

Power Management Solutions 2023



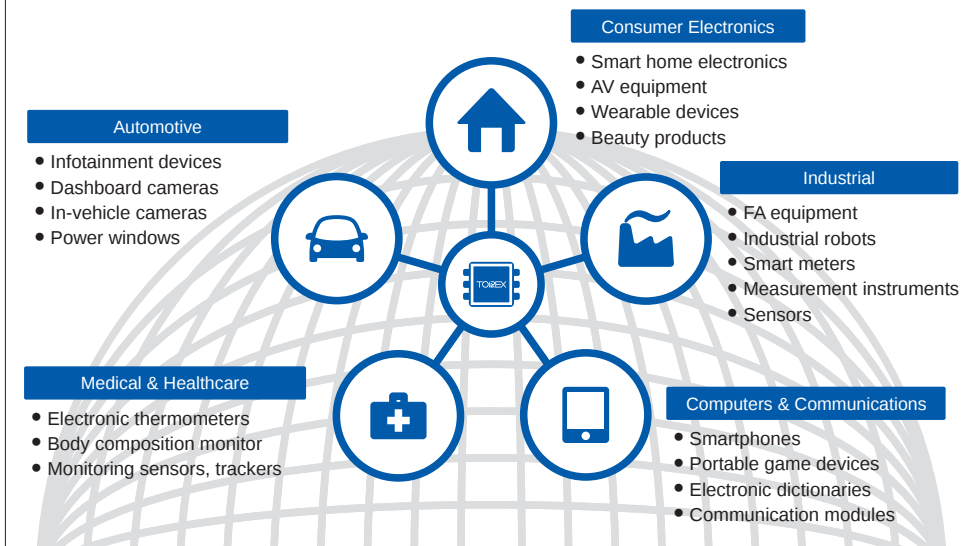
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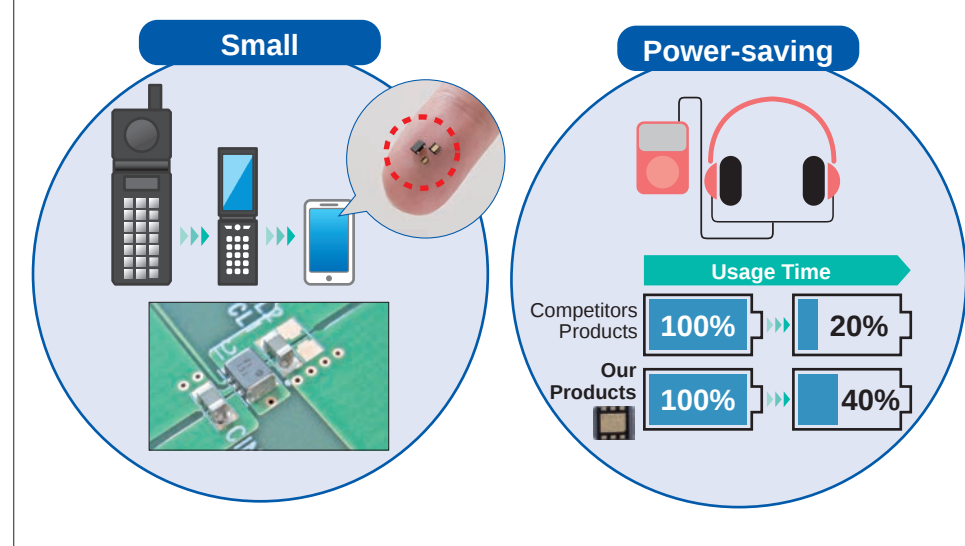
Corporate Data

TOREX SEMICONDUCTOR is specialized in manufacturing power management ICs featuring small size, low Iq, and low noise. We provide the most optimum solutions to promote a sustainable society and digital transformation.

Torex power management ICs: Supporting electronic devices in every field



Our proprietary technology contributes to the miniaturization and power savings of electronic devices.



TOREX SEMICONDUCTOR LTD. <https://www.torexsemi.com/>

Address : 3F DAIHO ANNEX 1-24-1 Shinkawa, Chuo-Ku, Tokyo 104-0033 Japan
 Founded : March 1995
 Capital : 2967.93 million JPY
 Operations : 1. Research and Development, Manufacturing of ICs and active discrete components.
 2. Sales of ICs and active discrete components.
 Stock Exchange : Prime Market of the Tokyo Stock Exchange



New Products, Featured Products Introduction

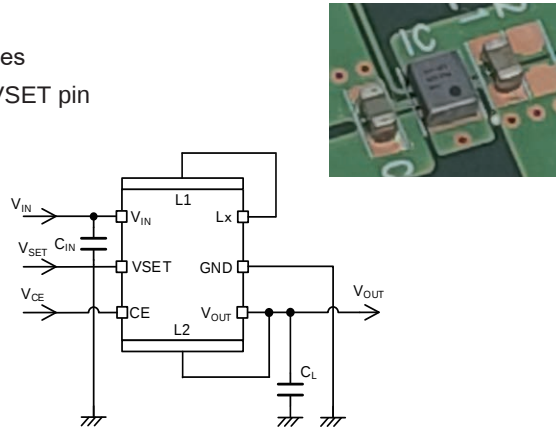
NEW

■XCL233 - Built-in inductor, Ultra-low Iq Step-down Micro DC/DC with VSET

- Built-in inductor makes contribution to smaller size, easier design, and low EMI
- Achieving smaller size, simple design, and low EMI with built-in Inductor
- 80% or higher efficiency even at $I_{OUT}=10\mu A$ with 200nA Ultra-low Iq
- VSET function enhancing further lower power consumption

V_{IN} : 1.8V ~ 6.0V
 V_{OUT} : 0.5V ~ 3.6V : 2 Values
 Selected by H/L of VSET pin

I_{OUT} : 150mA
 I_q : 200nA
 Control : PFM
 T_{opr} : -40°C ~ 85°C
 Package : CL-2025-03



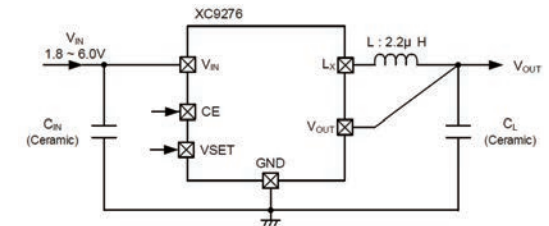
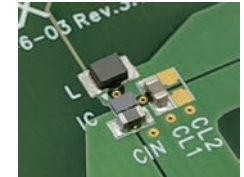
FEATURED

■XC9276 - Ultra-low Iq Step-down DC/DC with VSET function

- 80% or higher efficiency even at $I_{OUT}=10\mu A$ with 200nA Ultra-low Iq
- Achieving further lower power consumption with the VSET function that changes V_{OUT} based on the operation of the MCU

V_{IN} : 1.8V ~ 6.0V
 V_{OUT} : 0.5V ~ 3.6V : 2 Values
 Selected by H/L of VSET pin

I_{OUT} : 150mA
 I_q : 200nA
 Control : PFM
 T_{opr} : -40°C ~ 85°C
 Package : WLP-6-03
 SOT-26W
 USP-8B06

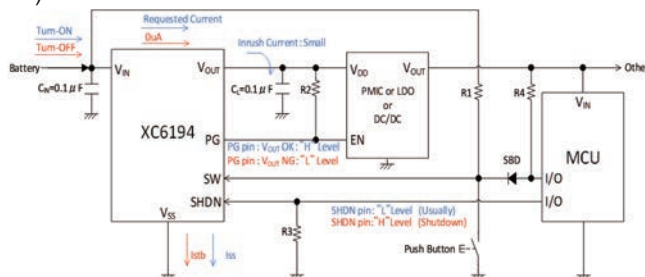


FEATURED

■XC6193 / XC6194 - Push Button Load Switch equipped with Shutdown function

- Shutdown Function cuts off current consumption to 1 nA
- Preventing discharge during shipment / System power switch / Freeze measures
- Essential for long battery life

V_{IN} : 1.8V ~ 6.0V
 I_{OUT} : 1A (XC6194)
 1A + External Pch FET (XC6193)
 I_{STB} : 1nA (at shutdown)
 R_{on} : 0.14Ω @3.0V
 I_q : 0.13μA
 T_{opr} : -40°C ~ 85°C
 Package : USP-8B06



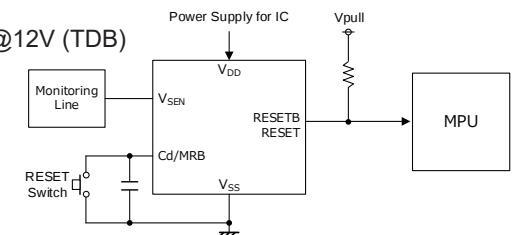
UNDER DEVELOPMENT

■XC6138 - 48V detection, Separated Sense pin Voltage Detector with Delay

- VSEN 76V operation
- Wide range of detect/release hysteresis.

Release/Detect Delay with External adjustment

V_{DD} : 2.2V ~ 6.0V
 V_{SEN} : 76.0V max
 V_{DF} : 2.3V ~ 30.0V
 V_{DR} : 2.4V ~ 45.0V
 T_{opr} : -40°C ~ 125°C
 Accuracy : ±1.5% (TDB)
 Hysteresis : 5% ~ 50%
 Supply Current : V_{DD} : 0.5μA, V_{SEN} : 0.2μA@12V (TDB)
 Output Type : CMOS, Nch open drain
 Output Logic : "L" or "H" at detection
 Function : Sense pin separated
 Release/Detect delay
 Manual reset

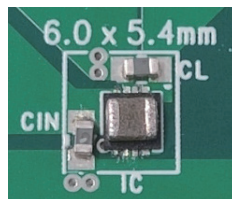


New Products, Featured Products Introduction

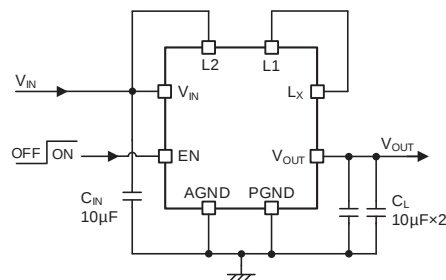
NEW

■XCL104 / XCL105 - Small, Multi-function Built-in inductor Step-up Micro DC/DC

- Built-in inductor realizing space saving and high efficiency
- Load disconnection / VOUT OR / Bypass types can be selected



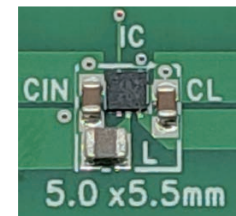
V_{IN} : 0.65V ~ 6.0V
 V_{ST} : 0.9V
 V_{OUT} : 1.8V ~ 5.5V
 f_{osc} : 1.2MHz
 I_{OUT} : 590mA @3.3V → 5V
 490mA @1.8V → 3.3V
 Control : F-PWM (XCL104)
 PWM/PFM (XCL105)
 T_{opr} : -40°C ~ 105°C
 Package : DFN3030-10B



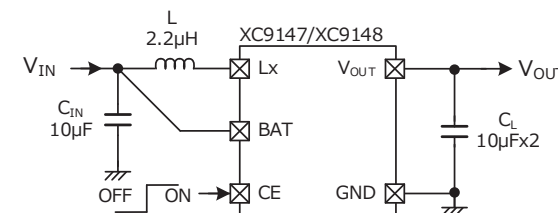
FEATURED

■XC9147 / XC9148 - Small, High Efficiency, Multi-function Step-up DC/DC

- Space-saving including peripheral parts and achieving high-efficiency
- Load disconnection / VOUT OR / Bypass types can be selected



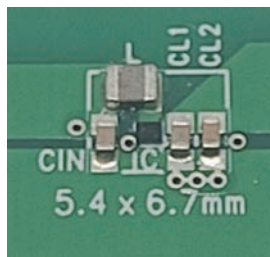
V_{IN} : 0.65V ~ 6.0V
 V_{ST} : 0.9V
 V_{OUT} : 1.8V ~ 5.5V
 f_{osc} : 1.2MHz, 3MHz
 I_{OUT} : 750mA @3.3V → 5V
 500mA @1.8V → 3.3V
 Control : F-PWM (XC9147)
 PWM/PFM (XC9148)
 T_{opr} : -40°C ~ 105°C
 Package : SOT-89-5
 USP-6C



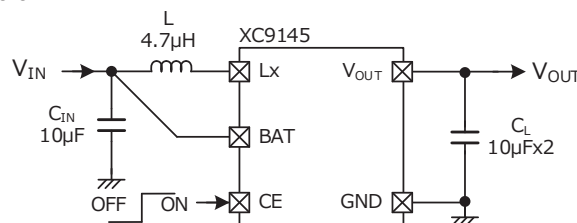
FEATURED

■XC9145 - Small, High Efficiency Ultra-low Iq Step-up DC/DC

- High efficiency of 89.9% even at $I_{OUT}=10\mu A$ with 400nA Ultra-low Iq
- Long battery life for IoT/wearable applications



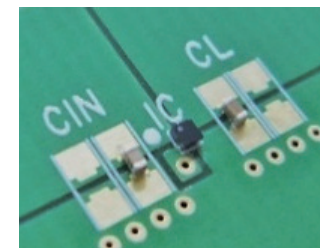
V_{IN} : 0.65V ~ 5.5V
 V_{ST} : 1.6V
 V_{OUT} : 3.0V ~ 5.5V
 f_{osc} : 1.2MHz
 I_{OUT} : 430mA @3.3V → 5V
 300mA @1.8V → 3.3V
 Control : PWM/PFM
 T_{opr} : -40°C ~ 105°C
 Package : USP-6C
 WLP-6-05



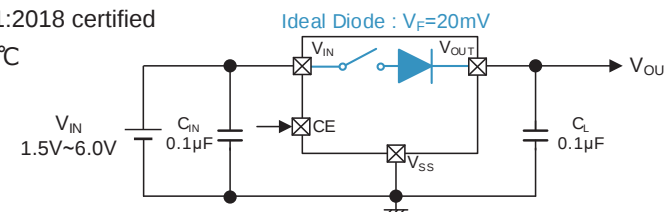
FEATURED

■XC8110 / XC8111 - Ideal Diode Load Switch

- Load SW with Ideal Diode function equivalent to $V_F = 20mV$
- For OR connection of multiple power lines and backup



V_{IN} : 1.5V ~ 6.0V
 I_{OUT} : 500mA (XC8110)
 1A (XC8111)
 R_{on} : 120mΩ @WLP-4-02
 I_q : 3.6µA (at Forward bias)
 0µA (at Reverse bias)
 Standard : IEC 62368-1:2018 certified
 T_{opr} : -40°C ~ 105°C
 Package : SOT-25
 USP-6B06
 WLP-4-02



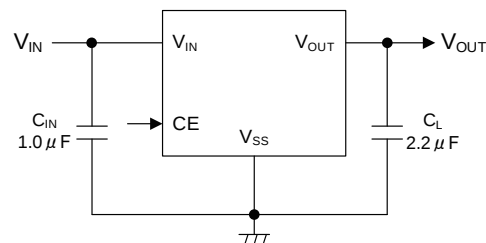
New Products, Featured Products Introduction

NEW

■XC6705 / XC6706 - 20V 200mA High-speed, Low Iq LDO with seamless GO

- Seamless GO function achieving both low Iq and fast response
- Ideal for Li 2 cells and 12V input

V_{IN}	: 3.5V ~ 20.0V
V_{OUT}	: 2.5V ~ 5.5V
I_{OUT}	: 200mA
I_q	: 1.2 μ A
PSRR	: 50dB @1kHz
Topr	: -40°C ~ 105°C
Package	: SOT-25 (XC6705) USP-4 (XC6705) SOT-89 (XC6706)

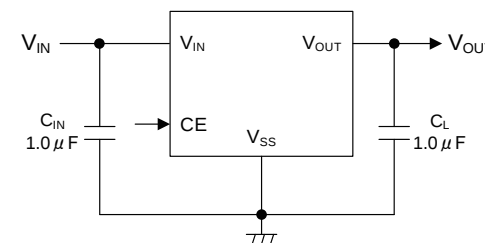
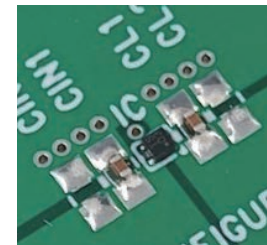


NEW

■XD6239 - AEC-Q100 Grade1, 300mA High-Speed LDO

- For automotive, AEC-Q100 Grade 1
- Fast response, ideal for suppressing power line fluctuations

V_{IN}	: 2.0V ~ 6.0V
V_{OUT}	: 1.2V ~ 3.4V
I_{OUT}	: 300mA
I_q	: 100 μ A
PSRR	: 80dB @1kHz
Ron	: 0.67 Ω
Function	: Inrush current prevention
Topr	: -40°C ~ 125°C
Package	: DFN1010-4C SOT-25 SOT-89-5

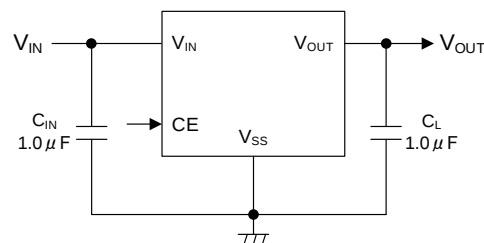
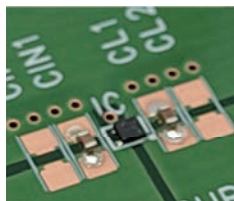


FEATURED

■XC6241 - Low Iq, High-speed "GO" LDO

- Achieving both low Iq and fast response with Low Ron and 105°C operation
- Ideal for IoT/wearables and all other applications

V_{IN}	: 1.6V ~ 6.0V
V_{OUT}	: 1.2V ~ 5.0V
I_{OUT}	: 150mA
I_q	: 0.6 μ A
Ron	: 1.1 Ω @3.3V
PSRR	: 60dB @1kHz
Topr	: -40°C ~ 105°C
Package	: USPQ-4B05 SSOT-24

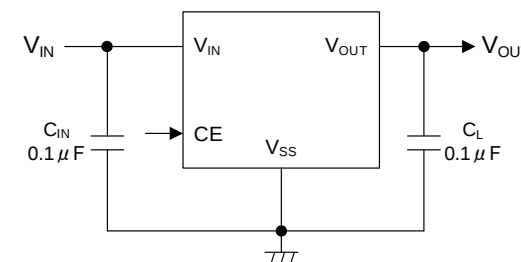
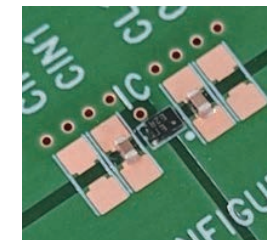


NEW

■XC6506 - 105°C operation, 150mA Low Iq LDO

- 105°C operation available
- Suitable for Low Iq applications

V_{IN}	: 1.5V ~ 6.0V
V_{OUT}	: 1.2V ~ 5.0V
I_{OUT}	: 150mA
I_q	: 0.8 μ A
PSRR	: 35dB @1kHz
Topr	: -40°C ~ 105°C
Package	: USPQ-4



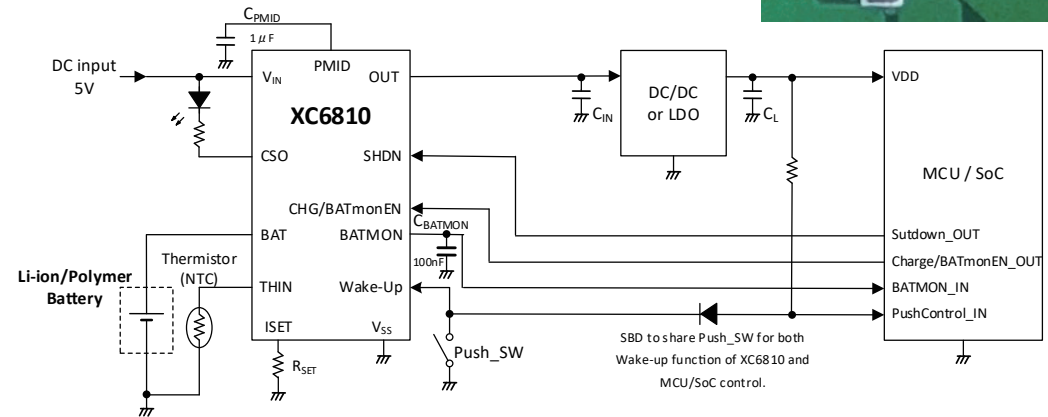
New Products, Featured Products Introduction

NEW

■ **XC6810** - Ultra-small Charger IC for Li-ion batteries compatible with Wireless charging

- Optimized for small-capacity Li-Ion, with Shutdown Function for shipping
- Two-wire communication / Charging status & Battery voltage monitoring

Input Voltage(Chargeable)	: 3.5V ~ 28.0V
Charge Voltage	: 3.80V ~ 4.40V (0.05V increments)
Charge Current	: 1mA ~ 25mA
BAT Sink Current	: 10nA (TYP. at shutdown)
Function	: Current path, Shutdown/Wake-up Charging status & Battery voltage monitoring OUT line switch interlocked with UVLO (option) Battery temperature monitor Charge Enable control
Protection	: Battery Over Discharge, Output Short Thermal control, Safety timer
Package	: WLP-12-01 (1.17 x 1.57 x 0.33 mm)
Topr	: -40°C ~ 85°C

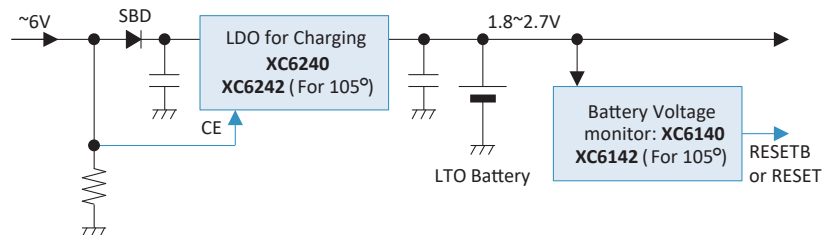


FEATURED

■ **XC6240 / XC6242** - Charger IC (LDO) for LTO batteries with CV charging

- Adopted as Reference design for LTO batteries of each battery manufacturer
- Charging at max 2.70V incl. temperature range to match LTO battery characteristics
- XC6242 is suitable for 105°C compatible LTO batteries

V _{IN}	: 1.5V ~ 6.0V	Topr	: -40°C ~ 85°C (XC6240) -40°C ~ 105°C (XC6242)
I _{OUT}	: ~150mA		
V _{OUT}	: 2.63V	Package	: USPN-4
I _q	: 0.8μA		SSOT-24 (XC6240 only)
I _{SINK}	: 0.24μA		USP-6B06 (XC6240 only)



FEATURED UNDER DEVELOPMENT

■ **XC6140 / XC6142** - Voltage monitor for LTO batteries

- Adopted as Reference design for LTO batteries of each battery manufacturer
- Optimal Release / Detect voltage for LTO batteries
- XC6142 is suitable for 105°C compatible LTO batteries

V _{IN}	: 1.1V ~ 6.0V	I _q	: 104nA
Detect Voltage	: 1.6V ~ 2.2V (XC6140) 1.6V ~ 2.1V (XC6142)	Output Type	: CMOS, Nch Open Drain
Release Voltage	: 2.475V (XC6140) 2.450V (XC6142)	Output Logic	: Active "L" or "H"
		Topr	: -40°C ~ 105°C
		Package	: USPQ-4B05 SSOT-24 (XC6140 only)



NGK Insulators
EnerCera ET Series



Nichicon
SLB Series

TOREX Product Groups and Features

■ lineup for the power supplies of automotive, industrial, and consumer products including DC/DC converters, voltage regulators, and voltage detectors

Built-in inductor DC/DC converter Micro DC/DC (XCL Series)

- DC/DC converter with integrated inductor
- Space-saving / low EMI DC/DC converter that can be used like an LDO

DC/DC converter

- Wide lineups including Step-down, Step-up, etc.
- Ultra-small, ultra-low Iq, and fast transient response

Voltage Regulator (LDO)

- Low Iq and high-speed LDO
- Low to medium and high voltages, small to higher currents
- Broad package lineup

Voltage Detector, Watchdog Timer (Reset, WDT)

- Ultra-low Iq of the nA order suitable for battery operations
- Various functions and 125°C operation required for industrial equipment etc.

TOREX Product Groups Small size, High performance, Low Iq, Low noise

Load Switch, Push Button Controller

- From simple load SW to USB protection and ideal diode function
- Load SW to cut off power supply with Push Button SW for Preventing discharge during shipment / System power SW / Freeze measures

Charger IC (Li-ion/Polymer & LTO batteries)

- Small, simple, and easy-to-use charger IC for Li-ion/Polymer
- LDO for charging and battery voltage monitoring IC optimum for LTO (lithium titanate) batteries

Automotive IC (XD Series)

- AEC-Q100 compliant
- Available in wide range of products such as LDO, voltage detector, and watchdog timer utilizing TOREX's small, high-performance devices

Discrete (MOSFET, SBD, TVS)

- MOSFET, Schottky barrier diode (SBD) and Transient voltage suppressor (TVS) used around power management ICs and for various other applications

Built-in inductor DC/DC Converter Micro DC/DC

■ Features of TOREX built-in inductor DC/DC Converter Micro DC/DC

- Space saving : Minimizes circuit board wiring of peripheral components. Makes small solutions possible.
- Design simplification : Only an input/output capacitor for the main components. Significantly reducing design evaluation workload.
- Noise reduction : The package configuration is optimized to suppress switching noise and achieves low EMI.
- Easy thermal design : Uses proprietary high heat dissipation packages.
- High efficiency : Small / High efficiency, even at light loads with Ultra-low Iq DC/DC.

■ Typical Built-in inductor Micro DC/DC

Standard

Low Iq

Small

► Step-down DC/DC

P2P

XCL210 Ultra-low Iq
50mA/200mA, Iq=0.5μA
PFM
Pocket Type

Ultra-low Iq

XCL205/XCL206
600mA, 3MHz
FB type/V_{OUT} fixed
Pocket Type

High current

XCL211/XCL212 High current
2A, 2.4MHz
FB type
Multiple Type

XCL232 Ultra-low Iq
150mA, Iq=200nA
PFM
Pocket Type

FEATURED

XCL201/XCL202 Ultra-low EMI
400mA, 1.2MHz
V_{OUT} fixed
Pocket Type

VSET (V_{OUT} selectable)
function

XCL233 Ultra-low Iq, V_{OUT} selectable
150mA, Iq=200nA, VSET
PFM
Pocket Type

NEW

► Inverting DC/DC

XCL301 small
5.5V, -50mA@3.3V→-3.3V
PWM/PFM
Pocket Type

► Step-up DC/DC

XCL100/XCL101 Low Iq
5.5V, 80mA@3.3V→5V
Iq=6.3μA, PFM, UVLO
Pocket Type

High current

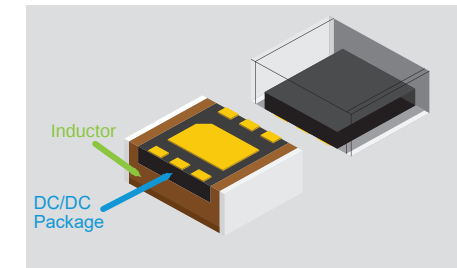
XCL102/XCL103 Low noise
6V, 450mA@3.3V→5V
3MHz
Pocket Type

High current,
Multi-function

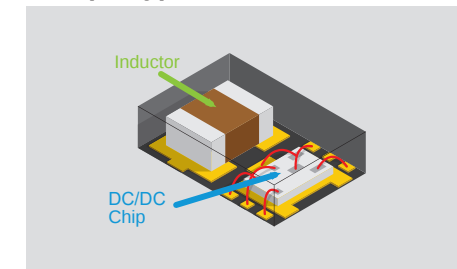
XCL104/XCL105 Multi-function
6V, 590mA@3.3V→5V
1.2MHz
Cool Post Type

NEW

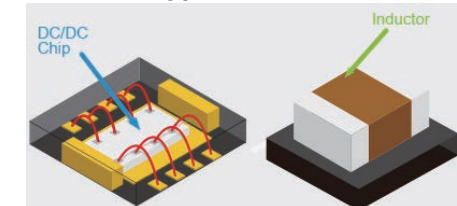
Pocket type



Multiple type



Cool Post type



See Page 25 for technical details of
Micro DC/DC XCL Series

DC/DC Converter / Controller

■ Features of TOREX DC/DC converter

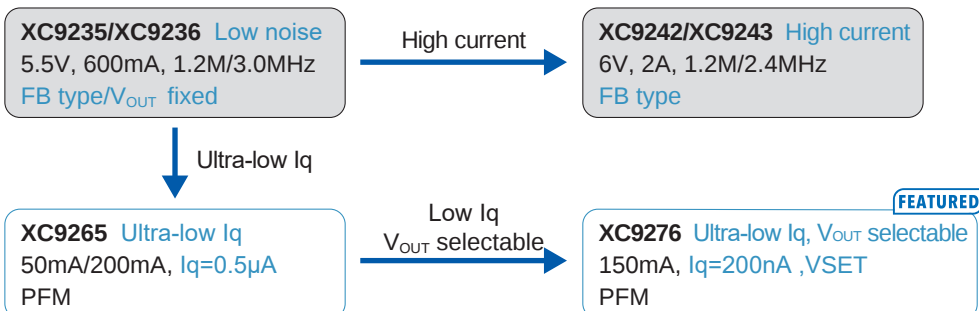
- Space-saving : Achieves space-saving not only with the IC but the peripheral components can be also made smaller.
- Ultra-low Iq : Ultra-low Iq technology for higher efficiency and longer battery life.

■ Typical DC/DC converter

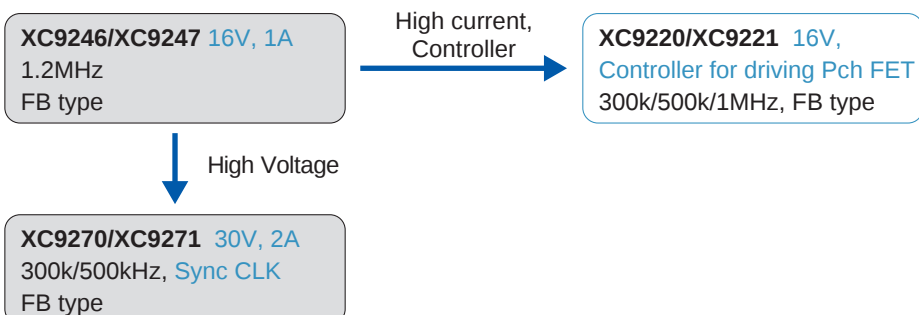
Standard

Low Iq

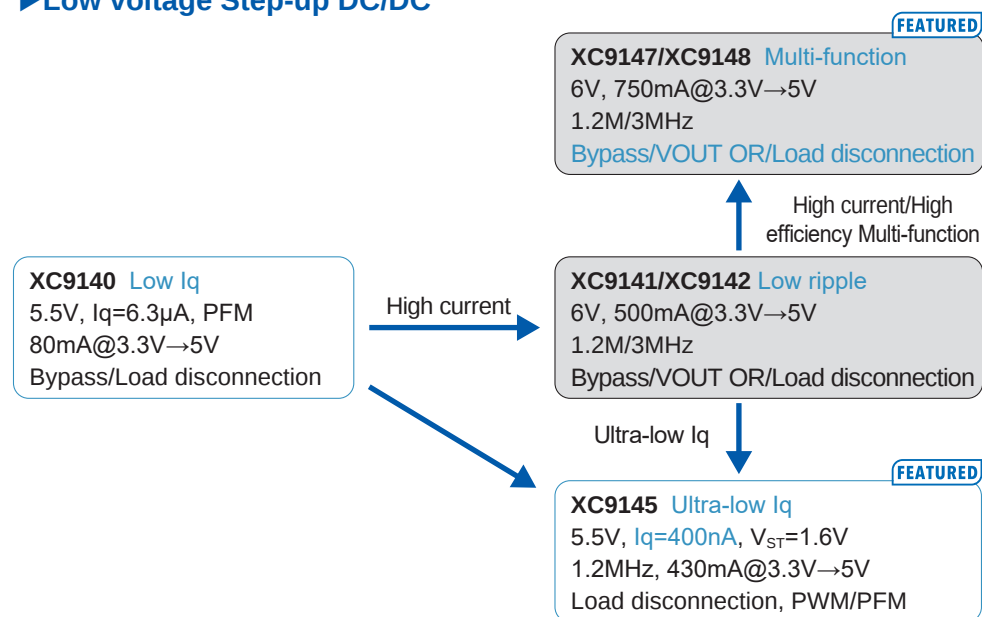
► Low voltage Step-down DC/DC



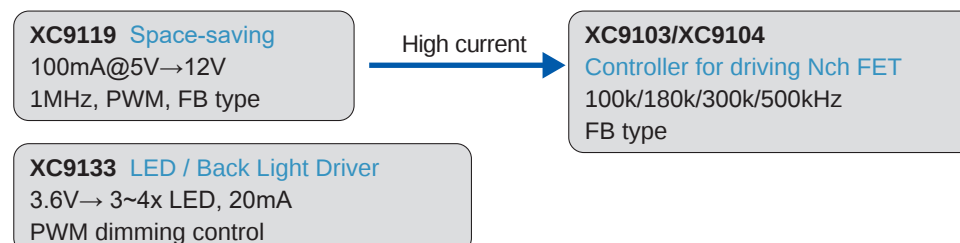
► Medium and high voltage Step-down DC/DC



► Low voltage Step-up DC/DC



► Medium and high voltage Step-up DC/DC



Voltage Regulator (LDO)

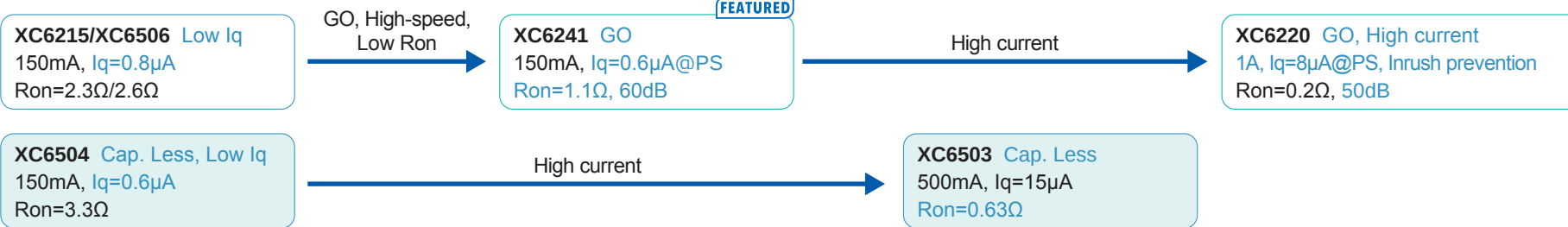
■ Features of TOREX Voltage Regulator

- Ultra-small : Wafer level and low-profile packages.
- Ultra-low Iq : Achieves long battery life.
- Various controls types : Green Operation (GO) type achieving both low Iq and high-speed response in addition to low Iq type and high-speed response type.

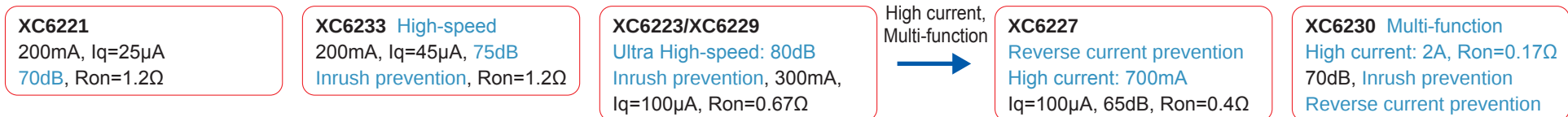
■ Typical Voltage Regulator

Standard Low Iq High-speed GO (Low Power/High PSRR) Cap Less

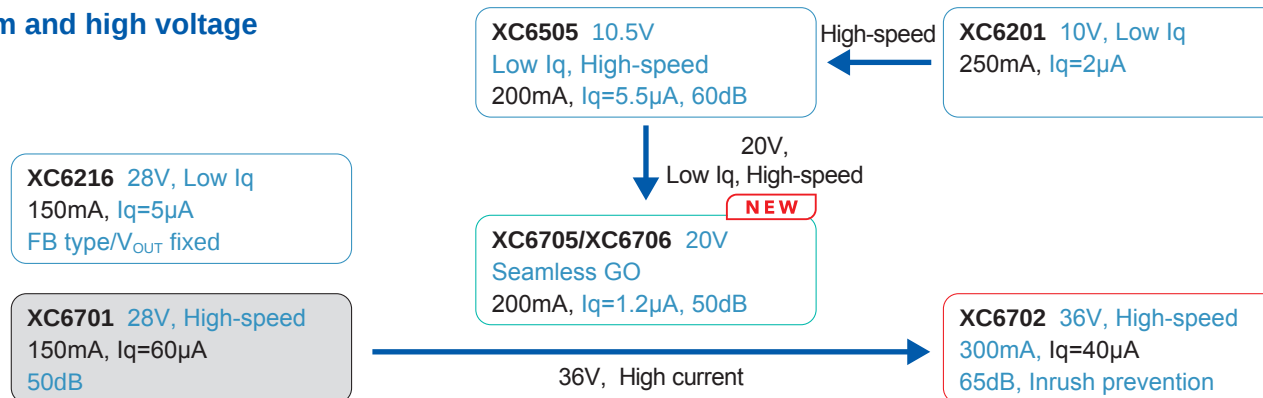
► Low voltage Low Iq



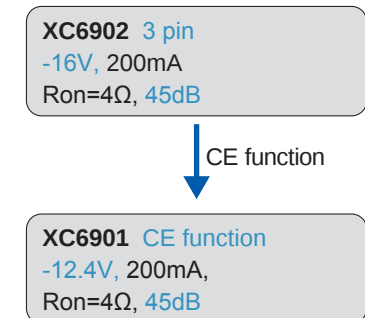
► Low voltage High-speed



► Medium and high voltage



► Negative Voltage



Voltage Detector, Watchdog Timer (RESET/WDT)

■Features of TOREX Voltage Detector & Watchdog Timer

- Ultra-small : Ultra-small package and low-profile package.
- Ultra-low Iq : nA level low Iq achieving long battery life.
- Medium and high voltage monitoring : Separated Sense pin (V_{SEN}), Adjustable Hysteresis (HYS) /wide-selection, Detection Delay.
- Various functions : Release Delay, Manual Reset (MR), Output logic: RESETB/RESET

■Typical Voltage Detector

Standard Low Iq Small

XC61C/G Simple function
10V, $I_q=0.7\mu A$

10V
operation

XC6126 Simple function
 $I_q=0.7\mu A, \pm 0.8\%$

Release Delay

Ultra-low Iq

XC6127 Fixed Release Delay
50~800ms
 $I_q=0.7\mu A, \pm 0.8\%$
RESETB/RESET, MR

Release Delay
Internally fixed

XC6119
Release Delay external adj.
 $I_q=0.9\mu A, \pm 2.0\%$

VSEN
separated

XC6136 Ultra-low Iq
 $I_q=88nA, \pm 0.8\%$
RESETB/RESET

Separated Sense pin (VSEN)

UNDER DEVELOPMENT

XC6138 Sense pin 76V operation
Multi-function
 $V_{DD}: 0.5\mu A, V_{SEN}: 0.2\mu A, \pm 1.5\%$ (TDB)
Detect/Release hysteresis : 5~50%
Detect/Release Delay external adj.
RESETB/RESET, MR

High Voltage
VSEN pin

XC6132/XC6134 Separated Sense pin
Hysteresis external adj.
Detect/Release Delay external adj.
RESETB/RESET, MR, 125°C

Multi-
function,
125°C

XC6118 Separated Sense pin
 $I_q=0.8\mu A, \pm 2.0\%$
Release Delay external adj.

XC6135 Separated Sense pin
Ultra-low Iq, $I_q=44nA, \pm 0.8\%$
RESETB/RESET

XC6133 Release Delay external adj.
Separated Sense pin
RESETB/RESET, MR, 125°C

■Typical Watchdog Timer (WDT) + Voltage Detector

XC6121/XC6122/XC6123/XC6124
Delay/WDT internally fixed
 $I_q=10\mu A$, WDT: 50~1,600ms
Release Delay: 3.13~400ms
WDT function ON/OFF control

Delay/WDT external adj.

XC6130/XC6131 Delay/WDT external adj.
MR or WDT function ON/OFF control
125°C

Load Switch, Push Button Controller

■ Load Switch

- Simple type : For internal power supply line distribution.
- Output protection : Current limit/protection for USB line, etc. Current limit external adjustment / Error flag function available.
- Built-in Ideal Diode function : Load SW with ideal diode function of low VF 20mV / low leakage / reverse current prevention, also with protection functions.

■ Typical Load Switch

Standard

Low Iq

Small

► Simple type

XC8101 Switch for internal power lines
6V, 200mA
Ron=0.75Ω, Iq=3μA

High current

XC8102 Switch for internal power lines
6V, 400mA
Ron=0.28Ω, Iq=4μA

► Output protection for power supply lines

XC8107 Selectable current limits
5.5V, 0.5A/1.0A/1.5A/2.0A, Ron=85mΩ
Soft-start, Reverse current prevention, Flag

Current limit
external adj.

XC8108/XC8109 Current limit external adj.
5.5V, 0.9~2.4A/0.075~1.3A adj., Ron=85mΩ
Soft-start, Reverse current prevention, Flag

► Built-in Ideal Diode function

XC8110 500mA, Ideal Diode
6V, Ron=120mΩ
True Reverse current prevention
IEC 62368-1 certified

FEATURED

High current

XC8111 1A, Ideal Diode
6V, Ron=120mΩ
True Reverse current prevention
IEC 62368-1 certified

FEATURED

■ Push Button

- Push Button Load SW : Shutdown function cuts off the power supply line and suppresses current consumption to 1 nA.
For preventing discharge during shipment / System power switch / Freeze measures.

Push Button Reboot controller

- : Long press of Push Button outputs reboot signal.
For countermeasures against freezes by system reset or toggling the power IC enable.

■ Typical Push Button Controller

► Push Button Load SW

XC6194 Shutdown/Wake-up SW
1.8V~6V, 1A, 0.14Ω, Power Good
I_{STB}=1nA, Iq=0.13μA

FEATURED

High current with
External FET

XC6193 High current, Driving External Pch FET
Shutdown/Wake-up SW
1.8V~6V, I_{STB}=1nA, Iq=0.13μA

FEATURED

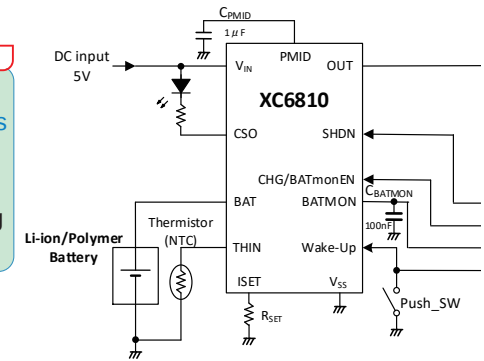
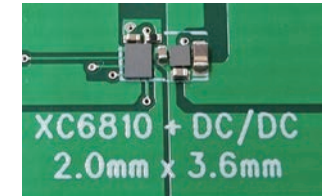
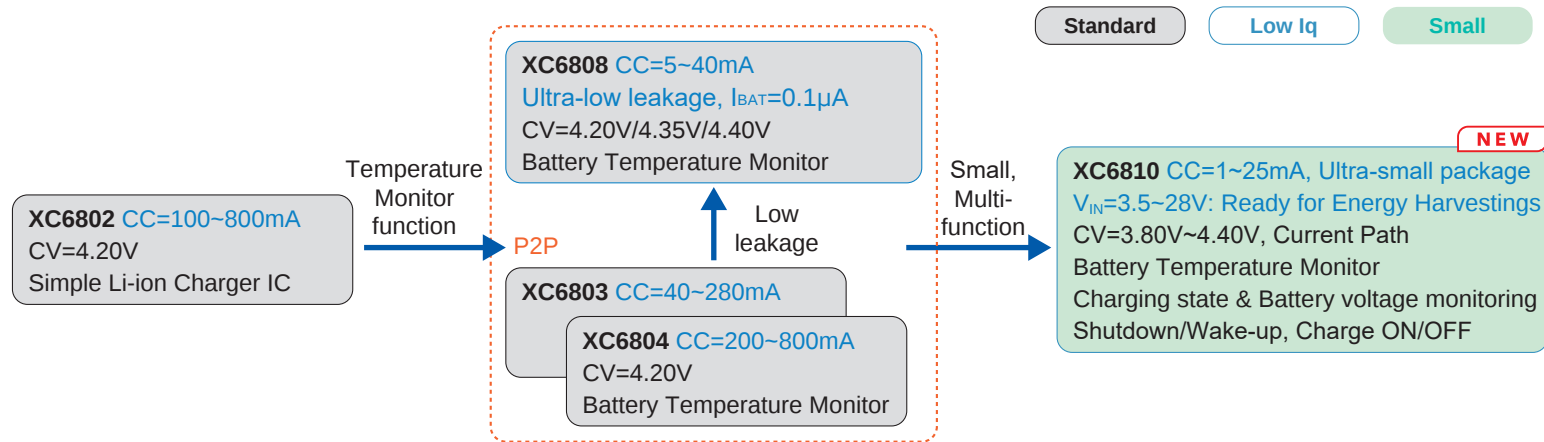
► Push Button Reboot controller

XC6190 Reset by long press at freeze
2 SW inputs, Press hold time: 7.5s/12.5s/adj
Iq=0.01μA

Charger IC : For Li-ion/Polymer & LTO batteries

Charger IC for Li-ion/Polymer batteries

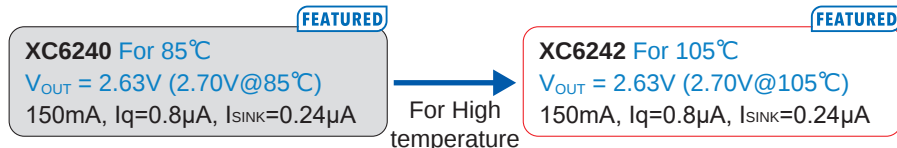
- Supports charging currents from 1mA to 800mA.
- For small-capacity Li-ion/polymer batteries, the multi-function all-in-one charger IC XC6810.



Charger IC & Voltage monitor for LTO batteries

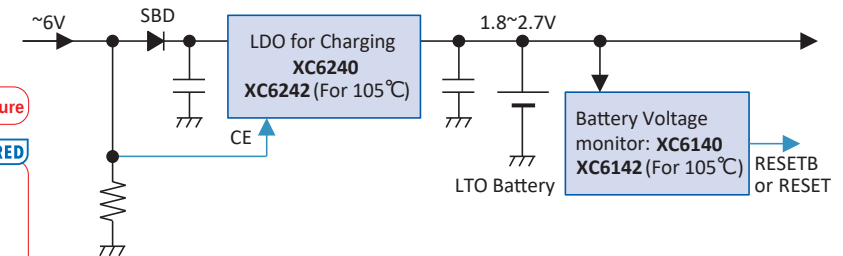
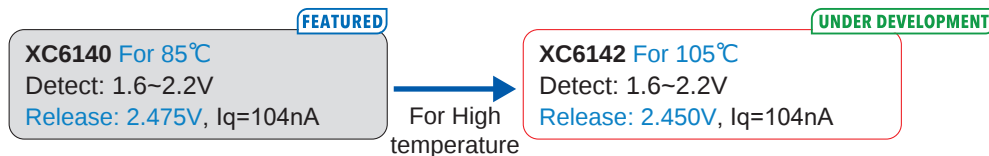
- LDO for charging and battery voltage monitoring IC recommended by LTO battery manufacturers.
- LDO for charging is selected based on operating temperature and output voltage including temperature variation
- Select a battery voltage monitoring IC set at a voltage to be released at the start of charging, depending on maximum temperature of the battery and operation.

LDO for Charging



*For charging at a lower voltage, use XC6215, $V_{OUT}=2.5V$.

LTO battery voltage monitor



Recommended charger IC/monitor for LTO batteries may vary depending on the battery used/conditions.

For details, please contact the battery manufacturer and us.

Automotive IC

■ Features of TOREX Automotive IC (XD Series)

- Automotive reliability support : AEC-Q100 compliant.
- Quality management : Statistical Process Control (SPC) and Measurement System Analysis (MSA) are used for process control.
- Manufacturing process control : AEC-Q001 / AEC-Q002 compliant.
- Traceability : Manufacturing/sales traceability is enhanced compared to general products (XC series).

■ Typical Automotive IC (XD Series)

Standard

Low Iq

High Temperature

About automotive products

Torex's automotive products comply with the guidelines of AEC-Q100.

► Voltage Regulator

XD6506 Low Iq
6V, 150mA
Iq=0.8μA

XD6239 Ultra High-speed
300mA, Iq=100μA, 80dB
Inrush prevention, Ron=0.67Ω

NEW

High Voltage

XD6216 28V, Low Iq
150mA, Iq=5μA
30dB@1kHz

XD6702 36V, High-speed
300mA, Iq=40μA
65dB@1kHz

► Voltage Detector

XD6133 Delay external adj.
Separated Sense pin
RESETB/RESET, MR, 125°C

Multi-function

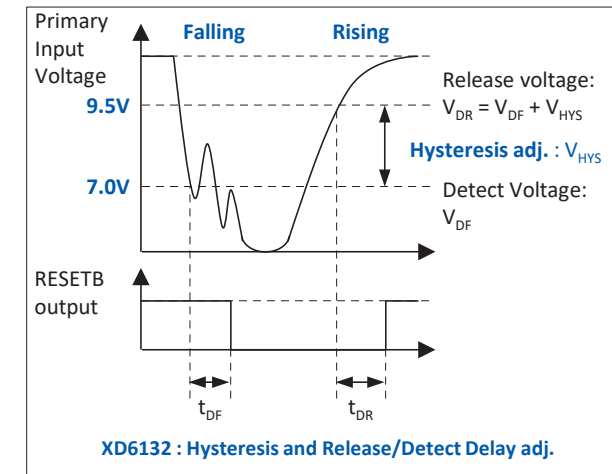
XD6132/XD6134 Separated Sense pin
Hysteresis external adj. (cold crank support)
Detect/Release Delay external adj.
RESETB/RESET, MR, 125°C

► Watchdog Timer (WDT) + Voltage Detector

XD6121/XD6122/XD6123/XD6124
Delay/WDT time internally fixed
Iq=10μA, WDT: 50~1,600ms
Release Delay: 3.13~400ms
WDT function ON/OFF

Delay/WDT
external adj.

XD6130/XD6131
Delay/WDT time external adj.
MR or WDT function ON/OFF, 125°C



Solution Guide : Contents

Various power supply configuration solutions to match each input power source, overall power supply requirements, and circuit applications

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Technical guide

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 - ✓Step-up DC/DCs for OR connection

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- Solution for Small and Low Consumption devices 33

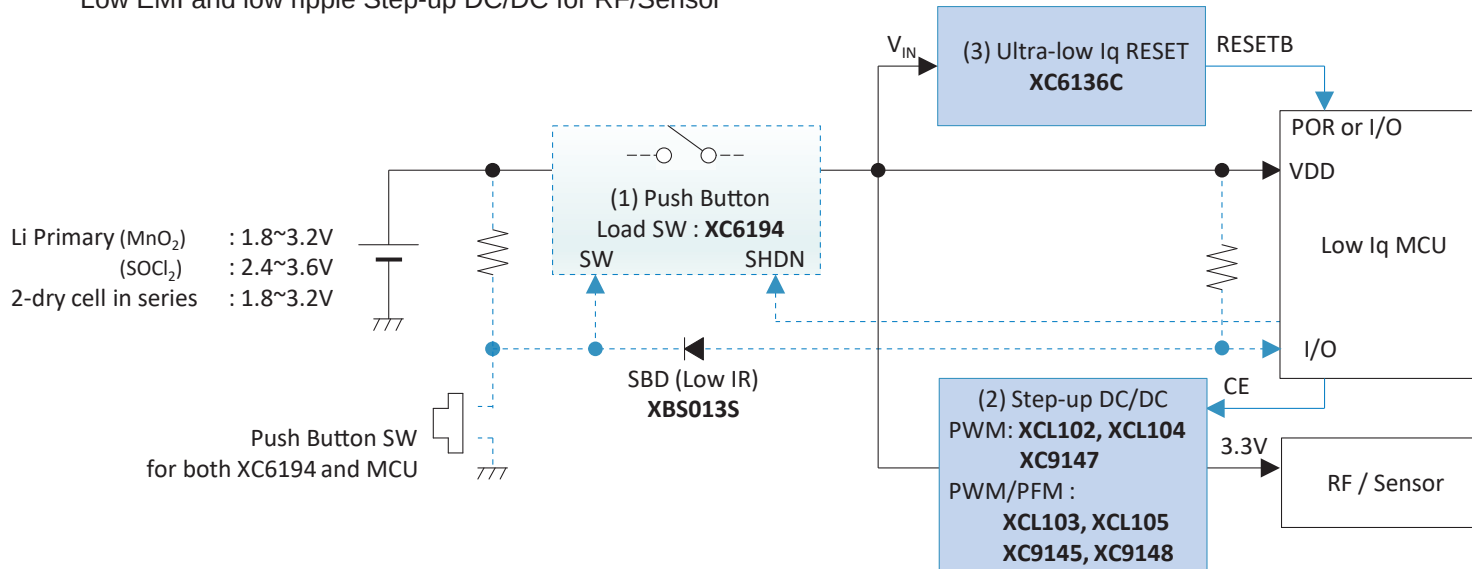
■Solution for Energy Harvesting 34

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Primary battery : Small and Low Consumption solution

■3V Li Primary battery or 2-dry cell : Supplying battery voltage to MCU directly

- Challenges : Preventing discharge of battery after shipment / Countermeasure for system freeze
Low EMI and low ripple Step-up DC/DC for RF/Sensor



	Product	Features
(1) Push button SW	XC6194 FEATURED	I _{STB} =1nA, Shutdown function(Ship/Main power SW) For system freeze, Preventing liquid leakage (UVLO)
(2) Step-up DC/DC	XCL102 / XCL103	Built-in inductor, F-PWM, PWM/PFM 3MHz, 450mA@3.3V→5V
	XCL104 / XCL105 NEW	Built-in inductor, F-PWM, PWM/PFM 1.2MHz, 590mA@3.3V→5V
	XC9145 FEATURED	Ultra-low Iq Iq=400nA, PWM/PFM 1.2MHz, 430mA@3.3V→5V, V _{ST} =1.6V
	XC9147 / XC9148 FEATURED	F-PWM, PWM/PFM 1.2MHz/3MHz, 750mA@3.3V→5V
(3) RESET IC	XC6136	Iq=100nA class Ultra-low Iq

(1) Push Button Load SW with Shutdown function : XC6194

Shutdown at shipment **to reduce the discharge current from the battery to 1nA**.
 For Main power SW / Forced shut-down at system freeze / Prevention of battery liquid leakage.

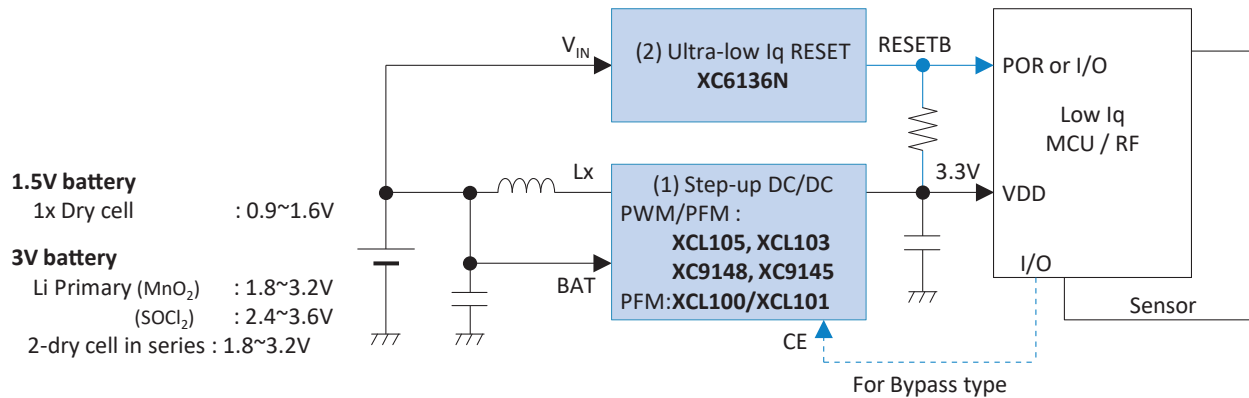
(2) Step-up DC/DC for RF/Sensor

- Step-up when only in use, cut-off by Load disconnection function when not in use.
- Built-in inductor Micro DC/DC** is suitable due to small size and low EMI.
(XCL102/XCL103, XCL104/XCL105)
- For RF/sensors always operating
400nA Ultra-low Iq PWM/PFM step-up XC9145 achieving high-efficiency always.
- When low ripple is important
PWM step-up DC/DC XCL102, XCL104, and XC9147 are suitable for low ripple regardless of load.

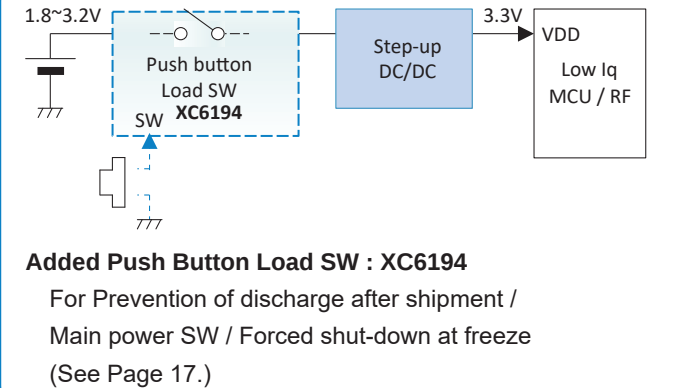
Primary battery : Small and Low Power Consumption solution

■ From 3V Li Primary battery, 1 or 2-dry cell : Supplying boosted voltage to MCU

- Challenges : High efficiency / low EMI / Low ripple Step-up DC/DC
Small / Low Iq / Long battery life



Example of adding Shutdown Function



	Product	Features
(1) Step-up DC/DC	XCL100 / XCL101	Built-in inductor, Low Iq PFM 80mA@3.3V→5V, UVLO (XCL100)
	XCL103 FEATURED	Built-in inductor, PWM/PFM 3MHz, 450mA@3.3V→5V
	XCL105 NEW	Built-in inductor, PWM/PFM 1.2MHz, 590mA@3.3V→5V
	XC9145 FEATURED	Ultra-low Iq Iq=400nA, PWM/PFM 1.2MHz, 430mA@3.3V→5V, V _{ST} =1.6V
	XC9148 FEATURED	Low Ron Bypass, PWM/PFM 1.2MHz/3MHz, 750mA@3.3V→5V,
(2) RESET IC	XC6136	Iq=100nA class Ultra-low Iq

(1) Step-up DC/DC for MCU

(a) For low power consumption

- General use - Supply with always boosting at high efficiency

For 3V battery : Iq=400nA PWM/PFM step-up DC/DC XC9145

High efficiency 89.9%@10μA

For 1.5V battery : Built-in inductor PFM Step-up Micro DC/DC XCL101

- Low Iq power technique - Boost only when MCU is active

Use products with "Bypass" function to boost only when necessary, and supply through battery voltage when the MCU is in sleep mode for even lower power consumption. (XCL101C, XCL103E, XCL105B/E/H/K, XC9148B/E/H/K)

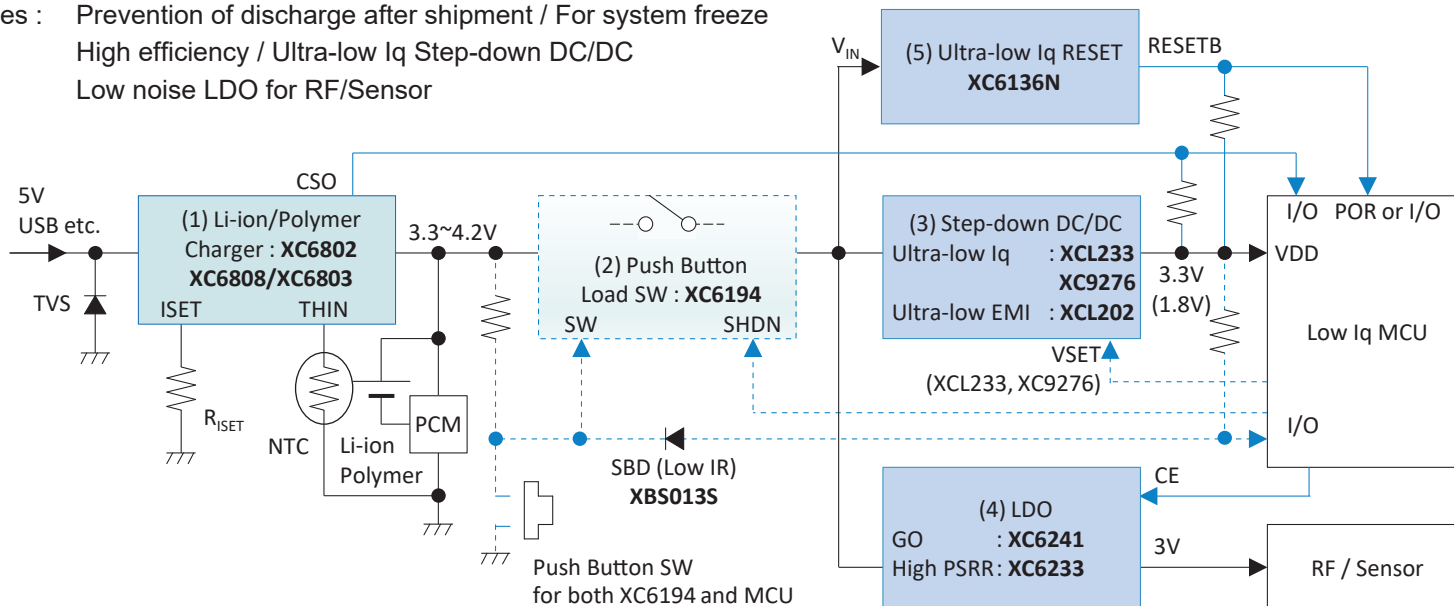
(b) For Small / Low EMI

Use Built-in inductor Micro DC/DC (XCL101, XCL103, XCL105)

Li rechargeable battery : Small and Low Power Consumption solution

■Products using Li-ion/Polymer rechargeable battery : IoT Sensor/Wearable etc.

- Challenges : Prevention of discharge after shipment / For system freeze
- High efficiency / Ultra-low Iq Step-down DC/DC
- Low noise LDO for RF/Sensor



	Product	Features
(1) Li Charger IC	XC6802	CC/CV Charger, CC=~800mA
	XC6808 / XC6803	CC/CV Charger, CC=~280/40mA, Battery Temperature Monitor
(2) Push button SW	XC6194 FEATURED	I _{STB} =1nA, Shutdown function(Ship/Main power SW) For system freeze
(3) Step-down DC/DC	XCL232 FEATURED	Built-in inductor, Iq=200nA, PFM, 150mA
	XCL233 NEW	Built-in inductor, Iq=200nA, PFM, 150mA, VSET(V _{OUT} selectable)
	XCL202	Built-in inductor, Ultra-low EMI, PWM/PFM, 1.2MHz, 400mA
	XC9276 FEATURED	Iq=200nA, PFM, 150mA, VSET(V _{OUT} selectable)
(4) LDO	XC6241 FEATURED	Iq=0.6μA, PSRR=60dB, GO, 150mA
	XC6233	High-speed PSRR=75dB, 200mA
(5) RESET IC	XC6136	Iq=100nA class Ultra-low Iq

(2) Push Button Load SW with Shutdown function : XC6194

Shutdown at shipment **to reduce the discharge current from the battery to 1nA.**
Main power SW / Forced shut-down at system freeze

(3) Ultra-low Iq Step-down DC/DC for MCU

Ultra-low Iq DC/DC is suitable. (XCL232, XCL233, XC9276 : Iq=200nA)
VSET function lowers V_{OUT} in sleep mode to achieve lower Iq. (XCL233, XC9276)
Ultra-low EMI XCL202 to prevent noise to the Sensor.

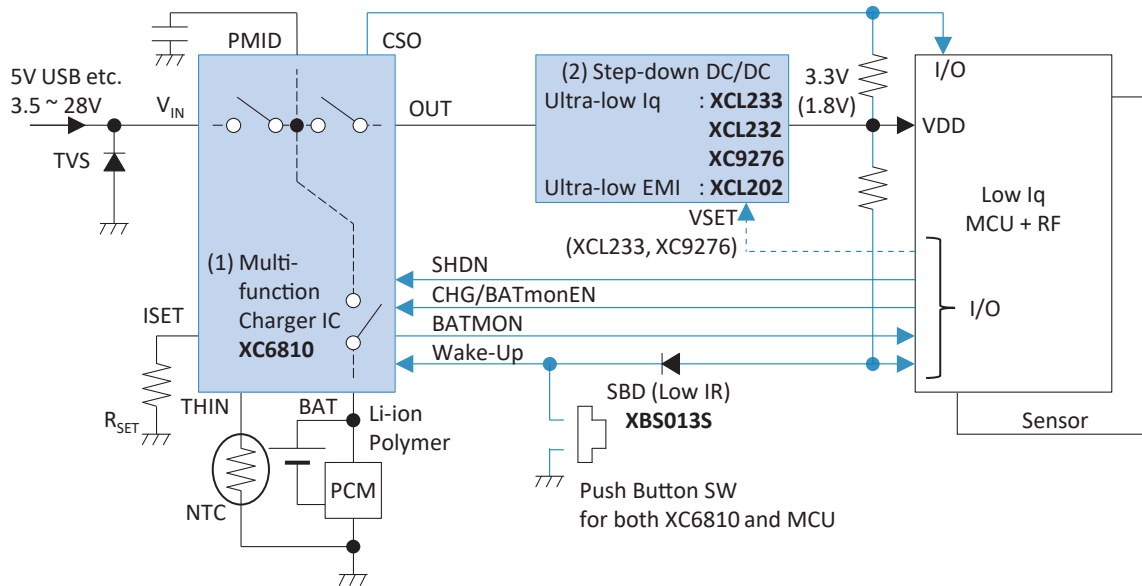
(4) LDO for RF/Sensor : XC6241

GO function automatically switches between low Iq and high-speed according to the output current, achieving both low consumption and high-speed response.

Li rechargeable battery : Ultra-small and Multi-function solution

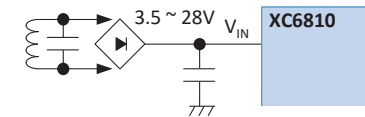
■ Ultra-small products using Li-ion/Polymer Rechargeable battery : Hearables/Wearables/IoT Sensor etc.

- Challenges : Various controls and protections suitable for small Li-ion/Polymer
Prevention of discharge after shipment / Charge status & Battery voltage monitoring
Two-wire communication to Cradle / Supports various types of energy harvesting

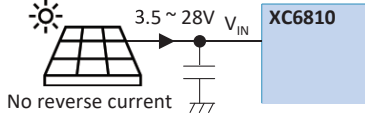


XC6810 Application Examples

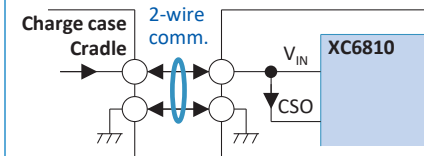
Wireless power transfer



Solar and Other Energy Harvesting



Charge state communication to Cradle



	Product	Features
(1) Li Charger IC	XC6810 NEW	3.5~28V, CV=3.80V~4.40V, CC=1mA~25mA Battery Temperature Monitor, Charge ON/OFF, Current path Charge status & Battery voltage monitoring Shutdown/Wake-up, Two-wire communication to Cradle Supports various types of energy harvesting
(2) Step-down DC/DC	XCL232 FEATURED	Built-in inductor, Iq=200nA, PFM, 150mA
	XCL233 NEW	Built-in inductor, Iq=200nA, PFM, 150mA, VSET(V _{OUT} selectable)
	XCL202	Built-in inductor, PWM/PFM, 1.2MHz, 400mA, Ultra-low EMI
	XC9276 FEATURED	Iq=200nA, PFM, 150mA, VSET

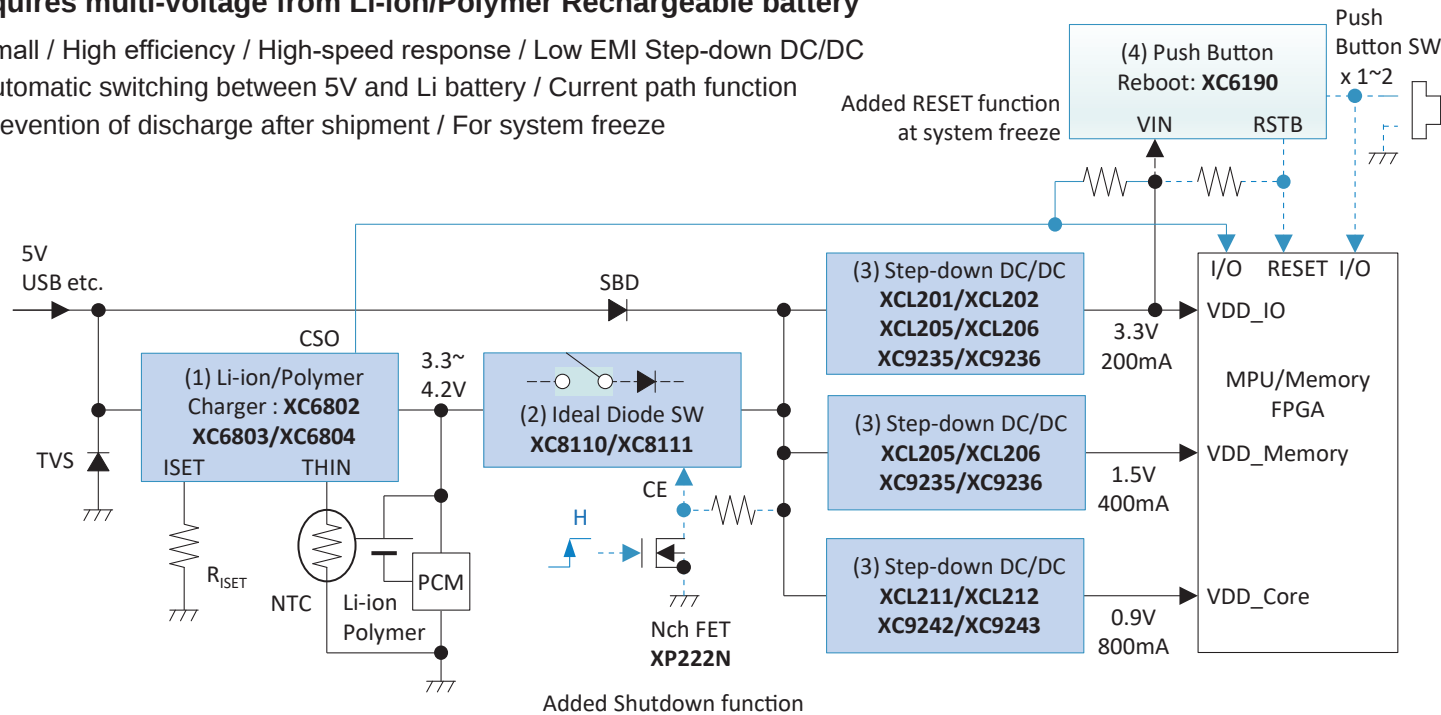
(1) Charger IC suitable for small and small-capacity Li batteries : XC6810

- CC/CV control and protection suitable for Li batteries up to 50mAh.
- Battery voltage monitor : BATMON
Suitable for battery voltage monitoring by A/D of MCU.
- Charger status monitor : CSO
 - Two types of charge status notifications are available: **LED and frequency based on charge level.** Both are ideal for notification to MCU.
 - The frequency type can also be connected to the CSO to modulate the input to achieve **two-wire communication with the charger case or cradle.**
- Shutdown by SHDN signal to prevent discharge of Li battery after shipment.
Startup by inputting "L" to Wake-up with Push Button SW or by applying V_{IN}.
- Supports input range up to 28V.
Supports **various types of Energy harvesting**

Li rechargeable battery : Multiple power rail solution

■Products that requires multi-voltage from Li-ion/Polymer Rechargeable battery

- Challenges : Small / High efficiency / High-speed response / Low EMI Step-down DC/DC Automatic switching between 5V and Li battery / Current path function Prevention of discharge after shipment / For system freeze



Block	Product	Features
(1) Li Charger IC	XC6802	CC/CV Charger, CC~800mA
	XC6803 / XC6804	CC/CV Charger, CC~280/800mA, Battery Temperature Monitor
(2) Ideal diode SW	XC8110 / XC8111 FEATURED	True Reverse current prevention Ideal Diode Load SW VF=20mV, 500mA (XC8110), 1A (XC8111) IEC 62368-1 certified
(3) Step-down DC/DC	XCL201 / XCL202	Built-in inductor, PWM, PWM/PFM, 1.2MHz, 400mA Ultra-low EMI
	XCL205 / XCL206	Built-in inductor, PWM, PWM/PFM, 3MHz, 600mA
	XCL211 / XCL212	Built-in inductor, F-PWM, PWM/PFM, 2.4MHz, 2A
	XC9235 / XC9236	PWM, PWM/PFM, 1.2MHz/3MHz, 600mA
	XC9242 / XC9243	F-PWM, PWM/PFM, 1.2MHz/2.4MHz, 2A
(4) Reboot IC	XC6190	For system freeze, Hold SW 1 and 2 "L" to output reset signal

(2) Ideal Diode Load SW : XC8110/XC8111

Ideal Diode achieves **automatic switching between 5V input and Li battery**
VF loss is also reduced. Adding Nch FET enables Shutdown function at shipment.

(3) Step-down DC/DC for MPU/Memory/FPGA (POL converter)

Stable operation, miniaturization, and low EMI are realized by placing **Built-in inductor Micro DC/DC** close to the load as **POL converter**.
(XCL201/XCL202, XCL205/XCL206, XCL211/XCL212)

(4) Push Button Reboot controller : XC6190

Added Push Button Reboot IC that can reboot the system by long pressing the physical SW for freeze countermeasure. Physical SW can be shared with other uses.

Low power consumption method utilizing operation range of MCU/SoC

■ Achieving longer battery life & low power consumption by changing the output voltage based on an operation of MCU/SoC

● Technical trend and challenges

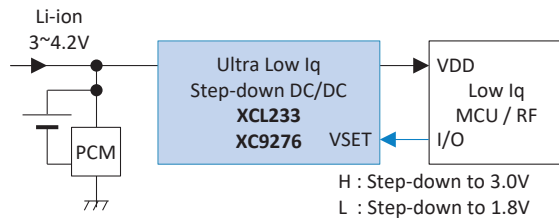
- Current MCU/SoC can operate in a wide voltage range (e.g. 1.6 to 3.8V).
- 3V is required for the analog part and high-speed processing, but a low supply voltage such as 1.8V can be used during sleep mode. This results in lower power consumption.

● TOREX Proposal : Low power consumption by changing output voltage

- Dynamically changing output voltage according to MCU/SoC operation, greatly reducing power consumption in standby state.

► Ultra-low Iq Step-down DC/DC with VSET function : XCL233, XC9276

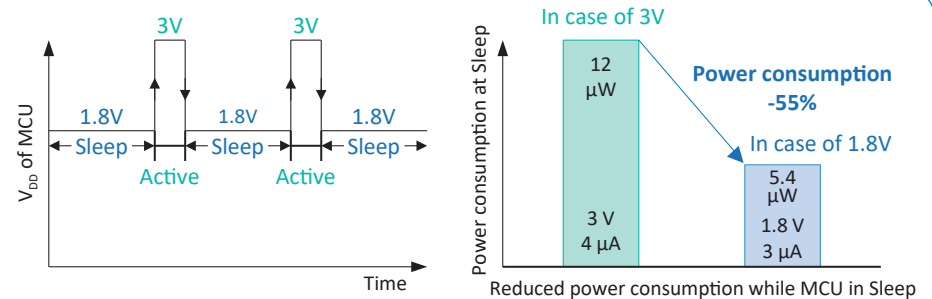
- V_{OUT} can be switched by the VSET pin.
- 200nA Ultra-low Iq achieves always high efficiency: 85.5% @ 10μA



■ Ultra-low Iq VSET (V_{OUT} selectable) function Step-down DC/DC

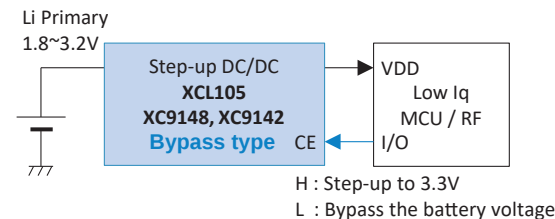
Product	Features	V_{IN} (V)	V_{OUT} (V)	I_{OUT} (mA)	Package
XCL233 NEW	Built-in inductor VSET(V_{OUT} selectable) $I_q=200nA$, PFM	1.8 ~ 6.0	0.5 ~ 3.6 2 values	150	CL-2025-03 (2.5x2.0x1.04mm)
XC9276 FEATURED	VSET(V_{OUT} selectable) $I_q=200nA$, PFM	1.8 ~ 6.0	0.5 ~ 3.6 2 values	150	USP-8B06 (2.0x2.0xh0.33mm) SOT-26W (2.8x2.9x1.3mm) WLP-6-03 (1.72x1.07xh0.33mm)

Change supply voltage according to MCU operation



► Step-up DC/DC with Bypass function : XCL105B, XC9148B/H, XC9142B/E

- Switching between voltage boost and battery voltage through
- During MCU sleep, supplying through battery voltage, and I_q of the IC is 0μA.



■ Bypass type Step-up DC/DC

Product	Features	V_{IN} (V)	V_{OUT} (V)	I_{OUT} (mA) @3.3V→5V	Package
XCL105B NEW	Built-in inductor PWM/PPM, 1.2MHz	0.65 ~ 6.0 $V_{ST} = 0.9$	1.8 ~ 5.5	590	DFN3030-10B (3.0x3.0xh1.7mm)
XC9148B/H FEATURED	PWM/PPM 1.2MHz/3MHz	0.65 ~ 6.0 $V_{ST} = 0.9$	1.8 ~ 5.5	750	USP-6C (1.8x2.0xh0.6mm) SOT-89-5 (4.5x4.6xh1.6mm)
XC9142B/E	PWM/PPM 1.2MHz/3MHz	0.65 ~ 6.0 $V_{ST} = 0.9$	1.8 ~ 5.5	500	SOT-25 (2.9x2.8xh1.3mm) USP-6C (1.8x2.0xh0.6mm) WLP-6-01 (1.08x1.28xh0.4mm)

Further lower power consumption / Battery life improvement

■ Ideal Diode to reduce power loss of diode

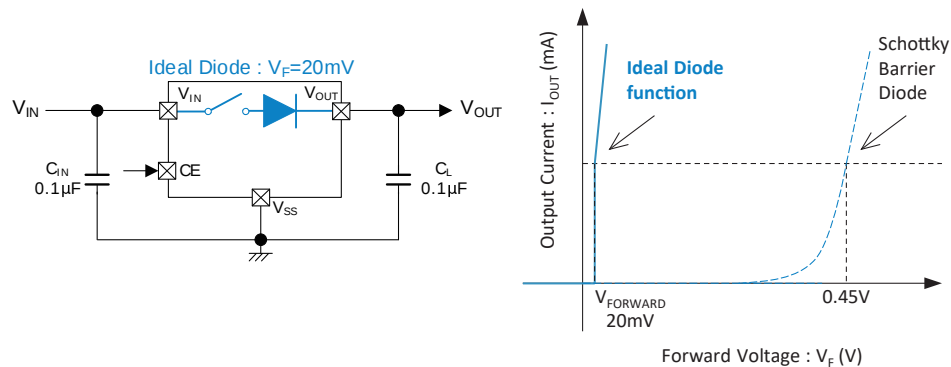
● Technical trend and challenges

- Many diodes used in each power lines for reverse current prevention, etc.
- SBD generates about 0.4V of VF loss and reverse current due to leakage, and the loss is more than 0.4W at IF=1A, which is an obstacle to high efficiency and miniaturization.

● TOREX Proposal : Significantly reducing VF loss

► Ideal Diode Load SW: XC8110 / XC8111

- Achieving $V_F=20\text{mV}$, and loss is 1/20 of SBD when current is 200mA or less. And even at 500mA, greatly reducing loss which is only 1/6 of SBD
- Leakage current is 0 μA , preventing reverse current harmful to batteries.
- IEC 62368-1:2018 certified. Greatly improving safety with current limit and other protections integrated.



■ Ideal Diode Load Switch

Product	Features	V_{IN} (V)	R_{on}	I_{OUT} (mA)	Package
XC8110 FEATURED	$V_F=20\text{mV}$ 3.6 μA (Forward bias) 0 μA (Reverse bias)	1.5 ~ 6.0	120m Ω	500	WLP-4-02 (0.82x0.82x0.5mm) SOT-25 (2.9x2.8x1.3mm) USP-6B06 (1.8x1.5x0.33mm)
XC8111 FEATURED	IEC 62368-1:2018 certified			1,000	

■ "Ship function" to prevent battery discharge during shipment.

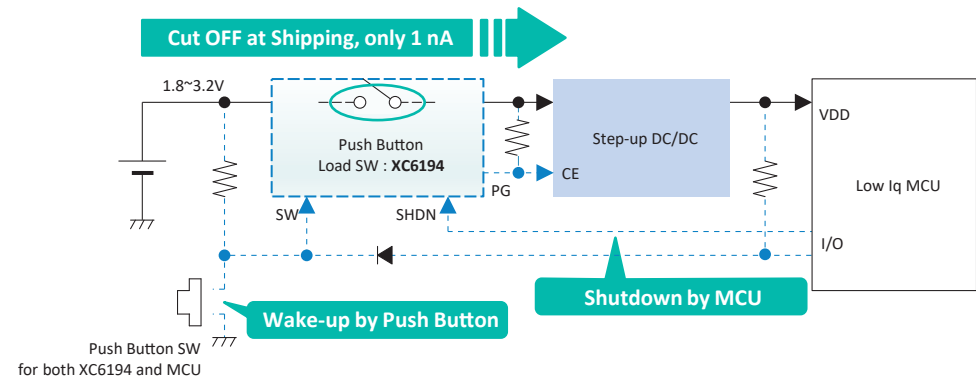
● Technical trend and challenges

- Discharge current from the battery after shipment is so large that the battery may not be usable at the time of usage.
- Due to an increase in the number of devices with built-in batteries and the need to ensure water resistance, the conventional method of preventing discharge by using plastic insulating tabs has become difficult.

● TOREX Proposal : Preventing battery discharge by Ship function

► Push Button Load SW: XC6194 (1A) / XC6193 (1A + External Pch FET)

- Ship function greatly reduces discharge after shipment to 1nA.
- When in use, operation is started by pressing push button.



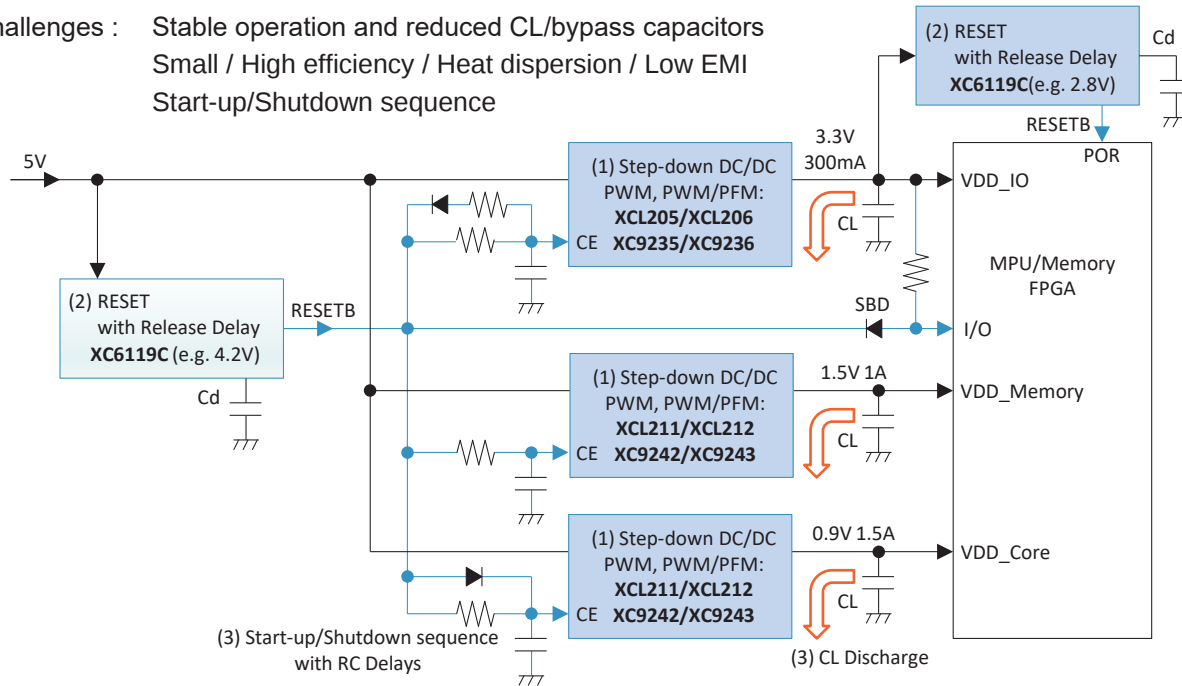
■ Push Button Load Switch with Ship function

Product	Features	V_{IN} (V)	R_{on}	I_{OUT} (mA)	Package
XC6193 FEATURED	$I_{STB}=1\text{nA}$ Shutdown function	1.8 ~ 6.0	Internal 1A + External Pch FET		USP-8B06 (2.0x2.0x0.33mm)
XC6194 FEATURED	(Ship/Main power SW) For system freeze		140m Ω	1,000	

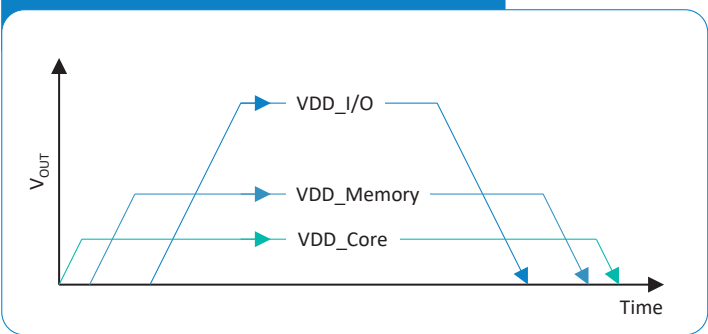
5V : POL solution for Multiple power rails

■POL multiple rails power supply for MPU/FPGA

- Challenges : Stable operation and reduced CL/bypass capacitors
Small / High efficiency / Heat dispersion / Low EMI
Start-up/Shut-down sequence



(3) Start-up/Shut-down power sequence



Block	Product	Features
(1) Step-down DC/DC	XCL205 / XCL206	Built-in inductor, PWM, PWM/PFM 3MHz, 600mA
	XCL211 / XCL212	Built-in inductor, F-PWM, PWM/PFM 2.4MHz, 2A
	XC9235 / XC9236	PWM, PWM/PFM 1.2MHz/3MHz, 600mA
	XC9242 / XC9243	F-PWM, PWM/PFM 1.2MHz/2.4MHz, 2A
(2) RESET IC	XC6119	Low Iq, External Cd Release Delay

(1) Step-down DC/DC for MPU/Memory/FPGA (POL converter)

Stable operation, miniaturization, and low EMI are realized by placing Built-in inductor Micro DC/DC close to the load as **POL converter**.

(XCL205/XCL206, XCL211/XCL212)

(2) Monitoring 5V input

Monitor 5V input with the voltage detector. (**XC6119**)

Controlling Start-up/Shut-down sequence and notifying voltage drop to MPU/FPGA.

(3) Start-up/Shut-down power sequence

The RC delay to each CE pin of the DC/DCs and the CL discharge function make it easier to implement start-up / shut-down sequence.

Drive the RC delays with the CMOS output type (**XC6119C**) voltage detector

TOREX Built-in inductor Micro DC/DC for achieving small / low EMI

■TOREX original Built-in inductor Micro DC/DC XCL Series

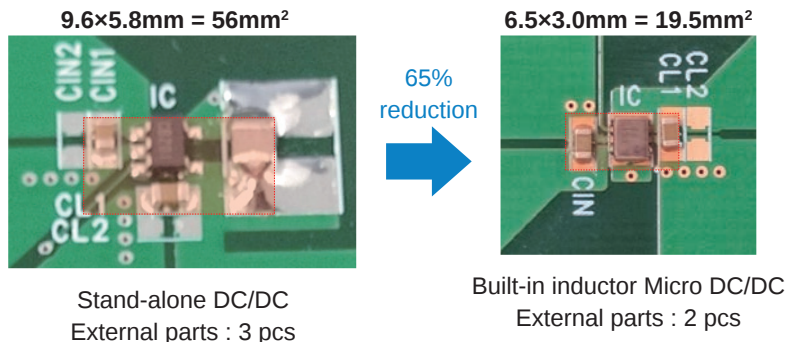
●Technical trend and challenges

- For stable operation of devices, it is important to place power supply ICs close to MCUs and FPGAs. Especially in cases where multiple power supplies are required, selecting power supply ICs suitable for POL (Point of Load) is a challenge.
- Miniaturization of power circuits including ICs and low EMI are essential.

●TOREX Proposal : Built-in inductor Micro DC/DC

►Significant miniaturization of power supply circuit

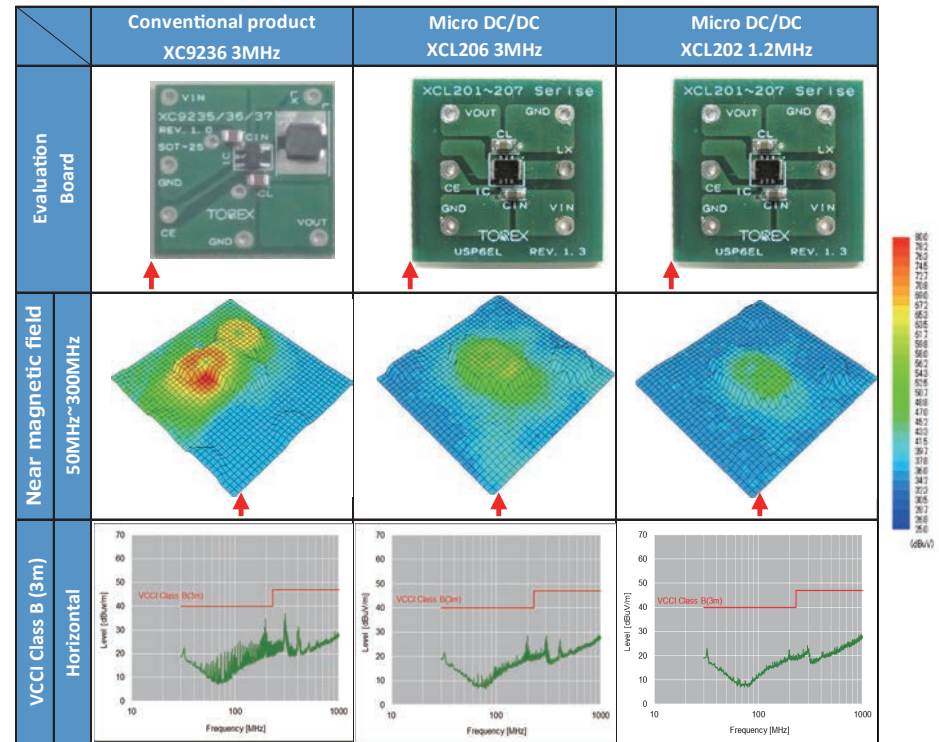
- Achieves a significant reduction in mounting area and providing s mallest class of power supply solution.
- Unique package structure / Optimum inductor for the internal IC.
- Efficient heat dissipation performance with structures that connect IC/coil and substrate with low thermal resistance.



►EMI reduction due to unique Built-in inductor structure

- ✓The pocket-type structure covering the IC with a coil and the optimum placement of the IC enable a **significant reduction of radiated noise** compared to the stand-alone IC.
- ✓Can be placed near RF ICs/Sensors, etc., contributing to miniaturization.

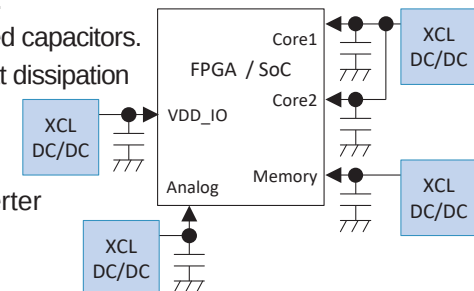
■EMI comparison of Built-in inductor Micro DC/DC and stand-alone DC/DC



Benefits of POL (Point of Load) power supply and Micro DC/DC

- Shorter power supply wiring length.
In addition to stable operation, reduced capacitors.
Heat source dispersion facilitates heat dissipation

- Using Micro DC/DC XCL Series with built-in inductor for POL converter enables further miniaturization, lower EMI, and easier design.

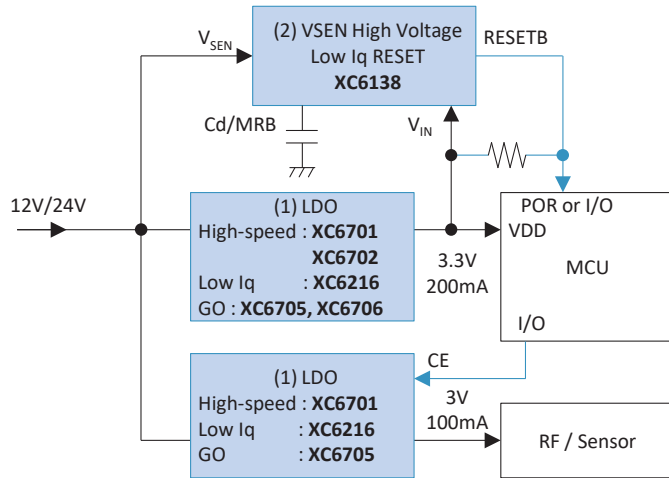


12V/24V and 2-cell Li or 4-dry cell : LDO solution

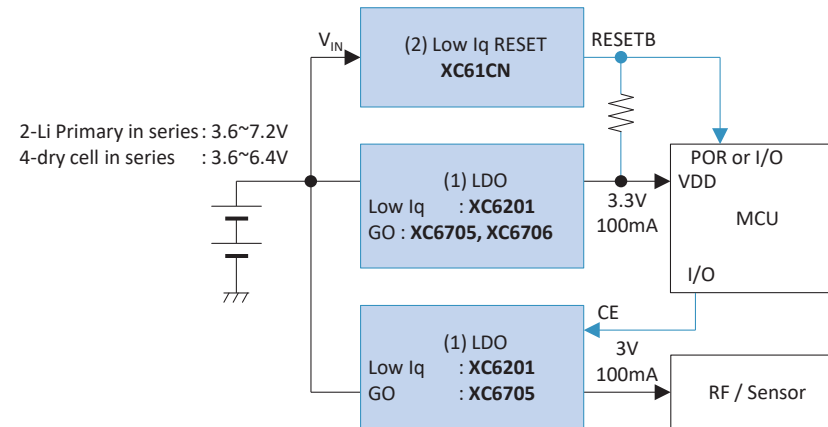
■12V/24V input, 2-cell Li / 4-cell dry cell operation: Low Power Consumption system with simple LDO

- Challenges : Small / Low Iq / Simple
Load transient response to RF/Sensor

12V/24V input



2-cell Li Primary or 4-dry cell in series



Block	Product	Features
(1) LDO	XC6701	28V, High-speed PSRR=50dB, 150mA
	XC6702	36V, High-speed PSRR=65dB, 300mA
	XC6216	28V, Iq=5μA, 150mA
	XC6705 / XC6706	20V, Iq=1.2μA, 200mA PSRR=50dB, Seamless GO, Soft-start, CE (XC6705) NEW
	XC6201	10V, Iq=2.0μA, 200mA
(2) RESET IC	XC6138	High Voltage Sense pin: 76V Ultra-low Iq V _{DD} : 0.5μA, V _{SEN} : 0.2μA@12V Detect/Release Delay external adj. Hysteresis: selectable from 5~50% UNDER DEVELOPMENT
	XC61CN	10V, Iq=0.7μA

(1) Medium Voltage LDO

- For 12V/24V input
Selecting by input voltage range and current consumption
- For 2-Li / 4-dry cell : XC6705/XC6706
Seamless GO achieves both low Iq and high-speed response.
Supports high-speed response required by RF and Sensor.

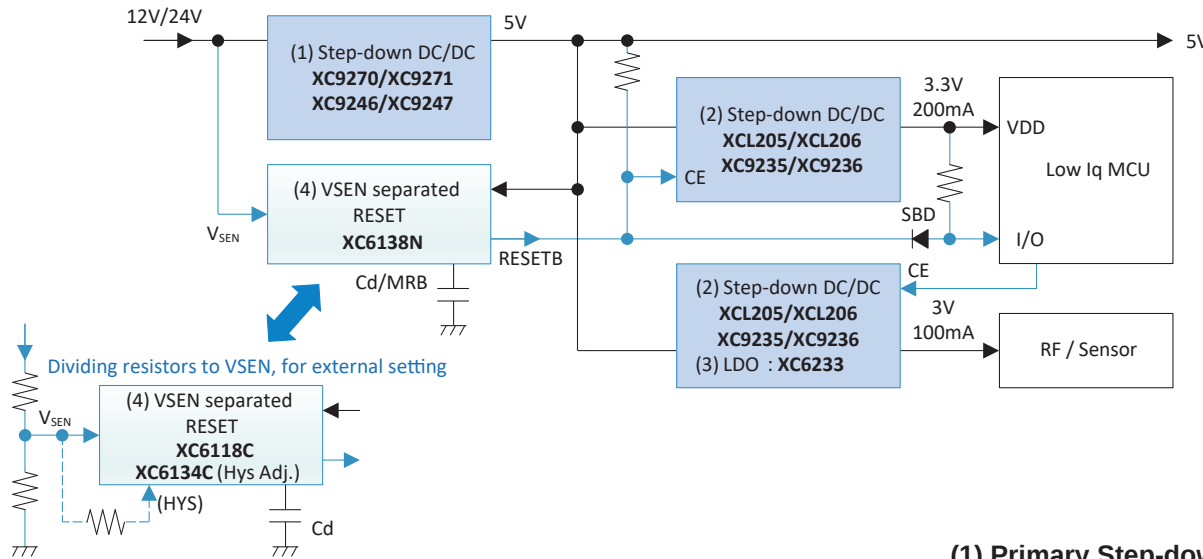
(2) RESET IC

- Direct monitoring of 12V/24V input with V_{SEN} pin of XC6138,
no dividing resistors required resulting in low Iq and high accuracy.
- For applications below 10V, monitor voltage with low Iq RESET IC XC61CN.

12V/24V : Small solution

■ Various small products and modules operating at 12V/24V : Industrial Sensors / IoT

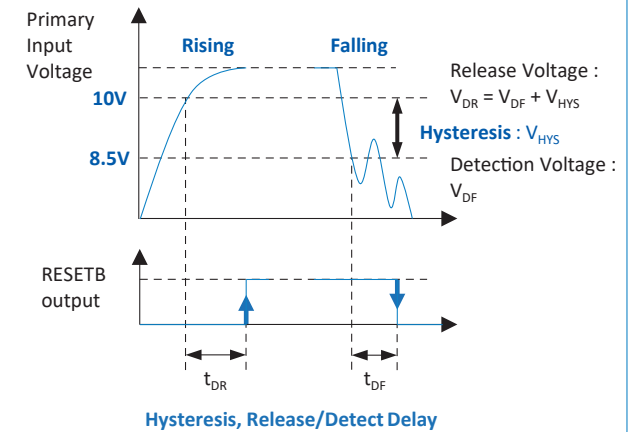
- Challenges : Miniaturization / low EMI / Heat dissipation
Monitoring / Responding to input voltage fluctuation



Block	Product	Features
(1) Primary Step-down DC/DC	XC9270 / XC9271	30V, PWM, PWM/PFM, 300kHz/500kHz, 2A
	XC9246 / XC9247	16V, PWM, PWM/PFM, 1.2MHz, 1A
(2) Step-down DC/DC	XCL205 / XCL206	Built-in inductor, PWM, PWM/PFM, 3MHz, 600mA
	XC9235 / XC9236	PWM, PWM/PFM, 1.2MHz/3MHz, 600mA
(3) LDO	XC6233	High-speed PSRR=75dB, 200mA, Inrush prevention
(4) RESET IC	XC6138 UNDER DEVELOPMENT	High Voltage Sense pin: 76V Ultra-low Iq V _{DD} : 0.5μA, V _{SEN} : 0.2μA@12V Detect/Release Delay external adj. Hysteresis: selectable from 5~50%
	XC6134	Separated Sense pin, Hysteresis adj., Release/Detect Delay adj.
	XC6118	Separated Sense pin, Low Iq, Release Delay external adj.

(4) 12V/24V input monitoring

Example of Detect/Release Hysteresis and Delay



(1) Primary Step-down DC/DC for 12V/24V input

Input voltage range and output current suitable for small devices, and frequency matches for miniaturization.

(2) Step-down DC/DC for MCU/RF/Sensor

Realizing stable operation, small size, low EMI, and low ripple by placing Built-in inductor Micro DC/DC close to the load as POL converter. (**XCL205/XCL206**)

(3) LDO for RF/Sensor : High-speed LDO **XC6233** is suitable.

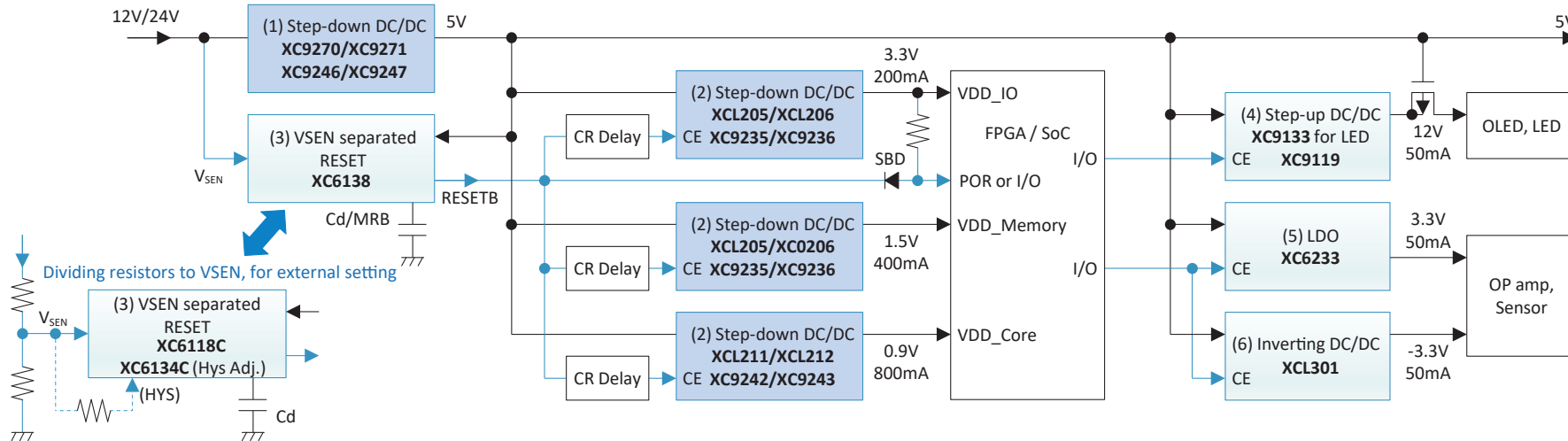
(4) 12V/24V input monitoring Voltage Detector

- Monitors 12V/24V input with sense pin separated Voltage Detector.
- XC6138 directly monitors without dividing resistor**, realizing low Iq and high accuracy, as well as supports Release Delay and Detect/Release Hysteresis options.
- Detect/Release voltage can be set by using **Separated Sense pin type** with dividing resistors and **Hysteresis external adjustment type**. (**XC6134, XC6118**)

12V/24V : Multiple power rail solution

■12V/24V POL multiple rail and Positive/Negative power supply

- Challenges : Small / High efficiency / Heat source dispersion / Low EMI power supply from 12V/24V
- Start-up/Shutdown sequence
- Positive/negative power supplies for various I/O and analog circuits



Block	Product	Features
(1) Primary Step-down DC/DC	XC9270 / XC9271	30V, PWM, PWM/PFM, 300kHz/500kHz, 2A
	XC9246 / XC9247	16V, PWM, PWM/PFM, 1.2MHz, 1A
(2) Step-down DC/DC	XCL205 / XCL206	Built-in inductor, PWM, PWM/PFM, 3MHz, 600mA
	XCL211 / XCL212	Built-in inductor, F-PWM, PWM/PFM, 2.4MHz, 2A
	XC9235 / XC9236	PWM, PWM/PFM, 1.2MHz/3MHz, 600mA
	XC9242 / XC9243	F-PWM, PWM/PFM, 1.2MHz/2.4MHz, 2A
(3) RESET IC	XC6138 UNDER DEVELOPMENT	High Voltage Low Iq Sense pin: 76V, 0.2μA@12V Ultra-low Iq 0.5μA, Release Delay adj., Selectable Hysteresis
	XC6134	Separated Sense pin, Hysteresis adj., Release/Detect Delay adj.
	XC6118	Separated Sense pin, Low Iq, Release Delay external adj.
(4) Step-up DC/DC	XC9119 / XC9133	~19.5V, PWM, 1MHz, 100mA@5V→12V, For LED: XC9133
(5) LDO	XC6233	High-speed PSRR=75dB, 200mA, Inrush prevention
(6) Inverting DC/DC	XCL301	Built-in inductor, PWM/PFM, -3.3V, -50mA

(1) Primary Step-down DC/DC for 12V/24V input

Input voltage range, output current, and frequency suitable for various industrial equipment.

(2) Step-down DC/DC for MPU/Memory/FPGA (POL converter)

Stable operation, miniaturization, and low EMI are realized by placing Built-in inductor Micro DC/DC close to the load as **POL converter**.
(XCL205/XCL206, XCL211/XCL212)

(3) 12V/24V input monitoring Voltage Detector

12V/24V input monitoring and driving CR delay for Start-up/Shutdown sequence.
12V/24V low voltage detection to stop processing, then shutdown each DC/DC.

(4) Step-up DC/DC for OLED/LED and other I/O : Medium voltage step-up XC9119.

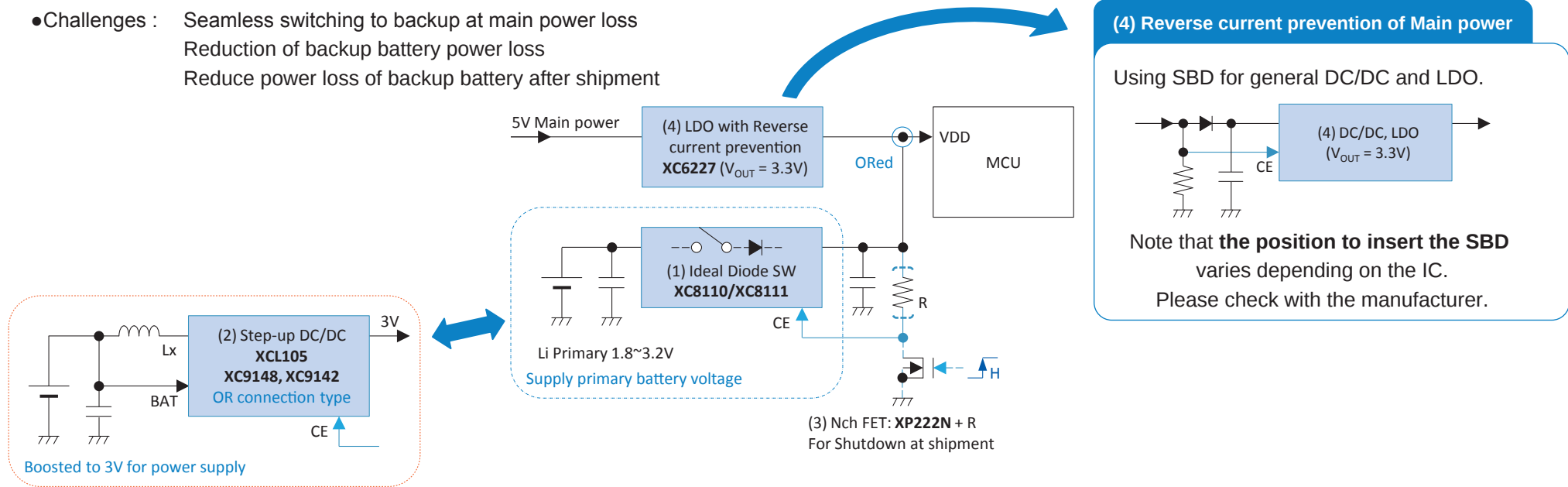
(6) Negative power supply for OP amp and various analog circuits

Built-in inductor Inverting Micro DC/DC XCL301

OR connection solution for Backup and Multiple power sources

Backup power supply with Primary battery

- Challenges : Seamless switching to backup at main power loss
Reduction of backup battery power loss
Reduce power loss of backup battery after shipment



Block	Product	Features
(1) Ideal diode SW	XC8110 / XC8111 FEATURED	True Reverse current prevention Ideal Diode Load SW VF=20mV, 500mA (XC8110), 1A (XC8111) IEC 62368-1 certified
(2) Step-up DC/DC	XCL105C NEW	Built-in inductor, PWM/PFM, 1.2MHz 590mA@3.3V→5V, For OR connection
	XC9148C FEATURED	1.2MHz/3MHz, PWM/PFM 750mA@3.3V→5V, For OR connection
	XC9142C/F	1.2MHz/3MHz, PWM/PFM 450mA@3.3V→5V, For OR connection
(4) LDO with Reverse current prevention	XC6227	High-speed PSRR=65dB, 700mA True Reverse current prevention

OR connection : How to connect Backup battery

(1) Supplying backup battery voltage directly to MCU

OR connection by using **Ideal Diode SW. (XC8110/XC8111)**

VF loss/leakage current can be significantly reduced compared to SBD.

(2) Supplying boosted voltage to MCU

Step-up DC/DC with **OR connection. (XCL105C, XC9148C, XC9142C/F)**

Please note that OR connection availability differs depending on the product and its option.

Method to extend battery life with Ship function

(3) Cut off supply from backup power source before shipment

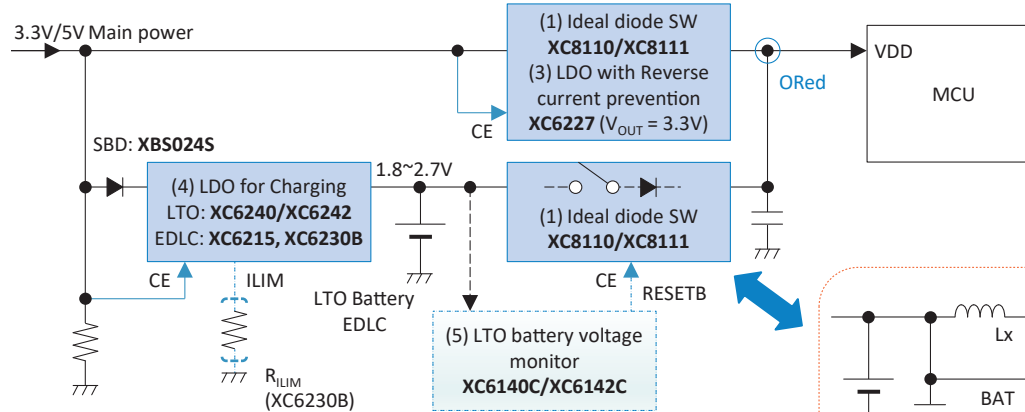
Turn on the Nch FET to turn off the CE.

Significantly reduces the discharge from the battery until the start of use.

OR connection solution for Backup and multiple power sources

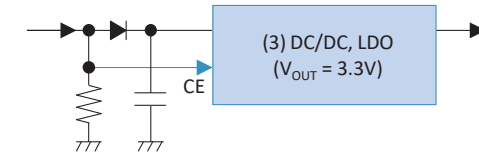
Backup power supply with Rechargeable battery / LTO battery / Supercap (EDLC)

- Challenges : Seamless switching to backup at main power loss
Efficient charging and discharging to backup devices

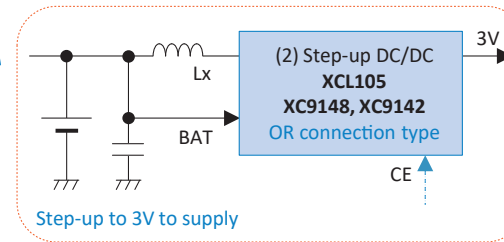


(3) Reverse current prevention of Main power prevention

Use SBD for general DC/DC and LDO.



Note that the position to insert the SBD varies depending on the IC. Check with the manufacturer.



Block	Product	Features
(1) Ideal diode SW	XC8110 / XC8111 FEATURED	True Reverse current prevention Ideal Diode Load SW VF=20mV, 500mA (XC8110), 1A (XC8111) IEC 62368-1 certified
(2) Step-up DC/DC	XCL105C NEW	Inductor built-in, 1.2MHz, 590mA@3.3V→5V, For OR connection
	XC9148C FEATURED	1.2MHz/3MHz, 750mA@3.3V→5V, For OR connection
	XC9142C/F	1.2MHz/3MHz, 450mA@3.3V→5V, For OR connection
(3) LDO with Reverse current prevention	XC6227	High-speed PSRR=65dB, 700mA True Reverse current prevention
(4) LDO for Charging	XC6240 / XC6242 FEATURED	For LTO charging, 150mA, Topr=105°C (XC6242)
	XC6215	Iq=0.8μA, 150mA, Select VOUT voltage suitable for EDLC
	XC6230B	2A, Current limit adj, True Reverse current prevention
(5) LTO battery voltage monitor	XC6140 / XC6142 FEATURED UNDER DEVELOPMENT	LTO battery voltage monitoring Release voltage: 2.475V/2.450V, Iq=104nA For 105°C compatible LTO battery: XC6142

OR connection : How to connect the backup device and Main power

- Supplies backup battery voltage directly to MCU : XC8110/XC8111
- Supplies boosted voltage to MCU : XCL105C, XC9148C, XC9142C/F
- LDO, DC/DC for Main power side

LDO with reverse current prevention to prevent reverse current flowing into the main power supply. (XC6227)
Also, SBD and DC/DC or Standard LDO can be configured for OR connection.

(4) LTO battery / Supercap (EDLC) charging

For LTO battery : Dedicated LDO, XC6240/XC6242.

For EDLC : XC6215, a low Iq LDO, or XC6230B with current limit external adjustment and reverse current prevention. Insert a few Ω resistor at VOUT.

(5) Battery voltage monitoring : XC6140/XC6142

Detect/Release voltage set according to LTO battery characteristics.

Ideal Diode SW and Step-up DC/DC suitable for "OR" connection

■OR connection of power supply rails

●Technical trend and challenges

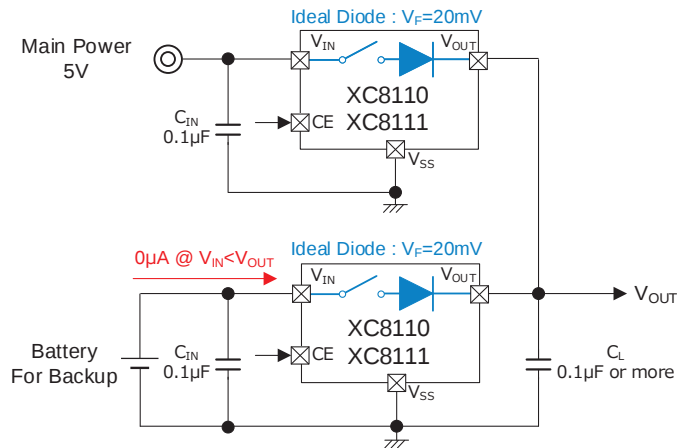
- For high efficiency and long battery life of the device, the circuit using SBD has large loss due to VF. Leakage current of reverse bias is also an issue.
- Difficult to supply stable voltage due to voltage drop and fluctuation caused by the VF characteristic of the diode which may cause unstable operation.

●TOREX Proposal : Dedicated ICs for OR connection

- Low consumption design to reduce battery discharge / Easy automatic switching of power supply path without control / Low VF and response to minimize output voltage fluctuation and loss.

►OR connection with Ideal Diode Load SW : XC8110 / XC8111

- Low VF: 20mV, and 0μA leakage current from output at reverse bias.
- Various built-in protection functions. **IEC 62368-1:2018** certified.
- Low loss requires no heat dissipation and contributes to miniaturization.

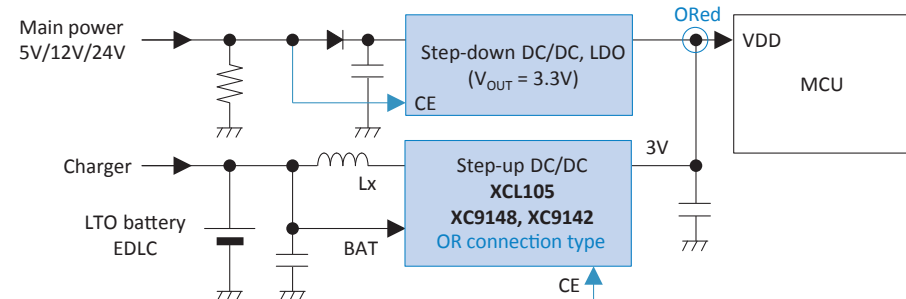


■Load Switch with Ideal Diode function

Product	Features	V _{IN} (V)	R _{on}	I _{OUT} (mA)	Package
XC8110 FEATURED	VF=20mV 3.6μA (Forward bias) 0μA (Reverse bias)	1.5 ~ 6.0	120mΩ	500	WLP-4-02 (0.82x0.82x0.5mm) SOT-25 (2.9x2.8x1.3mm) USP-6B06 (1.8x1.5x0.33mm)
XC8111 FEATURED	IEC 62368-1:2018 certified			1,000	

►Step-up DC/DC for OR connection : XCL105C, XC9148C, XC9142C/F

- Switching without control when main power is input or disconnected
- When main power is lost, immediately starts boosting to supply power.
- Low I_q minimizes battery discharge current.



■Step-up DC/DC for OR connection

Product	Features	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA) @3.3V→5V	Package
XCL105C NEW	Built-in inductor PWM/PFM, 1.2MHz	0.65 ~ 6.0 V _{ST} = 0.9	1.8 ~ 5.5	590	DFN3030-10B (3.0x3.0xh1.7mm)
XC9148C FEATURED	PWM/PFM 1.2MHz/3MHz	0.65 ~ 6.0 V _{ST} = 0.9	1.8 ~ 5.5	750	USP-6C (1.8x2.0xh0.6mm) SOT-89-5 (4.5x4.6xh1.6mm)
XC9142C/F	PWM/PFM 1.2MHz/3MHz	0.65 ~ 6.0 V _{ST} = 0.9	1.8 ~ 5.5	500	SOT-25 (2.9x2.8xh1.3mm) USP-6C (1.8x2.0xh0.6mm) WLP-6-01 (1.08x1.28xh0.4mm)

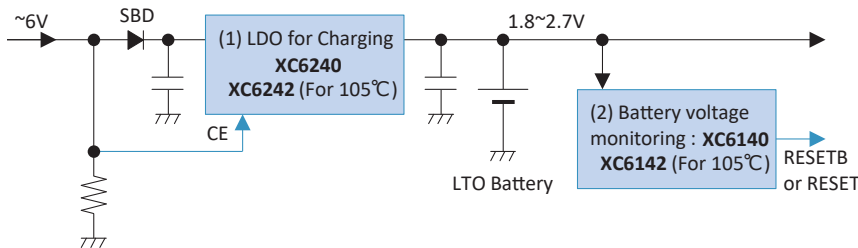
LTO battery : Charge/Discharge Reference solution

■ 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 2.1~2.4V.
Easy energy extraction compared to Supercap (EDLC).
 - 105°C high-temperature operation, reflow-compatible, thin and hot-laminate-compatible products are also available.

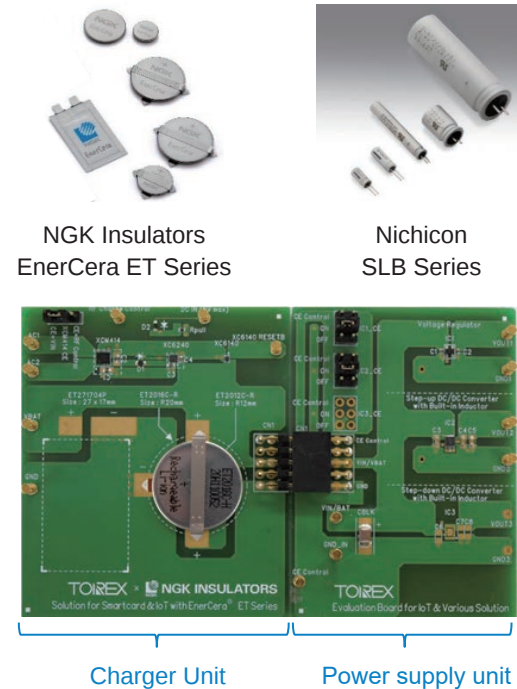
■ Reference circuit for LTO battery charging and battery voltage monitoring



Block	Product	Features
(1) LDO for Charging	XC6240 FEATURED	For LTO charging, 2.63V, 150mA
	XC6242 FEATURED	105°C compatible, For LTO charging, 2.63V, 150mA
(2) LTO battery voltage monitor	XC6140 FEATURED	RESET IC for LTO battery voltage monitoring Detect voltage: 1.6~2.2V, Release voltage: 2.475V, Iq=104nA
	XC6142 UNDER DEVELOPMENT	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.



(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.

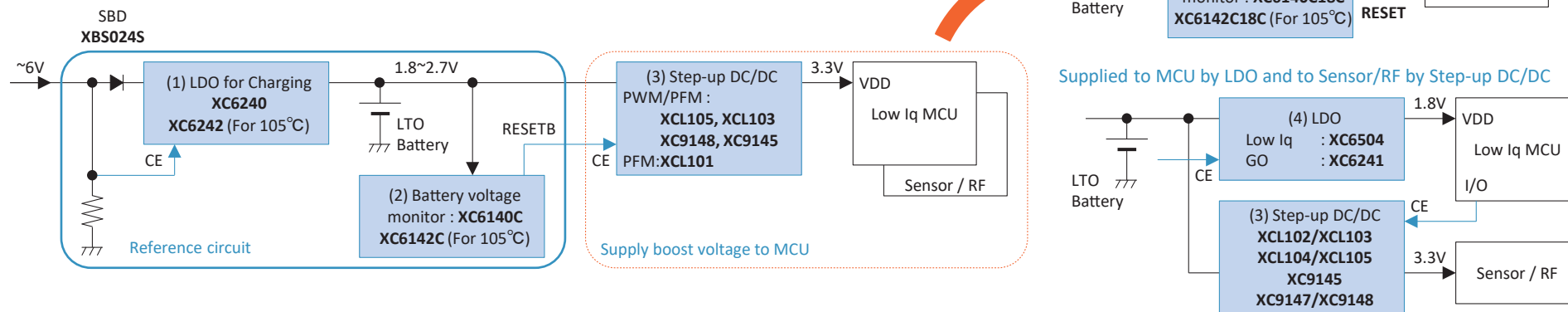
(2) LTO battery voltage monitoring : XC6140, XC6142

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

LTO battery : Solution for Small and Low Consumption devices

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

- Challenges : Simple structure / Small / Low Iq / High efficiency
For backup applications of small products, constantly charging while supplying power to the system



Block	Product	Features
(1) LDO for Charging	XC6240 / XC6242 FEATURED	For LTO charging, 150mA, Topr=105°C (XC6242)
(2) LTO battery voltage monitor	XC6140 / XC6142 FEATURED UNDER DEVELOPMENT	LTO battery voltage monitoring Release voltage:2.475V/2.450V, Iq=104nA For 105°C compatible LTO battery: XC6142
(3) Step-up DC/DC	XCL102 / XCL103	Built-in inductor, F-PWM, PWM/PFM 3MHz, 450mA@3.3V→5V
	XCL104 / XCL105 NEW	Built-in inductor, F-PWM, PWM/PFM, 1.2MHz 590mA@3.3V→5V
	XC9145 FEATURED	Ultra-low Iq Iq=400nA, PWM/PFM 1.2MHz, 430mA@3.3V→5V, V _{ST} =1.6V
	XC9147 / XC9148 FEATURED	F-PWM, PWM/PFM, 1.2MHz/3MHz 750mA@3.3V→5V
(4) LDO	XC6241 FEATURED	Iq=0.6μA, PSRR=60dB, GO, 150mA
	XC6504	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

XC9145 with ultra-low Iq and high efficiency and 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

If the MCU can operate at low voltages, use the LDO XC6241 for lower Iq, or use the Pch FET to supply the battery voltage directly.

For driving the Pch FET, select **XC6140CxxC**, which outputs the battery voltage as "H" level at detection.

Solution for Energy Harvesting

■ Examples of charging from Energy Harvesting to LTO battery or Supercap (EDLC)

- Challenges : Supporting various Energy Harvesting : Wireless power transfer (WPT), NFC, solar panels, piezo, etc.
Charge LTO battery or Supercap (EDLC) from unstable/micropower sources

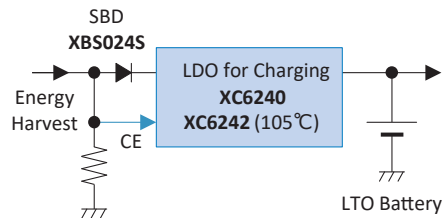
Depending on the voltage characteristics and power of Energy Harvesting, the optimal charging circuit and control voltage varies.

TOREX offers optimal power supply configurations to match the characteristics of your energy harvesting.

Please contact : <https://www.torexsemi.com/contact-us/technical-inquiry/>

Example of 3~6V input + LTO battery

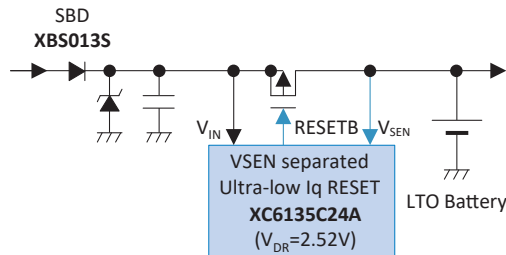
Supported by LTO charging reference circuit



At micro power source

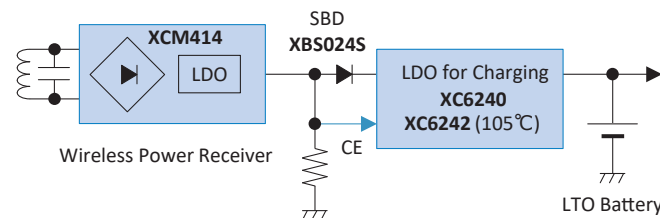
Example of 3~6V input (micro power a few μ W) + LTO battery

ON-OFF control of Pch FET with Ultra-low Iq Voltage Detector

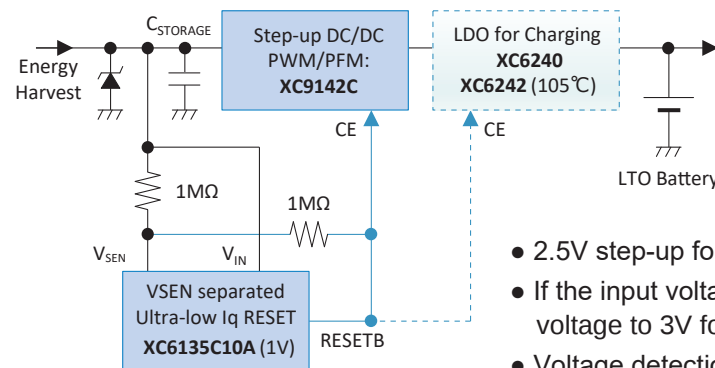


Example of Wireless power transfer + LTO battery

Charging with wireless power receiving IC + LDO



Example of 0.9~2.7V / 0.9~6V input + LTO battery



- 2.5V step-up for direct charging (no LDO required).
- If the input voltage is wide from 0.9 to 6V, boost the voltage to 3V for charging to LTO battery with LDO.
- Voltage detection with hysteresis using XC6135 and resistors. When C_{STORAGE} is charged to 2.1V, the step-up is started to charge LTO battery, and stopped when it drops to 1V.

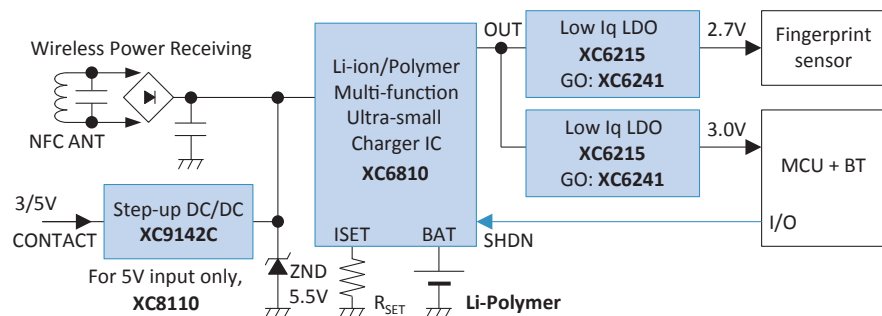
The same circuit can be used for Supercap (EDLC). Select the appropriate charge/detect voltage.

Low Profile Power Supply solution for h=0.33mm/0.40mm max.

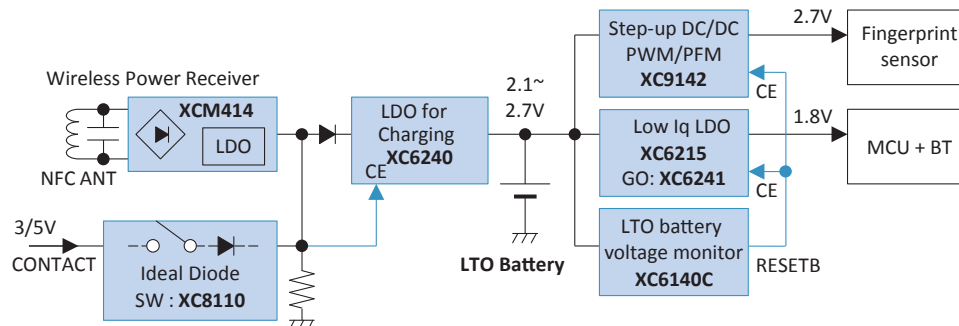
■ Example of thin power supply configuration with h = 0.33mm max for Smart card

- Challenges : Support h=0.33mm max. including external components
- High efficiency charging circuit for input sources such as NFC

Li-Polymer battery : Example of low-profile solution



LTO battery : Example of low-profile solution



■ List of low-profile power supply ICs with h ≤ 0.33mm or 0.40mm

	Product	Features	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA)	Package	Size
LDO	XC6216	28V	2.0 ~ 28.0	1.8 ~ 12.0	150	USP-6B06	1.8 x 1.5 x h 0.33mm
	XC6215	Iq=0.8μA	1.5 ~ 6.0	0.9 ~ 5.0	200		
	XC6241	High-speed, Iss=0.6μA, GO	1.6 ~ 6.0	1.5 ~ 5.0	150	USPQ-4B05	1.0 x 1.0 x h 0.33mm
	XC6504	Cap. Less, Iq=0.6μA	1.4 ~ 6.0	1.1 ~ 5.0	150	USPN-4B02	0.75 x 0.95 x h 0.40mm
LDO + Bridge Diode	XCM414	For wireless power receiving LDO with internal bridge diode	2.0 ~ 26	2.0 ~ 12.0	150	USP-8B10	2.6 x 2.9 x h 0.33mm
Step-up DC/DC	XC9142	PWM/PFM Step-up DC/DC	V _{ST} =0.9	1.8 ~ 5.5	500	WLP-6-01	1.08 x 1.28 x h 0.40mm
	XC9145	Iq=400nA, PWM/PFM Step-up DC/DC	V _{ST} =1.6	3.0 ~ 5.5	430	WLP-6-05	1.28 x 1.08 x h 0.40mm
Charge pump	XC9802	PWM/PFM Charge Pump	1.8 ~ 5.5	2.5 ~ 6.0 or x2	80	USP-8B05	2.4 x 2.4 x h 0.33mm
Step-down DC/DC	XC9276	Iq=200nA, Step-down DC/DC, VSET	1.8 ~ 6.0	0.5 ~ 3.6	150	WLP-6-03	1.72 x 1.07 x h 0.33 mm
Battery voltage monitor	XC6140	For LTO battery voltage monitoring Release voltage:2.475V	1.1 ~ 6.0	1.2 ~ 5.0	-	USPQ-4B05	1.0 x 1.0 x h 0.33mm
	XC6136	Iq=88nA		1.6 ~ 2.2			
Charger IC	XC6810	For 1 cell Li-ion, multi-function Charger IC	3.5 ~ 28	3.8 ~ 4.4	1 ~ 25	WLP-12-01	1.17 x 1.57 x h 0.33mm
	XC6808	Charger IC for 1 cell Li-ion	4.5 ~ 6.0	4.2, 4.35, 4.4	5 ~ 40	USP-6B07	1.8 x 2.0 x h 0.33mm
	XC6240	LDO for charging LTO battery	1.5 ~ 6.0	2.63	150	USP-6B06	1.8 x 1.5 x h 0.33mm
Load SW	XC8102	Load SW, Iq=3uA	1.2 ~ 6.0		400	USP-6B06	1.8 x 1.5 x h 0.33mm
	XC8110	Ideal Diode SW	1.5 ~ 6.0		500		
	XC6194	Push Button Load SW I _{STB} =1nA	1.8 ~ 6.0		1000		



Inputs and energy storage for smart cards

- Input sources : NFC, CONTACT input
- Energy storage : Li-Polymer, LTO battery, Supercap (EDLC), or battery les

Optimal power supply configuration for low-profile solutions varies depending on the input source and other factors.

TOREX offers **optimal power configurations.**

Built-in inductor DC/DC Converter Micro DC/DC

F-PWM : Forced PWM Mode
PWM : PWM Mode

► Step-down DC/DC

	Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
									External FET/SBD	V _{OUT} Setting	Protection	Other		
NEW	XCL233	I _q =200nA, Ultra Low Power VSET (Selectable V _{OUT})	PFM	1.8~6.0	0.5~3.6	150	-	0.2	-	V _{OUT}	Short	UVLO/CL Dischg /VSET (Selectable V _{OUT})	85°C	CL-2025-03 (2.5x2.0xh1.04mm)
FEATURED	XCL232	I _q =200nA Ultra Low Power	PFM	1.8~6.0	0.5~3.6	150	-	0.2	-	V _{OUT}	Short	UVLO/CL Dischg	85°C	CL-2025-03 (2.5x2.0xh1.04mm)
	XCL210	I _q =0.5μA Ultra Low Power	PFM	2.0~6.0	1.0~4.0	200	-	0.5	-	V _{OUT}	Short	UVLO/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL209	400mA, 3MHz Fixed V _{OUT} /FB Type	PWM/PFM	1.8~6.0	0.8~4.0	400	3.0M	46	-	V _{OUT} or FB	ILIM/Short	SS/UVLO/CL Dischg	85°C	USP-10B03 (2.5x2.15xh1.05mm)
	XCL208		PWM					21						
	XCL202	400mA, 1.2MHz Ultra Low EMI	PWM/PFM	2.0~6.0	0.8~4.0	400	1.2M	22	-	V _{OUT}	ILIM/Short	SS/UVLO/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL201		PWM					15						
	XCL206	600mA, 3MHz Fixed V _{OUT} /FB Type	PWM/PFM	1.8~6.0	0.8~4.0	600	3.0M	45	-	V _{OUT} or FB	ILIM/Short	SS/UVLO/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL205		PWM					21						
	XCL212	2A, 2.4MHz	PWM/PFM	2.7~6.0	0.9~6.0	2000	2.4M	53	-	FB	TSD/ILIM	SS/UVLO/CL Dischg	85°C	USP-11B01 (3.1x4.70xh1.35mm)
	XCL211		PWM											

► Step-up DC/DC

	Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA] (V _{IN} =3.3V, V _{OUT} =5.0V)	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
									External FET/SBD	V _{OUT} Setting	Protection	Other		
	XCL100/101	Built in Inductor, I _q =6.3μA Low Power	PFM	0.7~5.5	1.8~5.0	80	-	6.3	-	V _{OUT}	-	UVLO/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL103	Built in Inductor, I _{in} =0.8A Load Disconnection or Bypass	PWM/PFM	0.65~6.0	2.2~5.5	450	3.0M	75	-	V _{OUT}	ILIM/Short	SS/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL102		F-PWM					26						
NEW	XCL105	Built in Inductor, I _{in} =1.4A Load Disconnection	PWM/PFM	0.65~6.0	1.8~5.5	710	1.2M	19	-	V _{OUT}	ILIM/TSD/Short	SS/CL Dischg/UVLO	85°C	DFN3030-10B (3.0x3.0xh1.7mm)
NEW	XCL104	or Bypass or V _{OUT} OR	F-PWM					56						

► Inverting DC/DC

Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA] (V _{IN} =3.3V, V _{OUT} =-3.0V)	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
								External FET/SBD	V _{OUT} Setting	Protection	Other		
XCL301	Built in Inductor, Inverting DC/DC	PWM/PFM	2.7~5.5	-3.3	50	-	40	SBD	-	ILIM	UVLO/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)

See Page 25 for technical details of
Micro DC/DC XCL Series

Step-down DC/DC

F-PWM : Forced PWM Mode
PWM : PWM Mode

► Low Voltage DC/DC : Input voltage 6V or less

	Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
									External FET/SBD	V _{OUT} Setting	Protection	Other		
FEATURED ↓ Iout max	XC9276	I _q =200nA, Ultra Low Power VSET (Selectable V _{OUT})	PFM	1.8~6.0	0.5~3.6	150	-	0.2	-	V _{OUT}	Short	UVLO/CL Dischg /VSET (Selectable V _{OUT})	85°C	WLP-6-03 (1.72x1.07xh0.33mm) USP-8B06 (2.0x2.0xh0.33mm) SOT-26W (2.9x2.8xh1.3mm)
	XC9265	I _q =0.5μA Ultra Low Power	PFM	2.0~6.0	1.0~4.0	200	-	0.5	-	V _{OUT}	Short	UVLO/CL Dischg	85°C	SOT-25 (2.9x2.8xh1.3mm) USP-6EL (1.8x2.0xh0.4mm)
	XC9236	600mA, Low Noise/EMI Fixed V _{OUT} /FB Type	PWM/PFM	1.8~5.5	0.8~6.0	600	1.2M 3.0M	22 15	-	V _{OUT} or FB	ILIM/Short	SS/UVLO/CL Dischg	85°C	SOT-25 USP-6C (1.8x2.0xh0.6mm) USP-6EL (1.8x2.0xh0.4mm) WLP-5-03 (1.06x1.26xh0.4mm)
	XC9235		PWM											
	XC9243	2A	PWM/PFM	2.7~6.0	0.9~6.0	2000	1.2M 2.4M	41	-	FB	TSD/ILIM	SS/UVLO/CL Dischg	85°C	USP-10B (2.9x2.60xh0.6mm) SOP-8FD (4.9x6.0xh1.75mm)
	XC9242		F-PWM											

► Medium Voltage DC/DC : Input voltage 18V or less

	Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
									External FET/SBD	V _{OUT} Setting	Protection	Other		
↓ Iout max	XC9247	16V 1A	PWM/PFM	4.5~16.0	1.2~5.0	1000	1.2M	150	SBD	FB	TSD/ILIM/Short	SS Adj/UVLO	85°C	USP-6C (1.8x2.0xh0.6mm) SOT-26W (2.9x2.8xh1.3mm)
	XC9246		PWM											
	XCM526A	16V DC/DC Controller	PWM/PFM	4.0~16.0	1.2~15.0	3000	500k 1.0M	25	SBD	FB	ILIM/Short	SS Adj/UVLO	85°C	USP-12B01 (2.3x2.8x0.6mm)
	XCM526B		PWM											
	XC9221	16V DC/DC Controller	PWM/PFM	2.8~16.0	1.2~15.0	5000	300k 500k 1.0M	25	Pch+SBD	FB	ILIM/Short	SS Adj/UVLO	85°C	SOT-25 (2.9x2.8xh1.3mm) USP-6C (1.8x2.0xh0.6mm)
	XC9220		PWM											

► High Voltage DC/DC : Input voltage 36V or less

	Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
									External FET/SBD	V _{OUT} Setting	Protection	Other		
↓ Iout max	XC9271	30V (46V/400ms), 2A Ext CLK Sync	PWM/PFM	7.0~30.0	1.2~12.0	2000	300k 500k Ext CLK	200	SBD	FB	TSD/ILIM/Short	SS Adj/UVLO/SYNC	105°C	SOP-8FD (4.9x6.0xh1.75mm)
	XC9270		PWM											
↓ Iout max	XC9252	30V (46V/400ms) Ext CLK Sync, DC/DC Controller	PWM or PWM/PFM	3.0~30.0	1.5~30.0	10000	280k~550k Ext CLK	30	Pch+SBD	FB	TSD/ILIM/Short	SS Adj/UVLO/PG/SYNC	105°C	TSSOP-16 (5.10x6.4xh1.4mm) USP-10B (2.9x2.60xh0.6mm)

Step-up DC/DC, Step-up Charge Pump

F-PWM : Forced PWM Mode
PWM : PWM Mode

► Low Voltage Step-up DC/DC, Charge pump : Output Voltage 7V or less

	Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA] (V _{IN} =3.3V, V _{OUT} =5.0V)	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
									External FET/SBD	V _{OUT} Setting	Protection	Other		
I _{out} max	XC9802	Charge Pump, Regulated V _{OUT}	PWM/PFM	1.8~5.5	2.5~6.0 or V _{IN} X2	40	300k	80	-	V _{OUT}	-	-	85℃	MSOP-8A, USP-8 (2.7x2.5xh0.6mm) USP-8B05 (2.4x2.4xh0.33mm)
	XC9801		PWM											
	XC9111	2step PFM DC/DC	PFM	0.9~10.0	1.5~7.0	70	100k	2	SBD or SBD+Nch	V _{OUT}	ILIM	-	85℃	SOT-23, SOT-25, SOT-89, USP-6C
	XC9110	PFM DC/DC												SOT-25, USP-6C
	XC9140	I _q =6.3μA, Load Disconnection	PFM	0.7~5.5	1.8~5.0	80	-	6.3	-	V _{OUT}	-	UVLO/CL Dischg	85℃	SOT-25, USP-6EL (1.8x2.0xh0.4mm)
FEATURED	XC9145	I _{in} =0.8A, Ultra Low I _q 400nA Load Disconnection	PWM/PFM	0.65~5.5	3.0~5.5	430	1.2M	0.4	-	V _{OUT}	ILIM	SS	105℃	USP-6C (1.8x2.0xh0.6mm) WLP-6-05 (1.08x1.28xh0.4mm)
	XC9142	I _{in} =0.8A, Load Disconnection or Bypass or V _{OUT} OR (XC9142 Only)	PWM/PFM	0.65~6.0	1.8~5.5	500	1.2M 3.0M	17 56	-	V _{OUT}	ILIM/Short	SS/CL Dischg	85℃	SOT-25, USP-6C (1.8x2.0xh0.6mm) WLP-6-01 (1.08x1.28xh0.4mm)
	XC9141		F-PWM											
FEATURED	XC9148	I _{in} =0.8A, Load Disconnection or Bypass or V _{OUT} OR (XC9142 Only)	PWM/PFM	0.65~6.0	1.8~5.5	750	1.2M 3.0M	19 56	-	V _{OUT}	ILIM/TSD/Short	SS/CL Dischg/UVLO	105℃	USP-6C (1.8x2.0xh0.6mm) SOT-89-5 (4.5x4.6xh1.6mm)
FEATURED	XC9147	I _{in} =1.4A, Load Disconnection	F-PWM											

► Mid Voltage Step-up DC/DC : Output Voltage 7V~

I _{out} max ↓	Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA] (V _{IN} =5.0V, V _{OUT} =12V)	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
									External FET/SBD	V _{OUT} Setting	Protection	Other		
	XC9133	LED/Back Light Driver PWM Dimming	PWM	2.5~6.0	2.5~17.5	60	1.0M	60	SBD	FB	ILIM/OVP	PWM Dimming	85℃	SOT-25 (2.9x2.8xh1.3mm)
	XC9119	Simple PWM	PWM	2.5~6.0	2.5~19.5	100	1.0M	55	SBD	FB	ILIM	SS Adj	85℃	SOT-25, USP-6C
	XC9121	Max Duty=93% DC/DC Controller	PWM/PFM	0.9~6.0	1.5~30.0	2000	100k	13	Nch+SBD	FB	-	SS	85℃	SOT-25 (2.9x2.8xh1.3mm) USP-6C (1.8x2.0xh0.6mm)
	XC9120		PWM											
	XC9104	Standard DC/DC Controller	PWM/PFM	0.9~10.0			100k/180k/ 300k/500k	14						SOT-25 (2.9x2.8xh1.3mm) USP-6B (1.8x2.0xh0.6mm)
	XC9103		PWM											

Buck-Boost DC/DC, Inverting Charge Pump & DC/DC, LED/Back Light Driver

F-PWM : Forced PWM Mode
PWM : PWM Mode

Buck-Boost DC/DC

↑
I_{OUT} max
↓

Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA] (V _{IN} =5.0V, V _{OUT} =5.0V)	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
								External FET/SBD	V _{OUT} Setting	Protection	Other		
XC9302	Buck-Boost DC/DC Controller	PWM/PFM	2.0~10.0	2.4~6.0	400	180k 300k	15	Pch+SBDx2	V _{OUT}	-	SS	85℃	SOT-25 (2.9x2.8x1.3mm)
XC9301		PWM											
XC9303	Basic Buck-Boost DC/DC Controller	PWM or PWM/PFM	2.0~10.0	2.0~6.0	1500	300k	55	Pch+Nchx2+SBD	FB	-	SS	85℃	MSOP-8A (4.9x3.0x1.22mm)

Inverting DC/DC, Inverting Charge Pump

↑
I_{OUT} max
↓

Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA] (V _{IN} =3.3V, V _{OUT} =3.3V)	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
								External FET/SBD	V _{OUT} Setting	Protection	Other		
XC6351A	Charge Pump, Inverting	PWM	1.2~5.0	-1.2~-5.0	10	35k, 120k	100	-	-	-	-	80℃	SOT-25, USP-6B (1.8x2.0x0.6mm)
XCL301	Built in Inductor, Inverting DC/DC	PWM/PFM	2.7~5.5	-3.3	50	-	40	SBD	-	ILIM	UVLO/CL Dischg	85℃	CL-2025-02 (2.5x2.0x1.04mm)

LED/Back Light Driver

Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA] (V _{IN} =5.0V, V _{OUT} =12V)	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
								External FET/SBD	V _{OUT} Setting	Protection	Other		
XC9133	LED/Back Light Driver PWM Dimming	PWM	2.5~6.0	2.5~17.5	60	1.0M	60	SBD	FB	ILIM/OVP	PWM Dimming	85℃	SOT-25 (2.9x2.8x1.3mm)

Voltage Regulator : Low Iq type, Medium-speed type

► Low Voltage Regulators : Input Voltage 6V or less

	Product	Feature	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	I _Q [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
									CE	Current Limit	Other		
NEW	XC6242	Charger IC for LTO Battery I _Q =0.8μA, 150mA	1.5~6.0	2.60	150	0.8	4.50	35	Yes	ILIM	-	105℃	USPN-4 (0.90x1.2xh0.4mm)
FEATURED	XC6240			2.63								85℃	SSOT-24, USPN-4 (0.90x1.2xh0.4mm) USP-6B06 (1.8x1.5xh0.33mm)
FEATURED	XC6241	Go function I _Q =0.6μA, High Speed, 150mA	1.6~6.0	1.2~5.0	150	0.6	0.87	60	Yes	FB+ILIM	GO/CL Dischg	105℃	SSOT-24 (2.0x2.1xh1.1mm) USPQ-4B05 (1.0x1.0xh0.33mm)
NEW	XC6506	I _Q =0.8μA, 150mA	1.5~6.0	1.2~5.0	150	0.8	2.60	35	Yes	FB	-	105℃	USP-4 (0.9x1.2x0.4mm)
	XC6504	Cap Less, I _Q =0.6μA, 150mA	1.4~6.0	1.1~5.0	150	0.6	2.13	30	Yes	FB+ILIM	Cap less/CL Dischg	85℃	SOT-25, SSOT-24 USPN-4B02, USPQ-4B04
	XC6217	Go function I _Q =4.5μA, High Speed, 200mA	1.6~6.0	0.8~4.0	200	4.5	0.80	70	Yes	FB	GO/CL Dischg	85℃	SOT-25, SSOT-24 USP-4D, USPN-4
	XC6215P	I _Q =0.8μA, 200mA	1.5~6.0	0.9~5.0	200	0.8	2.30	35	-	FB+ILIM	-	85℃	USP-3 (1.2x1.2xh0.6mm)
	XC6215B								Yes				SOT-25, SSOT-24 USP-4, USPN-4, USP-6B06
	XC6501P	Cap Less, High Speed, 200mA	1.4~6.0	1.2~5.0	200	13	1.20	50	-	FB	Cap less/CL Dischg	85℃	USP-3 (1.2x1.2xh0.6mm)
	XC6501A-D								Yes				SOT-25, SSOT-24 USP-4, USPN-4, WLP-4-01
	XC6206	I _Q =1μA, 250mA	1.8~6.0	1.2~5.0	250	1	1.75	35	-	FB+ILIM	-	85℃	USP-6B (1.8x2.0xh0.6mm) SOT-89, SOT-23
	XC6503P	Cap Less, High Speed, 500mA	1.7~6.0	1.2~5.0	500	15	0.47	55	-	FB+ILIM	Cap less/CL Dischg	85℃	SOT-89 (4.5x4.0xh1.6mm)
	XC6503A-D								Yes				SOT-89-5, SOT-25 USP-4 (1.2x1.6xh0.6mm)
	XC6220	Go function I _Q =8μA, High Speed 1A	1.6~6.0	0.8~5.0	1000	8	0.18	50	Yes	FB+ILIM	GO/Inrush/TSD/CL Dischg	85℃	USP-6C (1.8x2.0xh0.6mm) SOT-25, SOT-89-5

► Middle Voltage Regulators : Input Voltage 20V or less

	Product	Feature	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	I _Q [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
									CE	Current Limit	Other		
NEW	XC6706	Seamless GO I _{SS} =1.2μA, High Speed	3.5~20.0	2.5~5.5	200	1.2	0.45	50	-	FB	GO/SoftStart/TSD	105℃	SOT-89 (4.5x4.0xh1.6mm)
NEW	XC6705	20V, 200mA							Yes		GO/SoftStart/TSD /CLDischarge		USP-4 (1.2x1.6xh0.6mm) SOT-25 (2.9x2.8xh1.3mm)
	XC6505	I _Q =5.5μA 10.5V, 200mA	1.7~10.5	1.5~8.0	200	5.5	1.10	60	Yes	FB+ILIM	TSD/CL Dischg	105℃	USP-6C (1.8x2.0xh0.6mm) SOT-89-5, SOT-25
	XC6201	I _Q =2μA 10V, 200mA	1.8~10.0	1.3~6.0	200	2	2.00	35	-	ILIM	-	85℃	USP-6B (1.8x2.0xh0.6mm) SOT-89, SOT-25

► High Voltage Regulators : Input Voltage 36V or less

	Product	Feature	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	I _Q [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
									CE	Current Limit	Other		
	XC6216B	28V, 150mA FB Type (XC6216C)	2.0~28.0	1.8~12.0	150	5	6.50	30	Yes	FB+ILIM	TSD	85℃	USP-6C, SOT-25 USP-6B06, SOT-89-5
	XC6216C			2.0~23.0									USP-6C (1.8x2.0xh0.6mm)
	XC6216D			1.8~12.0									SOT-89-5, SOT-25 TO-252
	XC6408	28V, 150mA RESET	2.0~28.0	2.0~18.0	150	8	3.50	40	-	FB+ILIM	TSD /RESET	85℃	SOT-89, SOT-223 USP-6C (1.8x2.0xh0.6mm) SOT-89-5, SOT-25

Voltage Regulator : High-speed type

► Low Voltage Regulators : Input Voltage 6V or less

	Product	Feature	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	I _q [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
									CE	Current Limit	Other		
I _{out} max	FEATURED XC6241	GO function I _q =0.6μA, High Speed, 150mA	1.6~6.0	1.2~5.0	150	0.6	0.87	60	Yes	FB+ILIM	GO/CL Dischg	105℃	SSOT-24 (2.0x2.1xh1.1mm) USPQ-4B05 (1.0x1.0xh0.33mm)
	XC6233	Inrush Protection, High Speed, 200mA	1.7~5.5	1.2~3.6	200	45	1.20	75	Yes	FB+ILIM	Inrush/CL Dischg	85℃	SOT-25, SSOT-24 USP-4, USPQ-4B04
	XC6221	High Speed, 200mA	1.6~6.0	0.8~5.0	200	25	0.80	70	Yes	FB	CL Dischg	85℃	SOT-25, SSOT-24 USP-4, USPN-4
	XC6217	GO function I _q =4.5μA, High Speed, 200mA	1.6~6.0	0.8~4.0	200	4.5	0.80	70	Yes	FB	GO/CL Dischg	85℃	SOT-25, SSOT-24 USP-4D, USPN-4
	XC6415	2ch LDO, 200mA x 2ch	1.5~6.0	0.8~5.0	200 x 2ch	28/ch	1.00	65	Yes	FB	CL Dischg	85℃	USP-6C (1.8x2.0xh0.6mm) SOT-26, USPN-6
	XC6229	High Speed, 300mA Inrush Protection	1.6~5.5	1.2~4.0	300	100	0.53	80	Yes	FB+ILIM	Inrush/TSD/CL Dischg	85℃	LGA-4B01 (0.75x0.75xh0.3mm)
	XC6228										Inrush/CL Dischg		USPQ-4B04 (1.0x1.0xh0.6mm)
	XC6223										Inrush/TSD/CL Dischg	105℃	SOT-25, SSOT-24, SOT-89-5 USP-4, USPQ-4B03
	XC6219	High Speed, 300mA	2.0~6.0	0.9~5.0	300	25	1.60	70	Yes	FB+ILIM	-	85℃	USP-6B (1.8x2.0xh0.6mm) SOT-25, SOT-89-5
	XC6227	Reverse Current Protection, High Speed, 700mA	1.7~6.0	0.8~5.0	700	100	0.40	65	Yes	FB	Reverse/TSD	85℃	USP-6C (1.8x2.0xh0.6mm) SOT-89-5, SOT-25
	XC6222	High Speed, 700mA	1.7~6.0	0.8~5.0	700	100	0.40	65	Yes	FB	Reverse/TSD/CL Dischg	85℃	USP-6C (1.8x2.0xh0.6mm) SOT-89-5, SOT-25
	XC6220	GO function I _q =8μA, High Speed 1A	1.6~6.0	0.8~5.0	1000	8	0.18	50	Yes	FB+ILIM	GO/Inrush/TSD/CL Dischg	85℃	USP-6C (1.8x2.0xh0.6mm) SOT-25, SOT-89-5
	XC6230	High Speed, 2A FB Type	1.7~6.0	1.2~5.0	2000	45	0.18	70	Yes	FB+ILIM	Reverse/Inrush/TSD/ILIM Adj/CL Dischg	105℃	USP-6C (1.8x2.0xh0.6mm) SOP-8FD (6.0 x 4.9 xh1.55mm)

► Middle Voltage Regulators : Input Voltage 20V or less

	Product	Feature	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	I _q [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
									CE	Current Limit	Other		
I _{out} max	NEW XC6706	Seamless GO Iss=1.2μA, High Speed 20V, 200mA	3.5~20.0	2.5~5.5	200	1.2	0.45	50	-	FB	GO/SoftStart/TSD	105℃	SOT-89 (4.5x4.0xh1.6mm)
	NEW XC6705								Yes		GO/SoftStart/TSD /CLDischarge		USP-4 (1.2x1.6xh0.6mm) SOT-25 (2.9x2.8xh1.3mm)
	XC6505	I _q =5.5μA 10.5V, 200mA	1.7~10.5	1.5~8.0	200	5.5	1.10	60	Yes	FB+ILIM	TSD/CL Dischg	105℃	USP-6C (1.8x2.0xh0.6mm) SOT-89-5, SOT-25
	XC6209	10V, 300mA High Speed	2.0~10.0	0.9~6.0	300	25	1.60	80	Yes	FB+ILIM	-	85℃	USP-6B (1.8x2.0xh0.6mm) SOT-89-5, SOT-25
	XC6231	10V, 500mA High Speed	2.0~10.0	0.9~5.5	500	35	1.60	65	-	FB+ILIM	-	85℃	SOT-89-5 (4.5x4.6xh1.6mm)

► High Voltage Regulators : Input Voltage 36V or less

	Product	Feature	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	I _q [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
									CE	Current Limit	Other		
I _{out} max	XC6701A	28V, 150mA High Speed	2.0~28.0	1.8~18.0	150	50	6.50	50	Yes	FB+ILIM	TSD	105℃	USP-6C (1.8x2.0xh0.6mm) SOT-89-5, SOT-25
	XC6701D								-			85℃	TO-252 SOT-223, SOT-89
	XC6702	36V (46V/400ms) High Speed, Low I _q	4.5~36.0	1.8~18.0	300	40	3.50	65	Yes	FB	SoftStart/TSD	105℃	USP-6C (1.8x2.0xh0.6mm) SOT-89-5, SOP-8FD

Voltage Regulator : For Low input voltage, Negative voltage and WPT

► Low Input Voltage ($V_{IN}=0.5V\sim3.0V$)

Product	Feature	V_{IN} [V]	V_{OUT} [V]	I_{OUT} [mA]	I_q [μ A]	R_{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
								CE	Current Limit	Other		
XC6601	Low Voltage input, Vbias=2.5~6V, 400mA	1.0~3.0	0.7~1.8	400	25	0.34	60	Yes	FB+ILIM	UVLO/TSD/SoftStart/CL Dischg	85°C	USP-6C (1.8x2.0x0.6mm) SOT-89-5 ,SOT-25
XC6604	Low Voltage input, 1A Vbias=2.5~6V Current Limit adj. (XC6604) SoftStart adj. (XC6603)	0.5~3.0	0.5~1.8	1000	100	0.15	75	Yes	FB	UVLO/TSD/SoftStart/CL Dischg ILIM Adj (XC6604) SoftStart Adj (XC6603)	85°C	USP-6C (1.8x2.0x0.6mm) SOT-26W (2.9x2.8x1.3mm) USP-6C, SOT-89-5 SOT-26W, WLP-5-02
XC6603												
XC6602												

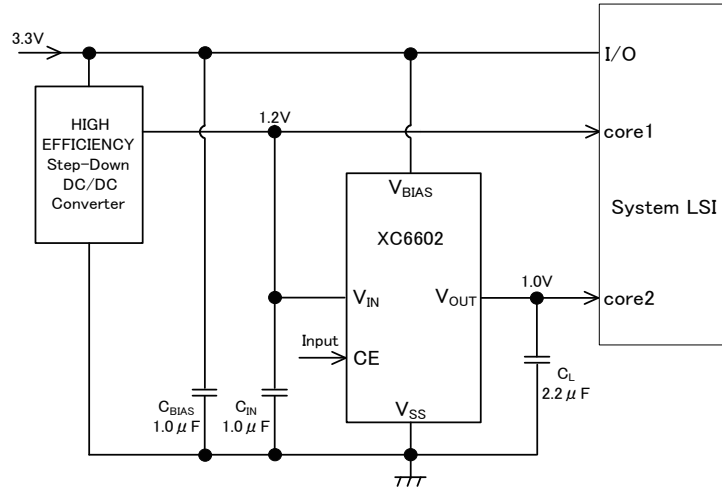
► Negative Voltage Regulator

Product	Feature	V_{IN} [V]	V_{OUT} [V]	I_{OUT} [mA]	I_q [μ A]	R_{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
								CE	Current Limit	Other		
XC62KN	-10V, 100mA	-10.0~-2.1	-6.0~-2.1	100	3	3.80	40	-	ILIM	-	85°C	USP-6B (1.8x2.0x0.6mm) SOT-89, SOT-23
XC6902	-16V, 200mA High Speed	-16.0~-2.4	-12.0~-0.9	200	100	3.90	45	-	FB	TSD/SoftStart	85°C	USP-6C (1.8x2.0x0.6mm) SOT-89 ,SOT-23
XC6901	-12.4V, 200mA High Speed	-12.4~-2.4	-12.0~-0.9	200	100	2.50	45	Yes	FB	TSD/SoftStart/CL Dischg	85°C	USP-6C (1.8x2.0x0.6mm) SOT-89-5 ,SOT-25

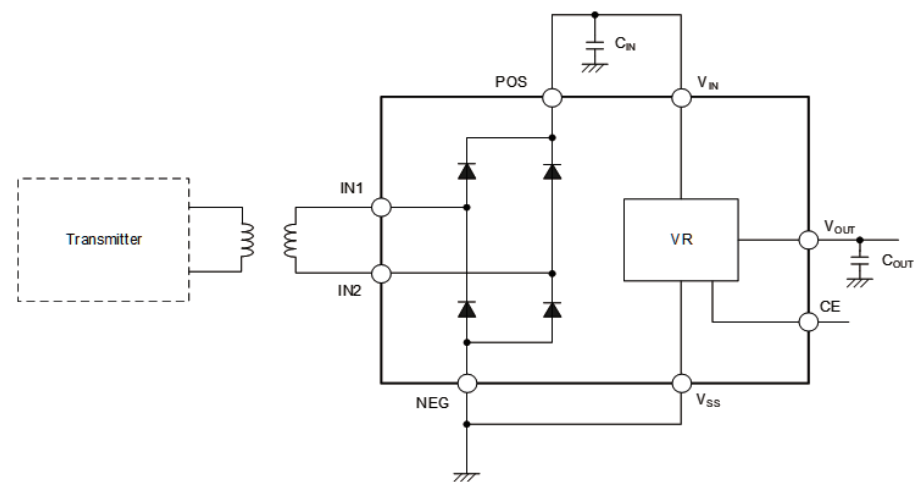
► Voltage Regulator with Bridge Diode for Wireless Power Receiver

Product	Feature	V_{IN} [V]	V_{OUT} [V]	I_{OUT} [mA]	I_q [μ A]	R_{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
								CE	Current Limit	Other		
XCM414	For Wireless Power Receiver Built-in Bridge Diode	2.0~26.0	2.0~12.0	150	5	6.50	30	Yes	FB+ILIM	TSD	85°C	USP-8B10 (2.6x2.9x0.33mm)

Voltage Regulator with Bridge Diode for Wireless Power Receiver



Voltage Regulator with Bridge Diode for Wireless Power Receiver



Voltage Detector, Watchdog Timer

► Low Voltage Voltage Detectors : Input Voltage/Sense pin Voltage 6V or less

	Product	Feature	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect						Watchdog		Topr max.	Package
							Config.	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Unstable operation prevention	Timeout Period	EN/ENB		
UNDER DEVELOPMENT	XC6142	LTO Battery/EDLC Monitor	1.1~6.0	1.6~2.1	0.8%	0.104	CMOS N-ch	Detect "H" Detect "L"	-	-	-	0.350V-0.850V	-	CMOS Only	-	-	105°C	USPQ-4B05(1.0x1.0xh0.33mm)
FEATURED	XC6140			1.6~2.2								0.275V-0.875V						USPQ-4B05(1.0x1.0xh0.33mm) SSOT-24(2.0x2.1xh1.1mm)
FEATURED	XC6136	Ultra Low Power	1.1~6.0	1.2~5.0	1.0%	0.088	CMOS N-ch	Detect "H" Detect "L"	-	-	-	VDFx0.1% VDFx5%	-	CMOS Only	-	-	105°C	USPQ-4B05(1.0x1.0xh0.33mm) SSOT-24 (2.0x2.1xh1.1mm)
	XC6135	Ultra Low Power, Separated Sense Pin		0.5~5.0														SOT-25 (2.9x2.8xh1.3mm)
	XC6134	Ta=-40~125°C, Hys Adj, Adj Release/Detect Delay Separate Sense pin	1.6~6.0	0.8~5.0	1.2%	1.32	CMOS N-ch	Detect "H" Detect "L"	Yes	Adj	Adj	Adj	Yes	-	-	-	125°C	SOT-26 (2.9x2.8xh1.3mm) USP-6C (1.8x2.0xh0.6mm)
	XC6133			1.0~5.0								VDFx5%						
	XC6132			0.8~2.0								Adj						
	XC6127	Built-in Release Delay, Manual Reset	0.7~6.0	1.5~5.5	0.8%	0.7	CMOS N-ch	Detect "H" Detect "L"	-	-	50ms ~800ms	VDFx5%	Yes	-	-	-	85°C	SOT-25,SSOT-24 USPN-4 (0.90x1.2xh0.4mm)
	XC6126	High Accuracy	0.7~6.0	1.5~5.5	0.8%	0.7	CMOS N-ch	Detect "L"	-	-	-	VDFx5%	-	-	-	-	85°C	SSOT-24 (2.0x2.1xh1.1mm) USPN-4B02(0.75x0.95xh0.4mm)
	XC6119	Adj Release Delay	0.7~6.0	0.8~5.0	2.0%	0.9	CMOS N-ch	Detect "L"	-	-	Adj	VDFx5% VDFx1% VDFx5%	-	CMOS Only	-	-	85°C	SSOT-24 (2.0x2.1xh1.1mm) USPN-4 (0.90x1.2xh0.4mm)
	XC6118	Separate Sense pin, Adj Release Delay	1.0~6.0															SOT-25 (2.9x2.8xh1.3mm) USP-4 (1.2x1.6xh0.6mm)

► Low Voltage Voltage Detectors with Watchdog function : Input Voltage/Sense pin Voltage 6V or less

	Product	Feature	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect						Watchdog		Topr max.	Package
							Config.	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Unstable operation prevention	Timeout Period	EN/ENB		
	XC6131	Ta=-40~125°C, RESET with Watchdog, Adj Delay time	1.5~6.0	1.5~6.0	1.0%	2.5@EN=L 9.8@EN=H	N-ch	Detect "L"	-	-	Adj	VDFx5%	-	-	Adj	Yes	125°C	SOT-26 (2.9x2.8xh1.3mm) DFN1515-6A (1.5x1.5xh0.38mm)
	XC6130					9.8												
	XC6121-XC6124	RESET with Watchdog, EN Built-in Delay time	1.0~6.0	1.6~5.0	2.0%	10	N-ch	Detect "L"	-	-	3.13ms ~400ms	VDFx5%	-	-	50ms ~1600ms	Yes	85°C	SOT-25 (2.9x2.8xh1.3mm) USP-6C (1.8x2.0xh0.6mm)

► Middle Voltage Voltage Detectors : Input Voltage/Sense pin Voltage 10V or less

	Product	Feature	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect						Watchdog		Topr max.	Package
							Config.	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Unstable operation prevention	Timeout Period	EN/ENB		
	XC61G	10V	0.7~10.0	0.8~6.0	2.0%	0.7	CMOS N-ch	Detect "L"	-	-	-	VDFx5%	-	-	-	-	85°C	USP-3 (1.2x1.2xh0.6mm)
	XC61C																	SOT-23,SSOT-24 SOT-89
	XC61H	10V, Built-in Release Delay	0.7~10.0	1.6~6.0	2.0%	1	CMOS N-ch	Detect "L"	-	-	1ms ~400ms	VDFx5%	-	-	-	-	80°C	SOT-23 (2.9x2.8xh1.3mm)
	XC61F																	SOT-23 (2.9x2.8xh1.3mm) SOT-89 (4.5x4.0xh1.6mm)

► High Voltage Voltage Detectors

	Product	Feature	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect						Watchdog		Topr max.	Package
							Config.	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Unstable operation prevention	Timeout Period	EN/ENB		
UNDER DEVELOPMENT	XC6138	VSEN pin 76V operation Hysteresis 5~50%, Adj Delay time	2.2~6.0	2.3~30.0	1.5%	0.5	CMOS N-ch	Detect "H" Detect "L"	Yes	Adj	Adj	5~50%	Yes	-	-	-	125°C	SOT-25 (2.8x2.9xh1.3mm) DFN1515-6A (1.5x1.5xh0.38mm)

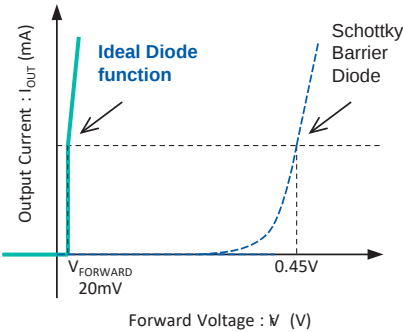
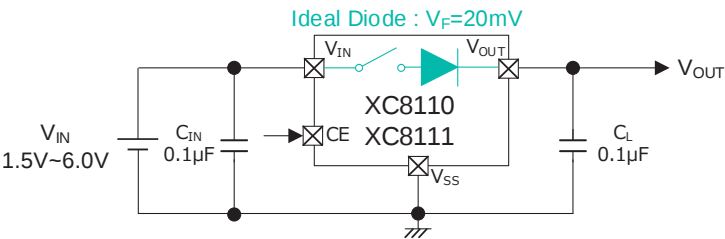
Load Switch

► Load SW

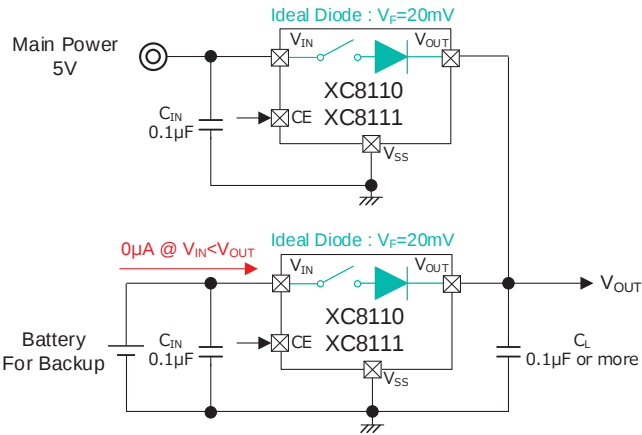
Product	Features	VIN [V]	IOUT [mA]	Current Limit		Iq [μA]	ISTB [μA]	Ron [mΩ]	Function		Topr max.	Package
				ILIM Value [mA]	Setting Method				Current Limit	Other		
XC8101	Iq=3μA, 200mA	1.8~6.0	200	300	Fixed	3	0.01	550	FB+ILIM	CL Dischg	85℃	SOT-25 (2.9x2.8xh1.3mm) SSOT-24 (2.0x2.1xh1.1mm) USP-4 (1.2x1.6xh0.6mm)
XC8102	Iq=3μA, 400mA	1.2~6.0	400	480	Fixed	3	0.01	280	FB+ILIM	CL Dischg	85℃	SOT-25, SSOT-24, USP-4 (1.2x1.6xh0.6mm) USP-6B06 (1.8x1.5xh0.33mm) USPN-4 (0.90x1.2xh0.4mm)
XC8109	900mA, 85mΩ, Multifunction	2.5~5.5	900	75~1300	Adj by External Resister	40	0.01	85	FB+ILIM or ILIM+Latch	TSD SS UVLO Reverse FLG	105℃	USP-6C (1.8x2.0xh0.6mm)
XC8107	0.5A~2A, 85mΩ, Multifunction		500/1000 1500/2000	900/1400 1900/2400	Fixed							SOT-25 (2.9x2.8xh1.3mm) USP-6C (1.8x2.0xh0.6mm)
XC8108	2A, 85mΩ, Multifunction Load SW		2000	900~2400	Adj by External Resister							USP-6C (1.8x2.0xh0.6mm)

► Load SW with Ideal Diode function

Diode Replacement / Forward Voltage Characteristics



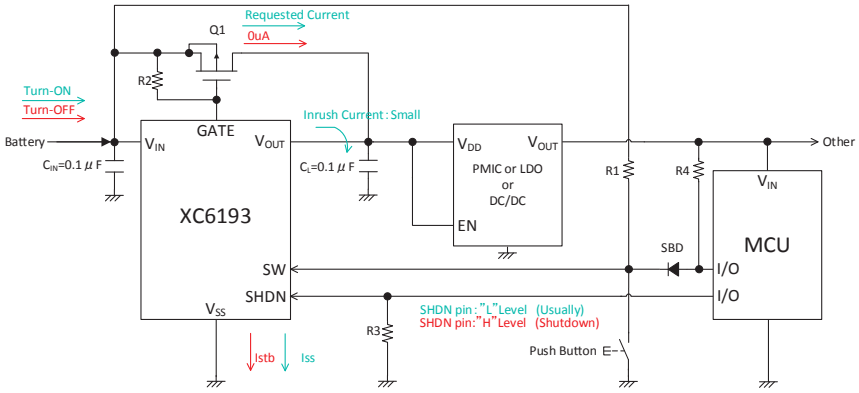
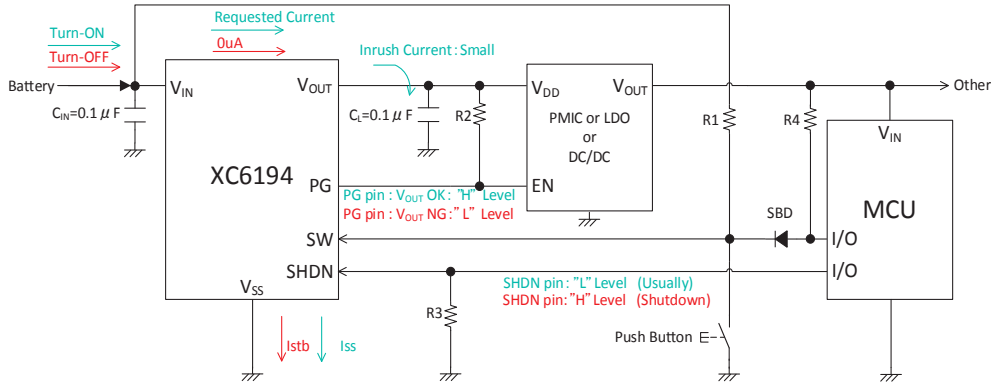
OR connection : For backup circuit, etc.



Product	Features	VIN [V]	IOUT [mA]	Current Limit		Iq [μA]	ISTB [μA]	Ron [mΩ]	Function		Topr max.	Package
				ILIM Value [mA]	Setting Method				Current Limit	Other		
FEATURED XC8110	Ideal Diode VF=20mV, Iq=3.6μA 500mA (XC8110), 1A (XC8111) IEC 62368-1 Certified	1.5~6.0	500	850	Fixed	3.6	0.8	120	FB+ILIM	TSD Inrush True Reverse	105℃	WLP-4-02 (0.82x0.82xh0.5mm) SOT-25 (2.9x2.8xh1.3mm) USP-6B06 (1.8x1.5xh0.33mm)
FEATURED XC8111			1000	1700								

Push Button Load Switch, Push Button Reboot Controller

► Push Button Load SW



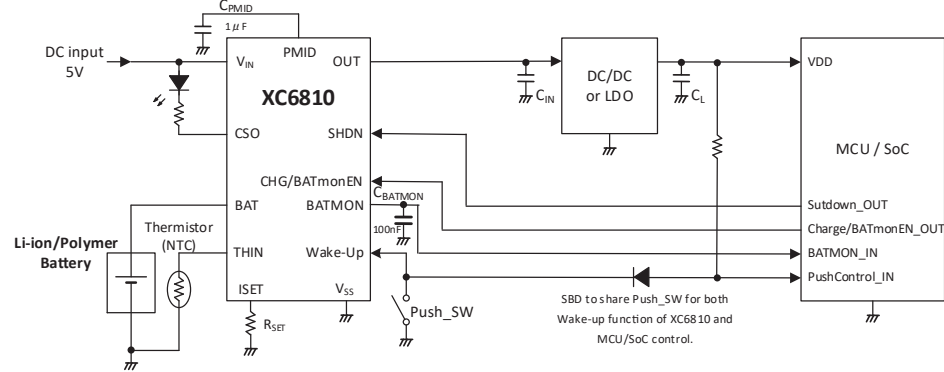
Product	Features	V _{IN} [V]		I _{OUT} [mA]	I _{STB} [μA]	I _q [μA]	Turn-on		Turn-off		Function	Topr max.	Package
		Min.	Max.				Operation Method	SW "L" time	Operation Method	SW "L" time			
FEATURED XC6194A	I _{STB} =1nA Shutdown function (Ship function/System Power SW) Freeze measures	1.8	6.00	1000	0.001	0.13	SW pin	0.2s / 1s / 3s / 5s	SHDN pin or SW pin	3s / 5s / 10s / 15s	Forced Shutdown Inrush Current Protection UVLO / Short Protection Thermal Shutdown Output CL Dischg Power Good (XC6194)	85℃	USP-8B06 (2.0x2.0xh0.33mm)
FEATURED XC6194B				SHDN pin					-				
FEATURED XC6193A				SHDN pin or SW pin					3s / 5s / 10s / 15s				
FEATURED XC6193B				SHDN pin					-				

► Push Button Reboot Controller

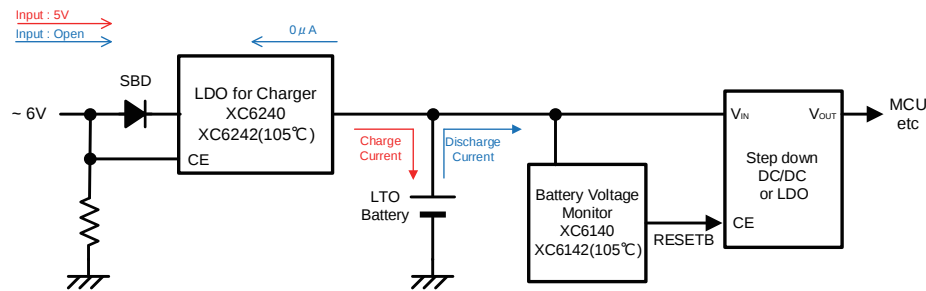
Product	Features	VIN [V]		Iq [μA]	RSTB Sink Current [mA]	Output Configuration	Reboot Delay Time			Topr max.	Package
		Min.	Max.				Adjustable Method	Reboot Delay time	Reboot time		
XC6190A	Push Button Reboot Controller	1.75	6.00	0.01	30	N-ch CMOS	External Resister	1s ~ 20s (±5%)	0.4s (±5%)	105°C	USPN-6 (1.3x1.3x0.4mm) USPN-6B01 (1.0x1.45x0.4mm)
XC6190B							Internal Fix	7.5s or 12.5s (±5%)			

Charger IC : For Li-ion/Polymer & LTO batteries

XC6810 Typical application circuit



LTO battery Reference circuit



Charger IC for Li-ion/ Li-polymer

Product	Features	Battery / Cell	V _{IN} [V]	Charge Voltage [V]	Charge Current[mA]	I _q [μA]	Battery Sink Current [μA]	Function					Topr max.	Package
								Temp. Monitor	Current Path	Safety Timer	Protection	Other		
NEW XC6810xxxC/D/G	1mA~25mA 3.80~4.40V Multi-function 1Cell Li-ion Linear Charger	Li-ion/Polymer 1Cell	3.5~28.0	3.80~4.40	1~25	330	3.0	Yes	Yes	Main:5h/10h Trickle:0.5h	Thermal Reg UVLO Short ILIM	Shutdown(Ship) BAT Monitor Shutdown(Ship) BAT Monitor Charge Enable	85℃	WLP-12-01 (1.57x1.17x0.33mm)
NEW XC6810xxxA/B/E/F									-					
NEW XC6810xxxH/J									Yes					
XC6808x2/3/4 XC6808xN	5mA~40mA, 4.20V/4.35V/4.40V, 1Cell Li-ion Linear Charger	Li-ion/Polymer 1Cell	4.5~6.0	4.20 4.35 4.40	5~40	100	0.1	Yes -	-	Main:5h/10h Trickle:0.5h	TSD UVLO ILIM	Trickle Charge Selectable	85℃	USP-6B07 (1.8x2.0x0.33mm)
XC6803 XC6804	40mA~280mA (XC6803) 200mA~800mA (XC6804) 1Cell Li-ion Linear Charger	Li-ion/Polymer 1Cell	4.5~6.0	4.20	40~280 200~800	100	0.5 4.5	Yes	-	Main:5h Trickle:0.5h Main:10h Trickle:2h	TSD UVLO ILIM	-	85℃	USP-6EL (1.8x2.0x0.4mm) SOP-8FD (4.9x6.0x1.75mm) USP-6EL (1.8x2.0x0.4mm)
XC6802	100mA~100mA, 1Cell Li-ion Linear Charger	Li-ion/Polymer 1Cell	4.25~6.0	4.20	100~800	15	2.0	-	-	-	TSD UVLO	-	85℃	SOT-25 , SOT-89-5 USP-6C (1.8x2.0x0.6mm) USP-6EL (1.8x2.0x0.4mm)

Charger IC for LTO Battery

	Product	Features	Battery / Cell	V _{IN} [V]	Charge Voltage [V]	Charge Current[mA]	I _q [μA]	Battery Sink Current [μA]	Function					Topr max.	Package
									Temp. Monitor	Current Path	Safety Timer	Protection	Other		
NEW	XC6242	Charger IC for LTO Battery Iq=0.8μA, 150mA LDO	LTO Batteries /EDLC	1.5~6.0	2.63	~150	0.8	0.24	-	-	-	ILIM	-	105℃	USPN-4 (0.90x1.2x0.4mm)
FEATURED	XC6240													85℃	SSOT-24, USPN-4 (0.90x1.2x0.4mm) USP-6B06 (1.8x1.5x0.33mm)

Battery Monitor IC for LTO Battery

Product	Features	Battery / Cell	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect						Topr max.	Package
							Configuration	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Unstable operation prevention		
UNDER DEVELOPMENT XC6142	LTO Battery/EDLC Monitor IC Release=2.450V (XC6142)	LTO Batteries /EDLC	1.1~6.0	1.6~2.1	0.8%	0.104	CMOS N-ch	Active "H" Active "L"	-	-	-	0.350V-0.850V	-	CMOS Only	105℃	USPQ-4B05(1.0x1.0x0.33mm)
FEATURED XC6140	Release=2.475V (XC6140)			1.6~2.2								0.275V-0.875V				USPQ-4B05(1.0x1.0x0.33mm) SSOT-24(2.0x2.1x1.1mm)

Automotive IC (AEC-Q100 compliant)

■ Voltage Regulator

Product	AEC-Q100	Feature	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	I _q [μA]	Ron [Ω]	PSRR @1kHz [dB]	Feature			Topr max.	Package
									CE	Current Limit	Other		
XD6506	Grade2	I _q =0.8μA, 150mA	1.5~6.0	1.2~5.0	150	0.8	2.60	35	Yes	FB+ILIM	-	105℃	SOT-25 (2.9x2.8xh1.3mm)
NEW XD6239	Grade1	300mA High Speed	2.0~6.0	1.2~3.4	300	100	0.66	80	Yes	FB+ILIM	Inrush/TSD/CL Dischg	125℃	DFN1010-4C (1.0x1.0xh0.6mm) SOT-25 (2.9x2.8xh1.3mm) SOT-89-5 (4.5x4.60xh1.6mm)
XD6216	Grade2	28V, 150mA	2.0~28.0	1.8~12.0	150	5	6.50	30	Yes	FB+ILIM	TSD	105℃	SOT-25 (2.9x2.8xh1.3mm) SOT-89-5 (4.5x4.60xh1.6mm)
XD6702	Grade2	36V (46V/400ms) High Speed, Low I _q	4.5~36.0	1.8~18.0	300	40	3.50	65	Yes	FB+ILIM	SoftStart/TSD	105℃	SOT-89-5 (4.5x4.60xh1.6mm)

■ Voltage Detector, Watchdog Timer

▶ Voltage Detector

Product	AEC-Q100	Feature	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect					Watchdog		Topr max.	Package
							Configuration	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Timeout Period	EN/ENB		
XD6132	Grade1	Ta=-40~125℃, Hys adj, Separate Sense pin, Adj Release/Detect Delay	1.6~6.0	0.8~2.0	1.2%	1.32	CMOS N-ch	Active "H" Active "L"	Yes	adj	adj	adj	Yes	-	-	125℃	SOT-26 (2.9x2.8xh1.3mm) USP-6C (1.8x2.0xh0.6mm)
XD6133				1.0~5.0													

▶ Voltage Detectors with Watchdog function

Product	AEC-Q100	Feature	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect					Watchdog		Topr max.	Package
							Configuration	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Timeout Period	EN/ENB		
XD6130	Grade1	Ta=-40~125℃, RESET with Watchdog, Adj Delay time	1.5~6.0	1.6~5.0	1.0%	9.8	N-ch	Active "L"	-	-	adj	V _{DF} ×5%	Yes	adj	-	125℃	SOT-26 (2.9x2.8xh1.3mm)
XD6131						2.5@EN=L 9.8@EN=H											
XD6121- XD6124	Grade3	RESET with Watchdog, EN Built-in Delay time	1.0~6.0	1.6~5.0	2.0%	10	N-ch	Active "L"	-	-	3.13ms ~400ms	V _{DF} ×5%	-	50ms ~1600ms	Yes	85℃	SOT-25 (2.9x2.8xh1.3mm)

N-Channel Single MOSFET

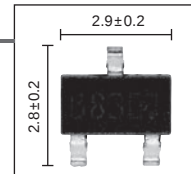
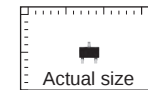
Product	Package	V _{DSS} [V]	V _{GSS} [V]	I _D [A]	R _{DS(on)} (Max.) [Ω]				Ciss [pF]
					V _{GS} =1.5V	V _{GS} =2.5V	V _{GS} =4.5V	V _{GS} =10V	
XP222N03017R-G	SOT-723 (8,000pcs/Reel)	20	±8	0.3	-	1.8	1.3	-	18
XP231N02017R-G		30	±20	0.2	-	11	5	-	6.5
XP232N03017R-G				0.3	-	-	2.5	2	22
XP261N70027R-G		60	±20	0.15	-	-	5.5	5	18
XP222N03015R-G	SOT-523 (3,000pcs/Reel)	20	±8	0.3	-	1.8	1.3	-	18
XP231N02015R-G		30	±20	0.2	-	11	5	-	6.5
XP232N03015R-G				0.3	-	-	2.5	2	22
XP261N70025R-G		60	±20	0.15	-	-	5.5	5	18
XP222N03013R-G	SOT-323-3A (3,000pcs/Reel)	20	±8	0.3	-	1.8	1.3	-	18
XP224N06013R-G				0.6	-	0.85	0.7	-	60
XP223N10013R-G				1.0	10	0.35	0.3	-	99
XP231N02013R-G		30	±20	0.2	-	11	5	-	6.5
XP232N03013R-G				0.3	-	-	2.5	2	22
XP233N05013R-G				0.5	-	4	1.5	-	40
XP234N08013R-G				0.8	-	-	0.4	0.29	64
XP261N70023R-G		60	±20	0.15	-	-	5.5	5	18
XP262N70023R-G				0.3	-	-	2.1	1.6	30
XP222N0301TR-G	SOT-23(TO-236) (3,000pcs/Reel)	20	±8	0.3	-	1.8	1.3	-	18
XP224N0601TR-G				0.6	-	0.85	0.7	-	60
XP223N1001TR-G				1.0	10	0.35	0.3	-	99
XP225N2001TR-G				2.0	-	0.13	0.1	-	280
XP231N0201TR-G		30	±20	0.2	-	11	5	-	6.5
XP232N0301TR-G				0.3	-	-	2.5	2	22
XP233N0501TR-G				0.5	-	4	1.5	-	40
XP234N0801TR-G				0.8	-	-	0.4	0.29	64
XP235N2001TR-G		60	±20	2.0	-	-	0.14	0.11	220
XP236N2001TR-G				2.0	-	-	0.14	0.11	230
XP261N7002TR-G				0.15	-	-	5.5	5	18
XP262N7002TR-G				0.3	-	-	2.1	1.6	30
XP264N0301TR-G		60	±20	0.3	-	-	2.1	1.6	30
XP263N1001TR-G				1.0	-	-	0.33	0.25	180
XP151A13A0MR-G	SOT-23 (3,000pcs/Reel)	20	±8	1.0	0.25	0.14	0.1	-	220
XP151A12A2MR-G			±12	1.0	-	0.16	0.1	-	180
XP151A11B0MR-G		30	±20	1.0	-	-	0.17	0.12	150
XP161A1265PR-G	SOT-89 (1,000pcs/Reel)	20	±12	4.0	-	0.095	0.055	-	320
XP161A1355PR-G			±8	4.0	0.15	0.07	0.05	-	390
XP161A11A1PR-G		30	±20	4.0	-	-	0.105	0.065	270

P-Channel Single MOSFET

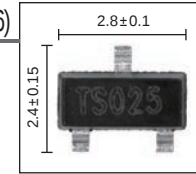
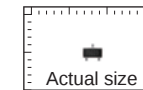
Product	Package	V _{DSS} [V]	V _{GSS} [V]	I _D [A]	R _{DS(on)} (Max.) [Ω]				Ciss [pF]
					V _{GS} =-1.5V	V _{GS} =-2.5V	V _{GS} =-4.5V	V _{GS} =-10V	
XP231P02017R-G	SOT-723 (8,000pcs/Reel)	-30	±8	-0.2	-	8	5	-	34
XP231P02015R-G	SOT-523 (3,000pcs/Reel)	-30	±8	-0.2	-	8	5	-	34
XP221P05013R-G	SOT-323-3A (3,000pcs/Reel)	-20	±8	-0.5	-	1.9	1.3	-	60
XP222P08013R-G				-0.8	-	0.65	0.56	-	118
XP231P02013R-G		-30	±8	-0.2	-	8	5	-	34
XP232P05013R-G				-0.45	-	2.15	1.25	-	56
XP221P0501TR-G	SOT-23(TO-236) (3,000pcs/Reel)	-20	±8	-0.5	-	1.9	1.3	-	60
XP222P0801TR-G				-0.8	-	0.65	0.56	-	118
XP223P1501TR-G		-30	±8	-1.5	-	0.23	0.17	-	165
XP231P0201TR-G				-0.2	-	8	5	-	34
XP232P0501TR-G	SOT-23 (3,000pcs/Reel)	-20	±12	-0.45	-	2.15	1.25	-	56
XP233P1501TR-G				-1.5	-	-	0.33	0.19	160
XP152A12C0MR-G		-30	±20	-3.0	-	-	0.095	0.067	435
XP152A11E5MR-G	SOT-89 (1,000pcs/Reel)	-20	±12	-2.5	-	0.3	0.17	-	310
XP162A12A6PR-G				-0.7	-	-	0.45	0.25	160
XP162A11C0PR-G		-30	±20	-2.5	-	-	0.28	0.15	280
XP202A0003PR-G				-5.0	-	-	0.1	0.059	450

Package

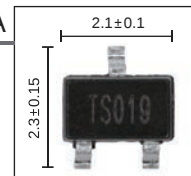
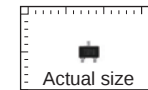
SOT-23

h=1.3 MAX.
p=1.9

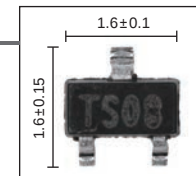
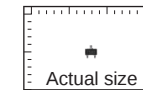
SOT-23 (TO-236)

h=1.15 MAX.
p=1.9

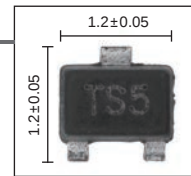
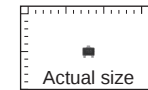
SOT-323-3A

h=1.1 MAX.
p=1.3

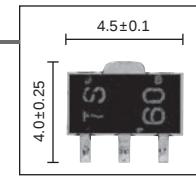
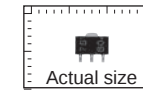
SOT-523

h=0.9 MAX.
p=1.0ss

SOT-723

h=0.5 MAX.
p=0.8

SOT-89

h=1.6 MAX.
p=1.5

Schottky Barrier Diode, Transient voltage suppressor (TVS)

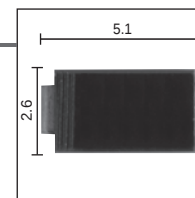
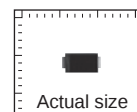
Schottky Barrier Diodes

Product	Package	VR [V]	IF [A]	VF [V]	IR [mA]	Ct [pF]
XBS013S16R-G	SOD-723 (3,000pcs/Reel)	30	0.1	0.71	0.002	6
XBS053V15R-G	SOD-523 (8,000pcs/Reel)	20	0.5	0.40	0.1	12
XBS013S15R-G		30	0.1	0.71	0.002	6
XBS024S15R-G		40	0.2	0.53	0.002	5
XBS053V13R-G	SOD-323A (3,000pcs/Reel)	20	0.5	0.40	0.1	12
XBS104S13R-G		40	1.0	0.49	0.2	35
XBS104S14R-G	SOD-123A (3,000pcs/Reel)	40	1.0	0.49	0.2	35
XBS104V14R-G				0.37	2	150
XBS203V19R-G	SMA-XG (2,000pcs/Reel)	30	2.0	0.35	3	280
XBS303V19R-G			3.0	0.36	3	385
XBS204S19R-G		40	2.0	0.49	0.2	180
XBS204V19R-G				0.46	0.1	75
XBS304S19R-G			3.0	0.47	0.3	180
XBS206S19R-G		60	2.0	0.62	0.3	120
XBS306S19R-G			3.0	0.59	0.3	195

Package

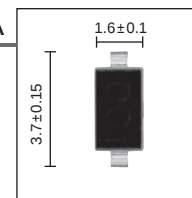
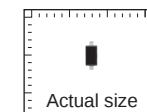
SMA-XG

h=2.1



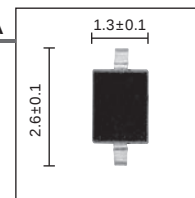
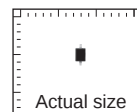
SOD-123A

h=1.25 MAX.



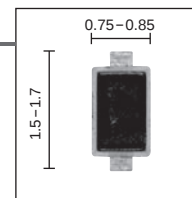
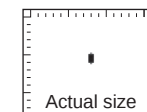
SOD-323A

h=1.0 MAX.



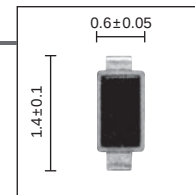
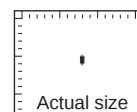
SOD-523

h=0.77 MAX.



SOD-723

h=0.65 MAX.



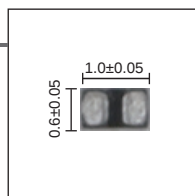
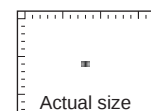
Transient Voltage Suppressors (TVS)

Product	Package	Application	Protected Lines	V _{RWM} (MAX) [V]	V _{BR} (MIN) [V]	IR (MAX) [μA]	Cj [pF]	Electrostatic discharge voltage (IEC61000-4-2)	Internal circuit
XBP06V0U25R-G	FBP1006-2A (10,000pcs/Reel)	USB3.0	1	5.0	6.0	1.0	0.35	Air : ±15kV Contact : ±15kV	
XBP06V0U2MR-G	SOT-23 (3,000pcs/Reel)	USB2.0	2	5.0	6.0	1.0	0.8	Air : ±15kV Contact : ±15kV	

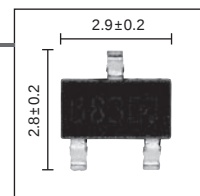
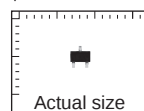
Package

FBP1006-2A

h = 0.55 MAX.



SOT-23

h=1.3 MAX.
p=1.9

Design Support Tool : DC/DC Measured Electrical Characteristics Comparison

■ Web DC/DC Measured Electrical Characteristics Comparison Tool

●For those looking to select a DC/DC converter!

- You can easily compare **the actual device characteristics and mounting area** among products!
- **You can select the optimum IC for the power supply specifications** even if you are not very familiar with the products!

- Point 1

There is data for various products/power supply specifications/peripheral components to allow you to check data that is close to the actual conditions.

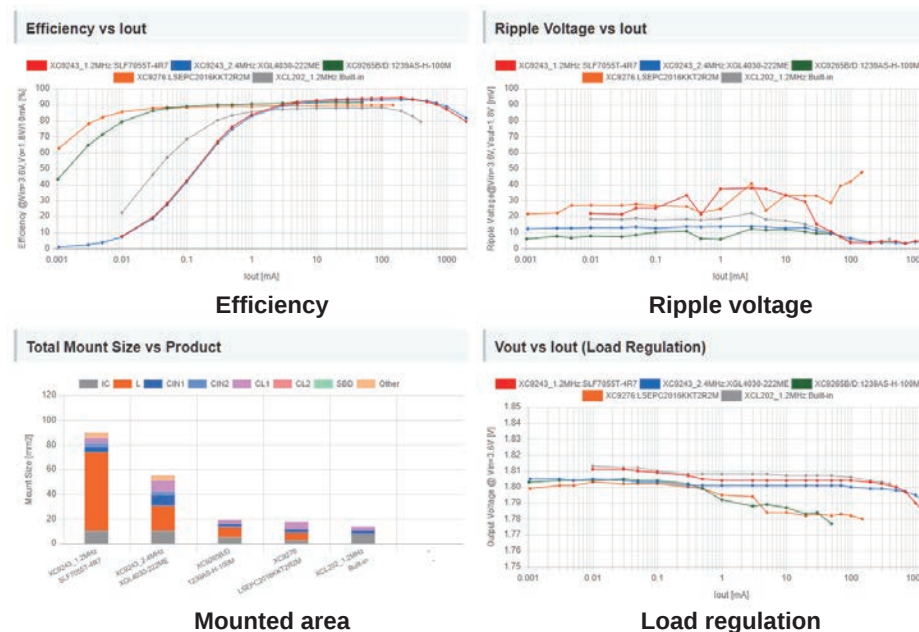
Power supply specification selection

[illegible]

- Point 2

Shows the "efficiency", "ripple voltage", and "load regulation" that are hard to grasp from the data sheet/simulation.

Measured data available from 1 μ A minimum, an ideal for comparing characteristics at light loads.

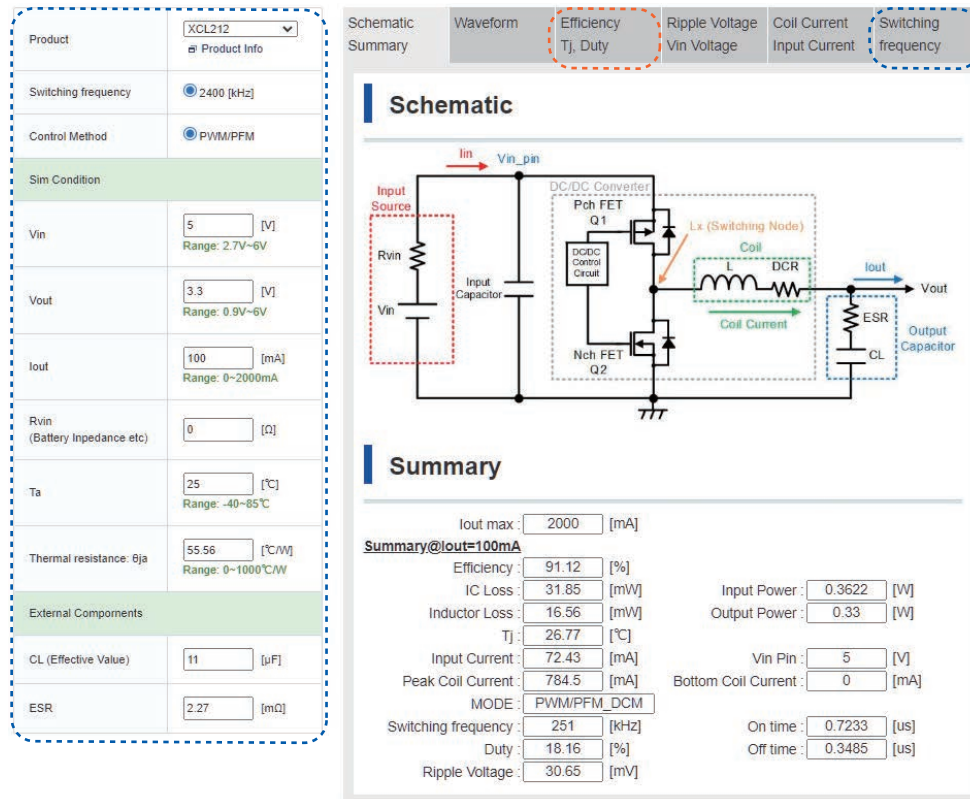


Design Support Tool : DC/DC Simulation

■ Web DC/DC Simulation

● For those who want to check the detailed operation of the products!

- Simulation results are displayed as soon as power supply specifications are entered.
- Helping to reduce IC selection and design man-hours.

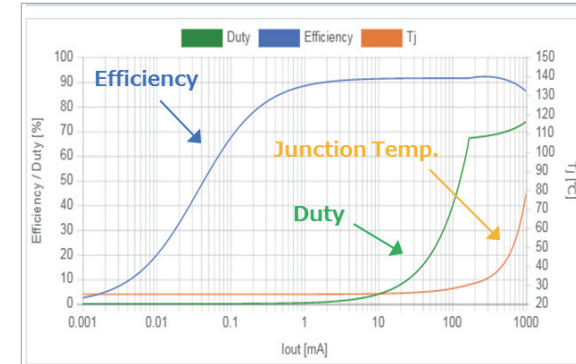


Entry fields

Simulation results

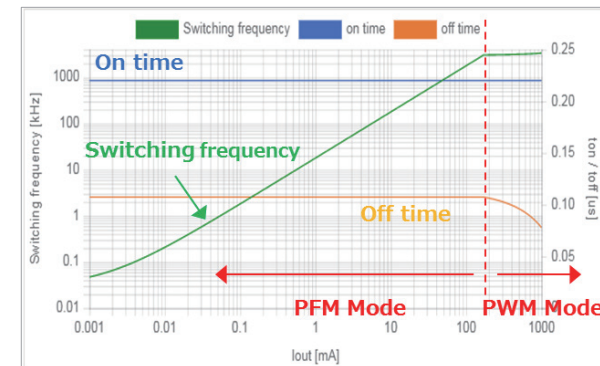
● Point 1

Junction temperature of DC/DC is calculated considering various losses/heat dissipation performance.



● Point 2

The frequency of PFM, which varies with input/output voltage and peripheral components, and the current at transition to PWM can be calculated. Possible to select products that do not interfere with peripherals or RF.



● Point 3

Simulation with input resistance (Battery impedance) is possible. Enables calculation of the maximum output current of Step-up DC/DC, which is greatly affected by the input voltage drop cause by the input resistance.

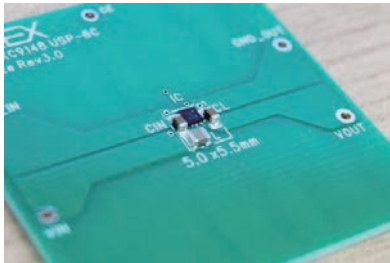
TOREX Customer Support

Free Evaluation Board support

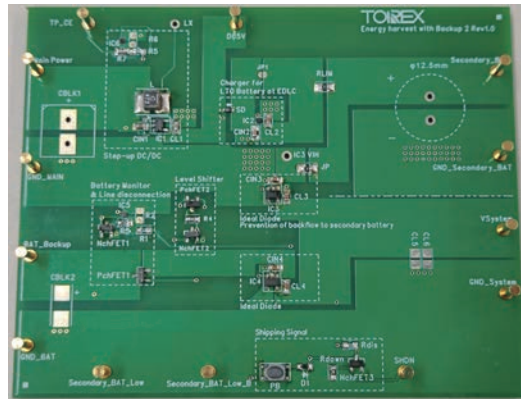
We provide [evaluation boards](#) for various ICs as [free of charge](#).

For evaluation boards, we provide "[evaluation boards optimized for power supply specifications](#)" by selecting "the most suitable IC" and "peripheral components" according to the power supply specifications.

In addition to evaluation boards for single ICs, we also provide evaluation boards for application circuits.

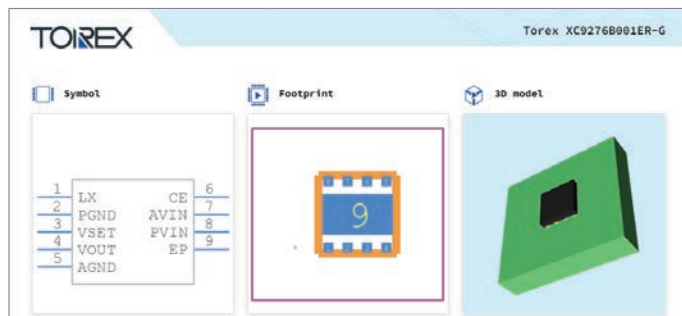


Example of evaluation board



Example of application circuit board

Provision of ECAD model and Gerber files

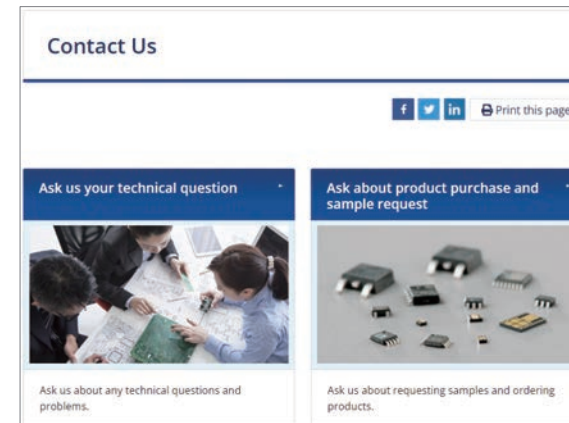


Technical Inquiries / Online Technical Consultation

For power supply IC and power supply circuit related technical consultations, please contact TOREX website "[Ask us your technical question](#)" page or the TOREX Sales Department or a sales agent.

Technical consultation with TOREX FAE is also available via online

We can also support [your individual inquiries](#) such as "[schematic verification](#)" or "[PCB layout verification](#)".



Online Purchase of ICs and Evaluation Boards



Links

■ Design Support Tools

● Web DC/DC Simulation

From the website : "Design Support" > "DC/DC Simulation"

URL : <https://www.torexsemi.com/design-support/dcdc-simulation/>

● Web DC/DC Measured Electrical Characteristics Comparison Tool

From the website : "Design Support "

> "DC/DC Measured Electrical Characteristics Comparison Tool"

URL : <https://www.torexsemi.com/design-support/dcdc-efficiency-size-comparison/>

● Spice Model

From the website : "Design Support" > "SPICE Model"

URL : <https://www.torexsemi.com/design-support/spicemodel/>

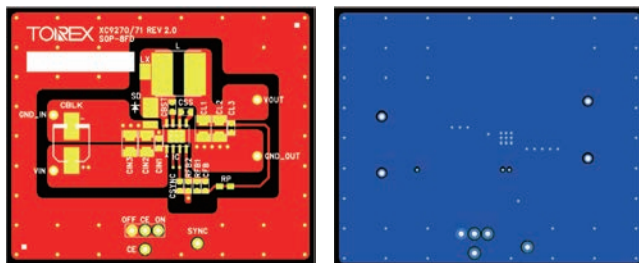
● ECAD Model

From the website : "Product Pages" > "Sample Request" → "EDA"

Part number	Sample	CE pin logic	Function	Package	EDA
	☐ In stock now	☐ CE High Active	☐ Ideal Diode function Equipped	☐ WLP-4-02 ☐ SOT-25 ☐ USP-6B06	
XC8110AA010R-G	Sample Request (in stock now)	CE High Active	Ideal Diode function Equipped	WLP-4-02	
XC8110AA018R-G	Sample Request (in stock now)	CE High Active	Ideal Diode function Equipped	USP-6B06	
XC8110AA01MR-G	Sample Request (in stock now)	CE High Active	Ideal Diode function Equipped	SOT-25	

● Gerber File

From the website : "Product Pages" > "Technical Document"



■ Technical Inquiries / Online Technical Consultation

From the website : "Contact Us" > "Ask us your technical question"

URL : <https://www.torexsemi.com/contact-us/technical-inquiry/>



■ Evaluation Board Requests

From the website : "Sample and Buy" > "Requesting Evaluation Boards"

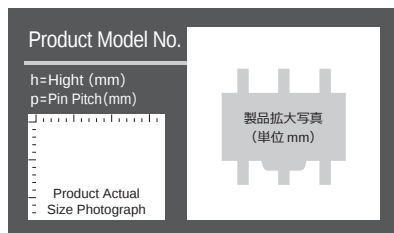
URL : <https://www.torexsemi.com/sample-and-purchase/evaboard/>

■ Download PDF of this brochure

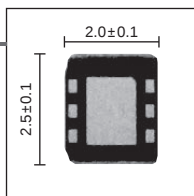
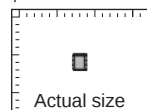
From the website : "Home" > "Products Power Management Solutions"

URL : <https://www.torexsemi.com/products/power-management-solutions/>

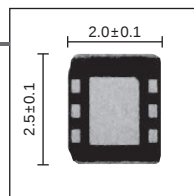
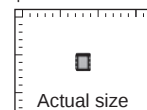
Package Lineup



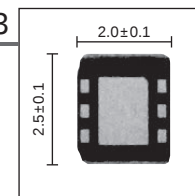
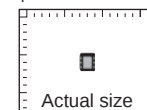
CL-2025

h=1.04 MAX.
p=0.55

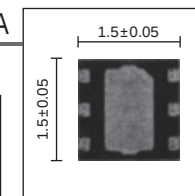
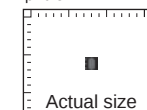
CL-2025-02

h=1.04 MAX.
p=0.55

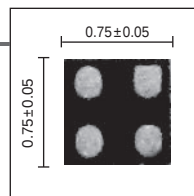
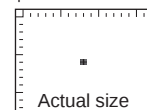
CL-2025-03

h=1.04 MAX.
p=0.55

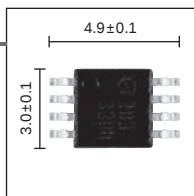
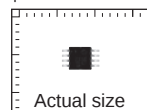
DFN1515-6A

h=0.375±0.05
p=0.5

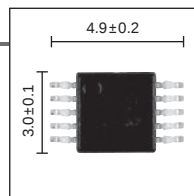
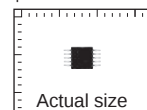
LGA-4B01

h=0.3 MAX.
p=0.4

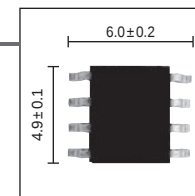
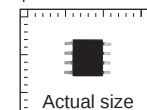
MSOP-8A

h=1.22 MAX.
p=0.65

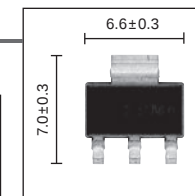
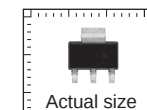
MSOP-10

h=1.16 MAX.
p=0.5

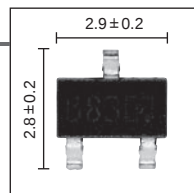
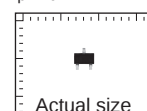
SOP-8FD

h=1.55±0.2
p=1.27

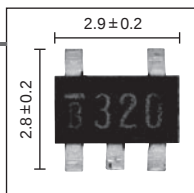
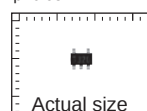
SOT-223

h=1.8 MAX.
p=2.3

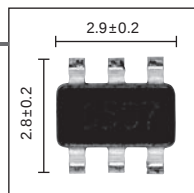
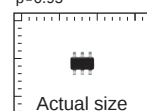
SOT-23

h=1.3 MAX.
p=1.9

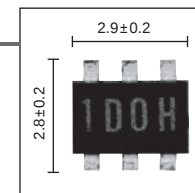
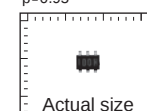
SOT-25

h=1.3 MAX.
p=0.95

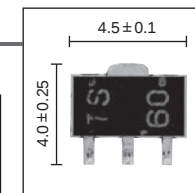
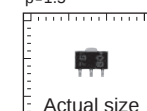
SOT-26

h=1.3 MAX.
p=0.95

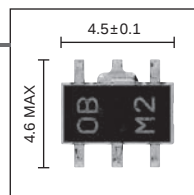
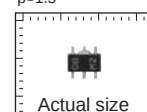
SOT-26W

h=1.3 MAX.
p=0.95

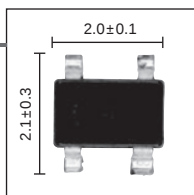
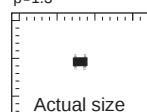
SOT-89

h=1.6 MAX.
p=1.5

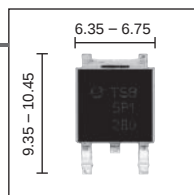
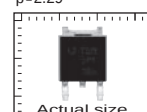
SOT-89-5

h=1.5 MAX.
p=1.5

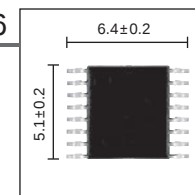
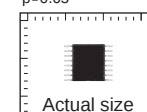
SSOT-24

h=1.1 MAX.
p=1.3

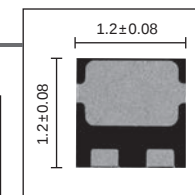
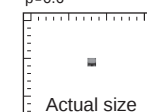
TO-252

h=2.4 MAX.
p=2.29

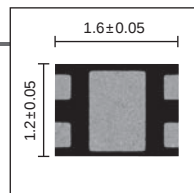
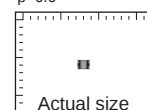
TSSOP-16

h=1.4 MAX.
p=0.65

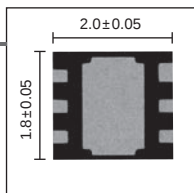
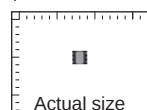
USP-3

h=0.6 MAX.
p=0.6

USP-4/USP-4D

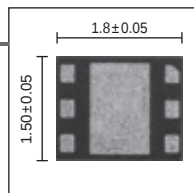
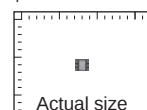
h=0.6 MAX.
p=0.6

USP-6B/USP-6C

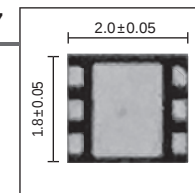
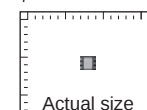
h=0.6 MAX. ※(0.7 MAX)
p=0.5

※ USP-6B

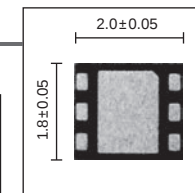
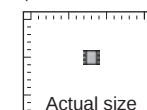
USP-6B06

h=0.33 MAX.
p=0.5

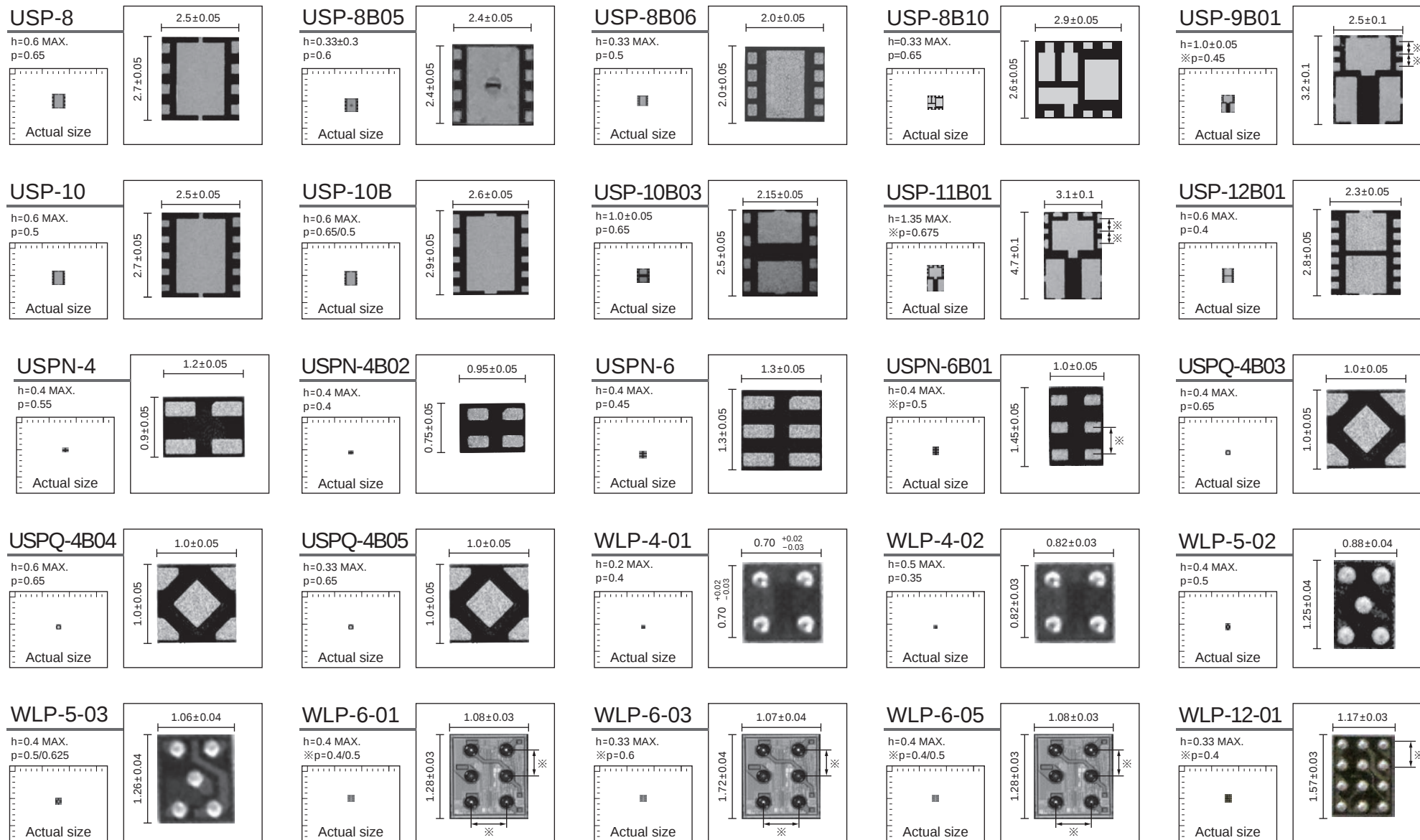
USP-6B07

h=0.33 MAX.
p=0.55

USP-6EL

h=0.4 MAX.
p=0.55

Package Lineup





<https://www.torexsemi.com/>

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