



# LA5619M

## Lead Battery Charger IC with Battery Voltage Detection Function

### Overview

The LA5619M is a single-chip IC that integrates a battery voltage detection function and a lead battery charger to support compact sets.

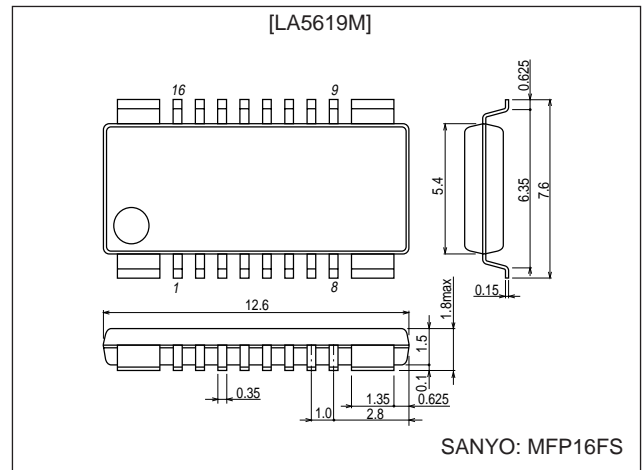
### Functions

- Charge voltage can be switched between cycle voltage and trickle voltage (4.9 V typ. → 4.6 V typ.).
- Charge current limit can be set with an external resistor (125 mA typ.).
- Built-in charge current detection circuit
- Built-in battery voltage detection circuit

### Package Dimensions

unit: mm

#### 3097-MFP16FS



### Specifications

#### Maximum Rating at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$ max		15	V
Battery pin voltage	$V_{\text{Battery max}}$		6	V
Allowable power dissipation	$P_d$ max		0.7	W
Operating temperature	$T_{opr}$		-20 to +80	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-30 to +125	$^\circ\text{C}$

#### Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$		5.5 to 14.5	V
Battery pin voltage	$V_{\text{Battery IN}}$		0 to 5.5	V
CHARGE LED sink current	$I_{\text{CHG-LED}}$		0 to 40	mA
DET.LED sink current	$I_{\text{DET-LED}}$		0 to 40	mA
$V_{\text{BAT}}$ sink current	$I_{\text{BAT-LED}}$		0 to 40	mA

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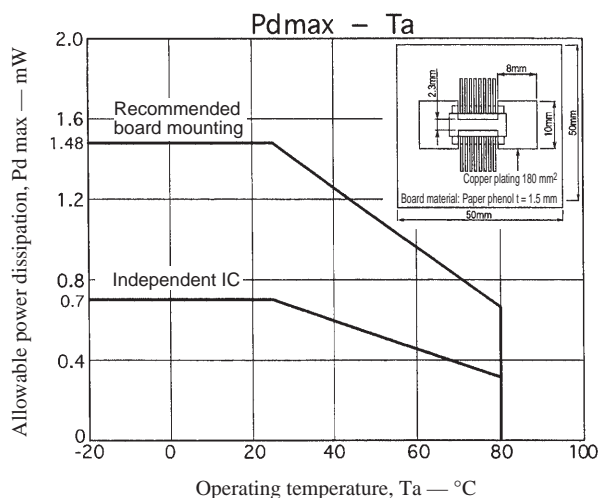
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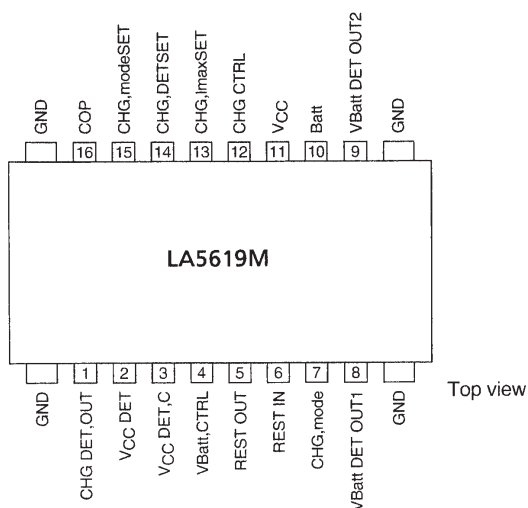
# LA5619M

## Operating Characteristics at Ta = 25°C, VCC = 9 V, Batt. IN = 4 V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
<b>[Charge System]</b>						
Charge voltage (when trickle is selected)	V <sub>O1</sub>	I <sub>O</sub> = 10 mA	4.4	4.6	4.7	V
Charge voltage (when cycle is selected)	V <sub>O2</sub>	I <sub>O</sub> = 50 mA	4.7	4.9	5.0	V
Differential charge voltage	V <sub>dif</sub>	ΔV <sub>O</sub> = V <sub>O2</sub> - V <sub>O1</sub>	0.2	0.3	0.4	V
Cycle → trickle switching current	I <sub>CT1</sub>		20	23	26	mA
Trickle → cycle switching current	I <sub>CT2</sub>		35	41	47	mA
Output peak current	I <sub>OP</sub>	R <sub>L</sub> = 33 Ω	112.5	125	137.5	mA
Line regulation (when trickle is selected)	V <sub>OLN1</sub>	V <sub>CC</sub> = 8 to 14.5 V, I <sub>O</sub> = 10 mA		50	100	mV
Line regulation (when cycle is selected)	V <sub>OLN2</sub>	V <sub>CC</sub> = 8 to 14.5 V, I <sub>O</sub> = 50 mA		100	150	mV
Load regulation (when trickle is selected)	V <sub>OLD1</sub>	I <sub>O</sub> = 0.5 to 30 mA		50	100	mV
Load regulation (when cycle is selected)	V <sub>OLD2</sub>	I <sub>O</sub> = 50 to 60 mA		100	150	mV
Current drain	I <sub>CC1</sub>	I <sub>O</sub> = 0 mA		6	10	mV
	I <sub>CC2</sub>	I <sub>O</sub> = 50 mA (I <sub>CC2</sub> includes I <sub>O</sub> )		65	73	mA
	I <sub>CC3</sub>	R <sub>L</sub> = 33 Ω (I <sub>CC3</sub> includes I <sub>O</sub> )		155	175	mA
CHG DET, OUT remaining voltage	V <sub>CHG-LED</sub>	I <sub>IN</sub> = 40 mA		1.1	1.3	V
CHG DET, OUT leak voltage	I <sub>CHG-LED</sub>	V <sub>IN</sub> = 9 V			200	nA
CHARGE detection current	I <sub>CHG-DET1</sub>	on → off	0.15	0.25	0.35	mA
	I <sub>CHG-DET2</sub>	off → on	0.8	1.0	1.2	mA
VCC DET remaining voltage	V <sub>DET</sub>	I <sub>IN</sub> = 40 mA		1.1	1.3	V
VCC DET leak voltage	I <sub>DET</sub>	V <sub>IN</sub> = 9 V			200	nA
VCC DET detection voltage	V <sub>CC-DET</sub>		4.95	5.2	5.3	V
VCC DET hysteresis width	V <sub>CC-DET, HYS</sub>		0.05	0.1	0.2	V
<b>[Battery System]</b>						
Battery detection voltage	V <sub>Batt</sub>		3.17	3.3	3.43	V
V <sub>Batt</sub> DET OUT1 pin's remaining voltage	V <sub>BAT-OUT1</sub>	I <sub>IN</sub> = 40 mA		0.3	0.5	V
V <sub>Batt</sub> DET OUT1 pin's leak current	I <sub>BAT-OUT1</sub>	V <sub>IN</sub> = 5 V			200	nA
Current drain when detection circuit is off	I <sub>OFF</sub>	batt = 2.5 V		5	6	μA
Current drain when detection circuit is on	I <sub>ON</sub>	No load		350	500	μA
Current drain during Battery SAVE	I <sub>SAVE</sub>	V <sub>Batt CTRL</sub> = 4 V		20	30	μA
V <sub>Batt</sub> DET OUT2 pin's remaining voltage	V <sub>BAT-OUT2</sub>	I <sub>IN</sub> = 40 mA		1.1	1.3	V
<b>[Internal Transistors for Reset]</b>						
REST OUT remaining voltage	V <sub>REST</sub>	REST.IN = 2 μA, I <sub>IN</sub> = 50 μA		0.3	0.5	V
REST OUT leak current	I <sub>REST</sub>	V <sub>IN</sub> = 5 V			200	nA
<b>[V<sub>Batt CTRL</sub> Pin]</b>						
Threshold voltage	V <sub>Batt-CTRL</sub>		1.10	1.27	1.50	V
V <sub>Batt CTRL</sub> pin input current	I <sub>Batt-CTRL</sub>	V <sub>IN</sub> = 4 V		17	24	μA

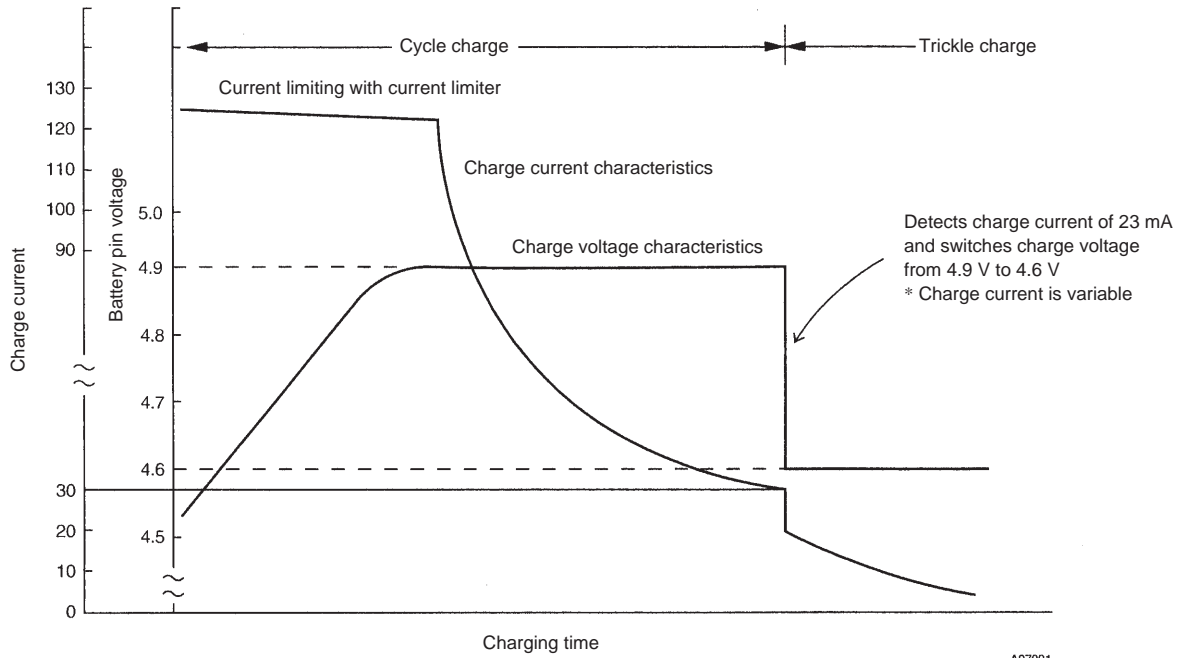


## Pin Assignment



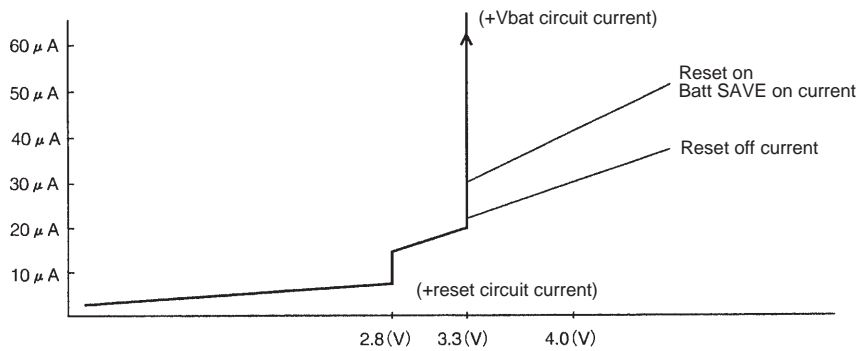
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Battery Charger Charging Characteristics



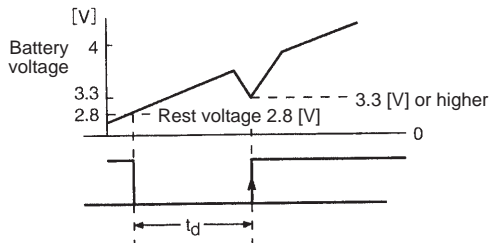
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Current Drain Characteristics



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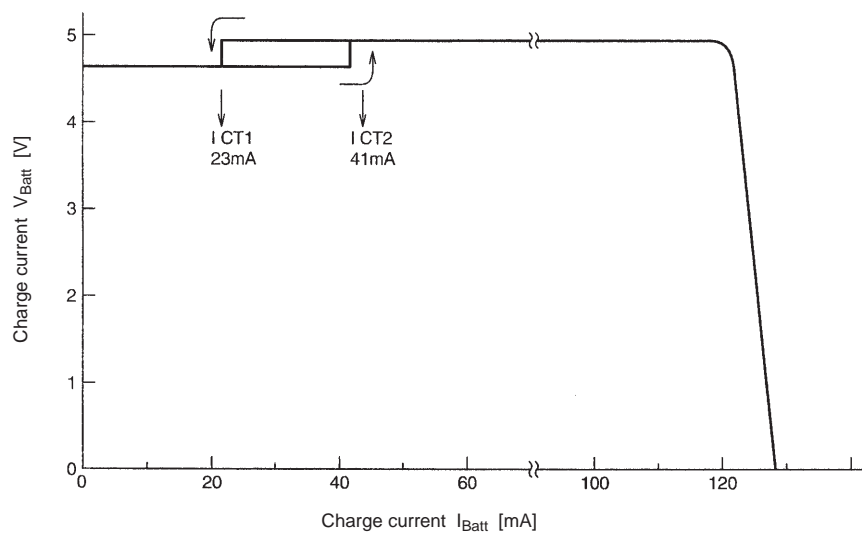
Relationship between Reset and Battery Circuit



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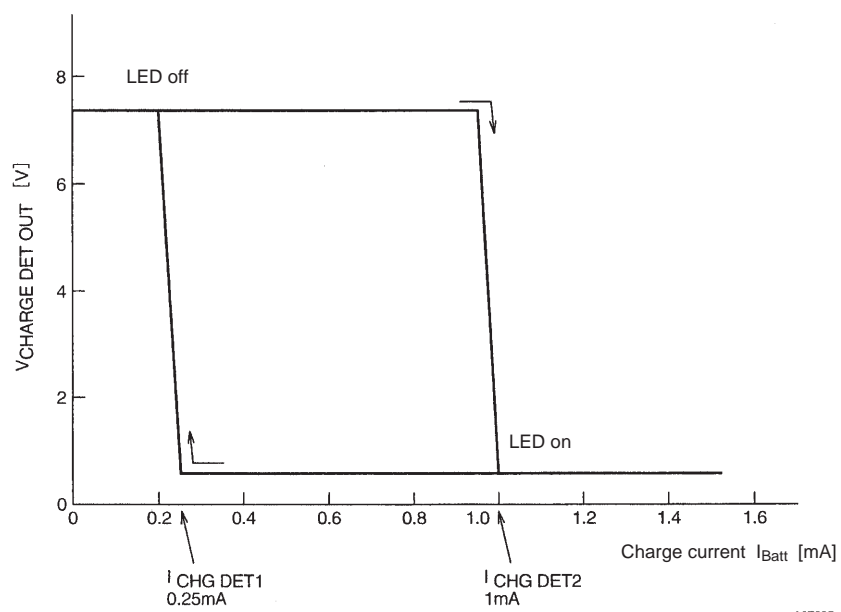
The  $V_{Batt}$  circuit operates at the edge where the reset voltage becomes Hi. (At this time, the output transistors are set on and the load is put on; If this voltage is 3.3 [V] or higher, the  $V_{Batt}$  circuit operates, and if it is lower than 3.3 [V], it does not start up.

Cycle ↔ Trickle Switching Hysteresis



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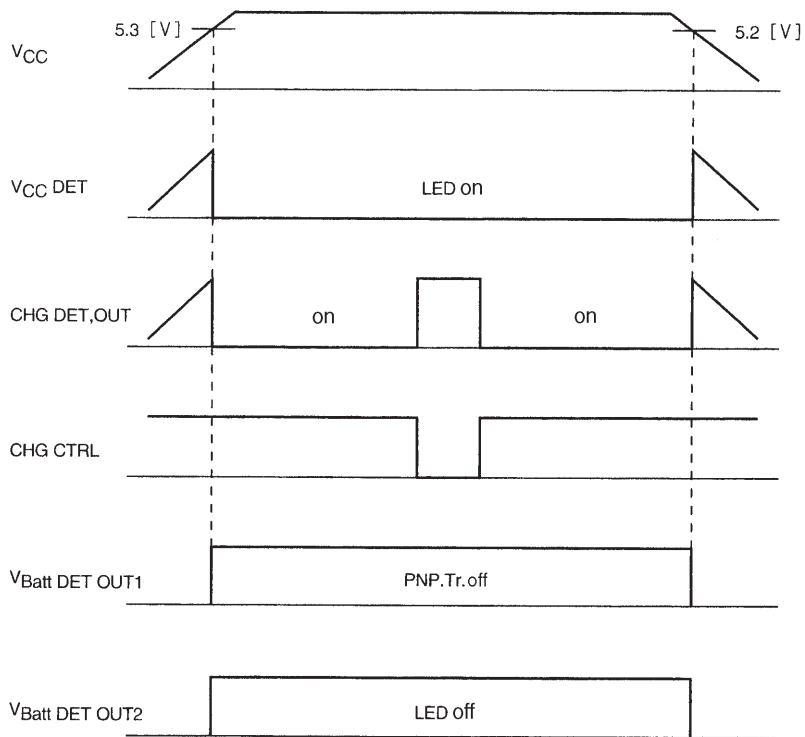
Charge Detection Hysteresis



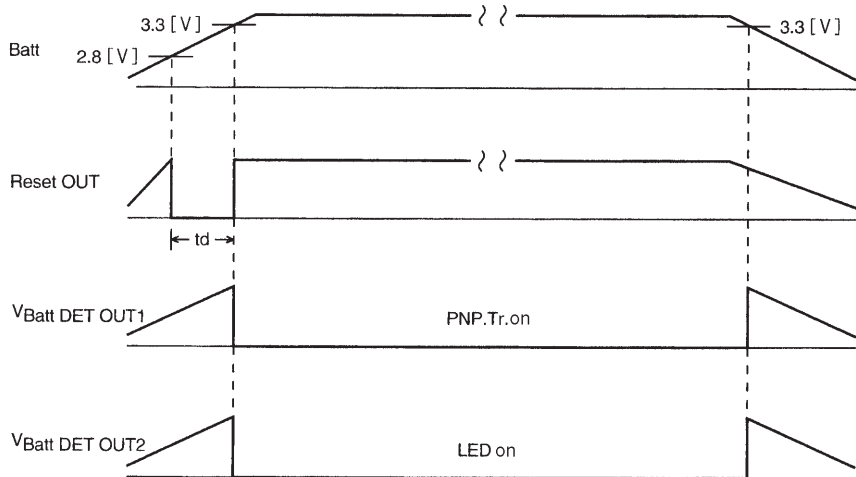
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Timing Charts

(Battery provided)

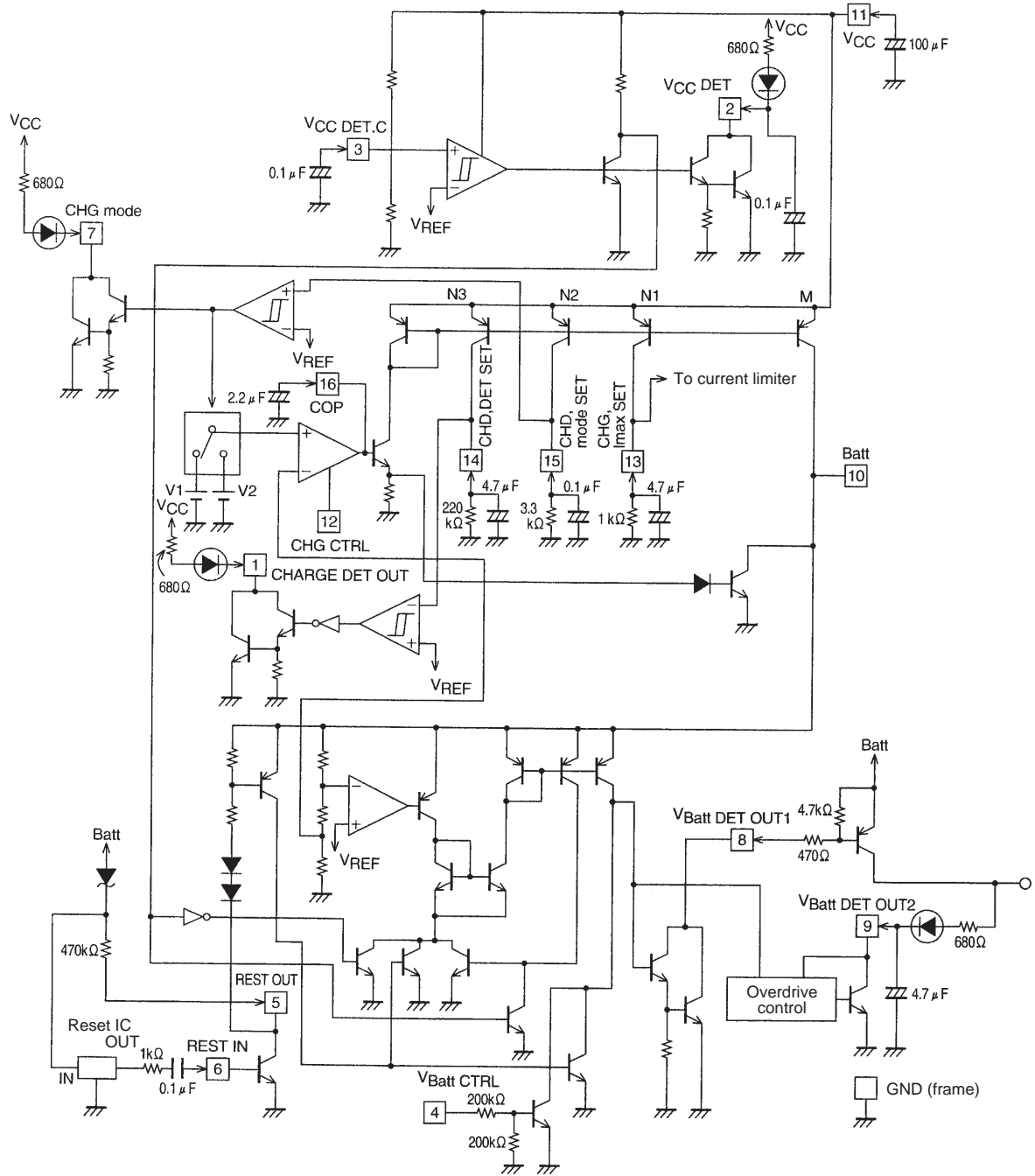


(Battery only)



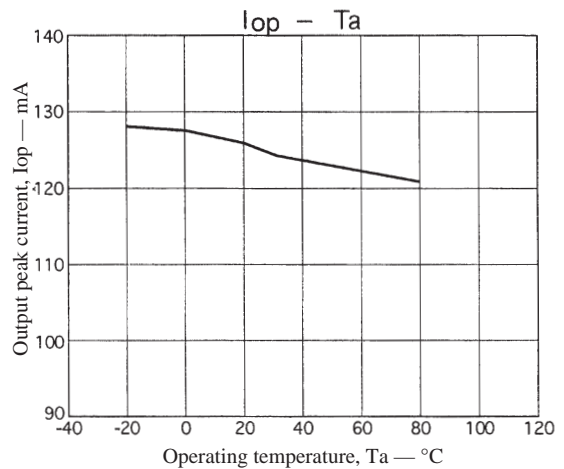
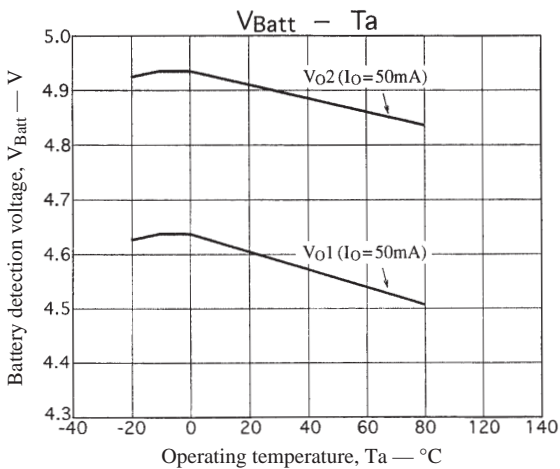
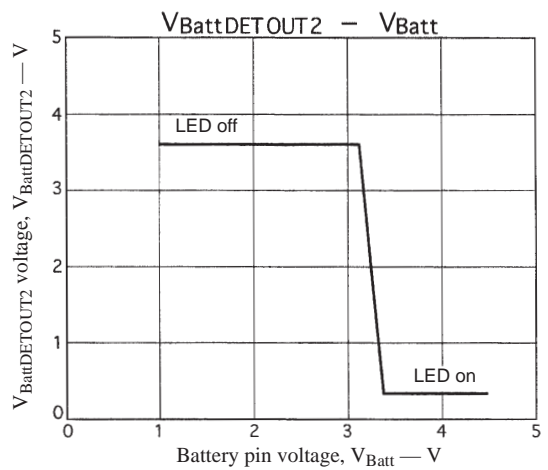
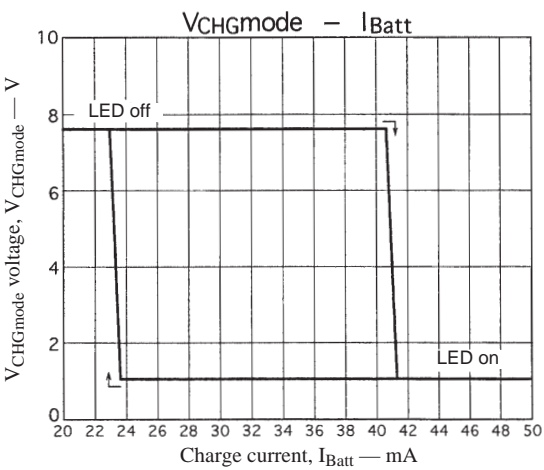
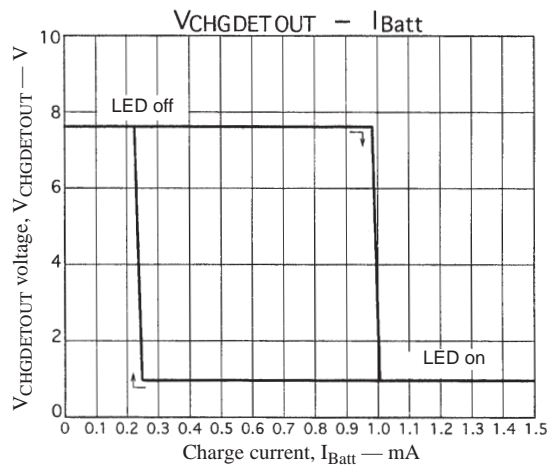
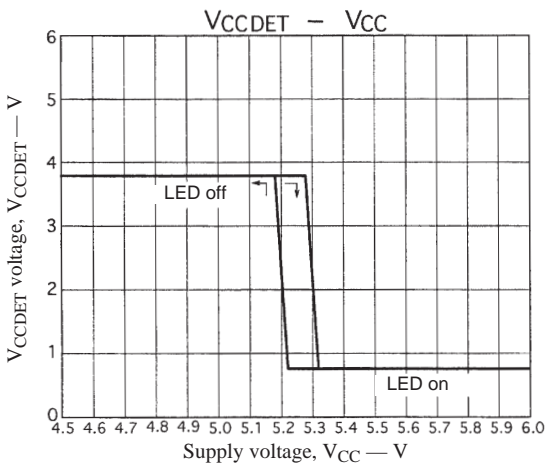
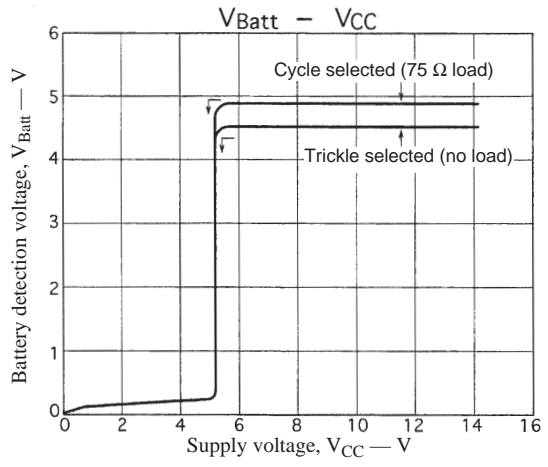
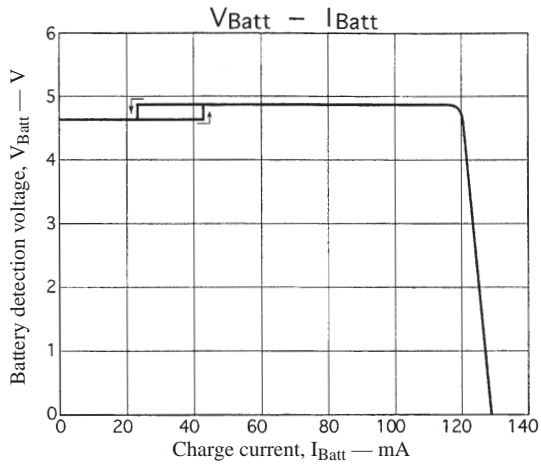
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Block Diagram



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- Notes: 1. Use capacitors with little temperature-related capacitance fluctuation.  
 2. Do not provide capacitors to the Batt pin (Pin 10)  
 3. The reset IC must be provided externally.



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