

**DC-DC PFM Mode Buck(Step-down)
Single-Cell Ni-Mh Battery Charger**

Description

FH53600 is a fixed off-time PFM mode step-down battery charge management chip with operating voltage range between 2.7V to 6.5V. It is specially designed for single-cell Ni-Mh battery charge management with fewer external components.

FH53600 adopts constant current and maintenance mode to charge battery.

On power up, FH53600 enters constant current charging mode, the on-chip P-channel MOSFET is turned on, inductor current rises. When inductor current reaches upper threshold, the P-channel MOSFET is turned off, a low-side switch is turned on, inductor is discharged, then the P-channel MOSFET is turned on again after 2.0us off time. When battery voltage rises to 1.36V(Typ.), FH53600 enters maintenance mode, in which the inductor current's upper threshold is reduced, in the meantime a timer is started. The charge process will not be terminated until the time out occurs or battery voltage reaches its highest value. In termination mode, the P-channel MOSFET is turned off, there is no current flowing into battery. When BAT pin voltage falls below recharge threshold, the FH53600 enters charge mode again. FH53600 switching frequency can be up to 500KHz, which makes a small-profile inductor usable.

The other features include 2 open-drain status indications, chip over temperature protection, inductor current's upper threshold selection, etc.

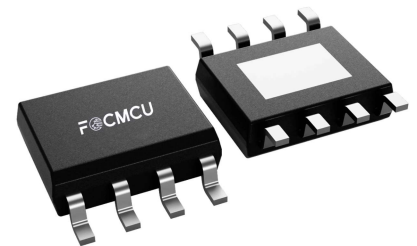
FH53600 is available in thermally-enhanced 8-pin ESOP package.

Features

- Input Voltage Range: 2.7V to 6.5V
- Operating Current: 320uA@VIN=5.0V
- Suitable for Solar Panel-Powered Applications
- Switching Frequency up to 500KHz
- Maintenance Charge Mode to Guarantee Fully-charged battery
- Selectable Upper Threshold of Inductor Current
- Charging terminated by timer or battery voltage
- Automatic Recharge
- Automatic Adaptability to Input Supply with Limited Driving Capability
- Battery Overvoltage Protection
- Chip Over Temperature Protection
- Two Open drain Status Indications
- Operating Temperature: -40°C to 85°C
- Available in ESOP-8L Package
- Lead-free, RoHs-Compliant and Halogen free

Applications

- Toys
- Car Models
- Flashlight
- Standalone NIMH Battery Charger



ABSOLUTE MAXIMUM RATINGS

VIN and ISEL Voltage	- 0.3V to 7.0V
BAT Voltage	- 0.3V to VIN
$\overline{\text{CHRG}}$ and $\overline{\text{DONE}}$ Voltage	- 0.3V to VIN
SW and CT Voltage	- 0.3V to VIN

Maximum Junction Temperature	150°C
Operating Temperature Range	-40°C to 85°C
Storage Temperature	-65°C to 150°C
Lead Temperature(Soldering, 10s)	260°C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied.

Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Typical Application Circuit

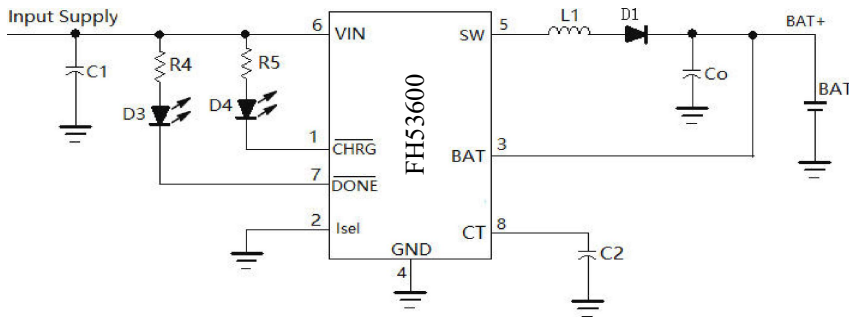
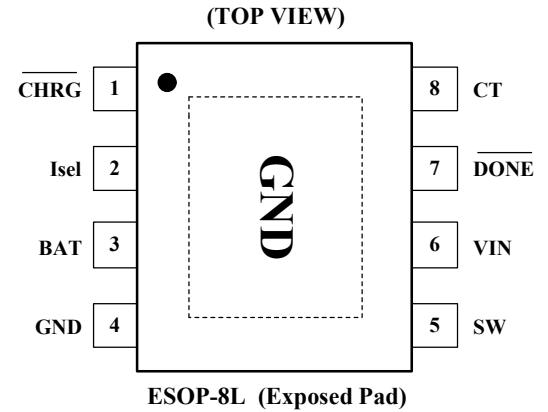


Figure 1. Typical Application Circuit

Pin Assignment

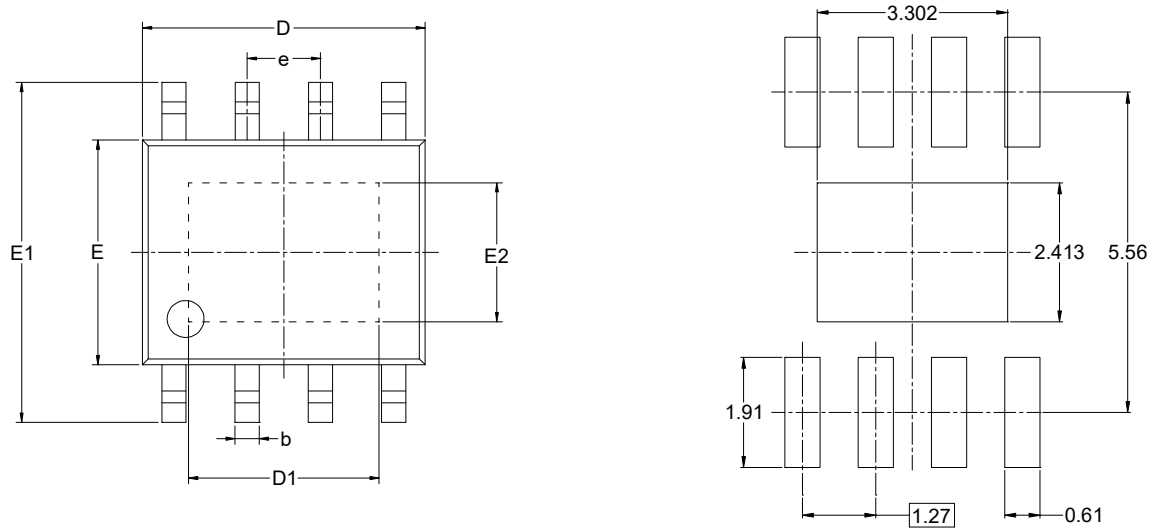


Pin Description

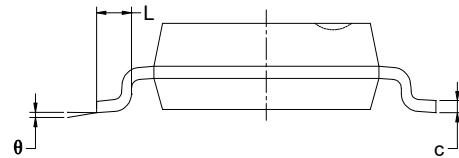
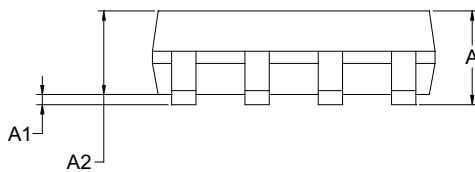
No.	Symbol	Description
1	$\overline{\text{CHRG}}$	Open-Drain Charge Status Output. When the battery is being charged, this pin is pulled low by an internal switch. Otherwise this pin is in high impedance state.
2	Isel	The Selection Pin of Upper Threshold of Inductor Current. A high input will set the upper threshold of inductor current (i_{peak}) in constant current mode at 1.19A (Typical); A low input will set the upper threshold of inductor current in constant current mode at 0.62A. The Isel pin can be driven by TTL or CMOS logic level.
3	BAT	Battery Positive Terminal Input. Battery voltage is feedback to the FH53600 through this pin. The FH53600 determines the charge mode based on the BAT pin voltage.
4	GND	Ground. The negative terminal of input supply and battery.
5	SW	Inductor Connection Pin. The inductor is tied to this pin. Internally SW pin is connected to a P-Channel MOSFET and an N-Channel MOSFET.
6	VIN	Positive Terminal of Input Supply. FH53600's internal circuit is powered by this pin.
7	$\overline{\text{DONE}}$	Open-Drain Termination Status Output. When the charging is terminated, this pin is pulled low by an internal switch. Otherwise this pin is in high impedance state.
8	CT	Timing Capacitor Connection Input. The timing capacitor should be connected between CT pin and GND. The timing function is started once FH53600 enters maintenance mode, and the timing time is determined by the following equation: $t_{\text{timing}} = 12.18 \times 10^9 \times C2 \quad (\text{s})$ Where C2 is the capacitance of capacitor C2 in Figure.1.

Package Information

- Type: ESOP-8L (Exposed Pad)



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.700		0.067
A1	0.000	0.100	0.000	0.004
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Ordering Information

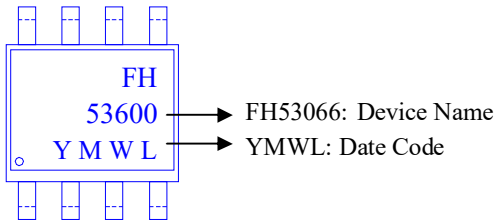
Part Number	Voltage Range	Features	Operating Temperature	Package Type	Top Mark	SPQ
FH53600S8	2.7V ~ 6.5V	<ul style="list-style-type: none"> • PFM mode buck(step-down) • Sing-cell Ni-Mh battery • Switch frequency 500KHz • Iout: Up to 1.19A(Continuous) 	-40°C to 85°C	ESOP-8L	FH53600 Y.M.W.L	4000PCS/Reel

Note:

- **FH53600** devices are Pb-free and RoHs compliant.
- The surface prints of our semiconductor devices are subject to change during the production process and do not involve changes in electrical parameters, and we will not separately state the notice.
- If you have any other custom purchase needs, please contact our sales department.



Device Name: PSOP-8



ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.



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