

# TOREX SEMICONDUCTOR

## NEW PRODUCT CATALOG 2010



## Global Network

TOREX SEMICONDUCTOR  
—supplying cutting edge,  
high performance power supply ICs  
to every corner of the world.

# TOIREX

A specialist in Analog power supply IC design,  
development and manufacturing.



## Marketing & Development

Quickly turning designers' ideas  
into reality.  
Providing innovative solutions  
by combining creativity  
with marketing expertise.

TOREX SEMICONDUCTOR  
was established in 1995 and  
has been meeting worldwide  
market demands ever since,  
by offering analog CMOS ICs  
that provide low current  
consumption, low operating  
voltage and are supplied in ultra  
miniature packages.

TOREX is unique in that it  
focuses its leading edge CMOS  
analog technology on  
battery-powered applications.

Our facilities, located not only  
in Japan, but throughout Asia,  
Europe and USA ensure that  
TOREX maintains a high level  
of communication with  
customers throughout the  
world, enabling us to deliver  
solutions that are both  
innovative and appropriate to  
our customer's needs.

## Torex Products

High quality,  
high precision products  
to support  
new innovation.

## Quality Management

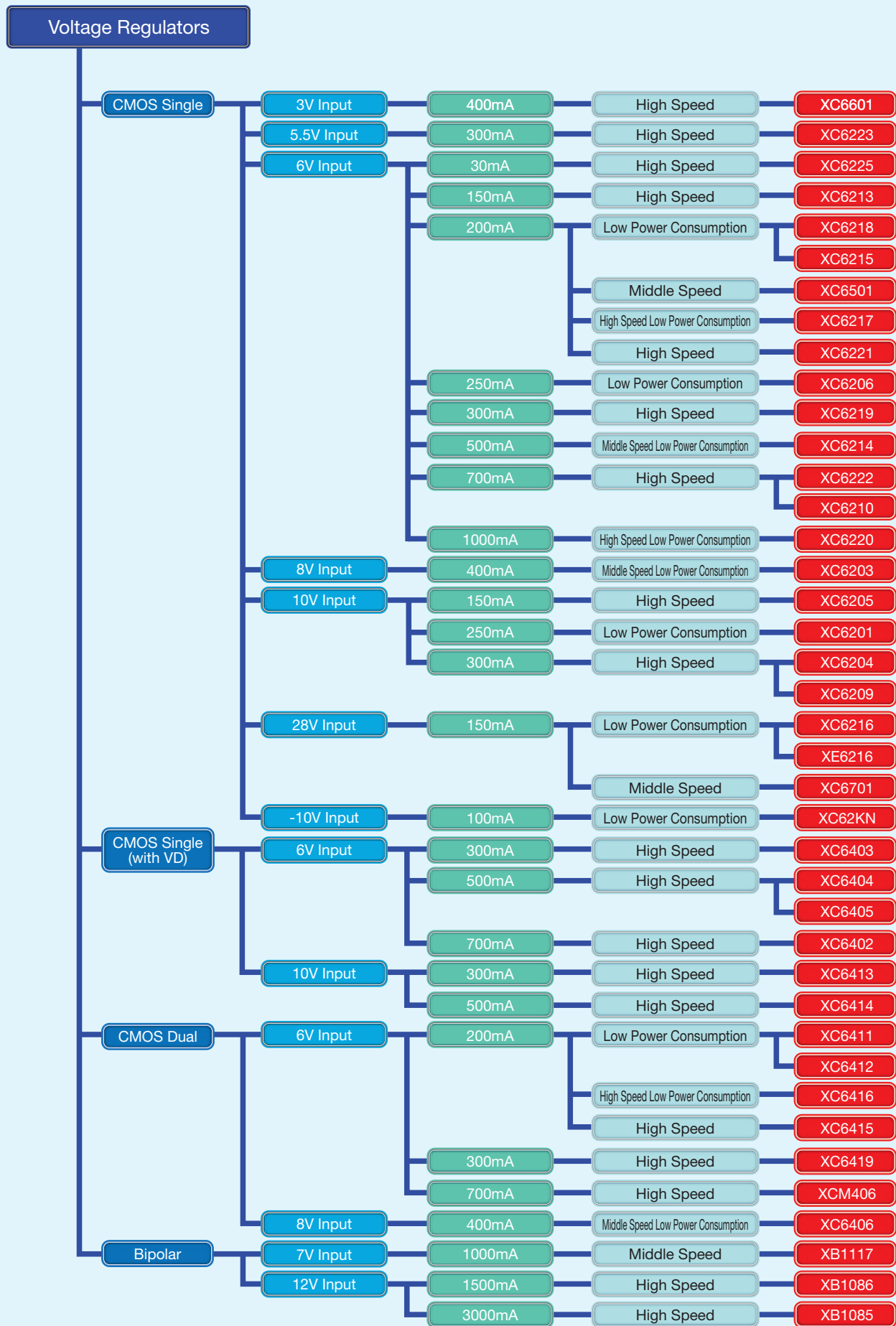
Earning Customers trust with the world's  
highest levels of quality control  
and environmentally friendly products.

# TOREX SEMICONDUCTOR

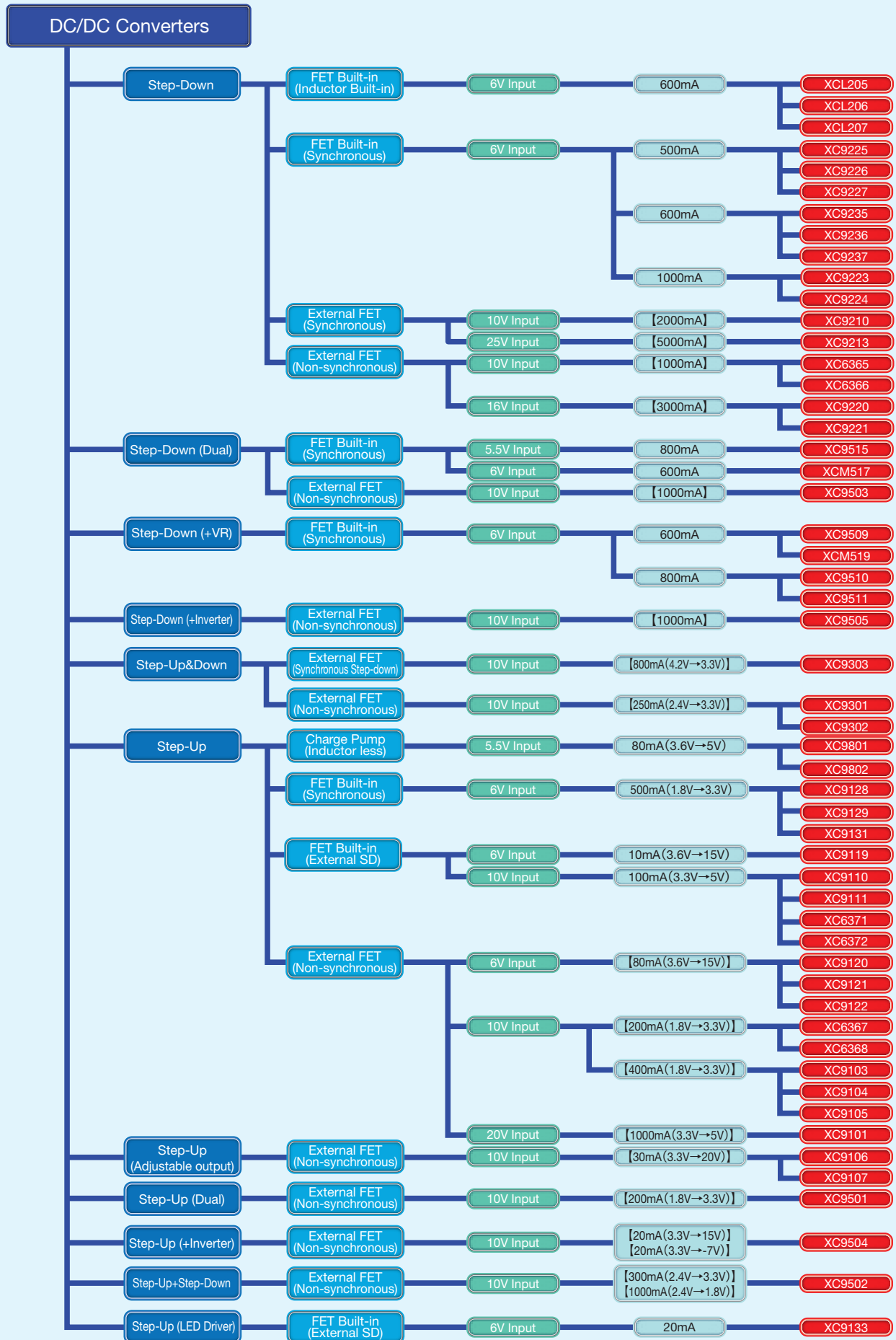
## NEW PRODUCT CATALOG 2010

### INDEX

Voltage Regulator Table .....	2
DC/DC Converter Table .....	3
Voltage Regulator Selection Guide .....	4
<b>NEW</b> Inductor Built-in micro Step-down DC/DC Converters XCL205/XCL206 Series ...	6
<b>NEW</b> Load Disconnection Function Step-Up DC/DC Converter XC9131 Series .....	7
<b>NEW</b> 300mA High Speed LDO Voltage Regulator XC6223 Series .....	8
<b>NEW</b> Small 400mA Load Switch with 1.2V Input XC8102 Series .....	9
<b>NEW</b> 400mA Low Voltage Input LDO with Bias Power Drive Pin XC6601 Series ....	10
<b>NEW</b> 600mA Step-down DC/DC Converter with 400mA LDO output XCM519 Series ...	11
<b>NEW</b> Voltage Detector with Delay Time Adjustable (Separated Sense Pin) XC6118 Series ...	12
<b>NEW</b> Voltage Detector with Delay Time Adjustable (Small Package) XC6119 Series ...	13
<b>NEW</b> 200mA Dual LDO Regulator XC6415 Series .....	14
<b>NEW</b> 800mA Dual Step-down DC/DC Converter XC9515 Series .....	14
<b>NEW</b> Ultra Small Package Schottky Barrier Diode XBS013R1DR-G/XBS013V1DR-G ...	15
<b>NEW</b> CMOS Low Noise Amplifier XC2404A816UR-G .....	16
<b>NEW</b> High Accuracy Temperature Sensor XC3101 Series .....	17
MCM IC .....	18
PACKAGE INFORMATION .....	20



\* High Speed Type: PSRR $\geq$ 60dB@1kHz, Middle Speed Type: PSRR $\geq$ 40dB@1kHz, Low Power Consumption Type: I<sub>Q</sub> $\leq$ 10 $\mu$ A



\* The value of output current is dependent on the performance of external FET.

# High Speed Dual LDO

## Flow of product development

Output Voltage	Previous generation	Current generation	Newest model	Features of newest model
150mA		XC6401		
200mA			XC6415 XC6416	High Speed LDO Green Operation
300mA			XC6419	ch1=300mA/ch2=100mA
700mA		XCM406		Multi Chip Module

## Package and output current of newest models

	200mA	300mA	700mA
USPN-6 (1.3×1.3)	XC6415		
USP-6C (1.8×2.0)	XC6415 XC6416	XC6419*	
USP-12B01 (2.3×2.8)			XCM406
SOT-26 (2.8×2.9)	XC6415 XC6416	XC6419*	

\* Ch1 of the XC6419 is 300 mA, however, ch2 is 100 mA.

# High Speed Single LDO

## Flow of product development

Output Voltage	Previous generation	Current generation	Newest model	Features of newest model
150mA		XC6213	(XC6224) XC6701B	3.6V Input, High Speed 28V Input, Middle and High Speed
200mA		XC6221	(XC6226) XC6217 XC6501	High Speed LDO Green Operation No Outout Capacitor, Middle and High Speed
300mA	XC6204 XC6209	XC6219	XC6223	High Speed
400mA			XC6601	Low Voltage (V <sub>BIAS</sub> Pin)
700mA		XC6210	XC6222	High Speed LDO
1000mA			XC6220	Green Operation

\* The XC6224 and XC6226 are under development as of December 2009.

## Package and output current of newest models

	150mA	200mA	300mA	400mA	700mA	1000mA
USPQ-4B03 (1.0×1.0)		(XC6226)	XC6223			
USP-6C (1.8×2.0)				XC6601	XC6222	XC6220
SSOT-24 (2.0×2.1)	(XC6224)	XC6221 (XC6226) XC6217 XC6501	XC6223			
SOT-25 (2.8×2.9)	(XC6224)	XC6221 (XC6226) XC6217 XC6501	XC6223	XC6601	XC6222	XC6220
SOT-89-5 (4.35×4.5)			XC6223	XC6601	XC6222	XC6220

\* The XC6224 and XC6226 are under development as of December 2009.



# 3-Terminal Regulators

## Flow of product development

Output Voltage	Previous generation	Current generation	Newest model	Features of newest model
150mA	XC6202 (20V Input, No Thermal Shutdown)		XC6216D XC6701D	28V Low Power Supply, 5μA, Thermal Shutdown 28V Middle and High Speed, Thermal Shutdown
200mA			XC6215P XC6218 XC6501P	Low Power Supply 0.8μA Low Power Supply 1μA No Outout Capacitor
250mA		XC6206 XC6201		Low Power Supply 1μA 10V Input
400mA	XC6203 (No Thermal Shutdown)			
500mA			XC6214	Thermal Shutdown
1000mA			XB1117	Thermal Shutdown
1500mA			XB1086	Thermal Shutdown
3000mA			XB1085	Thermal Shutdown

## Package and output current of newest models

	150mA	200mA	250mA	500mA	1A	1.5A	3A
USP-3 (1.2×1.2)		XC6215P XC6218 XC6501P					
USP-6B (1.8×2.0)		XC6206	XC6201				
SSOT-24 (2.0×2.1)		XC6218					
SOT-23 (2.8×2.9)		XC6206					
SOT-25 (2.8×2.9)			XC6201				
SOT-89 (4.0×4.5)	XC6216D XC6701D	XC6206	XC6201	XC6214			
SOT-223 (6.6×7.0)	XC6216D XC6701D				XB1117		
TO-252 (6.55×9.9)	XC6216D XC6701D			XC6214		XB1086	XB1085

High Voltage  
Regulator 28V  
Input

CMOS Low Power Supply LDO

Bipolar High Speed

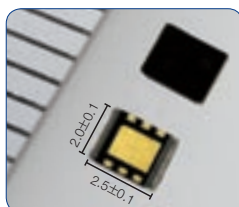
Inductor Built-in micro Step-down DC/DC Converters

# XCL205/XCL206 Series

NEW

Battery life can be extended by changing an LDO regulator to a DC/DC.

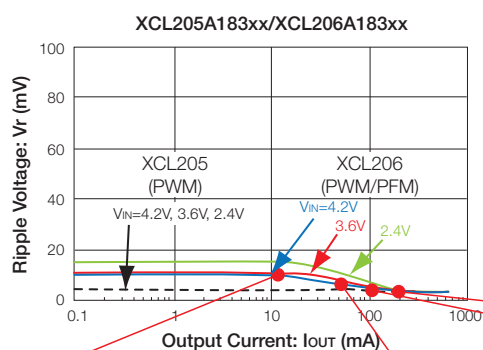
Like an LDO, a micro DC/DC has a simple circuit configuration by just adding two external capacitors.



Package appearance

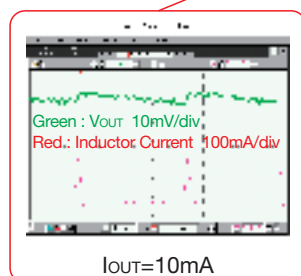
## Features

Input Voltage Range	2V~6V
Output Voltage	0.8V~4.0V (0.05V increments)
Maximum Output Current	600mA
High Efficiency	82%@VIN=3.6V→VOUT=1.8V
Oscillation Frequency	3MHz
External capacitor	CIN=4.7μF, CL=10μF
Product select	XCL205 PWM, Oscillation Frequency 3MHz
	XCL206 PWM/PFM Auto, Iq=21μA
Package Size	2.5×2.0×1.0

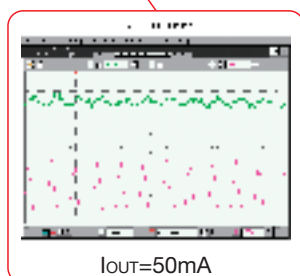


POINT

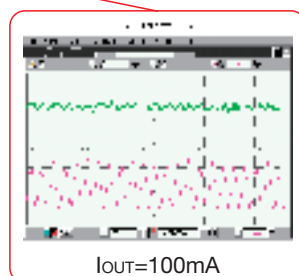
·Very small output voltage ripple.



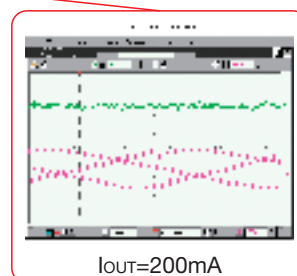
Iout=10mA



Iout=50mA

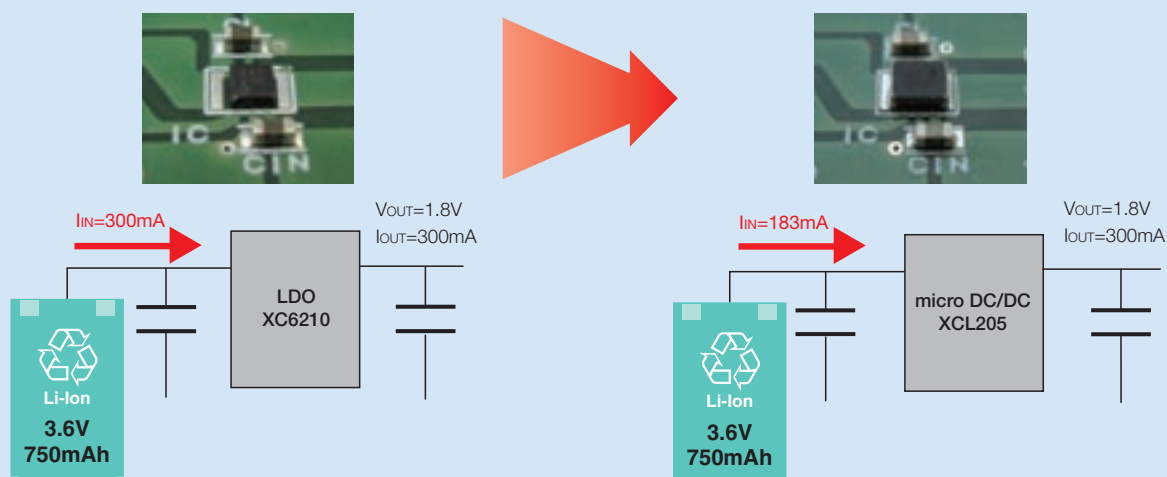


Iout=100mA



Iout=200mA

Extends a battery life of 2.5 hours (750/300) to 4 hours (750/183).



An efficiency of 82% enables a substantial reduction of current drawn from the battery.  
Formula:  $I_{IN} \times 3.6 \times 0.82 = 0.3 \times 1.8$



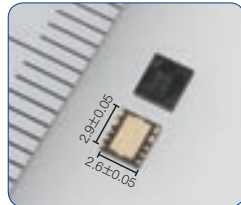
## Load Disconnection Function Step-Up DC/DC Converter

# XC9131 Series

NEW

The XC9131 Series of high-efficiency synchronous step-up DC/DC converters incorporate a load cut-off function and an internal FET.

Converter can start from a low voltage of 0.9V and operate all the way down to 0.65V allowing product to use the complete range of useful battery life.

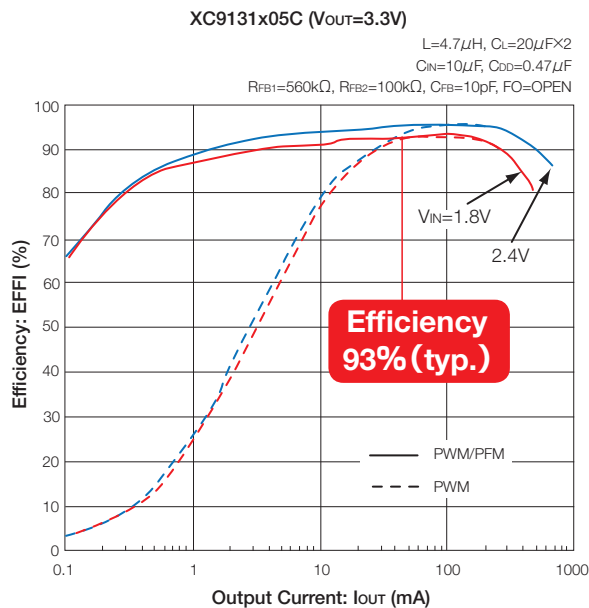


USP-10B

### Features

Input Voltage Range	0.65V~5.5V
Output Voltage Range	1.8V~5.0V (0.1V increments) ( $V_{FB}=0.50V \pm 0.01V$ Set up with external components)
Output Current	500mA@ $V_{OUT}=3.3V$ , $V_{IN}=1.8V$ (TYP.)
Oscillation Frequency	1.2MHz (Accuracy $\pm 15\%$ )
Package	USP-10B
Thermal shutdown, Over-current limit protection circuits built-in	
Soft-start, CL Discharge, Flag-out function	

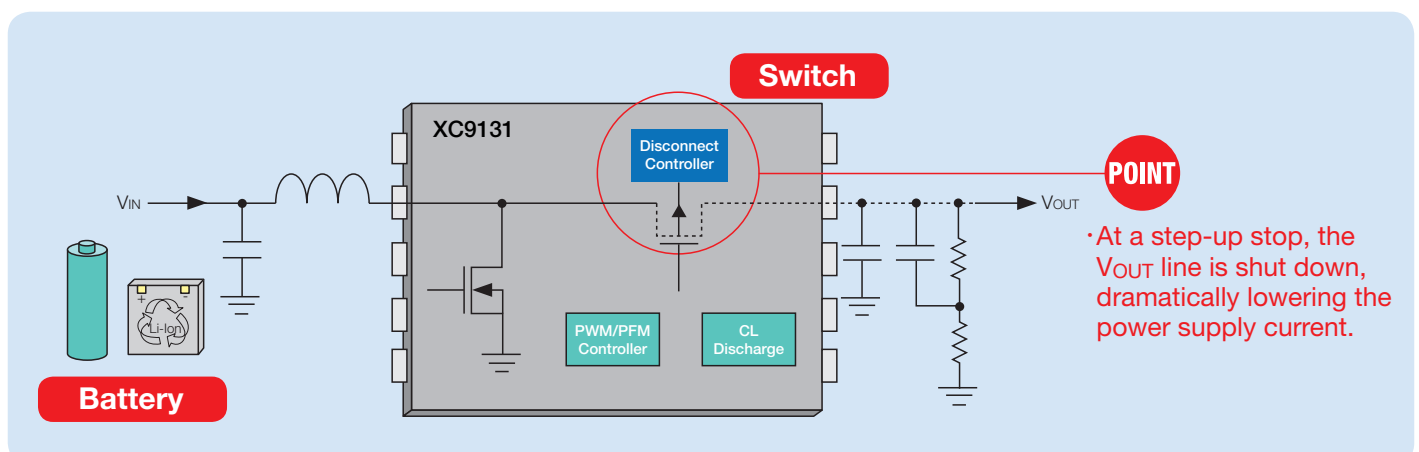
### Efficiency Performance



POINT

- Internal 1 A,  $0.2\Omega$  on-resistance driver transistor
- 1.2 MHz switching frequency allows selection of a small inductor

### Load Disconnection Function

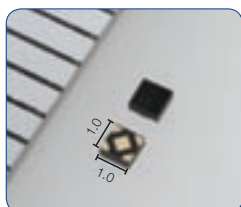


## 300mA High Speed LDO Voltage Regulator

# XC6223 Series

NEW

The XC6223 Series of high-speed LDO regulators has an output of 300mA. Output voltage accuracy is  $\pm 1\%$ , enabling high-accuracy output and high ripple rejection. An improved load transient response substantially reduces dropping due to sudden load changes and thereby contributes to stable load regulation. The reception area of communication devices is enlarged, helping to increase the reliability of devices with severe voltage changes.



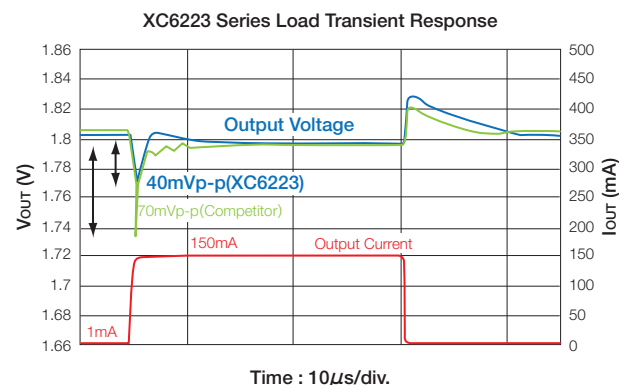
USPQ-4B03

### Features

Maximum Output Current	300mA (400mA Limit TYP.)
Dropout Voltage	200mV@ $I_{OUT}=300mA$ ( $V_{OUT}=3.0V$ )
Operating Voltage Range	1.6V~5.5V
Output Voltage	1.2~4.0V (0.05V increments)
Output Voltage Accuracy	$\pm 1\%$ ( $2.0 < V_{OUT} \leq 4.0V$ ) $\pm 20mV$ ( $1.2 \leq V_{OUT} \leq 1.95V$ )
High Ripple Rejection	80dB@f=1kHz
Stand-by Current	0.01 $\mu A$ (TYP.)
Protection Circuit	Short Circuit Protection, Thermal Shutdown, Inrush Current Protection
ON/OFF Function	CL High Speed Discharge
External capacitor	1.0 $\mu F$ (Ceramic capacitor)
Packages	USPQ-4B03, SSOT-24, SOT-25, SOT-89-5

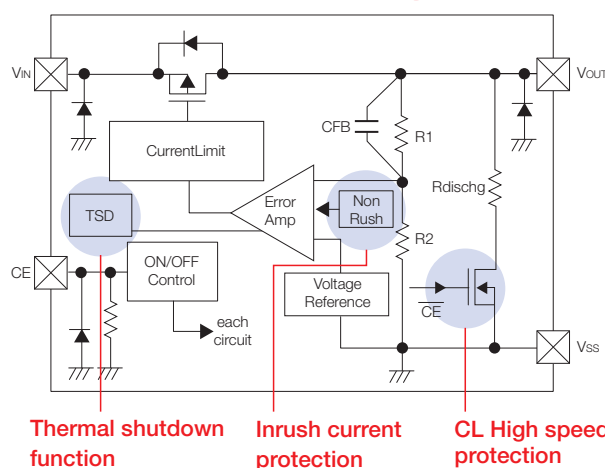
### Excellent Load Transient Response

$T_a=25^\circ C$ ,  $t_r=t_f=0.5\mu s$   $C_{IN}=1\mu F$ ,  $C_L=1\mu F$  (ceramic)



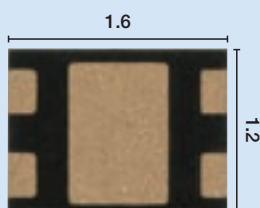
### Block Diagram

**POINT** Multiple built-in functions

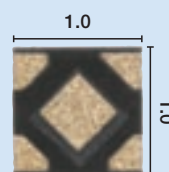


### Ultra small package

An ultra-small 1 mm × 1 mm, 0.6 mm thickness package (USPQ-4B03) helps reduce mounting area by 48% over previous packages, making these regulators ideal for portable products and modules that require a compact design. Other regular packages such as the SSOT-24, SOT-25, and SOT-89-5 are also available, allowing selection to match the application.



Conventional Solution  
USP-4



New Package  
USPQ-4B03

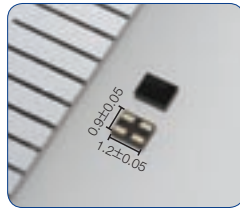
Small 400mA Load Switch with 1.2V Input

# XC8102 Series

NEW

The XC8102 Series of low-on resistance load switch ICs has an internal Pch MOS FET and an ON/OFF function.

Load switching can be accomplished by power line distribution switching at the CE pin, enabling high-efficiency power supply to the device. This product makes a big contribution to longer battery usage time, the source of power in portable devices.

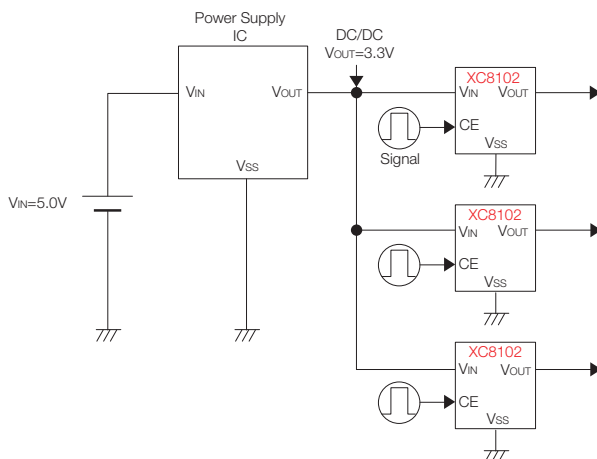


USPN-4

## Features

ON Resistance	0.35Ω@VIN=2.9V (TYP.)
Input Voltage Range	1.2V~6.0V
Power Consumption	3.6μA@VIN=2.9V
Standby Current	0.1μA
Protection Circuit	Protection Circuit (Output Current) 480mA (TYP.) (1.8≤VIN≤6.0V) Short-circuit Protection, Short current 30mA (TYP.)
ON/OFF Function	Active High High-Speed Discharge Function
Packages	USP-4, SSOT-24, SOT-25, USPN-4

## Typical Application Circuit



## Surprising 1.2 V drive!



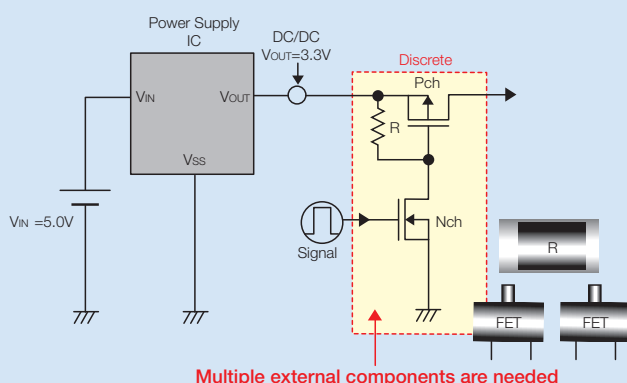
## POINT

- Low voltage operation from 1.2V is available, which is difficult to achieve with discrete solutions.
- Fewer components save space to reduce total solution cost.
- Internal over-current protection circuit and feedback circuit.
- Small package

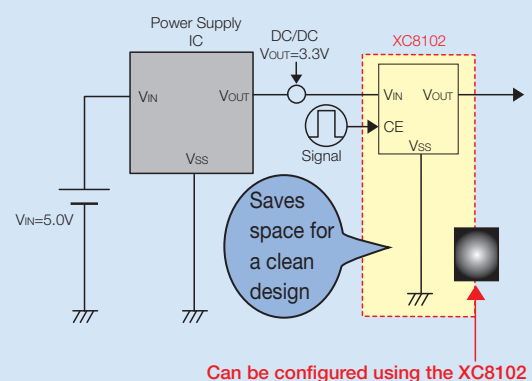
## Low cost, saves space

Compared to a switch circuit consisting of discrete components, the TOREX XC8102 enables a reduction of both mounting space and the number of components, and is ideal for applications where cost and space are restricted. In addition, a CL discharge function (which is complicated when made from discrete components) and an over-current protection function are built-in, enabling a simpler and more compact power circuit design.

## Discrete Component Solution



## XC8102 Solution



400mA Low Voltage Input LDO with Bias Power Drive Pin

# XC6601 Series

NEW

Capable of operation at an ultra-low on-resistance even at low output voltages, the XC6601 Series enables high-efficiency current output. This makes this series ideal for applications that require a low input voltage and low input/output voltage differential operation.



Portable Gaming



Head Set



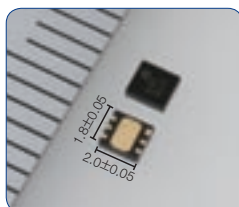
Mobile Phone



Set Top Box



Notebook PC

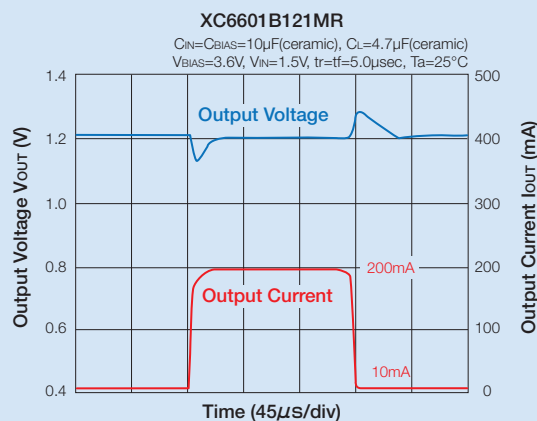
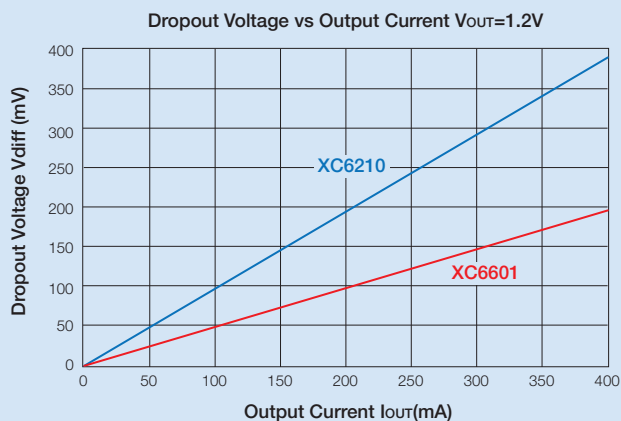
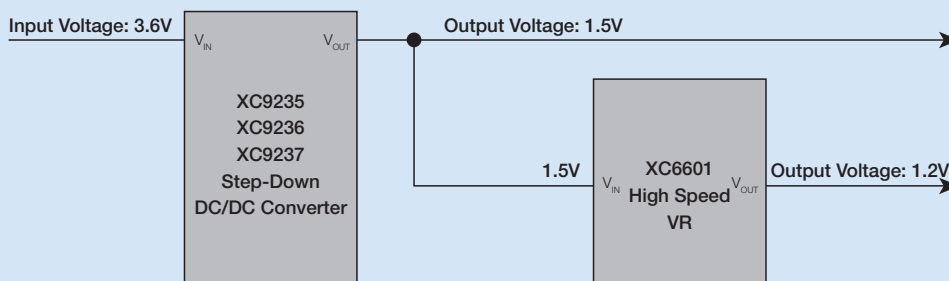


USP-6C

## Features

Maximum Output Current	400mA (Limit:550mA TYP.)
Dropout Voltage	38mV@I <sub>OUT</sub> =100mA (TYP.) (V <sub>BIAS</sub> - V <sub>OUT</sub> =2.4V)
Bias Voltage Range	2.5V~6.0V (V <sub>BIAS</sub> - V <sub>OUT</sub> ≥1.2V)
Input Voltage Range	1.0V~3.0V (V <sub>IN</sub> ≤V <sub>BIAS</sub> )
Output Voltage Range	0.7V~1.8V (0.05V increments)
Soft-Start Time	240μs@V <sub>OUT</sub> =1.2V (TYP.)
Packages	USP-6C, SOT-25, SOT-89-5

Makes it possible to create a circuit with high efficiency and a good load transient response at low voltages.

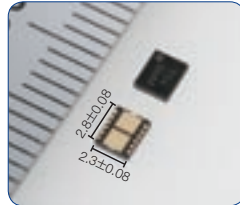
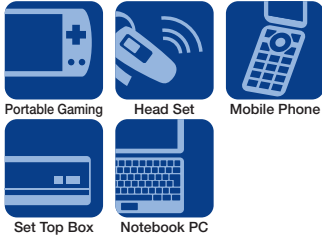


600mA Step-down DC/DC Converter with 400mA LDO output

# XCM519 Series

NEW

Internal series connection of a Step-down DC/DC converter followed by a voltage regulator enables support of low noise, low output voltage with high efficiency.



USP-12B01

Small Package  
USP-12B01

## Primary voltage combination

DCOUT	VROUT	P/N
1.8V	1.2V	XCM519BD01DR-G
1.8V	1.5V	XCM519BD02DR-G
1.5V	1.2V	XCM519BD03DR-G

## Features

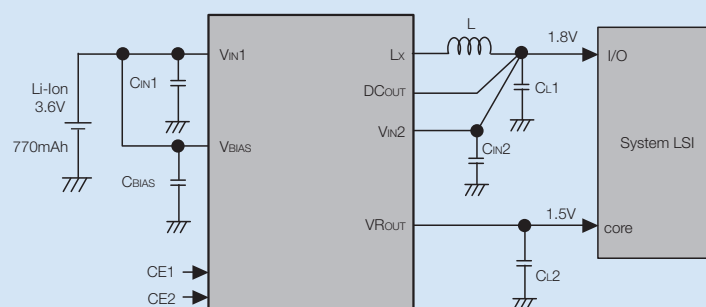
<DC/DC Converter Block>	
Input Voltage Range	2.7V~6.0V
Output Voltage Range	1.5V, 1.8V
High Efficiency	92% (TYP.)
Output Current	600mA (MAX.)
Oscillation Frequency	1.2MHz, 3.0MHz (±15%)
<Regulator Block>	
Maximum Output Current	400mA (500mA Limit TYP.)
Dropout Voltage	35mV@I <sub>OUT</sub> =100mA (TYP.) (V <sub>BIAS</sub> -V <sub>ROUT</sub> =2.4V)
Bias Voltage Range	2.5V~6.0V (V <sub>BIAS</sub> -V <sub>ROUT</sub> =0.9V)
Input Voltage Range	1.0V~3.0V (V <sub>IN2</sub> ≤V <sub>BIAS</sub> )
Output Voltage Range	1.0V, 1.2V, 1.5V
Package	USP-12B01

## Replacing an LDO regulator with the XCM519 (DC/DC + LDO) enables a substantial increase in battery life.

	Processor Mode	Off	Wait	Run1	Run2	Full Load
V <sub>IN</sub> =3.6V Li-ion 770mAh I/O=1.8V Core=1.5V	Processor Core Current (mA)	0.1	1	10	100	250
	% time	50	5	10	15	20
	Average Output Current	66.1mA				
Dual LDO	LDO only Efficiency (%)	42	42	42	42	42
	Average Battery Current	66.49mA				
XCM519	DC/DC+LDO Efficiency (%)	51	66	85	94	93
	Battery Current (mA)	0.08	0.63	4.90	44.33	112.01
	Average Battery Current	29.61mA				

Battery Life  
11.58 hours

Battery Life  
26.00 hours



Voltage Detector with Delay Time Adjustable (Separated Sense Pin)

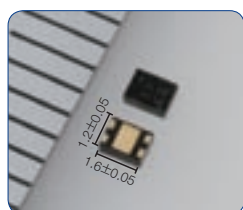
# XC6118 Series

NEW

The XC6118 Series separates the sense pin from the power input pin, making it possible to detect the voltage without causing the unstable IC operation that occurs when the voltage falls in the detected power line.

External resistors can be used to set a wide range of detection voltages as needed for the conditions of use, and any detection voltage can be supported.

These reset ICs are ideal for applications such as microcontroller rest and logic circuits, as well as battery voltage monitoring.



USP-4

**Ideal for microcontroller reset and battery voltage monitoring**

## Features

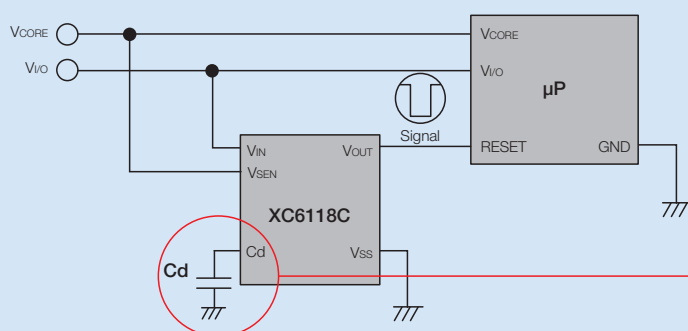
High Accuracy	$\pm 2\%$ (Detect Voltage $\geq 1.5V$ ) $\pm 30mV$ (Detect Voltage $< 1.5V$ )
Low Power Consumption	$0.4\mu A$ (Detect, $V_{IN}=1.0V$ ) (TYP.) $0.8\mu A$ (Release, $V_{IN}=1.0V$ ) (TYP.)
Fixed Detect Voltages	$0.8V \sim 5.0V$ (0.1V increments)
Operating Voltage Range	$1.0V \sim 6.0V$
Temperature Characteristics	$\pm 100ppm/^{\circ}C$ (TYP.)
Output Configuration	CMOS (The High voltage of the output signal is the same as $V_{IN}$ ) N-channel open drain (External pull-up resistor)
Operating Temperature Range	$-40^{\circ}C \sim +85^{\circ}C$
Sense Pin	Power supply separation
Built-in delay time	Release delay time adjustable
Packages	USP-4, SOT-25

POINT

• 33% less supply current during detection (compared to previous TOREX product)

## Application Circuit 1

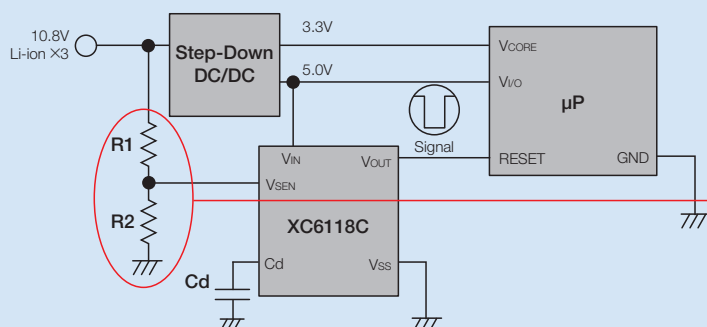
The reset signal high level is the same as the element to which  $V_{IN}$  is connected.



POINT

• Built-in delay circuit  
• The delay time can be set by external capacitor.

## Application Circuit 2



POINT

• Adding external resistors enable setting detect voltages separately beyond the maximum operation voltage range.



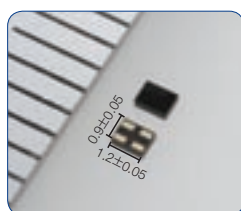
Voltage Detector with Delay Time Adjustable (Small Package)

# XC6119 Series

NEW

The XC6119 Series of voltage detectors with an internal delay circuit achieves low power consumption. One external capacitor can be used to set any release delay, enabling easy power circuit design with few peripheral components. This makes it possible to save circuit space and power.

The XC6119 Series achieves lower power consumption than previous products, and is further enhanced by the use of a small new package.



Ultra Small Package  
USPN-4

New  
Package

## Features

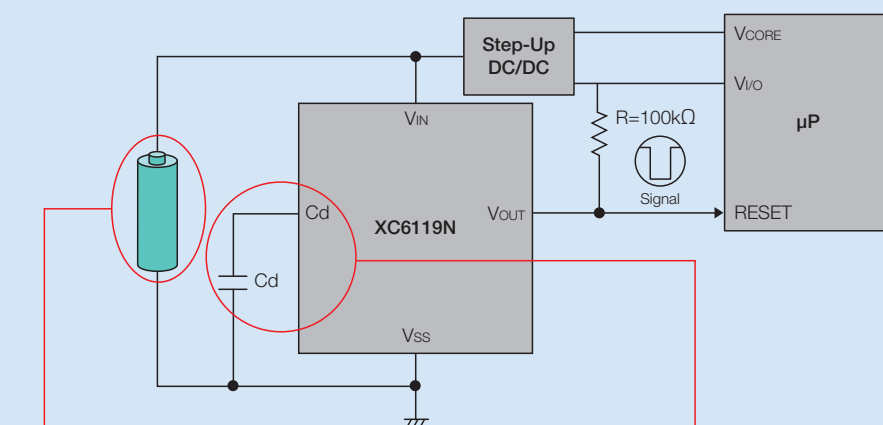
High Accuracy	$\pm 2\%$ (Detect Voltage $\geq 1.5\text{V}$ ) $\pm 30\text{mV}$ (Detect Voltage $< 1.5\text{V}$ )
Low Power Consumption	$0.5\mu\text{A}$ (Detect, $V_{\text{DF}}=1.0\text{V}$ $V_{\text{IN}}=0.9\text{V}$ ) (TYP.) $0.9\mu\text{A}$ (Release, $V_{\text{DF}}=1.0\text{V}$ $V_{\text{IN}}=1.1\text{V}$ ) (TYP.)
Detect Voltage Range	$0.8\text{V} \sim 5.0\text{V}$ ( $0.1\text{V}$ increments)
Operating Voltage Range	$0.7\text{V} \sim 6.0\text{V}$
Temperature Characteristics	$\pm 100\text{ppm}/^\circ\text{C}$ (TYP.)
Output Configuration	CMOS (The High voltage of the output signal is the same as $V_{\text{IN}}$ ) N-channel open drain (External pull-up resistor)
Operating Temperature Range	$-40^\circ\text{C} \sim +85^\circ\text{C}$
Built-in delay time	Release delay time adjustable
Packages	SSOT-24, USP-N-4

POINT

• 38% less supply current during detection  
(compared to previous TOREX product)

## Typical Application Circuit

The high level voltage of the reset signal is determined by the element to which the pull-up resistor is connected.



POINT

•  $0.7\text{V}$  low voltage operation is possible.

POINT

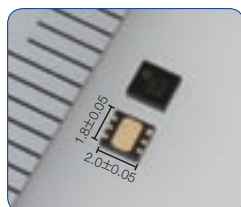
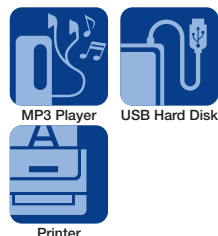
• Built-in delay circuit  
• The delay time can be set by external capacitor.

## 200mA Dual LDO Regulator

# XC6415 Series

NEW

The XC6415 Series of small, high-speed dual LDO regulators have a high continued power dissipation in a small package. Select from many output voltage combinations.

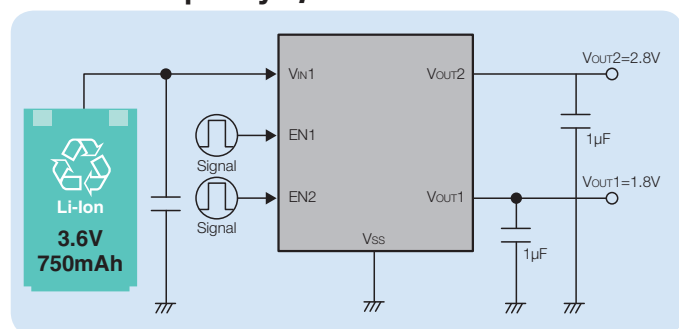


USP-6C

### Features

Maximum Output Current	200mA (250mA Limit TYP.)
Operating Voltage Range	1.5V~6.0V
Output Voltage Range	0.8V~5.0V (0.05V increments)
Output Voltage Accuracy	±1%, ±2%
Dropout Voltage	90mV@I <sub>OUT</sub> =100mA (V <sub>OUT</sub> =3.0V)
Ripple Rejection	65dB@1kHz
Power Consumption	25μA (TYP.)
ON/OFF Function	CL Discharge
Protection Circuit	Current Limit, Short-circuit Protection
Packages	USP-6C, SOT-26

### Independent ON/OFF control, stable output by 1μF ceramic

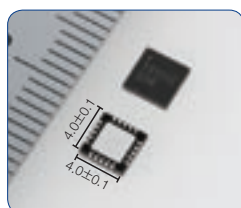
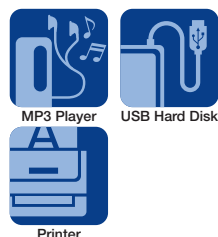


## 800mA Dual Step-down DC/DC Converter

# XC9515 Series

NEW

The XC9515 Series of two-channel output step-down DC/D/C converters is capable of an output of 800mA. The input voltage is monitored, and if it falls below the threshold voltage, a reset signal is output. The reset time can be set using the Cd capacitor.



QFN-20

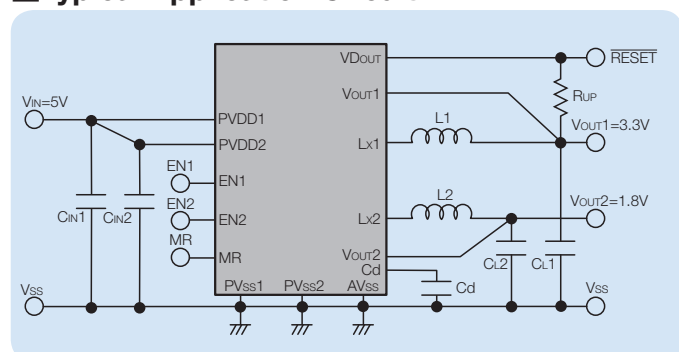
### Features

Output Current	800mA
Input Voltage Range	2.5V~5.5V
Output Voltage Range	1.2V~4.0V (0.05V increments)
High Efficiency	95% (TYP.) @V <sub>IN</sub> =5.0V, V <sub>OUT</sub> =3.3V
Oscillation Frequency	1.0MHz (Accuracy±15%)
Internal Switch-on Resistor	0.35Ω (Pch), 0.35Ω (Nch)
Control	PWM control
Power Consumption	75μA
Protection Circuit	Current Limit (Latch), Short Protection Circuit, Thermal Shutdown
PVDD1 Detect Voltage	2.0V~5.5V (Accuracy±2)
Reset Delay Time	173ms (Cd=0.1μF)
Output Configuration	N-channel open drain
Package	QFN-20

### Primary voltage combination

V <sub>OUT1</sub>	V <sub>OUT2</sub>	PVDD1 Detect Voltage	P/N
1.2	3.3	4.2	XC9515AA07ZR-G
3.3	1.8	4.5	XC9515AA08ZR-G
1.5	3.3	3.0	XC9515BB10ZR-G

### Typical Application Circuit



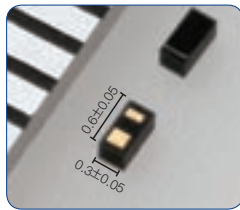
## Ultra Small Package Schottky Barrier Diode

# XBS013R1DR-G/XBS013V1DR-G

NEW

This is a 100mA Schottky barrier diode that achieves an ultra-small, ultra-thin profile by means of the newly developed USP-2B01 package (0.6mm × 0.3mm × 0.3mm). Saving space and allowing high-density mounting, this product satisfies the requirements of any mobile device. Two types are available, low  $V_F$  and low  $I_R$ , to meet your needs.

The diode is housed in the smallest package of the USP series, which enables high heat dissipation and high-density mounting.



USP-2B01

### •XBS013V1DR-G (30V/100mA/Low $V_F$ )

#### ■Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNITS
			MIN.	TYP.	MAX.	
Forward Voltage	$V_{F1}$	$I_F=10\text{mA}$	—	—	0.37	V
Reverse Current	$I_R$	$V_R=10\text{V}$	—	—	7	$\mu\text{A}$

$T_a=25^\circ\text{C}$

### •XBS013R1DR-G (30V/100mA/LOW $I_R$ )

#### ■Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNITS
			MIN.	TYP.	MAX.	
Forward Voltage	$V_{F1}$	$I_F=10\text{mA}$	—	—	0.46	V
Reverse Current	$I_R$	$V_R=10\text{V}$	—	—	0.3	$\mu\text{A}$

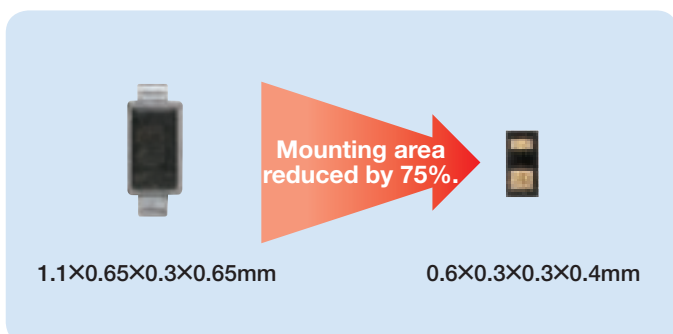
$T_a=25^\circ\text{C}$

#### ■Absolute Maximum Ratings

PARAMETER	SYMBOL	RATINGS	UNITS
Repetitive Peak Voltage	$V_{RM}$	30	V
Reverse Voltage (DC)	$V_R$	30	V
Forward Current (Average)	$I_{F(AV)}$	100	mA
Peak Forward Surge Current *1	$I_{FSM}$	0.5	A
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-40~+150	$^\circ\text{C}$

$T_a=25^\circ\text{C}$

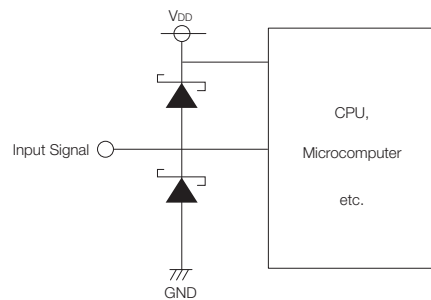
\*1) 60Hz Half sine wave, 1 cycle, Non-Repetitive.



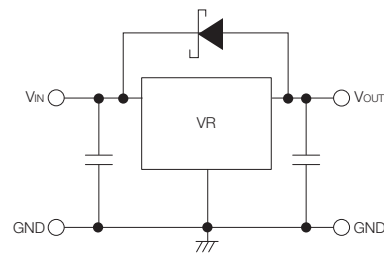
#### POINT

- Newly developed 0603 size of the USP-2B01 package
- 75% less mounting area than the previous SOD-723!

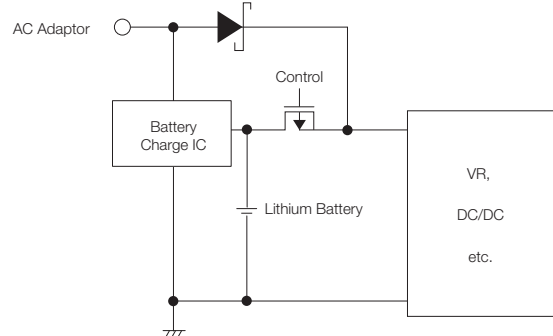
#### ■Applications of the 100 mA Schottky barrier diode (Example 1) Input protection



#### (Example 2) Input short-circuit protection



#### (Example 3) Reverse-current prevention



# CMOS Low Noise Amplifier

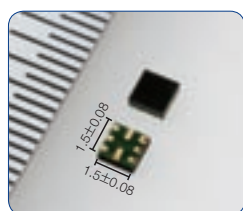
## XC2404A816UR-G

NEW

The XC2404 is a high-gain, low-noise amplifier (LNA) for GPS applications.

With a third-order intercept point of -14.5dBm, the gain is very high at 26.5dB and a low noise factor of 0.94dB is attained.

CMOS technology makes possible a minimum operating voltage from 1.2V, and a single resistor can be added for a self-bias that enables support of 1.8V, 2.85V, and other power voltages.

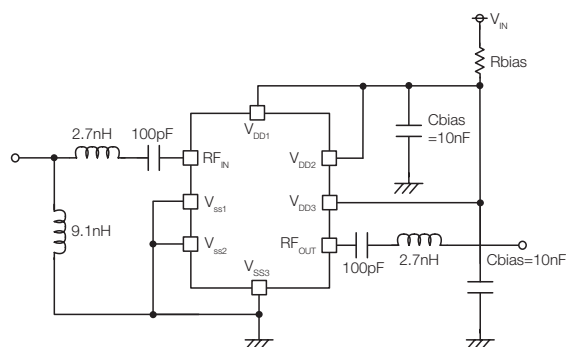


USP-8A01

### Features

Noise Figure	NF=0.94dB (TYP.) (@1.575GHz)
Low Power Consumption	12.0mW (TYP.) (V <sub>DD</sub> =1.2V, Fixed bias)
High Gain	S <sub>21</sub>  =26.5dB (TYP.) (@1.575GHz)
Operation Voltage Range	1.14V~1.26V (Fixed bias) 3.0V (Self bias) 2.85V (Self bias) 1.8V (Self bias)
Output	CMOS Output, 50Ω driver built-in
Operating Temperature Range	-40°C~+85°C
Package	USP-8A01

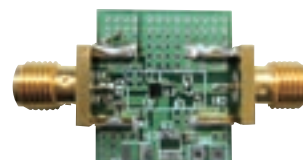
1.8V, 2.85V, and 3.0V operation can also be supported by means of a self bias.



V <sub>IN</sub> [V]	R <sub>bias</sub> [Ω]
3.00	270
2.85	240
1.80	82

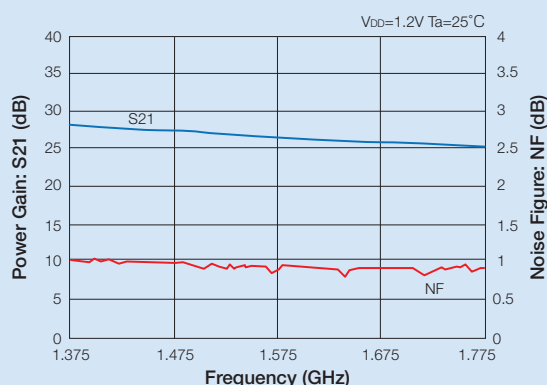
\* R<sub>bias</sub> should be in ±1% tolerance and ±200ppm/°C temperature stability.  
C<sub>bias</sub> is 10nF.

A standard evaluation board is available.

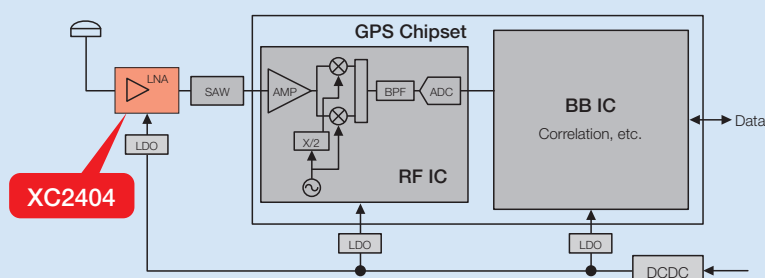


A low noise index is attained with high gain!

Power Gain&NF vs. Frequency  
XC2404A816



GPS Module Block



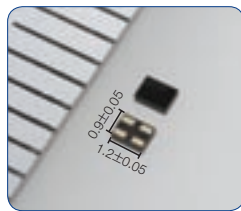
High Accuracy Temperature Sensor

# XC3101 Series

NEW

A temperature sensor function and a thermostat function (detection alarm) are provided as two outputs with ultra-low consumption in an ultra-small USPN-4 package (1.2mm × 0.9mm × 0.4mm) to protect and manage board temperature. Output accuracy is guaranteed to be  $\pm 2.5^{\circ}\text{C}$  (max.) over the entire range of operating temperatures.

User Select (1) The factory setting for the alarm temperature:  $50^{\circ}\text{C}$  to  $95^{\circ}\text{C}$  (increments of  $1^{\circ}\text{C}$ ).

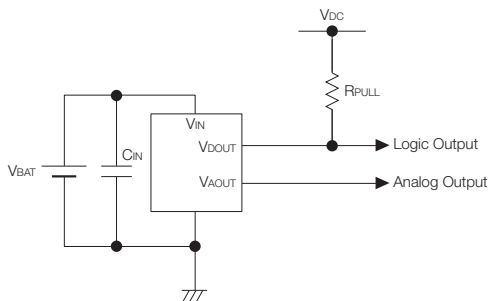


USPN-4

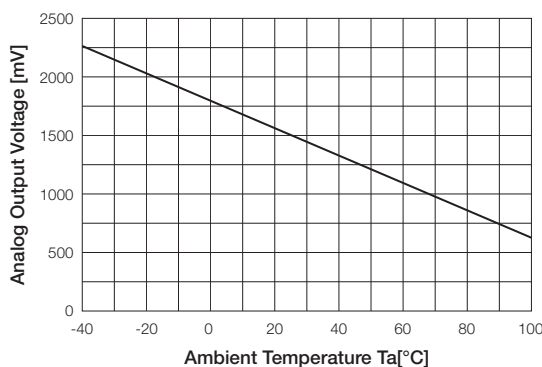
## Features

Operating Voltage	2.7V~5.5V
Analog Output Voltage	1.6V@25°C
Analog Output Temp. Coefficient	-11.77mV/°C
Analog Output Temp. Range	-40°C~+100°C
Alarm Trip Point Range	50°C~95°C (1°C increments)
Trip Point Accuracy	$\pm 2.5^{\circ}\text{C}$
Logic Output Configuration	N-channel Open-Drain
Logic Output Logic	Detect low when temp. rising
Power Consumption	3μA (TYP.) @25°C
Packages	USPN-4, SSOT-24

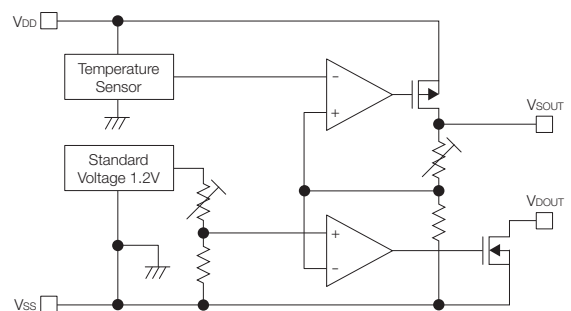
## Two output types: analog output voltage and temperature detection alarm



## Excellent linearity



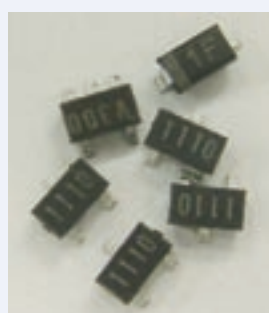
## Band gap reference is used to achieve ultra-low consumption



# MCM Product Overview

- The Torex MCM (Multi Chip Module) IC is a system integration IC that makes it possible to mount multiple power ICs and external discrete components in a special MCM USP (Ultra Small Package).  
By freely combining existing TOREX products, we can achieve miniaturization, reduce the number of components, and decrease mounting area, and can flexibly support increasingly diversified power specifications in individual applications.
- This MCM solution uses our unique high-density mounting technology, making it possible to reduce mounting area compared to multiple discrete ICs. Responding flexibly to applications that require a reduction of board mounting cost or a short development period, we provide our customers with the optimum system power solution.

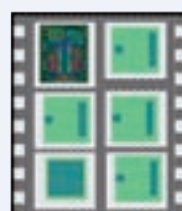
From multiple chips, a single package!!



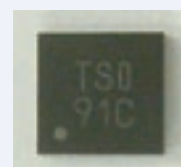
IC



Silicon chip



High-density mounting



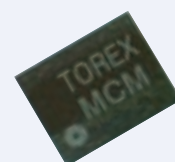
MCM IC

## MCM IC Features



### Quick product release (about 4 weeks to create a sample)

Existing (mass production) chips are used, so there is no need for electrical testing of individual chips. An evaluation sample based on the customer's required specifications can be created in about four weeks (one month), and mass production is possible in about 24 weeks (six months). A regular custom power IC requires about one year (48 weeks) for development, and thus the MCM IC minimizes the risk of delivery delays and enables a significant shortening of development lead time.



### Maintains high reliability

Each chip is mounted in complete isolation from the others, and thus the operation of the chips is stable and there is less probability that interference between functions and other crosstalk problems frequently found in ASIC development will occur. This contributes to the stability of power circuit operation.

In addition, the ICs are high-density mounted as chips in a single package, and thus reliability is much higher and yield is more stable than an HIC (hybrid IC), and a small, thin power IC can be developed.

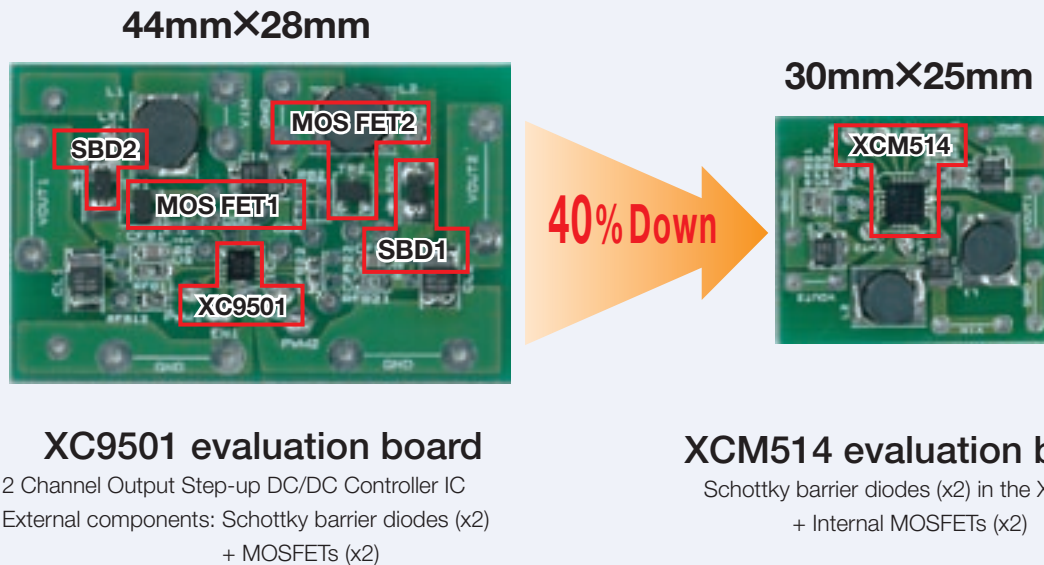


### Contributes to design and productivity

Existing mass production chips are used, enabling a sharp reduction of development expenses compared to developing a chip from scratch. In addition, the number of board-mounted components is reduced, helping to significantly cut mounting costs.



# Mounting Area Comparison Example



- Integration in an MCM IC enabled a reduction in mounting area on our evaluation board of about 40% compared to discrete ICs, and thus this product will help accomplish a dramatic reduction in board area.

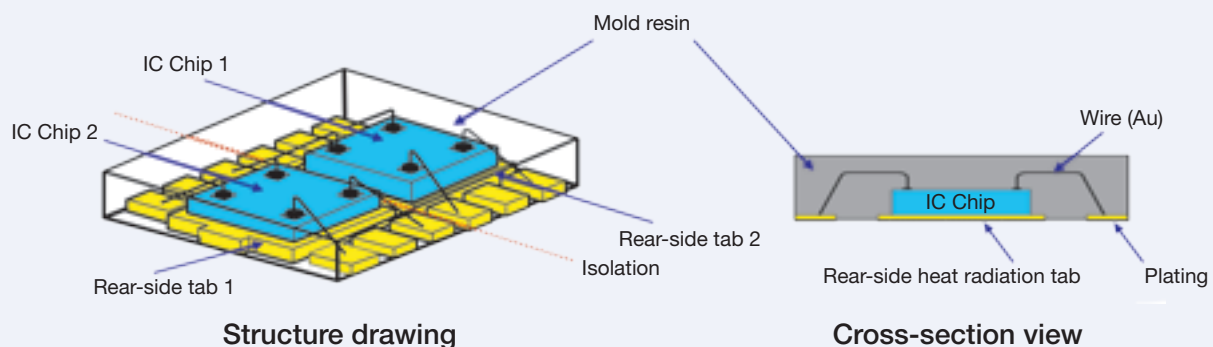
## Product design using USP technology

### ● Overview of electroformed packages

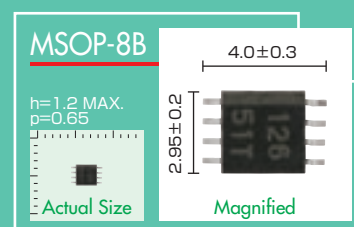
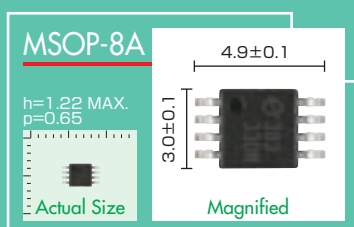
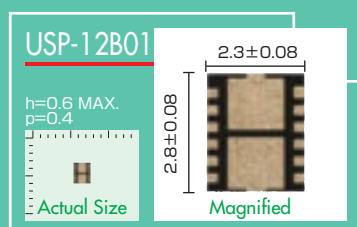
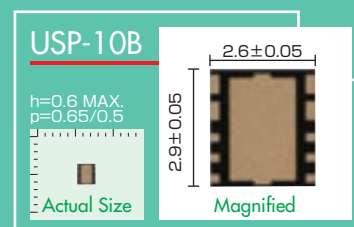
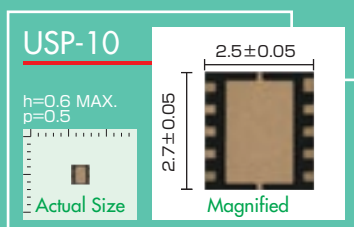
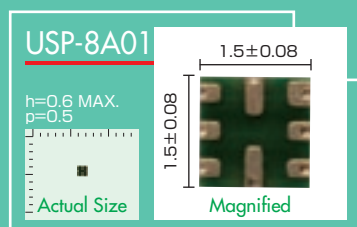
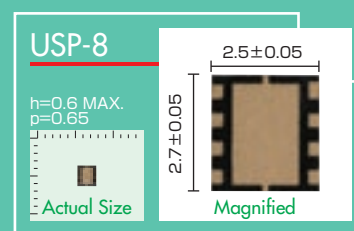
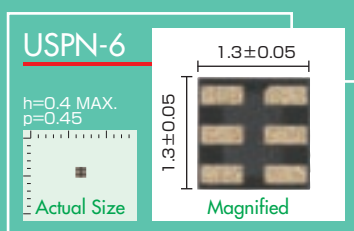
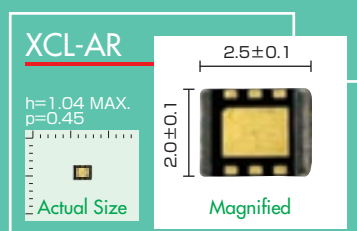
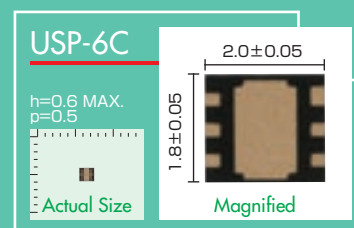
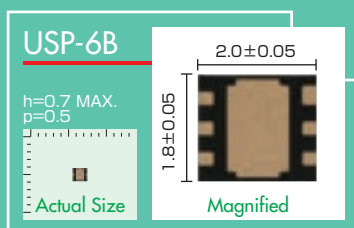
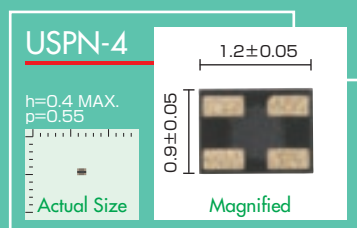
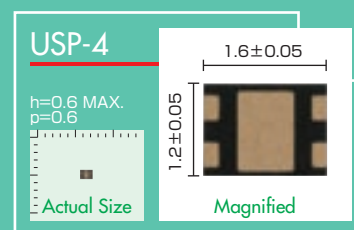
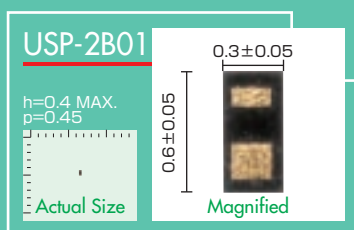
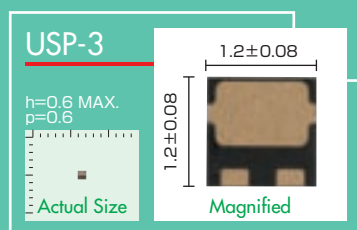
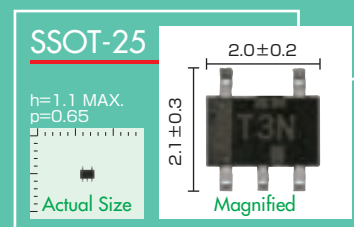
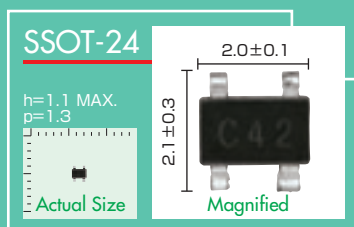
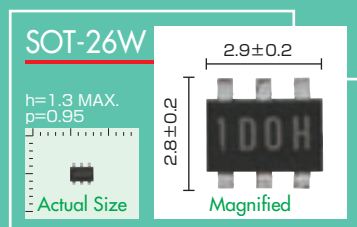
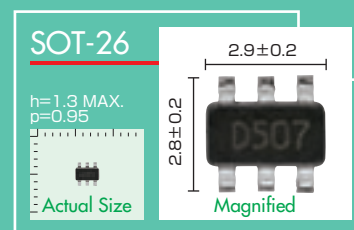
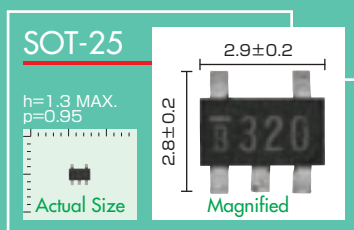
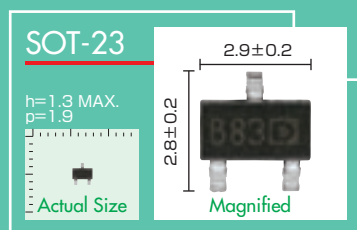
A general-purpose package is used to easily and quickly create a one-chip solution.

The electroformed package uses the special MCM USP, and as chips are mounted on tabs, mounting can be examined and a sample created in a short time. This technique allows combinations of two to four chips, and our lineup of packages has tab counts and pin counts for each function, regardless of the voltage of each device.

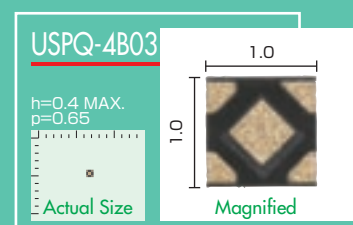
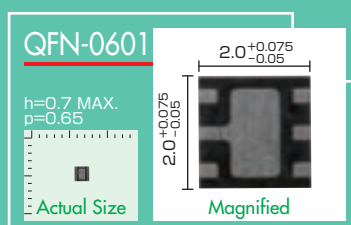
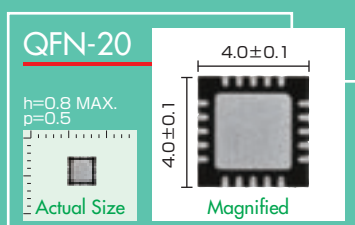
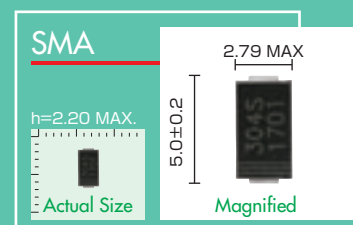
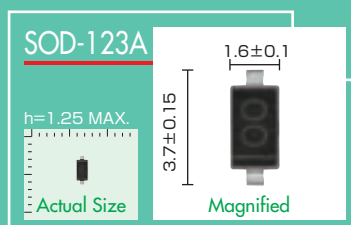
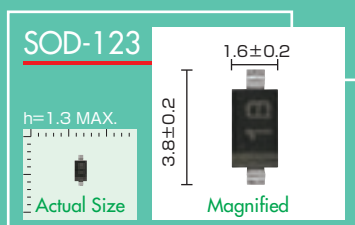
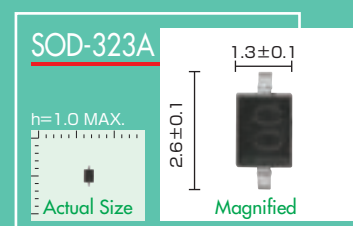
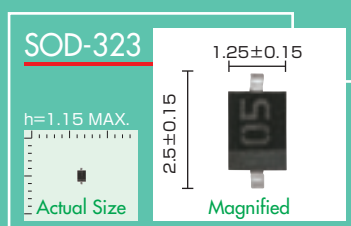
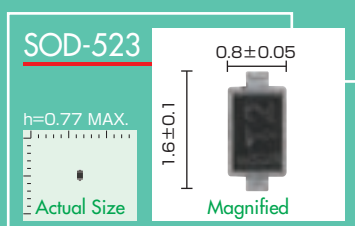
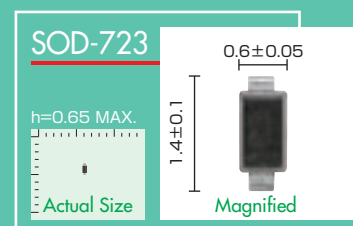
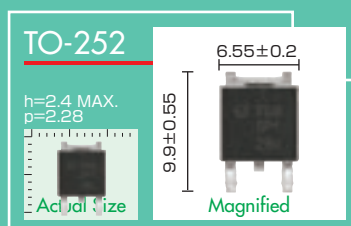
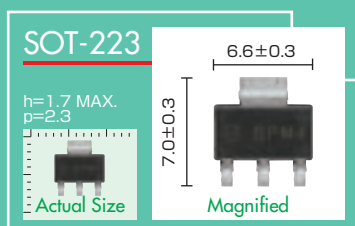
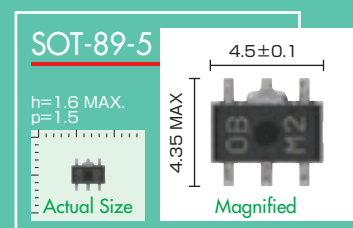
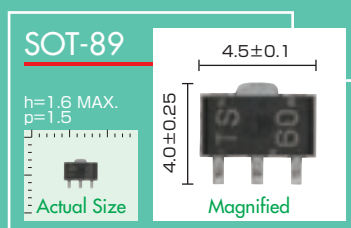
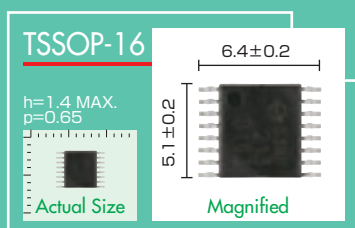
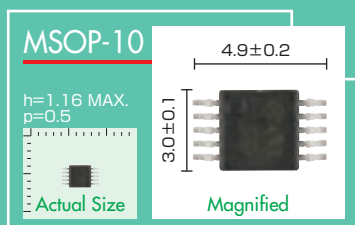
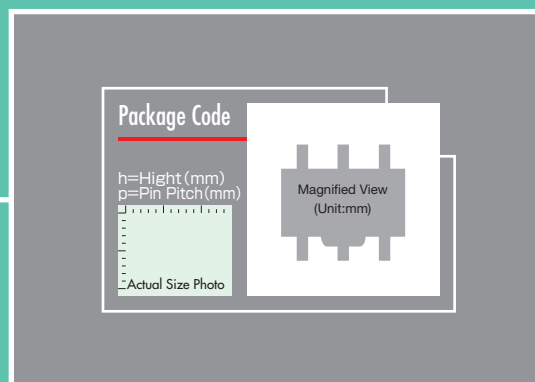
Example) USP-12B01



# PACKAGE INFORMATION



Torex provides products in the following packages.





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