TOREX

Torex...Powerfully Small!

400nA Ultra Low Iq PWM/PFM
Built-in inductor, Step-up Micro DC/DC Converter
XCL108 Series

October 2025

TOREX Semiconductor

Rev. 1.1

XCL108 : 400nA Ultra low Iq PWM/PFM Built-in inductor, Step-up Micro DC/DC Converter

Ultra Low Power / Ultra Small / Low EMI

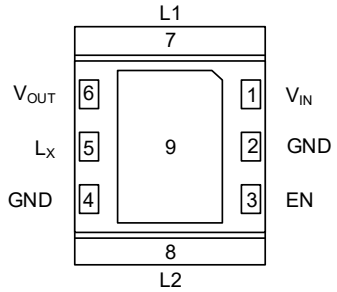
Features

Input Voltage Range	: 0.65V ~ 5.5V (abs MAX: 6.6V)
Operation Start Voltage	: 1.6V
Output Voltage Range	: 3.0V ~ 5.5V
Oscillation Frequency	: 1.2MHz
Quiescent Current	: 400nA
Output Current	: 180mA@V_{OUT}=5.0V, V_{IN}=3.3V 170mA@V_{OUT}=3.3V, V_{IN}=1.8V
Efficiency	: 85.9% (V_{BAT}=2.4V, V_{OUT}=3.3V, I_{OUT}=10μA) 90.6% (V_{BAT}=2.4V, V_{OUT}=3.3V, I_{OUT}=100mA)
Control Mode	: PWM/PFM
Functions	: ON/OFF Load Disconnection Soft Start
Protection function	: Current Limit
Package	: CL-2025-02
Operating Ambient Temp.	: -40℃ ~ 105℃

Package

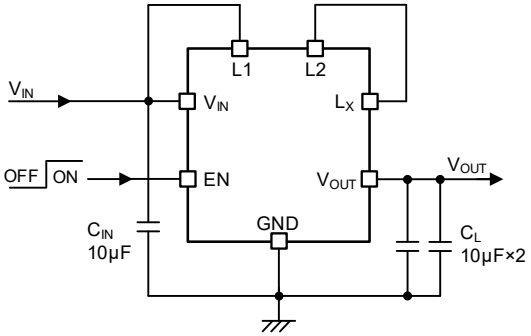
CL-2025-02
(2.5x2.0x1.04mm)

TOREX Longevity Program (TLP)

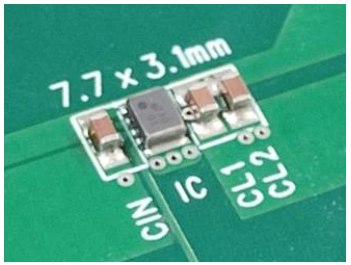


(BOTTOM VIEW)

Typical Application Circuit



Ultra Small



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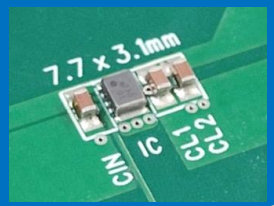
XCL108 : Overview / Features

- Step-up DC/DC for low power consumption of MCUs and high performance of IoT devices.

400nA ultra low-Iq Step-up Micro DC/DC XCL108 : PWM/PFM



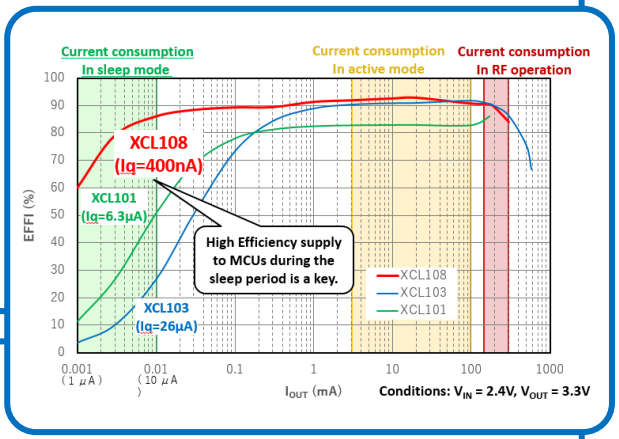
For ultra-low consumption

①

①Further low consumption for MCUs and SoCs

"Constant Boosting"
with "**Ultra-low Consumption**".

- ✓ High efficiency at any output current.
- ✓ Long battery life.
- ✓ Enables smaller battery capacity & size through improved battery life.



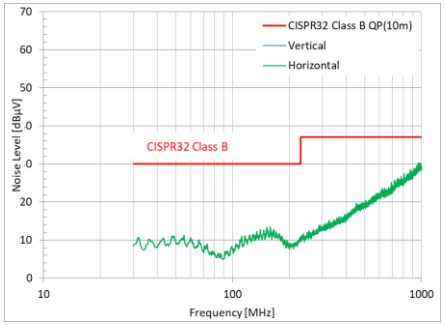
②

Low EMI

② Higher performance of IoT devices

With "**Low EMI**"
& "**105°C operation compatible**"

- ✓ Low EMI due to Built-in Inductor.
- ✓ Small and space-saving
- ✓ Wider operating temperature range.



Low power consumption contributes to **Longer Battery Life / Miniaturization**

- ➢ Battery-powered IoT / Sensors / Security
- ➢ Handhelds / Wearables & Healthcare

In addition, **+105°C operation** and **Low EMI**

- ➢ **Compatible with various Smart Factory sensors**

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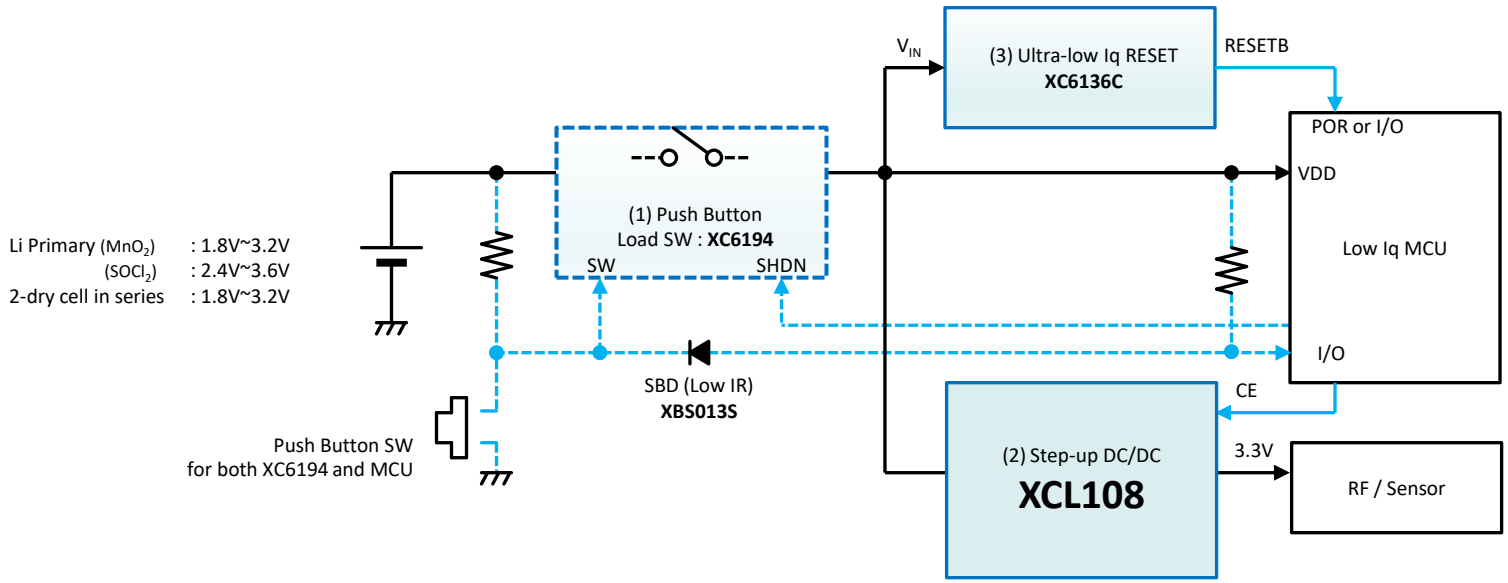
Primary Battery : Small and Low Consumption Solutions

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



Block	Product	Features
(1) Push button SW	**XC6194**	ISTB=1nA, Shutdown function(Ship/Main power SW) For system freeze (XC6194A), Preventing liquid leakage (UVLO)
(2) Step-up DC/DC	**XCL108**	Ultra-low Iq: 400nA, PWM/PFM 1.2MHz, 300mA@3.3V→5V, VST=1.6V
(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. For RF/sensors always operating
  400nA Ultra-low Iq PWM/PFM step-up XCL108 achieving high-efficiency always.

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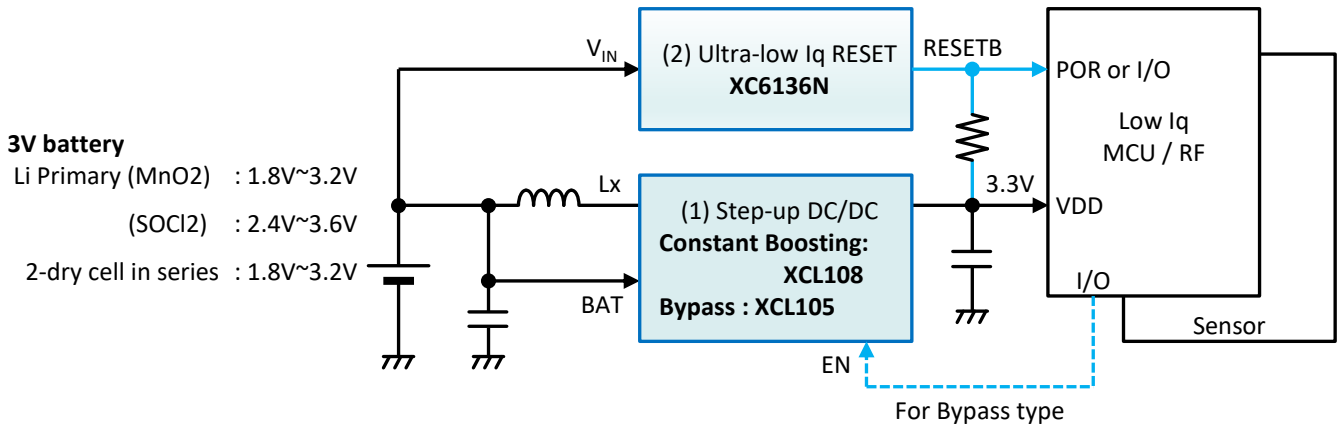
Primary Battery : Small and Low Power Consumption Solutions

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



Block	Product	Features
(1) Step-up DC/DC	**XCL108**	Built-in inductor, PWM/PFM 3MHz, 450mA@3.3V→5V
	XCL105	Built-in inductor, PWM/PFM 1.2MHz,710mA@3.3V→5V
(2) RESET IC	**XC6136**	Iq=100nA class Ultra-low Iq

(1) Step-up DC/DC for MCU

For low power consumption & Small/Low EMI built-in inductor "micro DC/DC"

- General use - Supply with always boosting at high efficiency
  For 3V battery : **Iq=400nA PWM/PFM step-up DC/DC XCL108**
- 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. **XCL105**

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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

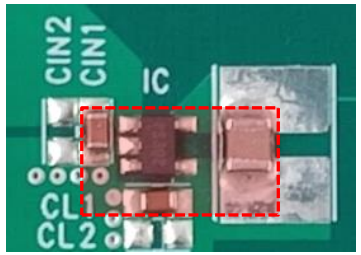
- For stable operation of devices, it is important to place power supply ICs close to MCUs and FPGAs. Especially in cases where multiple power supplies are required, selecting power supply ICs suitable for POL (Point of Load) is a challenge.
- Miniaturization of power circuits including ICs and low EMI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

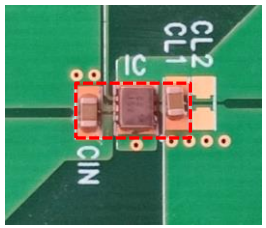
9.6×5.8mm = 56mm²



Stand-alone DC/DC
External parts : 3 pcs

65% reduction

6.5×3.0mm = 19.5mm²



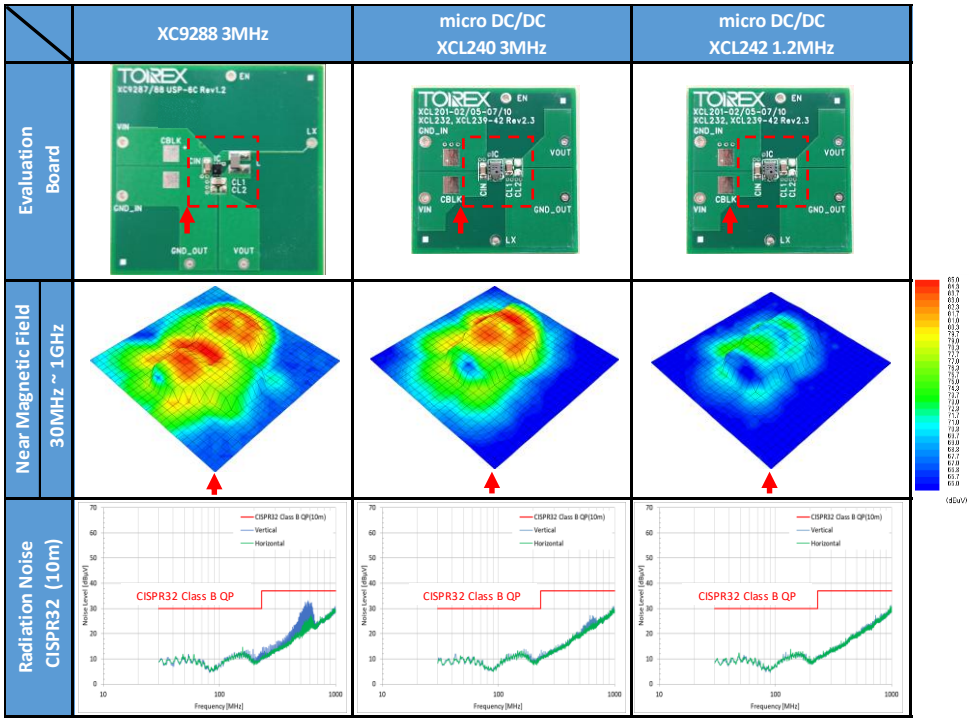
Built-in inductor Micro DC/DC
External parts : 2 pcs

➢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.

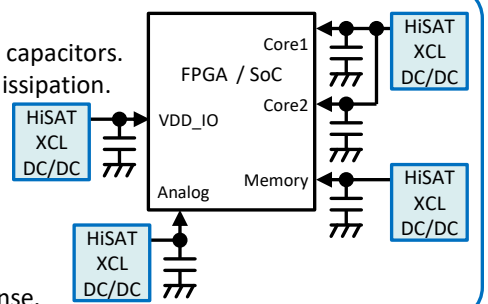
✓Can be placed near RF ICs/Sensors, etc., contributing to miniaturization.

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 & HiSAT-COT®

- 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.
- **HiSAT-COT** provides highly stable
  power supply, including transient response.



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