

NCP800

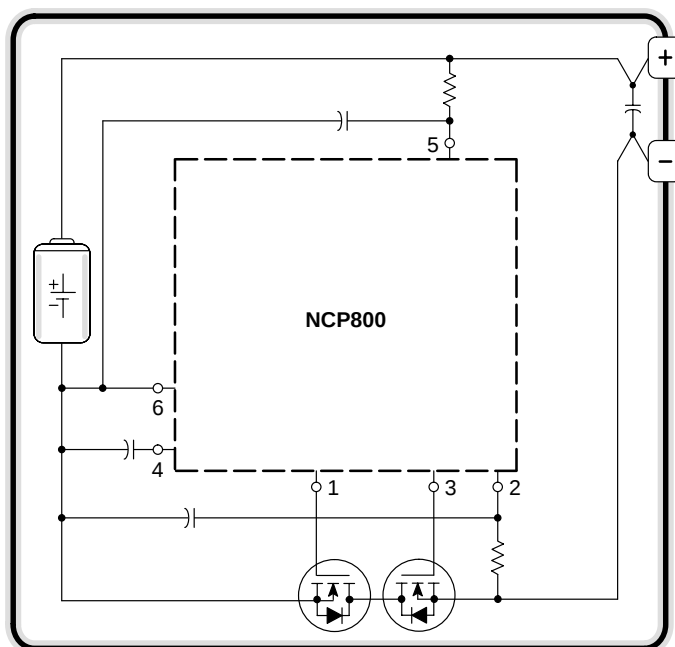
Product Preview

Lithium Battery Protection Circuit for One Cell Battery Packs

The NCP800 resides in a lithium battery pack where the battery cell continuously powers it. In order to maintain cell operation within specified limits, this protection circuit senses cell voltage, charge current, and discharge current, and correspondingly controls the state of two, N-channel, MOSFET switches. These switches reside in series with the negative terminal of the cell and the negative terminal of the battery pack. During a fault condition, the NCP800 open circuits the pack by turning off one of these MOSFET switches, which disconnects the current path.

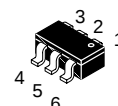
- Internally Trimmed Precision Charge and Discharge Voltage Limits
- Overvoltage Threshold Accuracy of ± 50 mV
- Discharge Current Limit Detection
- Automatic Reset from Discharge Current Faults
- Low Current Standby State when Cells are Discharged
- Available in a Low Profile Surface Mount Package

Typical One Cell Smart Battery Pack



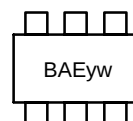
ON Semiconductor™

<http://onsemi.com>



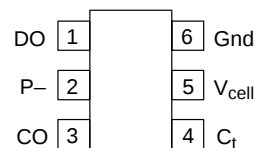
TSOP-6
SN SUFFIX
CASE 318G

MARKING DIAGRAM



y = Year
w = Week

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

Device	Package	Shipping
NCP800SN1T1	TSOP-6	3000 Units/Rail

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

NCP800

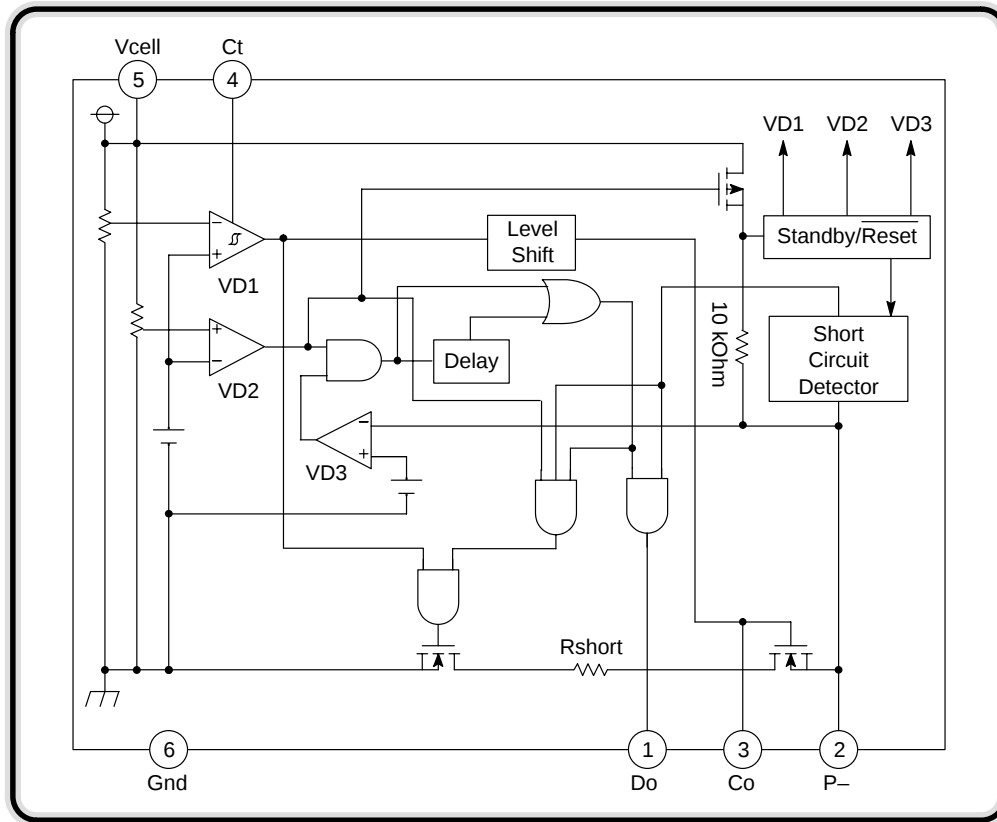


Figure 1. Detailed Block Diagram

PIN FUNCTION DESCRIPTION

Pin	Symbol	Description
1	DO	This output connects to the gate of the discharge MOSFET allowing it to enable or disable battery pack.
2	P-	This pin monitors cell discharge current. The excess current detector sets when the combined voltage drop of the charge MOSFET and the discharge MOSFET exceeds the discharge current limit threshold voltage, V(DET3). The short circuit detector activates when V(P-) is pulled within 0.8 V of the Vcell voltage. The Co driver is level shifted to the voltage at this pin.
3	CO	This output connects to the gate of the charge MOSFET switch Q1 allowing it to enable or disable battery pack charging.
4	C _t	This pin connects to the external capacitor for setting the output delay of the overvoltage detector (VD1).
5	V _{cell}	This input connects to the positive terminal of the cell for voltage monitoring and provides operating bias for the integrated circuit.
6	Gnd	This is the ground pin of the IC.

NCP800

MAXIMUM RATINGS

Ratings	Symbol	Value	Unit
Supply Voltage (Pin 5 to Pin 6)	V_{DD}	-0.3 to 12	V
Input Voltage Charge Gate Drive Common/Current Limit (Pin 5 to Pin 2) Overvoltage Delay Capacitor (Pin 4 to Pin 6)	V_{P-} V_{Ct}	$V(\text{pin}5) + 0.3$ to $V(\text{pin} 5) - 8$ 0.3 to 12	V
Output Voltage CO Pin Voltage (Pin 3 to Pin 2) DO Pin Voltage (Pin 1 to Pin 6)	V_{CO} V_{DO}	$V(\text{pin}5) + 0.3$ to $V(\text{pin} 5) - 8$ -0.3 to 12	V
Thermal Resistance, Junction-to-Air SN Suffix, TSOP-6 Plastic Package, Case 318G	$R_{\theta JA}$	—	°C/W
Operating Junction Temperature	T_J	-40 to 85	°C
Storage Temperature	T_{stg}	-55 to 125	°C

NOTES: ESD data available upon request.

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

VOLTAGE SENSING

Overvoltage Threshold, V_{DD} Increasing	V_{DET1}	4.30	4.35	4.40	V
Overvoltage Hysteresis V_{DD} Decreasing	V_{HYS1}	150	—	250	mV
Overvoltage Delay Time $C_t = 510$ pF $C_t = 0.01$ μF $C_t = 0.047$ μF	$t_{(DET1)}$	— 55 —	— — —	— 105 —	ms
Undervoltage Threshold, V_{DD} Decreasing	V_{DET2}	2.437	—	2.563	V
Undervoltage Delay Time	$t_{(DET2)}$	7.0	—	13	ms

CURRENT SENSING

Excess Current Threshold (Detect rising edge of P- pin voltage)	V_{DET3}	170	—	230	mV
Short Protection Voltage ($V_{DD} = 3.0$ V)	V_{SHORT}	—	—	$V_{DD} - 0.5$	V
Current Limit Delay Time ($V_{DD} = 3.0$ V)	$t_{(DET1)}$ $t_{(SHORT)}$	9.0 —	— 5	13 —	ms μs
Reset Resistance	R_{SHORT}	50	—	150	k Ω

OUTPUTS

Charge Gate Drive Output Low (Pin 3 to Pin 2) ($V_{DD} = 4.4$ V, $I_o = 50$ μA)	V_{ol1}	—	—	0.5	V
Charge Gate Drive Output High (Pin 5 to Pin 3) ($V_{DD} = 3.9$ V, $I_o = -50$ μA)	V_{oh1}	3.4	—	—	V
Discharge Gate Drive Output Low (Pin 1 to Pin 6) ($V_{DD} = 2.4$ V, $I_o = 50$ μA)	V_{ol2}	—	—	0.5	V
Discharge Gate Drive Output High (Pin 5 to Pin 1) ($V_{DD} = 3.9$ V, $I_o = -50$ μA)	V_{oh2}	3.4	—	—	V

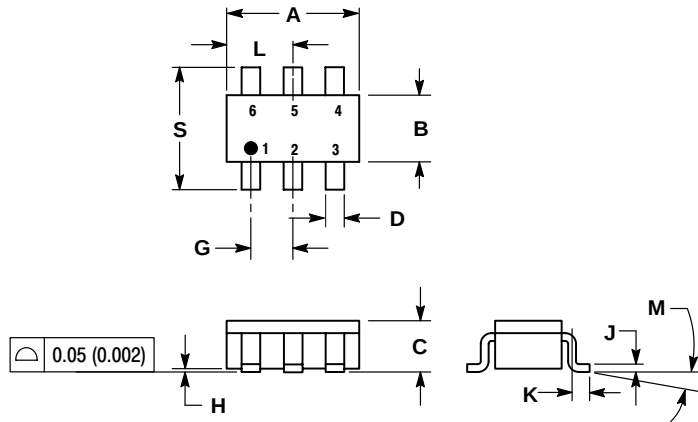
TOTAL DEVICE

Supply Current Operating ($V_{DD} = 3.9$ V, $V_{P-} = 0$ V) Standby ($V_{DD} = 2.0$ V)	I_{cell}	3.0 0.3	— —	6.0 0.6	μs μs
Operating Voltage	V_{DD}	1.5	—	12	V

NCP800

PACKAGE DIMENSIONS

(TSOP-6)
SN SUFFIX
CASE 318G-02
ISSUE G



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.1142	0.1220
B	1.30	1.70	0.0512	0.0669
C	0.90	1.10	0.0354	0.0433
D	0.25	0.50	0.0098	0.0197
G	0.85	1.05	0.0335	0.0413
H	0.013	0.100	0.0005	0.0040
J	0.10	0.26	0.0040	0.0102
K	0.20	0.60	0.0079	0.0236
L	1.25	1.55	0.0493	0.0610
M	0°	10°	0°	10°
S	2.50	3.00	0.0985	0.1181

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

PUBLICATION ORDERING INFORMATION

NORTH AMERICA Literature Fulfillment:

Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: ONlit@hibbertco.com
Fax Response Line: 303-675-2167 or 800-344-3810 Toll Free USA/Canada

N. American Technical Support: 800-282-9855 Toll Free USA/Canada

EUROPE: LDC for ON Semiconductor – European Support

German Phone: (+1) 303-308-7140 (Mon-Fri 2:30pm to 7:00pm CET)
Email: ONlit-german@hibbertco.com
French Phone: (+1) 303-308-7141 (Mon-Fri 2:00pm to 7:00pm CET)
Email: ONlit-french@hibbertco.com
English Phone: (+1) 303-308-7142 (Mon-Fri 12:00pm to 5:00pm GMT)
Email: ONlit@hibbertco.com

EUROPEAN TOLL-FREE ACCESS*: 00-800-4422-3781

*Available from Germany, France, Italy, UK, Ireland

CENTRAL/SOUTH AMERICA:

Spanish Phone: 303-308-7143 (Mon-Fri 8:00am to 5:00pm MST)
Email: ONlit-spanish@hibbertco.com
Toll-Free from Mexico: Dial 01-800-288-2872 for Access –
then Dial 866-297-9322

ASIA/PACIFIC: LDC for ON Semiconductor – Asia Support

Phone: 303-675-2121 (Tue-Fri 9:00am to 1:00pm, Hong Kong Time)
Toll Free from Hong Kong & Singapore:
001-800-4422-3781

Email: ONlit-asia@hibbertco.com

JAPAN: ON Semiconductor, Japan Customer Focus Center

4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031
Phone: 81-3-5740-2700
Email: r14525@onsemi.com

ON Semiconductor Website: <http://onsemi.com>

For additional information, please contact your local Sales Representative.