



■ Features

- 1.5V Dry Cell Output Voltage
- Up to 3A Peak Inductor Discharge Current
- 4.5~5.5V Charge Input Voltage
- Up to 1.5A Charge Current
- Up to 95% Efficiency Charge or Discharge
- Small Solution Size
- DFN3x3-10L Package

■ Application

- Dry cell
- Portable Devices

■ General Description

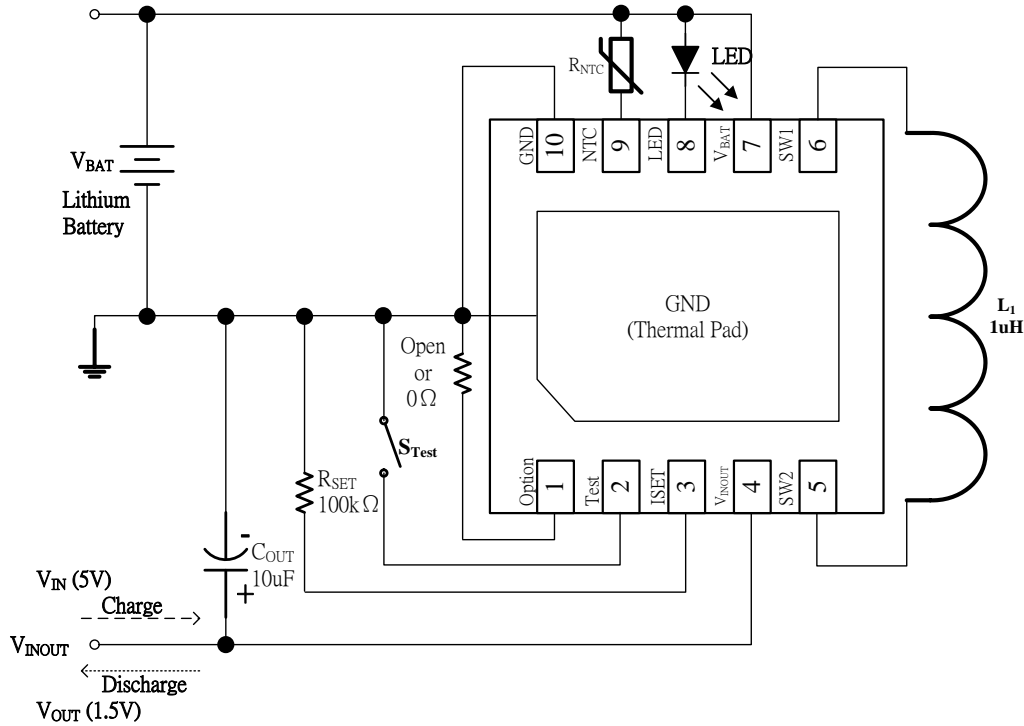
The GB2002 is a Lithium battery convert to dry cell charge and discharge management IC, it designed to efficiently transfer power between a Lithium battery and a dry cell in reversible buck operations using the same inductor.

When the main supply is present and above the minimum system supply voltage, the GB2002 operates in forward buck mode and charges the Lithium battery at up to 1.5A inductor current. When the main supply is removed, the GB2002 operates in reverse Buck mode and prevents the system from dropping below the minimum operating voltage, discharging the Lithium battery at up to 3A peak inductor current.

The GB2002 is externally programmable for charge current of the storage element, such as Lithium battery or super capacitor. The internal DC-DC converter requires only a 1 μ H inductor.



■ Typical Application Circuits



■ Pin Description

Pin No.	Name	Pin Description
1	Option	Option for Battery Capacity Test pin Function Open: Finger Touch Trigger Ground: Low Level Trigger
2	Test	Test Lithium Battery Capacity
3	ISET	Charge Current Set, Connect a 100kΩ resistor to Ground
4	V _{INOUT}	Input Voltage Charge and Output Voltage Discharge
5	SW2	DC-DC Switch Node 2
6	SW1	DC-DC Switch Node 1
7	V _{BAT}	Lithium Battery Voltage (Typical 4.2V)
8	LED	Charging and Lithium Battery Capacity Indicator Charge Mode: Charging: LED flashing, 50% duty and 1Hz frequency Charge Completed: LED Always On Test Pin Fall Edge and Keep Level at Least 10ms 75%~100%: Continuous flashing 4 times 50%~75%: Continuous flashing 3 times 25%~50%: Continuous flashing 2 times 0% ~ 25%: Only flashing 1 time
9	NTC	Negative Temperature Coefficient Sense Resistor
10	GND	Analog Ground
EXPAD	GND	Power Ground



■ Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{INOUT_MAX}	Max V_{INOUT} Voltage	6	V
Other	Max Other Pin Voltage	6	V
T_{J_MAX}	Maximum Junction Temperature	125	°C
T_{STG}	Storage Temperature Range	-65~ 150	°C
T_{LEAD}	Lead Temperature (Soldering, 10S)	260	°C

■ ESD Ratings

Symbol	Parameter	Value	Unit
HBM	All pins, Human Body Model	2k	V
MM	Machine Model	200	V
CDM	Charged Device Model	200	V

■ Recommended Operating Conditions

Symbol	Parameter	Value	Unit	
V_{INOUT}	Input and Output Voltage	As Input	5	V
		As Output	1.5	V
I_L	Inductor current	1.5	A	
T_J	Junction Temperature Range	-40 ~ 85	°C	



■ Electrical Characteristics

$V_{BAT} = 3.6V$, $R_{SET} = 100k\Omega$, $T_A = +25^\circ C$, unless otherwise noted

Symbol	Parameter	Conditions	Specification			Unit
			Min	Typ	Max	
Charge Mode						
V_{IN}	V_{INOUT} Pin Input Voltage		4.5	5	5.5	V
I_{Q_Charge}	Charge Mode Quiescent Current	No Load		500		uA
		No Switching		200		
V_{IN_UVLO}	V_{INOUT} Pin UVLO Threshold	V_{IN} Rise		4.7		V
$V_{IN_UVLO_Hys}$	V_{INOUT} Pin UVLO Hysteresis			0.2		V
V_{CV}	Regulation Voltage		4.15	4.25	4.35	V
V_{ReC}	V_{BAT} Re-Charge Threshold	V_{BAT} Fall		4.1		V
V_{PreC}	V_{BAT} Pre-Charge Threshold	V_{BAT} Rise		2.9		V
V_{PreC_Hys}	V_{BAT} Pre-Charge Hysteresis			0.2		V
I_{PreC}	V_{BAT} Pre-Charge Current	$V_{Short} < V_{BAT} < V_{PreC}$		150		mA
I_{FastC}	V_{BAT} Fast Charge Current	$V_{PreC} < V_{BAT} < V_{CV}$		1.5		A
I_{Term}	V_{BAT} Termination Current	CV mode		150		mA
Dis-Charge Mode						
I_{Q_DisC}	Dis-Charge Mode Quiescent Current	No Load		10		uA
		No Switching		6		
V_{BAT_UVLO}	V_{BAT} Pin UVLO Threshold	V_{BAT} Fall	2.8	2.9	3.0	V
$V_{BAT_UVLO_Hys}$	V_{BAT} Pin UVLO Hysteresis			0.2		V
V_{OUT}	V_{INOUT} Pin Output Voltage		1.48	1.5	1.52	V
V_{OUT_LP}	V_{INOUT} Pin Output Voltage at Battery Low Power	$V_{BAT} = 3.0V$		1.1		V
I_{CL}	Inductor Current Limit	$V_{BAT} = 3.6V$	1.5	3.5	4.5	A
I_{SC}	V_{INOUT} Pin Short Circuit Current			2		A
Other						
F_{OSC}	Switching Frequency	$V_{BAT} = 3.6V$ or $V_{IN} = 5V$		2		MHz
D_{MAX}	Maximum Duty Cycle			90		%
I_{LED_Sink}	LED Sink Current	$V_{BAT} = 3.6V$		5		mA
$R_{DSON(H)*}$	High-Side MOS On Resistance	$V_{BAT} = 3.6V$		35		mΩ
$R_{DSON(L)*}$	Low-Side MOS On Resistance	$V_{BAT} = 3.6V$		35		mΩ
V_{D_Bypass}	Bypass Diode Forward Voltage	$I_{D_Bypass} = 1A$		0.7		V
T_{SD*}	Thermal Shutdown	Temperature Rise		150		°C
T_{SD_Hys*}	Thermal Shutdown Hysteresis			30		°C

*: Guaranteed by design



■ Functional Description

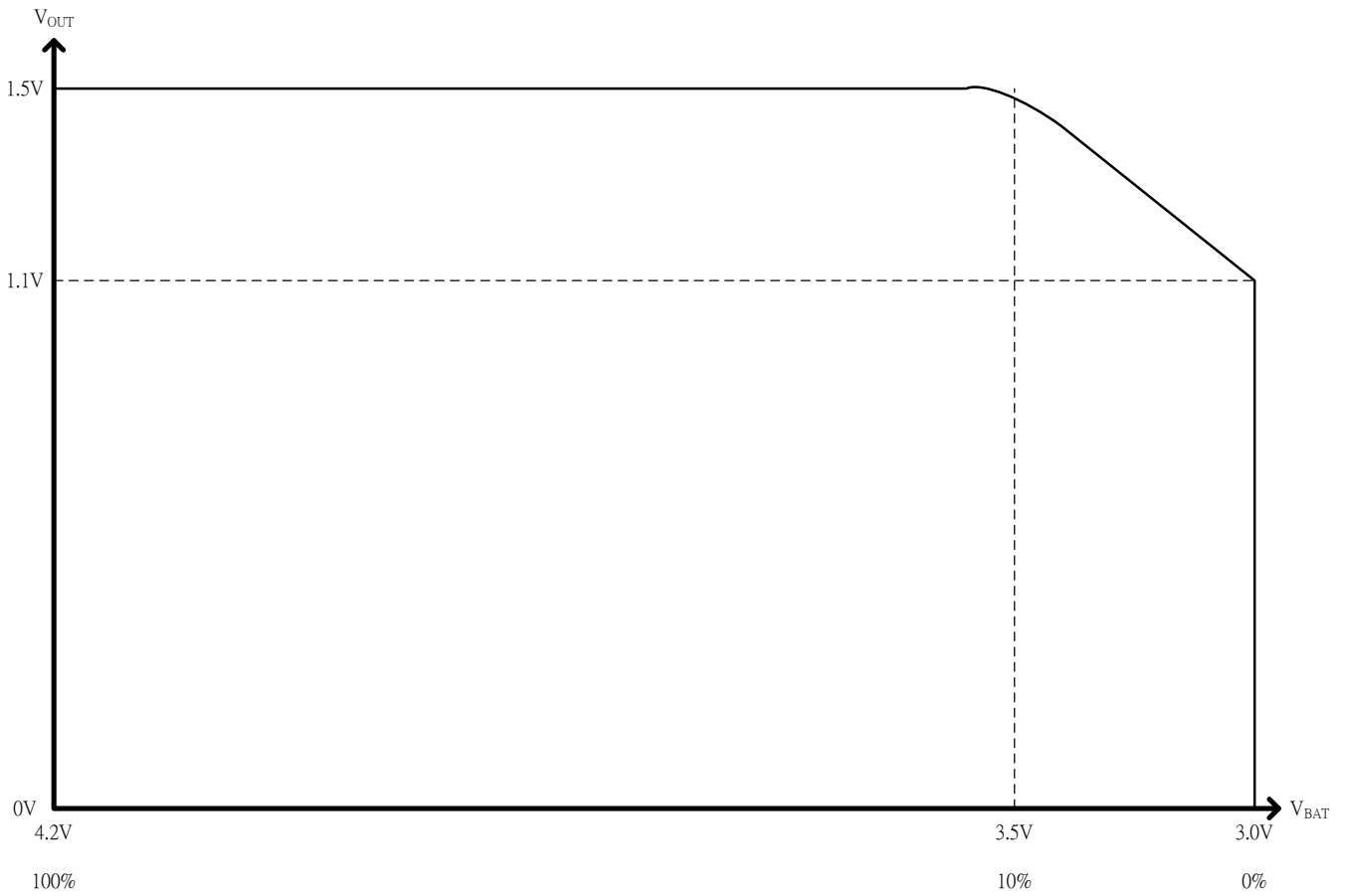
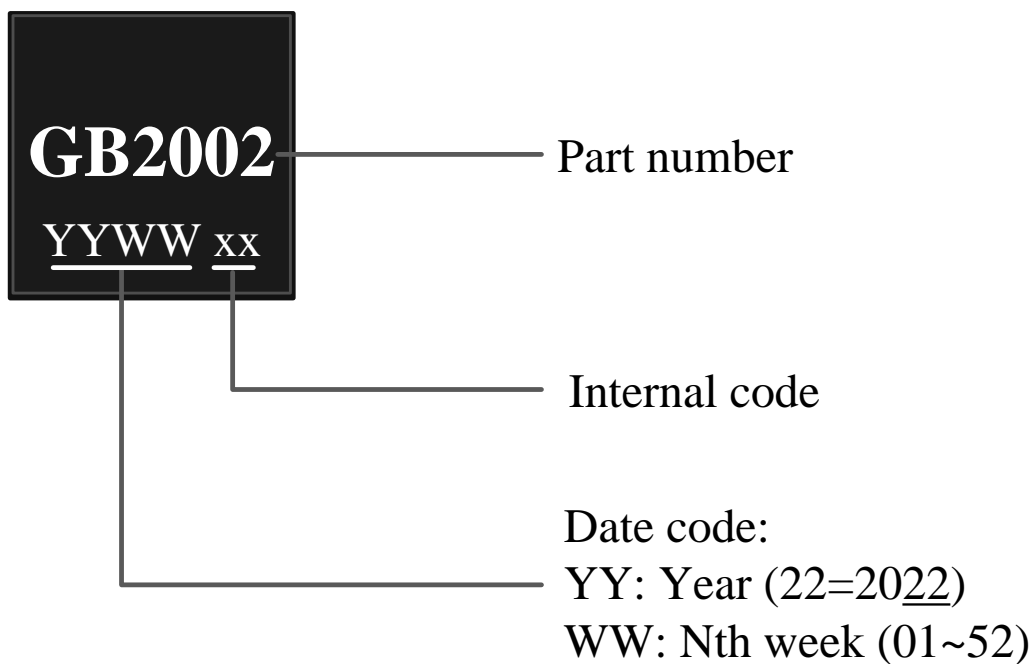


Figure 1. V_{OUT} v.s. V_{BAT}

**■ Ordering Information**

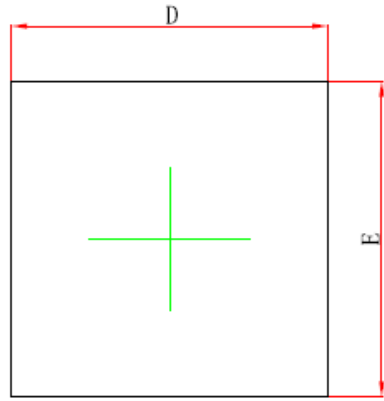
Order device	Package Type	Packaging
GB2002	DFN3x3-10L	Tape and reel

■ Marking Information

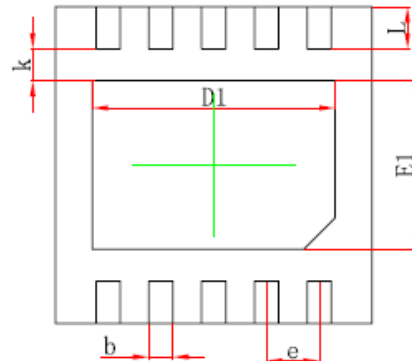


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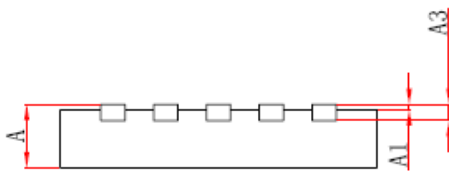
DFN3x3-10L(P0.5 / T0.5)



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.450	0.550	0.018	0.022
A1	0.000	0.050	0.000	0.002
A3	0.152 (Reference)		0.006 (Reference)	
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
D1	2.200	2.400	0.087	0.094
E1	1.500	1.700	0.059	0.067
k	0.200 (Minimum)		0.008 (Minimum)	
b	0.180	0.280	0.007	0.011
e	0.500 (Typical)		0.02 (Typical)	
L	0.324	0.476	0.014	0.019