

# CAT874

## Smart Phone Battery Switch Controller

### Description

CAT874 is a switch controller designed to start/shut-off smart phones with the push button input or by phone microcontroller unit.

CAT874 monitors two inputs and outputs an active high output after PWR\_ON input has been active (logic low) for a factory preset minimum time. Releasing input from its active state before the minimum timeout period resets the internal timer and must return to being active before the timer will restart with a fresh count down. The output remains high until the next PWR\_ON high-to-low or V<sub>CHG</sub> low-to-high transition.

CAT874's push pull output is capable of sinking up to 3 mA of current.

### Features

- Operate on 1.8 V to 5.5 V Power Supplies
- Ultra Low Quiescent Current: 100 nA (typical)
- Schmitt Trigger Inputs
- Small  $\mu$ LLGA-6 Package: 1.45 x 1.0 x 0.4 mm
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications

- Mobile Phones
- PDAs
- MP3 Players
- Personal Navigation Devices

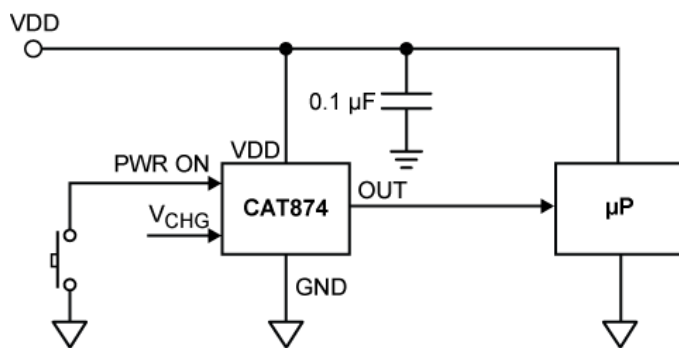
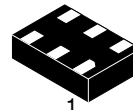


Figure 1. Application Schematic



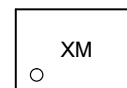
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ULLGA-6  
UL SUFFIX  
CASE 613AF

### MARKING DIAGRAM

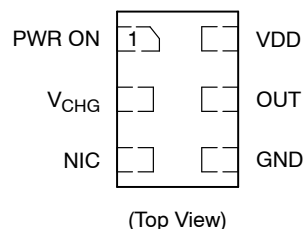


X = Specific Device Code  
(d = CAT874)

M = Date Code

"P" written at 180° clockwise rotation

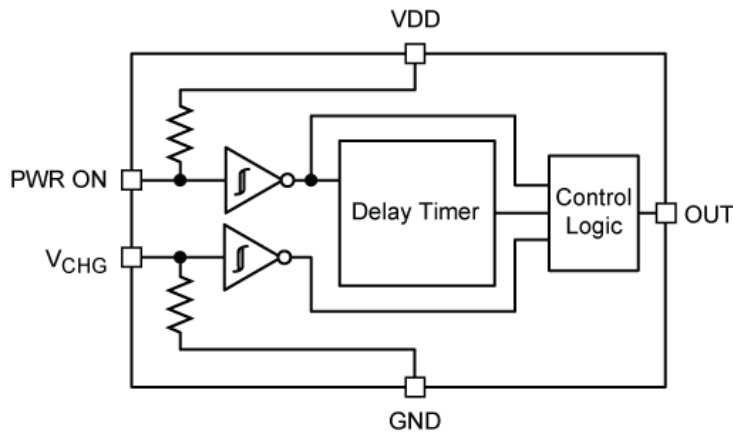
### PIN CONNECTIONS



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

# CAT874



**Figure 2. Functional Block Diagram**

**Table 1. PIN FUNCTION DESCRIPTION**

| Pin No. | Pin Name | Description                                                                                              |
|---------|----------|----------------------------------------------------------------------------------------------------------|
| 1       | PWR_ON   | Power ON, CMOS input.                                                                                    |
| 2       | V_CHG    | Charger IN, CMOS input.                                                                                  |
| 3       | NIC      | No Internal Connection. A voltage or signal applied to this pin will have no effect on device operation. |
| 4       | GND      | System Ground.                                                                                           |
| 5       | OUT      | Drive Output. Active-high push-pull output.                                                              |
| 6       | VDD      | Positive Power Supply.                                                                                   |

**Table 2. ABSOLUTE MAXIMUM RATINGS**

| Rating                                                                            | Symbol             | Value                                               | Unit |
|-----------------------------------------------------------------------------------|--------------------|-----------------------------------------------------|------|
| Input Voltage Range                                                               | $V_{DD}$           | -0.3 to 6                                           | V    |
| Output Voltage Range                                                              | $V_{OUT}$          | -0.3 to 6 or ( $V_{DD} + 0.3$ ), whichever is lower | V    |
| Input Voltage; PWR_ON, V_CHG                                                      | $V_{IN}$           | -0.3 to 6 or ( $V_{DD} + 0.3$ ), whichever is lower | V    |
| Maximum Junction Temperature                                                      | $T_{J(max)}$       | 150                                                 | °C   |
| Output Current; OUT                                                               | $I_{OUT}$          | 10                                                  | mA   |
| Storage Temperature Range                                                         | $T_{STG}$          | -65 to 150                                          | °C   |
| ESD Capability, Human Body Model (Note 1)                                         | ESD <sub>HBM</sub> | 2                                                   | kV   |
| ESD Capability, Machine Model (Note 2)                                            | ESD <sub>MM</sub>  | 150                                                 | V    |
| Lead Temperature Soldering<br>Reflow (SMD Styles Only), Pb-Free Versions (Note 2) | $T_{SLD}$          | 260                                                 | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- This device series incorporates ESD protection and is tested by the following methods:  
ESD Human Body Model tested per AEC-Q100-002 (EIA/JESD22-A114)  
ESD Machine Model tested per AEC-Q100-003 (EIA/JESD22-A115)  
Latch-up Current Maximum Rating: ≤150 mA per JEDEC standard: JESD78
- For information, please refer to our Soldering and Mounting Techniques Reference Manual, SOLDERRM/D

**Table 3. RECOMMENDED OPERATING CONDITIONS**

| Rating                       | Symbol    | Min | Max      | Unit |
|------------------------------|-----------|-----|----------|------|
| Input Voltage; VDD           | $V_{DD}$  | 1.8 | 5.5      | V    |
| Input Voltage; PWR_ON, V_CHG | $V_{IN}$  | 0   | $V_{DD}$ | V    |
| Output Current; OUT          | $I_{OUT}$ | 0   | 3        | mA   |
| Ambient Temperature          | $T_A$     | -40 | 85       | °C   |

**Table 4. ELECTRICAL OPERATING CHARACTERISTICS**(V<sub>DD</sub> = 1.8 V to 5.5 V. For typical values T<sub>A</sub> = 25°C, for min/max values T<sub>A</sub> = -40°C to +85°C unless otherwise noted.)

| Parameter                                                         | Test Conditions                                                                                                                                          | Symbol                 | Min                   | Typ  | Max                    | Unit |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|------|------------------------|------|
| POWER                                                             |                                                                                                                                                          |                        |                       |      |                        |      |
| V <sub>DD</sub> Supply Voltage                                    |                                                                                                                                                          | V <sub>DD</sub>        | 1.8                   |      | 5.5                    | V    |
| Quiescent Supply Current                                          | PWR_ON = V <sub>DD</sub> , V <sub>CHG</sub> = 0 V                                                                                                        | I <sub>DD</sub>        |                       | 100  | 1000                   | nA   |
| Operating Supply Current                                          | PWR_ON = 0 V, V <sub>CHG</sub> = 0 V<br>Measured during setup period.<br>Measurement includes current through internal 200 kΩ pull-up resistor on PWR_ON |                        |                       |      | 50                     | μA   |
| LOGIC INPUTS AND OUTPUTS                                          |                                                                                                                                                          |                        |                       |      |                        |      |
| Input Voltage; HIGH                                               | PWR_ON, V <sub>CHG</sub>                                                                                                                                 | V <sub>IH</sub>        | 0.7 x V <sub>DD</sub> |      |                        | V    |
| Input Voltage; LOW                                                | PWR_ON, V <sub>CHG</sub>                                                                                                                                 | V <sub>IL</sub>        |                       |      | 0.25 x V <sub>DD</sub> | V    |
| Hysteresis                                                        |                                                                                                                                                          | V <sub>HYS</sub>       |                       | 250  |                        | mV   |
| Input Current V <sub>CHG</sub>                                    | V <sub>CHG</sub> = 0 V; V <sub>DD</sub> = 5 V<br>(internal pull-down)                                                                                    | I <sub>IL1</sub>       |                       | 50   | 300                    | nA   |
| Input Current V <sub>CHG</sub>                                    | V <sub>CHG</sub> = 5 V; V <sub>DD</sub> = 5 V<br>(internal pull-down)                                                                                    | I <sub>IH1</sub>       |                       | 25   |                        | μA   |
| Input Current PWR_ON                                              | PWR_ON = 0 V; V <sub>DD</sub> = 5 V<br>(internal 200 kΩ pull-up resistor)                                                                                | I <sub>IL2</sub>       |                       | 25   |                        | μA   |
| Input Current PWR_ON                                              | PWR_ON = 5 V; V <sub>DD</sub> = 5 V<br>(internal 200 kΩ pull-up resistor)                                                                                | I <sub>IH2</sub>       |                       | 50   | 300                    | nA   |
| Output Voltage; HIGH                                              | I <sub>SOURCE</sub> = -0.1 mA, V <sub>DD</sub> = 1.8 V                                                                                                   | V <sub>OH</sub>        | V <sub>DD</sub> - 0.2 |      |                        | V    |
| Output Voltage; LOW                                               | I <sub>SINK</sub> = 3 mA, V <sub>DD</sub> = 1.8 V                                                                                                        | V <sub>OL</sub>        |                       | 0.1  | 0.4                    | V    |
| TIMING                                                            |                                                                                                                                                          |                        |                       |      |                        |      |
| Input Delay PWR_ON                                                | T <sub>A</sub> = 25°C                                                                                                                                    | t <sub>low_delay</sub> | 6.56                  | 8.00 | 9.44                   | s    |
|                                                                   | T <sub>A</sub> = -40°C to +85°C                                                                                                                          |                        | 6.00                  |      | 10.00                  |      |
| TEST MODE (V <sub>DD</sub> = 5 V, T <sub>A</sub> = 25°C) (Note 3) |                                                                                                                                                          |                        |                       |      |                        |      |
| Start TEST Window                                                 |                                                                                                                                                          | t <sub>ST</sub>        |                       |      | 35                     | μs   |
| Test Mode Delay                                                   | PWR_ON = 0 V, V <sub>CHG</sub> → 7 cycles, delay measured after 8th rising edge of V <sub>CHG</sub> clock pulse                                          | t <sub>D</sub>         |                       | 250  |                        | μs   |
| Test Mode Clock Frequency                                         | Clock applied to V <sub>CHG</sub>                                                                                                                        | f <sub>tm</sub>        |                       | 1    |                        | MHz  |
| PWR_ON Test Mode Clock Setup Time                                 | Measured from PWR_ON falling edge to first falling edge of V <sub>CHG</sub>                                                                              | t <sub>p</sub>         | 1                     |      |                        | μs   |
| V <sub>CHG</sub> Input Voltage; LOW                               | V <sub>CHG</sub> , Test Mode Operation                                                                                                                   | V <sub>IL_TM</sub>     |                       |      | 0.2 x V <sub>DD</sub>  | V    |
| V <sub>CHG</sub> Pulse Width                                      |                                                                                                                                                          | t <sub>pw</sub>        |                       | 500  |                        | ns   |

3. "Test Mode" parameters are not tested in production.

## TIMING WAVEFORMS

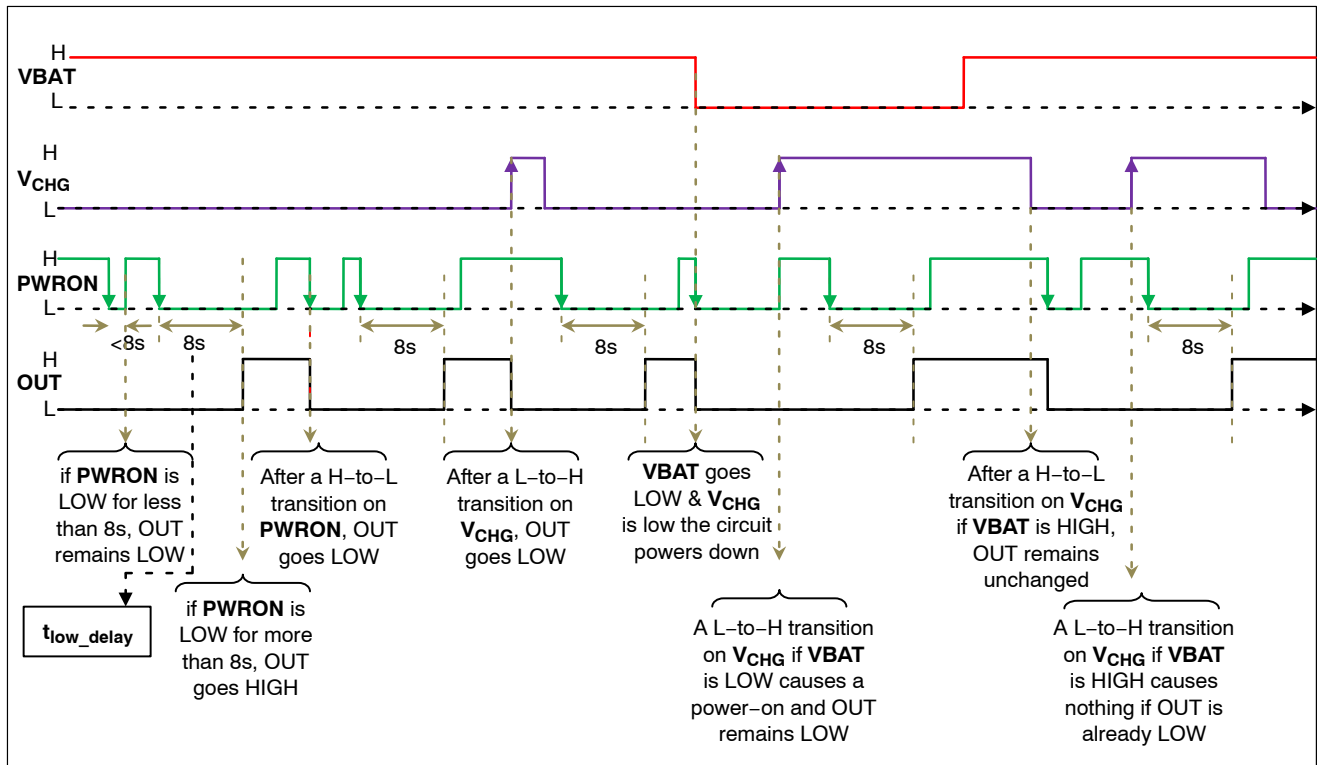


Figure 3. Timing Waveforms

## SYSTEM DESCRIPTION AND APPLICATIONS INFORMATION

### General

CAT874 is designed for the manual switching of microprocessors and microcontrollers. To prevent accidental resets, CAT874 requires PWR\_ON input be held low for a prescribed period before an Active high output is issued to the system processor.

### PWR\_ON and V<sub>CHG</sub> Inputs

PWR\_ON and V<sub>CHG</sub> are Schmitt trigger CMOS inputs. PWR\_ON must go low and stay low for a predetermined period ( $t_{\text{LOW\_DELAY}}$ ) to generate an Active high on the output.

V<sub>CHG</sub> is a standard CMOS input with internal pull down resistor 200 k $\Omega$  to keep the input low when charger is not plugged in and PWR\_ON is also a CMOS input with an internal 200 k $\Omega$  pull-up resistor, thus PWR\_ON can be left floating.

When PWR\_ON goes low, an internal timing cycle is initiated. If it goes high before the countdown timer has concluded its cycle, the timer will reset and will restart from the beginning when PWR\_ON returns to being low.

### Output (OUT)

CAT874 provides an active-high push pull output. This output will sink up to 3 mA.

### Delay Timer Testing:

A user test mode is provided to reduce the system test time after the CAT874 is mounted on the board. Instead of waiting  $t_{\text{LOW\_DELAY}}$  for the output to go active.

The user brings PWR\_ON low, and sends seven positive edges on the V<sub>CHG</sub> pin in a window of time  $t_{\text{ST}}$ . After a delay  $t_{\text{D}}$ , the device output will change state from low to high, and will return to the low state only when there is a high-to-low transition on PWR\_ON.

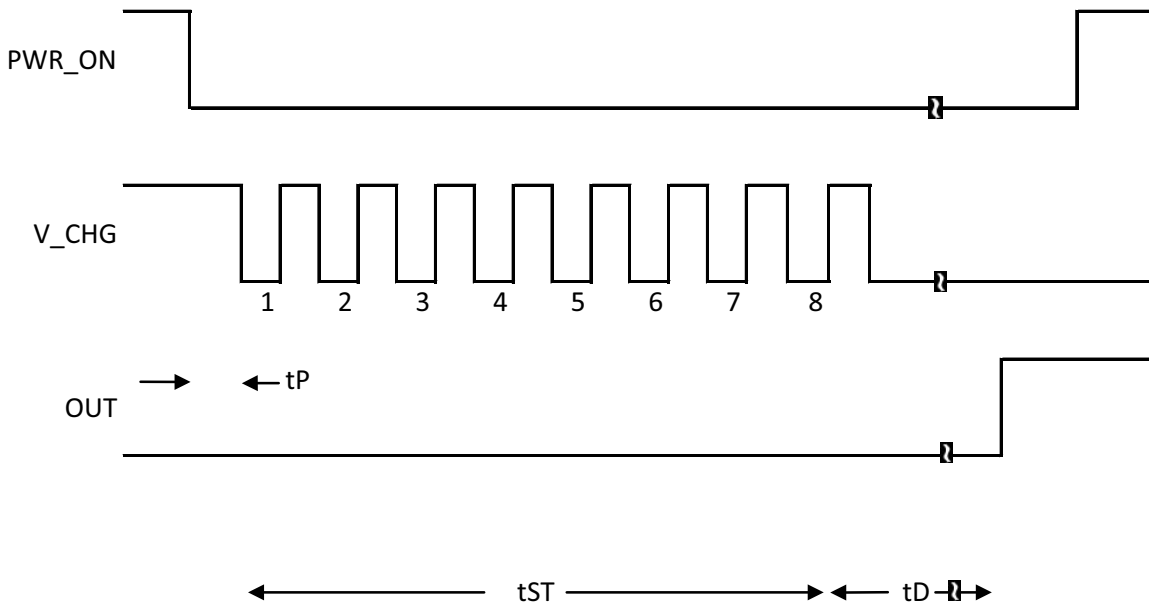


Figure 4. TOC Mode

## APPLICATION INFORMATION

### Output Operation

#### System with Two Different Power Supply Voltages

When both  $V_{CHG}$  and  $V_{BAT}$  are present, the following application can be adapted. Schottky diodes D1 and D2 can be used to isolate the two sources. The higher source will supply the VDD power.

If  $V_{CHG}$  is not present then drop across D2 should be low enough to turn off Q1. If both  $V_{CHG}$  and  $V_{BAT}$  are present, the timing waveforms should be used as shown in Figure 4.

An external resistor 1M should be used OUT, to discharge the output when both sources turn off.

#### Operation with Low VDD Voltage and Brownout Condition

The CAT874 requires a minimum supply voltage VDD of 1.8 V to guarantee the normal operation within the specification. To prevent small VDD supply glitch, a small ceramic capacitor can be added between the VDD pin and GND.

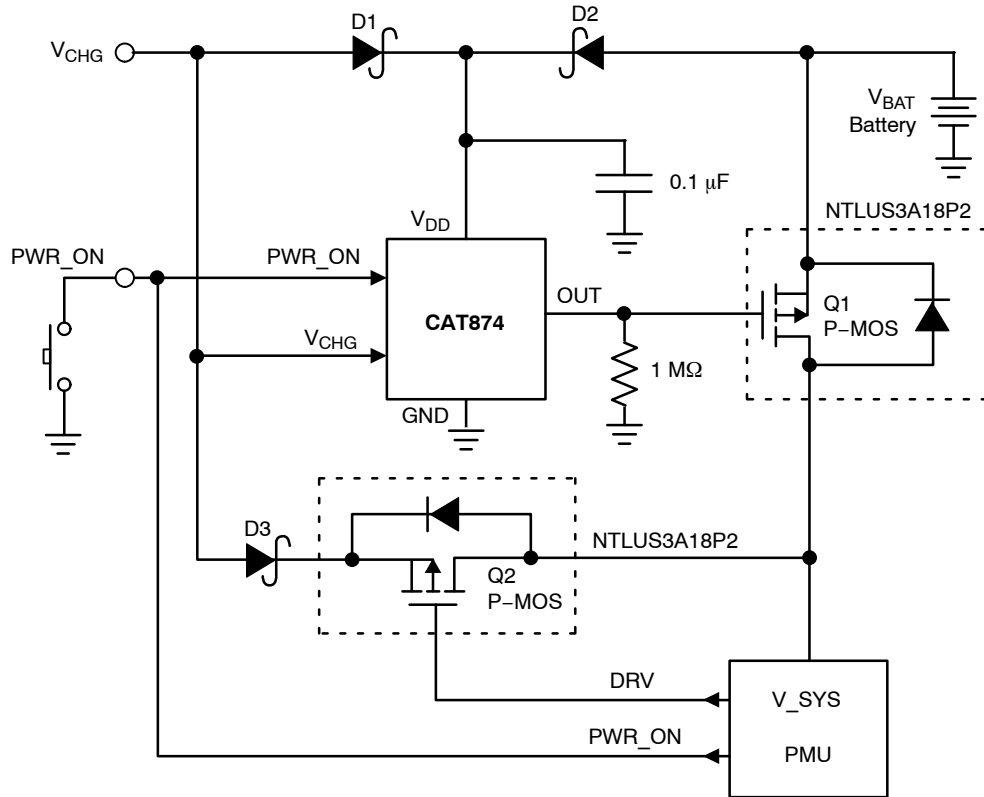


Figure 5. Application Schematic in Dual Supply System

**ON**



DATE 06 FEB 2008



1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

|     | MILLIMETERS |      |
|-----|-------------|------|
| DIM | MIN         | MAX  |
| A   | —           | 0.40 |
| A1  | 0.00        | 0.05 |
| b   | 0.15        | 0.25 |
| D   | 1.45 BSC    |      |
| E   | 1.00 BSC    |      |
| e   | 0.50 BSC    |      |
| L   | 0.25        | 0.35 |
| L1  | 0.30        | 0.40 |

[illegible]

DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

|                         |                               |                                                                                                                                                                                     |
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