

Torex...Powerfully Small!

400nA Ultra Low Iq PWM/PFM Step-up DC/DC Converter

XC9145 Series Product Overview

May 2023

TOREX Semiconductor

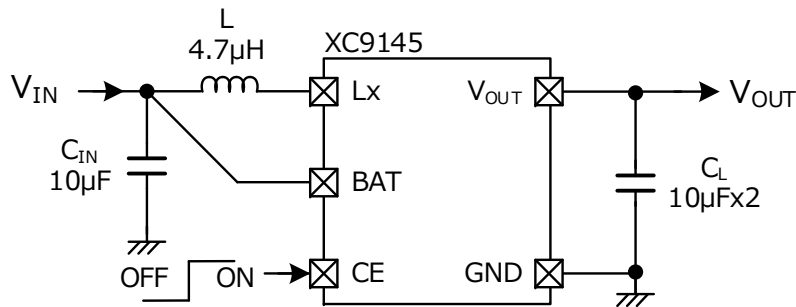
Rev. 1.0

Ultra-Low Iq & High Efficiency / Low Ripple / Longer Battery life

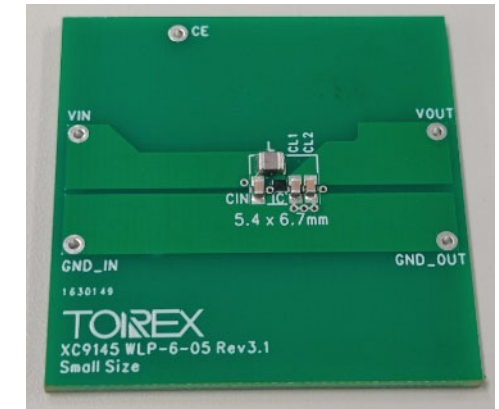
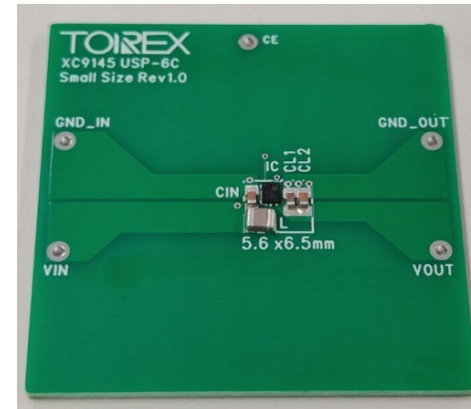
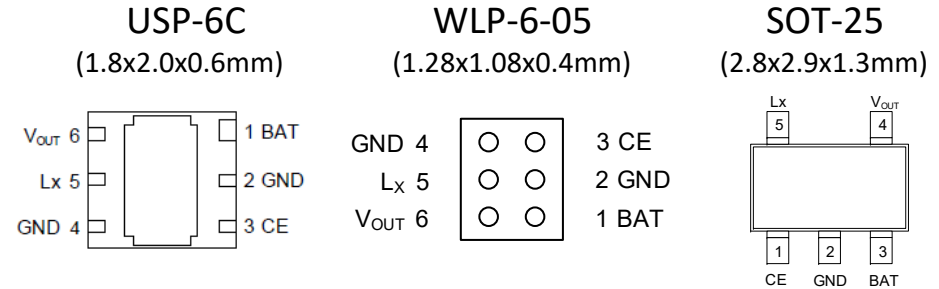
■ Features

| | |
|-------------------------|--|
| Input Voltage | : 0.65V ~ 5.5V (Absolute Max.: 6.6V) |
| Operation Start Voltage | : 1.6V |
| Output Voltage | : 3.0V ~ 5.5V |
| Oscillation Frequency | : 1.2MHz |
| Supply Current | : 400nA |
| Output Current | : 430mA@ $V_{OUT}=5.0V, V_{BAT}=3.3V$ 300mA@ $V_{OUT}=3.3V, V_{BAT}=1.8V$ |
| Efficiency | : 89.9% ($V_{BAT}=2.4V, V_{OUT}=3.3V, I_{OUT}=10\mu A$) 93.2% ($V_{BAT}=2.4V, V_{OUT}=3.3V, I_{OUT}=100mA$) |
| Control Method | : PWM/PFM |
| Functions | : ON/OFF Load Disconnection Soft-Start |
| Protection | : Current limit |
| Packages | : USP-6C, WLP-6-05, SOT-25 |
| Operating Ambient Temp. | : -40°C ~ 105°C |

■ Typical Application Circuit



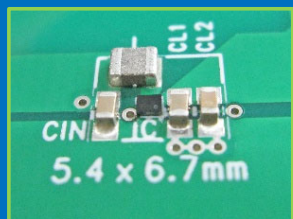
■ Packages



XC9145 : Overview / Features

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

**400nA ultra low-Iq
Step-up DC/DC
XC9145 : PWM/PFM**



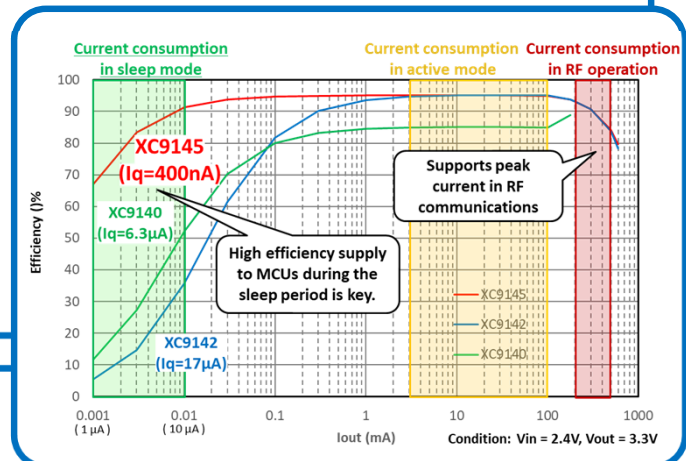
For ultra-low consumption

①

① Further low consumption of MCUs and SoCs

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

- ✓ High efficiency at any output current.
- ✓ Therefore, long battery life.
- ✓ Enabling smaller battery capacity / size through improved battery life.

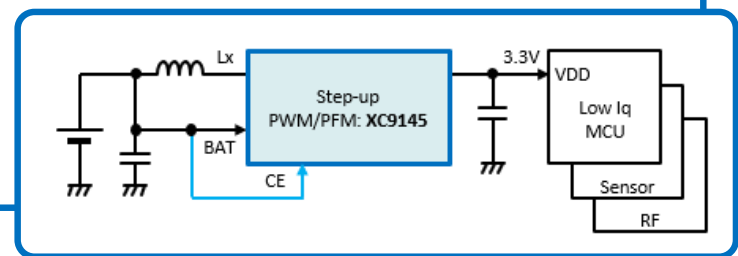


②

② Higher performance of IoT devices

With "Sufficient Output Current"
& "105°C operation compatible".

- ✓ Peak current support for radio and analog circuits.
- ✓ Wider operating temperature range.



Sufficient Current capability

Low power consumption contributes to Longer Battery Life / Miniaturization

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

In addition, +105°C operation and Peak Current Capability to RF communications

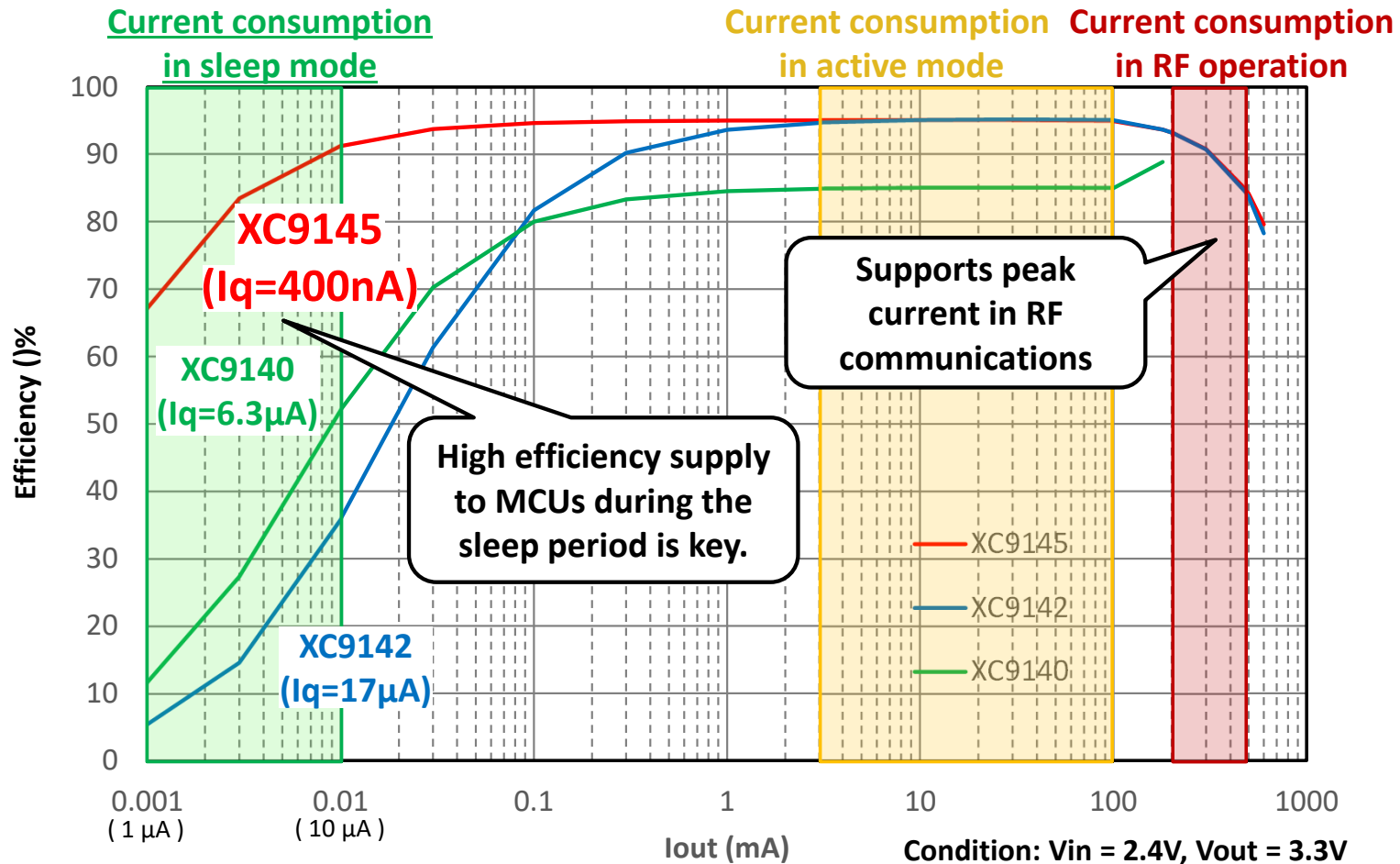
- **Compatible with various Smart Factory sensors**

1. High efficiency at very light loads:

Significantly reduces battery consumption when the MCU is in sleep mode (1 μ A to 10 μ A).

2. Current capability for communications:

Capable of handling load currents of several hundred mA required for RF communications.



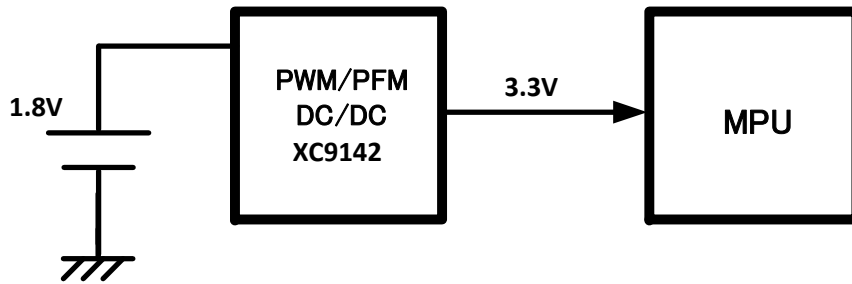
Always highly efficient power supply, from system sleep to peak current for RF communications.

Power Loss Comparison with other products

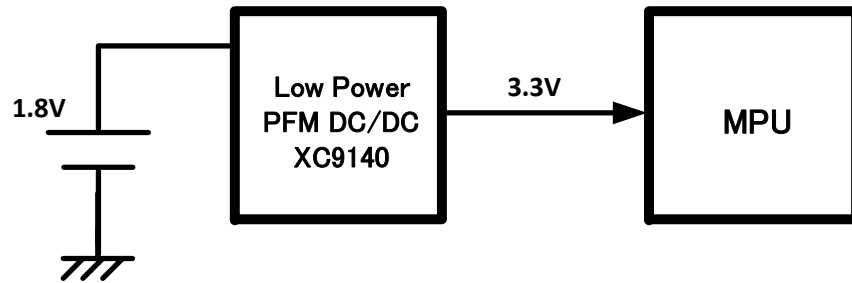
<Condition> $V_{in}=1.8V \rightarrow V_{out} = 3.3V$

Active: $I_{out}=10mA@10ms \leftrightarrow$ Sleep : $I_{out}=5\mu A@10s$

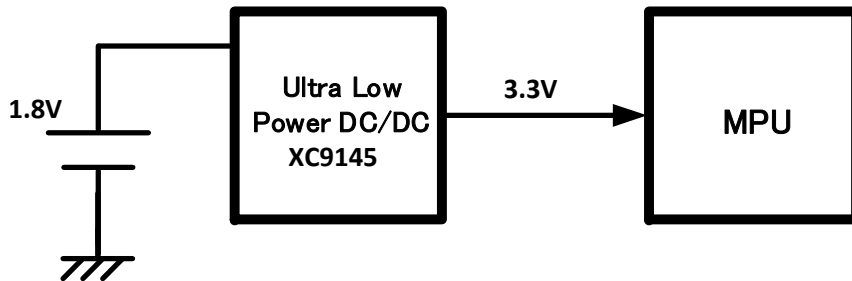
① Conventional PWM/PFM DC/DC : XC9142



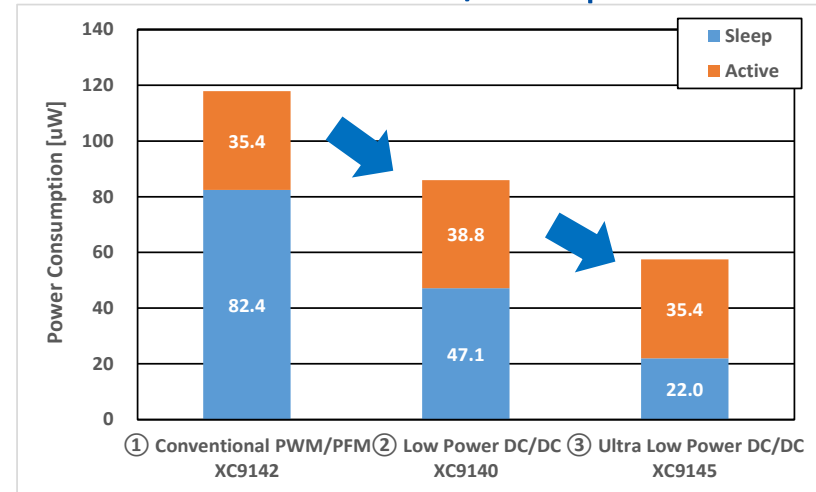
② Low Power PFM DC/DC : XC9140



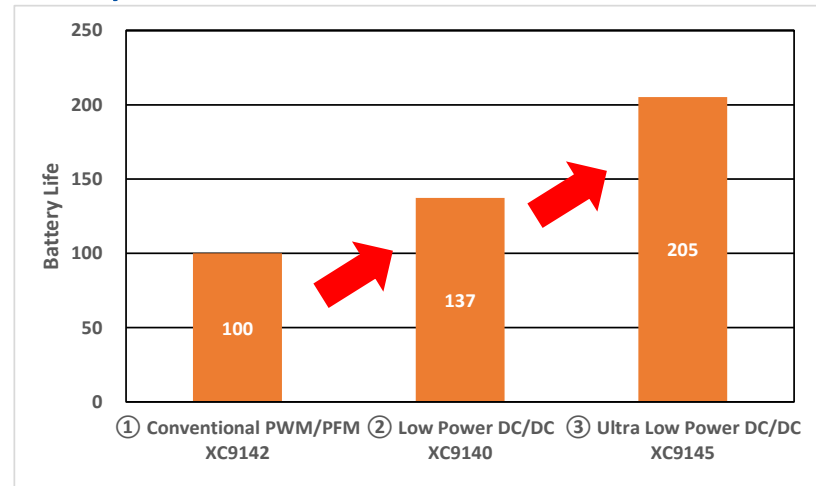
③ Ultra Low Power PFM DC/DC : XC9145



Power Losses at Active / Sleep



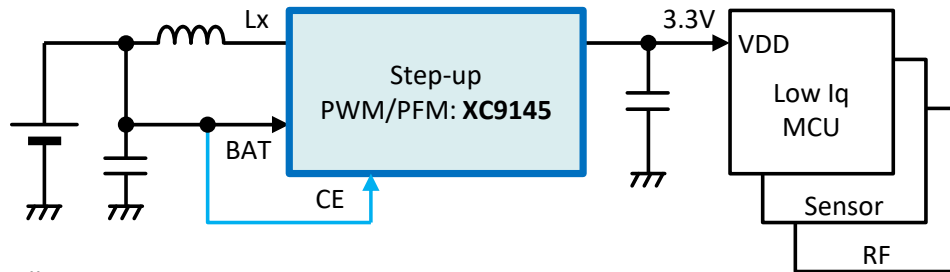
Battery life (Comparison with ① as 100)



Significant reduction in power consumption due to reduced losses during sleep.
Enables longer operation and lower capacity of batteries.

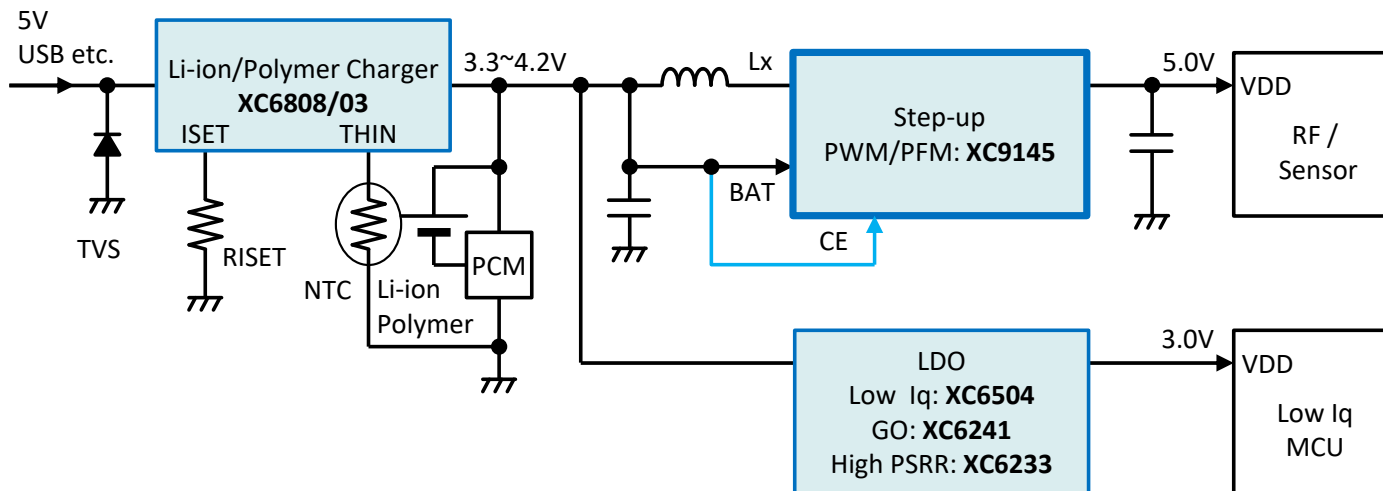
■ Examples of typical circuits with batteries

1. Products requiring always 3.3 V from a small primary battery.



2-dry cell in series : 1.8~3.2V
 Li Primary (MnO₂) : 1.8~3.2V
 (SOCl₂) : 2.4~3.6V

2. Products requiring always 5 V from a Li-ion rechargeable battery.



■ Application

IoT / Wearable

- Low power IoT modules
- Wearables / Tracker devices (Health monitoring, Fitness devices)
- Healthcare / Wearable medical, Nursing care monitors

Consumer products

- Remote controls
- Primary battery portable systems

Various Monitors / Sensors

- Home Security / Home Automation
- Metering devices / Smart meters
- FA equipment / Factory sensors

Step-up from Energy Harvest