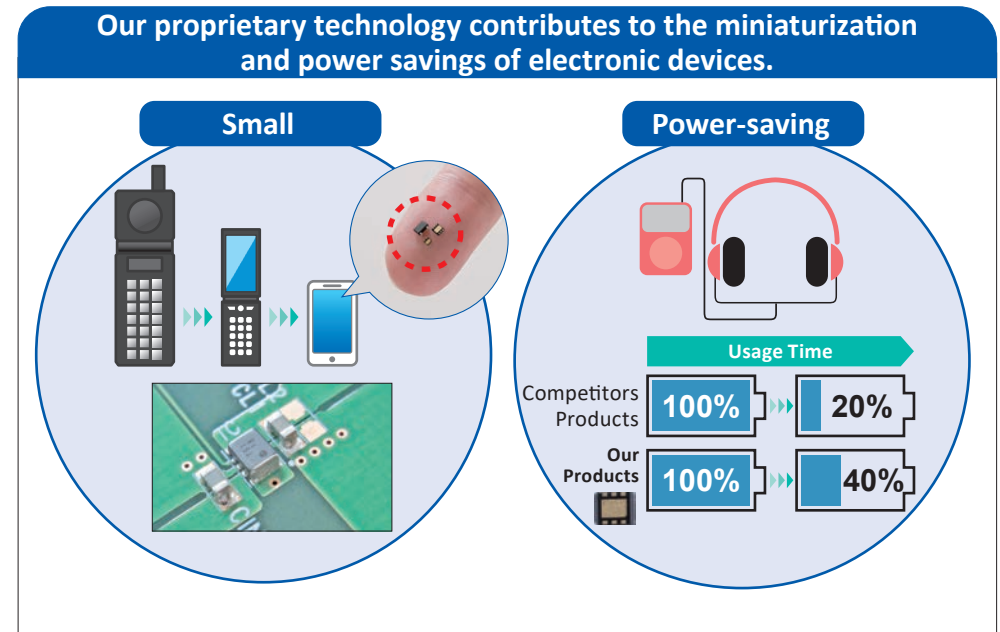
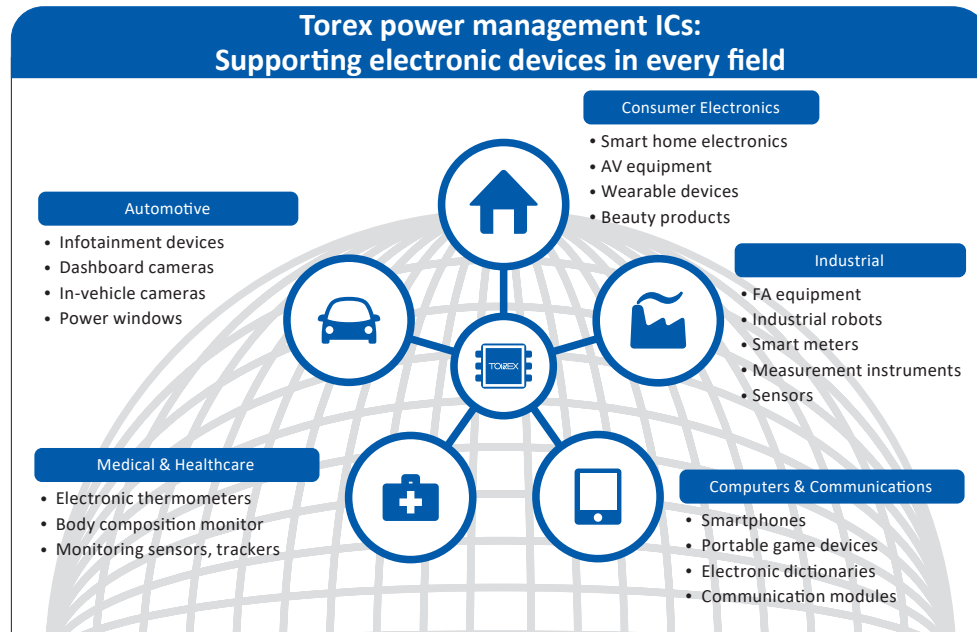


/ POWER MANAGEMENT SOLUTIONS 2025



■ Corporate Data	03	■ Selection Guide	48-61
■ New Products, Featured Products Introduction	04-11	● Built-In Inductor DC/DC Converter Micro DC/DC	48
■ TOREX Product Groups and Features	12-21	● Step-Down DC/DC	49
● Built-In Inductor DC/DC Converter Micro DC/DC	13-14	● Step-Up DC/DC, Step-Up Charge Pump, LED/Back Light Driver	50
● DC/DC Converter	15-16	● Buck-Boost DC/DC, Inverting Charge Pump & DC/DC	51
● Voltage Regulator (LDO)	17	● Voltage Regulator	52-54
● Voltage Detector, Watchdog Timer (RESET/WDT)	18	● Voltage Detector, Watchdog Timer	55
● Load Switch, Push Button Controller	19	● Load Switch	56
● Charger IC : For Li-ion/Polymer, LTO and Solid-State batteries	20	● Push Button Load Switch, Push Button Reboot Controller	57
● Automotive IC	21	● Charger IC : For Li-ion/Polymer, LTO, and Solid-State batteries	58
■ Solution Guide	22-47	● Automotive IC (AEC-Q100 Compliant)	59
● Optimal power supply configuration for each power source		● Discrete: MOSFET, Schottky Barrier Diode and TVS	60-61
● Primary Battery : Small and Low Power Consumption	23-24	■ Support Information	62-65
● Li Rechargeable Battery : Small and Low Consumption / Multi-Rails	25-27	● Design Support Tool	
● 3.3V/5V : Multiple Power Rails	30-31	● Web DC/DC Measured Electrical Characteristics Comparison Tool	62
● 12V/24V/Multi-Cell : Small, Multiple Rails	34-36	● Web DC/DC Simulation	63
● 60V Input Compatible : Small	38	● TOREX Customer Support	64
● Start-up/Shutdown Sequence Control of Multiple Power Rails	37	● Links	65
● Medium and High Voltage Input Step-down DC/DC	39	■ Package Lineup	66-67
● OR Connection for Backup or Multiple Power Sources	40-41	■ Head Office and Regional Offices	(Back Cover)
● LTO and Solid-State batteries Reference solutions	42		
● Energy Harvesting	43		
● Peak Current Assist/Backup using EDLC(Supercap)/Li-Cap	44		
● Reset IC Application Examples	45		
● Space-Saving / Low Profile Power Supply	46-47		

TOREX SEMICONDUCTOR is specialized in manufacturing power management ICs featuring small size, low Iq, and low noise. We have a lineup of Power Management ICs for automotive, industrial and consumer applications, with a focus on DC/DC converters, voltage regulators and voltage detectors.



TOREX SEMICONDUCTOR LTD.

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

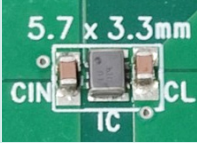
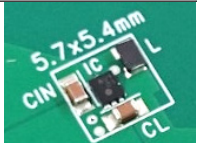
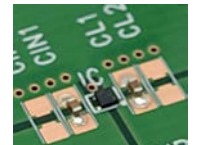
WEB Site : Corporate Site <https://www.torexsemi.com/>
Product Site <https://product.torexsemi.com/en>



TOREX flagship products

TOREX's representative compact, high-performance, low-consumption, low-noise Power Management ICs

Low voltage: Step-down DC/DC, LDO

Product	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA)	Solution size	Other choices
Built-in Inductor Step-down DC/DC XCL239/XCL240 High Performance	2.5 ~ 5.5	0.8 ~ 3.6	1000		I _{OUT} =1.5A XCL237/XCL238 Ultra-low I _q I _q =200nA XCL233
Step-down DC/DC XC9290/XC9291 World's smallest solution size	2.5~ 5.5	0.7 ~ 3.6	600		Ultra-low I _q I _q =200nA XC9276
Step-down DC/DC XC9287/XC9288 High Performance	2.5 ~ 5.5	0.8 ~ 3.6	1500		Ultra-small I _{OUT} =1.5A XC9289
LDO XC6241 Low I _q 0.6μA, Fast response	1.6 ~ 6.0	1.2 ~ 5.0	150		Low I _q XC6504 Fast response I _{OUT} =200mA/300mA XC6233/XC6223

Low voltage: Step-up DC/DC

Product	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA)	Solution size	Other choices
Built-in Inductor Step-up DC/DC XCL108 Low I _q I _q =400nA	0.65~ 5.5 V _{ST} =1.6	3.0 ~ 5.0	180 3.3V to 5V		I _{OUT} =610mA, V _{ST} =0.9V OR, Bypass XCL109/XCL110
Step-up DC/DC XC9145 Low I _q I _q =400nA	0.65~ 5.5 V _{ST} =1.6	3.0 ~ 5.0	430		I _{OUT} =750mA, V _{ST} =0.9V OR, Bypass XC9147/XC9148

12V/24V Medium/high voltage DC/DC, LDO

Product	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA)	Solution size	Other choices
Built-in Inductor 36V Step-down XCL247/XCL248 Low I _q & Low EMI	3.0 ~ 36	2.8 ~ 6.0	600		60V I _{OUT} =150mA XCL249
36V Step-down XC9704/XC9705 Small & Low I _q	3.0 ~ 36	2.8 ~ 15	600		60V I _{OUT} =300mA XC9702
20V LDO XC6705/XC6706 Low I _q 1.5μA, Fast response	3.5 ~ 20	2.5 ~ 5.5	200		28V Low I _q XC6216 28V/36V Fast response XC6701/XC6702

 indicates a built-in Inductor DC/DC.

Special function ICs : Ideal diode/Push Button Load Switch

Product			V _{IN} (V)	R _{on} (mΩ)	I _{OUT} (mA)	Features
Ideal Diode Load Switch	1ch	XC8110	1.5~ 6.0	120	500	“true” reverse current prevention VF=20mV
		XC8111			1000	
		XC8114		NEW	60	
	2ch	XC8112	NEW	2ch x 120	2x 500	
		XC8113	NEW		2x 1000	
Push Button Load Switch XC6194			1.8 ~ 6.0	140	1000	ISTB=1nA, Shutdown function(Ship/Main power SW) For system freeze, Preventing liquid leakage (UVLO)

New Products, Featured Products Introduction

UNDER DEVELOPMENT

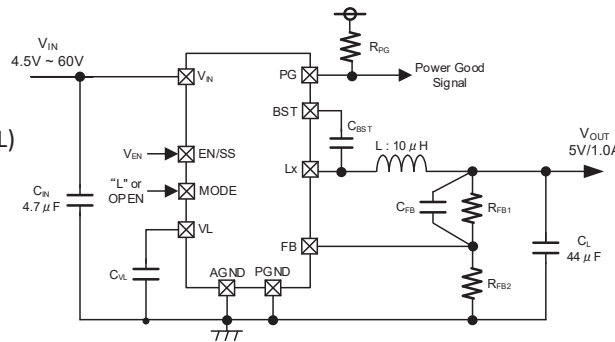
60V Input Compatible
Small Solution, Page 38

NEW

■XC9711 - 60V 1A Step-down DC/DC

- 60V 1A ideal for all applications
- Only 10uA Quiescent Current
- Supports High voltage, Low ripple, High temperature operation and High step-down ratios

V_{IN} : 4.5V ~ 60.0V
 V_{OUT} : 2.5V ~ 15.0V (FB voltage: 0.75V)
 I_{OUT} : 1.0A
 I_q : 10μA
 f_{osc} : 800kHz
 Control : F-PWM (MODE=H)
 PWM/PFM (MODE=L)
 T_{opr} : -40°C ~ 125°C
 Package : HSOP-8N
 DFN3030-12A

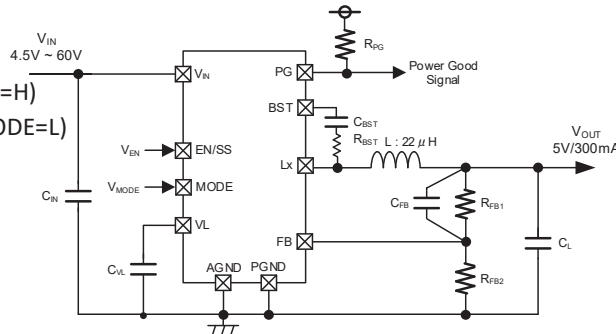


FEATURED

■XC9702 - 60V 0.3A High voltage Space-saving Step-down DC/DC

- World's smallest 60V buck DC/DC in terms of total solution size
- Low I_q and high efficiency at light loads
- Supports High voltage, Low ripple, High temperature operation and High step-down ratios

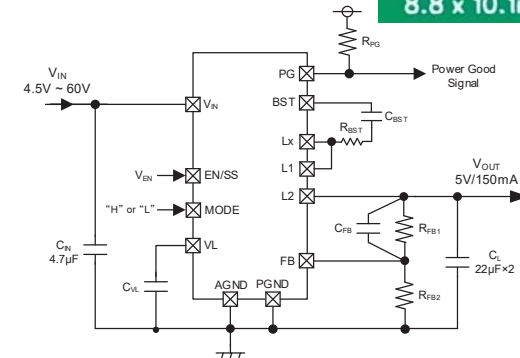
V_{IN} : 4.5V ~ 60.0V
 V_{OUT} : 2.5V ~ 12.0V (FB voltage: 0.75V)
 I_{OUT} : 300mA
 I_q : 12μA
 f_{osc} : 1.0MHz
 Control : F-PWM (MODE=H)
 PWM/PFM (MODE=L)
 T_{opr} : -40°C ~ 125°C
 Package : HSOP-8N
 USP-10B
 DFN3030-12A



■XCL249 - 60V 150mA Built-in inductor Step-down Micro DC/DC

- World's smallest 60V Built-in inductor step-down DC/DC in terms of total solution size
- Low I_q and high efficiency at light loads
- Supports High voltage, Low EMI, High temperature operation and High step-down ratios

V_{IN} : 4.5V ~ 60.0V
 V_{OUT} : 2.5V ~ 6.0V (FB voltage: 0.75V)
 I_{OUT} : 150mA
 I_q : 12μA
 f_{osc} : 1.0MHz
 Control : F-PWM (MODE=H)
 PWM/PFM (MODE=L)
 T_{opr} : -40°C ~ 105°C
 Package : CL-3225
 (Pocket type)



FEATURED

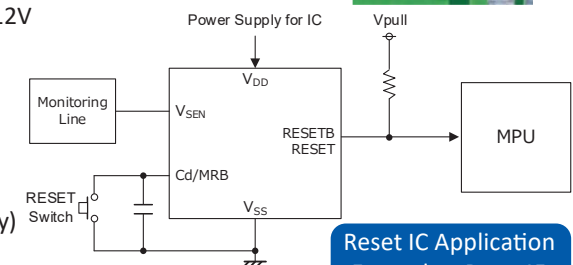
NEW

■XC6138 / XD6138 - High voltage Separated Sense pin Voltage Detector with Delay

- V_{SEN} 76V compatible & 0.15μA@12V, 125°C operation
- Wide range of Detect/Release hysteresis. Adjustable Release/Detect Delay
- AEC-Q100 Grade1 (XD6138)

V_{DD} : 2.2V ~ 6.0V
 V_{SEN} : 76V, Absolute Max.: 80V (90V@400ms)
 V_{DF} / V_{DR} : 2.3V ~ 20.0V / 2.5V ~ 24.0V
 Accuracy : ±1.5% ($T_a=25^\circ\text{C}$) ±3.0% ($T_a=-40^\circ\text{C} \sim 125^\circ\text{C}$)
 Hysteresis : 5% ~ 50%

Supply Current: V_{DD} : 0.5μA, V_{SEN} : 0.15μA@12V
 Output Type : CMOS, Nch open drain
 Output Logic : "L" or "H" at detection
 Function : Sense pin separated
 Release/Detect delay, Manual reset
 T_{opr} : -40°C ~ 125°C
 Package : SOT-25, DFN1515-6A(XC6138 only)



Reset IC Application
Examples, Page 45

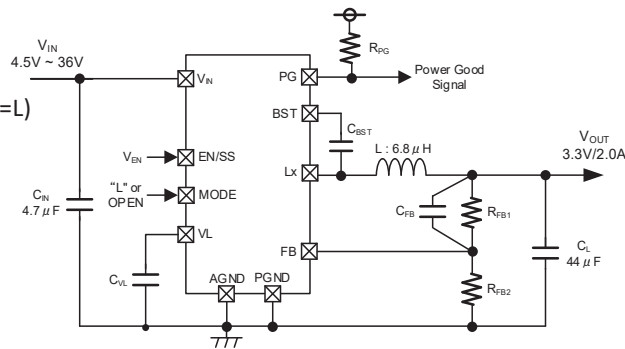
New Products, Featured Products Introduction

UNDER DEVELOPMENT

■XC9714 - 36V 2A Step-down DC/DC

- 36V 2A ideal for all industrial applications
- Low Iq and high efficiency at light loads
- High temperature operation and High step-down ratios

V_{IN} : 4.5V ~ 36.0V
 V_{OUT} : 2.5V ~ 15.0V (FB voltage: 0.75V)
 I_{OUT} : 2.0A
 I_q : 10 μ A
 f_{osc} : 800kHz
 Control : F-PWM (MODE=H)
 PWM/PFM (MODE=L)
 T_{opr} : -40°C ~ 125°C
 Package : HSOP-8N
 DFN3030-12A



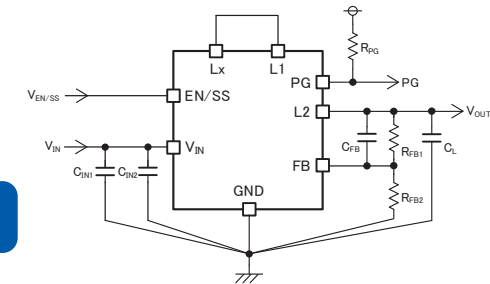
High voltage
Step-down
Page 39

NEW

■XCL247 / XCL248 - 36V 600mA Built-in inductor Step-down Micro DC/DC

- Small solution size
- Low Iq / high efficiency at light loads / Easy design by Built-in inductor
- Supports High voltage, Low EMI, High temperature operation

V_{IN} : 3.0V ~ 36.0V
 V_{OUT} : 2.8V ~ 6.0V (FB voltage: 0.75V)
 I_{OUT} : 600mA
 I_q : 11 μ A
 f_{osc} : 1.2MHz
 Control : F-PWM (XCL247)
 PWM/PFM (XCL248)
 T_{opr} : -40°C ~ 105°C
 Package : DFN3030-10B
 (Cool Post type)



High voltage
Step-down
Page 39

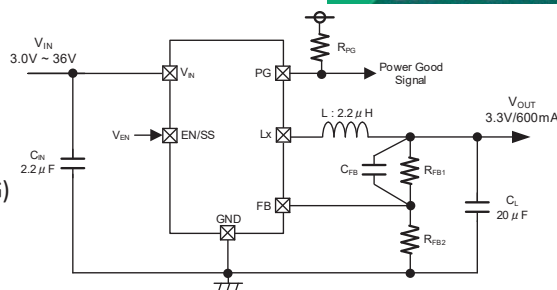
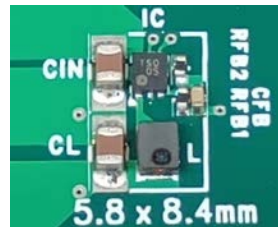
XCL
Page 33

NEW

■XC9704 / XC9705 - 36V 600mA Step-down DC/DC

- 36V compact, high-efficiency ideal for replacing high-voltage LDOs
- Pch driver, 100%Duty, Wide input voltage range(3.0~36V)
- Sequence control using PG and soft start functions.

V_{IN} : 3.0V ~ 36.0V
 V_{OUT} : 2.8V ~ 18.0V (XC9704)
 2.8V ~ 15.0V (XC9705)
 FB voltage : 0.75V
 I_{OUT} : 600mA
 I_q : 11 μ A
 f_{osc} : 1.2MHz, 2.2MHz
 Control : F-PWM (XC9704)
 PWM/PFM (XC9705)
 T_{opr} : -40°C ~ 125°C
 Package : SOT-89-5 (Without PG)
 USP-6C



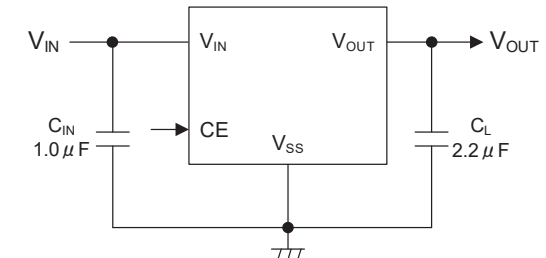
High voltage
Step-down
Page 39

FEATURED

■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 in series 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
 T_{opr} : -40°C ~ 105°C
 Package : SOT-25 (XC6705)
 USP-4 (XC6705)
 SOT-89 (XC6706)



12V/24V/Multi-Cell
LDO solutions, Page 34

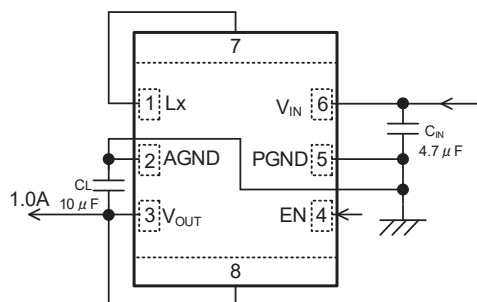
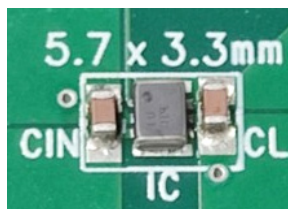
New Products, Featured Products Introduction

FEATURED

■ XCL239 / XCL240 - Built-in inductor HiSAT-COT 1.0A Step-down Micro DC/DC

- Smaller size, Easy design and Lower EMI by Built-in inductor
- High-speed transient response with HiSAT-COT control
- 1A Pocket type, suitable for any application

V_{IN} : 2.5V ~ 5.5V
 V_{OUT} : 0.8V ~ 3.6V
 I_{OUT} : 1.0A
 I_q : 25 μ A
 f_{osc} : 3MHz
 Control : HiSAT-COT
 F-PWM (XCL239)
 PWM/PFM (XCL240)
 T_{opr} : -40°C ~ 105°C
 Package : CL-2025-02
 (Pocket type)

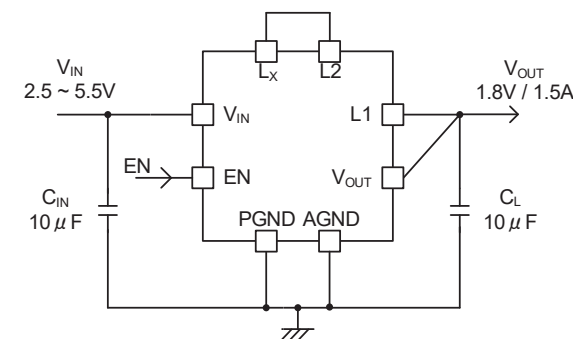


FEATURED

■ XCL237 / XCL238 - Built-in inductor HiSAT-COT 1.5A Step-down Micro DC/DC

- Smaller size, Easy design and Lower EMI by Built-in inductor
- High-speed transient response with HiSAT-COT control
- High heat dissipation and small size with high output by Multiple type

V_{IN} : 2.5V ~ 5.5V
 V_{OUT} : 0.8V ~ 3.6V
 I_{OUT} : 1.5A
 I_q : 25 μ A
 f_{osc} : 3MHz
 Control : HiSAT-COT
 F-PWM (XCL237)
 PWM/PFM (XCL238)
 T_{opr} : -40°C ~ 105°C
 Package : USP-9B01
 (Multiple type)

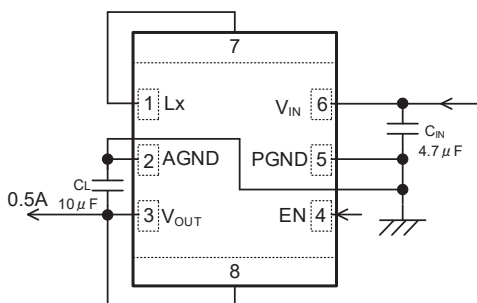


FEATURED

■ XCL241 / XCL242 - Built-in inductor HiSAT-COT 500mA Step-down Micro DC/DC

- Smaller size, Easy design and Lower EMI by Built-in inductor
- Ultra-low EMI by 1.2 MHz
- High-speed transient response with HiSAT-COT control

V_{IN} : 2.5V ~ 5.5V
 V_{OUT} : 0.8V ~ 3.6V
 I_{OUT} : 500mA
 I_q : 15 μ A
 f_{osc} : 1.2MHz
 Control : HiSAT-COT
 F-PWM (XCL241)
 PWM/PFM (XCL242)
 T_{opr} : -40°C ~ 105°C
 Package : CL-2025-02
 (Pocket type)

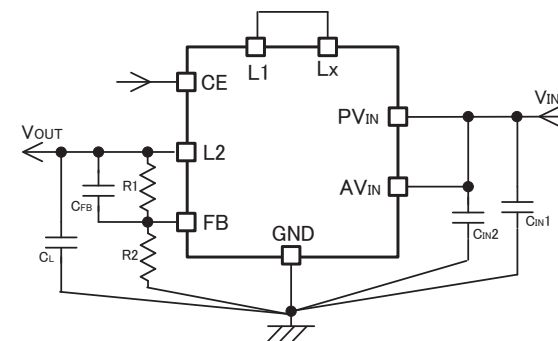
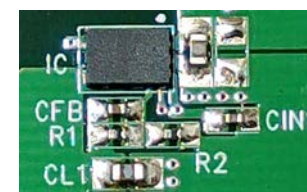


FEATURED

■ XCL211 / XCL212 - Built-in inductor 2.0A Step-down Micro DC/DC

- Smaller size, Easy design and Lower EMI by Built-in inductor
- FB type supports a wide range of output voltages
- High heat dissipation and small size with high output

V_{IN} : 2.7V ~ 6.0V
 V_{OUT} : 0.9V ~ V_{IN} (FB voltage: 0.80V)
 I_{OUT} : 2A
 I_q : 53 μ A
 f_{osc} : 2.4MHz
 Control : F-PWM (XCL211)
 PWM/PFM (XCL212)
 T_{opr} : -40°C ~ 85°C
 Package : USP-11B01
 (Multiple type)



New Products, Featured Products Introduction

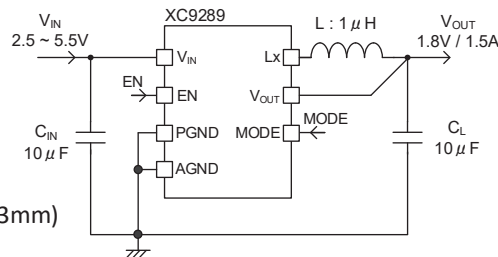
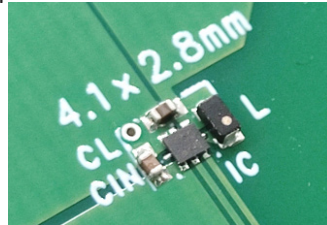
HiSAT-COT
Page 32

FEATURED

■XC9287 / XC9288 / XC9289 - HiSAT-COT 1.5A Step-down DC/DC

- High-speed transient response with HiSAT-COT control
- 1.5A, ideal for all applications
- LGA ultra-small package also available

V_{IN} : 2.5V ~ 5.5V
 V_{OUT} : 0.8V ~ 3.6V
 I_{OUT} : 1.5A
 I_q : 15 μ A
 f_{osc} : 1.2MHz, 3MHz
 Control : HiSAT-COT
 F-PWM (XC9287)
 PWM/PFM (XC9288)
 MODE selectable (XC9289)
 T_{opr} : -40°C ~ 105°C
 Package : USP-6C, SOT-89-5
 LGA-8B01 (XC9289, 1.2x1.4x0.3mm)

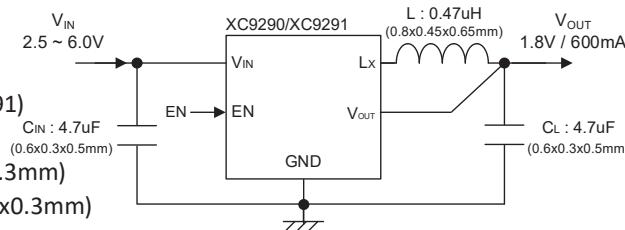


FEATURED

■XC9290 / XC9291 - HiSAT-COT Ultra space-saving 600mA step-down DC/DC

- World's smallest class solution size
- High-speed transient response with HiSAT-COT control
- Compatible with ultra-small capacitors/inductors

V_{IN} : 2.5V ~ 6.0V
 V_{OUT} : 0.7V ~ 3.6V
 I_{OUT} : 600mA
 I_q : 11 μ A
 f_{osc} : 4MHz, 6MHz
 Control : HiSAT-COT
 F-PWM (XC9290)
 PWM/PFM (XC9291)
 T_{opr} : -40°C ~ 105°C
 Package : LGA-6B01 (1.2x1.2x0.3mm)
 WLP-5-08 (0.96x0.88x0.3mm)

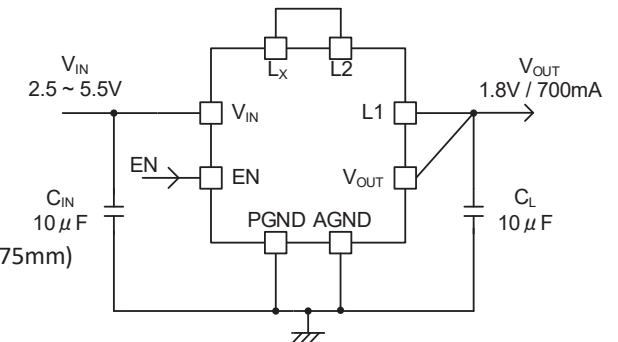


FEATURED

■XCL243 / XCL244 - Built-in inductor HiSAT-COT 700mA Step-down Micro DC/DC

- Smaller size, Easy design and Lower EMI by Built-in inductor
- High-speed transient response with HiSAT-COT control
- Small size and Low profile by Multiple type

V_{IN} : 2.5V ~ 5.5V
 V_{OUT} : 0.8V ~ 3.6V
 I_{OUT} : 700mA
 I_q : 25 μ A
 f_{osc} : 3MHz
 Control : HiSAT-COT
 F-PWM (XCL243)
 PWM/PFM (XCL243)
 T_{opr} : -40°C ~ 105°C
 Package : USP-8B04
 (Multiple type, 2.25x1.5x0.75mm)

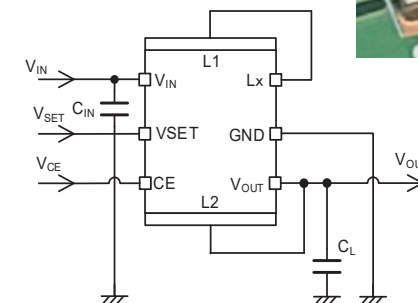


FEATURED

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

- Smaller size, Easy design, and Lower EMI by Built-in inductor
- 80% or higher efficiency even at IOUT=10 μ 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
 (Pocket type)



VSET
Page 28

XCL
Page 33

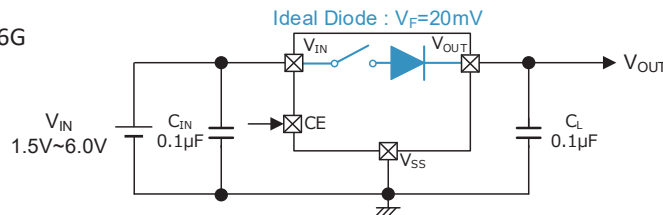
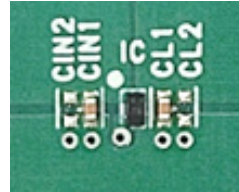
New Products, Featured Products Introduction

NEW

■XC8114 – 3A Ideal Diode Load Switch

- Load SW with **Ideal Diode function** equivalent to $V_F=20\text{mV}$
- 3.0A, ideal for industrial applications

V_{IN} : 1.5V ~ 6.0V
 I_{OUT} : 3A
 R_{on} : 60mΩ @WLP-4-04
 I_q : 3.6μA/ch (at Forward bias)
 0μA (at Reverse bias)
 T_{opr} : -40°C ~ 105°C
 Package : SOT-89-5
 DFN1820-6G
 WLP-4-04



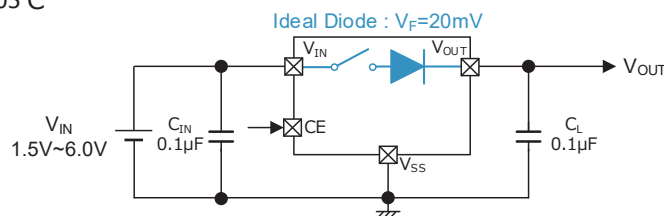
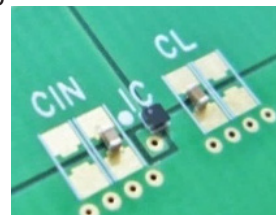
Ideal Diode
Page 29

FEATURED

■XC8110 / XC8111 - Ideal Diode Load Switch

- Load SW with **Ideal Diode function** equivalent to $V_F = 20\text{mV}$
- 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



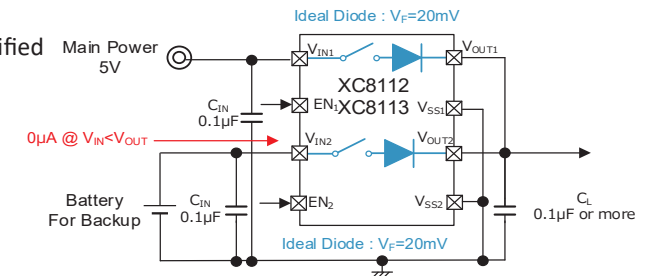
Ideal Diode
Page 29

NEW

■XC8112 / XC8113 – 2ch Ideal Diode Load Switch

- Load SW with **Ideal Diode function** equivalent to $V_F=20\text{mV}$
- Supports OR connection of two lines with only one IC.
- 1ch 1A/2A, $R_{on}=60\text{mΩ}$ in parallel connection

V_{IN} : 1.5V ~ 6.0V
 I_{OUT} : 2ch x 500mA (XC8112)
 2ch x 1A (XC8113)
 R_{on} : 120mΩ/ch
 I_q : 3.6μA/ch (at Forward bias)
 0μA (at Reverse bias)
 Standard : IEC 62368-1:2023 certified
 T_{opr} : -40°C ~ 105°C
 Package : USP-8B06



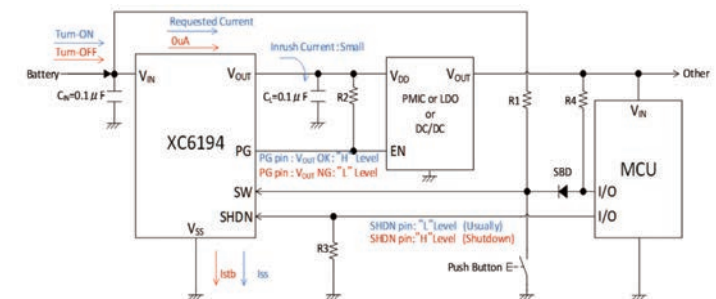
2ch OR connection
Page 41

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



XC6194
Page 29

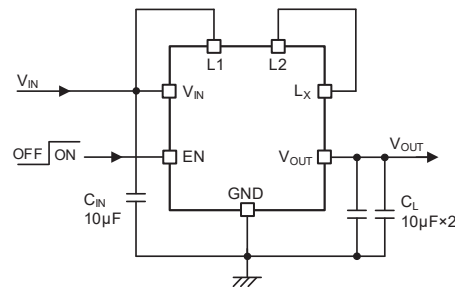
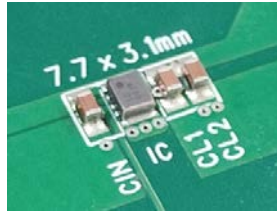
New Products, Featured Products Introduction

NEW

■XCL108 - Built-in inductor, Ultra-low Iq Step-up Micro DC/DC

- Smaller size / Easy design / Lower EMI by Built-in inductor
- 85.9% efficiency even at IOUT=10μA with 400nA Ultra-low Iq
- For longer battery life in 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} : 300mA @3.3V → 5V
 200mA @1.8V → 3.3V
 Control : PWM/PFM
 T_{opr} : -40°C ~ 105°C
 Package : CL-2025-02
 (Pocket type)

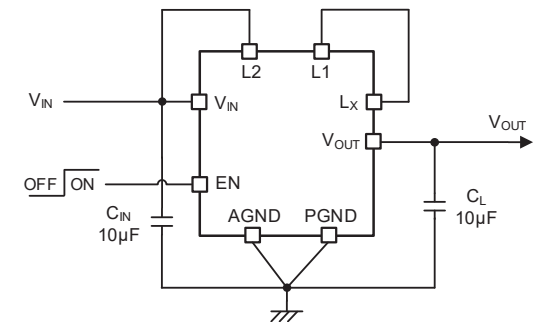
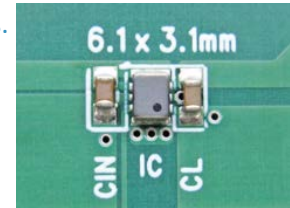


NEW

■XCL109 / XCL110 – Built-in inductor, Multi-function Step-up Micro DC/DC

- Smaller size and High efficiency by Built-in inductor.
- The range of options is expanded by P2P with other step-up XCLs.
- 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} : 610mA @3.3V → 5V
 380mA @1.8V → 3.3V
 Control : F-PWM (XCL109)
 PWM/PFM (XCL110)
 T_{opr} : -40°C ~ 105°C
 Package : CL-2025-02
 (Pocket type)

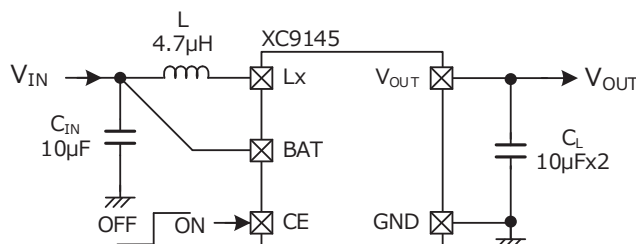
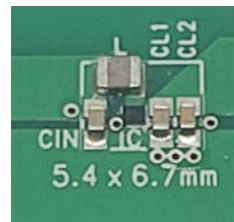


FEATURED

■XC9145 - Ultra-low Iq, Iin=800mA Step-Up DC/DC

- Iq = 400 nA and low ripple PWM/PFM for all boosting applications.
- High efficiency with a wide range from Deep Sleep to peak current for sensors, RF communications, MCUs, etc.

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
 SOT-25

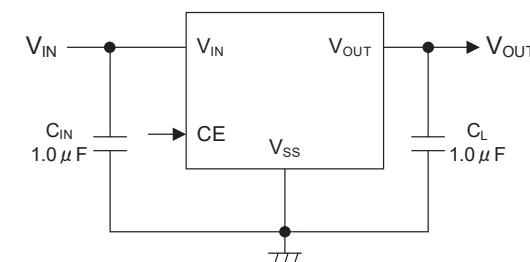
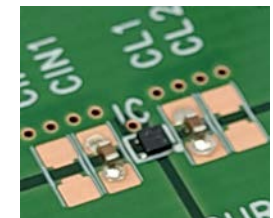


FEATURED

■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 : 0.6μA
 R_{on} : 1.1Ω @3.3V
 $PSRR$: 60dB @1kHz
 T_{opr} : -40°C ~ 105°C
 Package : USPQ-4B05
 SSOT-24



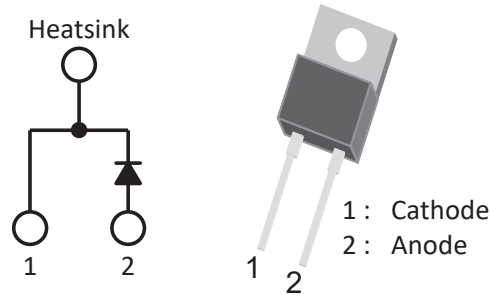
New Products, Featured Products Introduction

UNDER DEVELOPMENT

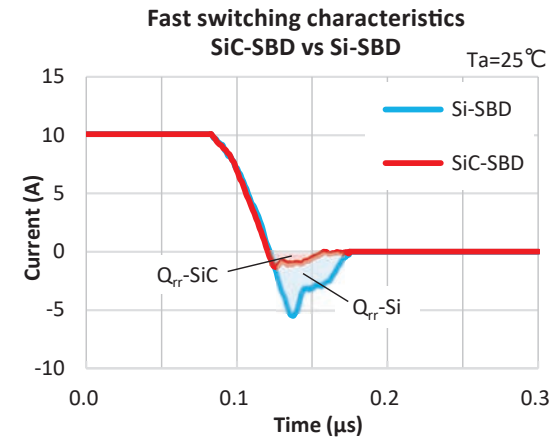
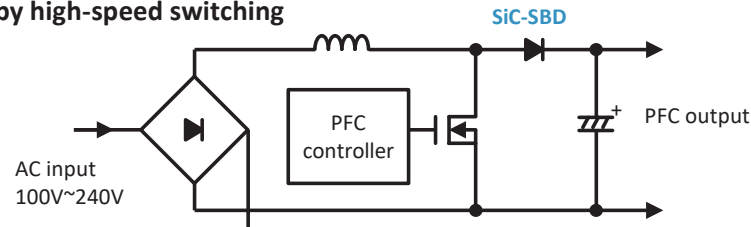
■XBSC41A066CS-G / XBSC42A086CS-G / XBSC43A106CS-G - 650V/6A, 8A, 10A SiC Schottky Barrier Diode

- Repetitive peak reverse voltage $V_{RM}=650V$
- Fast switching operation / Low recovery loss

V_{RM}	: 650V
V_R	: 650V
$I_{F(AVE)}$	: 6A, 8A, 10A
V_F	: 1.35V
Package	: TO-220AC
T_{jmax}	: 175°C



High efficiency of PFC circuits
by high-speed switching

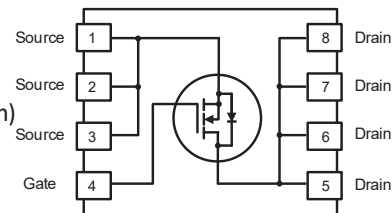
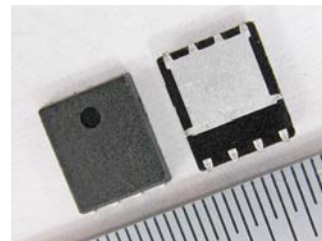


NEW

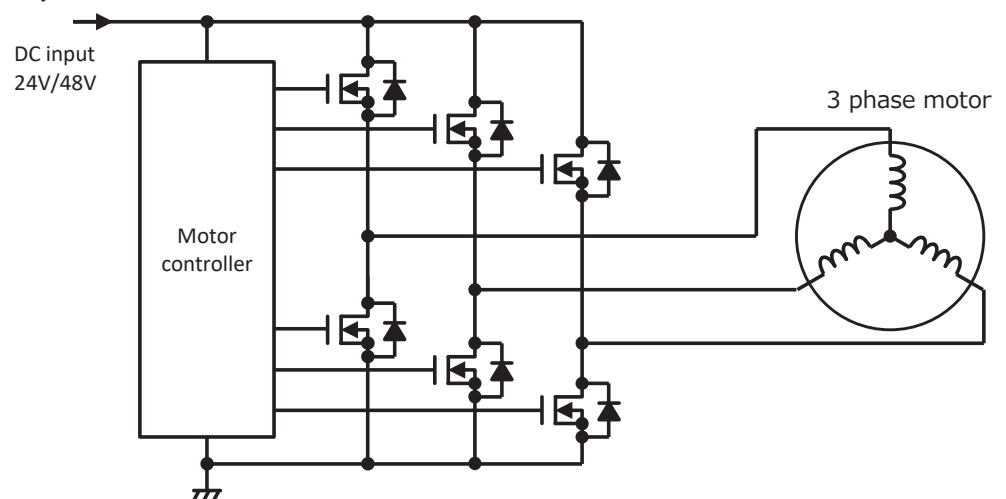
■XPJ102N09N8R-G / XPJ101N04N8R-G - N-channel MOSFET 100V, 9.4mΩ/4.4mΩ, 59A/122A

- 100V operation N-ch MOSFET, mounted in small DFN5060 package
- Low loss due to low on-resistance and reduced charge capacitance

V_{DS}	: 100V
V_{GS}	: $\pm 20V$
I_D	: 59A/122A
$V_{GS(th)}$	: 2.8V
$R_{DS(on)}$	: 9.4mΩ/4.4mΩ (MAX)
I_{DSS}	: 1μA ($V_{DS}=100V, V_{GS}=0V$)
I_{GSS}	: $\pm 100nA$ ($V_{GS}=\pm 20V, V_{DS}=0V$)
Q_{gs}	: 7.6nC/15.0nC
Q_{gd}	: 3.0nC/6.0nC
Q_g	: 19.0nC/40.5nC
Package	: DFN5060-8L (5.0 x 6.0 x 1.1mm)
T_{jmax}	: 150°C



3 phase motor drive



Discrete Products
SBD,TVS, Page 61

Discrete Products
FET, Page 60

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
- HiSAT-COT control ideal for high performance POL

Voltage Detector, Watchdog Timer (Reset, WDT)

- Ultra-low quiescent current in the nanoampere (nA) range, ideal for battery-powered applications
- Various functions and 125°C operation required for industrial equipment etc.

Charger IC (Li-ion/Polymer, LTO, and Solid-State batteries)

- Small, simple, and easy-to-use charger IC for Li-ion/Polymer
- LDO for charging and battery voltage monitoring IC optimum for LTO and Solid-State batteries

DC/DC converter

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

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

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

Voltage Regulator (LDO)

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

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

Discrete (MOSFET, SBD/SiC SBD, TVS)

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

■ 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.
- High-performance POL : **HiSAT-COT** ideal for FPGA/SoC, etc. with high-speed transient response and small components.

HiSAT-COT
Page 32

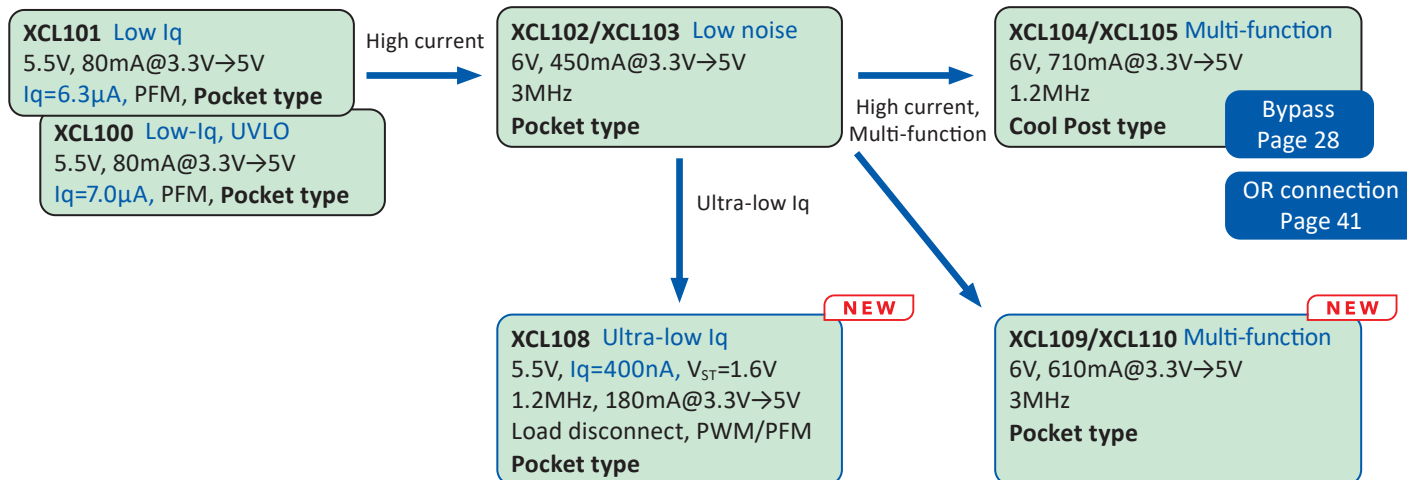
■ Typical Built-in inductor Micro DC/DC

Standard

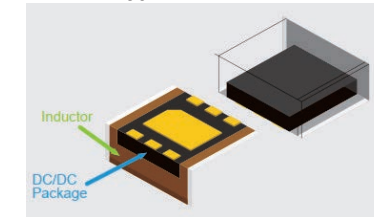
Low Iq

Small

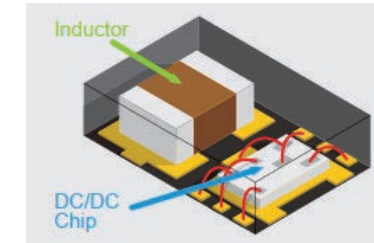
► Step-up DC/DC



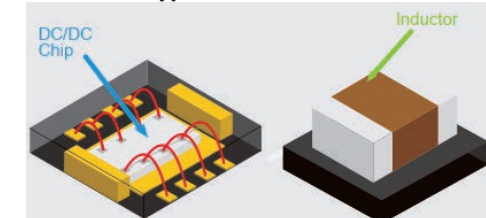
Pocket type



Multiple type



Cool Post type



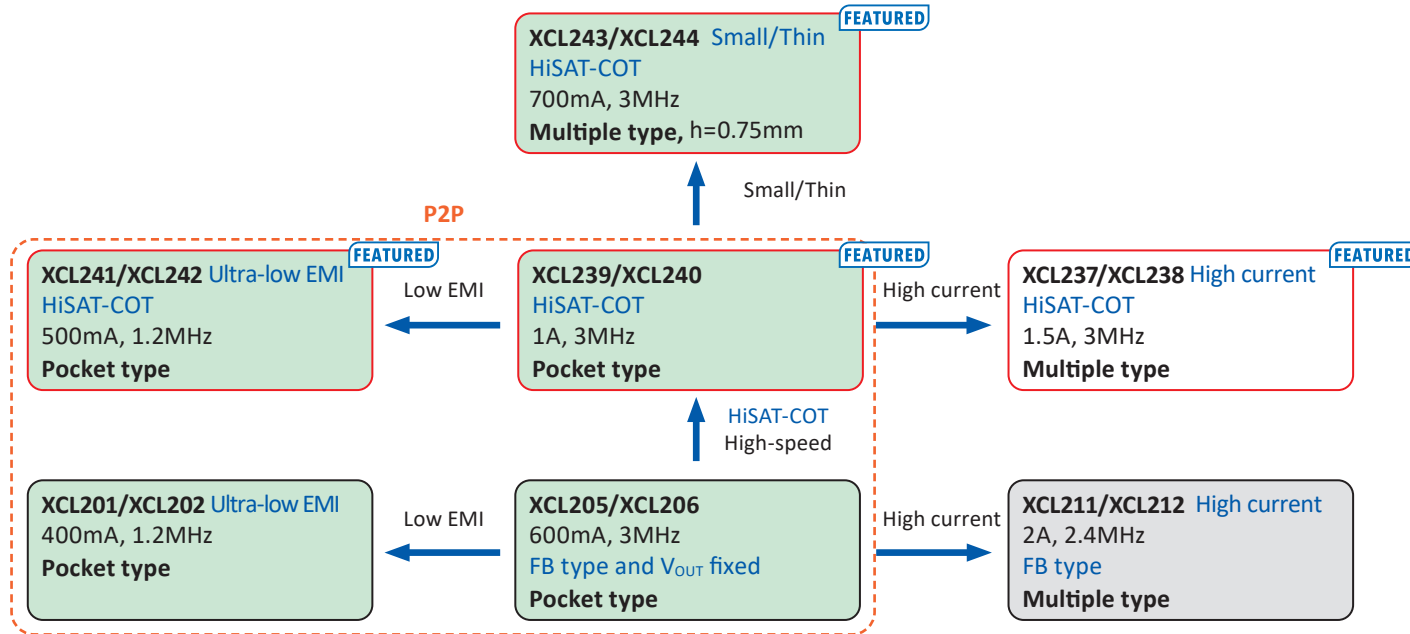
Page 33 for technical details of
Micro DC/DC XCL Series

Product name : Left "PWM", Right "PWM/PFM" control

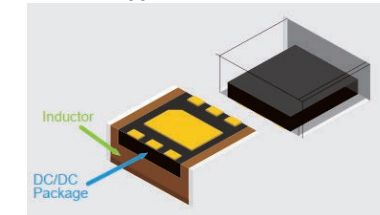
■ Typical Built-in inductor Micro DC/DC

Standard HiSAT-COT Low Iq Small

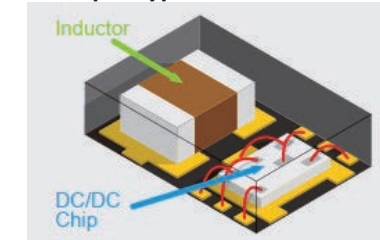
► High-speed response/low EMI step-down DC/DC



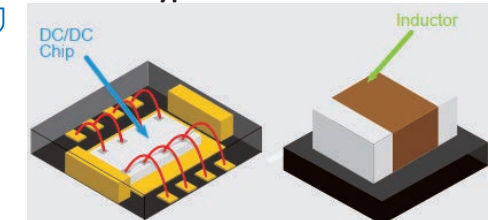
Pocket type



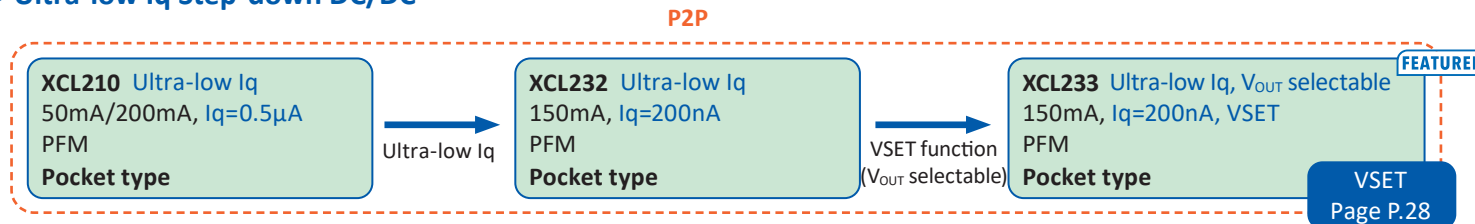
Multiple type



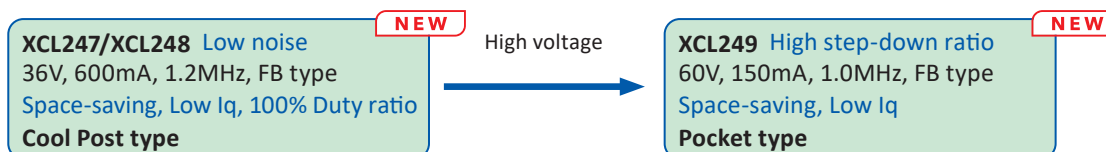
Cool Post type



► Ultra-low Iq Step-down DC/DC



► High-voltage Step-down DC/DC



Page 33 for technical details of Micro DC/DC XCL Series

Product name : Left "PWM", Right "PWM/PFM" control

■ Features of TOREX DC/DC converter

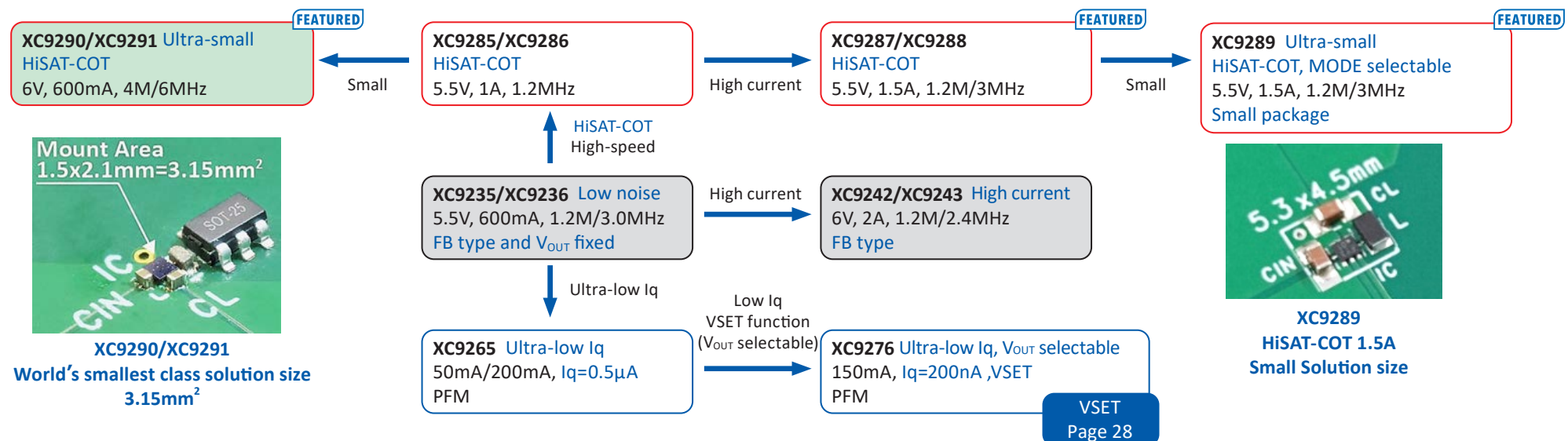
- Space-saving : Achieves space-saving not only with the IC but the peripheral components can be also made smaller.
- High-speed transient response : **HiSAT-COT** realizes high-speed transient response/good output stability and miniaturization of peripheral components.
- High functionality : Supports power supply start-up/shutdown sequences.
- Ultra-low Iq : Ultra-low Iq technology for higher efficiency and longer battery life.

HiSAT-COT
Page 32

■ Typical DC/DC converter



► Low voltage Step-down DC/DC



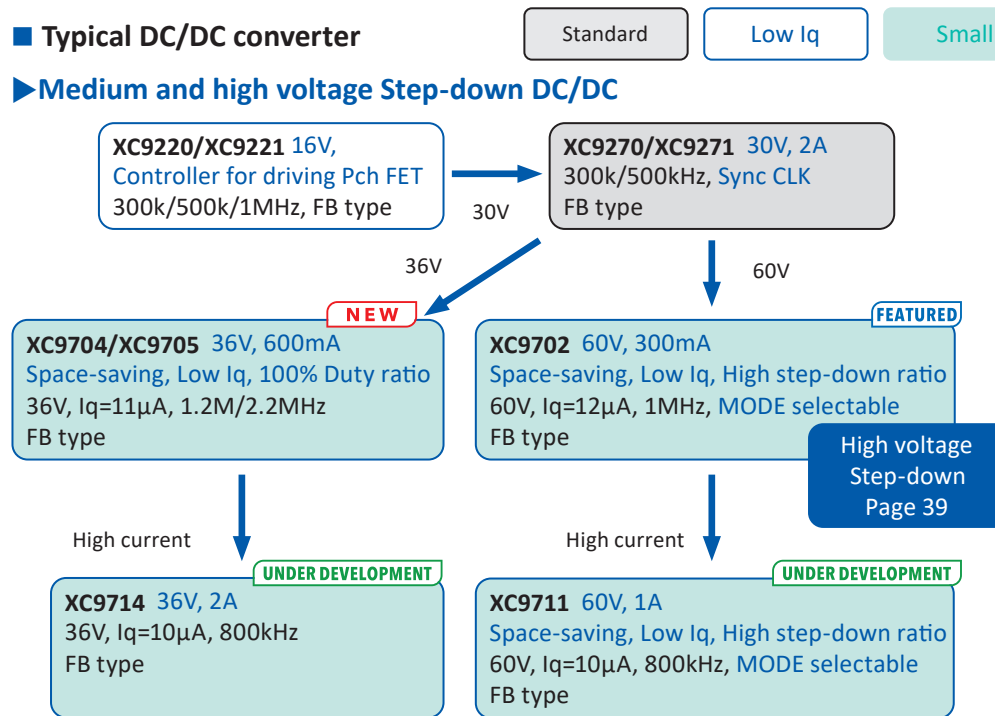
Product name : Left "PWM", Right "PWM/PFM" control

■ Features of TOREX DC/DC converter

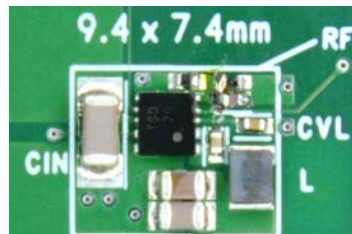
- Space-saving : Achieves space-saving not only with the IC but the peripheral components can be also made smaller.
- High functionality : Step-up DC/DCs have options (Bypass/V_{OUT} OR/Load disconnection) for various power supply configurations.
- Ultra-low I_q : Ultra-low I_q technology for higher efficiency and longer battery life.

■ Typical DC/DC converter

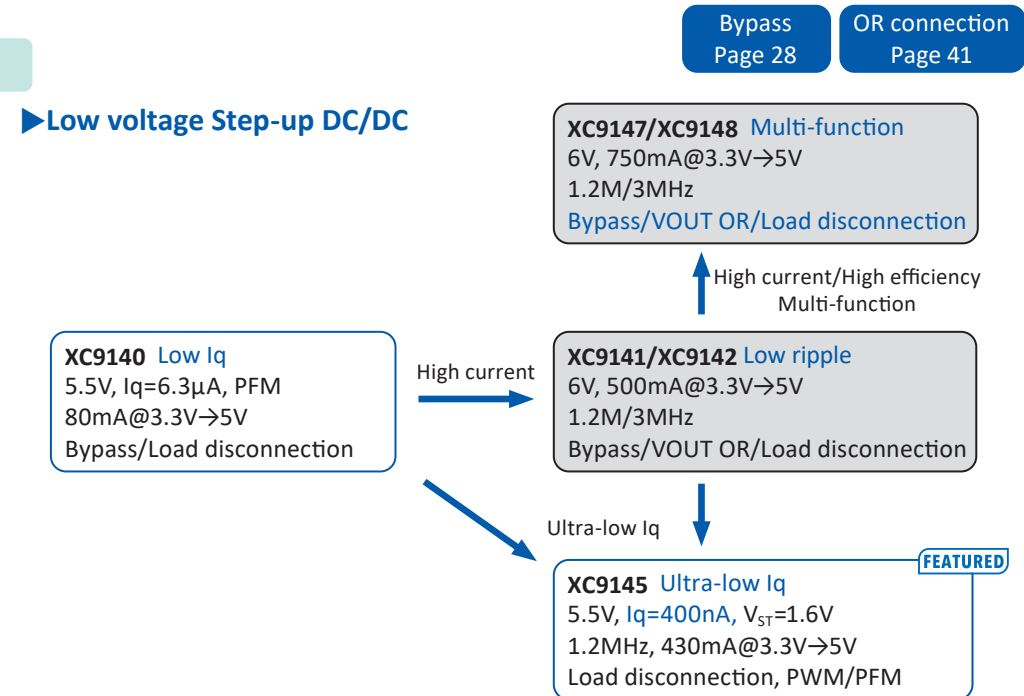
► Medium and high voltage Step-down DC/DC



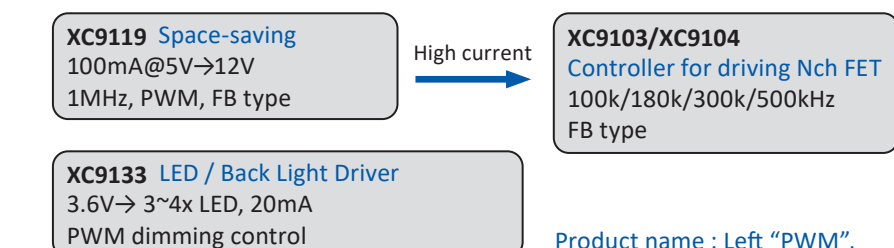
60V 300mA DC/DC : XC9702
World's smallest class solution size
9.4mm x 7.4mm = 69.6mm²



► Low voltage Step-up DC/DC



► Medium and high voltage Step-up DC/DC



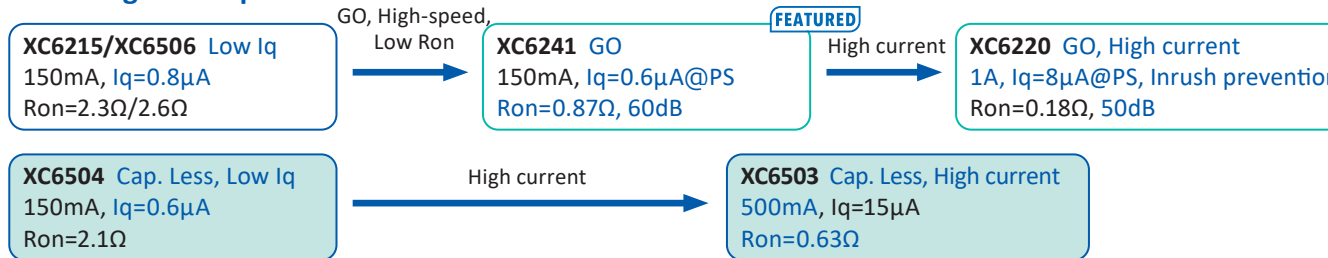
Product name : Left "PWM",
Right "PWM/PFM" control

■ Features of TOREX Voltage Regulator

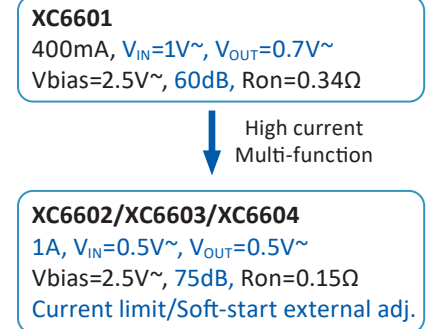
- Ultra-small : Wafer level and low-profile packages.
- Ultra-low Iq : Achieves long battery life.
- Various controls types : Green Operation (GO) type achieving both low Iq and high-speed response in addition to low Iq type and high-speed response type.

■ Typical Voltage Regulator

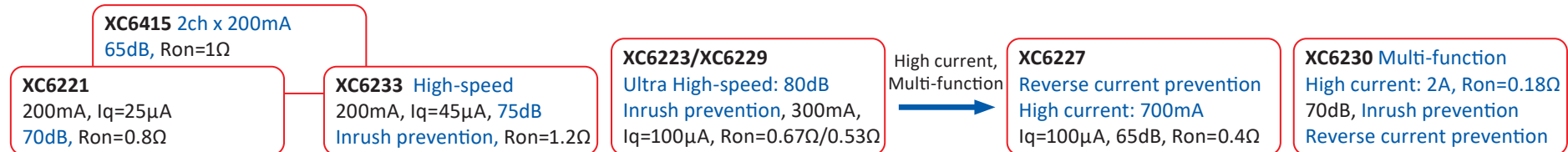
► Low voltage Low Iq



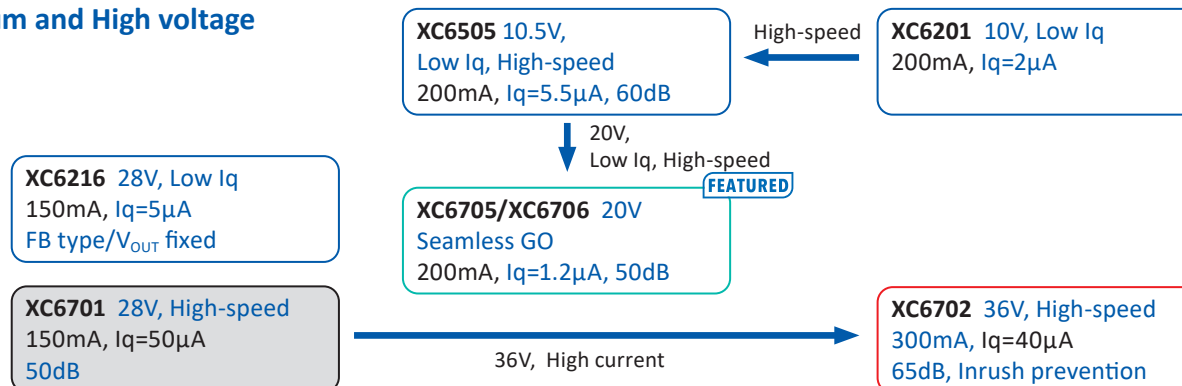
► Low input voltage, Bias type



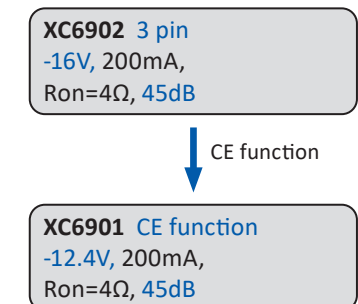
► Low voltage High-speed



► Medium and High voltage



► Negative Voltage



■ Features of TOREX Voltage Detector & Watchdog Timer

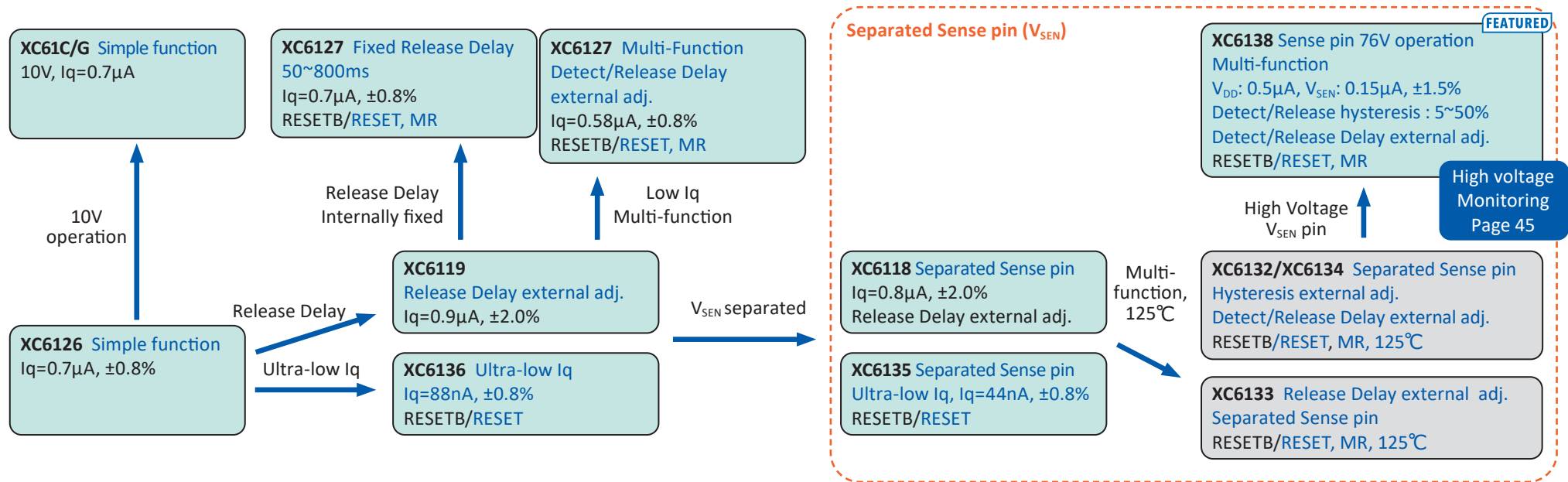
- Ultra-small : Ultra-small package and low-profile package.
- Ultra-low Iq : nA level low Iq achieving long battery life.
- Medium and high voltage monitoring : Separated Sense pin (V_{SEN}), Adjustable Hysteresis (HYS) /wide-selection, Detection Delay.
- Various functions : Release Delay, Manual Reset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

■ Typical Voltage Detector

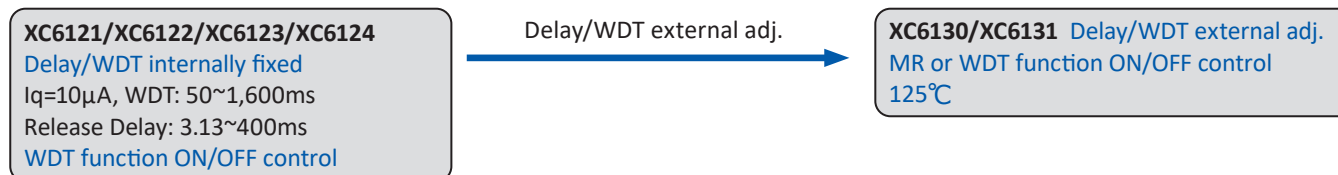
Standard

Low Iq

Small



■ Typical Watchdog Timer (WDT) + Voltage Detector

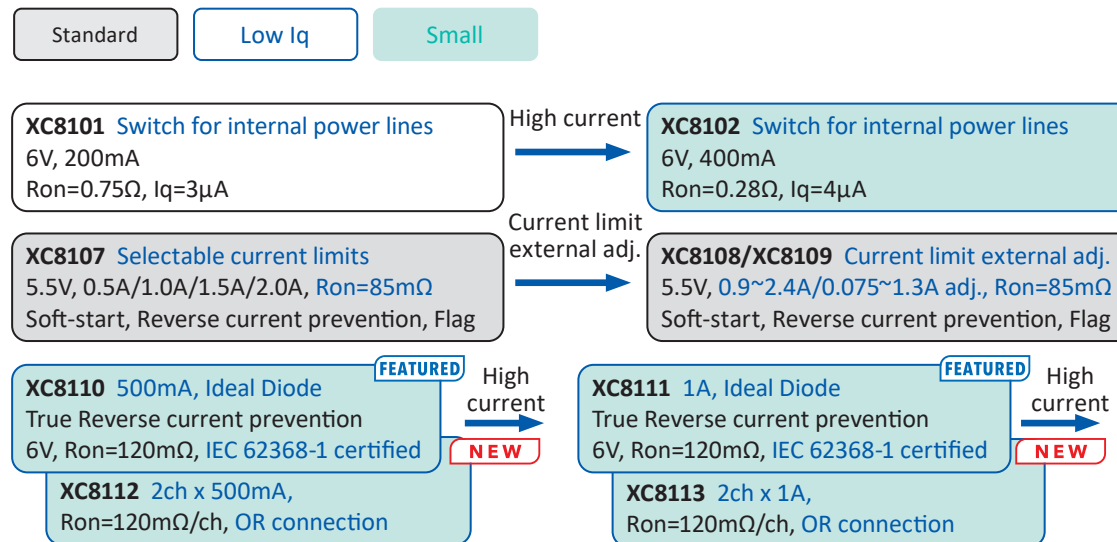


■ Load Switch

- 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 : Low VF 20mV / Low leakage / Reverse current prevention, also with protection functions. Two channel products also available.

■ Typical Load Switch

► Simple type



► Output protection for power supply lines

► Built-in Ideal Diode function

Ideal Diode
Page 29

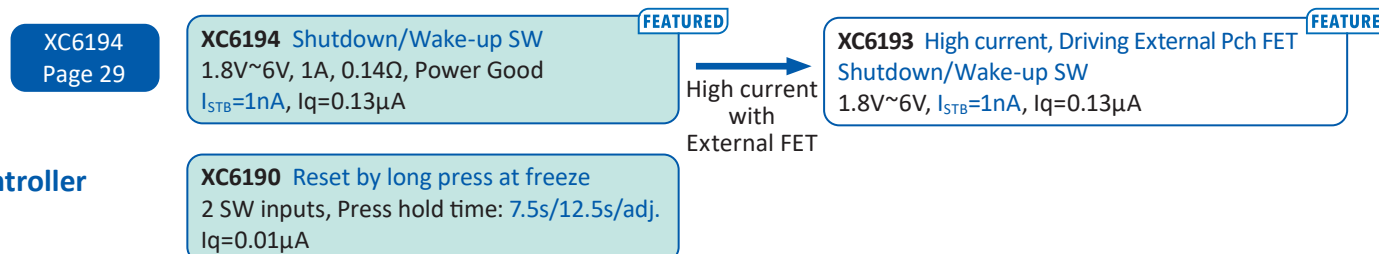
2ch OR connection
Page 40

■ Push Button

- Push Button Load SW : Current consumption 1nA at shutdown, 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

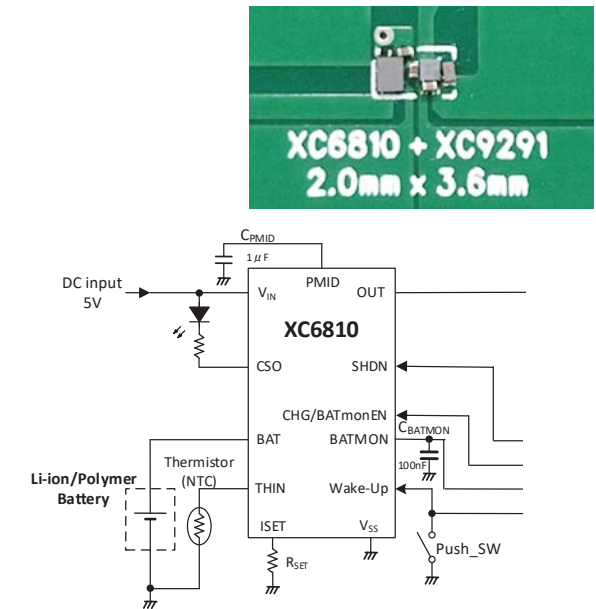
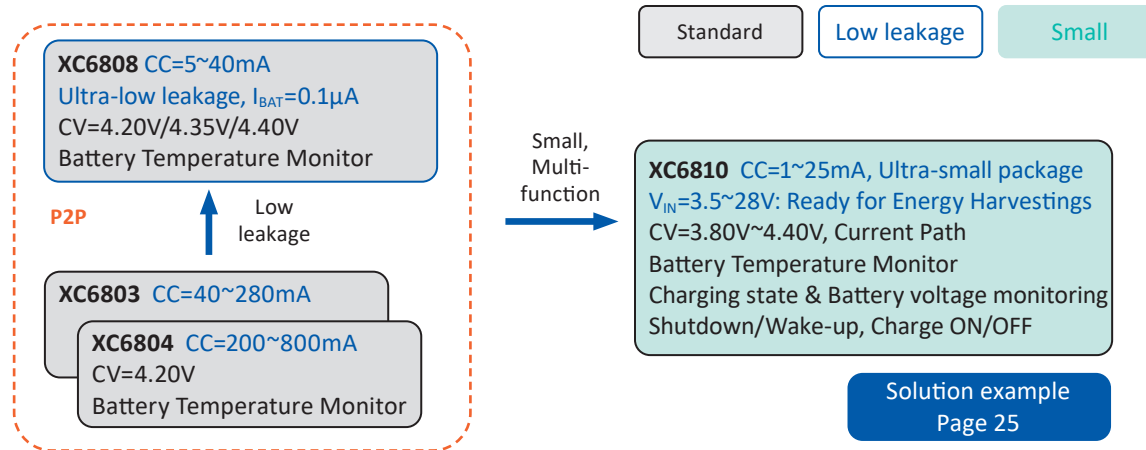
► Push Button Load SW



► Push Button Reboot controller

■ Charger IC for Li-ion/Polymer batteries

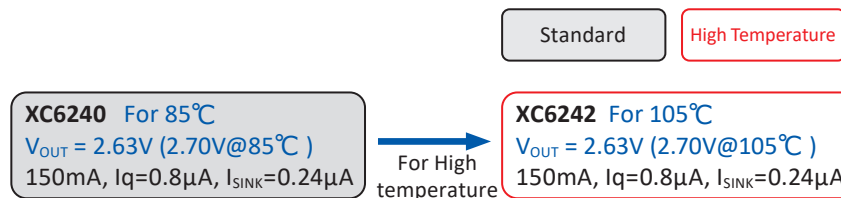
- Supports charging currents from 1mA to 800mA.
- For small-capacity Li-ion/polymer batteries, the multi-function all-in-one charger IC XC6810.



■ Charger IC & Voltage monitor for LTO and Solid-State batteries

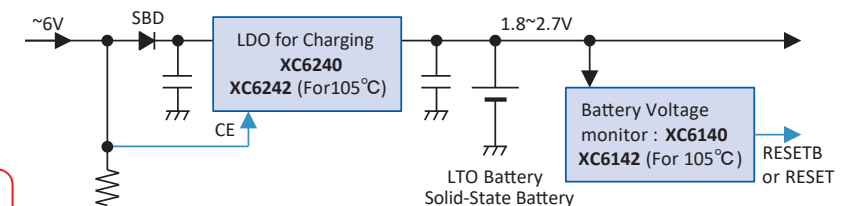
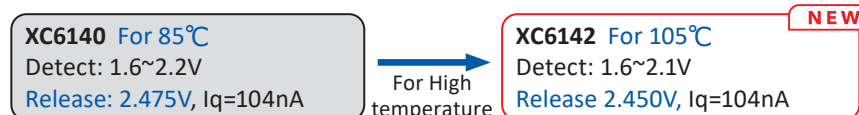
- LDO for charging and battery voltage monitoring IC recommended by LTO and Solid-State battery manufacturers.
- LDO for charging is selected based on operating temperature and output voltage including temperature variation
- Select a battery voltage monitoring IC set at a voltage to be released at the 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.

► Battery voltage monitor



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

For details, please contact the battery manufacturer and us.

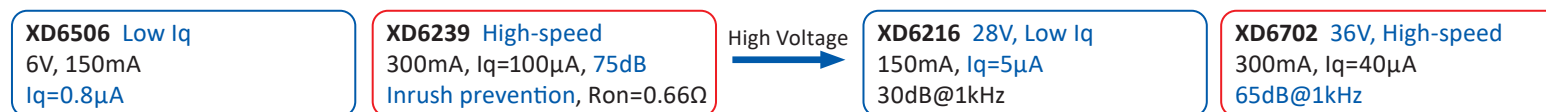
■ Features of TOREX Automotive IC (XD Series)

- 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).

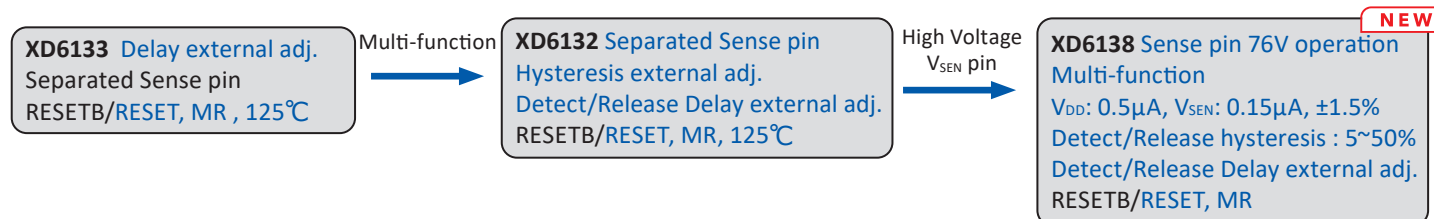
■ Typical Automotive IC (XD Series)



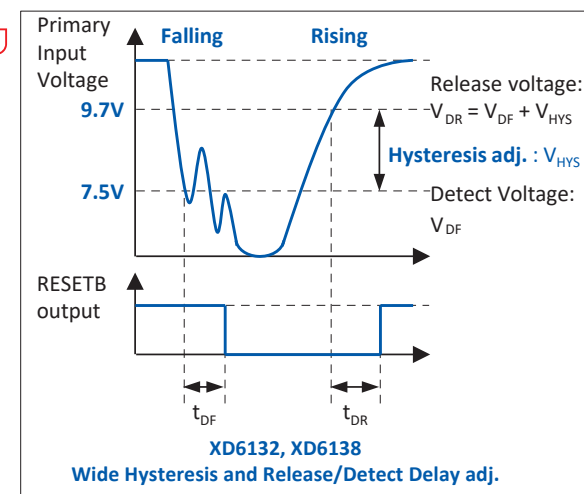
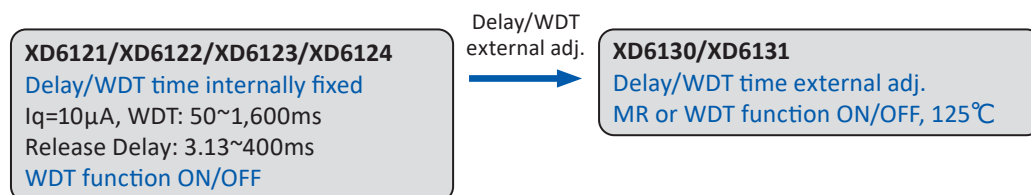
► Voltage Regulator



► Voltage Detector



► Watchdog Timer (WDT)+ Voltage Detector



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

■ Optimal Power Supply Configuration for Each Power Source

● Primary Battery	Small and Low Consumption	23-24
● Li Rechargeable Battery	Small and Low Consumption	25
	Ultra-Small and Multi-Function	26
	Multiple Power Rail	27

Technical Guide

- Low Power Consumption by Utilizing Operation Range of MCU/SoC 28
 - ✓ VSET (Step-Down) and Bypass (Step-Up) Functions
- For Further Lower Power Consumption / Battery Life Improvement 29
 - ✓ Ideal Diode Load SW / Push Button Load SW

● 3.3V	Small Solutions for Multiple Power Rails	30
● 5V	POL Solutions for Multiple power rails	31

Technical Guide

- HiSAT-COT Control for Fast Transient Response 32
- TOREX Built-In Inductor Micro DC/DC for Achieving Small / Low EMI 33

● 12V/24V, Li Multi-Cell and 4-Dry Cell		34
● 12V/24V	Input, Small Solutions	35
	Multiple Power Rail Solutions	36

Technical Guide

- Start-up/Shutdown Sequence Control of Multiple Power Rails 37

● 60V Input Compatible Small Solution	38
---------------------------------------	----

Technical Guide

- Medium and High Voltage Input Step-down DC/DC 39

■ OR Connection Solution

● OR Connection Solutions for Backup and Multiple Power Sources	40
---	----

Technical Guide

- Ideal Diode SW and Step-Up DC/DC Suitable for "OR" Connection 41
 - ✓ Ideal Diode SW / Step-Up DC/DCs

■ Various Types of Batteries: Charge/Discharge Reference Solutions

● LTO and Solid-State Batteries Reference Solutions	42
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■ Solution for Energy Harvesting

■ Other Applied Circuits

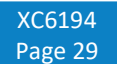
● Peak Current Assist/Backup using EDLC(Supercap)/Li-Cap	44
● Reset IC Application Examples	45

■ Space-Saving / Low Profile Solutions

● Compact and Space-Saving Power Supply	46
● Low Profile for h=0.33mm/0.40mm max.	47

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

- For Li Multi-cell
Page 34~



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

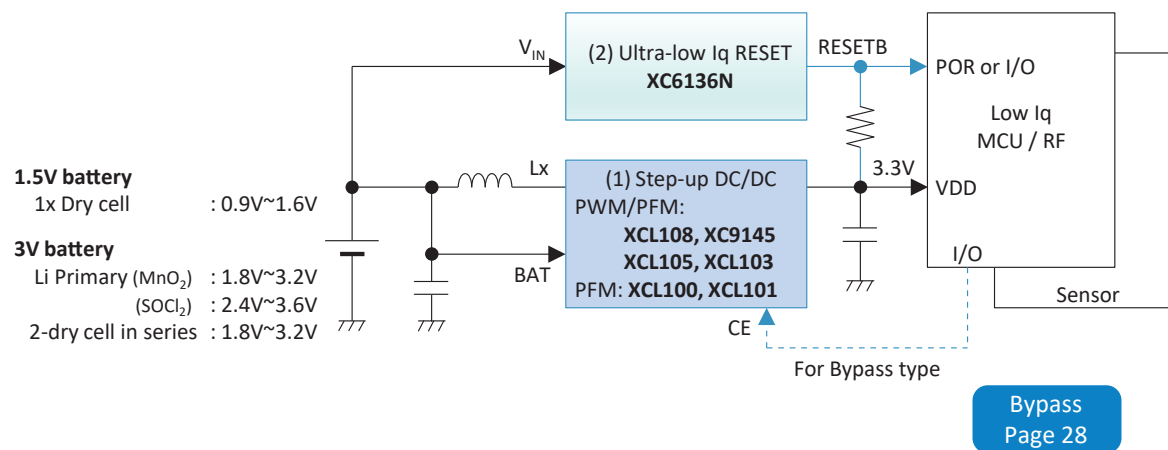
(2) Step-up DC/DC for RF/Sensor

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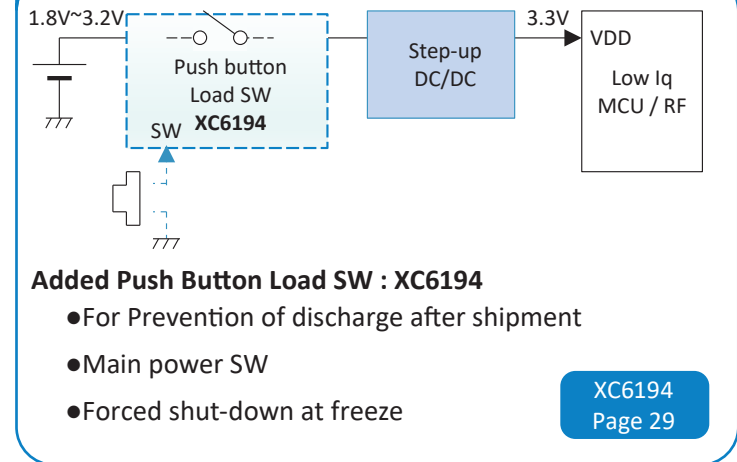
Primary Battery : Small and Low Power Consumption Solutions

■ 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



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)
	XCL110 NEW	Built-in inductor, Small but high current, PWM/PFM 3MHz, 610mA@3.3V→5V
	XCL105	Built-in inductor, PWM/PFM 1.2MHz, 710mA@3.3V→5V Others: XC9148 , 1.2MHz/3MHz, 750mA@3.3V→5V
	XCL108 NEW	Built-in inductor, Ultra-low Iq: 400nA, PWM/PFM 1.2MHz, 300mA@3.3V→5V, V _{ST} =1.6V
	XC9145 FEATURED	Ultra-low Iq: 400nA, PWM/PFM 1.2MHz, 430mA@3.3V→5V, V _{ST} =1.6V
(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 XCL108 and 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, XCL110C, XCL105B/E/H/K, XC9148B/E/H/K**)

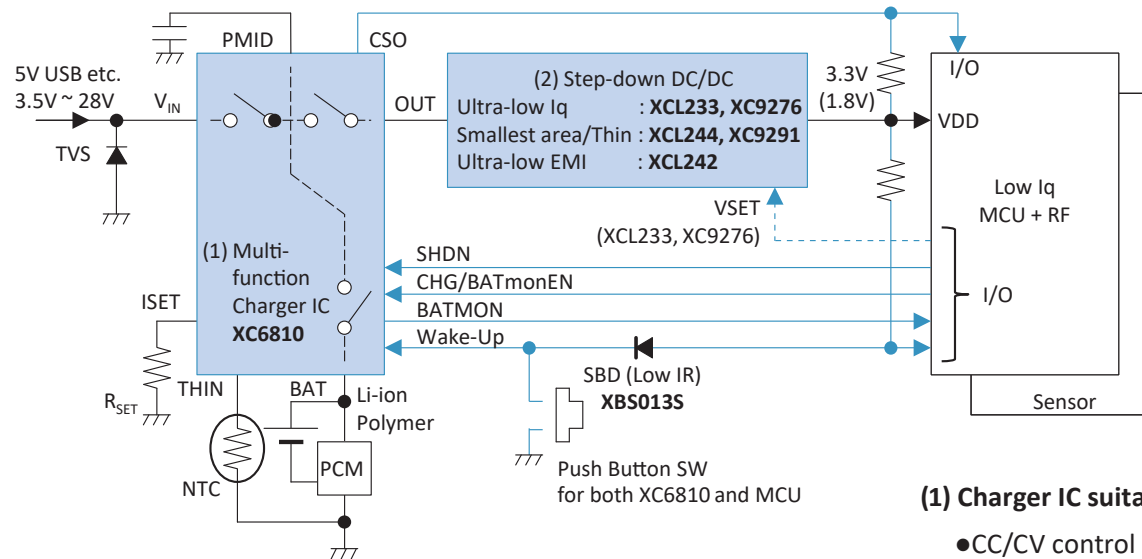
(b) For Small / Low EMI

Use **Built-in inductor Micro DC/DC (XCL101, XCL110, XCL105, XCL108)**

Li Rechargeable Battery : Ultra-Small and Multi-Function Solutions

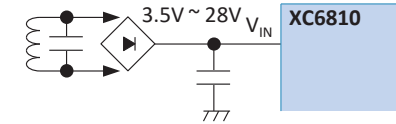
■ Ultra-small products using Li-ion/Polymer Rechargeable battery : Hearables/Wearables/IoT Sensor etc.

- 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

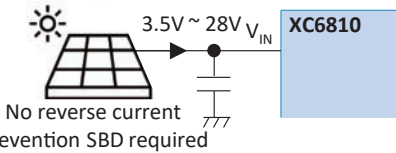


XC6810 Application Examples

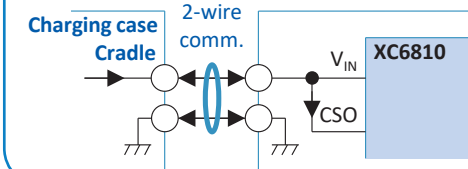
Wireless power transfer



Solar and Other Energy Harvesting



Charge state communication to Cradle



(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**, for monitoring by A/D of MCU.
- Two types of the charger status monitor, **CSO**, are available.

LED drive type and frequency notification type based on charge level which can be used for **two-wire communication with the charger case or cradle**.

- Shutdown by **SHDN** signal to prevent discharge of Li battery after shipment.

Start-up by inputting "L" to **Wake-up** with Push Button SW or by applying V_{IN} .

- Input range up to **28V** to support **various types of Energy harvesting**.

(2) Various ultra-small step-down DC/DCs with low consumption

- Ultra-low consumption / VSET function, Built-in inductor : **XCL233**
- World's smallest solution with ultra low EMI : **XC9291**

VSET
Page 28

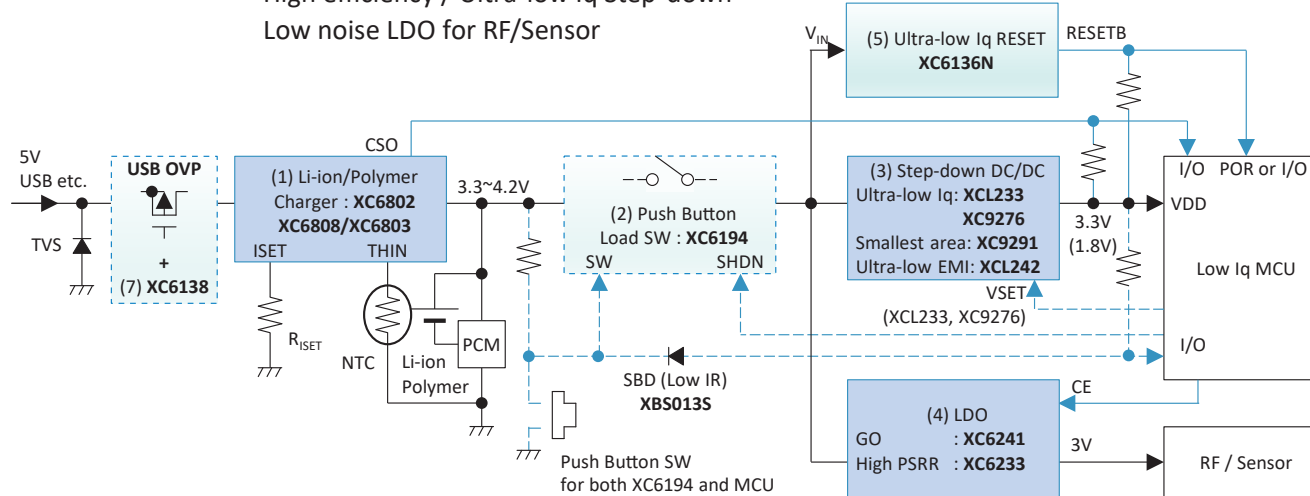
HiSAT-COT
Page 32

	Product	Features
(1) Li Charger IC	XC6810	3.5V~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	XCL244 FEATURED	Built-in inductor, HiSAT-COT , Small area/Thin, PWM/ PFM 3MHz, 700mA
	XCL233 FEATURED	Built-in inductor, Iq=200nA, PFM, 150mA, VSET(V _{OUT} selectable)
	XCL242 FEATURED	Built-in inductor, HiSAT-COT , Ultra-low EMI, PWM/PFM, 1.2MHz, 500mA
	XC9291 FEATURED	HiSAT-COT , Smallest area, PWM/PFM, 4MHz/6MHz, 600mA
	XC9276	Iq=200nA, PFM, 150mA, VSET

Li Rechargeable Battery : Small and Low Power Consumption Solutions

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

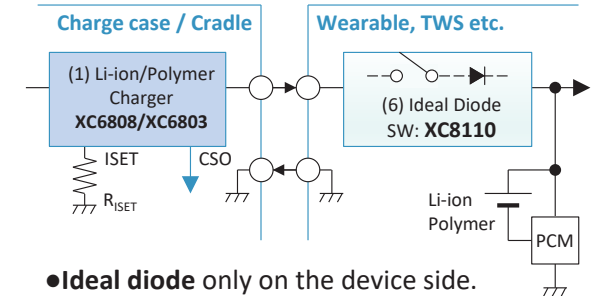
- Challenges : Prevention of discharge after shipment
- High efficiency / Ultra-low Iq Step-down
- Low noise LDO for RF/Sensor



	Product	Features
(1) Li Charger IC	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	XCL233 FEATURED	Built-in inductor, I _q =200nA, PFM, 150mA, VSET(V _{OUT} selectable)
	XCL242 FEATURED	Built-in inductor, HiSAT-COT , Ultra-low EMI, PWM/PFM, 1.2MHz, 500mA
	XC9291 FEATURED	HiSAT-COT , Smallest area, PWM/PFM, 4MHz/6MHz, 600mA
	XC9276	I _q =200nA, PFM, 150mA, VSET(V _{OUT} selectable)
(4) LDO	XC6241 FEATURED	I _q =0.6μA, PSRR=60dB, GO, 150mA
	XC6233	High-speed PSRR=75dB, 200mA, Inrush prevention
(5) RESET IC	XC6136	I _q =100nA class Ultra-low Iq
(6) Ideal diode SW	XC8110 / XC8111 FEATURED	True Reverse current prevention Ideal Diode Load SW VF=20mV, 500mA (XC8110), 1A (XC8111), IEC 62368-1 certified
(7) Reset IC	XC6138 FEATURED	High Voltage Sense pin: 76V, Wide hysteresis

(6) Example of charge control by the case/cradle

Configuration for charging control of Li batteries in **Wearable/Hearable/TWS**, etc. by the charging case/cradle side.



- Ideal diode only on the device side. Prevents terminal corrosion by reverse current prevention.
- Charging is controlled on the charging case side, **making it easy to stop output from the case** after charging is complete.

Ideal Diode
Page 29

(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

XC6194
Page 29

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

Ultra-low Iq DC/DC is suitable. (**XCL233, XC9276 : I_q=200nA**) **VSET function** lowers V_{OUT} in sleep mode to achieve lower I_q. **World's smallest class solution XC9291** with ultra low EMI. **XCL242 for ultra-low EMI** to further reduce noise to the Sensors.

VSET
Page 28

(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.

(7) RESET IC for OVP (Over Voltage Protection) of USB input : XC6138

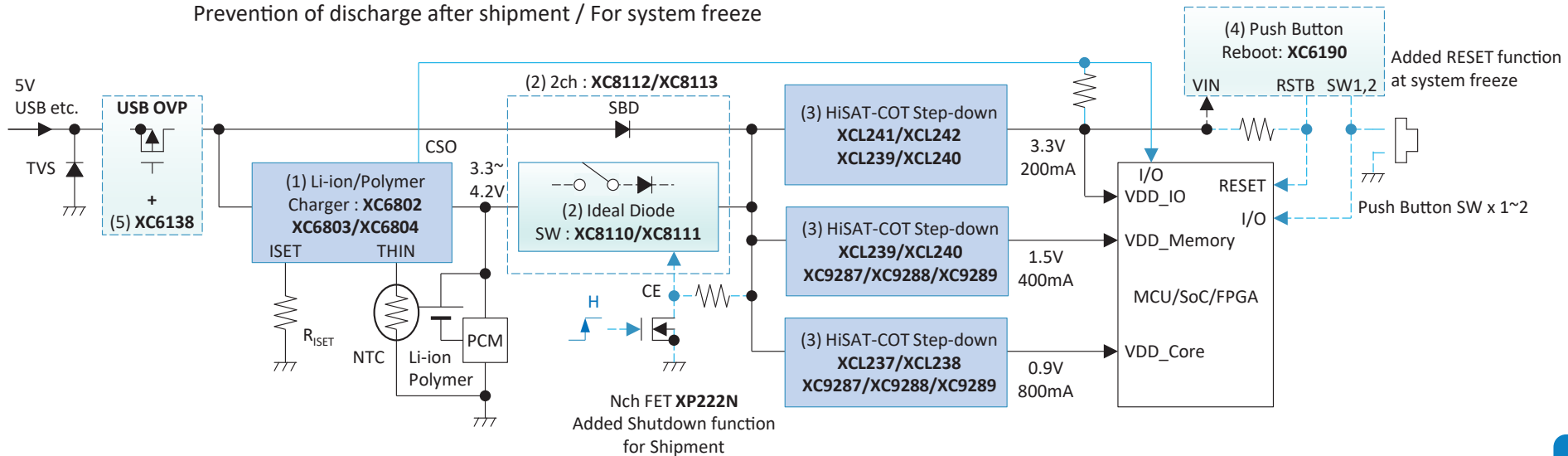
USB OVP
Page 45

Li Rechargeable Battery : Multiple Power Rail Solutions

■ 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

For Li Multi-cell
Page 34~



Block	Product	Features
(1) Li Charger IC	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
	XC8112 / XC8113 NEW	2ch True Reverse current prevention Ideal Diode SW, VF=20mV 2ch x 500mA (XC8110), 2ch x 1A (XC8111), IEC 62368-1 certified
(3) Step-down DC/DC	XCL241 / XCL242 FEATURED	Built-in inductor, HiSAT-COT , F-PWM, PWM/PFM 1.2MHz, 500mA, Ultra-low EMI
	XCL239 / XCL240 XCL237 / XCL238 FEATURED	Built-in inductor, HiSAT-COT , F-PWM, PWM/PFM 1A (XCL239/XCL240), 1.5A (XCL237/XCL238)
	XC9287 / XC9288 XC9289 FEATURED	HiSAT-COT , F-PWM, PWM/PFM, Selectable by MODE 1.2MHz/3MHz, 1.5A
(4) Reboot IC	XC6190	For system freeze, Hold SW 1 and 2 "L" to output reset signal
(5) Reset IC	XC6138 FEATURED	High Voltage Sense pin: 76V, Wide hysteresis

(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.
2ch type XC8112/XC8113 achieves low loss for both 5V input and Li-ion battery.

Ideal Diode
Page 29

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

HiSAT-COT controlled DC/DC with high-speed transient response arranged as POL power supply.
Built-in inductor Micro DC/DC achieves miniaturization and low EMI.

HiSAT-COT
Page 32

(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.

(5) RESET IC for OVP (Over Voltage Protection) of USB input : XC6138

USB OVP
Page 45

Low Power Consumption by Utilizing Operation Range of MCU/SoC : VSET, Bypass

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

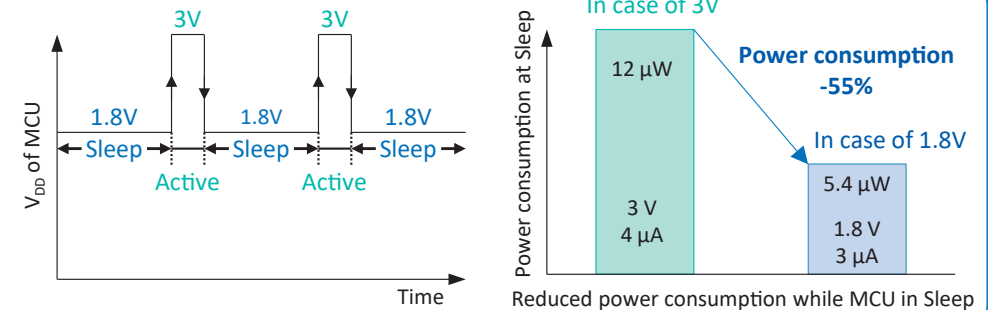
● Technical trend and challenges

- 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

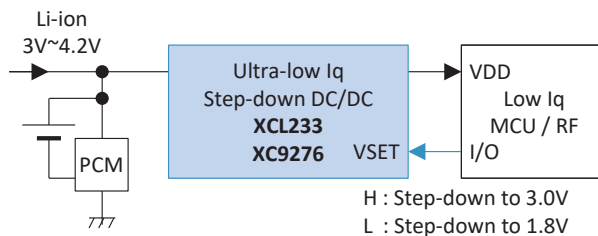
- Dynamically changing output voltage according to MCU/SoC operation, greatly reducing power consumption in standby state.

Change supply voltage according to MCU operation



► 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

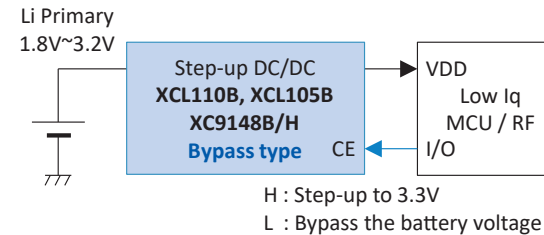


■ Ultra-low Iq VSET (V_{OUT} selectable) function Step-down DC/DC

Product	Features	V_{IN} (V)	V_{OUT} (V)	I_{OUT} (mA)	Package
XCL233 FEATURED	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	VSET(V_{OUT} selectable) $I_q=200nA$, PFM	1.8 ~ 6.0	0.5 ~ 3.6 2 values	150	USP-8B06 (2.0x2.0x0.33mm) SOT-26W (2.8x2.9x1.3mm) WLP-6-03 (1.72x1.07x0.33mm)

► Step-up DC/DC with Bypass function : XCL110B, XCL105B, XC9148B/H

- 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
XCL110B NEW	Built-in inductor PWM/PFM, 3MHz	0.65 ~ 6.0 $V_{ST} = 0.9$	1.8 ~ 5.5	610	CL-2025-02 (2.5x2.0x1.04mm)
XCL105B	Built-in inductor PWM/PFM, 1.2MHz	0.65 ~ 6.0 $V_{ST} = 0.9$	1.8 ~ 5.5	710	DFN3030-10B (3.0x3.0x1.7mm)
XC9148B/H	PWM/PFM 1.2MHz/3MHz	0.65 ~ 6.0 $V_{ST} = 0.9$	1.8 ~ 5.5	750	USP-6C (1.8x2.0x0.6mm) SOT-89-5 (4.5x4.6x1.6mm)

■ Ideal Diode to reduce power loss of diode

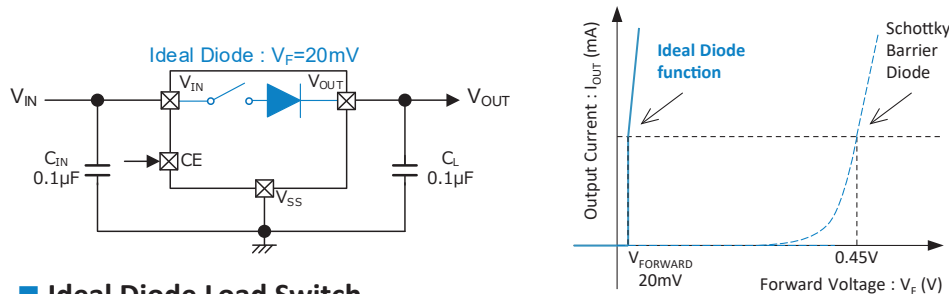
●Technical trend and challenges

- 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, XC8112 / XC8113

- Achieving **VF=20mV**. Loss is **1/20** of SBD@200mA or less and 1/6@500mA. Parallel connection of XC8112/XC8113 halves VF at high current.
- Leakage current is 0 μ A, preventing reverse current harmful to batteries.
- IEC 62368-1:2018 certified** with current limit and other protections.



■ Ideal Diode Load Switch

Product	Features	V _{IN} (V)	R _{on}	I _{OUT}	Package
XC8110 FEATURED	VF=20mV	1.5 ~ 6.0	120mΩ	500mA	WLP-4-02 (0.82x0.82x0.5mm)
XC8111	3.6μA (Forward bias) 0μA (Reverse bias) IEC 62368-1:2023 certified (XC8110/XC8111)			1A	SOT-25 (2.9x2.8x1.3mm) USP-6B06 (1.8x1.5x0.33mm)
XC8114 NEW			60mΩ	3A	WLP-4-04 (0.82x1.48x0.495mm) SOT-89-5 (4.5x4.6x1.6mm) DFN1820-6G (1.8x2.0x0.6mm)
XC8112 NEW	2ch (Parallel is allowed) VF=20mV		2ch x 120mΩ	2 x 500mA	USP-8B06 (2.0x2.0x0.33mm)
XC8113 NEW	3.6μA (Forward bias) 0μA (Reverse bias) IEC 62368-1:2023 certified			2 x 1A	

2ch OR connection
Page 40

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

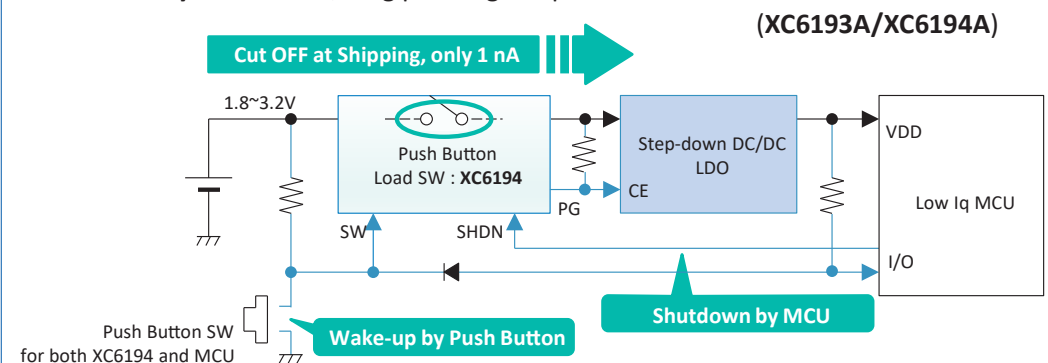
●Technical trend and challenges

- 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.
- Useful as main power switch as well.**
Turn ON by the push-button, and OFF by the signal from MCU to SHDN after processing termination. Safety shutdown is possible.
- At system freeze**, long pressing the push button forces OFF.



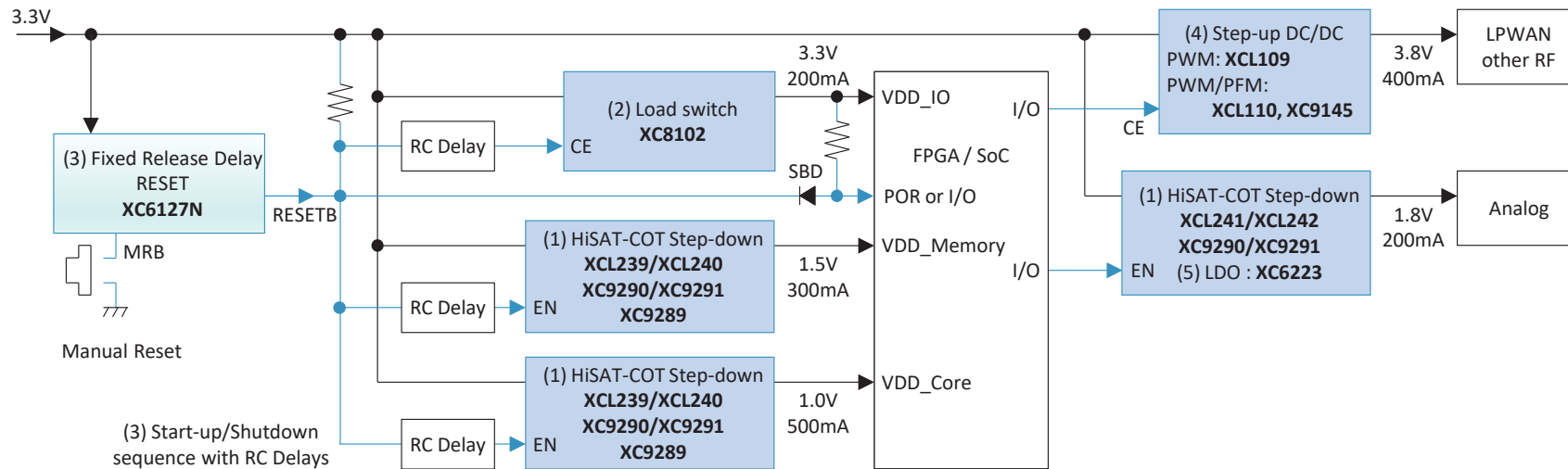
■ Push Button Load Switch with Ship function

Product	Features	V _{IN} (V)	R _{on}	I _{OUT}	Package
XC6193 FEATURED	I _{STB} =1nA Shutdown function (Ship/Main power SW) For system freeze (XC6193A/XC6194A) UVLO: Prevents battery leakage	1.8 ~ 6.0	Internal 1A + External Pch FET		USP-8B06 (2.0x2.0x0.33mm)
XC6194 FEATURED			140mΩ	1A	

3.3V : Small Solutions for Multiple Power Rails

■ Compact multiple power supplies for MCU/SoC/FPGA, sensors, and various modules

- Challenges : Fast transient response/High stability, Small size/High efficiency/Heat dispersion/Low EMI, Start-up/Shutdown sequence



HiSAT-COT
Page 32

Block	Product	Features
(1) Step-down DC/DC	XCL241 / XCL242 FEATURED	Built-in inductor, HiSAT-COT , F-PWM, PWM/PFM 1.2MHz, 500mA, Ultra-low EMI
	XCL239 / XCL240 FEATURED	Built-in inductor, HiSAT-COT , F-PWM, PWM/PFM 3MHz, 1A
	XC9289 FEATURED	HiSAT-COT , Ultra-small, F-PWM-PWM/PFM MODE selectable 1.2MHz/3MHz, 1.5A
	XC9290 / XC9291 FEATURED	HiSAT-COT , Smallest area, F-PWM, PWM/PFM 4MHz/6MHz, 600mA
(2) Load SW	XC8102	Low Iq, Small size, 400mA, Foldback current limit
(3) RESET IC	XC6127	Low Iq, High accuracy, Selectable Release delay, Manual reset
(4) Step-up DC/DC	XCL109 / XCL110 NEW	Built-in inductor, Small but high current, F-PWM, PWM/PFM 1.2MHz, 610mA@3.3V→5V
	XC9145 FEATURED	Ultra-low Iq: 400nA, PWM/PFM 1.2MHz, 430mA@3.3V→5V, V _{ST} =1.6V
(5) LDO	XC6223	High speed PSRR=80dB, 300mA, Inrush prevention

(1) Step-down DC/DC for MCU/SoC/FPGA, RF/Sensor (POL power supply)

High-speed transient response **HiSAT-COT** controlled DC/DC arranged as POL.
Built-in inductor Micro DC/DC realizes miniaturization and low EMI.

(XCL241/XCL242, XCL239/XCL240)

For RF and other analogs requiring even lower noise

Ultra-low EMI Built-in inductor **Micro DC/DC** XCL241/XCL242,
World's smallest solution size XC9290/XC9291.

XCL
Page 33

(4) 3.3V input monitoring and Start-up/Shutdown Power supply sequence

Monitored by voltage detector with Manual reset function : **XC6127**
RC delay to the EN(CE) pin of each DC/DC is **driven by XC6127**
for start-up/shutdown sequence.

Sequence
control
Page 37

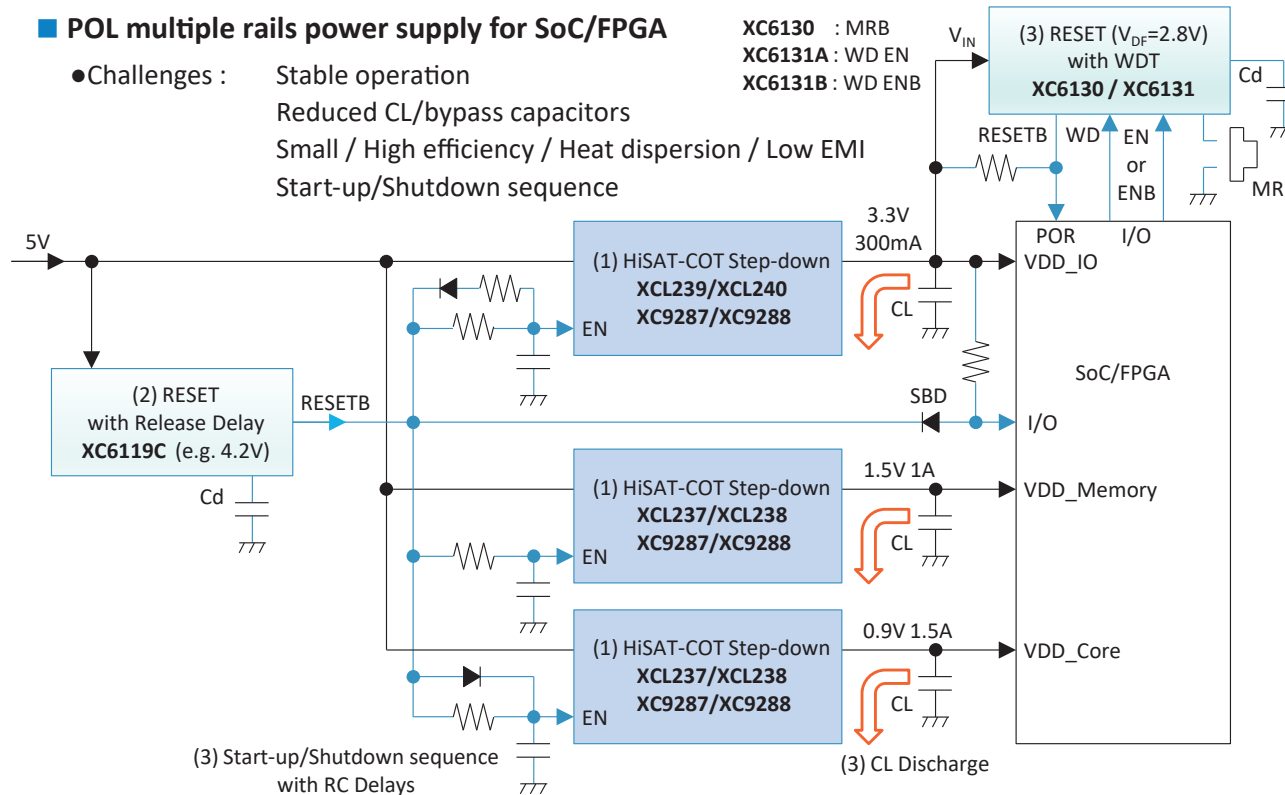
(4) Step-up DC/DC for LPWAN and other RF

Low ripple/Low EMI Built-in inductor **Micro DC/DC** XCL109/XCL110 and XC9145

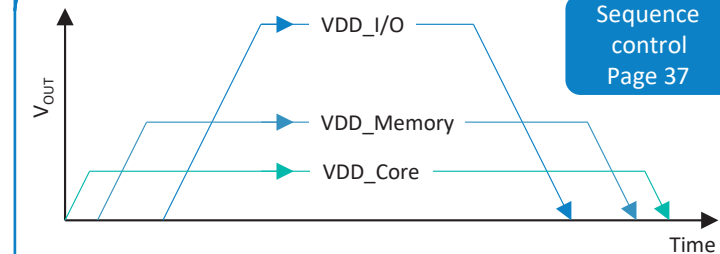
5V : POL Solutions for Multiple Power Rails

POL multiple rails power supply for SoC/FPGA

- Challenges :
 - Stable operation
 - Reduced CL/bypass capacitors
 - Small / High efficiency / Heat dispersion / Low EMI
 - Start-up/Shutdown sequence



(2) Start-up/Shutdown power sequence



Sequence control of both rising and falling is realized with Reset IC XC6119C and RC delay to EN of each DC/DC. The CL discharge function is used for the falling.

- The delay for each DC/DC to start turning ON/OFF is,

$$t_{\text{delay(ON)}} = R \times C \times (-\ln((V_{IN} - V_{EN}) / V_{IN}))$$

$$t_{\text{delay(OFF)}} = R \times C \times (-\ln(V_{EN} / V_{IN}))$$
 * V_{EN} is the threshold voltage of EN
- Set RC delays considering the soft-start time of each DC/DC and the discharge time by CL discharge.

Block	Product	Features
(1) Step-down DC/DC	XCL239 / XCL240 XCL237 / XCL238 FEATURED	Built-in inductor, HiSAT-COT , F-PWM, PWM/PFM 1A (XCL239/XCL240), 1.5A (XCL237/XCL238)
	XC9287 / XC9288 FEATURED	HiSAT-COT , 1.2MHz/3MHz, 1.5A, F-PWM, PWM/PFM
(2) RESET IC	XC6129	Low Iq, High accuracy, Detect/Release Delay external adj.
(3) WDT	XC6130 / XC6131	WDT/Release delay adjustable by an external Cd MR (XC6130) or WD ON/OFF control (XC6131)

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

High-speed transient response **HiSAT-COT** controlled DC/DC arranged as **POL**.
Built-in inductor Micro DC/DC realizes miniaturization and low EMI.
(XCL239/XCL240, XCL237/XCL238)

(3) Freeze countermeasure with Watchdog timer : XC6130/XC6131

Monitoring of 3.3V line voltage and detection of freezing by the WD function.
In case of abnormality, SoC/FPGA is automatically restarted.
Manual reset function is also available (XC6130)

HiSAT-COT® Control for Fast Transient Response

TOREX original COT control : HiSAT-COT®

Technical trend and challenges

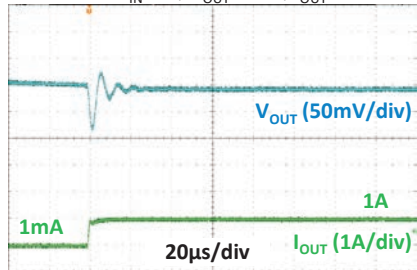
- Stable power supply including transient response to MCU/SoC/FPGA, etc.
- Miniaturization of circuits including peripheral components, and low EMI.

TOREX Proposal : HiSAT-COT® controlled Step-down DC/DC converter

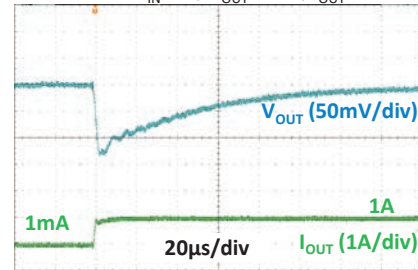
Significantly faster transient response

- Compared to conventional PWM and PWM/PFM control, it achieves **overwhelmingly fast response** and thus **good voltage stability**.

HiSAT-COT® $V_{IN}=5V$, $V_{OUT}=1.8V$, $I_{OUT}=1mA \rightarrow 1A$



Conventional $V_{IN}=5V$, $V_{OUT}=1.8V$, $I_{OUT}=1mA \rightarrow 1A$



Miniaturization including peripheral components

- High-speed transient response enables **significant reduction of large capacitance** required due to lack of response of conventional PWM.
- Unlike conventional PWM phase compensation, load capacitance CL can be reduced. Also **supports a significant reduction in effective capacitance due to the bias effect of ultra-small Ceramic capacitors**.

HiSAT-COT®



Conventional

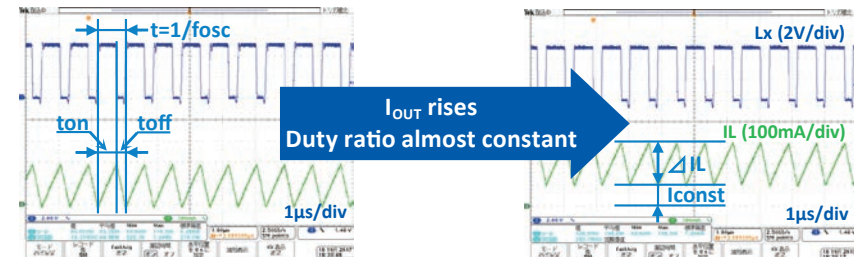


Overview of COT control and HiSAT-COT®

What is COT (Constant on time) control?

- PFM control with the “ton” determined by V_{IN} and V_{OUT} voltages, resulting that appears to be PWM control with constant frequency (f_{osc}).
High-speed PFM comparator enables fast transient response.
- Generate “ton” in CCM of the targeted f_{osc} from the V_{IN} and V_{OUT} set voltages so that it appears to be a constant frequency PWM control.

CCM (Continuous Conduction Mode) operation



- Ideal Duty ratio and t_{on} of step-down DC/DC at CCM PWM operation are
 $t_{on} = (1/f_{osc}) \times \text{Duty} = (1/f_{osc}) \times (V_{OUT} / V_{IN})$.
If there is no loss, **Duty ratio is constant** even if I_{OUT} rises.

How to determine the oscillation frequency of COT control

- Generate the t_{on} of COT control to be the t_{on} of ideal PWM control.
- Continuous mode operation with this t_{on} operates with the same duty as PWM control at the oscillation frequency f_{osc} .

COT issues and HiSAT-COT®

HiSAT-COT improves the issues of COT control with its own circuits.

- Improved issue of increased oscillation frequency due to output current.
- Improved the deterioration of load stability with an original circuit with an additional amplifier.

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

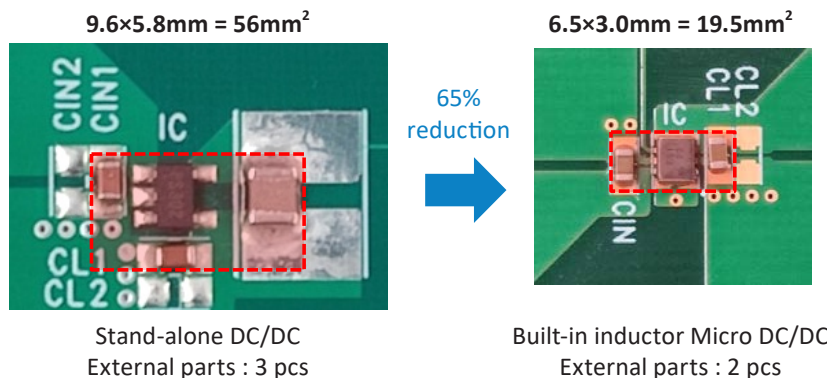
●Technical trend and challenges

- 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

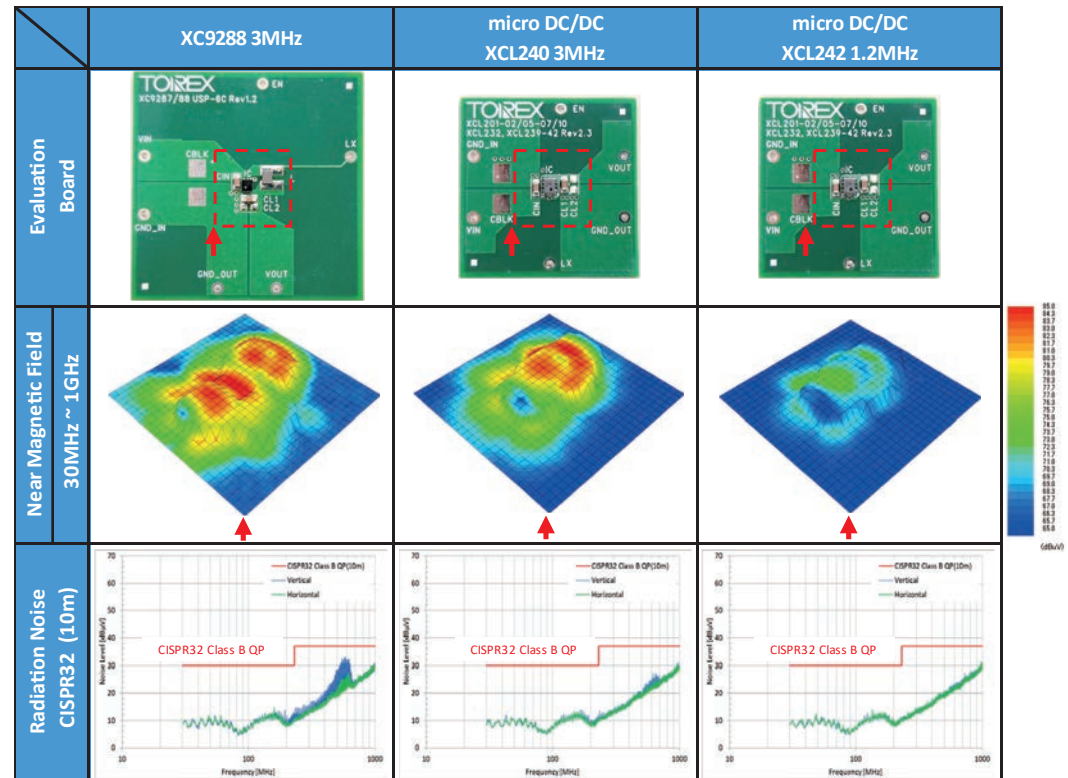
- Achieves a significant reduction in mounting area and providing smallest class of power supply solution.
- Unique package structure / Optimum inductor for the internal IC.
- Efficient heat dissipation performance with structures that connect IC/coil and substrate with low thermal resistance.



▶EMI reduction due to unique Built-in inductor structure

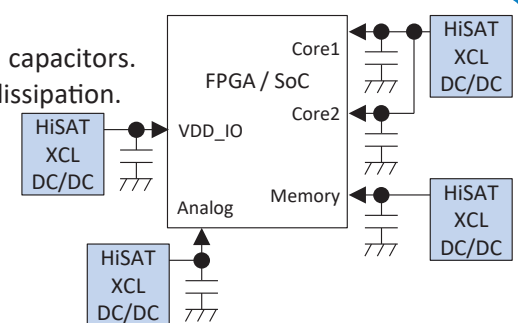
- ✓The pocket-type structure covering the IC with a coil and the optimum placement of the IC enable a **significant reduction of radiated noise** compared to the stand-alone IC.
- ✓Can be placed near RF ICs/Sensors, etc., contributing to miniaturization.

■ 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.

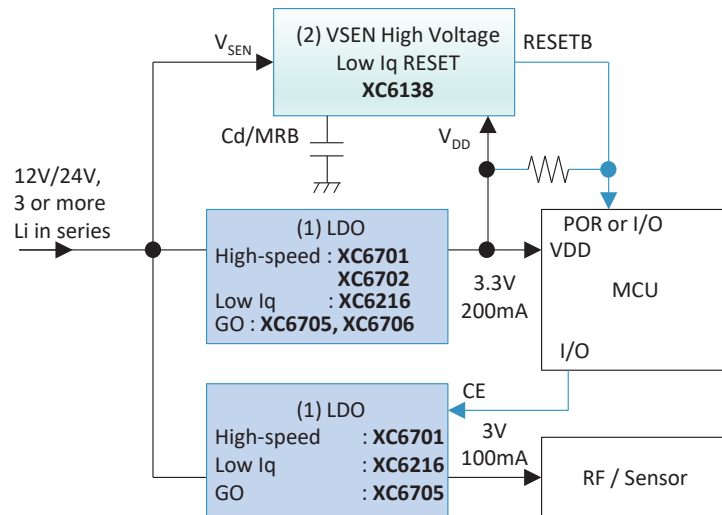


12V/24V, Li Multi-Cell and 4-Dry Cell Solutions

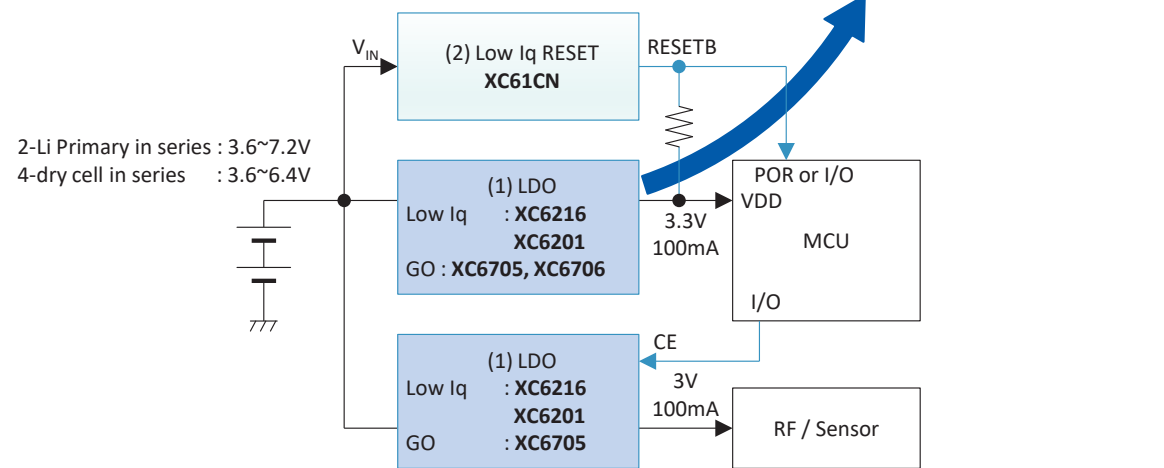
■ 12V/24V input, Li multi-cell and 4-dry cell operation: Low Power Consumption system

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

12V/24V or 3 or more Li in series 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 FEATURED	20V, Iq=1.2μA, 200mA PSRR=50dB, Seamless GO, Soft-start, CE (XC6705)
	XC6201	10V, Iq=2.0μA, 200mA
(2) Step-down DC/DC	XCL233 FEATURED	Built-in inductor, Iq=200nA, PFM, 150mA, VSET(V _{OUT} selectable)
	XC9276	Iq=200nA, PFM, 150mA, VSET(V _{OUT} selectable)
(3) RESET IC	XC6138 FEATURED	High Voltage Sense pin: 76V, Ultra-low Iq V _{DD} : 0.5μA, V _{SEN} : 0.15μA@12V Detect/Release Delay external adj., Selectable Hysteresis
	XC61CN	10V, Iq=0.7μA

(1) Medium Voltage LDO

- For 12V/24V or 3 or more Li in series input
Selecting by input voltage range and current consumption.
- For 2-Li / 4-dry cell in series : XC6705/XC6706
Seamless GO achieves both low Iq and high-speed response.
Supports high-speed response required by RF and Sensor.

(2) 2-Li and 4-dry cell compatible, high efficiency Step-down solution for light loads

- 10V low Iq LDO XC6201 + ultra-low Iq step-down XCL233/XC9276.

(3) RESET IC

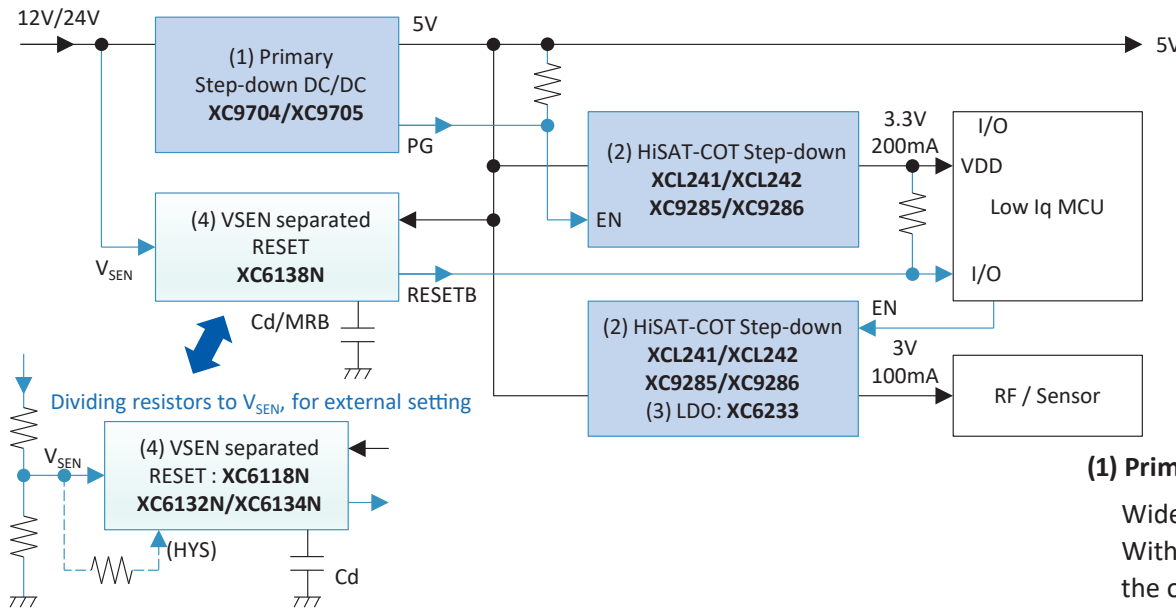
- Direct monitoring of 12V/24V input with V_{SEN} pin of XC6138
No dividing resistors required resulting in low Iq and high accuracy.
- For 10V or less, monitoring voltage with low Iq RESET IC XC61CN.

12V/24V Input : Small Solutions

■ **12V/24V input** : Small products, modules, industrial sensors, and IoT

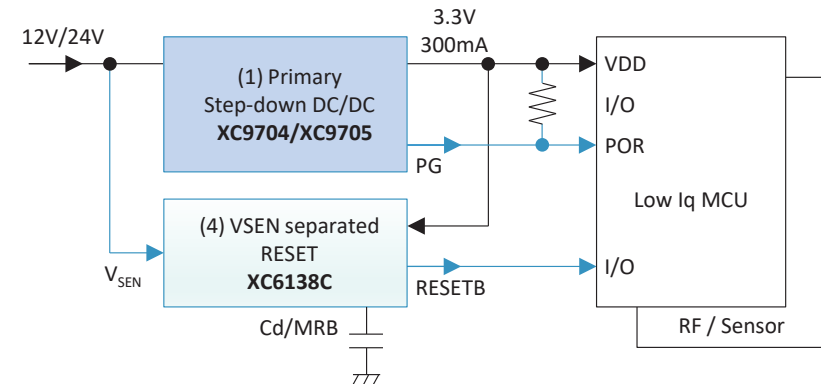
- Challenges : High voltage input / Overshoot capability / Monitoring and handling of input voltage fluctuation, Miniaturization / low EMI / Heat dissipation

(a) Step-down to 5V, then create 3.3V and other secondary voltages



Block	Product	Features
(1) Primary Step-down DC/DC	XC9704 / XC9705 NEW	36V, F-PWM, PWM/PFM, 1.2MHz/2.2MHz, 600mA Low Iq=11μA, Space-saving, High efficiency at light load
(2) Step-down DC/DC	XCL241 / XCL242 FEATURED	Built-in inductor, HISAT-COT , F-PWM, PWM/PFM 1.2MHz, 500mA, Ultra-low EMI
	XC9285 / XC9286	HISAT-COT , F-PWM, PWM/PFM 1.2MHz, 1A
(3) LDO	XC6233	High-speed PSRR=75dB, 200mA, Inrush prevention
(4) RESET IC	XC6138 FEATURED	High Voltage Sense pin: 76V, Ultra-low Iq V _{DD} : 0.5μA V _{SEN} : 0.15μA, Detect/Release Delay adj, Hysteresis: selectable
	XC6132 / XC6134	Separated Sense pin, Hysteresis adj., Release/Detect Delay adj.
	XC6118	Separated Sense pin, Low Iq, Release Delay external adj.

(b) Output 3.3V directly



(1) Primary step-down DC/DC for 12V/24V : XC9704/XC9705

Wide input voltage range for fluctuating input.

With a **100% maximum duty ratio**, even if the input voltage drops significantly, the output voltage drop is minimized.

Miniaturization of products by **space-saving** including peripheral components.
High efficiency including light loads.

High voltage
Step-down
Page 39

(2) Secondary 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. **(XCL241/XCL242)**

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

(4) 12V/24V input monitoring Voltage Detector : XC6138

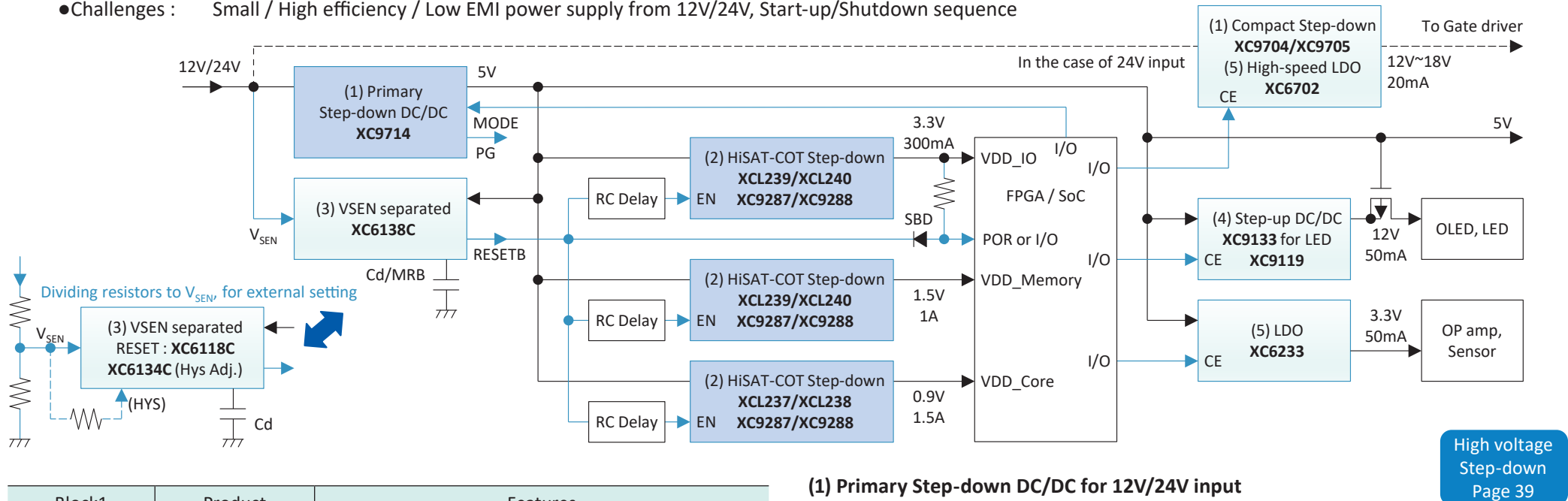
- **Monitoring with 76V** high-voltage sense pin that supports overshoot.
- **Directly monitors without dividing resistor**, realizing low Iq and high accuracy, as well as supports Release Delay and Detect/Release Hysteresis options.

High voltage
Monitoring
Page 45

12V/24V : Multiple Power Rail Solutions

■ 12V/24V POL multiple rail power supply

●Challenges : Small / High efficiency / Low EMI power supply from 12V/24V, Start-up/Shutdown sequence



Block1	Product	Features
(1) Primary Step-down DC/DC	XC9714 UNDER DEVELOPMENT	36V, F-PWM - PWM/PFM MODE selectable 800kHz, 2A, Low Iq=10μA
	XC9704 / XC9705 NEW	36V, F-PWM, PWM/PFM, 1.2MHz/2.2MHz, 600mA Low Iq=11μA, Space-saving, High efficiency at light load
(2) Step-down DC/DC	XCL239 / XCL240 XCL237 / XCL238 FEATURED	Built-in inductor, HiSAT-COT , F-PWM, PWM/PFM 1A (XCL239/XCL240), 1.5A (XCL237/XCL238) Others : XC9287/XC9288 1.5A, 1.2MHz/3MHz
	XC9287 / XC9288 FEATURED	HiSAT-COT 1.2MHz/3MHz, 1.5A, F-PWM, PWM/PFM
	XC6138 FEATURED	High Voltage Low Iq Sense pin: 76V, 0.15μA@12V Ultra-low Iq 0.5μA, Release Delay adj., Selectable Hysteresis
(3) RESET IC	XC6118 / XC6134	Separated Sense pin, Delay adj., Hysteresis adj. (XC6134)
(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
	XC6702	36V, High-speed PSRR=65dB, 300mA, V _{OUT} =1.8V~18V Fixed

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

Wide input voltage range to **handle input line overshoot**. **Space-saving** including peripheral components. **High efficiency** even at light loads. Low noise by switching between F-PWM and PWM/PFM using the **MODE** pin.

(2) Step-down DC/DC for FPGA/SoC (POL power supply)

High-speed transient response **HiSAT-COT** controlled DC/DC arranged as **POL**. **Built-in inductor** Micro DC/DC realizes miniaturization and low EMI.
(XCL239/XCL240, XCL237/XCL238)

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

12V/24V input monitoring and driving RC delay for Start-up/Shutdown sequence. Outputs voltage drop signal to FPGA/SoC, then shutdown each DC/DC.

Start-up/Shutdown Sequence Control of Multiple Power Rails

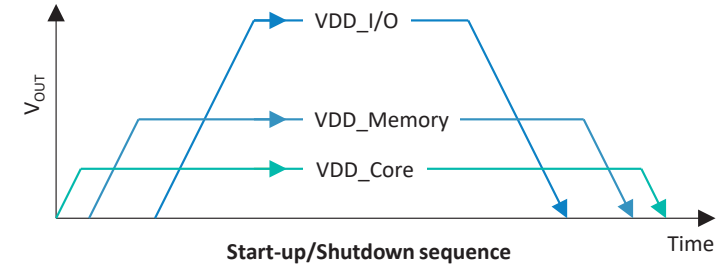
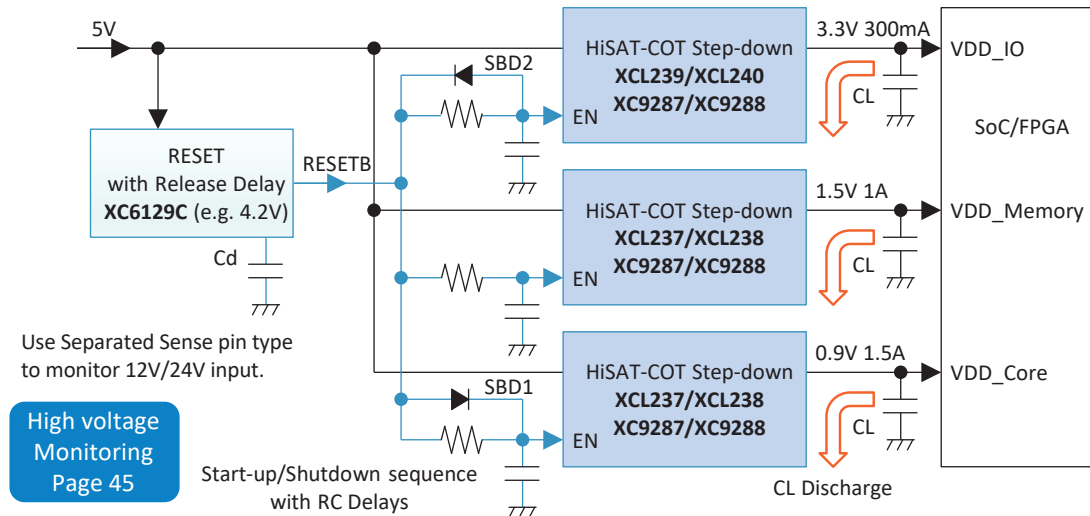
■ For multiple power rails of SoC/FPGA, Start-up/Shutdown Sequence Control

● Technical trend and challenges

- Start-up/shutdown sequences are required for multiple power rails for such as SoC/FPGA.
- As well as starting up using PG of each DC/DC, it is also important to shut down safely under control.

● TOREX Proposal : Start-up/shutdown sequence using EN voltage and CL discharge of DC/DC converter

▶ Start-up/shutdown control using RC delay of EN voltage of DC/DC converters.



- RC delay controls the timing of turns on and off of each DC/DC EN. Start-up/ shutdown sequence is switched using SBD1 and SBD2.
 - When starting up, SBD1 passes through the RC delay to the EN pin of the DC/DC converter for VDD_Core, so the VDD_Core power supply starts up first.
 - When shutting down, SBD2 passes through the RC delay to the EN pin of the DC/DC converter for VDD_IO, so the VDD_IO power supply shuts down first.

- The delay time until each DC/DC turns on/off is

$$t_{\text{delay(ON)}} = R \times C \times (-\ln((V_{\text{IN}} - V_{\text{EN}}) / V_{\text{IN}}))$$

$$t_{\text{delay(OFF)}} = R \times C \times (-\ln(V_{\text{EN}} / V_{\text{IN}}))$$

※V_{EN} : Threshold voltage of EN

- RC constant is set based on the soft-start time of each DC/DC and the discharge time using CL discharge.
- RC delay is driven by CMOS output of reset IC or PG of the primary DC/DC.

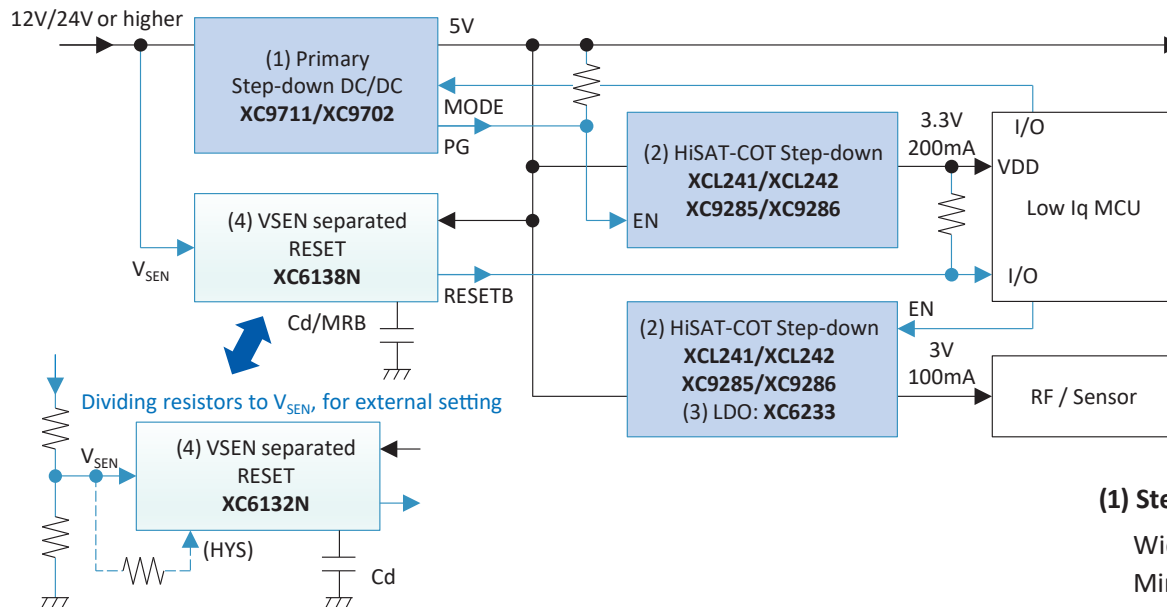
Block1	Product	Features
(1) Step-down DC/DC	XCL239 / XCL240 XCL237 / XCL238 FEATURED	Built-in inductor, HiSAT-COT, F-PWM, PWM/PFM 1A (XCL239/XCL240), 1.5A (XCL237/XCL238)
	XC9287 / XC9288 FEATURED	HiSAT-COT, F-PWM, PWM/PFM, MODE selectable 1.2MHz/3MHz, 1.5A
(2) RESET IC	XC6129	Low Iq, High accuracy, Detect/Release Delay external adj.
	XC6138 FEATURED	High Voltage Low Iq Sense pin: 76V, 0.15μA@12V Ultra-low Iq 0.5μA, Release Delay adj., Selectable Hysteresis
	XC6118 / XC6134	Separated Sense pin, Delay adj., Hysteresis adj. (XC6134)

60V Input Compatible Small Solution

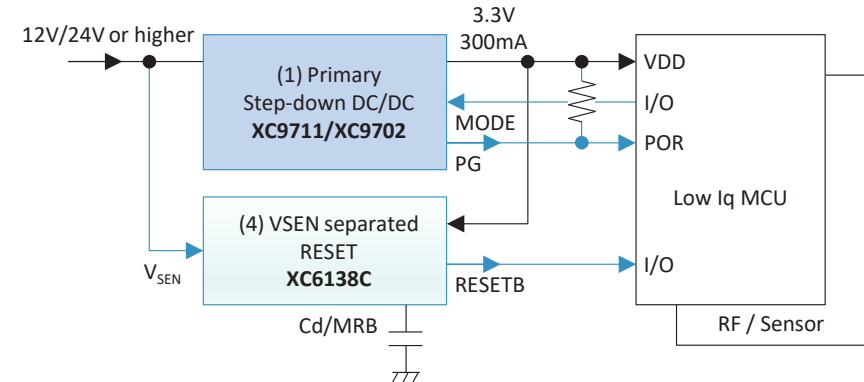
■ 24V or higher input : Small products, modules, industrial sensors, and IoT

- Challenges : High voltage input / Overshoot capability / Monitoring and handling of input voltage fluctuation, Miniaturization / low EMI / Heat dissipation

(a) Step-down to 5V, then create 3.3V and other secondary voltages



(b) Output 3.3V directly



(1) Step-down DC/DC for 24V or higher : 1A(XC9711), 300mA(XC9702)

Wide input voltage range to handle overshoot of 24V line.

Miniaturization of products by space-saving including peripheral components.

High efficiency including light loads.

Supports high step-down ratios, and can also handle direct step-down to 3.3V.

Low noise by switching between F-PWM and PWM/PFM using the **MODE** pin.

(2) Secondary 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. (XCL241/XCL242)

(4) 12V/24V input monitoring Voltage Detector : XC6138

●Monitoring with **76V** high-voltage sense pin that supports overshoot.

●**Directly monitors without dividing resistor**, realizing low Iq and high accuracy, as well as supports Release Delay and Detect/Release Hysteresis options.

High voltage
Step-down
Page 39

High voltage
Monitoring
Page 45

Block	Product	Features
(1) Primary Step-down DC/DC	XC9711 UNDER DEVELOPMENT	60V, MODE: F-PWM, PWM/PFM, 800kHz, 1A Space-saving, High efficiency, High step-down ratio compatible
	XC9702 FEATURED	60V, MODE: F-PWM, PWM/PFM, 1MHz, 300mA, Low Iq: 12μA Small area/High efficiency at light loads, High step-down ratio
(2) Step-down DC/DC	XCL241 / XCL242 FEATURED	Built-in inductor, HiSAT-COT , F-PWM, PWM/PFM 1.2MHz, 500mA, Ultra-low EMI
	XC9285 / XC9286	HiSAT-COT , F-PWM, PWM/PFM 1.2MHz, 1A
(3) LDO	XC6233	High-speed PSRR=75dB, 200mA, Inrush prevention
(4) RESET IC	XC6138 FEATURED	High Voltage Sense pin: 76V, Ultra-low Iq V _{DD} : 0.5μA V _{SEN} : 0.15μA, Detect/Release Delay adj, Hysteresis: selectable
	XC6132	Sense pin with surge voltage protection, Hysteresis adj.

Medium and High Voltage Input Step-down DC/DC

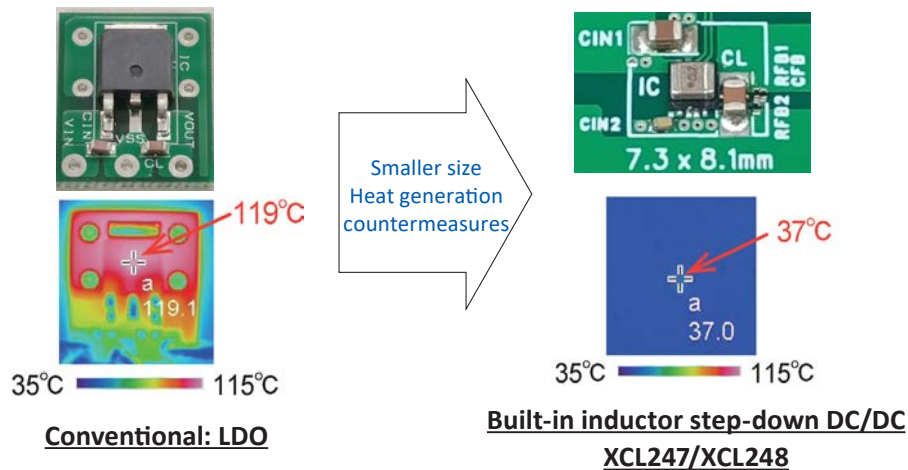
■ Step-down DC/DC for fluctuating 12V/24V and higher inputs.

●Technical trend and challenges

- The increased output current due to the higher functionality of devices makes the heat generated by using LDOs a problem.
- Large fluctuations in the power supply line due to impedance, load fluctuations and induction from motors, etc., must be addressed.

●TOREX Proposal : Small step-down DC/DC that can be used like an LDO

- Built-in inductor DC/DC can be used like an LDO, and achieves high efficiency. Low heat generation, ideal for replacing LDOs.
- **XCL249** 60V Built-in inductor step-down DC/DC that can handle voltage fluctuations such as motor operation

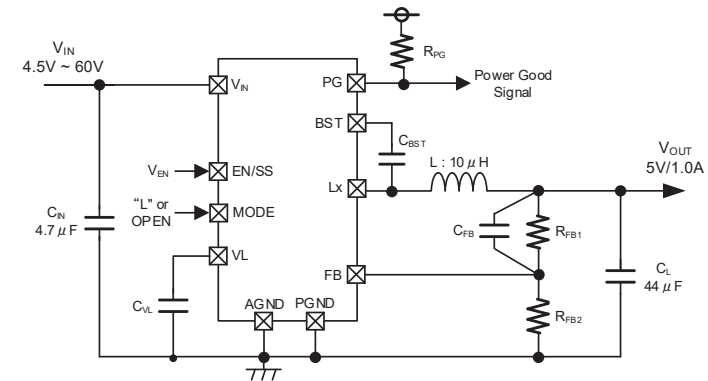


■ 36V/60V Built-in inductor step-down DC/DCs and Step-down DC/DCs

Product	Features	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA)	Package
XC9704 XC9705 NEW	F-PWM, PWM/PFM 1.2MHz, 2.4MHz	3.0 ~ 36.0	2.8 ~ 15 2.8 ~ 18	600	SOT-89-5 (4.5x4.6x1.6mm) USP-6C (1.8x2.0x0.6mm)
XCL247 XCL248 NEW	Built-in inductor F-PWM, PWM/PFM 1.2MHz	3.0 ~ 36.0	2.8 ~ 6.0	600	DFN3030-10B (3.0x3.0x1.7mm)
XCL249 NEW	Built-in inductor F-PWM, PWM/PFM	4.5 ~ 60.0	2.5 ~ 6.0	150	CL-3225 (3.2x2.5x2.0mm)

●TOREX Proposal : 36V/60V Step-down DC/DC for main power supply.

- World's smallest class of low current consumption at high voltage
- T_j 150°C operation / Low ripple / High step-down ratio
- Large capacitance support (Soft-start external adj. + PG)
- MODE pin: F-PWM - PWM/PFM can be switched while operating.



Step-down DC/DC : XC9711, XC9714

■ 36V/60V Step-down DC/DC

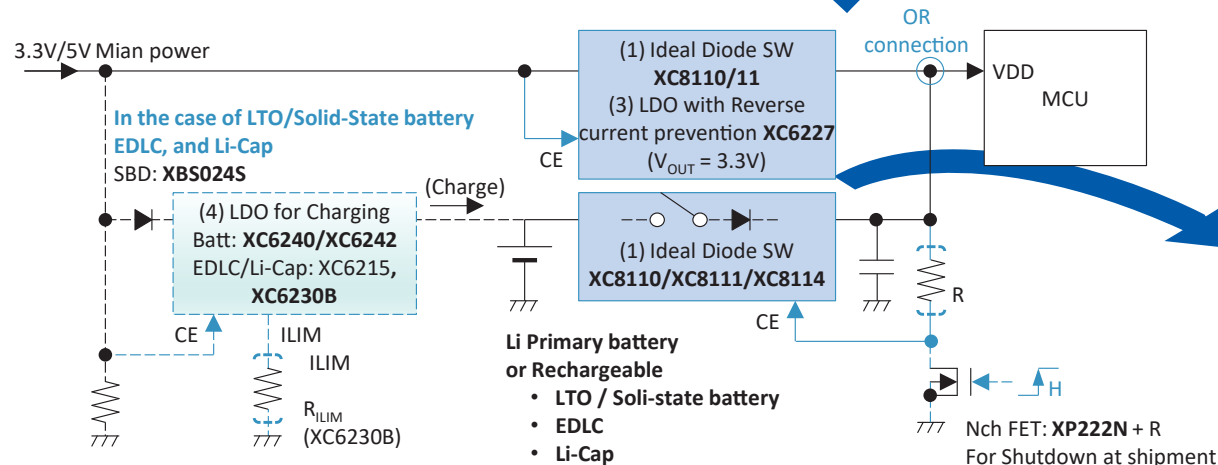
Product	Features	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA)	Package
XC9714 UNDER DEVELOPMENT	F-PWM, PWM/PFM 800kHz	4.5 ~ 36.0	2.5 ~ 15	2000	HSOP-8N (6.2x5.2x1.7mm) DFN3030-12A(3.0x3.0x0.75mm)
XC9711 UNDER DEVELOPMENT	F-PWM, PWM/PFM 800kHz	4.5 ~ 60.0	2.5 ~ 15	1000	HSOP-8N (6.2x5.2x1.7mm) DFN3030-12A(3.0x3.0x0.75mm)
XC9702 FEATURED	F-PWM, PWM/PFM 1MHz	4.5 ~ 60.0	2.5 ~ 12	300	HSOP-8N (6.2x5.2x1.7mm) DFN3030-12A(3.0x3.0x0.75mm) USP-10B(2.6x2.9x0.6mm)

OR Connection Solutions for Backup and Multiple Power Sources

Backup power supply with Primary, Rechargeable, LTO and Solid-State battery batteries

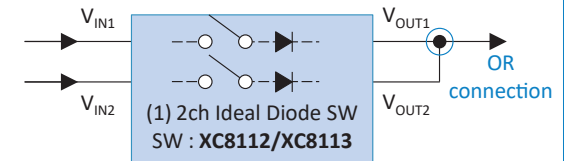
Supercap (EDLC) and Li-Cap

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

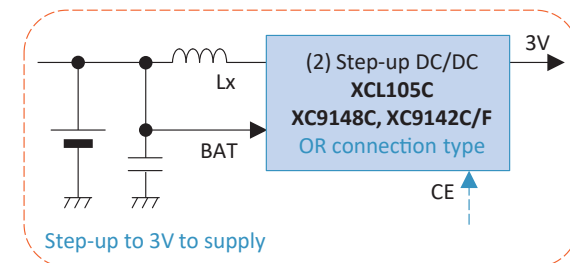


2ch product for OR Connection

Ideal diode load switch with 2 built-in channels for OR Connection is also available



XC8112 : 2ch x 500mA, XC8113 : 2ch x 1.0A



Block	Product	Features
(1) Ideal diode SW	XC8110 / XC8111 XC8114 NEW	True Reverse current prevention Ideal Diode SW, VF=20mV 0.5A (XC8110), 1A (XC8111), 1A (XC8114), IEC 62368-1:2023 certified (XC8110/XC8111)
	XC8112 / XC8113 NEW	2ch True Reverse current prevention Ideal Diode SW, VF=20mV 2ch x 500mA (XC8112), 2ch x 1A (XC8113), IEC 62368-1 certified
(2) Step-up DC/DC	XCL110C NEW	Inductor built-in, 3MHz, 610mA@3.3V→5V, For OR connection
	XC9148C	1.2MHz/3MHz, 750mA@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	For LTO/Solid-State battery 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) Battery voltage monitor	XC6140 / XC6142 NEW	Solid-State battery voltage monitoring Release voltage: 2.475V/2.450V, Iq=104nA For 105°C compatible battery: XC6142

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

OR connection
Page 41

(1) Supplies battery voltage directly to MCU : Ideal Diode Load SW
1ch XC8110/XC8111/XC8114, 2ch XC8112/XC8113

(2) Supplies boosted voltage to MCU : XCL110C, XC9148C

(3) LDO, DC/DC for Main power side

LDO with reverse current prevention to prevent reverse current flowing into the main power supply. (XC6227)

LTO/Solid-state battery
Reference circuit
Page 42

(4) LTO / Solid-State battery / Supercap (EDLC) / Li-Cap charging

For LTO / Solid-State battery : Dedicated LDO, XC6240/XC6242.

For EDLC/Li-Cap : 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 the battery characteristics.

Ideal Diode SW and Step-Up DC/DC Suitable for “OR” Connection

■ OR connection of power supply rails

● Technical trend and challenges

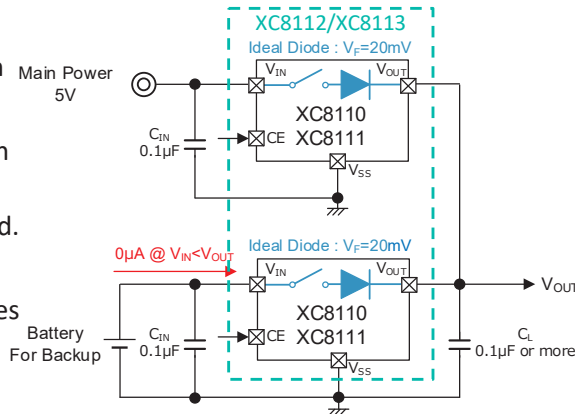
- For high efficiency and long battery life of the device, the circuit using SBD has large loss due to VF. Leakage current of reverse bias is also an issue.
- Difficult to supply stable voltage due to voltage drop and fluctuation caused by the VF characteristic of the diode which may cause unstable operation.

● 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 to minimize power loss.

► OR connection with Ideal Diode Load SW : XC8110 / XC8111 (1ch) XC8112 / XC8113 (2ch)

- Low VF: 20mV
- 0μA leakage current from output at reverse bias.
- Various built-in protection functions.
IEC 62368-1:2023 certified.
- Low loss requires no heat dissipation and contributes to miniaturization.

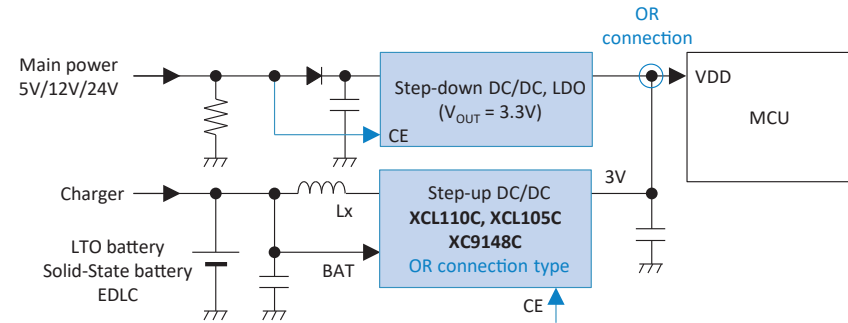


■ Load Switch with Ideal Diode function

Product	Features	V _{IN} (V)	R _{on}	I _{OUT}	Package
XC8110 FEATURED	VF=20mV	1.5 ~ 6.0	120mΩ	500mA	WLP-4-02 (0.82x0.82x0.5mm)
XC8111	3.6μA (Forward bias) 0μA (Reverse bias)			1A	SOT-25 (2.9x2.8x1.3mm) USP-6B06 (1.8x1.5x0.33mm)
XC8114 NEW	IEC 62368-1:2023 certified (XC8110/XC8111)		60mΩ	3A	WLP-4-04 (0.82x1.48x0.495mm) SOT-89-5 (4.5x4.6x1.6mm) DFN1820-6G (1.8x2.0x0.6mm)
XC8112 NEW	2ch VF=20mV		2ch x 120mΩ	2 x 500mA	USP-8B06 (2.0x2.0x0.33mm)
XC8113 NEW	3.6μA (Forward bias) 0μA (Reverse bias) IEC 62368-1:2023 certified			2 x 1A	

► 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 Iq 0.12μA minimizes battery discharge when main power supply.



■ Step-up DC/DC for OR connection

Product	Features	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA) @3.3V→5V	Package
XCL110C NEW	Built-in inductor PWM/PFM, 3MHz	0.65 ~ 6.0 V _{ST} = 0.9	1.8 ~ 5.5	610	CL-2025-02 (2.5x2.0x1.04mm)
XCL105C	Built-in inductor PWM/PFM, 1.2MHz	0.65 ~ 6.0 V _{ST} = 0.9	1.8 ~ 5.5	710	DFN3030-10B (3.0x3.0x1.7mm)
XC9148C	PWM/PFM 1.2MHz/3MHz	0.65 ~ 6.0 V _{ST} = 0.9	1.8 ~ 5.5	750	USP-6C (1.8x2.0x0.6mm) SOT-89-5 (4.5x4.6x1.6mm)

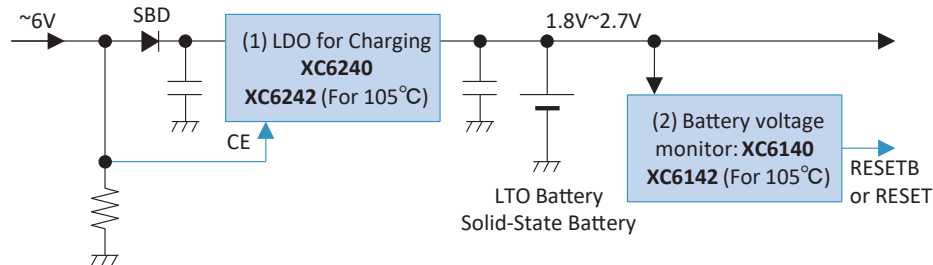
LTO and Solid-State batteries : Charge/Discharge Reference Solutions

■ LTO battery :

Li rechargeable battery using lithium titanate for negative electrode

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

■ Reference circuit for LTO and Solid-State battery charging and battery voltage monitoring

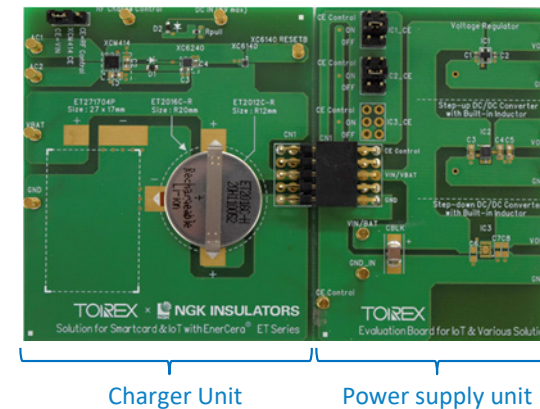


Block	Product	Features
(1) LDO for Charging	XC6240	For LTO/Solid-State battery charging, 2.63V, 150mA
	XC6242	For 105°C compatible charging, 2.63V, 150mA
(2) Battery voltage monitor	XC6140	RESET IC for battery voltage monitoring Detect voltage: 1.6~2.2V, Release voltage: 2.475V, Iq=104nA
	XC6142 NEW	105°C compatible, RESET IC for 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 and Solid-State battery : XC6240, XC6242

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

(2) Battery voltage monitoring : XC6140, XC6142

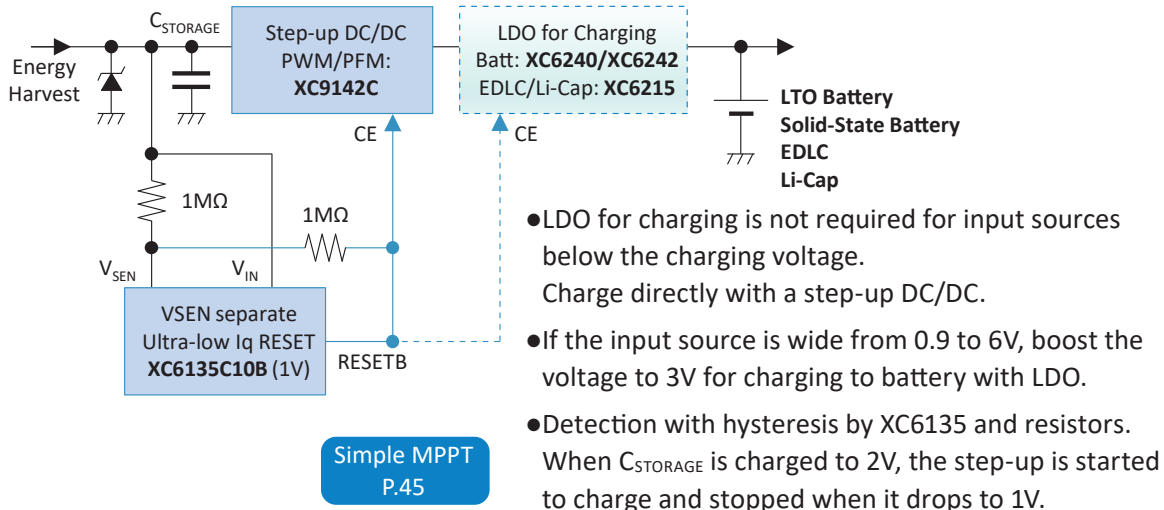
Set the voltage to release when charging starts by the LDO in accordance with the charging and discharging characteristics of the battery.

Solutions for Energy Harvesting

■ Examples of charging from Energy Harvesting to LTO battery, Solid-State battery, Supercap (EDLC), and Li-Cap

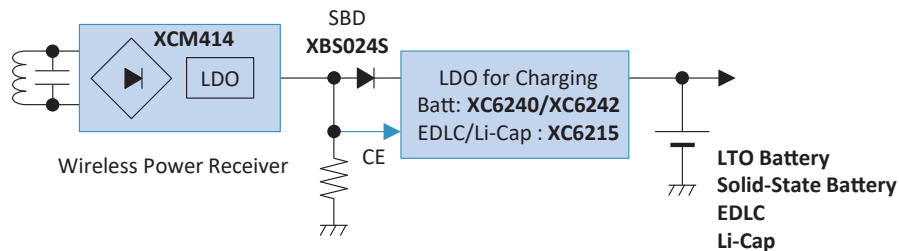
- Challenges : Supporting various Energy Harvesting : Wireless power transfer (WPT), NFC, solar panels, piezo, etc.
Charge LTO battery, Solid-State battery, Supercap (EDLC), and Li-Cap from unstable/micropower sources

0.9V~2.7V / 0.9V~6V input : Simple MPPT



NFC and other Wireless power transfer

Charging with wireless power receiving IC + LDO



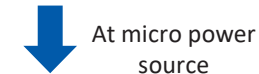
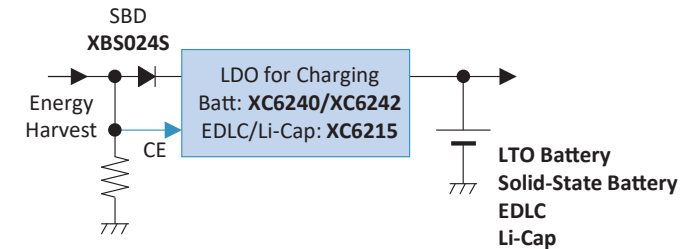
- Depending on the voltage characteristics and power of Energy Harvesting, the optimal charging circuit and control voltage varies.

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

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

3V~6V input

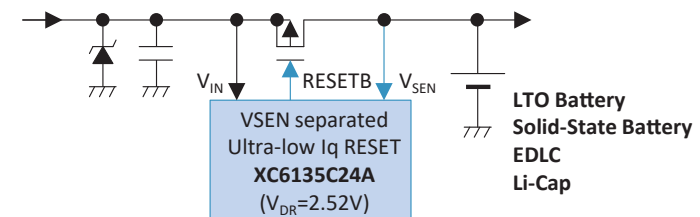
Supported by LTO/Solid-State reference circuit



At micro power source

3V~6V Rectenna and other micro power (a few μW)

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



Notes on charging EDLC (Supercap) and Li-Cap.

Select the suitable **charging / detection voltage**.

Insert a resistor of several Ω or more between the LDO or DC/DC and EDLC or Li-Cap for constant voltage charging as appropriate.

Peak Current Assist/Backup using EDLC(Supercap)/Li-Cap

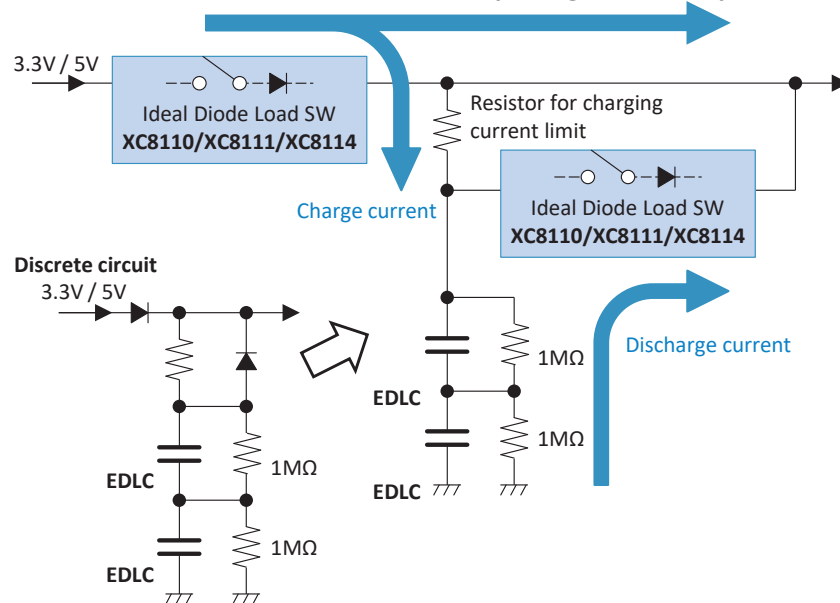
■ Peak current supply for RF communication and motor/solenoid drive

● Technical trend and challenges

- Voltage drops caused by short-term peak currents due to RF communication and drive of motors/solenoids are a major issue.
- For battery-powered devices, measures are needed to prevent the step-up DC/DC from shutting down due to peak current and battery impedance.
- This voltage drop countermeasure can also be used for short-term backup.

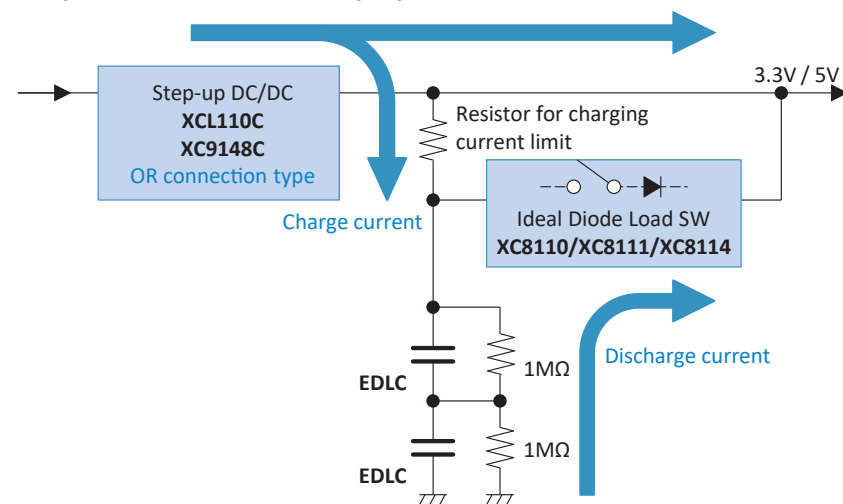
● TOREX Proposal : Current assist using EDLC (Supercap)/Li-Cap and ideal diode load switch

▶ Peak current assist / short-term backup using EDLC/Li-Cap



- By using an ideal diode load switch in a circuit that uses a conventional SBD, voltage drops can be reduced.
- EDLC is 2.5V~2.7V, so use 2 in series for 3.3V/5V lines.
- 3.8V Li-Cap is also becoming popular. Suitable for 3.3V lines.
In the case of Li-Cap, it is necessary to stop discharging at around 2V with a reset IC. **XC6140** is also suitable for voltage monitoring of Li-Cap.

▶ Output current assist for step-up DC/DC



- EDLC is connected to the output of the step-up DC/DC converter to assist with peak current. Because a large capacitance cannot be directly connected to the output side, it is connected to the EDLC via a resistor for current limiting.
The output from the EDLC is OR-connected to the output side via an ideal diode load switch.
- By using an OR connection type for the step-up DC/DC, reverse current from the EDLC is prevented after the step-up stops.

Reset IC Application Examples

■ Monitoring of 12V/24V input lines with large voltage fluctuations

●Technical trend and challenges

- It is necessary to monitor large voltage fluctuations in the power supply line due to loads such as motors and input impedance. Set the detect /release voltage to suit the application.

●TOREX Proposal : Reset IC with high voltage tolerance

and a wide range of detect/release voltages

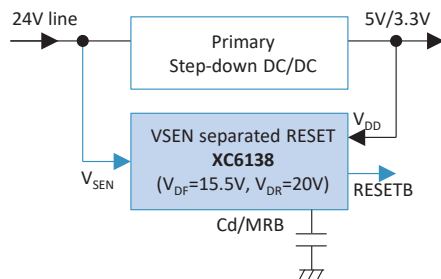
► Wide range of detect/release voltage difference (hysteresis) supported

- Separate sense pin type, monitoring 12V/24V lines.
- Select a release voltage high enough to ensure a stable rise, and select a detect voltage sufficiently different from the release voltage.

XC6138 **FEATURED**

76V High voltage Sense pin

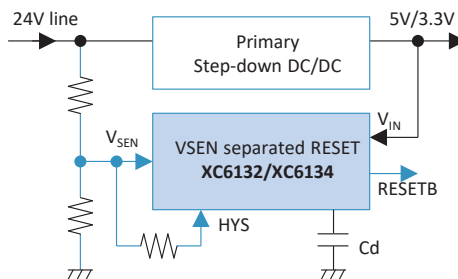
Wide hysteresis range selectable.



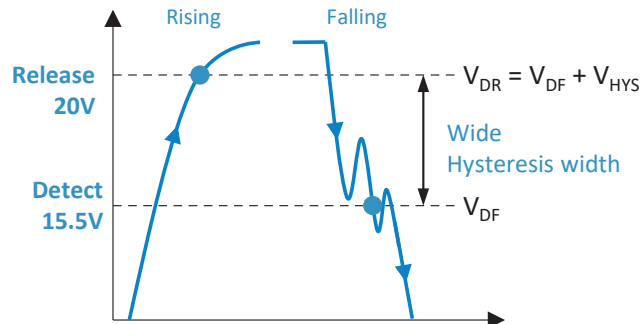
XC6132/XC6134

Detect and release voltages are set using external resistors.

(XC6132 has VSEN pin surge protection)



Example of 24V line voltage monitoring



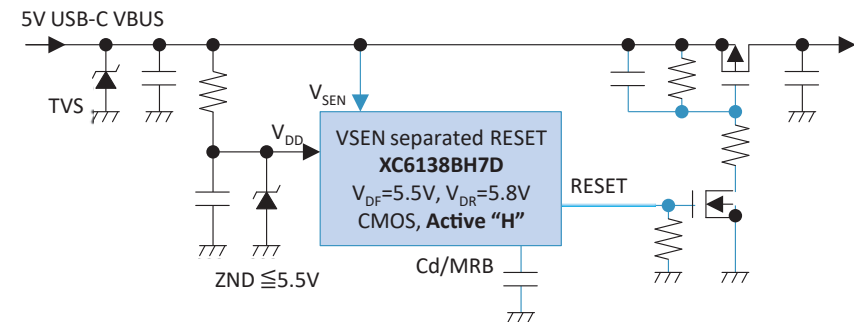
■ USB port Overvoltage protection (OVP)

●Technical trend and challenges

- 5V USB overshoot is an issue due to the spread of low-cost USB-PD adapters.

●TOREX Proposal : Overvoltage protection with a reset IC suitable for 5V USB

► Simple implementation with XC6138BH7D + external FETs.



■ Simple MPPT using an ultra-low Iq reset IC and a step-up DC/DC

●Technical trend and challenges

- ON/OFF control of step-up DC/DC in response to changes in input voltage is important for energy harvesting and backup power supply from EDLC.

●TOREX Proposal : Input voltage monitoring using an ultra-low Iq reset IC

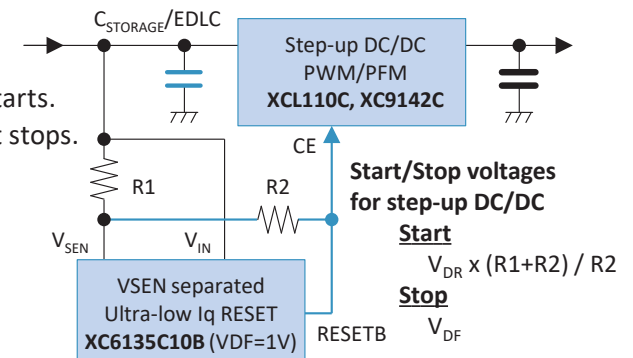
► Creating hysteresis with XC6135 + resistors

• Energy Harvesting

When voltage of C_{STORAGE} rises enough, boosting starts. When the voltage falls, it stops.

• EDLC for backup

When the EDLC voltage rises enough, backup supply starts. When the voltage falls, it stops.



Compact and Space-Saving Power Supply Solutions

■ World's smallest class product line of space-saving solutions

XC9290/XC9291 FEATURED

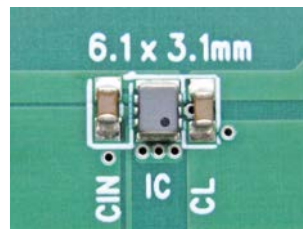
World's smallest class 6.0V 600mA step-down DC/DC



Actual Size

XCL239/XCL240 FEATURED, XCL109/XCL110 NEW

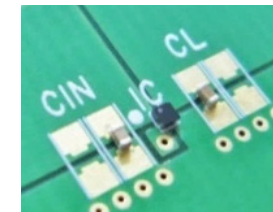
Built-in inductor Micro DC/DC: Step-down, Step-up



Actual Size

XC8110/XC8111 FEATURED

Ideal Diode Load Switch 0.5A/1.0A



Actual Size

XCL247/XCL248 NEW

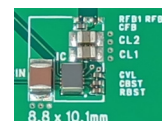
Built-in inductor 36V 600mA Step-down Micro DC/DC



Actual Size

XCL249 NEW

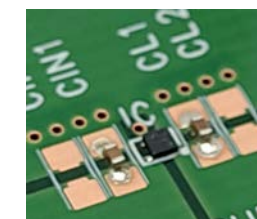
Built-in inductor 60V 150mA Step-down Micro DC/DC



Actual Size

XC6241 FEATURED, XC6135/XC6136

150mA LDO with GO function, Ultra-low Iq RESET



Actual Size

■ List of Compact and Space-saving Power Supply ICs

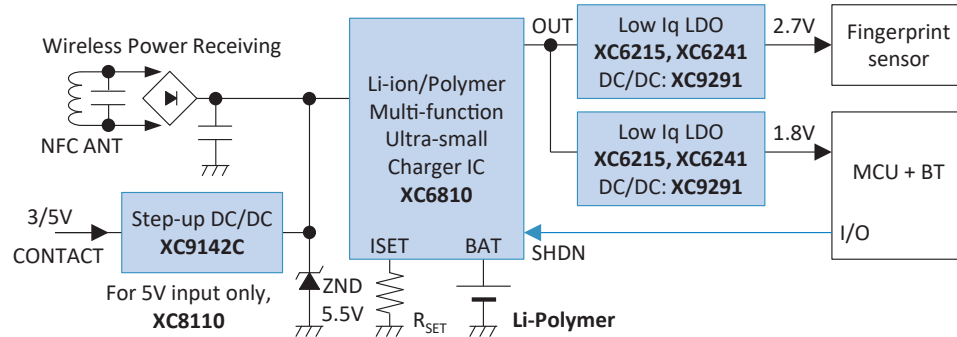
	Product	Features	V _{IN} (V)	V _{OUT} (V)	I _{OUT} (mA)	Package	Size
LDO	XC6241	High-speed, Iq=0.6μA, GO FEATURED	1.6 ~ 6.0	1.5 ~ 5.0	150	DFN1010-4D	1.0 x 1.0 x h 0.4mm
	XC6228	High-speed, PSRR=75dB, 300mA	1.6 ~ 5.5	1.2 ~ 4.0	300	USPQ-4B04	1.0 x 1.0 x h 0.6mm
	XC6504	Cap. Less, Iq=0.6μA	1.4 ~ 6.0	1.1 ~ 5.0	150	USPN-4B02	0.75 x 0.95 x h 0.40mm
Step-up DC/DC	XCL109/XCL110	Built-in inductor, F-PWM, PWM/PFM NEW	0.65 ~ 6.0	1.8 ~ 5.5	610 @3.3V→5V	CL-2025-02	2.0 x 2.5 x h 1.04mm
	XCL104/XCL105	Built-in inductor, F-PWM, PWM/PFM	0.65 ~ 6.0	1.8 ~ 5.5	710 @3.3V→5V	DFN3030-10B	3.0 x 3.0 x h 1.7mm
Step-down DC/DC	XCL243/XCL244	Built-in inductor, HiSAT-COT, 700mA, h=0.75mm max FEATURED	2.5 ~ 5.5	0.8 ~ 3.6	700	USP-8B04	2.25 x 1.5 x h 0.75mm
	XCL239/XCL240	Built-in inductor, HiSAT-COT, 1A FEATURED	2.5 ~ 5.5	0.8 ~ 3.6	1000	CL-2025-02	2.0 x 2.5 x h 1.04mm
	XCL233	Iq=200nA, Step-down DC/DC, VSET(V _{OUT} selectable) FEATURED	1.8 ~ 6.0	0.5 ~ 3.6	150	CL-2025-03	2.0 x 2.5 x h 1.04mm
	XC9290/XC9291	HiSAT-COT, 600mA, World's smallest mounting area 3.15mm² FEATURED	2.5 ~ 6.0	0.7 ~ 3.6	600	WLP-5-08	0.96 x 0.88 x h 0.33 mm
	XCL247/XCL248	Built-in inductor, 36V, 600mA, Iq=11μA NEW	3.0 ~ 36.0	2.8 ~ 6.0	600	DFN3030-10B	3.0 x 3.0 x h 1.7mm
	XCL249	Built-in inductor, 60V, 150mA, Iq=12μA, High step-down ratio NEW	4.5 ~ 60.0	2.5 ~ 6.0	150	CL-3225	3.2 x 2.5 x h 2.0mm
RESET IC	XC6135/XC6136	Ultra-low Iq: 88nA Voltage Detector	1.1 ~ 6.0	1.2 ~ 5.0	-	DFN1010-4D	1.0 x 1.0 x h 0.4mm
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
Load SW	XC8110/XC8111	Ideal diode load SW, VF=20mV, IEC 62368-1 certified FEATURED	1.5 ~ 6.0	-	1000	WLP-4-02	0.82 x 0.82 x h 0.5mm

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

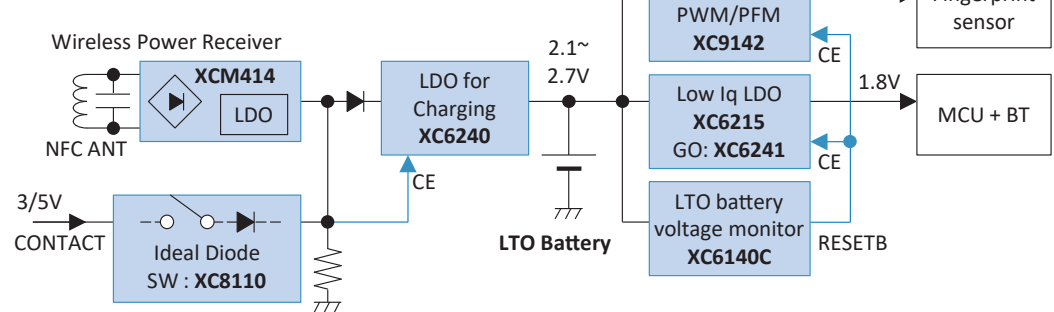
■ Example of thin power supply configuration with h = 0.33mm max for Smart card

- 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

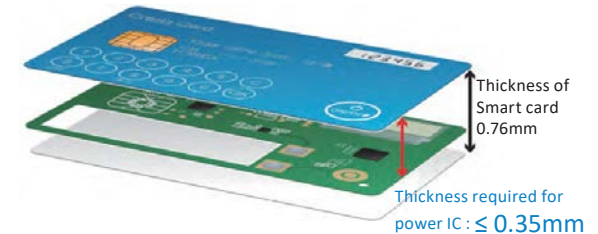


LTO battery : Example of low-profile solution



■ 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
LOD	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, Iq=0.6μA, GO	1.6 ~ 6.0	1.5 ~ 5.0	150		
	XC6504	Cap. Less, Iq=0.6μA	1.4 ~ 6.0	1.1 ~ 5.0	150		
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
	XC9291	HiSAT-COT, PWM/PFM, 6MHz	2.5 ~ 6.0	0.7 ~ 3.6	600	LGA-6B01	1.2 x 1.2 x h 0.3mm
Battery voltage monitor	XC6140	For LTO battery voltage monitoring Release voltage:2.475V	1.1 ~ 6.0	1.6 ~ 2.2	-	USPQ-4B05	1.0 x 1.0 x h 0.33mm
	XC6136	Iq=88nA		1.5 ~ 5.0			
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
	XC8102	Load SW, Iq=3uA	1.2 ~ 6.0	-	400	USP-6B06	1.8 x 1.5 x h 0.33mm
Load SW	XC8110	Ideal Diode Load SW	1.5 ~ 6.0	-	500		
	XC8112	2ch Ideal Diode Load SW	1.5 ~ 6.0	-	2 x 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 storages : Li-Polymer
LTO battery
Supercap (EDLC)
or battery less

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

See Page 31 for technical details of
Micro DC/DC XCL Series



New Products

Product Groups

Solution Guide

Selection Guide

Support / Packages

Built-in inductor DC/DC

DC/DC

LDO

RESET / WDT

Load SW

Charger

Automotive

Discrete

Low Voltage Step-down DC/DC : Input Voltage 6V or less

F-PWM : Forced PWM Mode, PWM : PWM Mode

	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	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)
	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)
	XCL202	400mA, 1.2MHz	PWM/PFM	2.0~6.0	0.8~4.0	400	1.2M	15	-	V _{out}	ILIM/Short	SS/UVLO/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL201	Ultra Low EMI	PWM	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)
FEATURED	XCL242	HiSAT-COT	PWM/PFM	2.5~5.5	0.8~3.6	500	1.2M	15	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	CL-2025-02 (2.5x2.0xh1.04mm)
FEATURED	XCL241	500mA, 1.2MHz	F-PWM	2.5~5.5	0.8~3.6	500	1.2M	250	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL206	600mA, 3MHz	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	Fixed V _{out} /FB Type	PWM	1.8~6.0	0.8~4.0	600	3.0M	21	-	V _{out} or FB	ILIM/Short	SS/UVLO/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
FEATURED	XCL244	HiSAT-COT	PWM/PFM	2.5~5.5	0.8~3.6	700	3.0M	25	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	USP-8B04 (2.25x1.5xh0.75mm)
FEATURED	XCL243	700mA, h=0.75mm max	F-PWM	2.5~5.5	0.8~3.6	700	3.0M	600	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	CL-2025-02 (2.5x2.0xh1.04mm)
FEATURED	XCL240	HiSAT-COT	PWM/PFM	2.5~5.5	0.8~3.6	1000	3.0M	25	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	CL-2025-02 (2.5x2.0xh1.04mm)
FEATURED	XCL239	1.0A, 3MHz	F-PWM	2.5~5.5	0.8~3.6	1000	3.0M	600	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	CL-2025-02 (2.5x2.0xh1.04mm)
FEATURED	XCL238	HiSAT-COT	PWM/PFM	2.5~5.5	0.8~3.6	1500	3.0M	25	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	USP-9B01 (2.5x3.2xh1.05mm)
FEATURED	XCL237	1.5A, 3MHz	F-PWM	2.5~5.5	0.8~3.6	1500	3.0M	600	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	USP-9B01 (2.5x3.2xh1.05mm)
FEATURED	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)
FEATURED	XCL211		F-PWM	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)

High Voltage Step-down DC/DC : Input Voltage 36V~

	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	XCL249	60V, 150mA	F-PWM or PWM/PFM	4.5~60.0	2.5~6.0	150	1.0M	12	-	FB	TSD/ILIM/OVP/Lx Short	SS Adj/UVLO/PG	105°C	CL-3225 (3.2x2.5xh2.0mm)
NEW	XCL248	36V, 600mA	PWM/PFM	3.0~36.0	2.8~6.0	600	1.2M	11	-	FB	TSD/ILIM	SS Adj/UVLO/PG	105°C	DFN3030-10B (3.0x3.0xh1.7mm)
NEW	XCL247		F-PWM	3.0~36.0	2.8~6.0	600	1.2M	270	-	FB	TSD/ILIM	SS Adj/UVLO/PG	105°C	DFN3030-10B (3.0x3.0xh1.7mm)

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	Built in Inductor, I _q =6.3μA Low Power	PFM	0.7~5.5	3.0~5.0	80	-	6.3	-	V _{out}	-	UVLO/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL101				1.8~5.0									
NEW	XCL108	Built in Inductor, I _{in} =0.5A I _q =400nA Low Power	PWM/PFM	0.65~5.5	3.0~5.5	180	1.2M	0.4	-	V _{out}	ILIM	SS	105°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL103	Built in Inductor, I _{in} =0.8A	PWM/PFM	0.65~6.0	2.2~5.5	450	3.0M	26	-	V _{out}	ILIM/Short	SS/CL Dischg	85°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL102	Load Disconnection or Bypass	F-PWM	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)
NEW	XCL110	Built in Inductor, Load Disconnection or Bypass or V _{OUT} OR	PWM/PFM	0.65~6.0	1.8~5.5	610	3.0M	30	-	V _{out}	ILIM/TSD/Short	SS/CL Dischg/UVLO	105°C	CL-2025-02 (2.5x2.0xh1.04mm)
NEW	XCL109		F-PWM	0.65~6.0	1.8~5.5	610	3.0M	75	-	V _{out}	ILIM/TSD/Short	SS/CL Dischg/UVLO	105°C	CL-2025-02 (2.5x2.0xh1.04mm)
	XCL105	Built in Inductor, I _{in} =1.4A	PWM/PFM	0.65~6.0	1.8~5.5	710	1.2M	19	-	V _{out}	ILIM/TSD/Short	SS/CL Dischg/UVLO	105°C	DFN3030-10B (3.0x3.0xh1.7mm)
	XCL104	Load Disconnection or Bypass or V _{OUT} OR	F-PWM	0.65~6.0	1.8~5.5	710	1.2M	56	-	V _{out}	ILIM/TSD/Short	SS/CL Dischg/UVLO	105°C	DFN3030-10B (3.0x3.0xh1.7mm)

Step-Down DC/DC

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

F-PWM : Forced PWM Mode, PWM : PWM Mode

	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		
	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 (1.72x1.07x0.33mm) SOT-26W, USP-8B06 (2.0x2.0x0.33mm)
FEATURED	XC9291	World Smallest Solution Size 3.15mm ²	PWM/PFM	2.5~5.5	0.7~3.6	600	4.0M 6.0M	11	-	V _{out}	ILIM	SS/UVLO/CL Dischg	105°C	LGA-6B01 (1.2x1.2x0.3mm) WLP-5-08 (0.88x0.96x0.33mm)
FEATURED	XC9290	HISAT-COT, 600mA	F-PWM	2.5~5.5	0.7~3.6	600	1.2M 3.0M	700	-	V _{out} Or FB	ILIM/Short	SS/UVLO/CL Dischg	85°C	SOT-25, USP-6C (1.8x2.0x0.6mm) USP-6EL (1.8x2.0x0.4mm) WLP-5-03 (1.06x1.26x0.4mm)
	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	15	-	V _{out} Or FB	ILIM/Short	SS/UVLO/CL Dischg	85°C	SOT-25, USP-6C (1.8x2.0x0.6mm) USP-6EL (1.8x2.0x0.4mm) WLP-5-03 (1.06x1.26x0.4mm)
	XC9235		PWM	1.8~5.5	0.8~6.0	600	1.2M 3.0M	22	-	V _{out} Or FB	ILIM/Short	SS/UVLO/CL Dischg	85°C	SOT-25, USP-6C (1.8x2.0x0.6mm) USP-6EL (1.8x2.0x0.4mm) WLP-5-03 (1.06x1.26x0.4mm)
	XC9286	HISAT-COT, 1.0A	PWM/PFM	2.5~5.5	0.8~3.6	1000	1.2M	15	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	SOT-25 (2.9x2.8x1.3mm) USP-6C (1.8x2.0x0.6mm)
	XC9285		F-PWM	2.5~5.5	0.8~3.6	1000	1.2M	250	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	SOT-25 (2.9x2.8x1.3mm) USP-6C (1.8x2.0x0.6mm)
FEATURED	XC9289	HISAT-COT, 1.5A	F-PWM or PWM/PFM	2.5~5.5	0.8~3.6	1500	1.2M 3.0M	15	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	LGA-8B01 (1.2x1.4x0.3mm)
FEATURED	XC9288		PWM/PFM	2.5~5.5	0.8~3.6	1500	1.2M 3.0M	15	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	SOT-89-5 (4.5x4.35x1.6mm) USP-6C (1.8x2.0x0.6mm)
FEATURED	XC9287		F-PWM	2.5~5.5	0.8~3.6	1500	1.2M 3.0M	250	-	V _{out}	TSD/ILIM/Short	SS/UVLO/CL Dischg	105°C	SOT-89-5 (4.5x4.35x1.6mm) USP-6C (1.8x2.0x0.6mm)
	XC9243	2A	PWM/PFM	2.7~6.0	0.9~V _{IN}	2000	1.2M 2.4M	41	-	FB	TSD/ILIM	SS/UVLO/CL Dischg	85°C	USP-10B (2.9x2.60x0.6mm) SOP-8FD (4.9x6.0x1.75mm)
	XC9242		F-PWM	2.7~6.0	0.9~V _{IN}	2000	1.2M 2.4M	41	-	FB	TSD/ILIM	SS/UVLO/CL Dischg	85°C	USP-10B (2.9x2.60x0.6mm) SOP-8FD (4.9x6.0x1.75mm)

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		
	XC526A	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)
	XC526B		PWM	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)
	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 (2.9x2.8x1.3mm) USP-6C (1.8x2.0x0.6mm)
	XC9220		PWM	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 (2.9x2.8x1.3mm) USP-6C (1.8x2.0x0.6mm)

High Voltage DC/DC : Input voltage 60V 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	XC9702	60V, 300mA	F-PWM or PWM/PFM	4.5~60.0	2.5~12.0	300	1.0M	12	-	FB	TSD/ILIM/OVP/ Lx Short	SS Adj/UVLO/PG	125°C	USP-10B (2.9x2.60x0.6mm) HSOP-8N (6.2x5.2x1.7mm) DFN3030-12A (3.0x3.0x0.75mm)
NEW	XC9705	36V, 600mA	PWM/PFM	3.0~36.0	2.8~15.0	600	1.2M 2.2M	11	-	FB	TSD/ILIM	SS Adj/UVLO/PG	125°C	SOT-89-5 (4.5x4.6x1.6mm) (Without PG) USP-6C (1.8x2.0x0.6mm) (With PG)
NEW	XC9704		F-PWM	3.0~36.0	2.8~18.0	600	1.2M 2.2M	270	-	FB	TSD/ILIM	SS Adj/UVLO/PG	125°C	SOT-89-5 (4.5x4.6x1.6mm) (Without PG) USP-6C (1.8x2.0x0.6mm) (With PG)
UNDER DEVELOPMENT	XC9711	60V, 1A	F-PWM or PWM/PFM	4.5~60.0	2.5~12.0	1000	800k	10	-	FB	TSD/ILIM/OVP/ Lx Short	SS Adj/UVLO/PG	125°C	DFN3030-12A (3.0x3.0x0.75mm) HSOP-8N (6.2x5.2x1.7mm)
UNDER DEVELOPMENT	XC9714	36V, 2A	F-PWM or PWM/PFM	4.5~36.0	2.5~15.0	2000	800k	10	-	FB	TSD/ILIM/OVP/ Lx Short	SS Adj/UVLO/PG	125°C	DFN3030-12A (3.0x3.0x0.75mm) HSOP-8N (6.2x5.2x1.7mm)
	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 (4.9x6.0x1.75mm)
	XC9270		PWM	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 (4.9x6.0x1.75mm)
	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 (5.10x6.4x1.4mm) USP-10B (2.9x2.60x0.6mm)

Step-Up DC/DC, Step-Up Charge Pump, LED/Back Light Driver

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

F-PWM : Forced PWM Mode, PWM : PWM Mode

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		
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 (2.7x2.5x0.6mm) USP-8B05 (2.4x2.4x0.33mm)
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 (1.8x2.0x0.4mm)
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℃	SOT-25, USP-6C (1.8x2.0x0.6mm) WLP-6-05(1.08x1.28x0.4mm)
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 (1.8x2.0x0.6mm) WLP-6-01 (1.08x1.28x0.4mm)
XC9141		F-PWM											
XC9148	I _{in} =1.4A, Load Disconnection or Bypass or V _{OUT} OR	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 (1.8x2.0x0.6mm) SOT-89-5 (4.5x4.6x1.6mm)
XC9147	I _{in} =1.4A, Load Disconnection	F-PWM											

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

Iout max	Product	Feature	Control Method	VIN [V]	VOUT [V]	IOUT [mA] (VIN=5.0V, VOUT=12V)	fosc [Hz]	Iq [μA]	Function				Topr max.	Package
									External FET/SBD	VOUT Setting	Protection	Other		
	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 (2.9x2.8x1.3mm) USP-6C (1.8x2.0x0.6mm)
	XC9120		PWM											
XC9104	Standard DC/DC Controller	PWM/PFM	0.9~10.0	100k/180k /300k/500k			14	85℃					SOT-25 (2.9x2.8x1.3mm) USP-6B (1.8x2.0x0.6mm)	
XC9103		PWM												

▷ 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)

Buck-Boost DC/DC, Inverting Charge Pump & DC/DC

▷ Buck-Boost DC/DC

F-PWM : Forced PWM Mode, PWM : PWM Mode

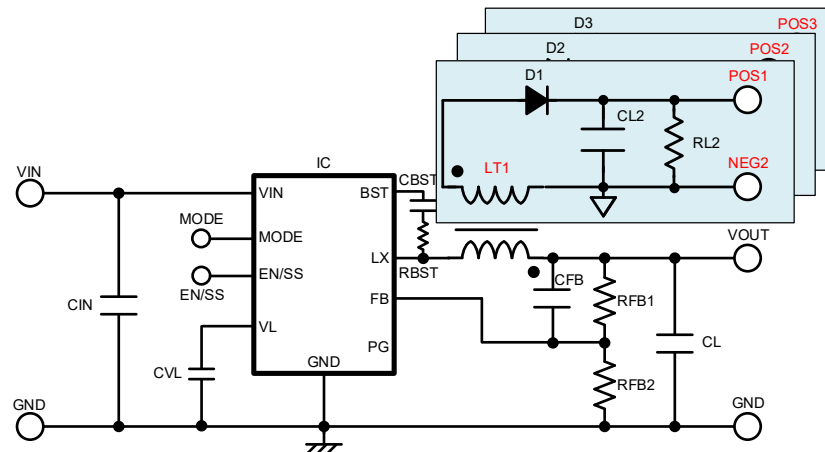
Product	Feature	Control Method	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA] (V _{IN} =5.0V, V _{OUT} =5.0V)	fosc [Hz]	I _q [μA]	Function				Topr max.	Package
								External FET/SBD	V _{OUT} Setting	Protection	Other		
XC9302	Buck-Boost DC/DC Controller	PWM/PFM	2.0~10.0	2.4~6.0	400	180k 300k	15	Pch+SBDx2	V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

▷ Inverting DC/DC, Inverting Charge Pump

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°C	SOT-25, USP-6B (1.8x2.0x0.6mm)
FEATURED XC9702	Step-down DC/DC (60V/300mA) for Inverting	PWM/PFM	4.5~60.0 + V _{OUT}	-12.0~-2.5	50 @ 12V→-5V	1.0M	12	-	FB	TSD/ILIM/OVP/Lx Short	SS Adj/UVLO/PG	125°C	USP-10B (2.9x2.60x0.6mm) HSOP-8N (6.2x5.2x1.7mm) DFN3030-12A (3.0x3.0x0.75mm)
NEW XC9705	Step-down DC/DC (36V/600mA) for Inverting	PWM/PFM	3.0~36.0 + V _{OUT}	-15.0~-2.8	100 @ 12V→-5V	1.2M 2.2M	11	-	FB	TSD/ILIM	SS Adj/UVLO/PG	125°C	SOT-89-5 (4.5x4.6x1.6mm) USP-6C (1.8x2.0x0.6mm)
XCMS26	Step-down DC/DC (16V/3A) for Inverting	PWM/PFM	4.0~16.0 + V _{OUT}	-15.0~-1.2	300 @ 12V→-5V	500k 1M	25	Pch+SBD	FB	Short	SS Adj/UVLO	85°C	USP-12B01 (2.8x2.30x0.6mm)
XC9271	Step-down DC/DC (30V/2A) for Inverting	PWM/PFM	7.0~30.0 + V _{OUT}	-12.0~-1.2	300 @ 12V→-5V	300k 500k Ext CLK	200	SBD	FB	TSD/ILIM/Short	SS Adj/UVLO/SYNC	105°C	SOP-8FD (4.9x6.0x1.75mm)

▷ Isolated DC/DC : For low-power applications (~0.5W)

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		
FEATURED XC9702	Step-down DC/DC (60V/300mA) for Isolated	F-PWM	4.5~60.0	2.5~12.0	50	1.0M	12	-	FB	TSD/ILIM/OVP/Lx Short	SS Adj/UVLO/PG	125°C	USP-10B (2.9x2.60x0.6mm) HSOP-8N (6.2x5.2x1.7mm) DFN3030-12A (3.0x3.0x0.75mm)



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]	R _{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
									CE	Current Limit	Other		
FEATURED	XC6242	Charger IC for Advanced Battery	1.5~6.0	2.60	150	0.8	4.50	35	Yes	ILIM	-	105℃	USPN-4 (0.90x1.2x0.4mm)
	XC6240	I _Q =0.8μA, 150mA		2.63								85℃	SSOT-24, USPN-4 (0.90x1.2x0.4mm) USP-6B06 (1.8x1.5x0.33mm)
	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, USPQ-4B05 (1.0x1.0x0.33mm) DFN1010-4D(1.0x1.0x0.4mm)
	XC6506	I _Q =0.8μA, 150mA	1.5~6.0	1.2~5.0	150	0.8	2.60	35	Yes	FB	-	105℃	USPN-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 (1.2x1.2x0.6mm)
	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 (1.2x1.2x0.6mm)
	XC6501A-D								Yes				SOT-25, SSOT-24 USP-4, USPN-4, WLP-4-01 USP-6B (1.8x2.0x0.6mm) SOT-89, SOT-23
	XC6206	I _Q =1μA, 250mA	1.8~6.0	1.2~5.0	250	1	1.75	35	-	FB+ILIM	-	85℃	SOT-89 (4.5x4.0x1.6mm)
	XC6503P	Cap Less, High Speed, 500mA	1.7~6.0	1.2~5.0	500	15	0.63	55	-	FB+ILIM	Cap less/CL Dischg	85℃	SOT-89-5, SOT-25
	XC6503A-D								Yes				USP-4 (1.2x1.6x0.6mm)
	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 (1.8x2.0x0.6mm) 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]	R _{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
									CE	Current Limit	Other		
FEATURED	XC6706	Seamless GO I _Q =1.2μA, High Speed 20V, 200mA	3.5~20.0	2.5~5.5	200	1.2	4.10	50	-	FB	GO/SoftStart/TSD	105℃	SOT-89 (4.5x4.0x1.6mm)
FEATURED	XC6705	I _Q =5.5μA 10.5V, 200mA							Yes		GO/SoftStart/TSD /CL Discharge		USP-4 (1.2x1.6x0.6mm) SOT-25 (2.9x2.8x1.3mm)
	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 (1.8x2.0x0.6mm) 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 (1.8x2.0x0.6mm) 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]	R _{on} [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 (1.8x2.0x0.6mm) SOT-89-5, SOT-25
	XC6216D			1.8~12.0									TO-252, SOT-89, SOT-223
	XC6408	28V, 150mA RESET	2.0~28.0	2.0~18.0	150	8	3.50	40	-	FB+ILIM	TSD /RESET	85℃	USP-6C (1.8x2.0x0.6mm) 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]	R _{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
								CE	Current Limit	Other		
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, USPQ-4B05 (1.0x1.0xh0.33mm) DFN1010-4D (1.0x1.0xh0.4mm)
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						0.67				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, DFN1010-4D (1.0x1.0xh0.4mm)
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	True Reverse Current Protection, High Speed, 700mA	1.7~6.0	0.8~5.0	700	100	0.40	65	Yes	FB	True Reverse/TSD	85℃	USP-6C (1.8x2.0xh0.6mm) SOT-89-5, SOT-25
XC6222	Reverse Current Protection, 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	True 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]	R _{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
								CE	Current Limit	Other		
FEATURED XC6706	Seamless GO I _q =1.2μA, High Speed 20V, 200mA	3.5~20.0	2.5~5.5	200	1.2	4.10	50	-	FB	GO/SoftStart/TSD	105℃	SOT-89 (4.5x4.0xh1.6mm)
FEATURED XC6705								Yes		GO/SoftStart/TSD /CL Discharge		USP-4 (1.2x1.6xh0.6mm) SOT-25 (2.9x2.8xh1.3mm)
XC6505	I _q =5.5μA 10.5V, 200mA 10V, 300mA	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
XC6204/XC6205	High Speed, Low Noise	2.0~10.0	0.9~6.0	300	25	1.60	70	Yes	FB+ILIM	-	85℃	USP-6B (1.8x2.0xh0.6mm) SOT-89-5, SOT-25
XC6209	10V, 300mA High Speed						80					
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]	R _{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
								CE	Current Limit	Other		
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 ($V_{IN}=0.5V \sim 3.0V$)

Product	Feature	V_{IN} [V]	V_{OUT} [V]	I_{OUT} [mA]	I_q [μA]	R_{on} [Ω]	PSRR @1kHz [dB]	Function			Topr max.	Package
								CE	Current Limit	Other		
XC6601	Low Voltage input, $V_{bias}=2.5\sim 6V$, 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 $V_{bias}=2.5\sim 6V$ 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												

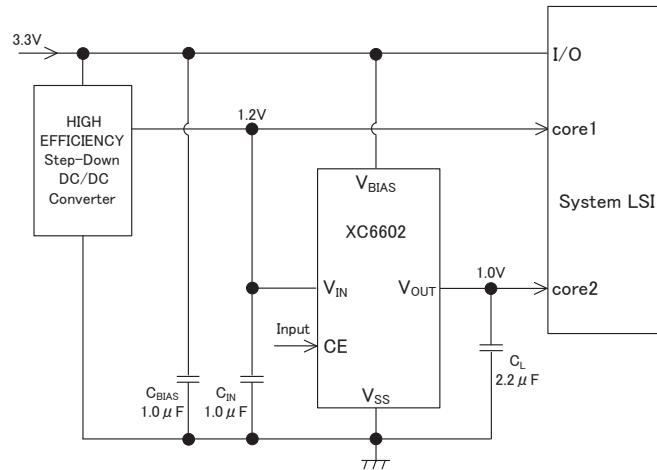
▷ Negative Voltage Regulator

Product	Feature	V_{IN} [V]	V_{OUT} [V]	I_{OUT} [mA]	I_q [μA]	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

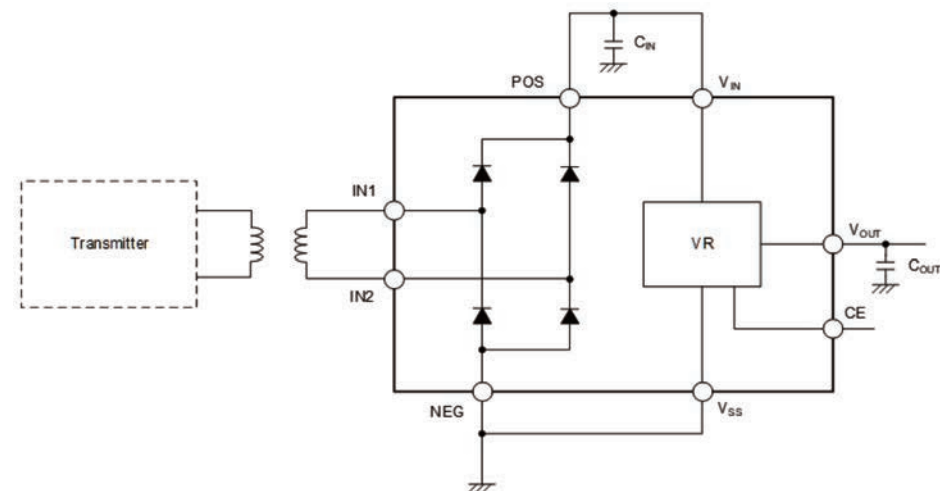
▷ Voltage Regulator with Bridge Diode for Wireless Power Receiver

Product	Feature	V_{IN} [V]	V_{OUT} [V]	I_{OUT} [mA]	I_q [μA]	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)

Low Input Voltage Regulator



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		
NEW XC6142	Advanced 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) SSOT-24(2.0x2.1xh1.1mm)
XC6140			1.6~2.2								0.275V -0.875V						USPQ-4B05(1.0x1.0xh0.33mm) SSOT-24(2.0x2.1xh1.1mm) DFN1010-4D(1.0x1.0xh0.4mm)
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, SOT-25 DFN1010-4D(1.0x1.0xh0.4mm)
XC6135	Ultra Low Power, Separated Sense Pin		0.5~5.0		0.044												
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						
XC6129	Adj Release/Detect Delay, High Accuracy, Low Iq	1.3~6.0	1.5~5.5	0.8%	0.58	CMOS N-ch	Detect "H" Detect "L"	-	Adj	Adj	VDFx5%	Yes	CMOS Only	-	-	105°C	USP-4, SSOT-24 USPQ-4B05(1.0x1.0xh0.33mm) DFN1010-4D(1.0x1.0xh0.4mm)
XC6126	Adj Release Delay	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%	-	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			0.8			Yes			VDFx1% VDFx5%						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		
XC61G	10V	0.7~10.0	0.8~6.0	2.0%	0.7	CMOS N-ch	Detect "L"	-	-	-	VDFx5%	-	-	-	-	85℃	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℃	SOT-23 (2.9x2.8xh1.3mm)
XC61F																	SOT-23 (2.9x2.8xh1.3mm) SOT-89 (4.5x4.0xh1.6mm)

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

Feature	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect						Watchdog		Topr max.	Package	Package
					Config.	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Unstable operation prevention	Timeout Period	EN/ENB			
FEATURED XC6138	VSEN pin 76V operation Hysteresis 5~50%, Adj Delay time	2.2~6.0	2.3~20.0	1.5%	0.5	CMOS N-ch	Detect "H" Detect "L"	Yes	Adj	Adj	5~50%	Yes	-	-	-	12°C	SOT-25 (2.8x2.9xh1.3mm) DFN1515-6A (1.5x1.5xh0.38mm)

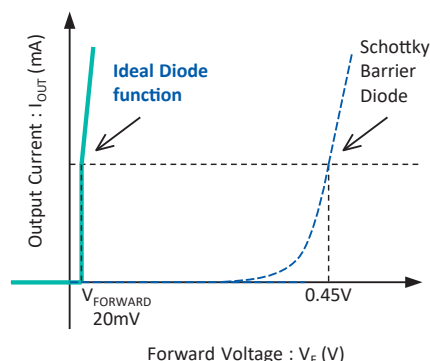
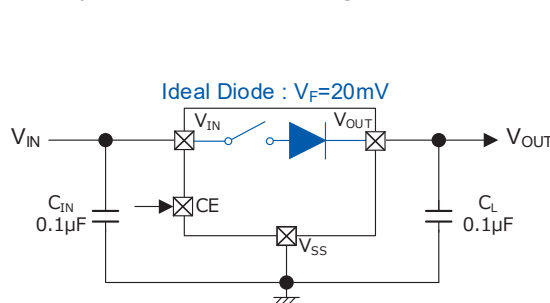
High Voltage Voltage Detectors

Feature	V _{IN} [V]	V _{DF} [V]	Accuracy	I _q [μA]	Output		Voltage Detect						Watchdog		Topr max.	Package	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	1.6~6.0	1.0%	2.5@EN=L 9.8@EN=H	N-ch	Detect "L"	-	-	Adj	VDFx5%	-	-	Adj	Yes	12°C	SOT-26 (2.9x2.8xh1.3mm) DFN1515-6A (1.5x1.5xh0.38mm)
XC6130					9.8							Yes		-			
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)

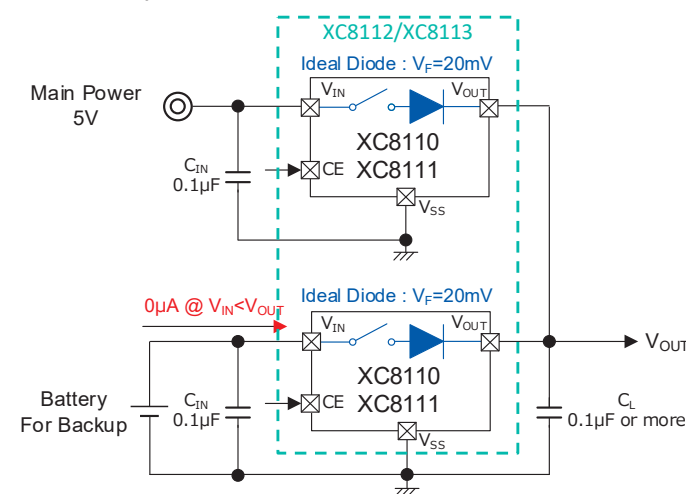
Load SW

Product	Features	V_{IN} [V]	I_{OUT} [mA]	Current Limit		I_Q [μ A]	I_{STB} [μ A]	R_{on} [Ω]	Function		$T_{opr. max.}$	Package
				ILIM Value [mA]	Setting Method				Current Limit	Other		
XC8101	$I_Q=3\mu A$, 200mA	1.8~6.0	200	300	Fixed	3	0.01	550	FB+ILIM	CL Dischg	85°C	SOT-25 (2.9x2.8x1.3mm) SSOT-24 (2.0x2.1x1.1mm) USP-4 (1.2x1.6x0.6mm)
XC8102	$I_Q=3\mu A$, 400mA	1.2~6.0	400	480	Fixed	3	0.01	280	FB+ILIM	CL Dischg	85°C	SOT-25, SSOT-24, USP-4 (1.2x1.6x0.6mm) USP-6B06 (1.8x1.5x0.33mm) USPN-4 (0.90x1.2x0.4mm)
XC8109	900mA, 85m Ω , 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°C	USP-6C (1.8x2.0x0.6mm)
XC8107	0.5A~2A, 85m Ω , Multifunction		500/1000 1500/2000	900/1400 1900/2400	Fixed							SOT-25 (2.9x2.8x1.3mm) USP-6C (1.8x2.0x0.6mm)
XC8108	2A, 85m Ω , Multifunction Load SW		2000	900~2400	Adj by External Resister							USP-6C (1.8x2.0x0.6mm)

Diode Replacement / Forward Voltage Characteristics



OR connection : For backup circuit, etc.

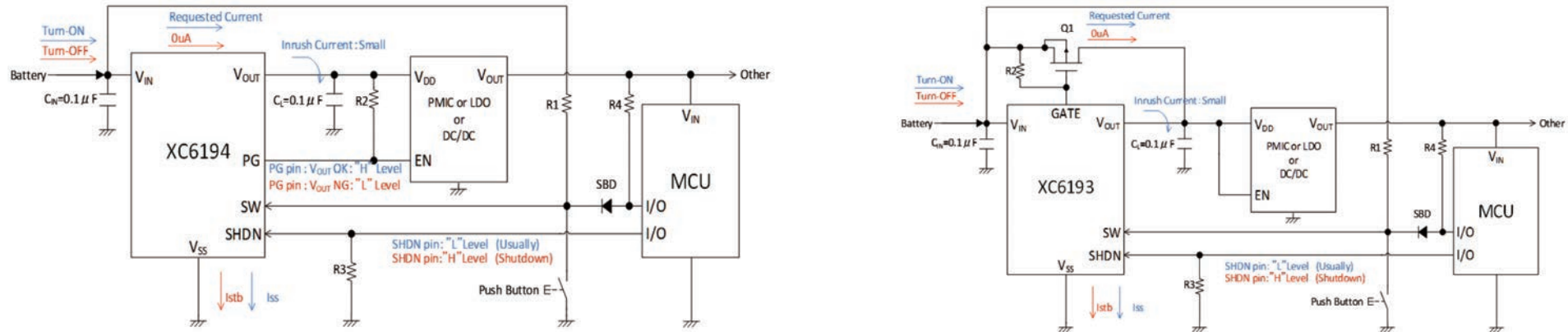


Load SW with Ideal Diode function

Product	Features	V_{IN} [V]	I_{OUT} [mA]	Current Limit		I_Q [μ A]	I_{STB} [μ A]	R_{on} [m Ω]	Function		$T_{opr. max.}$	Package
				ILIM Value [mA]	Setting Method				Current Limit	Other		
FEATURED XC8110	Ideal Diode $V_F=20mV$, $I_Q=3.6\mu A$ 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°C	WLP-4-02 (0.82x0.82x0.5mm) SOT-25 (2.9x2.8x1.3mm) USP-6B06 (1.8x1.5x0.33mm)
FEATURED XC8111			1000	1700								
NEW XC8112	Ideal Diode $V_F=20mV$, $I_Q=3.6\mu A$ 500mA (XC8112), 1A (XC8113) 2ch Load SW IEC 62368-1 Certified	1.5~6.0	2ch x 500	850	Fixed	3.6/ch	0.65/ch	120	FB+ILIM	TSD Inrush True Reverse	105°C	USP-8B06 (2.0x2.0x0.33mm)
NEW XC8113			2ch x 1000	1700								
NEW XC8114	Ideal Diode $V_F=20mV$, $I_Q=3.6\mu A$, 3A	1.5~6.0	3000	4500	Fixed	3.6	0.65	60	FB+ILIM	TSD Inrush True Reverse	105°C	WLP-4-04 (0.82x1.48x0.495mm) SOT-89-5 (4.5x4.6x1.6mm) DFN1820-6G (1.8x2.0x0.6mm)

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	1.80	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°C	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%)	85°C	USPN-6 (1.3x1.3x0.4mm) USPN-6B01 (1.0x1.45x0.4mm)
XC6190B							Internal Fix	7.5s or 12.5s (±5%)			

Automotive IC (AEC-Q100 Compliant)

■ Voltage Regulator

Product	AEC-Q100	Feature	V _{IN} [V]	V _{OUT} [V]	I _{OUT} [mA]	I _q [μA]	R _{on} [Ω]	PSRR @1kHz [dB]	Function			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)
XD6239	Grade1	300mA High Speed	2.0~6.0	1.2~3.4	300	100	0.66	75	Yes	FB+ILIM	Inrush/TSD/CL Dischg	125℃	DFN1010-4C (1.0x1.0xh0.6mm) SOT-25 (2.9x2.8xh1.3mm)
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

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

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	Detect "H" Detect "L"	Yes	adj	adj	adj	Yes	-	-	125℃	SOT-26 (2.9x2.8xh1.3mm) USP-6C(1.8x2.0xh0.6mm)
XD6133				1.0~5.0								VDFx5%					

▷ High Voltage Voltage Detectors

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		
NEW XD6138	Grade1	VSEN pin 76V operation Hysteresis 5~50%, Adj Delay time	2.2~6.0	2.3~20.0	1.5%	0.5	CMOS N-ch	Detect "H" Detect "L"	Yes	Adj	Adj	5~50%	Yes	-	-	12℃	SOT-25 (2.9x2.8xh1.3mm)

▷ 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	Detect "L"	-	-	adj	VDFx5%	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	Detect "L"	-	-	3.13ms ~400ms	VDFx5%	-	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		30	±20	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		30	±20	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				0.2	-	11	5	-	6.5
XP232N03013R-G		30	±20	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				0.15	-	-	5.5	5	18
XP262N70023R-G		60	±20	0.3	-	-	2.1	1.6	30
XP222N0301TR-G				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	SOT-23(TO-236) (3,000pcs/Reel)	20	±8	2.0	-	0.13	0.1	-	280
XP231N0201TR-G				0.2	-	11	5	-	6.5
XP232N0301TR-G				0.3	-	-	2.5	2	22
XP233N0501TR-G				0.5	-	4	1.5	-	40
XP234N0801TR-G		30	±20	0.8	-	-	0.4	0.29	64
XP235N2001TR-G				2.0	-	-	0.14	0.11	220
XP236N2001TR-G				2.0	-	0.14	0.11	-	230
XP261N7002TR-G		60	±20	0.15	-	-	5.5	5	18
XP262N7002TR-G				0.3	-	-	2.1	1.6	30
XP264N0301TR-G				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		30	±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		20	±8	4.0	0.15	0.07	0.05	-	390
XP161A11A1PR-G		30	±20	4.0	-	-	0.105	0.065	270

N-Channel Single MOSFET : 10A or more

Product	Package	V _{DSS} [V]	V _{GSS} [V]	I _D [A]	R _{DS(on)} (Max.)				Ciss [pF]
					V _{GS} =1.5V	V _{GS} =2.5V	V _{GS} =6.0V	V _{GS} =10V	
NEW XPJ102N09N8R-G	DFN5060-8L (6,000pcs/2Reel)	100	±20	59	-	-	14.3mΩ	9.4mΩ	1370
NEW XPJ101N04N8R-G		100	±20	122	-	-	6.5mΩ	4.4mΩ	3010

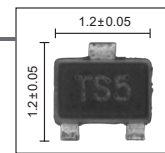
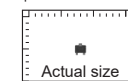
P-Channel Single MOSFET

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		-20	±8	-0.8	-	0.65	0.56	-	118
XP231P02013R-G		-30	±8	-0.2	-	8	5	-	34
XP232P05013R-G		-30	±8	-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				-1.5	-	0.23	0.17	-	165
XP231P0201TR-G		-30	±8	-0.2	-	8	5	-	34
XP232P0501TR-G				-0.45	-	2.15	1.25	-	56
XP233P1501TR-G				-1.5	-	-	0.33	0.19	160
XP152A12C0MR-G	SOT-23 (3,000pcs/Reel)	-20	±12	-0.7	-	0.5	0.3	-	180
XP152A11E5MR-G		-30	±20	-0.7	-	-	0.45	0.25	160
XP202A0003MR-G		-30	±20	-3.0	-	-	0.095	0.067	435
XP162A12A6PR-G	SOT-89 (1,000pcs/Reel)	-20	±12	-2.5	-	0.3	0.17	-	310
XP162A11C0PR-G		-30	±20	-2.5	-	-	0.28	0.15	280
XP202A0003PR-G		-30	±20	-5.0	-	-	0.1	0.059	450

Package

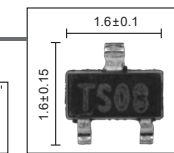
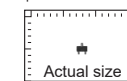
SOT-723

h=0.5 MAX.
p=0.8



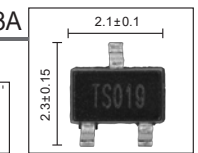
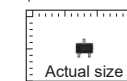
SOT-523

h=0.9 MAX.
p = 1.0sss



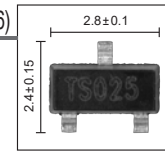
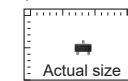
SOT-323-3A

h=1.1 MAX.
p=1.3



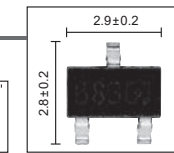
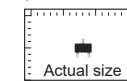
SOT-23 (TO-236)

h=1.15 MAX.
p=1.9



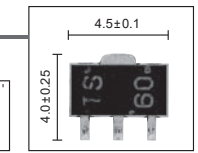
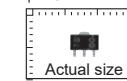
SOT-23

h=1.3 MAX.
p=1.9



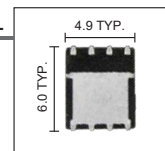
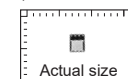
SOT-89

h=1.6 MAX.
p=1.5



DFN5060-8L

h=1.1 MAX.
p=1.27



Schottky Barrier Diode, Transient Voltage Suppressor (TVS)

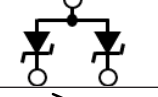
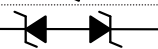
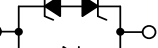
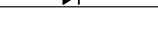
Schottky Barrier Diodes

Product	Package	V _R [V]	I _F [A]	V _F [V]	I _R [mA]	C _t [pF]
XBS013P11R-G	SOD-923 (8,000pcs/Reel)	30	0.1	0.35	0.01	4
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
XBS023P11R-G	SOD-523P (5,000pcs/Reel)	30	0.2	0.5	0.1	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
XBS053P11R-G	SOD-323P (5,000pcs/Reel)	20	0.5	0.49	0.1	15
XBS104S14R-G	SOD-123A (3,000pcs/Reel)	40	1.0	0.49	0.2	35
XBS104V14R-G				0.37	2	150
XBS104P11R-G	SOD-123P (3,000pcs/Reel)	40	1.0	0.56	0.5	30
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			3.0	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

SiC Schottky Barrier Diodes

Product	Package	V _R [V]	I _F [A]	V _F [V]	I _R	C _t [pF]
XBSC41A066CS-G	TO-220AC (1,000pcs/20Tubes)	650	6	1.35	0.15μA	300
XBSC42A086CS-G			8	1.35	0.20μA	400
XBSC43A106CS-G			10	1.35	0.25μA	500
NEW XBSC11A108CS	TO-220AC (1,000pcs/20Tubes)	850	10	1.5	2μA	400

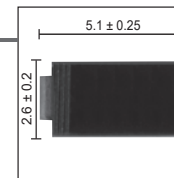
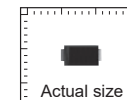
Transient Voltage Suppressors (TVS)

Product	Package	Application	Protected Lines	V _{RWM} (MAX) [V]	V _{BR} (MIN) [V]	C _j [pF]	Electrostatic discharge voltage (IEC61000-4-2)	Internal circuit
XBP06V0U25R-G	FBP1006-2A (10,000pcs/Reel)	USB3.0	1	5.0	6.0	0.35	Air : ±15kV Contact : ±15kV	
XBP06V0U2MR-G	SOT-23 (3,000pcs/Reel)	USB2.0	2	5.0	6.0	0.8	Air : ±15kV Contact : ±15kV	
XBP1010-G	SOT-923P (3,000pcs/Reel)	ESD Protection	1	5.0	6.2	35	Contact : ±8kV	
XBP1011-G	SOT-523P (5,000pcs/Reel)	ESD Protection	1	5.0	6.0	110	Contact : ±25kV	
XBP1013-G	SOT-323P (5,000pcs/Reel)	ESD Protection	1	5.0	6.0	300	Contact : ±25kV	
XBP1012-G		ESD Protection	1	12.0	13.3	110	Contact : ±8kV	
XBP1007-G		DVI Ethernet USB 2.0	1	24.0	27.3	3	Contact : ±8kV	

Package

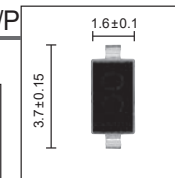
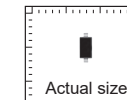
SMA-XG

h=2.3 MAX.



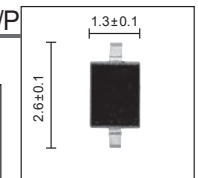
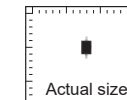
SOD-123A/P

h=1.25 MAX.



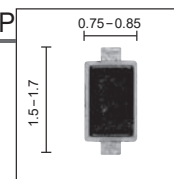
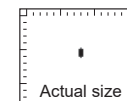
SOD-323A/P

h=1.0 MAX.



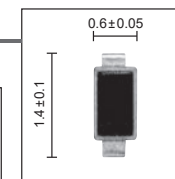
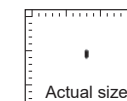
SOD-523A/P

h=0.77 MAX.



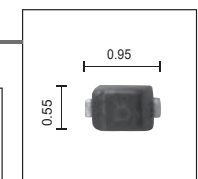
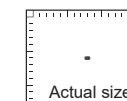
SOD-723

h=0.65 MAX.



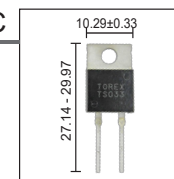
SOD-923

h=0.35



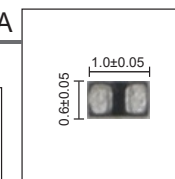
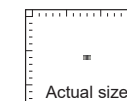
TO-220AC

h=4.75 MAX.



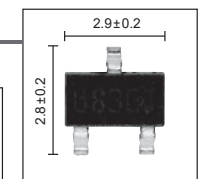
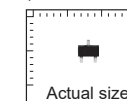
FBP1006-2A

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 (<https://product.torexsemi.com/en/design-support/dcdc-efficiency-size-comparison>)

●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

Topology

☒ Step-down
☐ Step-up
☐ Inverter

Mode

☒ PWM/FFM or FFM
☐ PWM

Vin

3.6 V

Vout

1.8 V

Iout

10 mA

Product	Inductor	Efficiency	Total Mount Area	Iout max.	HSAT-COT
☒ XC9243 or ☒ XC9243 or ☐ XC9243	☒ ALL ☐ Built-in Inductor ☐ External Inductor	%	mm ²	mA	☒ ALL ☐ Yes ☐ No
☒ XC9243_1.2MHz	SLF7055T-4R7 (4.7uH)	92.67%	90.05mm ²	2000mA	-
☒ XC9243_2.4MHz	XGL4030-222ME (2.2uH)	91.89%	55.3mm ²	2000mA	-
☐ XC9273_1.2MHz(NRND)	XAL6030-561ME (56uH)	91.72%	108.35mm ²	3000mA	Yes
☒ XC9265B/D	1239AS-H-100M (10uH)	91.29%	19.24mm ²	50mA	-
☐ XC9265B/D	LTF5022T-4R7NR20 (4.7uH)	90.98%	48.89mm ²	1000mA	Yes
☐ XC9236_1.2MHz	DPE252012F-4R7M-P2 (4.7uH)	90.52%	14.56mm ²	600mA	-
☐ XC9276	OLUH2R201A (2.2uH)	89.81%	16.37mm ²	150mA	-
☐ XCL2108B/D	Built-in Inductor	89.72%	13.74mm ²	50mA	-
☐ XC9276	DPE252010F-2R2M (2.2uH)	89.51%	19.62mm ²	150mA	-
☐ XCL222_1.2MHz(NRND)	Built-in Inductor	89.58%	13.74mm ²	500mA	Yes
☒ XC9276	LSEPC2016KKT2R2M (2.2uH)	89.41%	17.75mm ²	150mA	-
☐ XC9232/24_1MHz	DPE252012F-4R7M-P2 (4.7uH)	89.29%	27.91mm ²	1000mA	-
☐ XC9236_1.2MHz	LSXBD4040TKL4R7M (4.7uH)	89.1%	33.49mm ²	600mA	-
☐ XC9232/24_1MHz	XGL4030-472ME (4.7uH)	88.95%	39.91mm ²	1000mA	-
☐ XC9276	MWTC201608S2R2MT (2.2uH)	88.71%	17.75mm ²	150mA	-
☐ XC9262_1.2MHz(NRND)	LTF5022T-4R7NR20 (4.7uH)	88.23%	45.36mm ²	1500mA	Yes
☐ XC9282_4MHz(NRND)	DPE18SAN1R0M0L (1uH)	87.96%	5.79mm ²	600mA	Yes
☐ XCL220_3MHz(NRND)	Built-in Inductor	87.95%	13.74mm ²	1000mA	Yes
☐ XC9276	MLP2520V2R2MT051 (2.2uH)	87.94%	19.62mm ²	150mA	-
☒ XCL202_1.2MHz	Built-in Inductor	87.75%	13.74mm ²	400mA	-
☐ XC9276	DPE18SBN2R2MELL (2.2uH)	87.58%	14.37mm ²	150mA	-
☐ XC9285A/C	1239AS-H-100M (10uH)	87.54%	22.17mm ²	200mA	-
☐ XC9282_4MHz(NRND)	LSANB2016KKT1R0M (1uH)	87.47%	13.87mm ²	1500mA	Yes
☐ XC9282_6MHz(NRND)	XAL4020-221ME (0.22uH)	87.35%	78.77mm ²	3000mA	Yes
☐ XCL214_3MHz(NRND)	LSCNB1005EET4R7MB (0.47uH)	87.16%	4.58mm ²	600mA	Yes
☐ XC9236_3MHz	LSCNB1005EET1R0MB (1uH)	87.15%	4.58mm ²	600mA	Yes
☐ XC9236_3MHz	MCCC1005T4R7MJN (0.47uH)	86.97%	6.04mm ²	800mA	Yes
☐ XC9236_3MHz	Built-in Inductor	86.78%	17.06mm ²	1500mA	Yes
☐ XC9236_3MHz	DPE252012F-1R5M-P2 (1.5uH)	86.75%	14.55mm ²	600mA	-
☐ XC9236_3MHz	LSCNB1605HKT1R5MD (1.5uH)	86.51%	9.53mm ²	600mA	-

Select products to compare

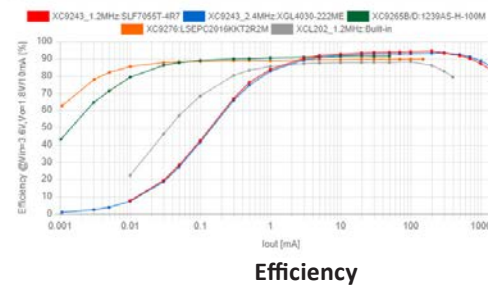
Hide

Select products to compare

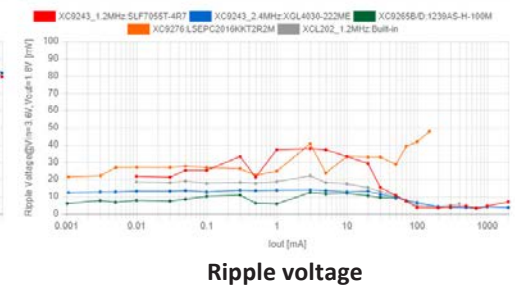
●Point 2

Shows the “efficiency”, “ripple voltage”, and “load regulation” that are hard to grasp from the data sheet/simulation.
Measured data available from 1μA minimum, an ideal for comparing characteristics at light loads.

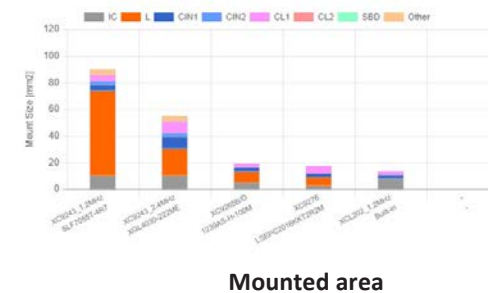
Efficiency vs Iout



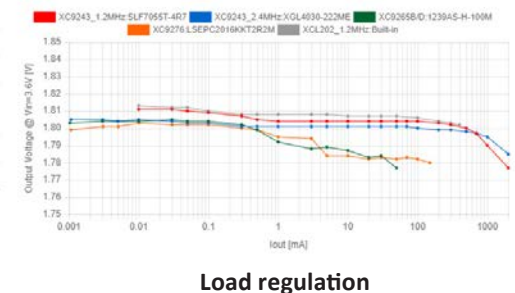
Ripple Voltage vs Iout



Total Mount Size vs Product



Vout vs Iout (Load Regulation)



Design Support Tool : DC/DC Simulation

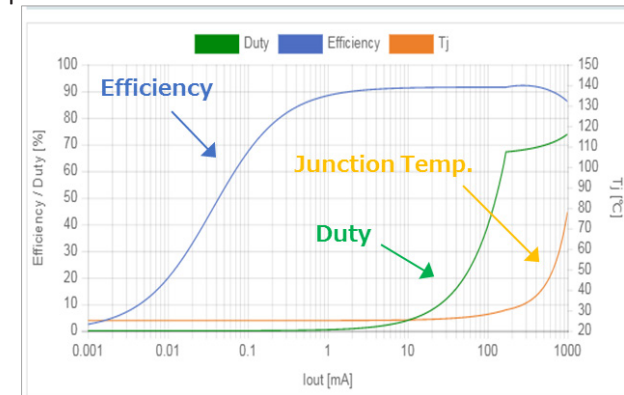
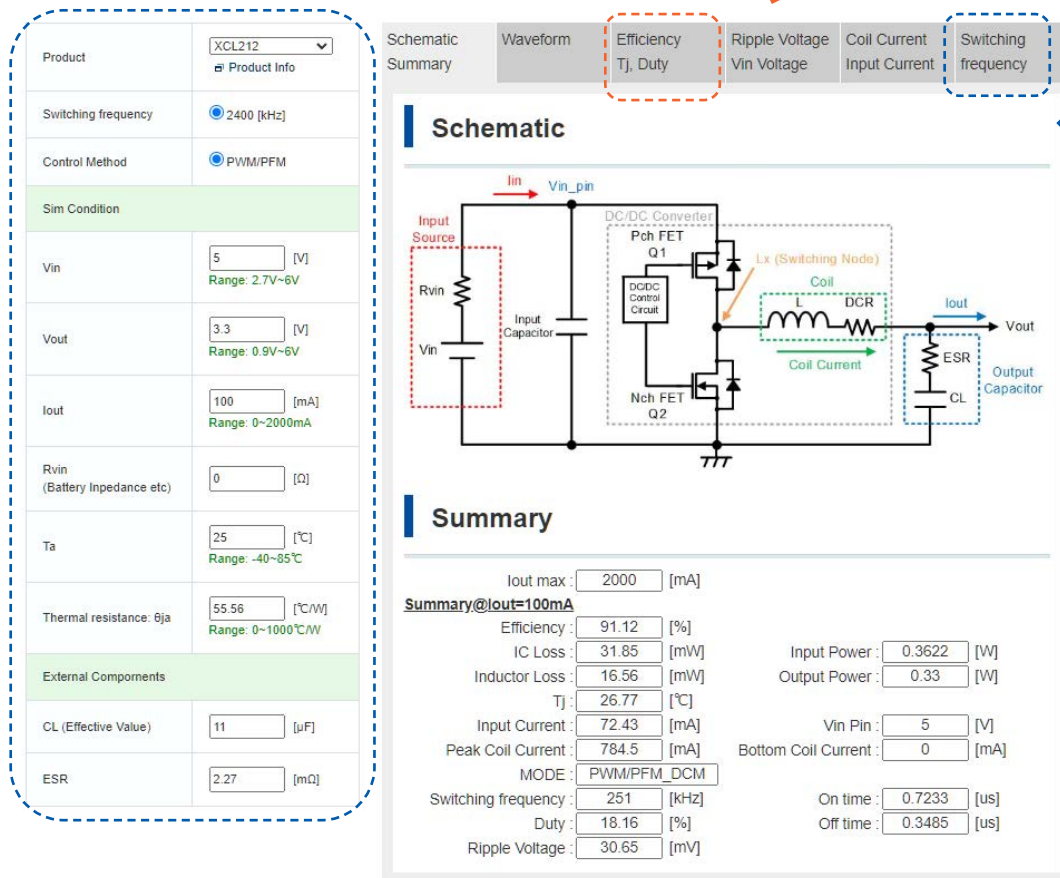
■ Web DC/DC Simulation (<https://product.torexsemi.com/en/design-support/dcdc-simulation>)

●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.

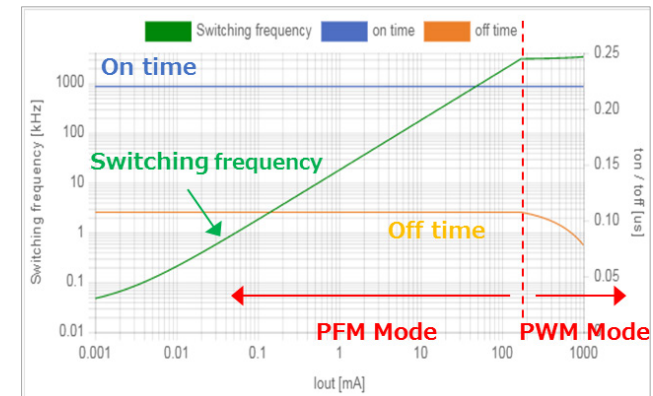
●Point 1

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

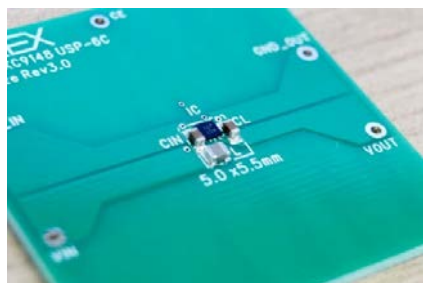
Simulation with input resistance (Battery impedance) is possible. Enables calculation of the maximum output current of Step-up DC/DC, which is greatly affected by the input voltage drop cause by the input resistance.

■ Free Evaluation Board support

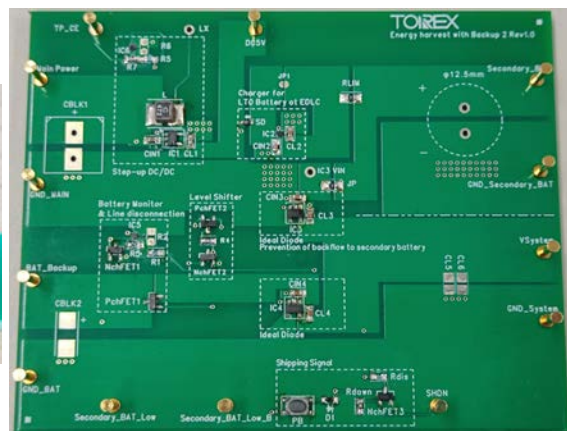
We provide [evaluation boards](#) for various ICs as [free of charge](#).

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



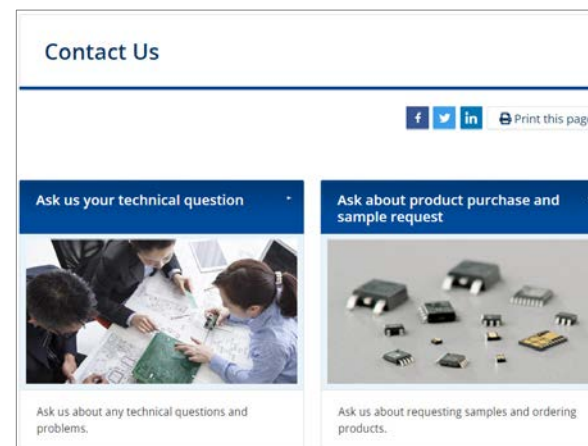
Example of application circuit board

■ 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](#)”.



■ Torex Longevity Program(TLP)

Torex operates the “[Torex Longevity Program \(TLP\)](#)” to allow customers with long product life cycles to confidently select products.

TLP maintains the products supply for at least 10 years.

[Product WEB Page](#)

[DC/DC Converters](#)

XC9285 Series

Active

New

Torex Longevity Program(TLP)

TLP product

■ Online Purchase of ICs and Evaluation Boards



(USA / Japan Only)

■ Design Support Tools

●Web DC/DC Simulation

From the website : “Design Tools” > “DC/DC Simulation”

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

●Web DC/DC Measured Electrical Characteristics Comparison Tool

From the website : “Design Tools”

> “DC/DC Measured Electrical Characteristics Comparison Tool”

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

●Spice Model

From the website : “Design Tools” > “SPICE Model”

URL : <https://product.torexsemi.com/en/design-support#spicemodel>

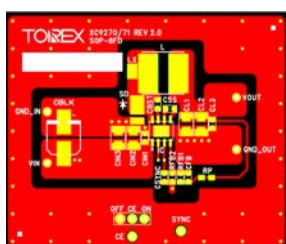
●ECAD Model

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	
XC8110AAQ10R-G	Sample Request (in stock now)	CE High Active	Ideal Diode function Equipped	WLP-4-02	
XC8110AAQ18R-G	Sample Request (in stock now)	CE High Active	Ideal Diode function Equipped	USP-6B06	
XC8110AAQ1MR-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://product.torexsemi.com/en/contact-us/technical-inquiry>



■ Evaluation Board Requests

From the website : “Sample and Buy” > “About applying for Evaluation Board”

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

■ Technical Information / FAQ

From the website : “Technical Information”

URL : <https://product.torexsemi.com/en/technical-support>

■ Download PDF of this brochure

From the website : “Home” > “Selection Guide” > “Product Brochure Download”

URL : <https://product.torexsemi.com/en/selection-guide/catalog>

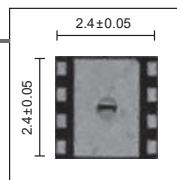
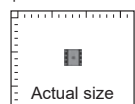
Package Lineup

Product Model No.	h=Hight (mm) p=Pin Pitch (mm)	Product Magnified View Photograph (Unit: mm)	Product Actual Size Photograph
CL-2025	h=1.04 MAX. p=0.55	2.0±0.1 2.5±0.1	Actual size
CL-2025-02	h=1.04 MAX. p=0.55	2.0±0.1 2.5±0.1	Actual size
CL-2025-03	h=1.04 MAX. p=0.55	2.0±0.1 2.5±0.1	Actual size
CL-3225	h=2.0 MAX. p=0.5/0.4	2.5±0.05 3.2±0.05	Actual size
DFN1010-4C	h=0.6 MAX. p=0.65	1.0±0.05 1.0±0.05	Actual size
DFN1010-4D	h=0.4 MAX. p=0.65	1.0±0.05 1.0±0.05	Actual size
DFN1515-6A	h=0.375±0.05 p=0.5	1.5±0.05 1.5±0.05	Actual size
DFN1820-6G	h=0.6 MAX. p=0.5	1.8±0.05 2.0±0.05	Actual size
DFN3020-8D	h=0.8 MAX. p=0.65	2.0±0.1 3.0±0.1	Actual size
DFN3030-12A	h=0.8 MAX. p=0.5	3.0±0.1 3.0±0.1	Actual size
HSOP-8N	h=1.50±0.1 p=1.27	5.2±0.3 6.2±0.3	Actual size
LGA-4B01	h=0.3 MAX. p=0.4	0.75±0.05 0.75±0.05	Actual size
LGA-6B01	h=0.3 MAX. p=0.4	1.2 ± x.xx 1.2 ± x.xx	Actual size
LGA-8B01	h=0.3 MAX. p=0.4/0.485	1.2 ± 0.05 1.4 ± 0.05	Actual size
MSOP-8A	h=1.22 MAX. p=0.65	4.9±0.1 3.0±0.1	Actual size
MSOP-10	h=1.16 MAX. p=0.5	4.9±0.2 3.0±0.1	Actual size
SOP-8FD	h=1.55±0.2 p=1.27	6.0±0.2 4.9±0.1	Actual size
SOT-223	h=1.8 MAX. p=2.3	6.6±0.3 7.0±0.3	Actual size
SOT-23	h=1.3 MAX. p=1.9	2.9±0.2 2.8±0.2	Actual size
SOT-25	h=1.3 MAX. p=0.95	2.9±0.2 2.8±0.2	Actual size
SOT-26	h=1.3 MAX. p=0.95	2.9±0.2 2.8±0.2	Actual size
SOT-26W	h=1.3 MAX. p=0.95	2.9±0.2 2.8±0.2	Actual size
SOT-89	h=1.6 MAX. p=1.5	4.5±0.1 4.0±0.25	Actual size
SOT-89-5	h=1.5 MAX. p=1.5	4.5±0.1 4.6 MAX	Actual size
SSOT-24	h=1.1 MAX. p=1.3	2.0±0.1 2.1±0.3	Actual size
TO-252	h=2.4 MAX. p=2.29	6.35 - 6.75 9.35 - 10.45	Actual size
TSSOP-16	h=1.4 MAX. p=0.65	6.4±0.2 5.1±0.2	Actual size
USP-3	h=0.6 MAX. p=0.6	1.2±0.08 1.2±0.08	Actual size
USP-4/USP-4D	h=0.6 MAX. p=0.6	1.6±0.05 1.2±0.05	Actual size
USP-6B/USP-6C	h=0.6 MAX. *(0.7 MAX) p=0.5	2.0±0.05 1.8±0.05	Actual size
USP-6B06	h=0.33 MAX. p=0.5	1.8±0.05 1.50±0.05	Actual size
USP-6B07	h=0.33 MAX. p=0.55	2.0±0.05 1.8±0.05	Actual size
USP-6EL	h=0.4 MAX. p=0.55	2.0±0.05 1.8±0.05	Actual size
USP-8	h=0.6 MAX. p=0.65	2.5±0.05 2.7±0.05	Actual size
USP-8B04	h=0.70 ± 0.05 p=0.43	1.5±0.05 2.25 ± 0.05	Actual size

*USP-6B

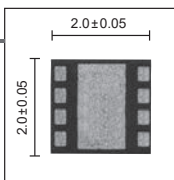
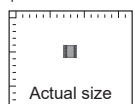
USP-8B05

h=0.33±0.3
p=0.6



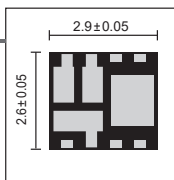
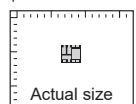
USP-8B06

h=0.33 MAX.
p=0.5



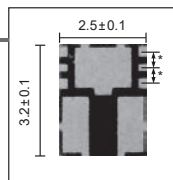
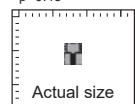
USP-8B10

h=0.33 MAX.
p=0.65



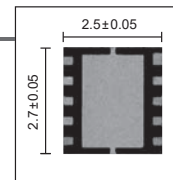
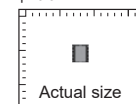
USP-9B01

h=1.0±0.05
*p=0.45



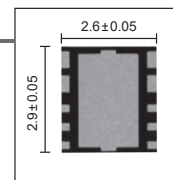
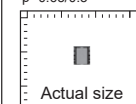
USP-10

h=0.6 MAX.
p=0.5



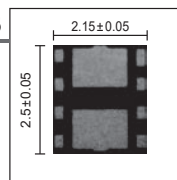
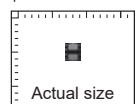
USP-10B

h=0.6 MAX.
p=0.65/0.5



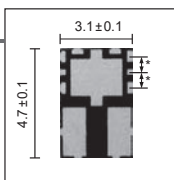
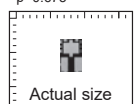
USP-10B03

h=1.0±0.05
p=0.65



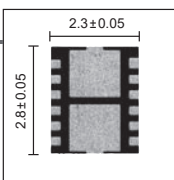
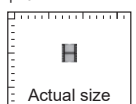
USP-11B01

h=1.35 MAX.
*p=0.675



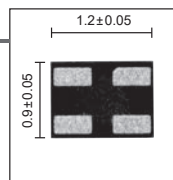
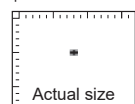
USP-12B01

h=0.6 MAX.
p=0.4



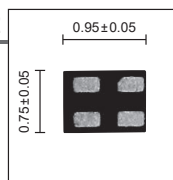
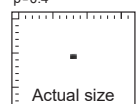
USPN-4

h=0.4 MAX.
p=0.55



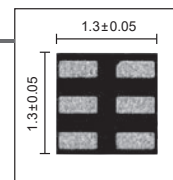
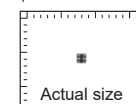
USPN-4B02

h=0.4 MAX.
p=0.4



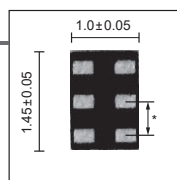
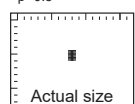
USPN-6

h=0.4 MAX.
p=0.45



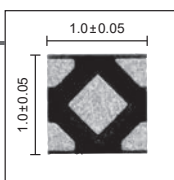
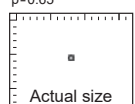
USPN-6B01

h=0.4 MAX.
*p=0.5



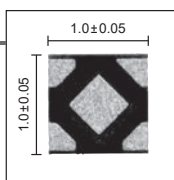
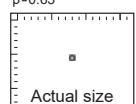
USPQ-4B03

h=0.4 MAX.
p=0.65



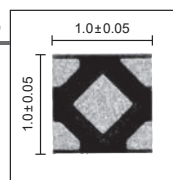
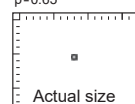
USPQ-4B04

h=0.6 MAX.
p=0.65



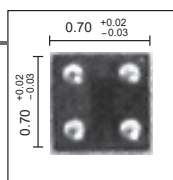
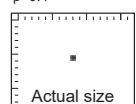
USPQ-4B05

h=0.33 MAX.
p=0.65



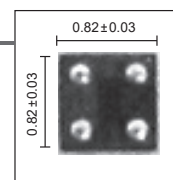
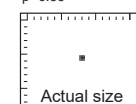
WLP-4-01

h=0.2 MAX.
p=0.4



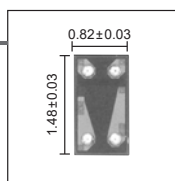
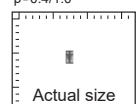
WLP-4-02

h=0.5 MAX.
p=0.35



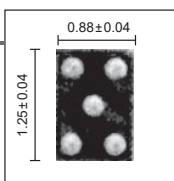
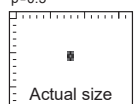
WLP-4-04

h=0.495 MAX.
p=0.4/1.0



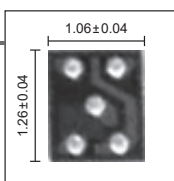
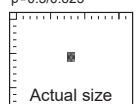
WLP-5-02

h=0.4 MAX.
p=0.5



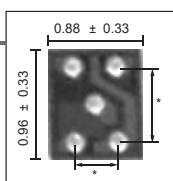
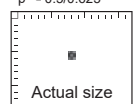
WLP-5-03

h=0.4 MAX.
p=0.5/0.625



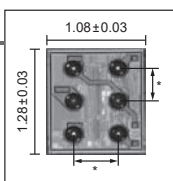
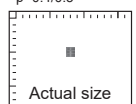
WLP-5-08

h=0.33 MAX.
*p=0.5/0.625



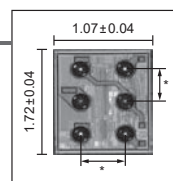
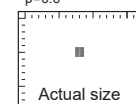
WLP-6-01

h=0.4 MAX.
*p=0.4/0.5



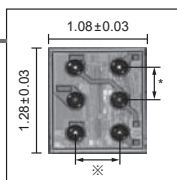
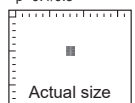
WLP-6-03

h=0.33 MAX.
*p=0.6



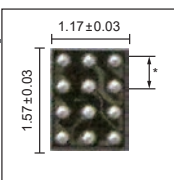
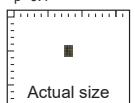
WLP-6-05

h=0.4 MAX.
*p=0.4/0.5



WLP-12-01

h=0.33 MAX.
*p=0.4



Head office

3F DAIHO ANNEX 1-24-1 Shinkawa, Chuo-ku, Tokyo 104-0033 Japan
TEL:+81-3-6222-2851 FAX:+81-3-6222-2892

Sales Contacts

Tokyo Sales office

6F DAIHO ANNEX 1-24-1 Shinkawa, Chuo-ku, Tokyo 104-0033 Japan
Tel:+81-3-6222-2860 Fax:+81-3-6222-2894

Kansai sales office

1-9-23 Esaka-cho, Suita, Osaka 564-0063 Japan
Tel:+81-6-7670-1114 Fax:+81-6-7670-0768

Central Japan sales office

605 NK Marunouchi Bldg., 2-17-13 Marunouchi, Naka-ku, Nagoya, Aichi
460-0002 Japan
Tel:+81-52-766-3183

TOREX SEMICONDUCTOR (S) PTE LTD

60 Kaki Bukit Place Eunos Techpark #05-17 Singapore 415979
Tel:+65-6745-1352 Fax:+65-6741-0389

TOREX USA Corp.

2 Venture Suite 470 Irvine, CA 92618
Tel:+1-949-261-2022 Fax: +1-949-261-2066 <https://www.torex-usa.com/>

TOREX SEMICONDUCTOR EUROPE LIMITED

Unit 1, The Courtyard Whitwick Business Park Stenson Road Coalville Leicestershire LE67 4JP UK
Tel:+44-1530-510190 Fax:+44-1530-512400 <https://www.torex-europe.com/>

TOREX SEMICONDUCTOR DEVICE (Shanghai) CO., LTD.

Room 401, West Tower, Sun Plaza, No.88 Xianxia Road, Shanghai, China
Tel:+8621-6209-1166 Fax:+8621-3255-0536

TOREX SEMICONDUCTOR DEVICE (Shanghai) CO., LTD. SHENZHEN OFFICE

RM1705, E BLDG of BAONENG Center, No.3008, North BAOAN Road, LUOHU District, Shenzhen,
Guangdong, China
Tel:+86-755-8326-6338 Fax:+86-755-8326-6383

TOREX (HONG KONG) LIMITED

Unit 505, Energy Plaza, 92 Granville Road, TST East, Kowloon, HK
Tel:+852-2312-7489 Fax:+852-2312-7589

TOREX SEMICONDUCTOR TAIWAN LTD.

11F-1, No21, Sec.6, Zhong Xiao E. Rd., Taipei City 11575, Taiwan
Tel:+886-2-27 89-2089 Fax:+886-2-2789-0799