

Features

- Fast charge and conditioning of nickel cadmium or nickel-metal hydride batteries
- Supports logic-level-controlled low-power mode ($< 5\mu\text{A}$ standby current)
- Optional peak voltage detect (PVD) fast-charge termination
- Flexible current regulation:
 - Frequency-modulated switching current regulator
 - Gating control for use with external regulator
- 150-mil SOIC is ideal for integration into portable systems
- Pre-charge qualification for temperature and voltage faults
- Programmable LED outputs display battery and charge status
- Fast charge termination by Δ temperature/ Δ time, $-\Delta V$ or peak voltage, and maximum temperature, time, and voltage

General Description

The bq2004 Fast Charge IC provides comprehensive fast charge control functions together with high-speed switching power control circuitry on a monolithic CMOS device.

Flexible control of constant-current or current-limited charging supply allows the bq2004 to be the basis of a cost-effective system-integrated charger for batteries of two or more cells. High-efficiency switched constant-current regulation is accomplished using the bq2004 as a frequency-modulated controller. The bq2004 may alternatively be used with a transistor to gate an external charging current or in a cost-effective frequency-modulated linear regulator.

Switch-activated or automatic discharge-before-charge allows bq2004-based chargers to support battery conditioning and capacity determination.

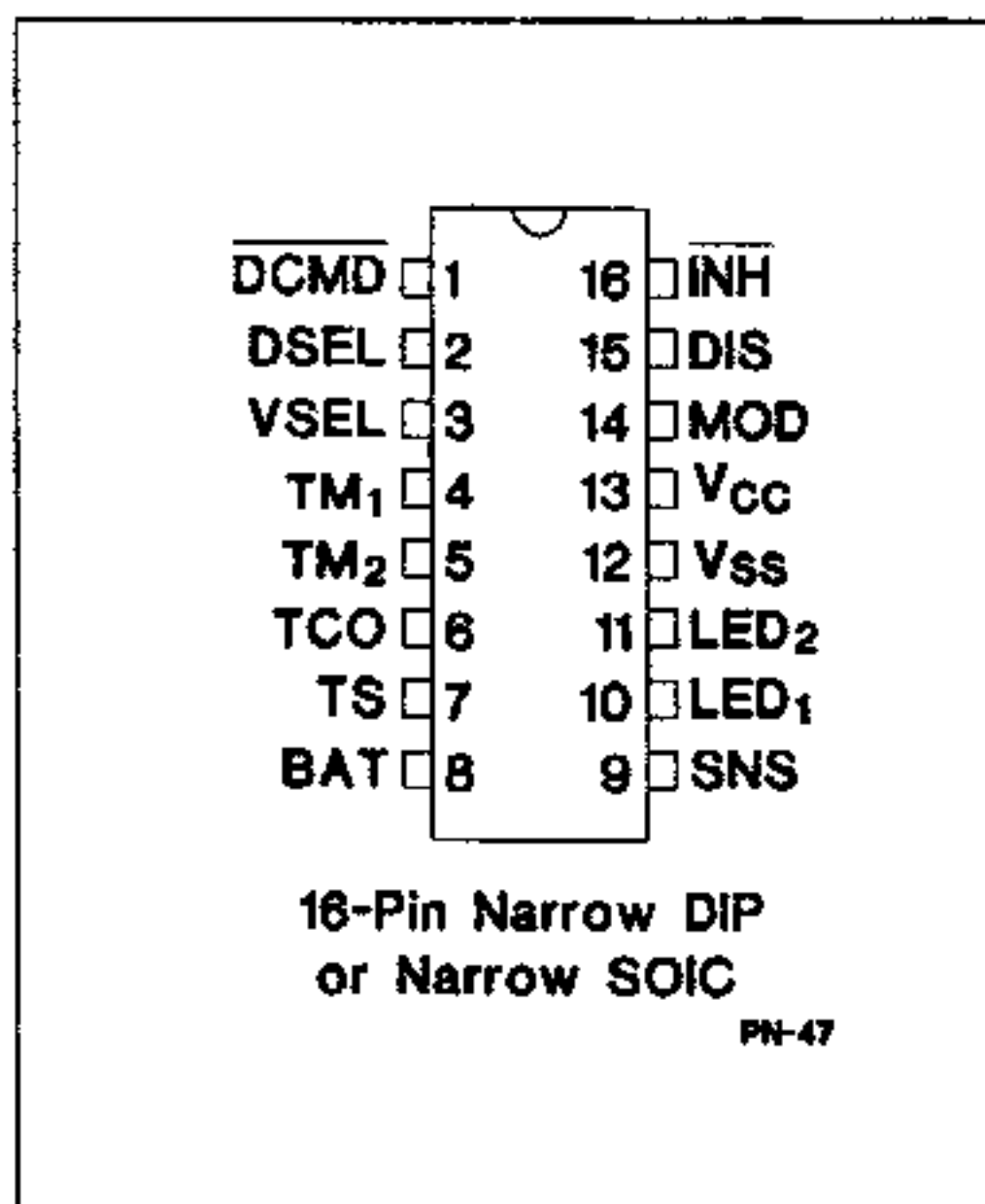
Fast charge may begin on application of V_{CC} to the bq2004, replacement of the battery, or use of the $\overline{\text{INH}}$ pin. For safety, fast charge is inhibited until the battery temperature and voltage are within configured limits.

Temperature, voltage, and time are monitored throughout fast charge. Fast charge is terminated by any of the following:

- Delta temperature/delta time ($\Delta T/\Delta t$)
- Negative delta voltage ($-\Delta V$) or peak voltage detect
- Maximum temperature
- Maximum time
- Maximum voltage

Following fast charge, the bq2004 proceeds with a pulsed top-off charge (if enabled) and a pulsed trickle charge. Figure 1 shows a block diagram of the bq2004 Fast Charge IC.

Pin Connections



Pin Names

$\overline{\text{DCMD}}$	Discharge command	SNS	Sense resistor input
DSEL	Display select	LED_1	Charge status output 1
VSEL	Voltage termination select	LED_2	Charge status output 2
TM_1	Timer mode select 1	V_{SS}	System ground
TM_2	Timer mode select 2	V_{CC}	5.0V $\pm 10\%$ power
TCO	Temperature cutoff	MOD	Charge current control
TS	Temperature sense	DIS	Discharge control output
BAT	Battery voltage	$\overline{\text{INH}}$	Charge inhibit input