

OVERVIEW

The SM6781BV is a quick charge control IC for Nickel Metal Hydride (NiMH) and Nickel-Cadmium (NiCd) rechargeable batteries. Quick charging ends in response to negative delta voltage detection ($-\Delta V$) and maximum charging time detection functions. Also, quick charge mode is placed on hold if the battery voltage becomes abnormal, until normal conditions are restored. The SM6781BV requires few external components to realize a high-stability quick charge battery charger.

FEATURES

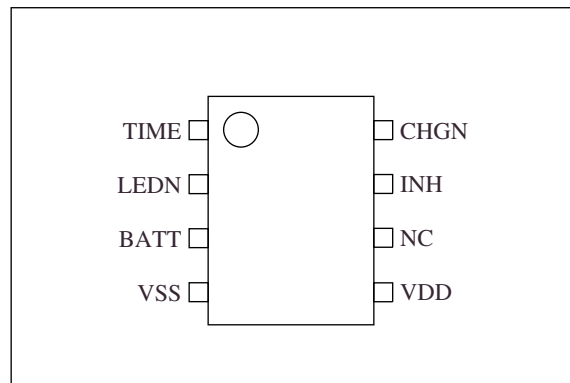
- Ni-MH/Ni-Cd battery quick charge control
- $-\Delta V$ and maximum charge time cutoffs
- 15min (typ) $-\Delta V$ detection invalid time
- -4mV (typ) $-\Delta V$ detection accuracy
- Inhibit function
- Charge condition LED indicator output (on, pulsed, off)
- Low power dissipation standby mode ($< 1\mu\text{A}$)
- 8-pin VSOP package

ORDERING INFORMATION

Device	Package
SM6781BV	8-pin VSOP

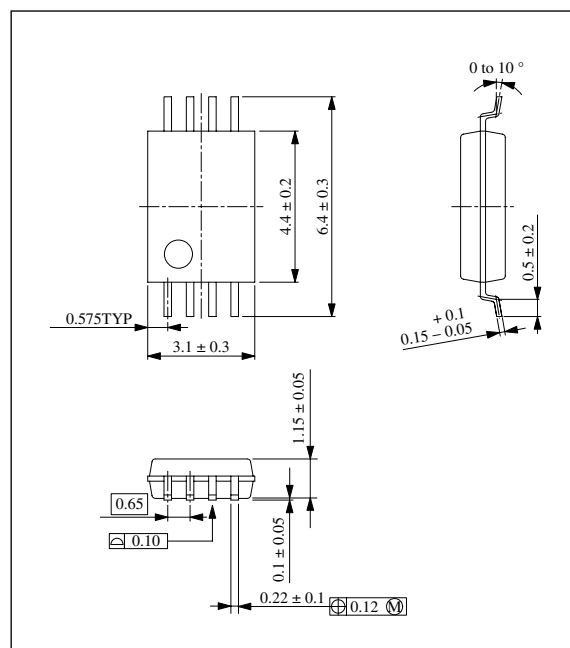
PINOUT

(Top view)

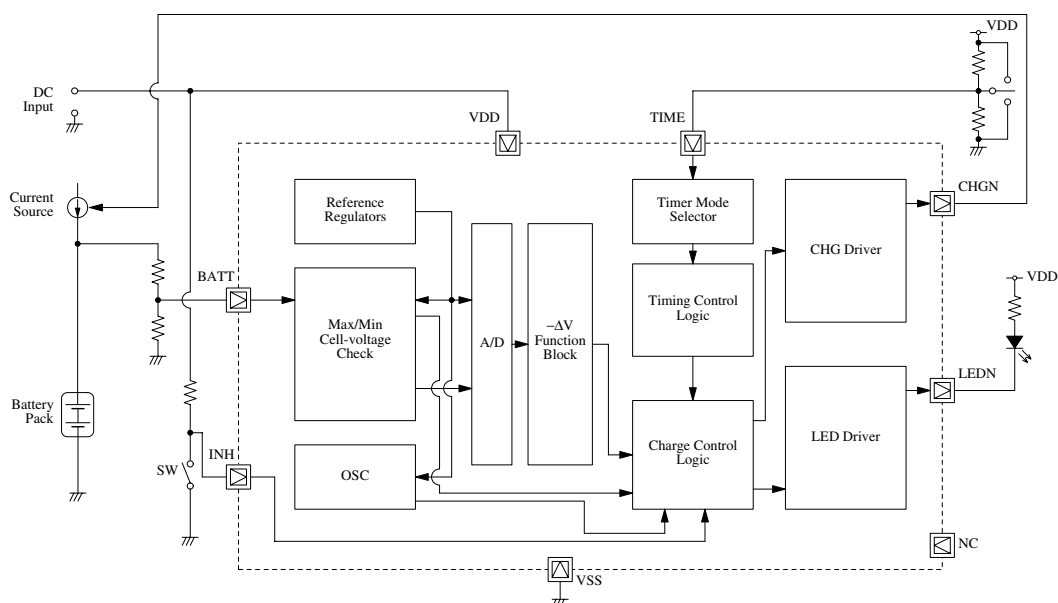


PACKAGE DIMENSIONS

(Unit: mm)



BLOCK DIAGRAM



PIN DESCRIPTION

Number	Name	I/O	Description
1	TIME	I	Timer mode select input (3-level) HIGH and LOW levels applied using pull-up and pull-down, respectively. MID-level is applied using a voltage divider resistor network with voltage VDD/2.
2	LEDN	O	Charge status display LED driver output (open-drain output) LOW-level output in quick charge mode. 1Hz pulse output when abnormal battery voltage is detected during quick charge or when INH is HIGH. High impedance when charging finishes.
3	BATT	I	Battery voltage detector input. Connect a high-impedance resistor voltage divider between the poles of the battery for voltage detection.
4	VSS	-	Ground
5	VDD	-	Supply
6	NC	-	No connection (must be open)
7	INH	I	Charge inhibit input Charging operation is stopped when HIGH. Charging recommences with the same charging parameters when INH goes LOW again.
8	CHGN	O	Charge control (open-drain output) High impedance output when charging current is flowing. LOW-level output when charging current stops.

SPECIFICATIONS

Absolute Maximum Ratings

$$V_{SS} = 0V$$

Parameter	Symbol	Condition	Rating	Unit
Supply voltage range	V_{DD}		- 0.3 to 7.0	V
Input voltage range	V_{IN}		- 0.3 to 7.0	V
Storage temperature range	T_{stg}		- 55 to 125	°C
Operating temperature range	T_{opr}		- 25 to 85	°C
Power dissipation	P_D		150	mW

DC Characteristics 1

$$V_{DD} = 4.0 \text{ to } 5.5V, V_{SS} = 0V, T_a = 25^\circ C$$

Parameter	Symbol	Condition	Rating	Variation	Unit
Minimum battery voltage	V_{MNV}	$V_{BATT} < V_{MNV}$ quick charge cutoff or prohibition	0.6	± 0.2	V
Maximum battery voltage	V_{MXV}	$V_{BATT} > V_{MXV}$ quick charge cutoff or prohibition	2.0	± 0.1	V

DC Characteristics 2

$$V_{DD} = 4.0 \text{ to } 5.5V, V_{SS} = 0V, T_a = 0 \text{ to } 85^\circ C \text{ unless otherwise noted.}$$

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
VDD supply voltage	V_{DD}		4.0	5.0	5.5	V
BATT input voltage	V_{BATT}		0	-	V_{DD}	V
INH HIGH-level input voltage	V_{IH1}		$V_{DD} - 0.5$	-	-	V
INH LOW-level input voltage	V_{IL1}		-	-	0.5	V
TIME HIGH-level input voltage	V_{IH2}		$V_{DD} - 0.5$	-	-	V
TIME MID-level input voltage	V_{IM}		$(V_{DD}/2) - 0.5$	-	$(V_{DD}/2) + 0.5$	V
TIME LOW-level input voltage	V_{IL2}		-	-	0.5	V
BATT $-\Delta V$ detection voltage range	V_{DET}		1	-	2	V
LEDN output pulse frequency	f_{LED}		-	1	-	Hz
BATT standby voltage	V_{STB}		$V_{DD} - 1.5$	-	$V_{DD} - 0.5$	V
VDD current consumption	I_{DD}	$V_{DD} = 5V, \text{ no load}$	-	-	0.5	mA
VDD standby current	I_{STB}	$V_{DD} = 5V, V_{BATT} = V_{DD}, \text{ no load}$	-	-	1	μA
LEDN, CHGN sink current	I_{OL}	$V_{OL} = V_{SS} + 0.8V$	10	-	-	mA
INH, TIME input leakage current	I_L	$V_{INH} = V_{TIME} = V_{SS} \text{ to } V_{DD}$	-	-	± 1	μA
LEDN, CHGN output leakage current	I_{OZ}		- 5	-	-	μA

Maximum Quick Charging Time $V_{DD} = 5V, T_a = 25^{\circ}C$

TIME pin	min	typ	max	Unit
HIGH	192	240	288	min
MIDDLE	96	120	144	min
LOW	64	80	96	min

– ΔV Detection Voltage $V_{DD} = 5V, T_a = 25^{\circ}C$

	min	typ	max	Unit
– ΔV detection voltage	–	–4	–	mV

– ΔV detection prohibit time $V_{DD} = 5V, T_a = 25^{\circ}C$

	min	typ	max	Unit
– ΔV detection prohibit time	720	900	1080	sec