To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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M62254FP

Standard Battery Charger Controller

REJ03F0244-0200
Rev.2.00
Jun 16, 2008

Description

The M62254FP is designed as standard battery charger controller. The M62254FP has functions which require for the battery charge control on single chip. Not only the combination of M62254 and MCU capable of handling battery charge control, but also it is capable of monitoring battery temperature, prevent from over current or voltage, using minimal peripherals. It also has feedback function to the primary source of SW power supply, which can used to control feedback of charge current and output voltage.

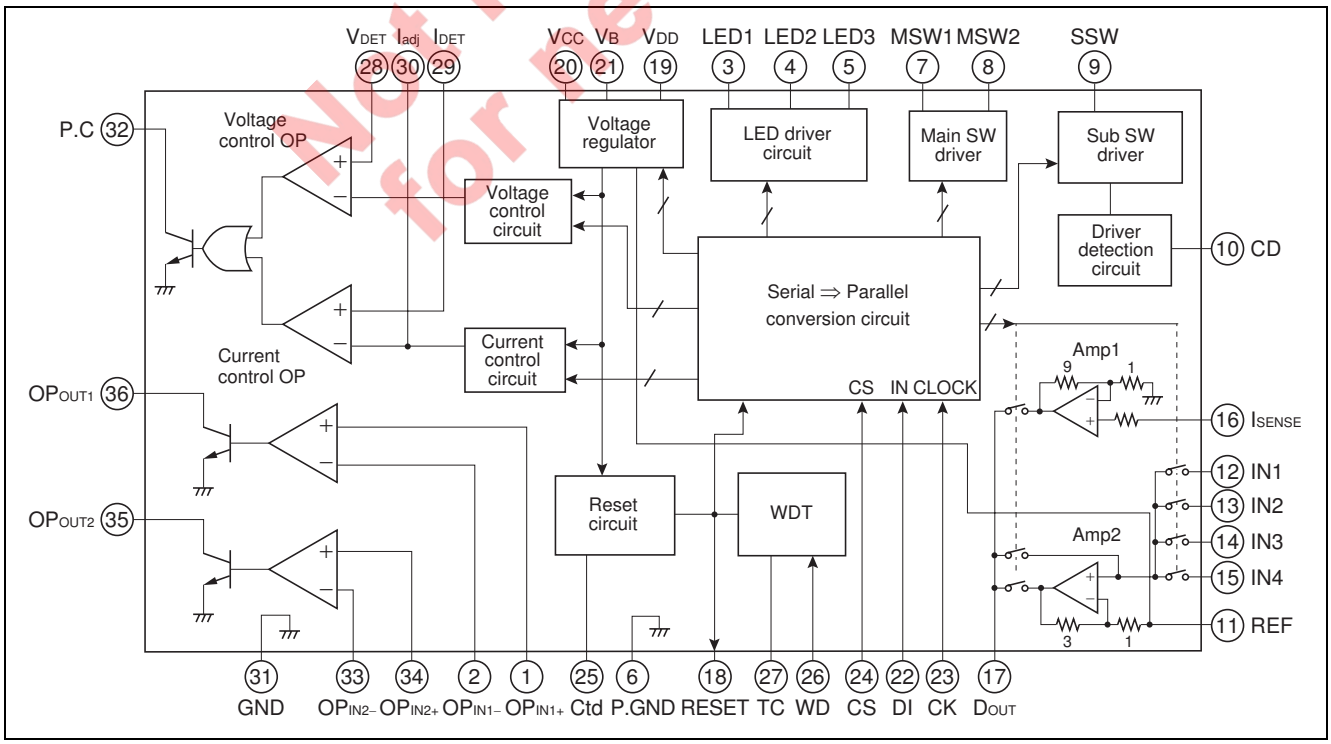
Features

- Built-in reset circuit and WDT function
- Built-in multiplexer and level magnification circuit with 4 input ports
- Built-in two standard stand alone OP-amp
- Built-in sub-switch circuit with feedback function
- Built-in 3 line serial data interface function
- Built-in low input/output operation 5 V voltage regulator function
- Built-in charge current/output voltage control circuit

Applications

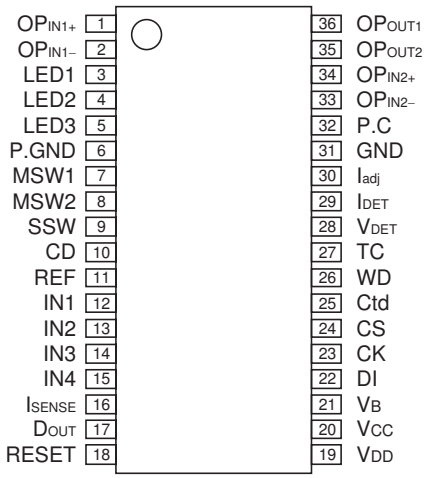
Video camera, mobile phone and general battery charger for other digital equipments

Block Diagram



Pin Arrangement

M62254FP



(Top view)

Outline: PRSP0036GA-A (36P2R-A)

Pin Description

Pin No.	Pin Name	Function
24	CS	The serial data input pin which used to receives 8-bit wide serial data.
23	CK	The shift clock input pin which takes the input signal of DI pin to 8-bit shift register by the rising edge of the clock signal.
22	DI	When CS pin is "Low", this pin can receive the data into the 8-bit shift register. The each bit will be latched at rising edge of the clock signal.
17	D_{OUT}	The output pin of the amplified A/D input.
11	REF	The reference voltage output pin of the A/D converter.
12 to 15	IN1 to IN4	The A/D converter input pin.
16	I_{SENSE}	The current sense input pin.
10	CD	The input pin for the current detection to feedback of sub-switch driver.
9	SSW	The sub-switch driver output pin.
7, 8	MSW1, MSW2	The main switch driver output pin. (Open collector)
3 to 5	LED1 to LED3	The LED driver output pin. (Open collector)
19	V_{DD}	The stabilized +5 V output pin.
21	V_B	The pre-drive pin which used to connect the external PNP Tr.
20	Vcc	The power supply pin.
29	I_{DET}	The current detection input pin.
30	I_{adj}	The input pin for current detection adjustment.
28	V_{DET}	The voltage detection input pin.
32	P.C	The feedback pin for voltage and current control.
2, 33	OP_{IN1-}, OP_{IN2-}	The inverted input pin of OP-amp.
1, 34	OP_{IN1+}, OP_{IN2+}	The non-inverted input pin of OP-amp.
36, 35	OP_{OUT1}, OP_{OUT2}	The OP-amp. output pin. (Open collector output)
31	GND	The ground pin.
6	P.GND	The ground pin of power unit. (Main switch driver and LED driver)
18	RESET	The output pin of Reset and WDT. (Pulled up to V_{DD})
27	TC	The pin used to connect capacitor to determine the time constant of WDT.
26	WD	The input pin of the WDT.
25	Ctd	The pin used to connect capacitor to determine delay time the output after the Reset.

Absolute Maximum Ratings

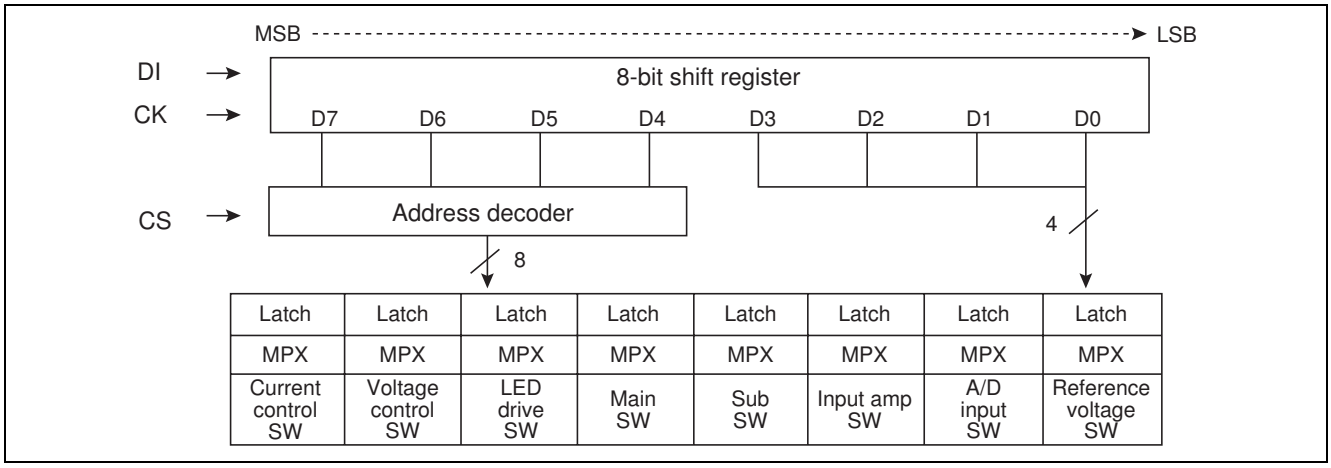
Items	Symbols	Ratings	Unit
Power supply voltage	Vcc	16	V
Main switch drive current	I_{SW}	200	mA
Sub switch drive current	I_{SUB}	–5	mA
LED drive current	I_{LED}	30	mA
Regulator output current	I_B	20	mA
P.C drive current	I_{PC}	10	mA
Main switch maximum voltage	V_{SW}	Vcc	V
Sub switch maximum voltage	V_{SUB}	Vcc	V
LED maximum drive voltage	V_{LED}	Vcc	V
P.C maximum voltage	V_{PC}	Vcc	V
Power dissipation	Pd	650	mW
Thermal derating ratio	Kθ	6.5	mW/°C
Operating temperature	Topr	–20 to +85	°C
Storage temperature	Tstg	–40 to +125	°C

Electrical Characteristics

(Ta = 25°C, Vcc = 12 V, I_{SW} = 50 mA, I_{LED} = 20 mA, unless specified otherwise)

Block	Item	Symbol	Min	Typ	Max	Unit	Test Conditions
	Power supply voltage	Vcc	V_{DD} + 0.2	—	15	V	
	Circuit current	Icc	—	15	—	mA	
5 V power supply	Stabilized voltage output	V_{DD}	4.75	5.00	5.25	V	I_B = 10 mA
	Input variable ratio	Reg-in	—	50	200	mV	V_{DD} + 0.2 V
	Load variable ratio	Reg-L	—	10	100	mV	I_{DD} = 1 to 100 mA
	Ripple remove ratio	R.R	—	60	—	dB	f = 120 Hz, Vin = 0 dBm
	Min I/O voltage difference	V_{DEF}	—	0.2	—	V	
WDT/RESET	V_{DD} detection voltage	V_{TH1}	4.05	4.25	4.45	V	
	Hysteresis voltage	ΔV_{TH1}	30	50	80	mV	
	WD input current	I_{WD}	—	0.15	—	mA	V_{WD} = +5 V
	WD "H" input voltage	V_{WDH}	3.5	—	—	V	
	WD "L" input voltage	V_{WDL}	—	—	1.5	V	
	TC charge current	I_{TCH}	—	25	—	µA	
	TC discharge current	I_{TCL}	—	100	—	µA	
	Reset output saturation voltage	V_{RESL}	—	0.2	0.4	V	I_{RES} = 1 mA
	WDT time	t_{WD}	—	$1 \times 10^5 C_T$	—	s	
	Reset timer time	t_{RT}	—	$2.5 \times 10^4 C_T$	—	s	
	Reset output delay time	td	—	2×10^5Ctd	—	s	
	Min input pulse width	$t_{WDIN\ (MIN)}$	5	10	20	µs	
Driver	Main SW "L" output voltage	$Vsat_M$	—	0.8	1.2	V	I_M = 50 mA
	Sub SW "L" output voltage	$Vsat_S$	—	0.8	1.2	V	I_S = 5 mA
	LED "L" output voltage	$Vsat_L$	—	0.8	1.2	V	I_{LED} = 20 mA
	Sub SW detection voltage	V_{CD}	—	1.0	—	V	
Control OP	Input voltage range	V_{IN}	0	—	V_{CC} – 2	V	
	Input bias current		–1	—	—	µA	
	P.C "L" output voltage	V_{PCL}	—	0.2	0.4	V	I_{PC} = 5 mA
OP-Amp.	Input offset voltage	V_{Io}	—	2	7	mV	
	Input bias current	I_{IB}	–100	—	—	nA	
	Input offset current	I_{IO}	—	—	100	nA	
	Phase input range	V_{ICM}	–0.3	—	V_{CC} – 2	V	
	Open loop gain	AV	80	—	—	dB	
	Slew rate	SR	—	—	—	V/µs	
	Output voltage range	V_{OR}	0.2	4	V_{CC}	V	
	Output sink current	Isink	20	—	—	mA	
Voltage Mag.	I_{SENSE} input voltage range	V_{ISENSE}	—	—	0.5	V	
	IN input voltage range	V_{IN}	0.2	—	5	V	Vcc ≥ 7 V
			0.2	—	3.5	V	Vcc = 5.5 V
	IN input current	I_{IN}	–100	—	—	nA	

Digital Data Format



Data Setting

Control Function	Address				Data				Description
	D7	D6	D5	D4	D3	D2	D1	D0	
RESET	0	0	0	0	—	—	—	—	All SW is OFF A/D reference voltage = 0.4 V Voltage setting reference voltage = 4.0 V
Current control	0	0	0	1	—	—	—	—	See table 1
Voltage control	0	0	1	0	—	—	—	—	See table 2
LED driver select	0	0	1	1	—	—	—	—	See table 3
Main SW	0	1	0	0	—	—	—	—	See table 4
Sub SW	0	1	0	1	—	—	—	—	See table 5
Amp. select	0	1	1	0	—	—	—	—	See table 6
A/D input select	0	1	1	1	—	—	—	—	See table 7
A/D reference select	1	0	0	0	—	—	—	—	See table 8

Table 1 Current Control Data

D3	D2	D1	D0	Current Control OP-Amp 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: During trickle charge, use constant voltage mode and charge directly to the battery using external resistor.
20 mV is selected at RESET.

Table 2 Voltage Control Data

D3	D2	D1	D0	Voltage Control OP-Amp Input Voltage	Voltage Ratio
0	0	0	0	0 V	10
0	0	0	1	0.4 V	1
0	0	1	0	0.8 V	2
0	0	1	1	1.2 V	3
0	1	0	0	1.6 V	4
0	1	0	1	2.0 V	5
0	1	1	0	2.4 V	6
0	1	1	1	2.8 V	7
1	0	0	0	3.2 V	8
1	0	0	1	3.6 V	9
1	0	1	0	4.0 V	10
1	0	1	1	4.4 V	11
1	1	0	0	4.8 V	12

Note: Output port of MCU can be used to control the voltage and current settings.
4.0 V is selected at RESET.

Table 3 LED Driver Select

D2	D1	D0	LED3	LED2	LED1
0	0	0	OFF	OFF	OFF
0	0	1	OFF	OFF	ON
0	1	0	OFF	ON	OFF
0	1	1	OFF	ON	ON
1	0	0	ON	OFF	OFF
1	0	1	ON	OFF	ON
1	1	0	ON	ON	OFF
1	1	1	ON	ON	ON

Table 4 Main SW

D1	D0	SW1	SW2
0	0	OFF	OFF
0	1	OFF	ON
1	0	ON	OFF
1	1	Not select	

Table 5 Sub SW

D0	SW
0	OFF
1	ON

Table 6 Amp. Select

D1	D0	State
0	0	Select Amp1 output
0	1	Select Amp2 input
1	0	Select Amp2 output

Note: Amp1 output is selected at RESET.

Table 7 A/D Input Select

D1	D0	State
0	0	Select input 1
0	1	Select input 2
1	0	Select input 3
1	1	Select input 4

Note: Input 1 is selected at RESET.

Table 8 A/D Reference Voltage Select

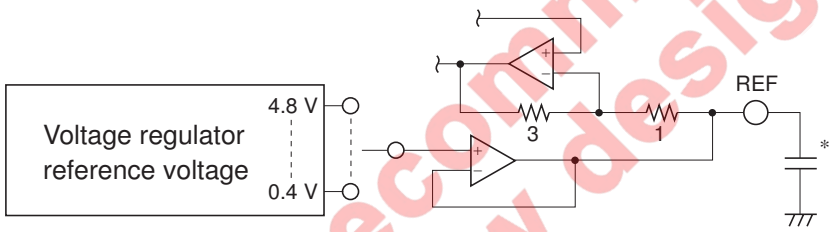
D3	D2	D1	D0	State
0	0	0	0	Select 0 V
0	0	0	1	Select 0.4 V
0	0	1	0	Select 0.8 V
0	0	1	1	Select 1.2 V
0	1	0	0	Select 1.6 V
0	1	0	1	Select 2.0 V
0	1	1	0	Select 2.4 V
0	1	1	1	Select 2.8 V
1	0	0	0	Select 3.2 V
1	0	0	1	Select 3.6 V
1	0	1	0	Select 4.0 V
1	0	1	1	Select 4.4 V
1	1	0	0	Select 4.8 V

Note: 0.4 V is selected at RESET.

Note: All outputs will be OFF at RESET.

Function Block Descriptions

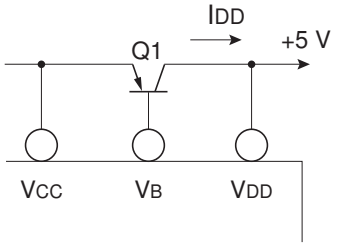
(1) A/D converter input



Note: Connect few 1000 pF capacitor to stabilize the reference voltage.

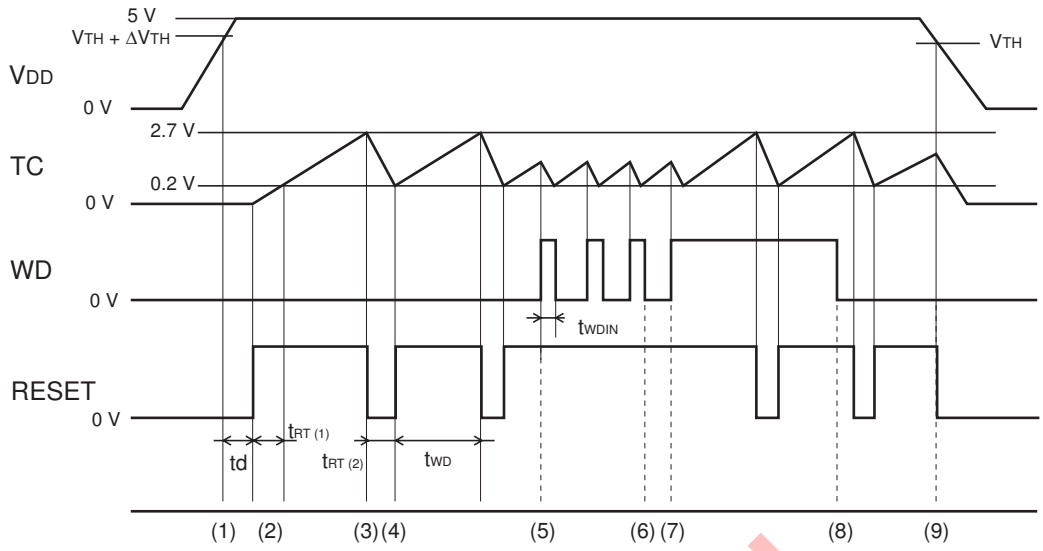
Select the desire reference voltage to be detected by serial data from the MCU.
The input voltage level of IN1 to IN4 will be magnified 4 times using selected reference voltage as a center. This magnified data will be return to the A/D input port of the MCU. As result, accuracy of the A/D converter of the MCU will be increased by 2-bit.

(2) +5 V voltage regulator



Since it is capable of driving external PNP Tr. base up to 20 mA, it can supply current of $I_{DD\ MAX}$ = 20 mA × Q1h_{FE}.
Also, since this is low I/O type power source, it can operate $V_{CC\ MIN} = V_{CC} - V_{DD}$ = 0.1 V.

(3) Watchdog timer



(1) When V_{DD} reaches 4.75 V (V_{TH1} + ΔV_{TH1}); after fixed amount of time (td), Reset pin outputs "High" and begin charging of the capacitor connected TC pin.

(2) (3) When TC pin reaches 2.7 V ($V_{TH2\ (H)}$); the capacitor connected TC pin begin discharge, and the Reset pin outputs "Low". During the Reset outputs "High" for the first time; the time of charge will be t_{WD} + $t_{RT\ (1)}$, since TC pin begin charging its capacitor starting from 0 V.

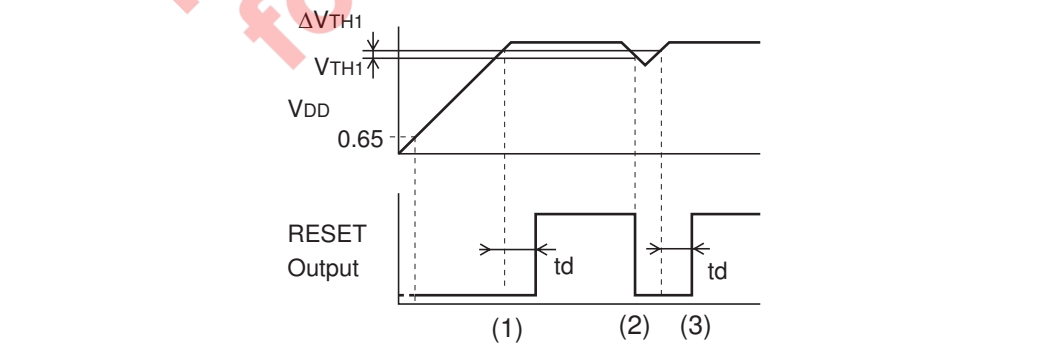
(4) When TC pin drops to 0.2 V ($V_{TH2\ (L)}$); the Reset will outputs "High" again. At same time, TC pin will begin charging again. Unless correct clock input is given to WD pin, the TC pin will repeats the charging from 0.2 V to 2.7 V, and the Reset will also repeats "High" during the t_{WD} cycle, and "Low" during $t_{RT\ (2)}$ cycle.

(5) (6) When correct clock input is given to WD pin before TC pin reaches 2.7 V, the Reset holds "High" output.

(7) (8) When incorrect clock is given to WD pin, the TC pin will repeats the charging from 0.2 V to 2.7 V, and the Reset will also repeats "High" during the t_{WD} cycle, and "Low" during $t_{RT\ (2)}$ cycle.

(9) When V_{DD} drops down to 4.25 V (V_{TH1}), the Reset circuit will function, and it will output "Low" to Reset pin and TC pin changes to discharging state.

(4) Reset circuit



(1) When V_{DD} reaches 4.75 V (V_{TH1} + ΔV_{TH1}), the Reset outputs "High" after fixed amount of time (td).

(2) When V_{DD} drops below 4.25 V (V_{TH1}), the Reset outputs "Low".

(3) When V_{DD} reaches 4.75 V (V_{TH1} + ΔV_{TH1}) again, the Reset outputs "High" after fixed amount of time (td). Also, Reset output will be "Low" until V_{DD} reaches 0.65 V (Typ).

Word Description:

td: The time after V_{DD} reaching Reset release voltage to "High" Reset output.

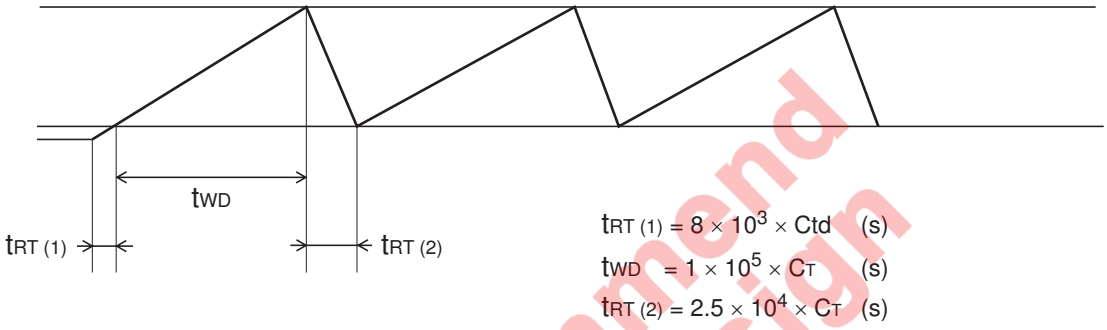
$t_{RT\ (1)}$: The time TC pin voltage changes from 0 V to $V_{TH2\ (L)}$, when V_{DD} is given.

t_{WD}: The time TC pin voltage changes from $V_{TH2\ (L)}$ to $V_{TH2\ (H)}$.

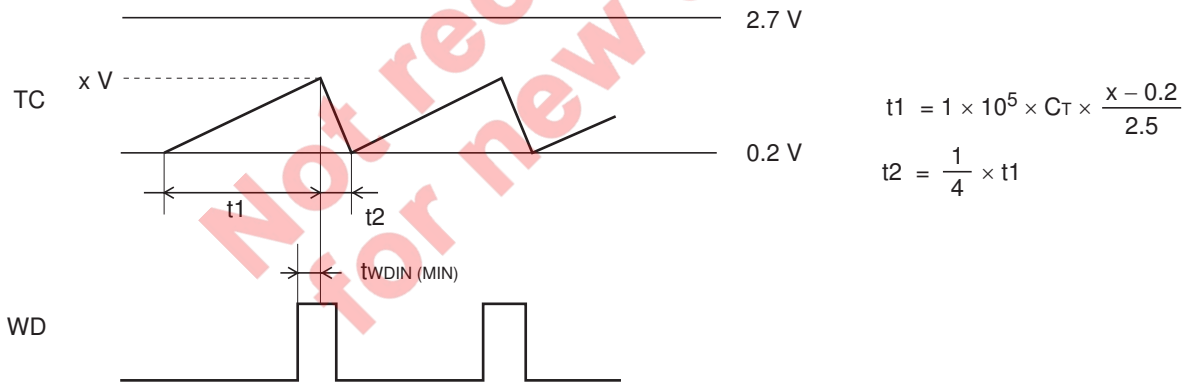
$t_{RT\ (2)}$: The time TC pin voltage changes from $V_{TH2\ (H)}$ to $V_{TH2(L)}$.

1. Regarding the pin 25 (Ctd pin) capacity and the delay time (td)
   The delay time (td) of Reset output can be found using following equation.
   $td = 2 \times 10^5 \times Ctd \quad (s)$

2. Regarding charge and discharge of pin 27 (TC pin)
   When incorrect clock is given to the WD pin, the voltage level of TC pin will be changed as show below.

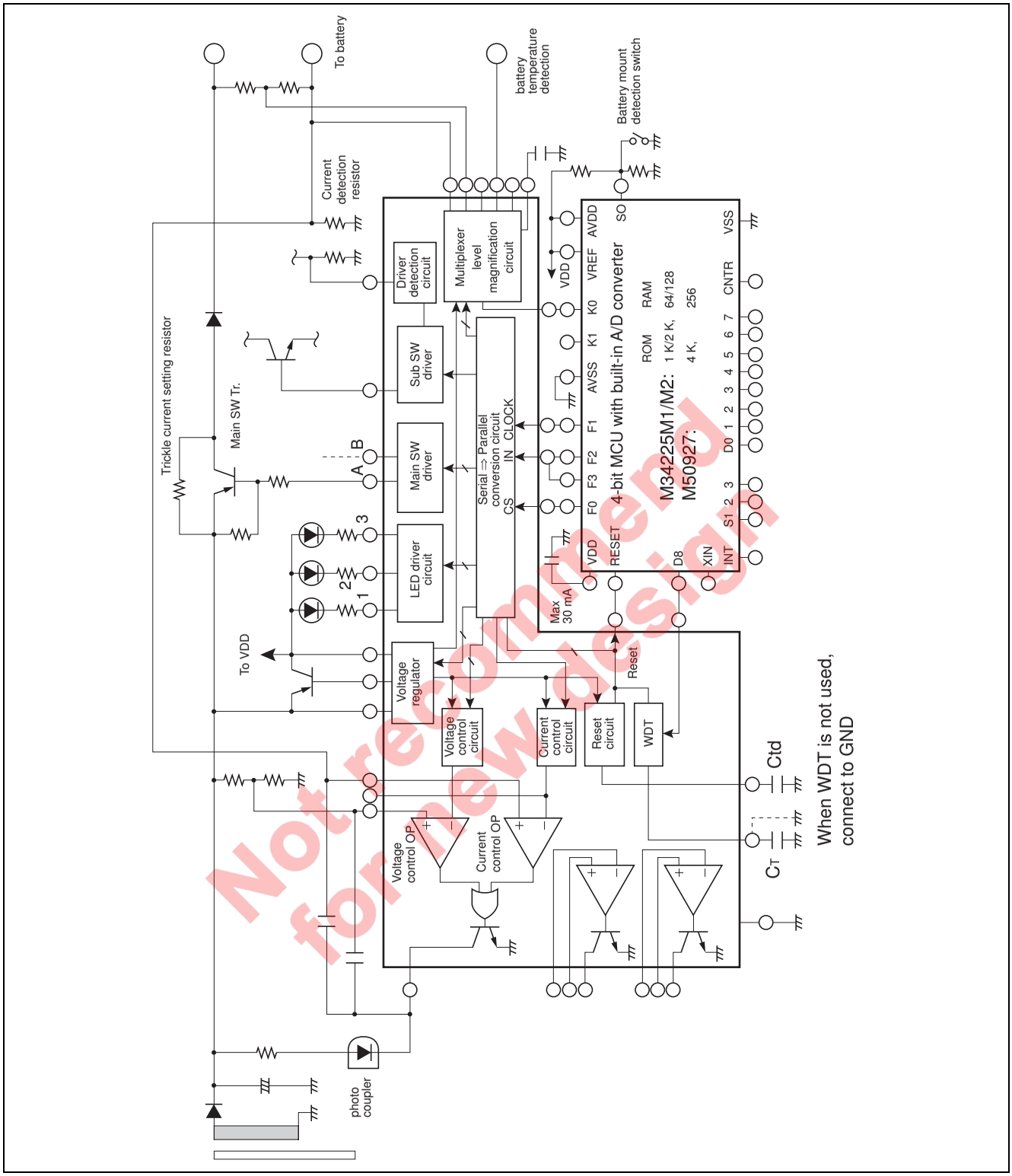


3. Regarding the input clock, input pulse width, charging time, and discharging time of pin 26 (WD pin)
   When correct clock is given to the WD pin, the voltage level of TC pin will be changed as show below.



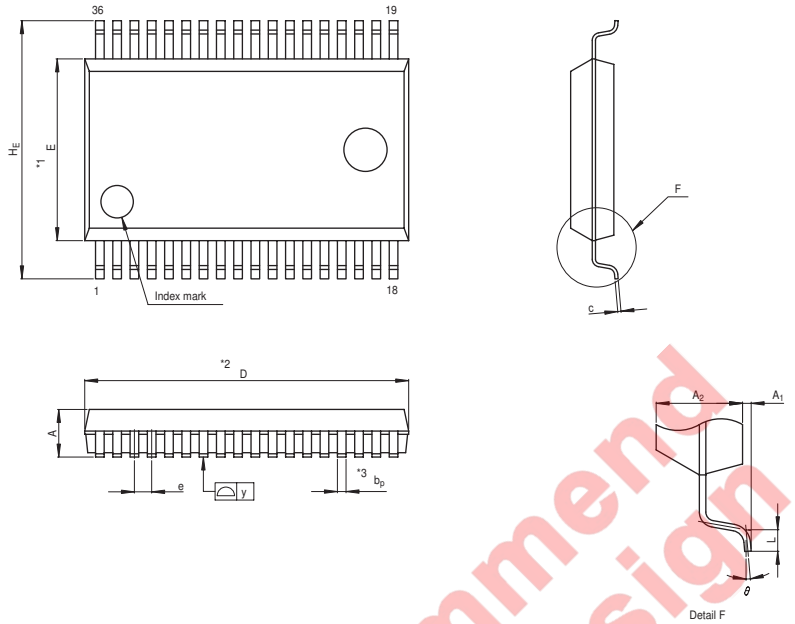
Please, set the pulse width (t_{WDIN}) more than $t_{WDIN\ (MIN)}$.

Application Example of M62254FP



Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SSOP36-8.4x15-0.80	PRSP0036GA-A	36P2R-A	0.5g



NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	14.8	15.0	15.2
E	8.2	8.4	8.6
A_2	—	2.0	—
A	—	—	2.4
A_1	0.05	—	—
b_p	0.35	0.4	0.5
c	0.13	0.15	0.2
θ	0°	—	10°
H_E	11.63	11.93	12.23
e	0.65	0.8	0.95
y	—	—	0.15
L	0.3	0.5	0.7

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