To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

M62240FP

SINGLE CHIP BATTERY CHARGER CONTROL IC

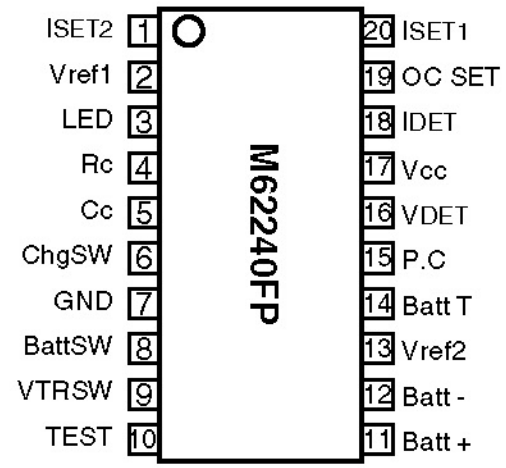
GENERAL DESCRIPTION

The M62240FP is a general purpose battery charger control IC. It can control all of the sequence needed for battery charging, it also has functions such as detection of battery temperature, a protection against over-current/voltage, a safety timer and so on. Moreover, it can adapt to charge Ni-Cd, Ni-MH batteries by adding few peripheral components.
The IC has the feedback control of the charge current and output voltage.

FEATURES

- Low voltage (3V) operation
- Built-in following functions and circuits ;
  - CR oscillator for internal logic
  - Initialization timer and safety timer for ΔV error detection and over-charging
  - D-A converter and shift registers to maintain the peak voltage of battery.
  - Main output SW driving circuits
  - LED driving circuit for displaying the status of the charging
  - System reset circuit for detecting the power supply voltage
  - Temperature detection circuit for the Ni-MH battery
  - Voltage and current control circuits for feedback to the primary side of the SMPS.
  - Protective functions including detection of over-voltage in charge mode and over-current in adapter mode and so on

PIN CONFIGURATION (TOP VIEW)

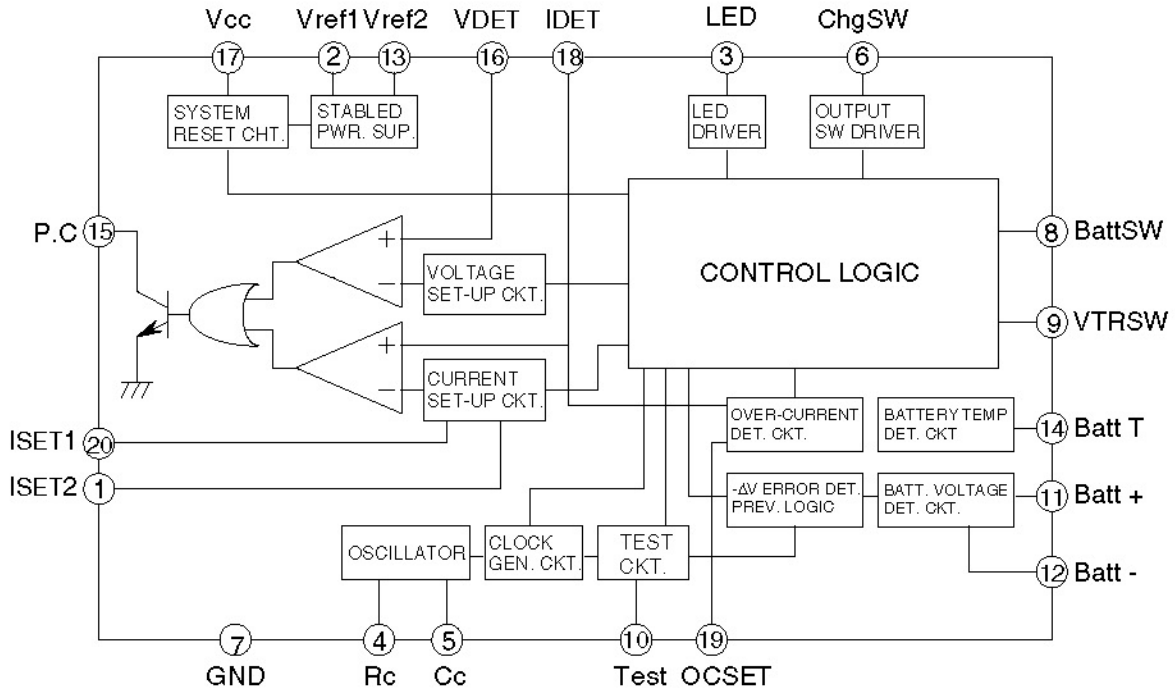


Outline 20P2N-A

APPLICATION

Battery charger for video cameras and handheld telephones, etc.

BLOCK DIAGRAM



EXPLANATION OF TERMINALS

Pin No.	Symbol	Function
3	LED	LED drive (Open collector outputs)
4, 5	Rc, Cc	Setting the oscillating frequency of the internal clocks.
6	Chg SW	The SW drive terminal used for charging battery. (Open collector outputs)
7	GND	Ground
8	Batt SW	Checking whether a bettery is mounted or not. (It has a pull-up resistor)
9	VTR SW	Detecting VTR connection. (It has a pull-up resistor)
10	Test	Test mode set-up. (It has a pull-up resistor)
11	Batt +	This is connected to the + terminal of the battery.
12	Batt -	This is connected to the - terminal of the battery.
14	Batt T	This is connected to the the temperature detecting terminal of the battery.
13	Vref2	The voltage reference terminal for temperature detection.
15	P.C	This is connected to the photo-coupler used for feedback. (It has a pull-up resistor)
16	V_{DET}	Monitoring the output voltage.
18	I_{DET}	Detecting the charging current or output current.
19	OC SET	Setting the over-current detection value in the adapter mode.
20, 1	Iset1, 2	These are used to the charging current. (Iset1 is for quick charge and Iset2 is for trickle charge)
2	Vref1	Setting the standard voltage for over-current set-up value and the charge current set-up.
17	Vcc	Power supply.

ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		16	V
I_{ChgSW}	ChgSW terminal drive current		50	mA
I_{LED}	LED drive current		20	mA
$I_{P.C}$	P.C drive current		20	mA
Iref1	Vref1 output current		-0.5	mA
Iref2	Vref2 output current		-1	mA
Pd	Power dissipation		650	mW
K_θ	Thermal derating	Ta=25°C	6.5	mW/°C
Topr	Operating temperature	Ta>25°C	-20 to +75	°C
Tstg	Storage temperature		-40 to +125	°C

Note
Polarity of current:
The direction of current flowing into the IC is equivalent to the positive (+).
The direction of current flowing out of the IC is equivalent to the negative (-).
The voltage applied to the open collector output terminal should be less than the absolute maximum voltage of the power supply.
The voltage difference between the negative terminal of the battery and the GND terminal should be 0 to 0.6V.

ELECTRICAL CHARACTERISTICS (Vcc=7V,Ta=25°C,unless otherwise noted)

All device

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
Vcc	Supply voltage		3.0		15.0	V
Icc	Circuit current	Vcc=7V when quick charge	10.0	20.0	30.0	mA
V_{THVCC}	Power supply detecting voltage		2.70	2.80	2.90	V

Reference

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
Vref1	Vref1 output voltage	Iref1=150μA	1.21	1.25	1.30	V
Vref2	Vref2 output voltage	Iref2=350μA	1.73	1.80	1.87	V

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{OCSET}	OCSET terminal flow out current	V_{OCSET}=220mV	-1			μA
I_{SET1-1}	I_{SET1} terminal flow out current 1	Excluding charging time	30	50	85	μA
I_{SET1-2}	I_{SET1} terminal flow out current 2	When charging	-1			μA
I_{SET2-1}	I_{SET2} terminal flow out current 1	Excluding trickle charging time	30	50	85	μA
I_{SET2-2}	I_{SET2} terminal flow out current 2	When trickle charging	-1			μA

Driver

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{satChgSW}$	ChgSW terminal output flow out current	IChgSW=30mA	—	0.3	0.6	V
V_{satLED}	LED output low voltage	ILED=10mA	—	0.3	0.6	V

Control Section

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{IN}	Range of input voltage		0		Vcc	V
I_{Bias}	Input bias current		-1			μA
V_{PCL}	P.C output low voltage	$I_{P.C}$=10mA	—	0.3	0.6	V

Each SW Detection Terminal

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{BattSW}	Batt SW terminal flow out current	Vcc=7V,V_{BattSW}=0V	-240	-140	-80	μA
V_{THBatt}	Batt SW terminal threshold voltage	Vcc=7V	3.0	4.0	5.0	V
I_{VTRSW}	VTR SW terminal flow out current	Vcc=7V,V_{VTRSW}=0V	-240	-140	-80	μA
V_{THVTR}	VTR SW terminal threshold voltage	Vcc=7V	3.0	4.0	5.0	V

Internal Voltage Set-up

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{VTR}	Set-up output voltage at VTR mode		828	864	900	mV
V_{CHG}	Set-up output voltage at charge mode		1.21	1.26	1.30	V
V_{ISET1}	Iset1 set-up voltage	When quick charging	124.8	130	135.2	mV
V_{ISET2}	Iset2 set-up voltage	When trickle charging	11.52	12.0	12.48	mV
V_{OCSET}	OCSET set-up voltage	When VTR mode	211.2	220	228.8	mV
V_{CHG}	Voltage at the start of quick charging		0.40	0.54	0.68	V
V_{OVP}	Over-voltage set-up voltage		0.91	0.95	0.99	V
$V_{-\Delta V}$	-ΔV detection set-up voltage	after initialization timer has passed	70	100	130	mV
V_{VTHH1}	Temperature detection set-up voltage	Temperature at the start of charging	0.91	0.97	1.01	V
$V_{O/H}$	Over-heating detection set-up voltage	Charge stop temperature	0.82	0.86	0.90	V

Internal Voltage Set-up

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
fosc	Oscillation frequency	Rc=30KΩ,Cc=2200pF	9.42	10.24	11.06	KHz
Tm1	Initialization timer 1	Battery voltage < 5V	18.4	20.0	21.6	min
Tm2	Initialization timer 2	Battery voltage ≥ 5V	4.6	5.0	5.4	min
Tms1	Safety timer 1	When quick charging	4.6	5.0	5.4	hr
Tms2	Safety timer 2	When trickle charging	4.6	5.0	5.4	hr
Toc	Over-current detection time	When VTR mode	9.2	10.0	10.8	sec

Note:
Each timer is set at an oscillation frequency of 10.24KHz.

APPLICATION EXAMPLE