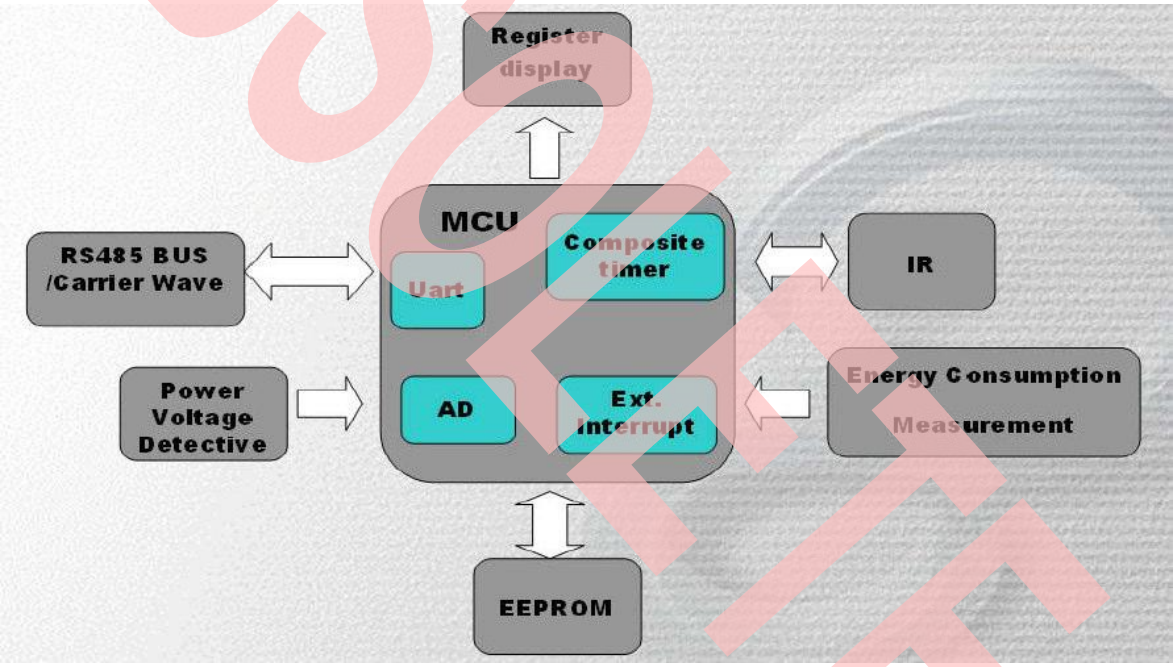
Hardware of Energy Meter

4.1 System Block Diagram

Figure 2 shows the demo system block diagram. The demo one phase energy meter is developed based on MCU MB95F204K.

MCU: AD module, UART module, extern interrupt and composite timer
Register display
RS485 bus / Carrier wave
Power voltage detective
EEPROM
IR
Energy consumption measurement

Figure 2. System Block Diagram

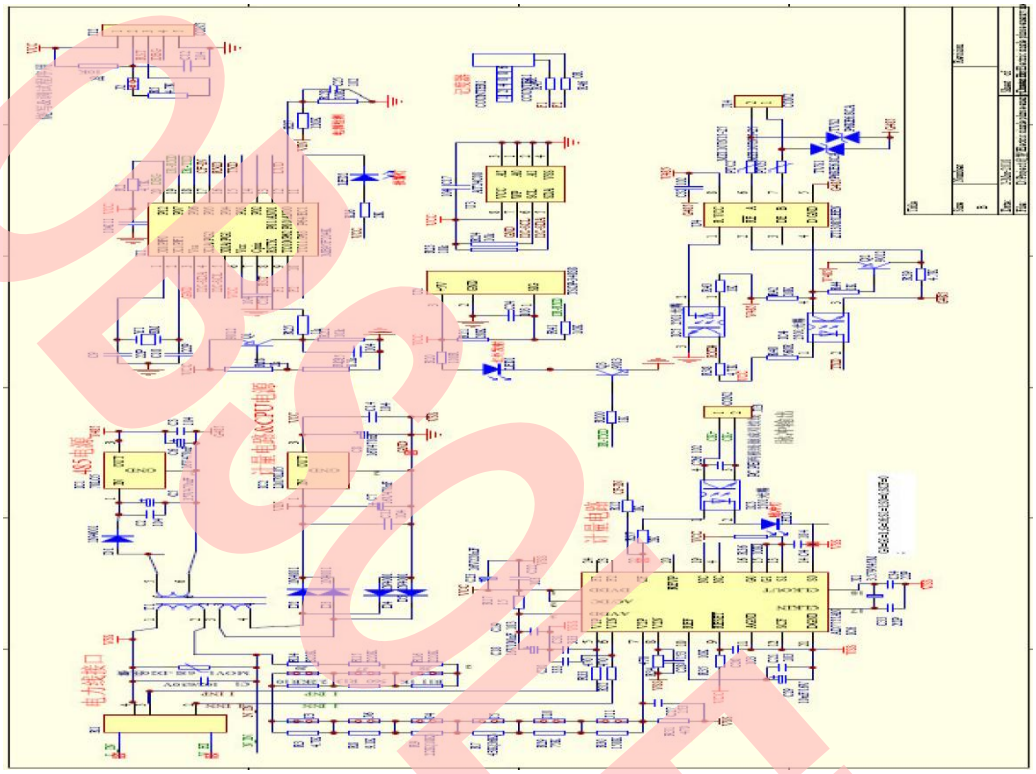


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4.2 Schematic

Figure 3 shows the schematic.

Figure 3. One Phase Energy Meter



4.3 MCU Pin Assignment

Table 1 shows the MB95F204K pin assignment in this system.

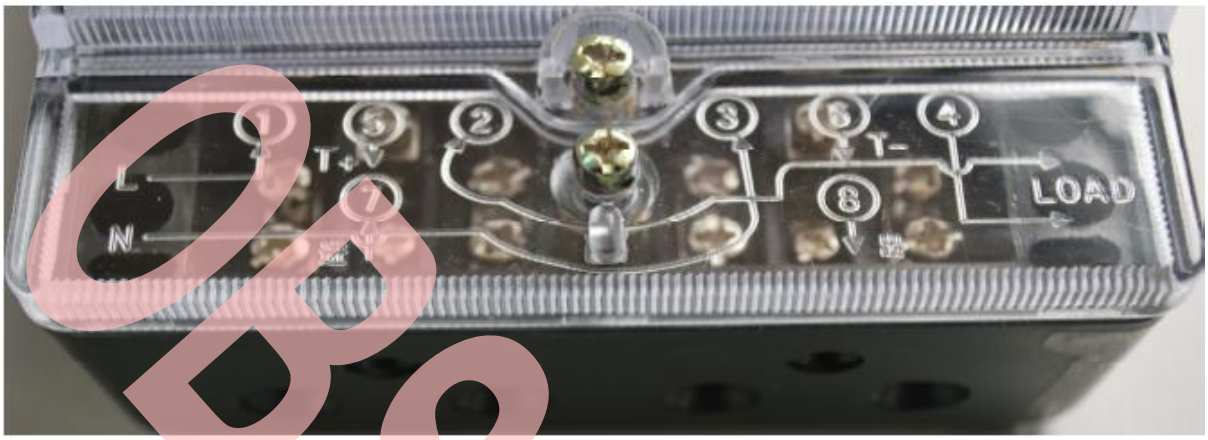
Table 1. Pin Assignment

Pin Number	Pin	Function
4	X1A/PG2	I2C_SDA
5	X0A/PG1	I2C_SCL
9	T010/P62	F1 signal
10	T011/P63	F2 signal
12	P00/AN00	Lower power detected
19	P07	IR_RXD
18	P06	IR_TXD
16	P04	485 communication RXD
15	P03	485 communication TXD

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4.4 Connecting Method

Figure 4. Connecting Method



①③terminal: 220V AC input terminal

②④terminal: load output terminal

⑤⑦terminal: Calibrated pulse output terminal, ⑤→+⑦→–

⑥⑧terminal: RS485 bus interface,⑥→A line ⑧→ line

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5 Firmware

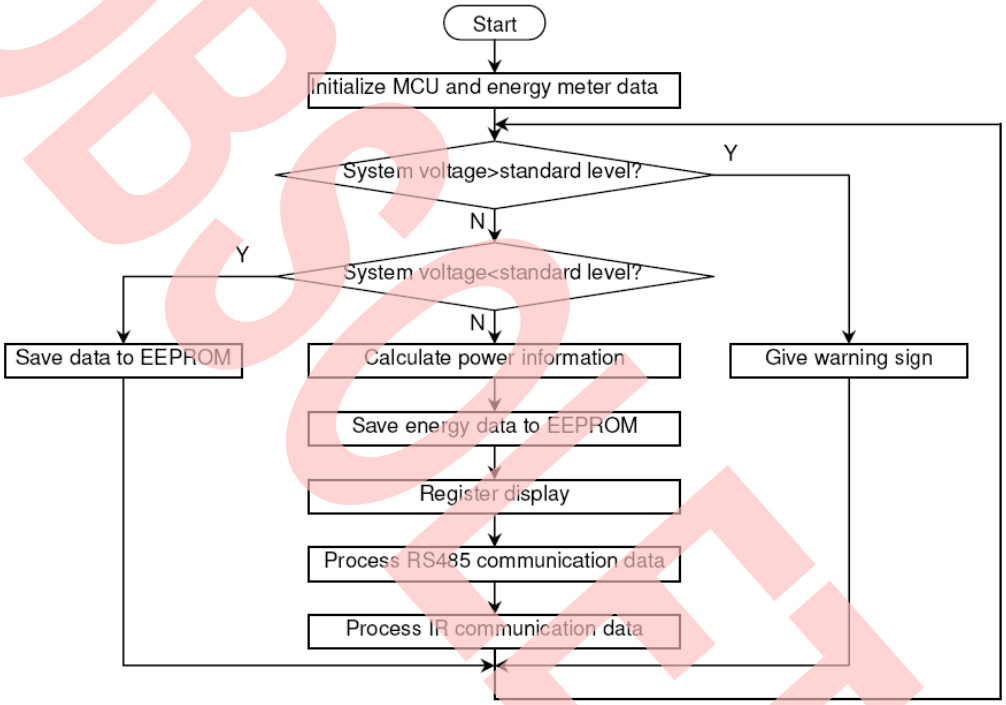
Firmware of Energy Meter

5.1 Flowchart

The software of electronic single phase energy meter is composed of eeprom_driver.c, i2c.c, main.c, signal_stream.c, sys_timer_driver.c and system.c.

The description of main loop function is shown in Figure 5.

Figure 5. Main Loop Flowchart



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5.2 Firmware Project

This demo uses MB95F204K to implement all the functions. MB2146-08-E and SOFTUNE V3 are used to debug the demo.

The table below explains the functions of the main files.

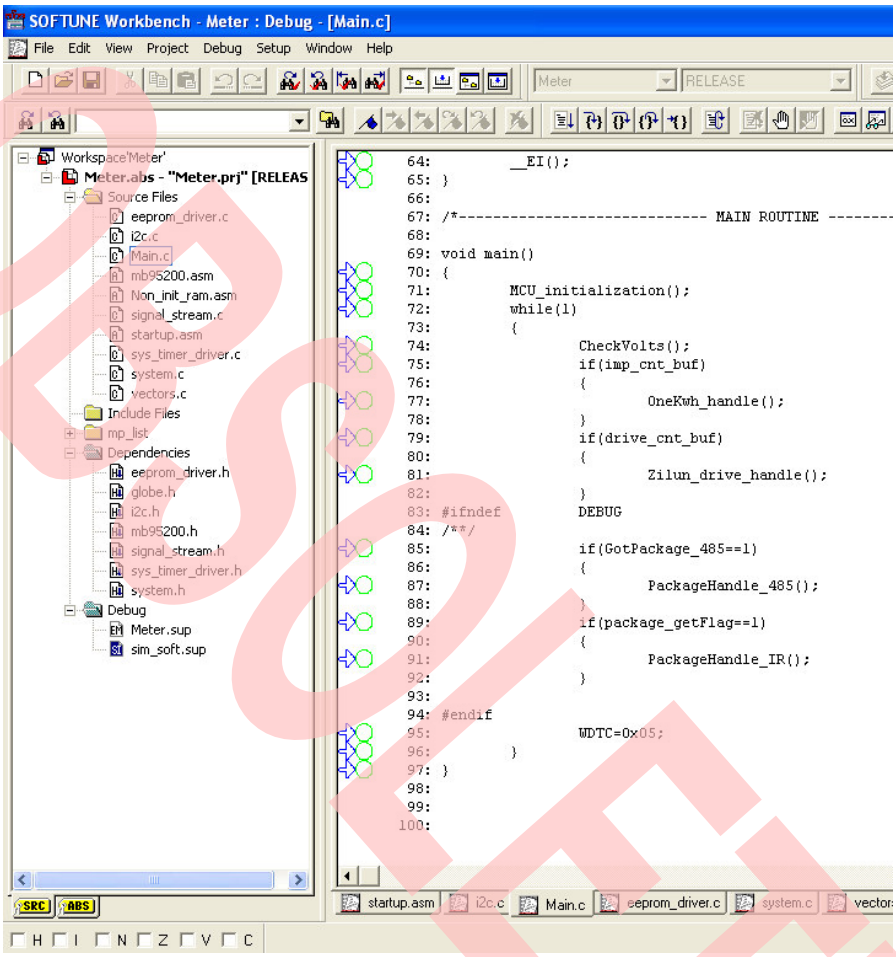
Table 2. One Phase Energy Meter Functions

Files	Function
Main.c	Main function
Eeprom_driver.c	External EEPROM read/write
I2c.c	I2C bus read/write is for EEPROM
Signal_stream.c	Deal with IR and RS485 communication
Sys_timer_driver.c	Operation of software real timer clock
System.c	System control function
Ma95200.asm	Cypress MCU head file
Startup.asm	MCU configure file
Vecter.c	Interrupt setting file

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The project is shown in Figure 6 Demo Project.

Figure 6. Demo Project



6 Additional Information

For more Information on Cypress Semiconductor products, visit the following website:

www.cypress.com/documentation/application-notes/mb95200-one-phase-energy-meter

Document History

Document Title: AN205122 - F²MC-8FX Family MB95200 /210H Series One Phase Energy Meter Reference Solution

Document Number: 002-05122

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	—	HUAL	09/27/2010	Initial release.
*A	5258946	HUAL	06/28/2016	Migrated Spansion Application note from MCU-AN-500099-E-10 to Cypress format. Hardware no longer exist and this AN to be Obsolete.

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