

M62255FP

General Purpose Battery Charger Control IC

REJ03F0245-0200

Rev.2.00

Sep 14, 2007

Description

The M62255FP is intended to be used as a general purpose battery charger control for Note PC. The M62255FP contains the functions which are required for the battery charge control, on single chip using low peripheral component requirement. The M62255FP can handle battery charge control, monitor battery temperature and prevent from over current and voltage with microcomputer. It contains DC-DC converter circuit which can be used for the feedback control of the charge current and the output voltage.

It is the best fit for Smart Battery Charger.

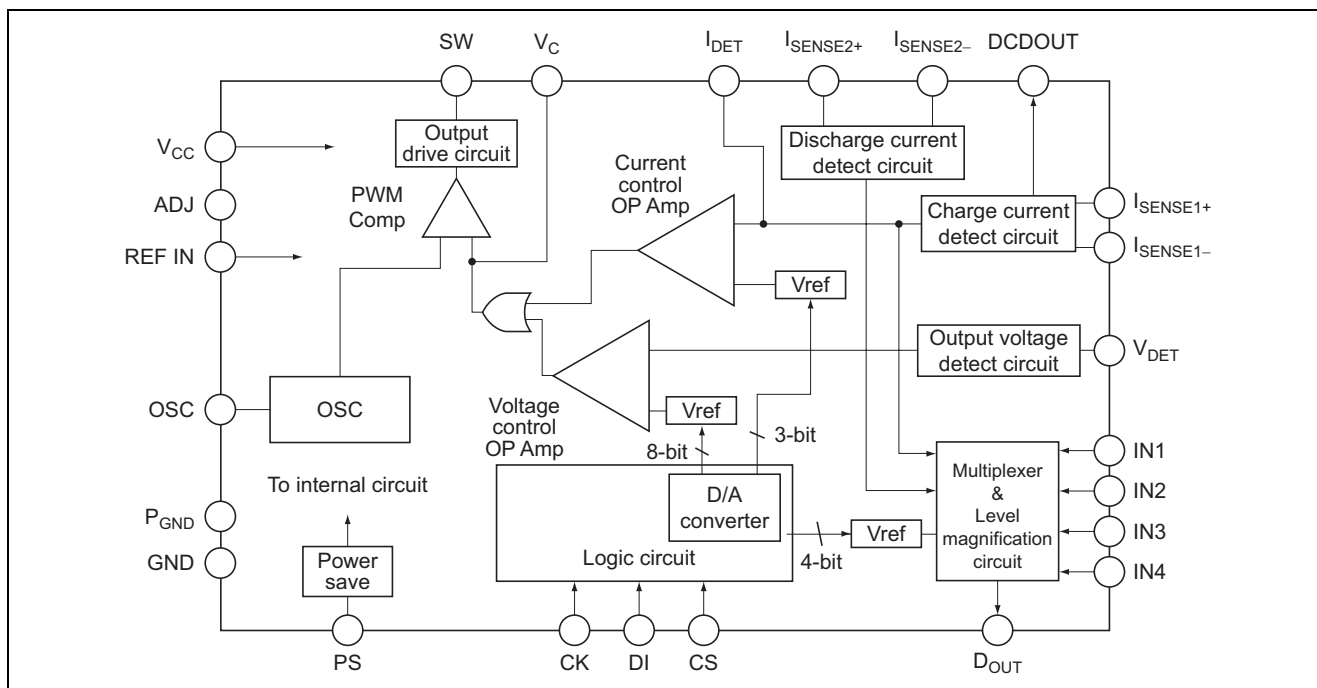
Features

- Built-in 3 wire serial data interface for MCU.
- Built-in multiplexer and level magnification circuit with 4 input ports.
- Built-in DC-DC converter circuit for PWM function
- Built-in two current detection circuits. These circuits can detect charge current and discharge current.
- ON/OFF control with low power dissipation mode. (Power save)

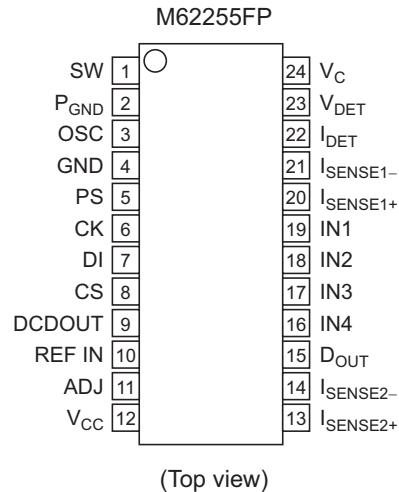
Application

Note.P.C, Video camera and general battery charger for other digital equipment

Block Diagram



Pin Arrangement



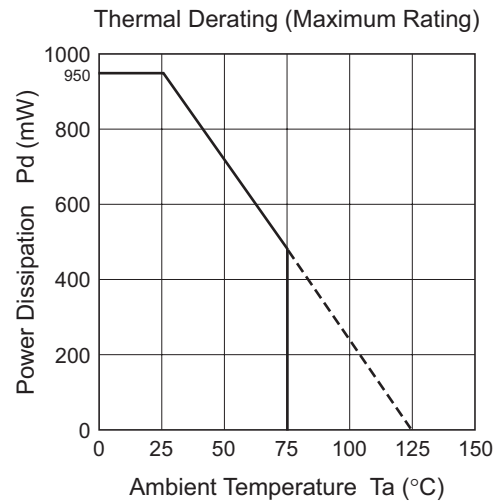
Outline: PRSP0024GA-A (24P2Q-A)

Pin Description

Pin No.	Pin Name	Function
7	DI	The serial data input pin which used to receive 8-bit wide serial data
6	CK	The shift clock input pin which input signal from DI pin to 8-bit shift register by the rising edge of clock signal
8	CS	When this pin is "Low", DI pin can receive the data into the 8-bit shift register. The each bit will be latched at rising edge of the clock signal
15	D _{OUT}	The output pin of the amplified A/D data
11	ADJ	The voltage output pin for adjusting A/D reference voltage
10	REF IN	The reference voltage input pin of the A/D converter
19	IN1	The A/D converter input pin
18	IN2	The A/D converter input pin
17	IN3	The A/D converter input pin
16	IN4	The A/D converter input pin
20	I _{SENSE1+}	The charge current sense input pin for high side voltage
21	I _{SENSE1-}	The charge current sense input pin for low side voltage
13	I _{SENSE2+}	The discharge current sense input pin for high side voltage
14	I _{SENSE2-}	The discharge current sense input pin for low side voltage
9	DCDOUT	The discharge current detect circuit output pin
23	V _{DET}	The voltage detection input pin
22	I _{DET}	The current detection input pin
24	V _C	This pin is used to make connection with capacitor and resistor which are used for phase compensation
1	SW	The pre-drive pin which used to connect the external Pch Tr
3	OSC	The pin used to connect capacitor to determine the frequency of oscillator
5	PS	The control pin of power save mode (H: power save mode, L: normal mode)
12	V _{CC}	The power supply pin
4	GND	The ground pin
2	P _{GND}	The ground pin of power unit

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	28	V	
SW drive current	I_{SW}	50	mA	
SW max. voltage	V_{SW}	V_{CC}	V	
PS max. voltage	V_{PS}	7	V	
Power dissipation	P_d	950	mW	$T_a = 25^{\circ}\text{C}$
Thermal derating ratio	K_{θ}	9.5	mW/ $^{\circ}\text{C}$	$T_a > 25^{\circ}\text{C}$
Operating temperature	T_{opr}	-20 to +75	$^{\circ}\text{C}$	
Storage temperature	T_{stg}	-40 to +125	$^{\circ}\text{C}$	

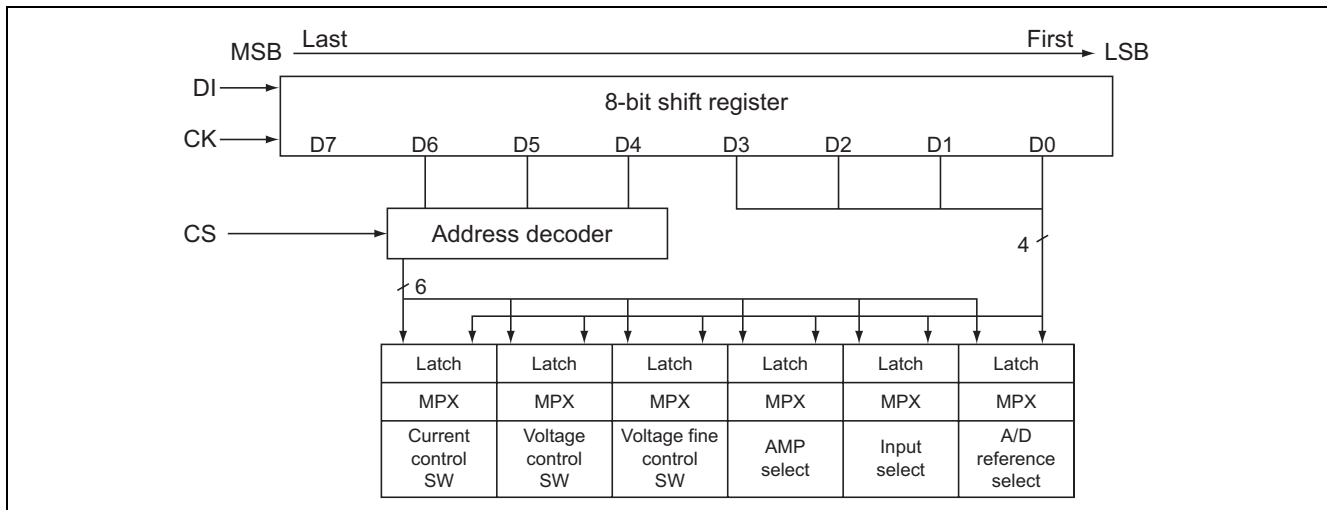


Electrical Characteristics

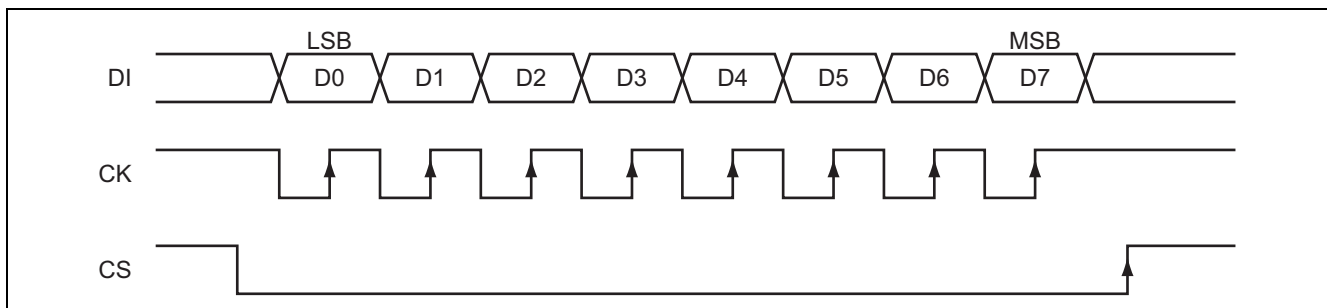
(Ta = 25°C, V_{CC} = 15 V)

Block	Item	Symbol	Min	Typ	Max	Unit	Test Condition
All block	Supply voltage	V _{CC}	7.5	—	22	V	
	Circuit current	I _{CC1}	4.0	7.0	10.0	mA	
	Circuit current at power save	I _{CC2}	—	50	80	μA	PS input voltage V _{PS} = 2.0 V
	Input reference voltage	V _{ref}	—	5.0	—	V	
PWM	Main-SW output saturation voltage	V _{satM}	—	0.9	1.2	V	I _{sw} = 50 mA
	SW output leak current	I _{SWL}	−1	—	1	μA	
Charge detection block	V _{DET} input voltage range	V _{DET-IN}	0.6	—	5.0	μA	
	V _{DET} input bias current	I _{DETB}	−1	—	0	μA	
	I _{SENSE1+} input voltage range	V _{ISENSE1+}	2.0	—	V _{CC} − 0.5	V	
	I _{SENSE1−} input voltage range	V _{ISENSE1−}	2.0	—	V _{CC} − 0.5	V	
	I _{SENSE2+} input voltage range	V _{ISENSE2+}	2.0	—	V _{CC} + 1.5	V	
	I _{SENSE2−} input voltage range	V _{ISENSE2−}	2.0	—	V _{CC} + 1.5	V	
	Charge voltage of fixed voltage	V _{CH}	4.18	4.20	4.22	V	V _{ref} = 5.0 V, Voltage control data is 4.2 V selected at Reset
	Charge current detection voltage of fixed current	V _{ICH}	140	160	180	mV	V _{ref} = 5.0 V, Current control data is 160 mV selected
	Differential nonlinearity at 8-bit DAC	DNL	−1	—	1	LSB	V _{ref} = 5.0 V
Level Mag.	IN input voltage range	V _{IN-IN}	0.3	—	5	V	
	IN input current	I _{IN}	−100	—	0	nA	
	D _{OUT} output voltage range	V _{DOUT}	0.5	—	5	V	
OSC	Oscillation frequency	f _{osc}	70	100	130	kHz	C _{osc} = 390 pF
	Oscillation charge current	I _{oscch}	−150	−120	−90	μA	
	Oscillation discharge current	I _{oscds}	20	30	40	μA	
	Maximum ON duty	T _{DUTY}	—	95	—	%	
	Oscillation output high level	V _{osch}	0.85	0.95	1.05	V	
	Oscillation output low level	V _{oscl}	0.35	0.4	0.45	V	
Interface	DI input high level	V _{DIH}	3.5	—	6.0	V	
	DI input low level	V _{DIL}	0	—	0.5	V	
	CS input high level	V _{CSH}	3.5	—	6.0	V	
	CS input low level	V _{CSL}	0	—	0.5	V	
	CK input high level	V _{CKH}	3.5	—	6.0	V	
	CK input low level	V _{CKL}	0	—	0.5	V	
	PS input high level	V _{PSH}	1.0	1.5	—	V	
	PS input low level	V _{PSL}	0	—	0.3	V	

Digital Data Format



Data Timing Chart (Model)



Data Setting

Control Function	Address				Data				Description
	D7	D6	D5	D4	D3	D2	D1	D0	
RESET	0	0	0	0	—	—	—	—	A/D reference voltage = 2.5 V Voltage control setting = 4.2 V Voltage fine control setting = 0 V Current control setting = 20 mV
Current control	0	0	0	1	—	—	—	—	See Table 1
Voltage control	0	0	1	0	—	—	—	—	See Table 2
Voltage fine control	0	0	1	1	—	—	—	—	See Table 3
Amp. select	0	1	0	0	—	—	—	—	See Table 4
A/D Input select	0	1	0	1	—	—	—	—	See Table 5
A/D Reference select	0	1	1	0	—	—	—	—	See Table 6

Control Data

Table 1 Current Control Data

D3	D2	D1	D0	Current Control Input Voltage	Current Ratio
0	0	0	0	0 V	0
0	0	0	1	20 mV	1/16
0	0	1	0	40 mV	1/8
0	0	1	1	80 mV	1/4
0	1	0	0	160 mV	1/2
0	1	0	1	240 mV	3/4
0	1	1	0	320 mV	1
0	1	1	1	—	Trickle

Note: 20 mV selected at RESET

Table 2 Voltage Control Data

D3	D2	D1	D0	Ref. Voltage
0	0	0	0	select 5.0 V
0	0	0	1	select 4.84 V
0	0	1	0	select 4.68 V
0	0	1	1	select 4.52 V
0	1	0	0	select 4.36 V
0	1	0	1	select 4.20 V
0	1	1	0	select 4.04 V
0	1	1	1	select 3.88 V
1	0	0	0	select 3.72 V
1	0	0	1	select 3.56 V
1	0	1	0	select 3.40 V
1	0	1	1	select 3.24 V
1	1	0	0	select 3.08 V
1	1	0	1	select 2.92 V
1	1	1	0	select 2.76 V
1	1	1	1	select 2.60 V

Note: 4.20 V selected at RESET

Table 3 Voltage Fine Control Data

D3	D2	D1	D0	Fine Cntl. Voltage
0	0	0	0	select 0 V
0	0	0	1	select -10 mV
0	0	1	0	select -20 mV
0	0	1	1	select -30 mV
0	1	0	0	select -40 mV
0	1	0	1	select -50 mV
0	1	1	0	select -60 mV
0	1	1	1	select -70 mV
1	0	0	0	select -80 mV
1	0	0	1	select -90 mV
1	0	1	0	select -100 mV
1	0	1	1	select -110 mV
1	1	0	0	select -120 mV
1	1	0	1	select -130 mV
1	1	1	0	select -140 mV
1	1	1	1	select -150 mV

Note: 0 V selected at RESET

- Set-up voltage of Voltage control is fixed by Ref. voltage (at table2) and fine cntl. voltage (at table3).
Set-up voltage of Voltage control can be fixed at 10 mV step between 2.45 V and 5.0 V.

Example 1

Table 1				Table 2			
D3	D2	D1	D0	D3	D2	D1	D0
0	1	0	1	1	0	1	0

Set-up voltage: 4.20 V (Ref. voltage) – 100 mV (fine cntl. voltage) = 4.10 V

Example 2

Table 1				Table 2			
D3	D2	D1	D0	D3	D2	D1	D0
1	0	0	1	1	1	1	1

Set-up voltage: 3.56 V (Ref. voltage) – 150 mV (fine cntl. voltage) = 3.41 V

Table 4 Amp Select

D3	D2	D1	D0	State
—	0	0	0	select Output of Charge Current Detect Amp
—	0	0	1	select Input of Battery Voltage Detect Amp
—	0	1	0	select Output of Battery Voltage Detect Amp
—	0	1	1	select Output of Discharge Current Detect Amp
—	1	0	0	select Output of A/D reference Voltage

Note: Output of Battery Voltage Detect Amp is selected at RESET

Table 5 A/D Input Select

D3	D2	D1	D0	State
—	—	0	0	select IN1
—	—	0	1	select IN2
—	—	1	0	select IN3
—	—	1	1	select IN4

Note: IN1 is selected at RESET

Table 6 A/D Reference Voltage Select

D3	D2	D1	D0	State
0	0	0	0	select 5.0 V
0	0	0	1	select 4.69 V
0	0	1	0	select 4.38 V
0	0	1	1	select 4.06 V
0	1	0	0	select 3.75 V
0	1	0	1	select 3.44 V
0	1	1	0	select 3.13 V
0	1	1	1	select 2.81 V
1	0	0	0	select 2.50 V
1	0	0	1	select 2.19 V
1	0	1	0	select 1.88 V
1	0	1	1	select 1.56 V
1	1	0	0	select 1.25 V
1	1	0	1	select 0.94 V
1	1	1	0	select 0.63 V
1	1	1	1	select 0.31 V

Note: 2.50 V is selected at RESET

Block Description

(1) Battery Voltage Detect Block

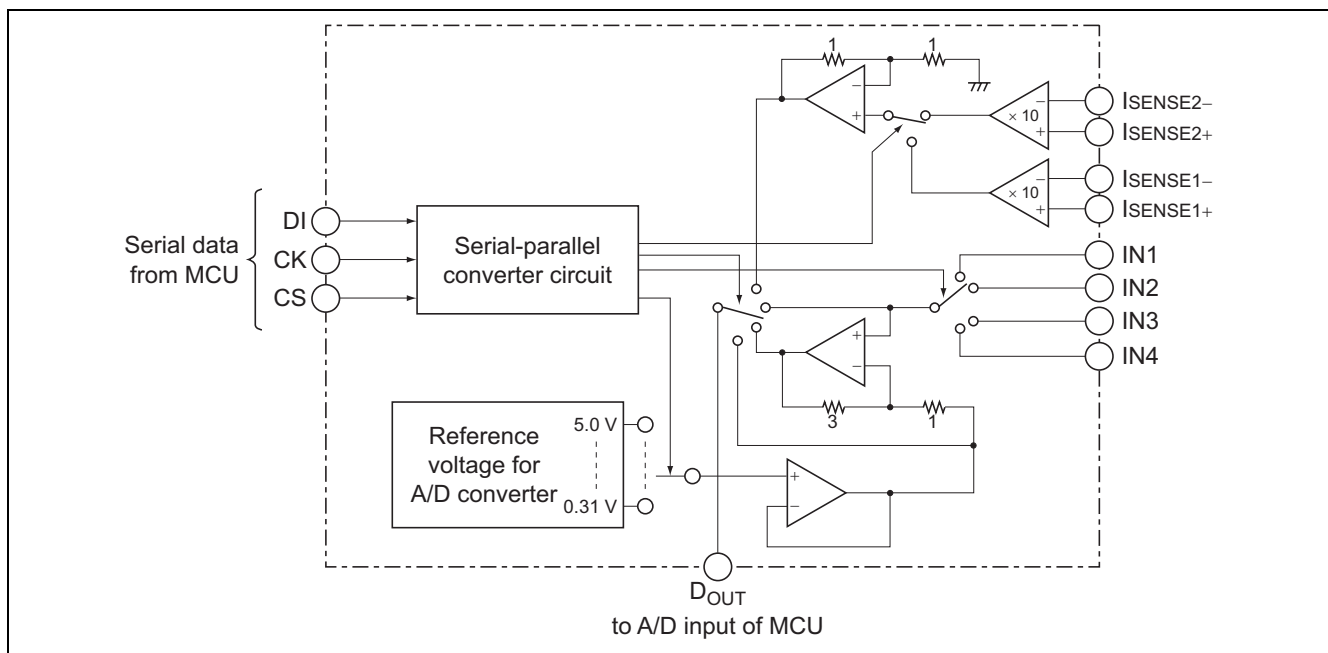


Figure 1 Block Diagram of Multiplexer and Level Magnification Circuit

Multiplexer and level magnification circuit of M62255 consists from reference voltage, 4 times amplifier, 10 times amplifier and 4 input multiplexer.

When setting the reference voltage correspond to detecting voltage by serial data from MCU, this set voltage supply to reference voltage for A/D converter. The difference between input voltage of IN1 to IN4 and reference voltage is multiplied by 4 at the center of this setting voltage.

This multiplied voltage is supplied to A/D input of MCU from D_{OUT} terminal. The resolution of A/D converter of MCU is improved by 2-bit as against the difference of IN1 to IN4 input.

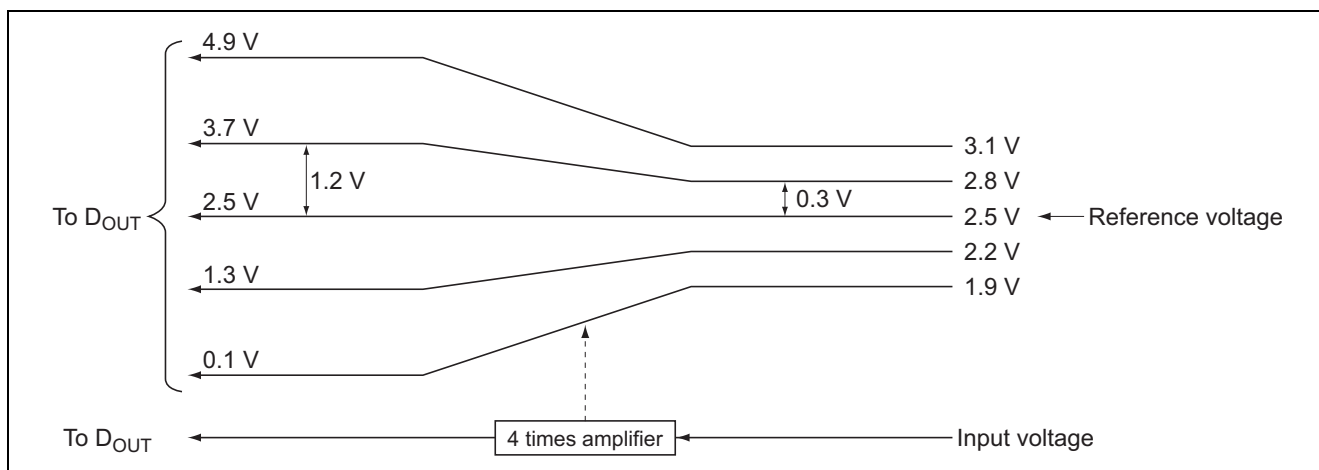


Figure 2 Description of Level Magnification

Output voltage of D_{OUT} is fixed as follows;

$$V_{DOUT} = (V_{IN} - V_{ref}) \times 4 + V_{ref} \text{ (V)} \dots\dots\dots (1)$$

V_{DOUT} : Output voltage of D_{OUT}

V_{IN} : Voltage of IN1 (or IN2, IN3, IN4)

V_{ref} : Reference voltage for A/D converter

In figure 2 reference voltage is 2.5 V. When input voltage of IN1 (or IN2, IN3, IN4) is set at 2.8 V, the difference between input voltage and reference voltage is 0.3 V. The difference voltage (0.3 V) multiplied by 4 is 1.2 V. 1.2 V added to reference voltage (2.5 V) makes 3.7 V which is output voltage of V_{DOUT} .

The range of output voltage of V_{DOUT} is between 0 V and 5 V. So in figure 2 the range of input voltage of IN1 (or IN2, IN3, IN4) is between 1.9 V and 3.1 V. (This range of input voltage is difference from selected reference voltage.)

Charge current of current detect R is multiplied by 10 and outputted from D_{OUT}.

M62255 is for the floating detection type. Current detect R is connected to + terminal of battery. So M62255 is best fit for SM-bus system, because the common GND can be given between PC system and the charger circuit.

Discharge current is detected by the same method as charge current. Detecting discharge current can be used for monitoring the current consumption and the remnant of the battery.

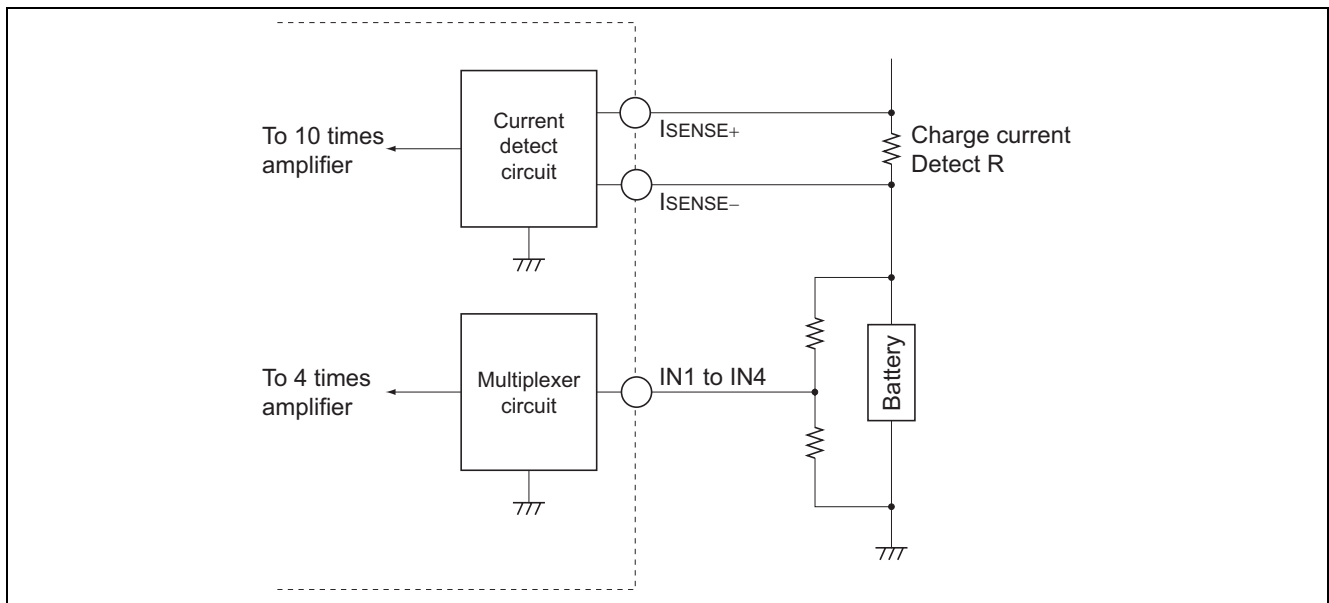
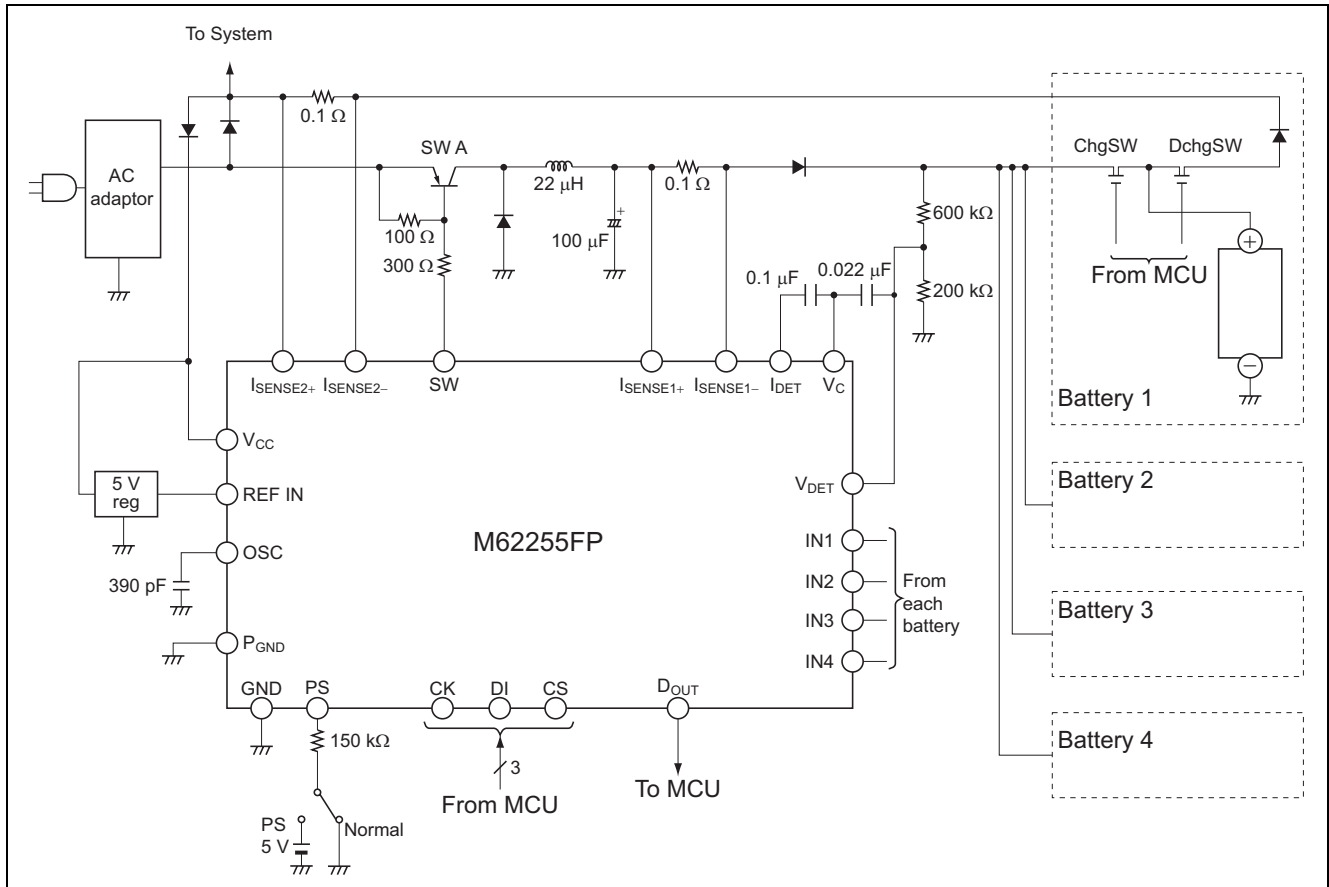
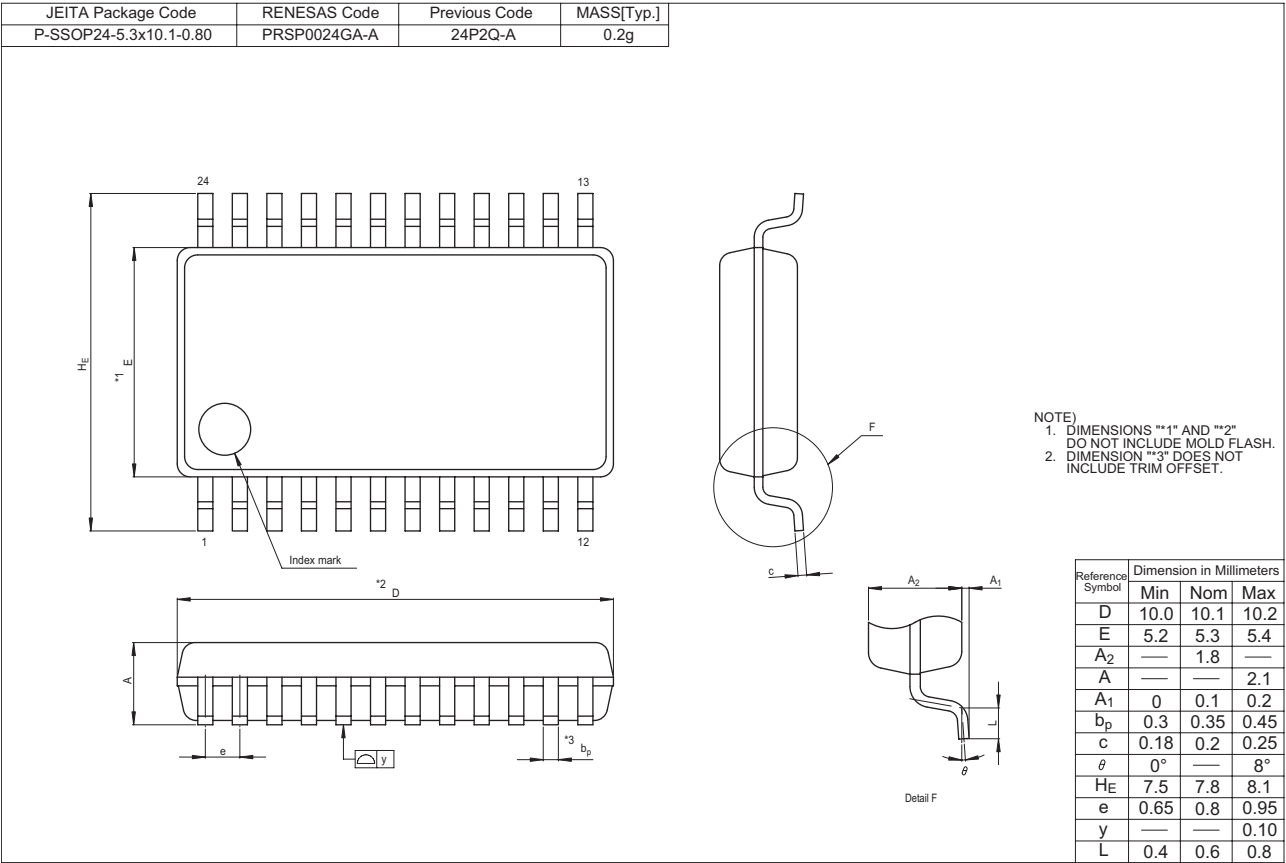


Figure 3 Detector Circuit of Battery Voltage/Charge Current

Application Circuit



Package Dimensions



Notes:

1. This document is provided for reference purposes only so that Renesas customers may select the appropriate Renesas products for their use. Renesas neither makes warranties or representations with respect to the accuracy or completeness of the information contained in this document nor grants any license to any intellectual property rights or any other rights of Renesas or any third party with respect to the information in this document.
2. Renesas shall have no liability for damages or infringement of any intellectual property or other rights arising out of the use of any information in this document, including, but not limited to, product data, diagrams, charts, programs, algorithms, and application circuit examples.
3. You should not use the products or the technology described in this document for the purpose of military applications such as the development of weapons of mass destruction or for the purpose of any other military use. When exporting the products or technology described herein, you should follow the applicable export control laws and regulations, and procedures required by such laws and regulations.
4. All information included in this document such as product data, diagrams, charts, programs, algorithms, and application circuit examples, is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas products listed in this document, please confirm the latest product information with a Renesas sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas such as that disclosed through our website. (<http://www.renesas.com>)
5. Renesas has used reasonable care in compiling the information included in this document, but Renesas assumes no liability whatsoever for any damages incurred as a result of errors or omissions in the information included in this document.
6. When using or otherwise relying on the information in this document, you should evaluate the information in light of the total system before deciding about the applicability of such information to the intended application. Renesas makes no representations, warranties or guarantees regarding the suitability of its products for any particular application and specifically disclaims any liability arising out of the application and use of the information in this document or Renesas products.
7. With the exception of products specified by Renesas as suitable for automobile applications, Renesas products are not designed, manufactured or tested for applications or otherwise in systems the failure or malfunction of which may cause a direct threat to human life or create a risk of human injury or which require especially high quality and reliability such as safety systems, or equipment or systems for transportation and traffic, healthcare, combustion control, aerospace and aeronautics, nuclear power, or undersea communication transmission. If you are considering the use of our products for such purposes, please contact a Renesas sales office beforehand. Renesas shall have no liability for damages arising out of the uses set forth above.
8. Notwithstanding the preceding paragraph, you should not use Renesas products for the purposes listed below:
 - (1) artificial life support devices or systems
 - (2) surgical implantations
 - (3) healthcare intervention (e.g., excision, administration of medication, etc.)
 - (4) any other purposes that pose a direct threat to human lifeRenesas shall have no liability for damages arising out of the uses set forth in the above and purchasers who elect to use Renesas products in any of the foregoing applications shall indemnify and hold harmless Renesas Technology Corp., its affiliated companies and their officers, directors, and employees against any and all damages arising out of such applications.
9. You should use the products described herein within the range specified by Renesas, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas shall have no liability for malfunctions or damages arising out of the use of Renesas products beyond such specified ranges.
10. Although Renesas endeavors to improve the quality and reliability of its products, IC products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Please be sure to implement safety measures to guard against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other applicable measures. Among others, since the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
11. In case Renesas products listed in this document are detached from the products to which the Renesas products are attached or affixed, the risk of accident such as swallowing by infants and small children is very high. You should implement safety measures so that Renesas products may not be easily detached from your products. Renesas shall have no liability for damages arising out of such detachment.
12. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written approval from Renesas.
13. Please contact a Renesas sales office if you have any questions regarding the information contained in this document, Renesas semiconductor products, or if you have any other inquiries.



RENESAS SALES OFFICES

<http://www.renesas.com>

Refer to "<http://www.renesas.com/en/network>" for the latest and detailed information.

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510