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Spec No: 002-05175

Spec Title: AN205175 - F2MC-8FX Family, MB95410H/470H Series One Phase Power Meter energy measure chip-RN8209

Replaced by: None

AN205175

F²MC-8FX Family, MB95410H/470H Series One Phase Power Meter energy measure chip-RN8209

This application note describes how to use One Phase Power Meter (RN8209) solution's energy measure chip-RN8209.

Contents

1 Introduction

This application note describes how to use One Phase Power Meter (RN8209) solution's energy measure chip-RN8209.

Chapter 2 explains the background of RN8209.

Chapter 3 explains the HW diagram of energy measure function.

Chapter 4 explains the HW reference SCH.

Chapter 5 explains the FW diagram.

Chapter 6 explains the FW function list.

2 Background

Background of RN8209

2.1 Overview

RN8209 can measure active power, inactive power, active energy, inactive energy, and can also provide 2 channels of individual active power and current RMS, voltage RMS, and so on. RN8209 can realize the solution to prevent the theft of power.

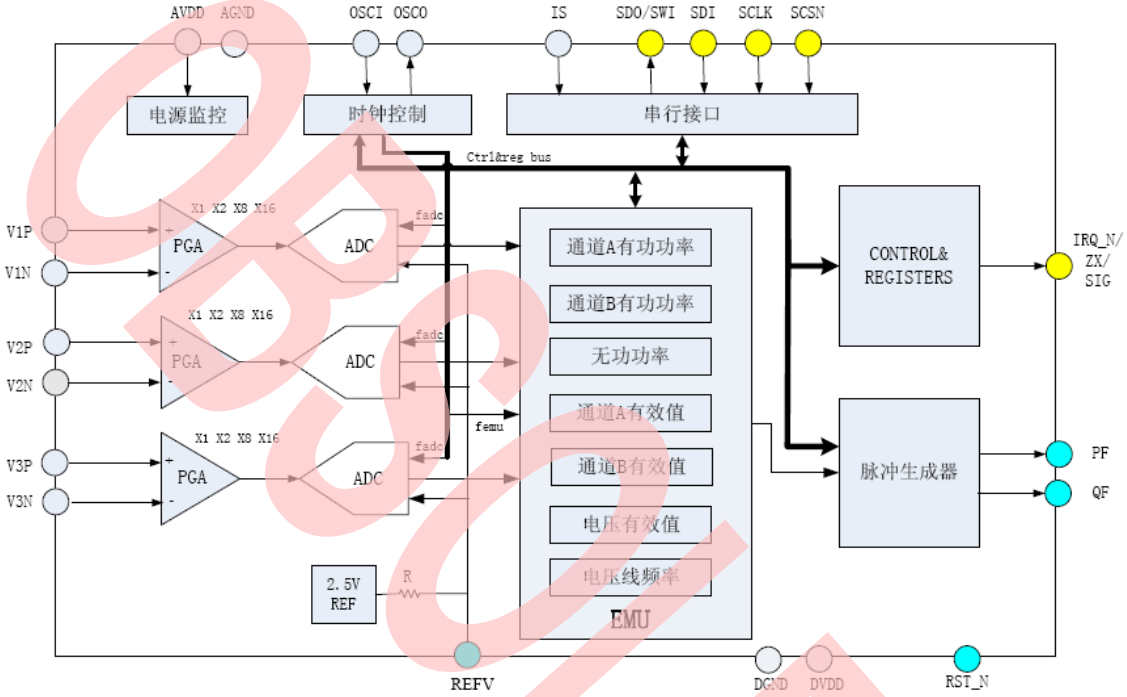
RN8209 support the gain calibration, phase calibration and offset calibration.

2.2 Features of RN8209

- Measure
- Software calibration
- SPI/RSIO communication
- Power watch function
- VCC-+5v, power consume-32mw
- Internal reference voltage-2.5v±3%, the type value of temperature parameter-25ppm/℃

2.3 Function diagram

Figure 1. The Function Diagram of RN8209

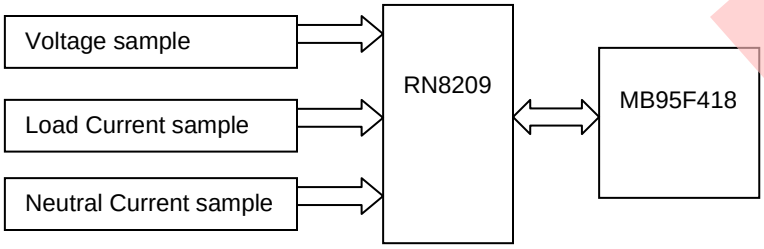


3 HW Diagram

Hardware diagram of energy measure system

3.1 The HW diagram of energy measure

Figure 2. Hardware diagram



4 HW Reference SCH

Hardware reference SCH of energy measure system

Figure 3. RN8209 Periphery Diagram

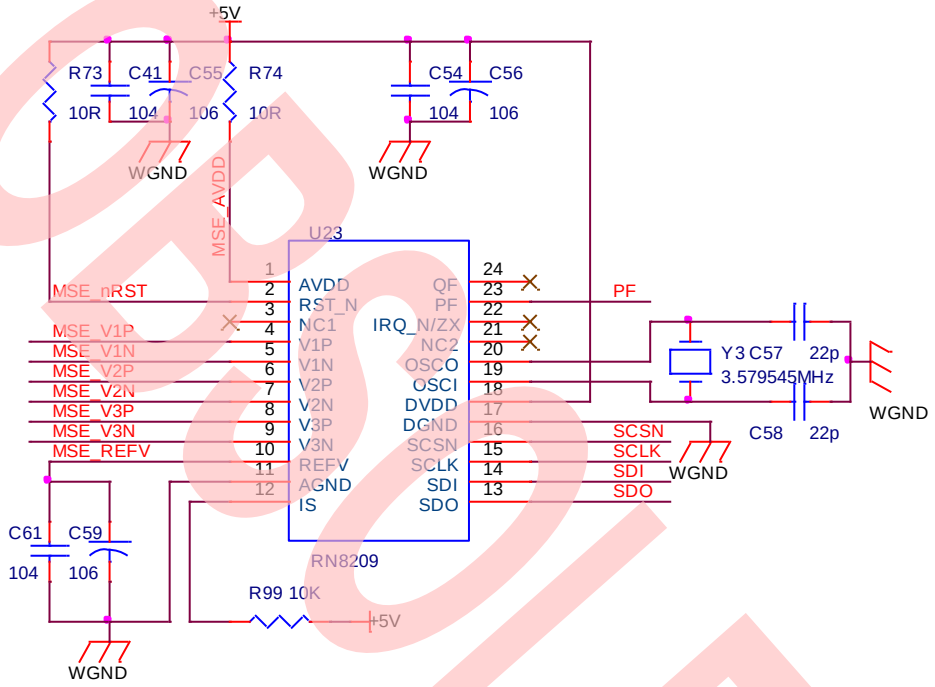


Figure 4. Load Current Sample Circuit

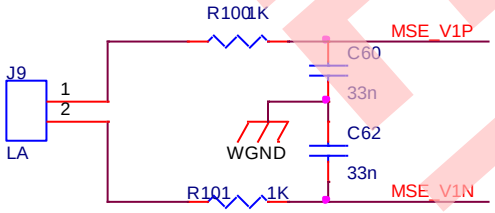


Figure 5. Neutral Current Sample Circuit

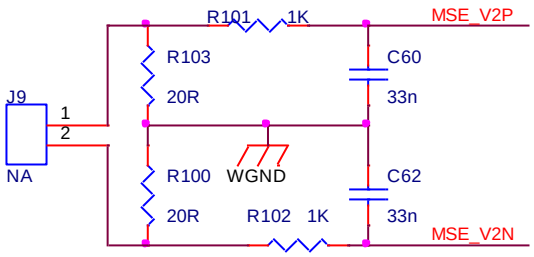


Figure 6. Voltage Sample Circuit

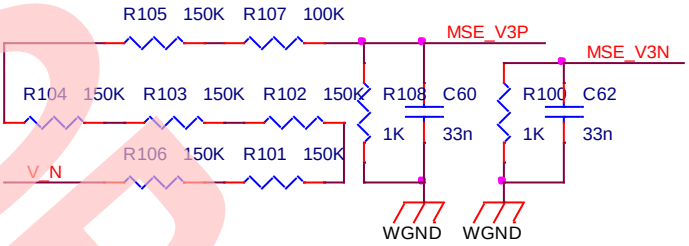
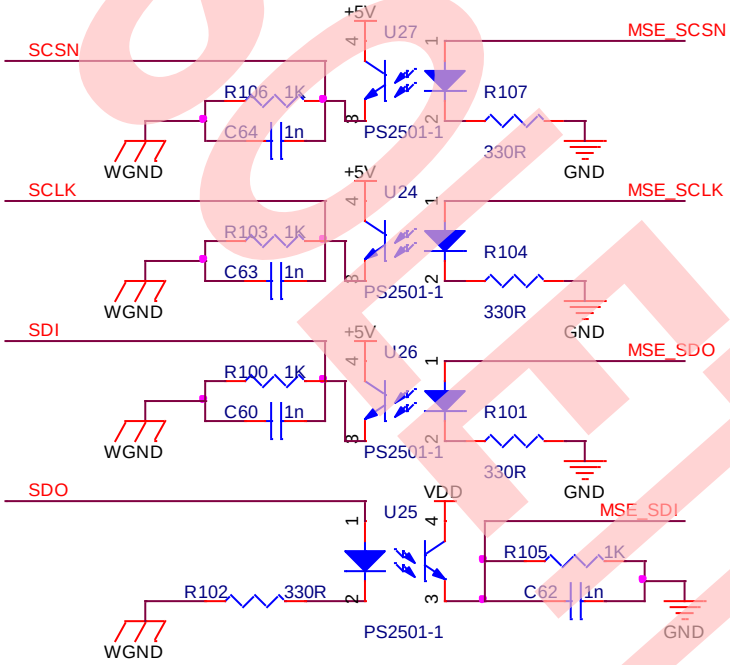


Figure 7. SPI Communication Circuit



5 FW diagram

Firmware system diagram of energy measure system

5.1 SPI Frame Format

Table 1. SPI Frame Format

Command	Command Register	Data	Remark
Read Command	{0，REG_ADR[6:0]}	RDATA	
Write Command	{1，REG_ADR[6:0]}	WDATA	
Write Enable Command	0xEA	0xE5	
Write Protect Command	0xEA	0xDC	
A Channel Select Command	0xEA	0x5A	
B Channel Select Command	0xEA	0Xa5	

5.2 SPI Communication Process

Figure 8. SPI Write Process

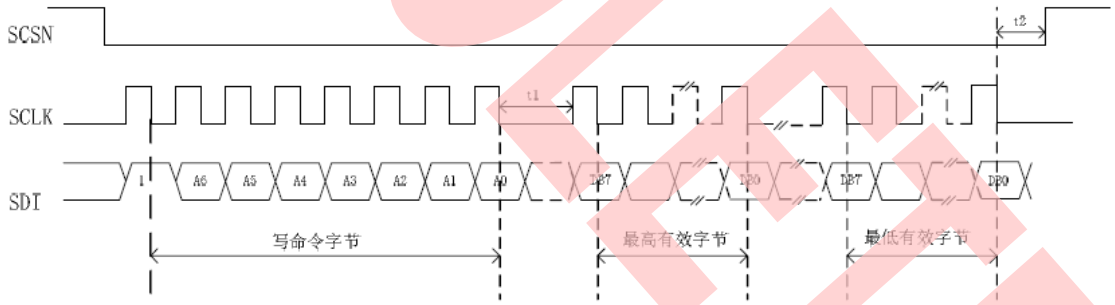
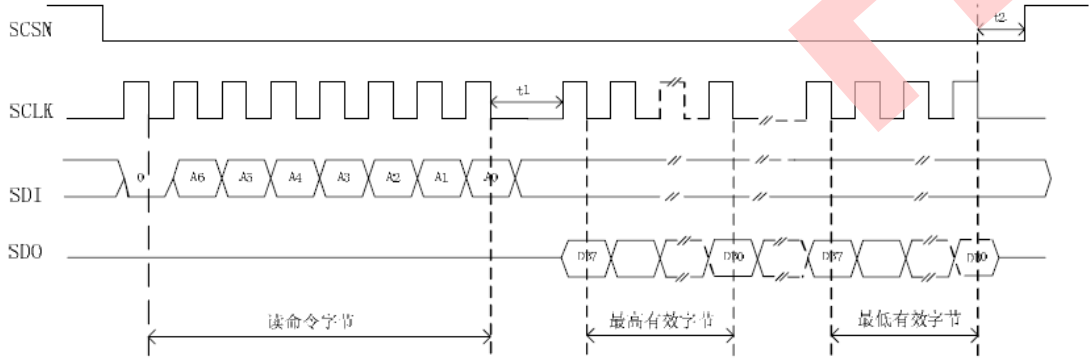
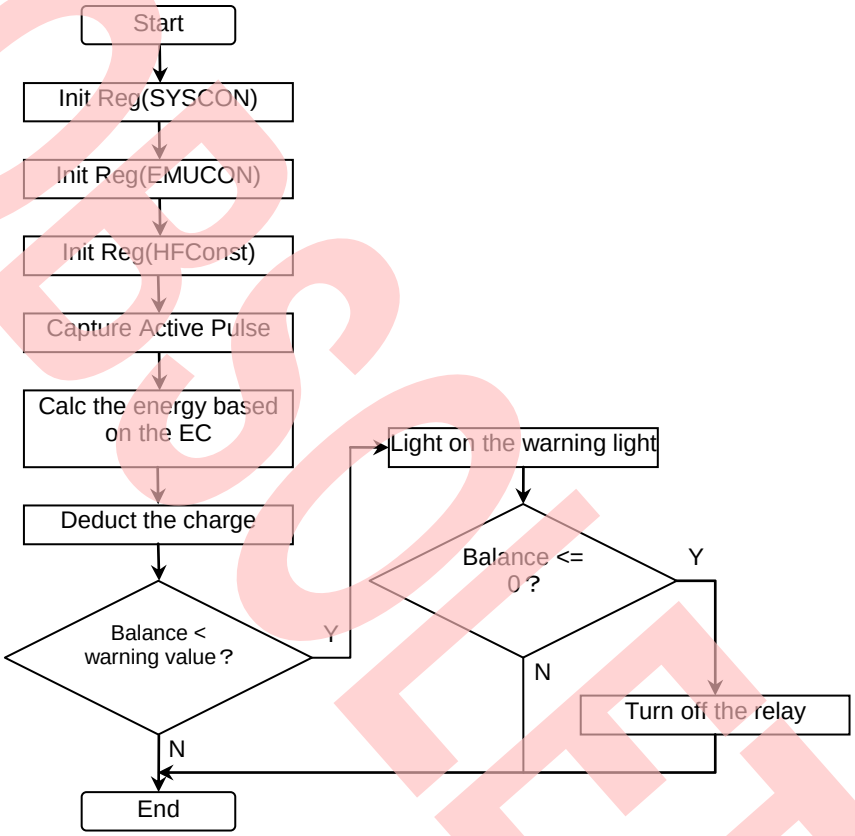


Figure 9. SPI Read Process



5.3 Firmware System Diagram

Figure 10. Firmware System Diagram



6 FW Function List

6.1 API

Table 2. FW API List 1

Function Prototype	Description
void RN8209_Reg_Init(void)	Initialize RN8209 register
void EnergyCount_Init(void)	Initialize for energy counting
void EnergyCount_Reset(void)	Reset all meter energy data
void CurEnergyCount_Reset(void)	Reset current meter energy data
void MeterKwhInc(void)	Accumulate meter KWH with each pulse received
void PowerEnergy(void)	Accumulate energy pulses & output calibration pulses
void GetMeterCurFwdEnergySum(INT8U *sumBuff)	Retrieve current sum of meter forward energy data
void GetMeterCurRevEnergySum(INT8U *sumBuff)	Retrieve current sum of meter reverse energy data
void GetMeterCurAllEnergySum(INT8U *sumBuff)	Retrieve current sum of meter total energy data
void ReadMeterRuntimeData(void)	Read meter energy data saved in EEPROM
void SaveMeterRuntimeData(void)	Save meter energy data to EEPROM
void ReadMeterConst(void)	Read meter constant from EEPROM
void ReadMeterClibData(void)	Read meter clibration data from EEPROM
void SaveMeterClibData(void)	Write meter calibration data to EEPROM
void LoadTimeSegInfo(void)	Load or reset time-seg parameter in EEPROM
void UpdateTimeSegTable(INT8U tableId, INT8U segCount, INT8U *segData)	Update time-seg table
INT8U FindTimeZoneSegTableSeriesId(INT8U idType)	Find a time-zone series ID base on current calendar
INT8U FindTimeZoneSegTableId(INT8U idType)	Find a time-zone-ID and time-seg-table-ID base on current calendar
INT8U FindTimeSegTariffId(INT8U hh, INT8U mm)	Find a time-seg tariff ID base on given time value hh(hour) & mm(minute)
void ValidateTimeZoneId(void)	Validate time-zone ID base on current calendar
void ValidateTimeSegTableId(void)	Validate time-seg table ID base on current calendar

Table 3. FW API List 2

Function Prototype	Description
void SaveLastMonthAllEnergyCounter(void)	Save last month's all energy counter value to EEPROM
void SaveLastMonthFwdEnergyCounter(void)	Save last month's forward energy counter value to EEPROM
void SaveLastMonthRevEnergyCounter(void)	Save last month's reverse energy counter value to EEPROM
void SaveCurrentEnergyCounter(void)	Save current energy counter value base on tariff ID
void LoadEnergyCounter(void)	Load meter energy counter base on energy direction state
void EnergyDirValidate(void)	Validate energy direction/state
void GetTimeSegFwdEnergySum(INT8U *sum, INT8U monthId, INT8U segId)	Get forward energy sum for a specific time segment
void GetTimeSegRevEnergySum(INT8U *sum, INT8U monthId, INT8U segId)	Get reverse energy sum for a specific time segment
void GetTimeSegAllEnergySum(INT8U *sum, INT8U monthId, INT8U segId)	Get energy forward+reversed sum for a specific time segment
void UpdateTimeSegTariffId(void)	Update tariff ID based on current time segment
INT32U GetVoltageRmsValue(void)	Get scaled voltage reading
INT32U GetLoadCurRmsValue(void)	Get scaled load current reading
INT32U GetNeutralCurRmsValue(void)	Get scaled neutral current reading
INT32U GetActivePowerValue(void)	Get scaled active power reading
INT32U GetPowerFactorValue(void)	Get scaled power factor reading

6.2 HAL

Table 4. FW HAL List

Function Prototype	Description
void SPIPortInit(void)	Initialize SPI port
void BcdEnergySumIntInc(INT8U *bcd)	Increment a 4 byte BCD energy number by 1 from integer part(bcd[2])
void BcdEnergySumDecimalAcc(INT8U *bcd, INT8U accVal)	Accumulate a 4 byte BCD energy number
void RN8209_ReadRegister(INT8U regAddr, INT8U *buff, INT8U total)	Read RN8209 register value
INT8U SPI_ReadByte(void)	Byte in through SPI port
void RN8209_WriteRegister(INT8U regAddr, INT8U *buff, INT8U total)	Write RN8209 register value
void SPI_SendByte(INT8U outDat)	Byte out through SPI port

7 Additional Information

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

English version address:

www.cypress.com/cypress-microcontrollers

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8 Document History

Document Title: AN205175 - F²MC-8FX Family, MB95410H/470H Series One Phase Power Meter energy measure chip-RN8209

Document Number: 002-05175

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	-	HUAL	05/31/2011	Initial release
*A	5247905	HUAL	06/17/2016	Migrated Spansion Application Note MCU-AN-500115-E-10 to Cypress format There is no information on how/where to acquire the RN8209 source code, so this AN is for obsolete.

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