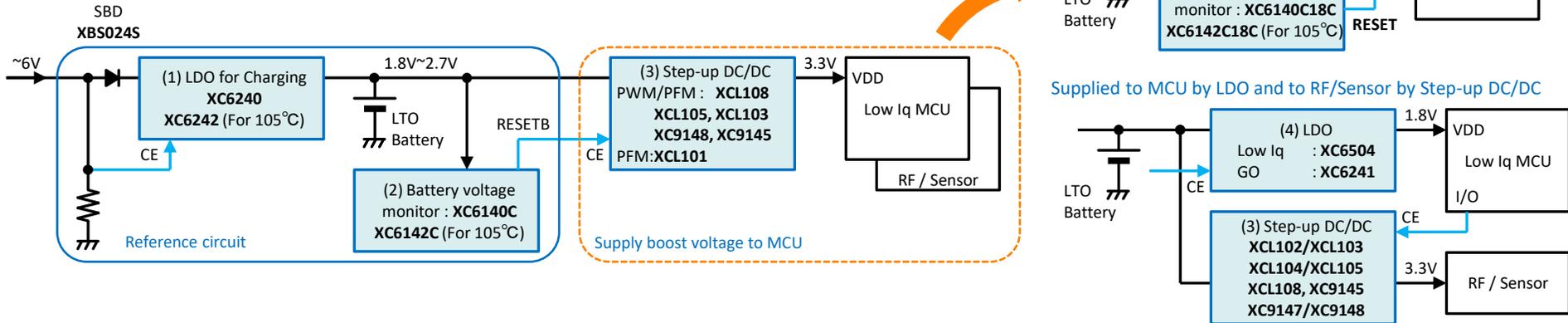


# LTO Battery : Solutions for Small and Low Consumption Devices

## Products using LTO battery : IoT Sensor/Wearable etc.

- Challenges : Simple structure / Small / Low Iq / High efficiency  
Simple main and backup power supply / Power supply to the system during charging



Block	Product	Features
(1) LDO for Charging	<b>XC6240 / XC6242</b> <small>FEATURED</small>	For LTO charging, 150mA, Topr=105°C (XC6242)
(2) LTO battery voltage monitor	<b>XC6140 / XC6142</b> <small>FEATURED UNDER DEVELOPMENT</small>	LTO battery voltage monitoring Release voltage: 2.475V/2.450V, Iq=104nA For 105°C compatible LTO battery: XC6142
(3) Step-up DC/DC	<b>XCL102 / XCL103</b>	Built-in inductor, F-PWM, PWM/PFM 3MHz, 450mA@3.3V→5V
	<b>XCL104 / XCL105</b> <small>FEATURED</small>	Built-in inductor, F-PWM, PWM/PFM, 1.2MHz 710mA@3.3V→5V
	<b>XCL108</b> <small>NEW</small>	Built-in inductor, Ultra-low Iq: 400nA, PWM/PFM 1.2MHz, 300mA@3.3V→5V, V <sub>ST</sub> =1.6V
	<b>XC9145</b> <small>FEATURED</small>	Ultra-low Iq: 400nA, PWM/PFM 1.2MHz, 430mA@3.3V→5V, V <sub>ST</sub> =1.6V
	<b>XC9147 / XC9148</b> <small>FEATURED</small>	F-PWM, PWM/PFM, 1.2MHz/3MHz 750mA@3.3V→5V
(4) LDO	<b>XC6241</b> <small>FEATURED</small>	Iq=0.6μA, PSRR=60dB, GO, 150mA
	<b>XC6504</b>	Iq=0.6μA, CL less, 150mA

### (1) LDO for LTO battery charging : XC6240, XC6242

Charging at max. 2.70V with low Iq LDO considering temperature range and LTO battery specifications

### (2) LTO battery voltage monitor : XC6140, XC6142

Set the voltage to Release when charging starts using the LDO in accordance with the charging and discharging characteristics of the LTO battery.

### Power supply for MCU and RF/Sensor

#### (3) Cases of Boosting voltage

Ultra-low Iq=400nA and high efficiency XCL108 and XC9145.

Built-in inductor Micro DC/DC for low EMI.

PWM for low ripple requirement for RF/Sensor (XCL102, XCL104, XC9147)

#### (4) LDO or (5) Pch FET cases

Supplied by GO LDO XC6241 for lower consumption.

Also, XC6140CxxC with detection "H" output is used to drive Pch FET and supply battery voltage directly.

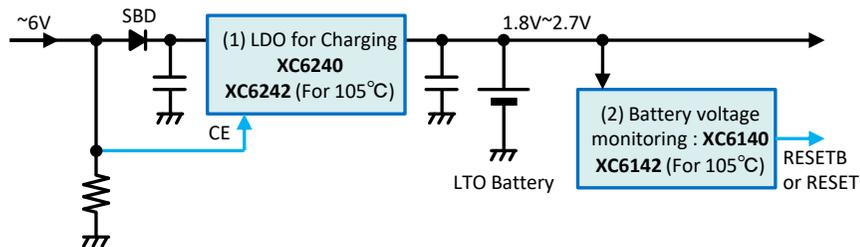
# LTO battery : Charge/Discharge Reference solutions

## ■ LTO battery :

### Li rechargeable battery using lithium titanate for negative electrode

- Ideal for power supplies and backup circuits for small devices and modules in Industrial/IoT/Automotive applications.
  - Constant voltage charging by LDO is possible.  
No need for dedicated expensive CC/CV charger ICs.
  - Reliable and safe with long life and resistance to repeated charge/discharge.
  - Resistant to over-discharge. Simple voltage detector is sufficient.
  - Stable voltage of 2.1V~2.4V.  
Easy energy extraction compared to Supercap (EDLC).
  - 105°C high-temperature operation, reflow-compatible, thin and hot-laminate-compatible products are also available.

## ■ Reference circuit for LTO battery charging and battery voltage monitoring



Block	Product	Features
(1) LDO for Charging	<b>XC6240</b> <span style="border: 1px solid blue; padding: 2px;">FEATURED</span>	For LTO charging, 2.63V, 150mA
	<b>XC6242</b> <span style="border: 1px solid blue; padding: 2px;">FEATURED</span>	105°C compatible, For LTO charging, 2.63V, 150mA
(2) LTO battery voltage monitor	<b>XC6140</b> <span style="border: 1px solid blue; padding: 2px;">FEATURED</span>	RESET IC for LTO battery voltage monitoring Detect voltage: 1.6~2.2V, Release voltage:2.475V, Iq=104nA
	<b>XC6142</b> <span style="border: 1px solid green; padding: 2px;">UNDER DEVELOPMENT</span>	105°C compatible, RESET IC for LTO battery voltage monitoring Detect voltage; 1.6~2.1V, Release voltage:2.450V, Iq=104nA

## ■ Reference Solution / Evaluation board for LTO batteries

Adopted as reference designs for charger IC and battery monitoring IC for LTO batteries by each manufacturer  
Evaluation boards for charging and power supply are provided for each battery.



NGK Insulators  
EnerCera ET Series

Nichicon  
SLB Series



Charger Unit

Power supply unit

### (1) LDO for charging LTO battery : XC6240, XC6242

Charging with low Iq LDO of max.  $V_{OUT} = 2.70V$  including temperature range in accordance with LTO battery specifications.  
To suppress inrush current, insert a few ohms resistor between the LDO and the LTO battery.

### (2) LTO battery voltage monitoring : XC6140, XC6142

Set the voltage to release when charging starts by the LDO in accordance with the charging and discharging characteristics of the LTO battery.