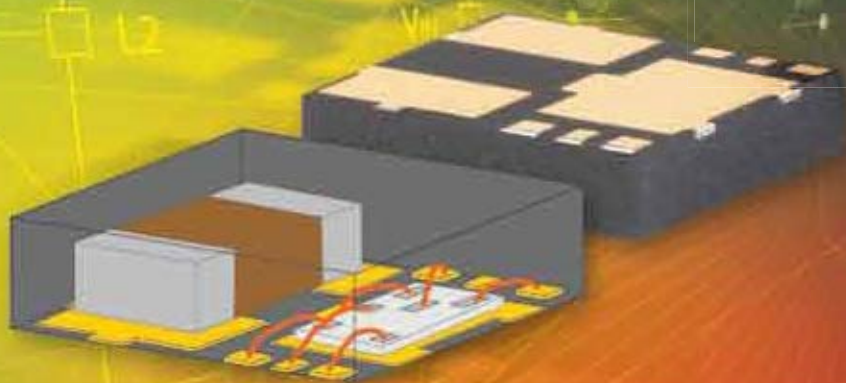


## Power Management Solutions

**LATEST RELEASE**  
MICRO DC/DC WITH INTEGRATED COIL



**1.5A, 5.5V**  
**CONSTANT ON TIME**  
**ONLY 2.5 x 3.2 x 1.0mm**

### IN THIS ISSUE

#### **XC8107/08/09**

85mΩ High Function Power Switch

#### **XC9270/71**

30V, 2A Step-Down DC/DC Converter

#### **XC9252**

30V, Low Power Step-Down DC/DC Controller

#### **XC9248**

2A, 18V Synchronous Step-Down DC/DC Converter

#### **XC9260/61**

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#### **XCL213/14**

1.5A, Hi-SAT-COT Step-Down Micro DC/DC Converter with Integrated Coil

#### **XCL211/12**

2A Step-Down Micro DC/DC Converter with Integrated Coil

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Ultra Low Power, Step-Up, Micro DC/DC with Integrated Coil

#### **XC9306**

Synchronous Buck-Boost DC/DC Converter

#### **XC9131/35/36**

Synchronous Step-Up DC/DC Converter

**INCLUDES 6 PAGE SELECTION GUIDE**



The XC8107/08/09 series power switches are optimised for **USB 2.0 and 3.0 applications**, as well as power line distribution applications. These devices incorporate 85mΩ Pch MOSFET power switches for low ON resistance.

The XC8107/08/9 series includes an over-current limiting function with a high precision of ±10% and a high speed response time of 2μs and is available as a fixed or adjustable type.

Protection circuits such as a current limiting, reverse current prevention, thermal shutdown, under-voltage lockout (UVLO) and soft start contribute to the safe operation of the application.

A flag function is provided to allow monitoring of the switch state. The flag pin is an Nch open drain output which outputs a low level during detection of over-current or over-heating, or while the reverse current prevention function is operating.

An **Auto Recovery Type or a Latch Type** current limiting feature can be chosen as needed for the application.

A small USP-6C package or a SOT-25 package (XC8107 only) can be selected as appropriate for the application.

### KEY FEATURES

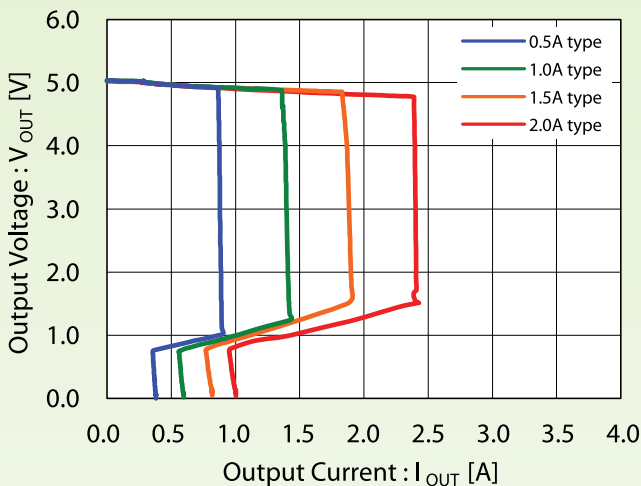
ON Resistance	85mΩ (typ)
Maximum Output Current	<b>See Table Below</b>
Output Current Limit	<b>See Table Below</b>
Input Voltage	2.5V ~ 5.5V
Current Limit Response Time	2μs (typ)
Current Limit Accuracy	±10%
Turn-On Time	0.6ms (typ)
Supply Current	40μA
Standby Supply Current	0.1μA (max)
Protection Circuits	Current Limit
	Short Circuit Protection
	Thermal Shutdown
	Under Voltage Lockout(UVLO)
	Soft-start
Op. Ambient Temperature	-40°C ~ +105°C
Additional Features: Flag Output & High speed CL discharge	
Packages: USP-6C, SOT-25 (XC8107 only)	

### SELECTION GUIDE

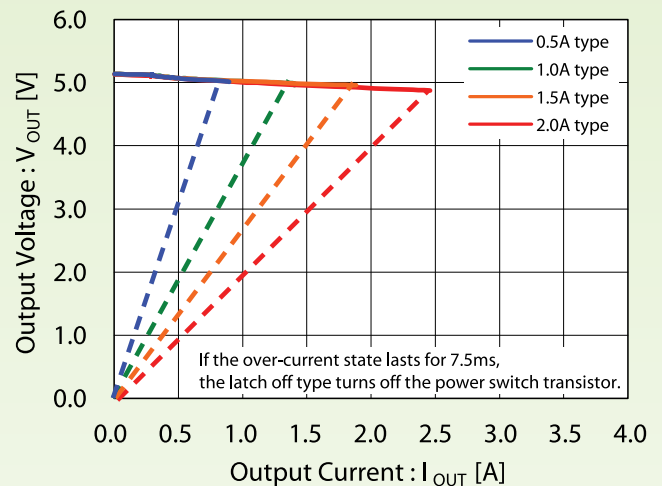
DEVICE	CURRENT LIMIT TYPE	MAXIMUM RECOMMENDED OUTPUT CURRENT	TYPICAL CURRENT LIMIT
XC8107	Fixed	0.5A	0.9A
		1.0A	1.4A
		1.5A	1.9A
		2.0A	2.4A
XC8108	Adjustable	2.0A	0.9A – 2.4A
XC8109	Adjustable	0.9A	0.075A – 1.3A

### CURRENT LIMIT CIRCUIT TYPES

#### AUTO RECOVERY TYPE



#### LATCH TYPE



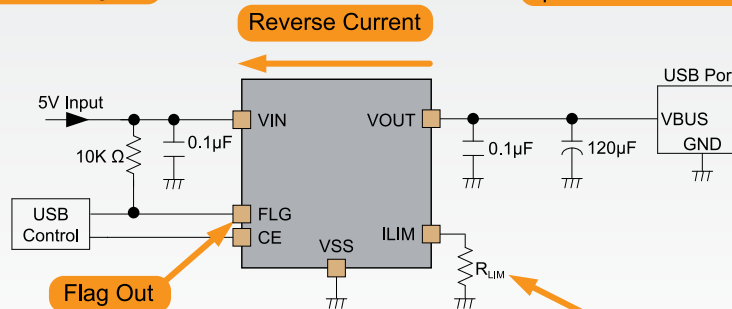
## USB POWER DISTRIBUTION REQUIREMENTS

USB DEVICE CLASS	USB POWER DISTRIBUTION REQUIREMENT	XC8107/08/09
Host / Self-Powered Hubs	Current limit downstream ports	✓
	Report over current conditions on USB V <sub>BUS</sub>	✓
Bus Powered Hubs	Enable/disable power to downstream ports	✓
	Power up at <100mA	✓
	Limit inrush current (if load of the function is more than 44Ω and 10μF in parallel)	✓
Functions (USB Peripherals)	Limit inrush current	✓
	Power up at <100mA	✓

## TYPICAL USB HOST APPLICATION

UVLO turns switch off when VIN goes down to lower voltage

Soft-start limits inrush currents and provides a controlled softer start-up

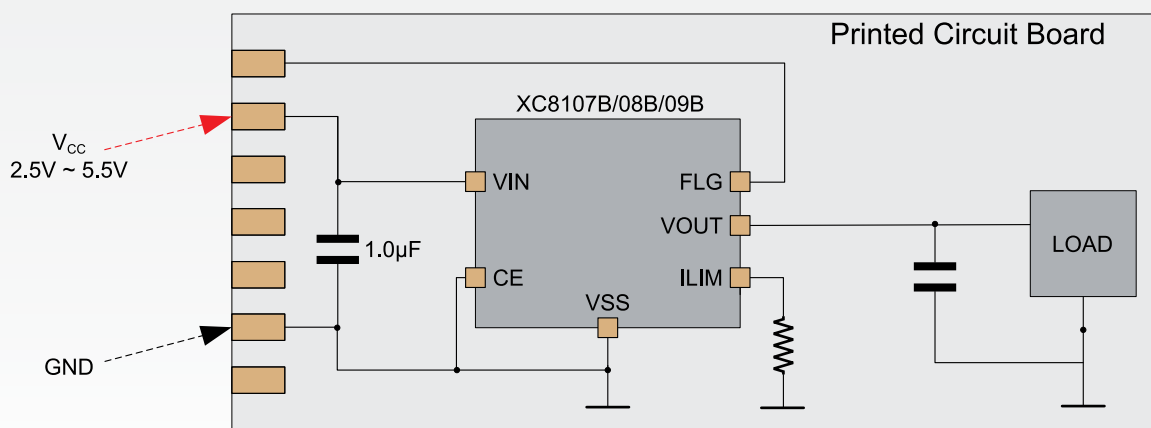


Flag output reports over current conditions on USB V<sub>BUS</sub> as well as over heating or reverse current

Adjustable Current Limit (XC8108/09)

## HOT-PLUG APPLICATIONS

Hot-plug applications where modules or PCBs are required to be removed while the main power supply and the card being inserted. The soft-start feature of the XC8107/08/09 effectively controls these surges by limiting and slowly ramping up the voltage and current being applied to the module or card. The UVLO feature of the XC8107/08/09 ensures the switch is off after the module has been removed, and that the switch is off during the next insertion. The XC8107/08/09 controls system surge currents and provides a hot-plugging mechanism for any device.





The XC9270/71 series is a step-down DC/DC Converter with internal  $0.3\Omega$  N-ch driver. It incorporates an integral bootstrap step-up circuit and the Lx and gate of the Nch driver operate in phase to reduce high-frequency noise normally associated with older Pch models.

The XC9270/71 is an ideal choice for more demanding industrial applications and the wide input voltage range from 7V to 30V accommodates a variety of step-down conditions. Using the internal 0.8V reference voltage, the output voltage can be set using two external resistors within a range of 1.2V to 12V. High efficiency over a wide load range is achieved by scaling down the switching frequency at light load conditions to reduce the switching and gate driving losses.

With a maximum output current of 2A the XC9270/71 includes over current and short circuit protection circuits and the designer can select either an Integral Latch or Auto Recovery configuration depending on the application requirements. The XC9270/71 is readily available with a 300kHz or 500kHz switching frequency and designers can also opt to synchronize the switching frequency of the DC/DC with an external CLK signal (within  $\pm 25\%$  of the nominal frequency).

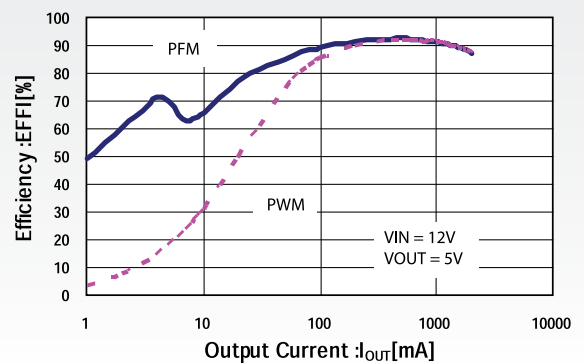
The XC9270/71 series include an integral soft-start circuit to limit rush current and output voltage overshoot during start-up. The soft-start time is fixed internally at 1.3ms (300kHz) or 0.7ms (500kHz) and an external capacitor CSS can be connected to extend the time as desired.

The XC9270/71 is available in a thermally enhanced SOP-8FD package with exposed die attach pad for low thermal resistance.

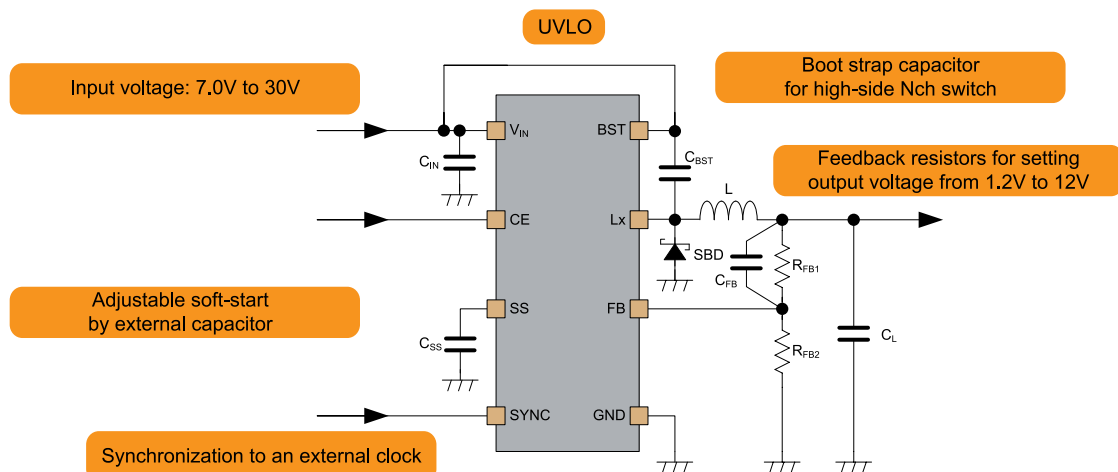
#### KEY FEATURES

Output Current		2.0A
ON Resistance	N-Ch	$0.3\Omega$ (typ)
Input Voltage		7.0V ~ 30V
Surge Voltage		Up to 46V for 400ms
Output Voltage		1.2V ~ 12V (Adjustable)
Switching Frequency		300kHz or 500kHz
Quiescent Current		200 $\mu$ A
Protection Circuits		Thermal Shutdown
		Current Limit
Product Select	<b>XC9270</b>	Fixed PWM Control
	<b>XC9271</b>	PWM/PFM Automatic Switching
Op. Ambient Temperature		-40°C ~ +105°C
Additional Features: Adjustable Soft-start, UVLO & External Clock Synchronization		
Low ESR Ceramic capacitor compatible		
Package: SOP-8FD		

#### EFFICIENCY VS. OUTPUT CURRENT



#### TYPICAL APPLICATION CIRCUIT



## OVER CURRENT AND SHORT CIRCUIT PROTECTION

### Auto Recovery Method

The current limiting circuits of type B combine both current limiting and short-circuit protection.

#### A Over Current Protection

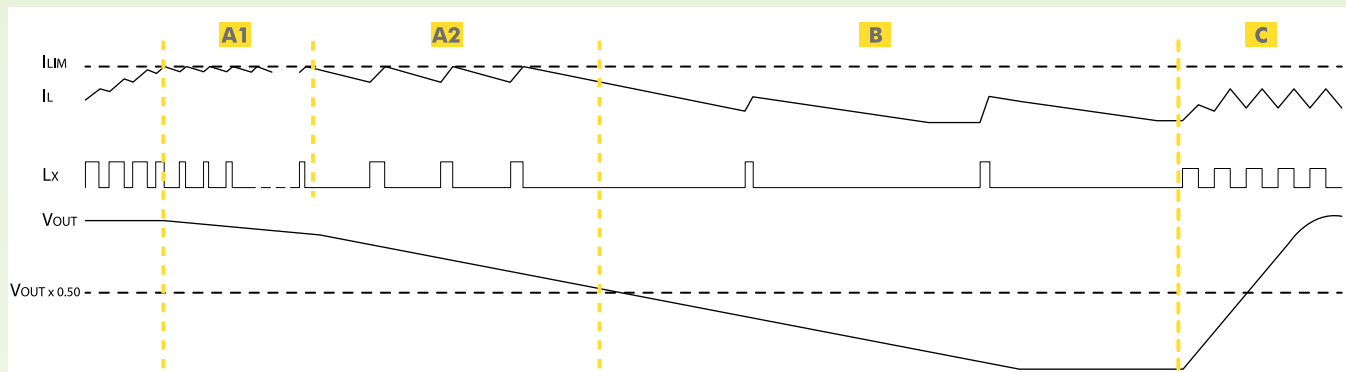
- A1:** Current limiting operates
- A2:** If the over current condition continues, switching frequency is lowered.

#### B Short Circuit Protection

If  $V_{OUT}$  drops to 50% (typ.) or less of the regular level in the state of A1 or A2, the output current is reduced, the switching frequency is further lowered and the IC enters short circuit state.

#### C Soft Start

When the load becomes lighter than the short circuit state, restart takes place automatically. Soft start reduces inrush current and output voltage overshoot during start up.

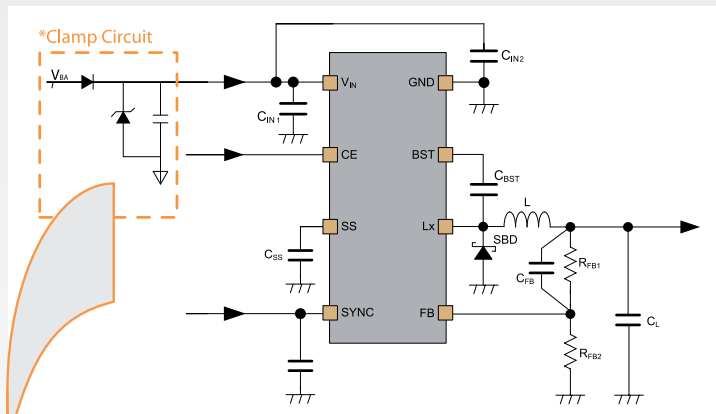


### Integral latch method

When the current limiting state continues for a certain time, the limiting circuit of type A latches and turns off the Nch driver transistor. In order to restart operation by soft start once in the latched state.

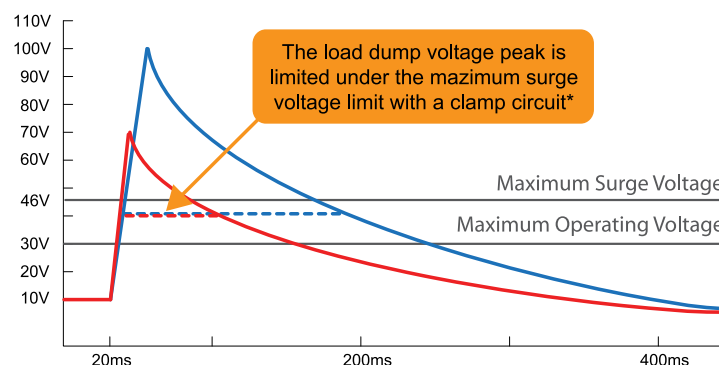
- "Low" level must be input into the CE pin followed by "High" level; OR
- $V_{IN}$  voltage must be briefly lowered below the UVLO detection voltage

## AUTOMOTIVE LOAD DUMP PROTECTION



With the  $V_{IN}$  terminal absolute maximum rating of 36V and a maximum surge voltage of 46V (during 400ms), the XC9270/71 is capable of operating in demanding industrial applications that require protection against transient surge voltages.

The XC9270/71 can withstand automotive level (ISO7637-2 and JASO A-1) load dump conditions with a clamp circuit connected to the  $V_{IN}$  input terminal.



ISO7637-2  
JASO A-1

## XC9252 30V, Low Power Step-Down DC/DC Controller



Able to operate from inputs up to 30V, Torex's new XC9252 is a step-down DC/DC controller IC designed specifically for applications that require high efficiency and low power consumption. Power consumption is increasingly critical for many applications and the XC9252 requires only 30 $\mu$ A when operating in PFM mode under no load conditions.

To ensure maximum efficiency at higher output loads the designer can select fixed frequency PWM mode using the MODE/SYNC pin or alternatively PFM/PWM automatic switching can be used for improved efficiency during light loads.

With an external Pch transistor the XC9252 is able to provide high output currents and generate a stable output from input voltages as low as 3.0V. When an input voltage lower than the set output voltage is applied, the MAX duty cycle is 100% and the output voltage drop is much smaller than with a traditional N-ch driver based DC/DC solution.

With a 0.8V reference voltage source (FB) the output voltage can be set freely from 1.5V using external resistors (RFB1, RFB2). There is also an optional Power-Good feature that allows the user to monitor the output state and the PG pin will go low if the FB drops below 90% of its nominal voltage.

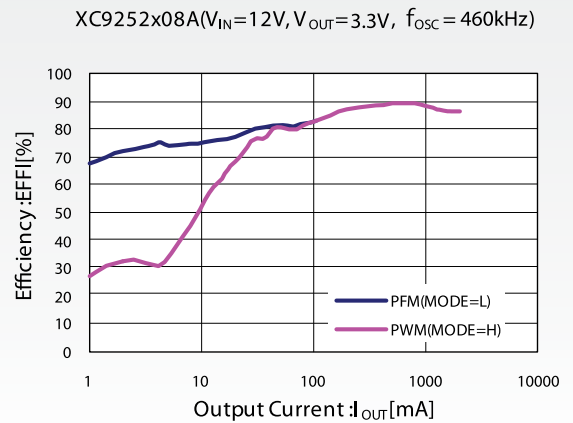
The internal switching frequency can be externally set-up between 280kHz to 550kHz by connecting a resistor to the ROSC pin and the designers can also opt to synchronize the switching frequency of the DC/DC with an external CLK signal (within  $\pm 25\%$  of the nominal frequency). The XC9252 includes over current and short circuit protection. The current limit threshold can be set externally with RSENSE resistor and the designer can select either a Latch or Auto-restart configuration.

The XC9252 is available in a small USP-10B package for applications that require both a small form factor and a good amount of power dissipation and in TSSOP-16 package for handling even higher power dissipations.

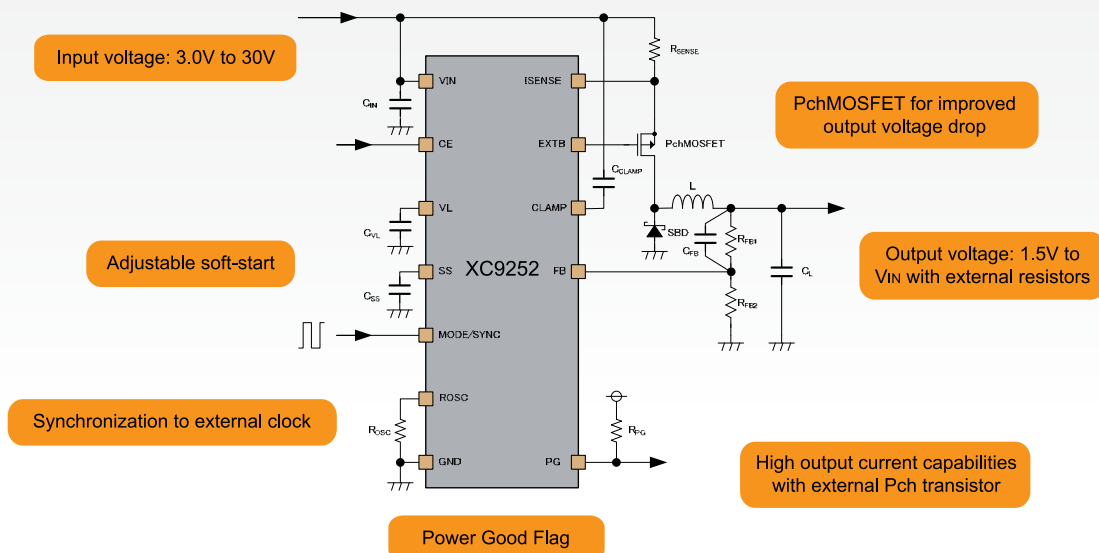
### KEY FEATURES

Input Voltage	3.0V ~ 30V	
Surge Voltage	Up to 46V for 400ms	
Output Voltage	1.5V ~ V <sub>IN</sub>	
Switching Frequency	280kHz ~ 550kHz	
Quiescent Current	30 $\mu$ A	
Protection Circuits	Thermal Shutdown	
	Current Limit	
	Short Circuit Protection	
Control Method	PWM	MODE/SYNC pin high
	PWM/PFM	MODE/SYNC pin low
Op. Ambient Temperature	-40°C ~ +105°C	
Additional Features: Adjustable Soft-start, UVLO, External Clock Synchronization & Power Good Flag		
Low ESR Ceramic capacitor compatible		
Packages: USP-10B, TSSOP-16		

### EFFICIENCY VS. OUTPUT CURRENT



### TYPICAL APPLICATION CIRCUIT







The XC9248 is a monolithic synchronous step-down DC/DC converter. The device integrates two 120mΩ Nch driver transistors and provides 2.2A of load current over a wide input voltage range of 4.5V to 18V. High efficiency of up to 93.8% is achieved over a wide range of load current.

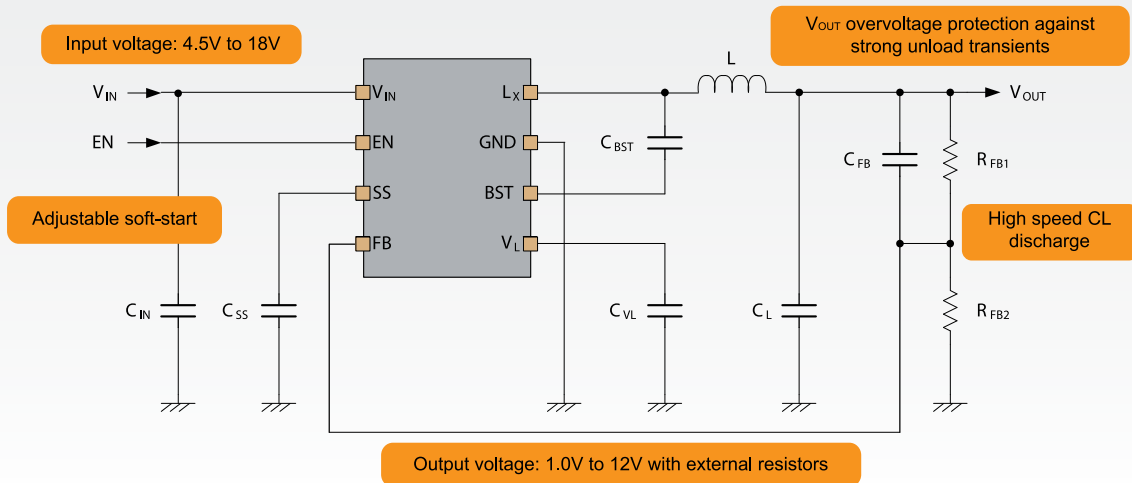
An overvoltage transient protection circuit limits output voltage overshoots during transient conditions. Over current and short-circuit protection and thermal shutdown provides reliable, fault tolerant operation. The XC9248 also includes a high speed CL discharge to quickly discharge the output capacitor when the IC is turned off in order to avoid the application malfunctioning.

The XC9248 is readily available in a thermally enhanced SOP-8FD package with an exposed die attach pad for low thermal resistance.

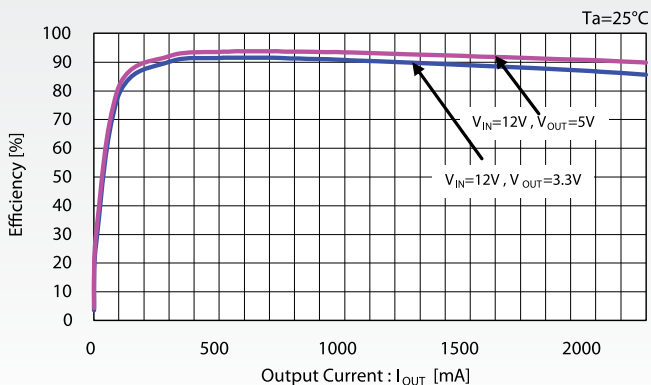
### KEY FEATURES

Output Current	2.2A
Efficiency	Up to 93.8%
ON Resistance	N-Ch 0.12Ω (typ.)
Input Voltage	4.5V ~ 18V
Output Voltage	1.0V ~ 12V (Adjustable)
Switching Frequency	500kHz
Quiescent Current	760μA
Protection Circuits	Thermal Shutdown
	Low-side Over Current Protection
	Short Circuit Protection
	Overvoltage Protection
Control Method	Fixed PWM Control
Op. Ambient Temperature	-40°C ~ +105°C
Additional Features: Adjustable Soft-start, UVLO & High Speed CL Discharge	
Low ESR Ceramic capacitor compatible	
Package: SOP-8FD	

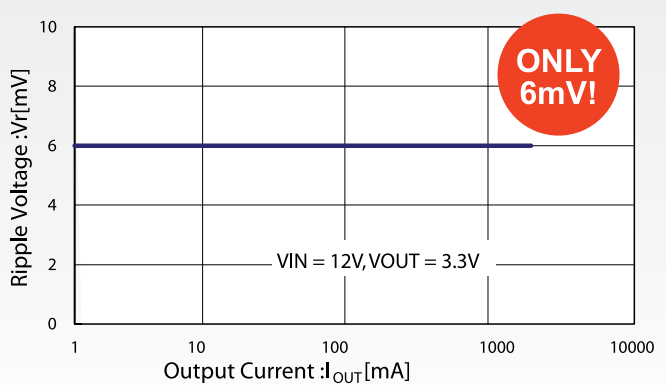
### TYPICAL APPLICATION CIRCUIT



### EFFICIENCY VS. OUTPUT CURRENT



### OUTPUT RIPPLE VS. OUTPUT CURRENT



## XC9260/61

1.5A, HiSAT-COT Synchronous Step-Down DC/DC Converter



The XC9260/61 series is a high speed transient response 1.5A synchronous step-down DC/DC converter. The extremely fast **load transient performance** is as a result of a new High Speed circuit Architecture for Transient with Constant On Time (HiSAT-COT) control method, which, when compared to standard Constant On Time(COT) control, provides less fluctuation in oscillation frequency against load and input voltage.

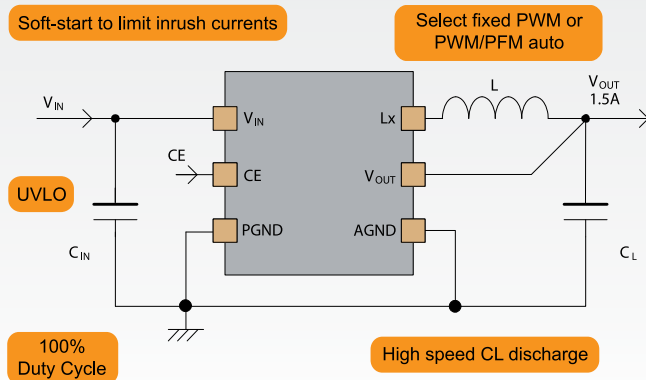
The unique HiSAT-COT architecture enables ultra-fast transient response, low ripple and high efficiency while using small external components that optimise PCB mounting area for space saving. HiSAT-COT is able to dynamically adjust the on-time duration based on the input voltage, output voltage, and load current so that it can achieve relative **constant frequency operation**. Constant switching frequency minimizes the EMI interference at some sensitive bands of certain frequencies in the system.

The XC9260/61 is available in the small USP-6C package for applications that require a small form factor or in the industry standard SOT-89-5 package.

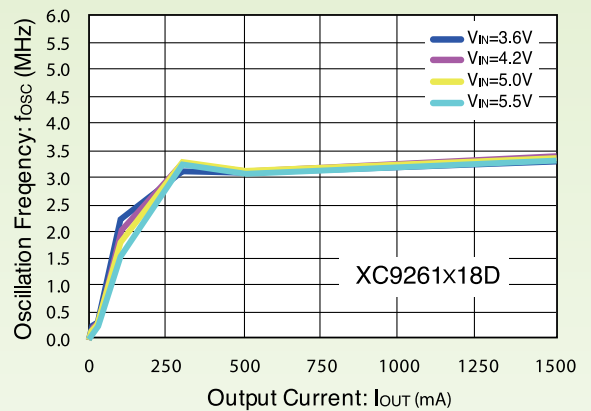
### KEY FEATURES

Output Current		1.5A
ON Resistance	N-Ch	0.13Ω (typ)
	P-Ch	0.16Ω (typ)
Input Voltage		2.5V ~ 5.5V
Output Voltage		0.8V ~ 3.6V
Switching Frequency		1.2MHz or 3.0MHz
Quiescent Current		15μA
Protection Circuits	Thermal Shutdown	
	Current Limit	
	Short Circuit Protection	
Product Select	<b>XC9260</b>	Fixed PWM Control
	<b>XC9261</b>	PWM/PFM Automatic Switching
Op. Ambient Temperature		-40°C ~ +105°C
Additional Features: Soft-start, UVLO, High Speed CL Discharge & 100% Duty Cycle		
Low ESR Ceramic capacitor compatible		
Packages: USP-6C, SOT-89-5		

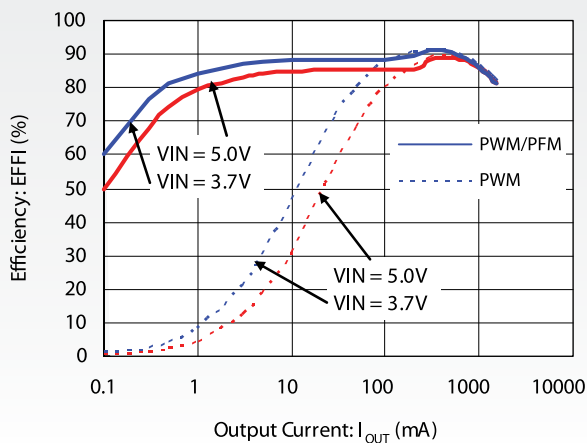
### TYPICAL APPLICATION CIRCUIT



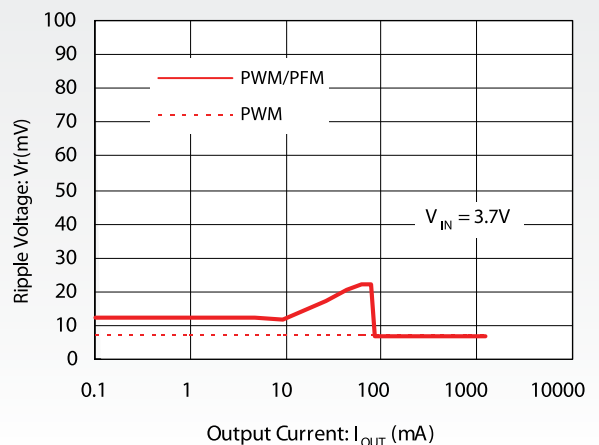
### OSCILLATION FREQUENCY VS. OUTPUT CURRENT



### EFFICIENCY VS. OUTPUT CURRENT



### OUTPUT RIPPLE VS. OUTPUT CURRENT



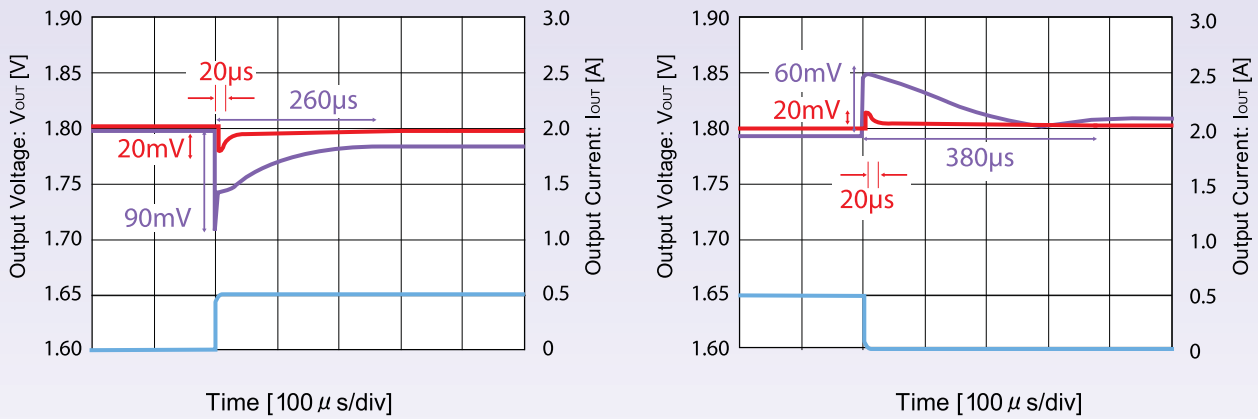


## LOAD TRANSIENT RESPONSE

Compared to our previous product, the XC9235 that uses a traditional architecture, the new XC9260 offers ultra fast load transient response. The benefits are shown below.

### XC9260 vs XC9235

VIN = 3.6V, VOUT = 1.8V, TRISE = TFALL = 2 $\mu$ s, TA = 25°C,  
XC9260B18DER-G: CIN = CL = 10 $\mu$ F (ceramic), XC9235A18DMR: CIN = 4.7 $\mu$ F (ceramic), CL = 10 $\mu$ F (ceramic)



SPECIFICATION / SERIES		UNDER DEVELOPMENT XC9257/58	UNDER DEVELOPMENT XC9259	XC9260/61	UNDER DEVELOPMENT XC9262
Output current		0.8A (SOT25) 1.0A (USP-6C)	0.8A	1.5A	1.5A
Input Voltage		2.7V ~ 5.5V	2.7V ~ 5.5V	2.7V ~ 5.5V	2.7V ~ 5.5V
Output Voltage		0.8V ~ 3.6V	0.8V ~ 3.6V	0.8V ~ 3.6V	0.8V ~ 3.6V
Switching Frequency		1.2MHz or 6.0MHz	1.2MHz or 6.0MHz	1.2MHz or 3.0MHz	1.2MHz or 3.0MHz
Quiescent Current		15 $\mu$ A	15 $\mu$ A	15 $\mu$ A	15 $\mu$ A
Ambient Operating Temperature		-40°C to 105°C			
Protection Circuits		Current Limit, Short Circuit and Thermal Shutdown			
Additional Features		Soft-start, UVLO, CL Auto Discharge and 100% Duty Cycle			
Product Select	Fixed PWM	XC9257	Fixed PWM or PWM/PFM Auto with MODE Pin Control	XC9260	Fixed PWM or PWM/PFM Auto with MODE Pin Control
	PWM/PFM Auto	XC9258		XC9261	
Package		USP-6C, SOT-25	LGA-8B01	USP-6C, SOT-89-5	LGA-8B01
Smallest Package Dimensions [mm]		2.0 x 1.8 x 0.6	1.2 x 1.4 x 0.3	2.0 x 1.8 x 0.6	1.2 x 1.4 x 0.3

Want An Integrated Inductor >>> XCL213/214

## XCL213/14

1.5A, HiSAT-COT Step-Down Micro DC/DC Converter with Integrated Coil



The XCL213/214 series is a **high speed transient response 1.5A synchronous step-down Micro DC/DC converter with integrated inductor** which fits in an **extremely small 2.5mm x 3.2mm x 1.0mm USP-9B01 package** and needs **only two capacitors connected externally to generate a stable power supply.**

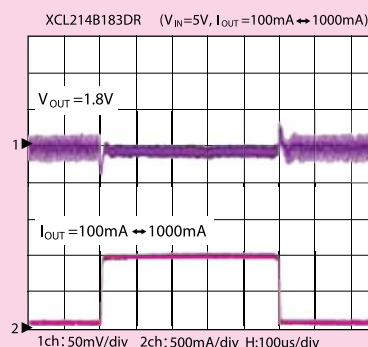
### KEY FEATURES

Output Current		1.5A
Efficiency		Up to 92%
ON Resistance	N-Ch	0.10Ω (typ)
	P-Ch	0.14Ω (typ)
Input Voltage		2.7V ~ 5.5V
Output Voltage		0.8V ~ 3.6V
Switching Frequency		3.0MHz
Quiescent Current		25μA
Product Select	<b>XCL213</b>	Fixed PWM Control
	<b>XCL214</b>	PWM/PFM Automatic Switching
Additional Features: Soft-start, UVLO, CL Auto Discharge & 100% Duty Cycle		
Low ESR Ceramic capacitor compatible		
Package: USP-9B01		

HiSAT-COT, Torex's Constant ON Time architecture gives the XCL213/214 extremely fast load transient response performance in comparison to standard DC/DC solutions as well as achieving less fluctuation in oscillation frequency against load and input voltage when compared to standard COT control.

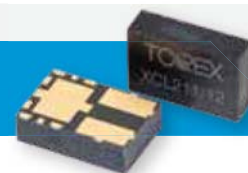
The XCL213/214 utilises a 3MHz switching frequency. The XCL213 series offers PWM control, whereas the XCL214 series applies automatic PWM/PFM switching control, providing low ripple, low current consumption (25μA typ.) and high efficiency over the full range of output loads (from light load to heavy load).

### HIGH SPEED TRANSIENT RESPONSE



## XCL211/12

2A Step-Down Micro DC/DC Converter with Integrated Coil



The XCL211/12 series is an **ultra small (3.1 x 4.7, 1.3mm) micro step-down DC/DC converter with an integrated coil** that achieves a level of miniaturization and profile reduction that is **one of the smallest in class for a load current of 2A.**

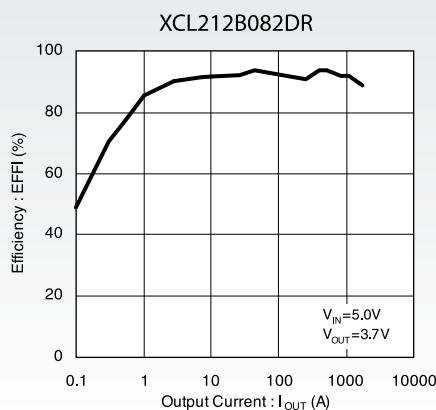
### KEY FEATURES

Output Current		2.0A
Efficiency		Up to 94%
ON Resistance	N-Ch	0.12Ω (typ)
	P-Ch	0.11Ω (typ)
Input Voltage		2.7V ~ 6.0V
Output Voltage		0.9V ~ VIN
Switching Frequency		2.4MHz
Quiescent Current		53μA
Protection Circuits		Thermal Shutdown Current Limit
Product Select	<b>XCL211</b>	Fixed PWM Control
	<b>XCL212</b>	PWM/PFM Automatic Switching
Additional Features: Soft-start, UVLO, CL Auto Discharge & 100% Duty Cycle		
Low ESR Ceramic capacitor compatible		
Package: USP-11B01		

With the integrated Inductor, this new series is designed to minimise EMC emissions and radiated noise, whilst maximising efficiency. The operating voltage range is from 2.7V to 6.0V and the output voltage can be set freely from 0.9V to VIN using external resistors.

The XCL211/212 series include a 1ms (typ.) high speed soft-start function for quick turn-on, a chip enable pin to turn the IC on and off and a CL discharge function to quickly discharge the output capacitor when the IC is turned off. A thermal shutdown circuit is also built in which shuts down the IC when the chip's temperature reaches 150°C and re-starts it when the temperature drops to 130°C (TYP) or less.

### EFFICIENCY VS. OUTPUT CURRENT





The XCL101 series is a step-up micro DC/DC converter with integrated coil in an ultra-small 2.5 x 2.0 x 1.0mm CL-2025 package! A stable and efficient power supply circuit can be configured by simply adding only two ceramic capacitors externally thereby contributing to PCB space saving and the shortening of development time. Integration of the coil simplifies the board layout and minimizes any unwanted radiated noise.

Able to start operation from Input Voltages as low as 0.9V the XCL101 is suitable for use with single alkaline or nickel metal hydride cells. Like all step-up DC/DCs, the output current that the XCL101 can supply will depend on the (VIN, VOUT) conditions, but up to 100mA of output current can be supplied with VIN=1.8V and VOUT=3.3V and with a VIN=0.9V, more than 50mA is possible.

With a quiescent current of only 6.3µA (typ), reducing to 0.1µA (typ) during standby, the XCL101 helps to maximise battery life in portable applications in addition to saving PCB space.

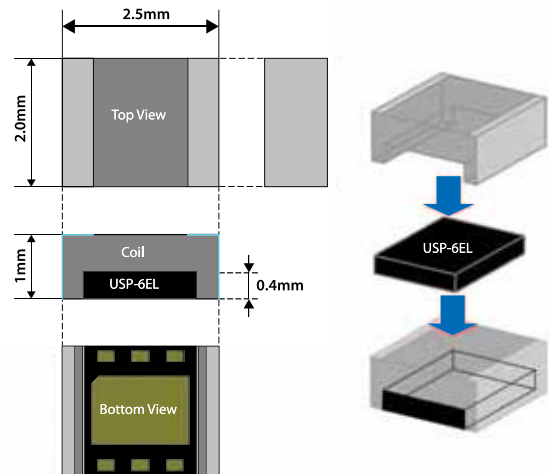
The XCL101 series also features a load disconnect function that prevents the battery charge from leaking to the output while the IC is not operating (XCL101A). An optional CL discharge function can quickly discharge the output capacitor when the IC is turned off and an Input by-pass mode function type is also available to keep the connection between the input and output side during shutdown (XCL101C).

In addition, a built in inrush current protection circuit suppresses inrush current spikes at start-up which results in a more stable power supply which in turn extends battery life.

**Application note available at: [www.torex-europe.com/microdc](http://www.torex-europe.com/microdc)**

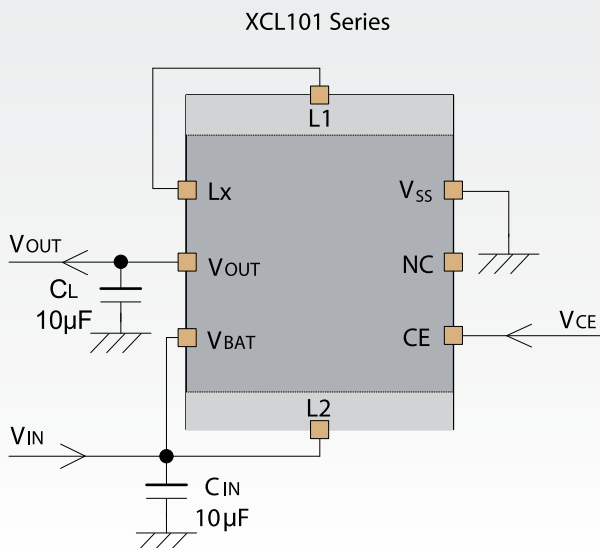
### KEY FEATURES

Output Current		More than 100mA
ON Resistance	N-Ch	0.6Ω (typ)
	P-Ch	0.65Ω (typ)
Input Voltage Range		0.9V ~ 5.5V
Operation Hold Voltage		0.7V
Output Voltage		1.8V ~ 5.0V (0.1V increments)
Switching Frequency		1.2MHz
Quiescent Current		6.3µA
Stand-by Current		0.1µA
Product Select	<b>XCL101A</b>	Load Disconnection Function
	<b>XCL101C</b>	Input Bypass Function
Additional Features: Soft-start		
Low ESR Ceramic capacitor compatible		
Package: CL-2025		

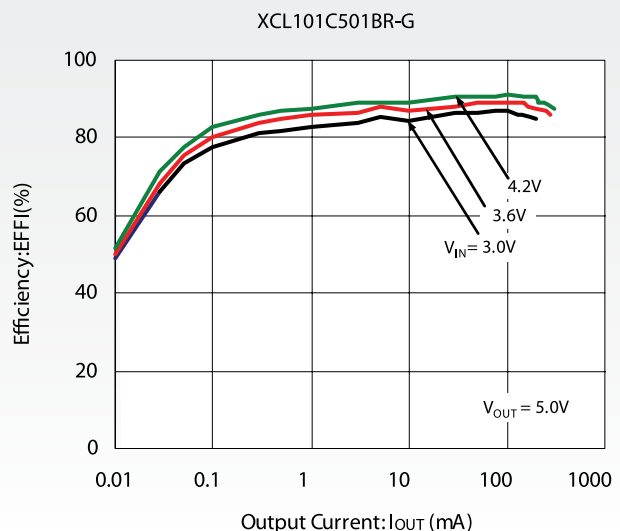


2.5 X 2.0 X 1.0mm

### TYPICAL APPLICATION CIRCUIT



### EFFICIENCY VS. OUTPUT CURRENT



## XC9306 Synchronous Buck-Boost DC/DC Converter



Providing a regulated output voltage from an input supply that can be higher or lower than the output voltage, the XC9306 synchronous buck-boost DC/DC converter is ideal for a Lithium Ion applications where the output voltage is within the battery voltage range.

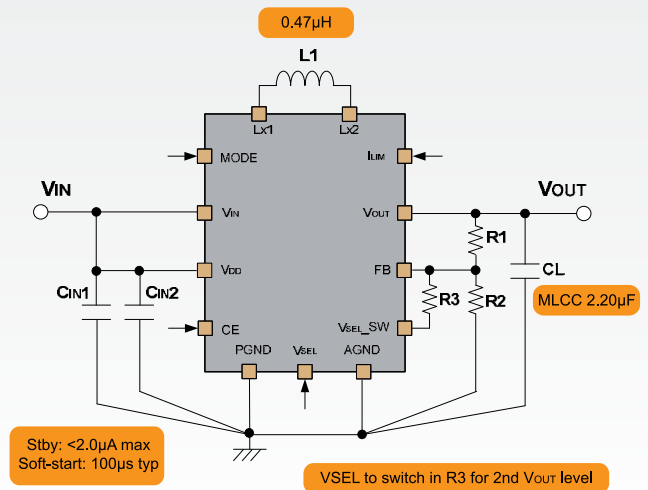
A fully charged Li-ion battery starts at a high operating voltage, but as the battery is discharged its operating voltage declines to the point it can no longer provide sufficient voltage to power its load, even if some charge remains. The XC9306 can extend the usable life of a battery by boosting (stepping up) the output voltage to provide sufficient power to continue operation. This extends battery life by more efficiently using the remaining charge of the battery.

The XC9306 uses 6MHz switching frequency that allows for a smaller size inductor and capacitors, reducing the overall mounting area by as much as half. The buck-boost converter is based on a fixed frequency, PWM controller using synchronous rectification to obtain maximum efficiency. At low load currents, the converter can be switched over to Power Save mode (MODE pin: L) to maintain high efficiency over a wide load current range. The input current can be limited to a typical value of 3.1A, 1.3A or 0.49A. The output voltage is programmable using an external resistor divider in the range 0.8V~5.0V. In addition the VSEL pin can be used to select a second output Voltage level for applications that require a lower chipset core Voltage during standby.

### KEY FEATURES

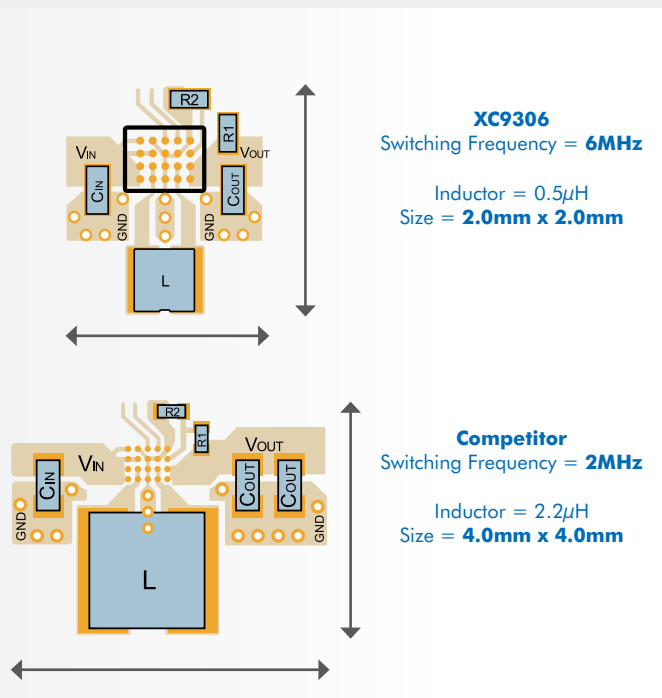
Output Current	1.2A (Buck PWM-mode)
	0.8A (Boost PWM-mode)
Efficiency	Up to 92%
Input Voltage	2.5V ~ 5.5V
Output Voltage	0.8V ~ 5.0V
Switching Frequency	6MHz
Quiescent Current	50μA
Protection Circuits	Thermal Shutdown
	Input Current Limit
Additional Features: Adjustable Soft-start & UVLO	
Low ESR Ceramic capacitor compatible	
Package: WLP-20 (2.15 x 1.94 x 0.625mm)	

### TYPICAL APPLICATION CIRCUIT

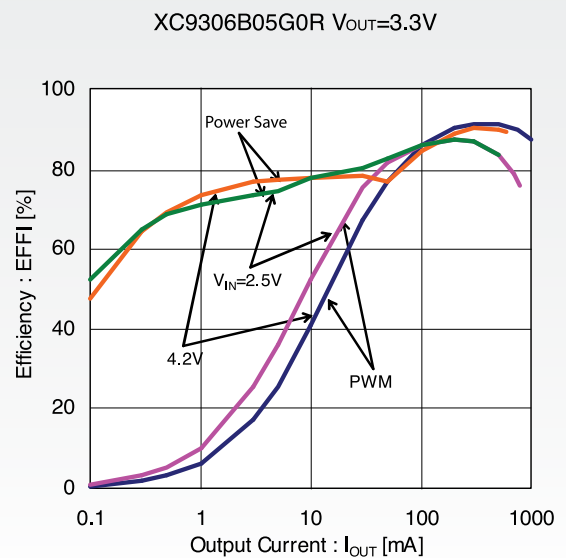


### PCB AREA SAVINGS

The XC9306 reduces board mounting area compared to a conventional DC/DC converter that has switching frequencies between 2-3MHz.



### EFFICIENCY VS. OUTPUT CURRENT





Able to start operation from  $V_{IN}$  as low as 0.9V the XC9131/35/36 is ideally suited for applications powered by a single Alkaline or Nickel metal hydride battery. Efficiency is optimised with the integration of two  $0.2\Omega$  driver transistors and the miniature USP-10B package, measuring only  $2.9 \times 2.6 \times 0.6\text{mm}$ , helps reduce the overall solution size.

After the start-up procedure has completed, it is worth noting that these series will carry on operating for input voltages decreasing down to 0.65V (or down to the UVLO detect value for the XC9135 series). The output voltage is set internally and is available in 0.1V increments.

Like all step-up DC/DCs, the output current that the XC9131/35/36 series can supply will depend on the ( $V_{IN}$ ,  $V_{OUT}$ ) conditions. For example, up to 500mA of output current can be supplied with  $V_{IN}=1.8\text{V}$  and  $V_{OUT}=3.3\text{V}$ .

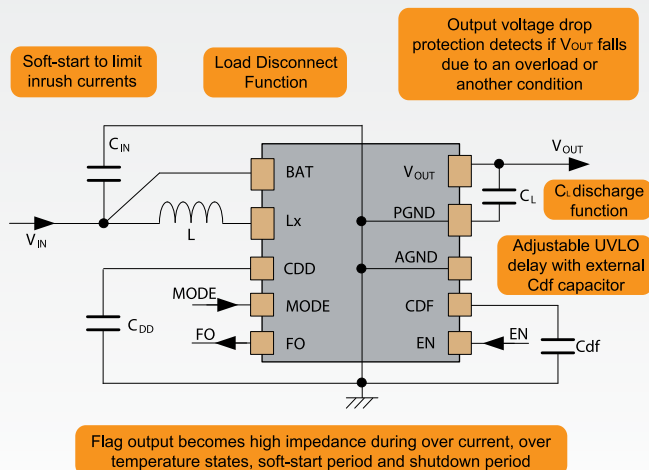
The protection circuits of the XC9131/35/36 series comprise a thermal shutdown and a current limiting circuit. In addition to that, it is possible to select the XC9135 with an output voltage drop protection function. On its input side, the XC9135 series includes a UVLO (Under Voltage Lock Out) function that reduces the leaking of potassium hydroxide by stopping IC operation when the battery voltage drops below a selectable threshold. This UVLO function can come with a delay adjusted via an external capacitor ( $C_{df}$ ) if temporary drops in the battery voltage caused by load transients or other conditions should be ignored.

The XC9131/35/36 series feature a soft-start circuit and a Load Disconnect function that prevents the battery charge from leaking to the output while the IC is not operating. Moreover, all series are available with a CL discharge function that quickly discharges the output capacitor when the IC is turned off.

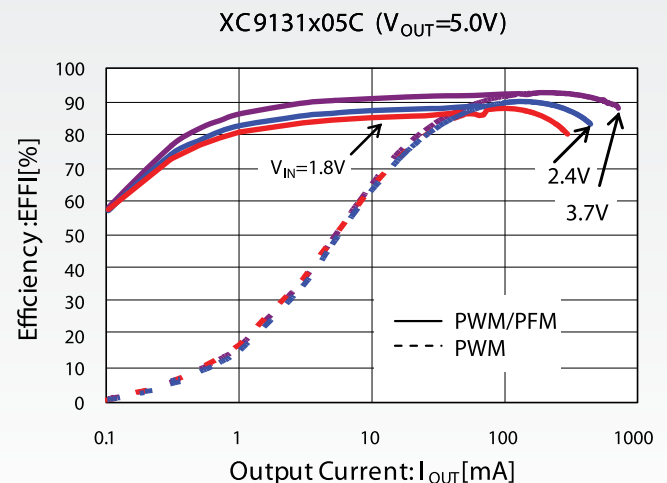
### KEY FEATURES

Input Current Limit		1.0A
Efficiency		93% (typ)
ON Resistance	N-Ch	0.52 $\Omega$ (typ)
	P-Ch	0.42 $\Omega$ (typ)
Input Voltage		0.9V ~ 5.5V
Operation Hold Voltage		0.65V
Output Voltage		1.8V ~ 5.0V (0.1V increments)
Switching Frequency		1.2MHz
Quiescent Current		35 $\mu\text{A}$ (@ $V_{OUT}=1.8\text{V}$ )
Protection Circuits		Thermal Shutdown
		Current Limit
		Output Voltage Drop Protection
Control Method	<b>PWM</b>	MODE/SYNC pin high
	<b>PWM/PFM</b>	MODE/SYNC pin low
Product Select	<b>XC9131</b>	ADJ Output Voltage, No UVLO
	<b>XC9135</b>	Fixed Output Voltage, With UVLO
	<b>XC9136</b>	Fixed Output Voltage, No UVLO
Additional Features: Load Disconnect Function, Soft-start, Flag Output & CL Auto Discharge		
Low ESR Ceramic capacitor compatible		
Package: USP-10B		

### TYPICAL APPLICATION CIRCUIT



### EFFICIENCY VS. OUTPUT CURRENT



## INDUCTOR BUILT-IN MICRO DC/DC CONVERTERS

SERIES	TYPE	CONTROL	EFFICIENCY	INPUT VOLTAGE	OUTPUT VOLTAGE	ACCURACY	OSCILLATION FREQUENCY	OUTPUT CURRENT	PACKAGE
XCL101	Step-Up	PFM	90%	0.9 ~ 5.5V	1.8 ~ 5.0V	±2.0%	1.2MHz	100mA	CL-2025
XCL201	Step-Down	PWM	92%	2.0 ~ 6.0V	0.8 ~ 4.0V	±2.0%	1.2MHz	400mA	CL-2025
XCL202		PWM/PFM							
XCL205	Step-Down	PWM	85%	2.0 ~ 6.0V	0.8 ~ 4.0V	±2.0%	3MHz	600mA	CL-2025
XCL206		PWM/PFM							
XCL207		PWM/PFM Manual							
XCL208	Step-Down	PWM	90%	1.8 ~ 6.0V (F Type)	0.8 ~ 4.0V	±2.0%	3MHz	400mA	USP-10B03
XCL209		PWM/PFM		2.0 ~ 6.0V (A/B Type)					
XCL211	Step-Down	PWM	94%	2.7 ~ 6.0V	0.9 ~ Vin	±2.0%	2.4MHz	2000mA	USP-11B01
XCL212	Step-Down	PWM/PFM	94%	2.7 ~ 6.0V	0.9 ~ Vin	±2.0%	2.4MHz	2000mA	USP-11B01
XCL213	Step-Down	HiSat-COT + PWM	92%	2.5 ~ 5.5V	0.8 ~ 3.6V	±2.0%	3MHz	1500mA	USP-9B01
XCL214	Step-Down	HiSat-COT + PWM/PFM	92%	2.5 ~ 5.5V	0.8 ~ 3.6V	±2.0%	3MHz	1500mA	USP-9B01

## STEP UP DC/DC CONVERTERS & CONTROLLERS

SERIES	CONTROL	EFFICIENCY	INPUT VOLTAGE	OUTPUT VOLTAGE	ACCURACY	OSCILLATION FREQUENCY	FUNCTIONS	PACKAGE
XC6371	PWM	85%	0.9 ~ 10V	2.0 ~ 7.0V	±2.5%	50kHz 100kHz 180kHz	100mA (Vin=3.0V, Vout=5.0V)	SOT-89, SOT-89-5, USP-6B
XC6372	PWM/PFM							
XC9103	PWM	85%	0.9 ~ 10V	1.5 ~ 30V ADJ=0.9V	±2.0%	100kHz 180kHz 300kHz 500kHz	400mA (Vin=1.8V, Vout=3.3V) FB=0.9V (1.5 ~ 30V)	SOT-25, USP-6B
XC9104	PWM/PFM							
XC9105	PWM/PFM Manual							
XC9106	PWM	85%	0.9 ~ 10V	ADJ=Variable	±2.0%	100kHz 300kHz	Variable Output Voltage 30mA (Vin=3.3V, Vout=20V)	SOT-25, USP-6B
XC9107	PWM/PFM							
XC9110	PFM	87%	0.9 ~ 10V	1.5 ~ 7.0V	±2.5%	100kHz	200mA (Vin=2.4V, Vout=3.3V)	SOT-23, SOT-25, SOT-89, USP-6C
XC9111								
XC9119	PWM	86%	2.5 ~ 6.0V	ADJ=1.0V	±2.0%	1MHz	50mA (Vin=3.6V, Vout=15V) FB=1.0V (2.5 ~ 19.5V)	SOT-25, USP-6C
XC9120	PWM	85%	0.9 ~ 6.0V	1.5 ~ 3.0V ADJ=0.9V	±2.0%	100kHz	80mA (Vin=3.6V, Vout=15V) FB=0.9V (1.5 ~ 30V)	SOT-25, USP-6C
XC9121	PWM/PFM							
XC9122	PWM/PFM Manual							
XC9128	PWM/PFM Manual	93%	0.8 ~ 6.0V	ADJ=0.45V	0.45V±10mV	1.2MHz	700mA (Vout=5.0V, Vin=3.7V) With Adapter Enable FB=0.45V (1.8 ~ 5.3V)	MSOP-10, USP-10B
XC9129	PWM/PFM Manual	93%	0.8 ~ 6.0V	ADJ=0.45V	0.45V±10mV	1.2MHz	Without Adapter Enable FB=0.45V (1.8 ~ 5.3V)	USP-10B
XC9131	PWM PWM/PFM	93%	0.65 ~ 5.5V	1.8 ~ 5.0V	±10mV	1.2MHz	500mA@Vout=3.3V, Vin=1.8V(TYP.) 100mV, Vout=3.3V, Vin=1.8V, Iout=1mA 200mA	USP-10B
XC9133	PWM	85%	2.5 ~ 6.0V	2.5 ~ 17.5V ADJ=0.2V	0.2V±5.0%	1MHz	3 white LEDs in series Vin=3.6V, ILED=20mA	SOT-25
XC9135	PWM PWM/PFM	93%	0.65 ~ 5.5V	1.8 ~ 5.0V	±10mV	1.2MHz	500mA@Vout=3.3V, Vin=1.8V(TYP.) 100mV Vout=3.3V, Vin=1.8V, Iout=1mA 200mA	USP-10B
XC9136								
XC9140	PFM	90%	0.9 ~ 5.5V	1.8 ~ 5.0V	±2.0%	1.2MHz	100mA (Vin=1.8V, Vout=3.3V Load Disconnect or Input Bypass Function Available, Quiescent Current 6.3µA	USP-6EL, SOT-25

## STEP-DOWN DC/DC CONVERTERS & CONTROLLERS

SERIES	CONTROL	EFFICIENCY	OPERATING VOLTAGE	OUTPUT VOLTAGE	ACCURACY	OUTPUT CURRENT	OSCILLATION FREQUENCY	SUPPLY CURRENT	PACKAGE
XC9213	PWM/PFM Manual	93%	4.0 ~ 25V	ADJ=1.0V	±1.5%	5A (Vin=5.0V, Vout=3.3V)	300kHz	450µA	TSSOP-16
XC9220	PWM	92%	2.8 ~ 16.0V	ADJ=0.9V	±1.5%	3A	300kHz 500kHz 1MHz	25µA	SOT-25, USP-6C
XC9221	PWM/PFM								
XC9223	PWM/PFM Manual	95%	2.5 ~ 6.0V	ADJ=0.8V	±2.5%	1A	1MHz 2MHz	30µA	MSOP-10, USP-10B
XC9224									
XC9235	PWM	92%	1.8 ~ 6.0V	0.8 ~ 4.0V	±2%	600mA	1.2MHz 3MHz	15µA	SOT-25, USP-6C, USP-6EL, WLP-5-03
XC9236	PWM/PFM								
XC9237	PWM/PFM Manual								



SERIES	CONTROL	EFFICIENCY	OPERATING VOLTAGE	OUTPUT VOLTAGE	ACCURACY	OUTPUT CURRENT	OSCILLATION FREQUENCY	SUPPLY CURRENT	PACKAGE
XC9242	PWM	95%	2.7 ~ 6.0V	0.9 ~ 6.0V	±2%	2A	1.2MHz 2.4MHz	41μA	USP-10B, SOP-8FD
XC9243	PWM/PFM								
XC9244	PWM	90%	2.3 ~ 6.0V	0.8 ~ 4.0V	±2%	400mA	1.2MHz	18μA	USPN-6
XC9245	PWM/PFM								
XC9246	PWM	90%	4.5~16.0V	1.2 ~ 5.5V	±2%	1A	1.2MHz	100μA	USP-6C, SOT-26W
XC9247	PWM/PFM								
XC9248	PWM	93.8%	4.5~1.8V	1~12V	±1.5%	2.2A	500kHz	800μA	SOP-8FD
XC9252	PWM/PFM	90%	3.0~30V	1.5~Vin V	±2%	3A	280kHz, 550kHz	30μA	TSSOP-16, USP-10B
XC9260	HiSAT COT	90%	2.7~5.5V	0.8~3.6V	±2%	1.5A	1.2MHz, 3MHz	250μA	SOT-89-5, USP-6C
XC9261	HiSAT COT	90%	2.7~5.5V	0.8~3.6V	±2%	1.5A	1.2MHz, 3MHz	15μA	SOT-89-5, USP-6C
XC9270	PWM	91%	7.0~30V	1.2~12V	±2%	2A	300kHz, 500kHz	200μA	SOP-8FD
XC9271	PWM/PFM	91%	7.0~30V	1.2~12V	±2%	2A	300kHz, 500kHz	200μA	SOP-8FD

### STEP-UP/DOWN DC/DC CONVERTERS & CONTROLLERS

SERIES	CONTROL	EFFICIENCY	OPERATING VOLTAGE	OUTPUT VOLTAGE	ACCURACY	OSCILLATION FREQUENCY	OUTPUT CURRENT	PACKAGE
XC9303	PWM/PFM Manual	84%	2.0 ~ 10V	ADJ=0.9V	±2%	300kHz	800mA (VIN=2.7V, VOUT=3.3V)	MSOP-8A
XC9306	PWM/PFM	92%	2.5~5.5V	0.8~5.0V	±2%	6MHz	800mA (VIN=3.1V, VOUT=4.5V)	WLP-20

### MULTI CHANNEL DC/DC CONVERTERS & CONTROLLERS

SERIES	TYPE	CONTROL	EFFICIENCY	OPERATING VOLTAGE	OUTPUT VOLTAGE	ACCURACY	OSCILLATION FREQUENCY	OUTPUT CURRENT	PACKAGE
XC9501	Step-up + Step-up	PWM/PFM Manual	83%	0.9 ~ 10V	ADJ=0.9V	±2.0%	100kHz 180kHz 300kHz 500kHz	Iout = ~ 200mA (Iin=1.8V, Vout=3.3V)	MSOP-10, USP-10
XC9502	Step-up	PWM/PFM Manual	83%	2.0 ~ 10V	ADJ=0.9V	±2.0%	180kHz 300kHz 500kHz	Iout = ~ 300mA (Iin=1.8V, Vout=3.3V)	MSOP-10, USP-10
	Step-down	PWM/PFM Manual	92%		ADJ=0.9V	±2.0%	180kHz 300kHz 500kHz	Iout = ~ 1000mA (Iin=3.3V, Vout=1.8V)	
XC9503	Step-down + Step-down	PWM/PFM Manual	92%	2.0 ~ 10V	ADJ=0.9V	±2.0%	180kHz 300kHz 500kHz	Iout = ~ 1000mA (Iin=5.0V, Vout=3.3V)	MSOP-10, USP-10
XC9504	Step-up		83%	2.0 ~ 10V	ADJ=0.9V		180kHz 300kHz 500kHz	Iout = ~ 20mA (Iin=3.3V, Vout=1.5V)	MSOP-10, USP-10
	Inverting		76%		ADJ=0.9V			Iout = ~ -20mA (Iin=3.3V, Vout=-7.0V)	
XC9505	Step-down		92%	2.0 ~ 10V	ADJ=0.9V		180kHz 300kHz 500kHz	Iout = ~ 1000mA (Iin=5.0V, Vout=3.3V)	MSOP-10, USP-10
	Inverting	76%	ADJ=0.9V		Iout = ~ -200mA (Iin=5.0V, Vout=-3.3V)				
XC9509	Step-down DC/DC + LDO + VD	PWM/PFM Manual	90%	2.4 ~ 6.0V	DC/DC 0.9 ~ 4.0V VR 0.9 ~ 4.0V	±2.0%	300kHz 600kHz 1.2MHz	DCDC 600mA[MSOP10] 400mA[USP-10] VR 300mA	MSOP-10, USP-10
XC9515	Step-down + Step-down	PWM	95%	2.5 ~ 5.5V	DC1: Vout1=1.2 ~ 4.0V DC2: Vout2=1.2 ~ 4.0V Detect Voltage Range : 2.0 ~ 5.5V	±2.0%	1MHz	800mA	QFN-20
XC9516	Step-up + Positive and Negative Charge Pump	-	95%	2.5 ~ 5.5V	19V (Step-up DC/DC)	±1.5%	300kHz ~ 1.2MHz	500mA (VIN=5.0V, VOUT=9.0V)	QFN-20
XC9519	Step-up Inverting	PWM PWM/PFM	83%	2.7 ~ 5.5V	4.0~18.0V(Step-up) 15.0~-4.0V(Inverting)	±1.5%	1.2MHz	500mA@VIN=3.7V, (VOUTP=5.0V, VOUTN=-5.0V)	QFN-24

### CHARGE PUMPS

SERIES	TYPE	EFFICIENCY	OPERATING VOLTAGE	OUTPUT VOLTAGE	SUPPLY CURRENT	OSCILLATION FREQUENCY	OUTPUT CURRENT	PACKAGE
XC6351A	Inverter	90%	-1.2 ~ 5.0V	Inverting	310μA	120kHz	10mA	SOT-26, USP-6B
					100μA	35kHz		
XC9801 XC9802	Step-up Doubler	69%	1.8 ~ 5.5V	2.5 ~ 6.0V	80μA	300kHz	80mA (VIN=3.6V, VOUT=5.0V)	MSOP-8A, USP-8

## VOLTAGE REGULATORS

SERIES	TYPE	INPUT VOLTAGE	OUTPUT VOLTAGE	ACCURACY	MAX. OUTPUT CURRENT	SUPPLY CURRENT	DROPOUT VOLTAGE@100mA	OUTPUT CAPACITOR	PACKAGE
XB1085	Bipolar 3A	~ 12V	1.5V, 1.8V, 2.5V, 3.3V, 5.0V, ADJ	±1%	3000mA	5000μA	1.3V@3A		TO-252
XB1086	Bipolar 1.5A	~ 15V	1.5V, 1.8V, 2.5V, 3.3V, 5.0V, ADJ	±1%	1500mA	5000μA	1.3V@1.5A		TO-252
XB1117	Bipolar 1A	~ 7V	1.8V, 2.5V, 3.3V, ADJ 5.0V	±1%	1000mA	6000μA	1.2V@1A		SOT-223
		~ 10V							
XC6201	Low Power	2.0 ~ 10V	1.3 ~ 6.0V	±2%(1%)	250mA	2μA	160mV	Ceramic	SOT-25, SOT-89, TO-92, USP-6B
XC6203	Large Current	2.0 ~ 8.0V	1.8 ~ 6.0V	±2%(1%)	400mA	8μA	150mV		SOT-89, SOT-223, TO-92, SOT-23
XC6204	High Speed	2.0 ~ 10.0V	1.8 ~ 6.0V	±2%(1%)	300mA	70μA	200mV	Ceramic	SOT-25, USP-6B, SOT-89-5
XC6205	High Speed	2.0 ~ 10.0V	0.9 ~ 1.75V		150mA				
XC6206	Low Power	1.8 ~ 6.0V	1.2 ~ 5.0V	±2%(1%)	250mA	1μA	160mV	Ceramic	SOT-23, SOT-89, TO-92, USP-6B
XC6209	High Speed	2.0 ~ 10.0V	0.9 ~ 6.0V	±2%	300mA	25μA	200mV	Ceramic	SOT-25, USP-6B, SOT-89-5
XC6210	High Speed Large Current	1.5 ~ 6.0V	0.8 ~ 1.5V	±2%	500mA	35μA	50mV	Ceramic	SOT-25, USP-6B, SOT-89-5
			1.6 ~ 5.0V		700mA				
XC6213	High Speed	2.0 ~ 6.0V	1.2 ~ 5.0V	±2%	150mA	35μA	400mV	Ceramic	SSOT-24, SOT-25, USP-4, USPN-4
XC6214	Large Current	1.8 ~ 6.0V	1.2, 1.5, 1.8, 2.5, 3.0, 3.3V	±2%	500mA	8μA	100mV	Ceramic	SOT-89, TO-252
XC6215	Low Power CE Pin	1.5 ~ 6.0V	0.9 ~ 5.0V	±2%	200mA	0.8μA	320mV	Ceramic	USP-4, SSOT-24, USP-3, SOT-25, USPN-4
XC6216 XE6216	28V Input Low Power Consumption	2.0 ~ 28.0V	2.0 ~ 12.0V ADJ	±2%(1%)	150mA	5μA	1500mV	Ceramic	SOT-25, SOT-89-5, USP-6C, SOT-223, TO-252, SOT-89
XC6217	High Speed "GreenOperation"	1.6 ~ 6.0V	0.8 ~ 4.0V	±2%	200mA	4.5μA	80mV	Ceramic	USP-4D, SOT-25, SSOT-24, USPN-4
XC6218	Positive Voltage	1.5 ~ 6.0V	0.9 ~ 4.0V	±2%	200mA	1μA	200mV	Ceramic	USP-3, SSOT-24
XC6219	High Speed	2.0 ~ 6.0V	0.9 ~ 5.0V	±2%(1%)	300mA	25μA	200mV	Ceramic	SOT-25, USP-6B, SOT-89-5
XC6220	1A LDO	1.6 ~ 6.0V	0.8 ~ 5.0V	±1%	1000mA	8μA	20mV	Ceramic	USP-6C, SOT-25, SOT-89-5, SOP-8FD
XC6221	High Speed	1.6 ~ 6.0V	0.8 ~ 5.0V	±2%(1%)	200mA	25μA	80mV	Ceramic	USPN-4, USP-4, SOT-25, SSOT-24
XC6222	High Speed	1.7 ~ 6.0V	0.8 ~ 5.0V	±1%	700mA	100μA	40mV	Ceramic	USP-6C, SOT-25, SOT-89-5
XC6223	High Speed	1.6 ~ 5.5V	1.0 ~ 4.0V	±1%	300mA	100μA	70mV	Ceramic	USPQ-4B03, SSOT-24, SOT-25, SOT-89-5, USP-4
XC6224	Low Power High Speed	1.2 ~ 3.6V	0.8 ~ 3.0V	±1.5%	150mA	33μA	210mV	Ceramic	USPN-4B02, SOT-25
XC6225	High Speed	2.5 ~ 6.0V	0.8 ~ 5.0V	±2%	30mA	25μA	70mV	Ceramic	USP-4, SOT-25, SSOT-24
XC6227	High Speed Reverse Current Protection	1.7 ~ 6.0V	0.8 ~ 5.0V	±1%	700mA	100μA	40mV	Ceramic	USP-6C, SOT-25, SOT-89-5
XC6229	Ultra Small Inrush Current Protection	1.6 ~ 5.5V	1.2 ~ 4.0V	±1%	300mA	100μA	60mV	Ceramic	LGA-4B01
XC6233	High Speed Inrush Current Protection	1.7 ~ 5.5V	1.2 ~ 3.6V	±1%	200mA	45μA	140mV	Ceramic	USP-4, SSOT-24, SOT-25, USPQ-4B04
XC6501	Ct Capacitor-Less	1.4 ~ 6.0V	1.2 ~ 5.0V	±1%	200mA	13μA	150mV	-	USP-3, USP-4, USPN-4, SSOT-24, SOT-25
XC6503	Ct Capacitor-Less High Speed	1.7 ~ 6.0V	1.2 ~ 5.0V	±1%	500mA	15μA	60mV	-	USP-4, SOT-25, SOT-89-5, SOT-89
XC6504	Ct Capacitor-Less Ultra Low IQ	1.4 ~ 6.0V	1.1 ~ 5.0V	±1%	150mA	0.6μA	340mV	-	USPN-4B02, SSOT-24, SOT-25, USPQ-4B04
XC6505	10.5V Operation High Speed	1.7 ~ 10.5V	1.5 ~ 8.0V	±1%	200mA	5.5μA	190mV	Ceramic	USP-6C, SOT-25, SOT-89-5
XC6601	N Channel Driver Low Voltage	1.0 ~ 3.0V	0.7 ~ 1.8V	±20mV	400mA	25μA	38mV	Ceramic	USP-6C, SOT-25, SOT-89-5
XC6602	N Channel Driver Low Voltage 1A	0.5 ~ 3.0V	0.5 ~ 1.8V	±15mV Vou<1.2V ±20mV Vou≥1.2V	1A	100μA	15mV	Ceramic	USP-6C, SOT-26W, SOT-89-5, WLP-5-02
XC6603	Low Input Voltage (Adjustable Soft-start time with an external component)	0.5 ~ 3.0V	0.5 ~ 1.8V	±0.015V ±0.020V	1A	100μA	15mV	Ceramic	USP-6C, SOT-26W
XC6604	Low Input Voltage (Adjustable Current Limit with an external component)	0.5 ~ 3.0V	0.5 ~ 1.8V	±0.015V ±0.020V	1A	100μA	15mV	Ceramic	USP-6C, SOT-26W

SERIES	TYPE	INPUT VOLTAGE	OUTPUT VOLTAGE	ACCURACY	MAX. OUTPUT CURRENT	SUPPLY CURRENT	DROPOUT VOLTAGE@100mA	OUTPUT CAPACITOR	PACKAGE
XC6701	28V Operation High Speed	2 ~ 28V	1.8 ~ 18.0V	±2%	150mA	50μA	1300mV	Ceramic	SOT-25, SOT-89, SOT-89-5, USP-6C, SOT-223, TO-252
XC62KN	Negative Voltage	-2.1 ~ -10V	-2.1 ~ -6.0V	±2%(1%)	100mA	3μA	380mV		SOT-23, SOT-89, TO-92, USP-6B
XC6901	Negative Voltage	-2.4 ~ -12.4V	-0.9 ~ -12.0V	±1.5%	200mA	100μA	400mV	Ceramic	SOT-25, SOT-89-5, USP-6C
XC6902	Negative Voltage	-2.4 ~ -16.0V	-0.9 ~ -12.0V	±1.5%	200mA	100μA	400mV	Ceramic	SOT-23, SOT-89, USP-6C

### DUAL CHANNEL VOLTAGE REGULATORS

SERIES	TYPE	INPUT VOLTAGE	OUTPUT VOLTAGE	ACCURACY	MAX. OUTPUT CURRENT	SUPPLY CURRENT	DROPOUT VOLTAGE@100mA	OUTPUT CAPACITOR	PACKAGE
XC6415	High Speed Dual	1.5 ~ 6.0V	0.8 ~ 5.0V	±1%	200mA	28μA	95mV	Ceramic	SOT-26, USPN-6, USP-6C
XC6416	Dual	1.5 ~ 6.0V	0.8 ~ 4.0V	±1%	200mA	10μA	95mV	Ceramic	USP-6C, SOT-26
XC6419	ON/OFF 2ch	1.5 ~ 6.0V	0.8 ~ 5.0V	±2%(1%)	300mA (ch1) 100mA (ch2)	28μA (ch1) 23μA (ch2)	60mV(ch1) 230mV (ch2)	Ceramic	USP-6C, SOT-26
XC6420	Small 150mA High Speed	1.6 ~ 5.5V	1.2 ~ 3.6V	±1.5%	150mA	55μA	130mV	Ceramic	SOT-26, USPN-6, USP-6B04
XC6421	Inrush Current Protection 300mA	1.6 ~ 5.5V	1.2 ~ 3.6V	±1%	300mA	90μA	70mV	Ceramic	USP-6C
XC6423	300mA High Speed Dual	1.6 ~ 5.5V	1.2 ~ 3.6V	±1%	300mA	90μA	95mV	Ceramic	LGA-6A01

### VOLTAGE REGULATORS WITH BUILT-IN DETECTOR

SERIES	TYPE	INPUT VOLTAGE	OUTPUT VOLTAGE	ACCURACY	MAX. OUTPUT CURRENT	SUPPLY CURRENT	DROPOUT VOLTAGE@100mA	OUTPUT CAPACITOR	PACKAGE
XC6402	700mA LDO with VD	1.5 ~ 6.0V	0.8 ~ 5.0V	±2%	700mA	35μA	50mV	Ceramic	SOT-25, SOT-89-5, USP-6B
XC6403	300mA LDO with VD	2.0 ~ 6.0V	0.9 ~ 5.6V	±2%	300mA	35μA	200mV	Ceramic	SOT-25, SOT-89-5, USP-6B
XC6404	500mA LDO with VD	2.0 ~ 6.0V	0.9 ~ 5.1V	±2%	500mA	35μA	200mV	Ceramic	SOT-25, SOT-89-5, USP-6B
XC6405	500mA LDO with VD	2.0 ~ 6.0V	0.9 ~ 5.1V	±2%	500mA	90μA	200mV	Ceramic	SOT-25, SOT-89-5
XC6408	Large Current	2.0 ~ 28.0V	2.0 ~ 18.0V	±1%	150mA	8μA	1100mV	Ceramic	SOT-89-5, SOT-25, USP-6C
XC6413	10V Input LDO with VD	2.0 ~ 10V	0.9 ~ 5.5V	±2%	300mA	35μA	200mV	Ceramic	SOT-25, SOT-89-5, USP-6B
XC6414	10V Input LDO with VD	2.0 ~ 10V	0.9 ~ 5.5V	±2%	500mA	35μA	200mV	Ceramic	SOT-25, SOT-89-5, USP-6B

### POWER SWITCHES

SERIES	TYPE	INPUT VOLTAGE	OUTPUT CURRENT	SUPPLY CURRENT	ON RESISTANCE	PACKAGE
XC8102	Low On-Resistance	1.2 ~ 6.0V	0.4A	3μA	0.28V@VIN = 6.0V	USPN-4, USP-4, SOT-25, SSOT-24
XC8107	Low On-Resistance	2.5~5.5V	0.5A, 1A, 1.5A, 2A	40μA	0.085V	USP-6C, SOT25
XC8108	Low On-Resistance	2.5~5.5V	0.9A~2A	40μA	0.085V	USP-6C
XC8109	Low On-Resistance	2.5~5.5V	0.075A~0.9A	40μA	0.085V	USP-6C

### BATTERY CHARGER ICs

SERIES	TYPE	OPERATING VOLTAGE RANGE		CHARGE TERMINATION VOLTAGE	CHARGE CURRENT	SUPPLY CURRENT	PACKAGE
		TYP.	MAX.				
XC6801	1Cell + Li-ion	4.25V	6.0V	4.2V ± 0.7%	500mA	12μA	SOT-89-5 SOT-25, USP-6C
XC6802	1Cell + Li-ion	4.25V	6.0V	4.2V ± 0.7%	800mA	15μA	SOT-89-5, SOT-25, USP-6C, USP-6EL

## MULTI CHIP MODULES

SERIES	TYPE	INPUT VOLTAGE	OUTPUT VOLTAGE	ACCURACY	MAX. OUTPUT CURRENT	SUPPLY CURRENT	DROPOUT VOLTAGE @100mA	OUTPUT CAPACITOR	PACKAGE
XCM406	2 Channel Voltage Regulator	1.5 ~ 6.0V	0.8 ~ 5.0V	±1%	700mA	35µA	50mV	Ceramic	USP-12B01

SERIES	TYPE	CONTROL	EFFICIENCY	OPERATING VOLTAGE	OUTPUT VOLTAGE	ACCURACY	OSCILLATION FREQUENCY	OUTPUT CURRENT	PACKAGE
XCM517	2 Channel Step-down DC/DC	PWM PWM/PFM	92%	2.7 ~ 6.0V	0.8 ~ 4.0V	±2%	1.2MHz 3MHz	600mA	USP-12B01
XCM519	Step-down DC/DC + LDO	PWM/PFM	92%	2.7 ~ 6.0V 2.5 ~ 6.0V	0.8 ~ 4.0V 0.7 ~ 1.8V	±2% ±0.02V	1.2MHz 3MHz -	600mA 400mA	USP-12B01
XCM526	Step-down DC/DC	PWM PWM/PFM	92%	4.0 ~ 16.0V	1.2V ~ Externally Set	±2%	1MHz 500kHz	3A	USP-12B01

## VOLTAGE DETECTORS

SERIES	TYPE	DETECT VOLTAGE	ACCURACY	OPERATING VOLTAGE	SUPPLY CURRENT	OUTPUT	PACKAGE
XC61C	Standard	0.8 ~ 1.5V	±2%	0.7 ~ 6.0V	0.7µA (VIN = 1.5V)	Open Drain CMOS	SSOT-24, SOT-23, SOT-89
XE61C		1.6 ~ 6.0V	±2% (±1%)	0.7 ~ 10V			
XC61F	Delay Built-in	1.6 ~ 6.0V	±2%	0.7 ~ 10V	1.0µA (VIN = 2V)	Open Drain CMOS	SOT-23 SOT-89
XC61G	Small Package	0.8 ~ 1.5V	±2%	0.7 ~ 6.0V	0.7µA (VIN = 1.5V)	Open Drain CMOS	USP-3
		1.6 ~ 6.0V	±2%	0.7 ~ 10V			
XC61H	Delay Circuit Built-in	1.6 ~ 6.0V	±2%	0.7 ~ 10V	1.0µA(TYP.)(VIN = 2.0V)	Open Drain CMOS	SOT-23
XC6101 ~ 6103	Watchdog & Manual Reset	1.6 ~ 5.0V	±2%	1.0 ~ 6.0V	5µA (TYP.)	Open Drain CMOS	SOT-25, USP-6C
XC6111 ~ 6113	Watchdog & Manual Reset	1.6 ~ 5.0V	±2%	1.0 ~ 6.0V	5µA (TYP.)	Open Drain CMOS	SOT-25, USP-6C
XC6104 ~ 6105	Watchdog	1.6 ~ 5.0V	±2%	1.0 ~ 6.0V	5µA (TYP.)	Open Drain CMOS	SOT-25, USP-6C
XC6114 ~ 6115	Watchdog	1.6 ~ 5.0V	±2%	1.0 ~ 6.0V	5µA (TYP.)	Open Drain CMOS	SOT-25, USP-6C
XC6118	Separated Sense Pin	0.8 ~ 5.0V	±2%	1.0 ~ 6.0V	0.8µA (VIN = 2.0V)	Open Drain CMOS	USP-4, SOT-25
XC6119	External Delay Capacitor	0.8 ~ 5.0V	±2%	0.7 ~ 6.0V	0.9µA (VIN = 2.0V)	Open Drain CMOS	USPN-4, SSOT-24
XC6120	Super Small, Low Supply	1.0 ~ 5.0V	±2%	0.7 ~ 6.0V	0.6µA (VIN = 2.0V)	Open Drain CMOS	USP-3, SSOT-24
XC6121 ~ 24	Watchdog, ON/OFF	1.6 ~ 5.0V	±2%	1.0 ~ 6.0V	5µA (VIN = VDF × 0.9) 10µA (VIN = VDF × 1.1)	Open Drain CMOS	SOT-25, USP-6C
XC6126	Ultra Small High Accuracy	1.5 ~ 5.5V	±0.8%	0.7 ~ 6.0V	0.6µA(TYP.)(VIN = 1.62V)	Open Drain CMOS	USPN-4B0, SSOT-24
XC6127	Manual Reset Function High Accuracy	1.5 ~ 5.5V	±0.8%	0.7 ~ 6.0V	0.6µA(TYP.)(VIN = 1.62V)	Open Drain CMOS	USPN-4, SSOT-24, SOT-25

## TEMPERATURE SENSOR

SERIES	TYPE	TEMPERATURE COEFFICIENTS	DETECTABLE TEMPERATURE RANGE	INPUT VOLTAGE	OUTPUT VOLTAGE	ACCURACY	SUPPLY CURRENT	PACKAGE
XC3101	Analog Output	-11.77mV/°C	-40°C ~ +100°C	2.7 ~ 5.5V	1.6V@25°C	±3.5°C	3.5µA	USPN-4 SSOT-24

## HALL IC (MAGNETIC SENSOR)

SERIES	TYPE	OPERATING VOLTAGE		AVERAGE SUPPLY CURRENT	OPERATING MAGNETIC FLUX DENSITY	HYSTERISIS WIDTH	PACKAGE
		(TYP.)	(MAX.)				
XC3202B	Low power consumption	2.4V	5.5V	8µA	3mT	1mT	SOT-23D, QFN-0601

## POWER MOSFETS

SERIES	CHANNEL	V <sub>dss</sub> (MAX.)	V <sub>gss</sub> (MAX.)	I <sub>d</sub> (MAX.)	R <sub>ds_ON</sub> (MAX.)	DRIVING VOLTAGE (MIN.)	PACKAGE
XP151	Nch (Single)	20 ~ 30V	±8 ~ 20V	0.8 ~ 1A	0.1 ~ 0.33Ω	1.5 ~ 4.5V	SOT-23
XP152	Pch (Single)	-20 ~ -30V	±12 ~ 20V	-0.5 ~ -0.7A	0.3 ~ 0.48Ω	-2.5 ~ -4.5V	SOT-23
XP202A0003MR-G	P-ch (Single)	-30V	±20v	-3A	0.067Ω	-4.0V	SOT23
XP161	Nch (Single)	20 ~ 30V	±8 ~ 20V	3 ~ 4A	0.05 ~ 0.18Ω	1.5 ~ 4.5V	SOT-89
XP162	Pch (Single)	-20 ~ -30V	±12 ~ 20V	-1.5 ~ -2.5A	0.17 ~ 0.45Ω	-2.5 ~ -4.5V	SOT-89
XP202A0003PR-G	P-ch (Single)	-30V	±20v	-5A	0.07Ω	-4.0V	SOT-89

### OSCILLATOR ICs

SERIES	TYPE	OSCILLATION FREQUENCY	OPERATING VOLTAGE RANGE	SUPPLY CURRENT	PACKAGE
XC2163	Overtone crystal oscillator	20M ~ 125MHz	3.3V(±10%) 5.0V(±10%)	15mA(fOSC=120MHz)	SOT-26
XC2164	Fundamental crystal oscillator	4M ~ 30MHz	3.3V(±10%) 5.0V(±10%)	5mA(fOSC=30MHz)	SOT-26
	Overtone crystal oscillator	20M ~ 125MHz		10.5mA(fOSC=125MHz)	
XC2165	Fundamental crystal oscillator with low voltage operation	8M ~ 120MHz	1.5 ~ 3.6V	5mA(fOSC=70MHz)	SOT-26
XC2301	Tri-State Buffer IC	160MHz	3.3V±10%	13mA(fIN=fOUT=160MHz)	SOT-26

### PLL CLOCK GENERATOR ICs

SERIES	TYPE	INPUT FREQUENCY	OUTPUT FREQUENCY	OPERATING VOLTAGE RANGE	PACKAGE
XC2173	Fundamental Crystal Oscillator with PLL Circuit	10 ~ 25MHz (OSCILLATION FREQUENCY)	50 ~ 125MHz(VDD=3.3V), 80 ~ 160MHz(VDD=5.0V)	3.3V(±10%) 5.0V(±10%)	SOT-26
XC25BS7	Low voltage PLL clock generator	32kHz ~ 30MHz	1 ~ 100MHz	2.5 ~ 5.5V	SOT-25, USP-6C
XC25BS8	Low Voltage PLL clock generator	8kHz ~ 36MHz	1 ~ 100MHz	2.5 ~ 5.5V	SOT-26W, USP-6C

### SCHOTTKY BARRIER DIODES

SERIES	VR(V)	IF(A)	VF(TYP)	IR(MAX.)	CT@F=1MHZ(PF)	PACKAGE
XBS013R1DR-G	30	0.1	0.46V@10mA (MAX.)	0.3μA@VR=10V	2 (VR=10V)	USP-2B01
XBS013S15R-G	30	0.1	0.71V@100mA	2μA@VR=25V	6(VR=0V)	SOD-523
XBS013S16R-G	30	0.1	0.71V@100mA	2μA@VR=25V	6(VR=0V)	SOD-723
XBS013S1CR-G	30	0.1	0.71V@100mA	2μA@VR=25V	2 (VR=10V)	USP-2B02
XBS013V1DR-G	30	0.1	0.37V@10mA (MAX.)	7μA@VR=10V	2 (VR=10V)	USP-2B01
XBS024S15R-G	40	0.2	0.53V@200mA	2μA@VR=40V	5(VR=10V)	SOD-523
XBS053V13R-G	30	0.5	0.40V@500mA	100μA@VR=20V	12(VR=10V)	SOD-323A
XBS053V15R-G	30	0.5	0.40V@500mA	100μA@VR=20V	12(VR=10V)	SOD-523
XBS104P11R-G	40	1	0.56V@1A	500μA@VR=40V	230(VR=0V)	SOD-123P
XBS104S13R-G	40	1	0.49V@1A	200μA@VR=40V	35(VR=10V)	SOD-323A
XBS104S14R-G	40	1	0.49V@1A	200μA@VR=40V	35(VR=10V)	SOD-123A
XBS104V14R-G	40	1	0.365V@1A	2mA@VR=40V	150(VR=1V)	SOD-123A
XBS303V19R-G	30	3	0.355V@3A	3mA@VR=30V	385(VR=1V)	SMA-XG
XBS304F11R-G	40	1	0.45V@3A	1mA@VR=20V		SMA-PG
XBS304S19R-G	40	3	0.465V@3A	300μA@VR=40V	180(VR=1V)	SMA-XG
XBS306P11R-G	60	1	0.75V@3A	100μA@VR=60V		SMA-PG

### TRANSIENT VOLTAGE SUPPRESSORS (TVS)

SERIES	BREAKDOWN VOLTAGE (MIN)	LEAKAGE CURRENT (MAX)	INTER-TERMINAL CAPACITY	ESD DURABILITY	NUMBER OF ELEMENTS	PACKAGE
XBP06V4E4GR-R	6.4V	1.0V	40pF	30kV	4	USP-4
XBP06V4E2HR-G	6.4V	1.0V	40pF	30kV	2	USP-3
XBP06V1E4MR-G	6.1V	2.5V	170pF	30kV	4	SOT-25
XBP1001-G	6.2V	1.0V	1.2pF	8kV	5	SOT-563
XBP1002-G	6.0V	3.0V	1pF	8kV	9	SOT-363
XBP1004-G	6.2V	1.0V	1.2pF	8kV	5	SOT-543
XBP1006-G	6.0V	1.2V	1pF	8kV	4	SOT-23P
XBP1007-G	27.27V	1.0V	3pF	8kV	3	SOD-323P
XBP1008-G	6.0V	20V	1pF	8kV	4	SOT-23P
XBP1009-G	6.0V	1.0V	0.35pF	25kV	2	DFN2L
XBP1010-G	6.2V	1.0V	35pF	8kV	1	SOD-923
XBP1011-G	6.0V	5.0V	110pF	25kV	1	SOD-523P
XBP1012-G	13.3V	1.0V	100pF	8kV	2	SOD-323P
XBP1013-G	6.0V	10V	300pF	25kV	1	SOD-323P

### SINGLE PHASE BRIDGE RECTIFIERS

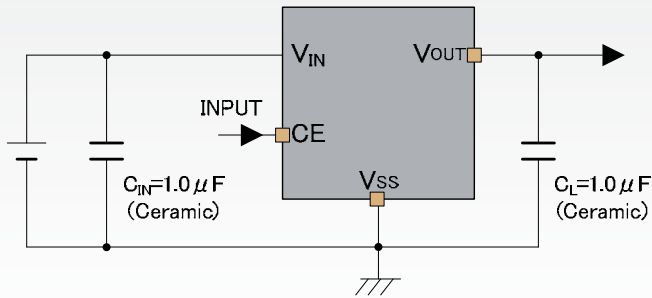
SERIES	IF (AV)	VRRM	VF(MAX)	CJ(TYP)	PACKAGE
XBR11A	1A	100~1000V	1.0V	10pF	MDIP
XBR12A	1.5A	50~1000V	1.1V	25pF	SDIP

\* Values shown in the chart can be changed without any prior notice.

# COMING SOON

## XC6702 36V, 300mA Low Power High Speed Voltage Regulator

### TYPICAL APPLICATION CIRCUIT



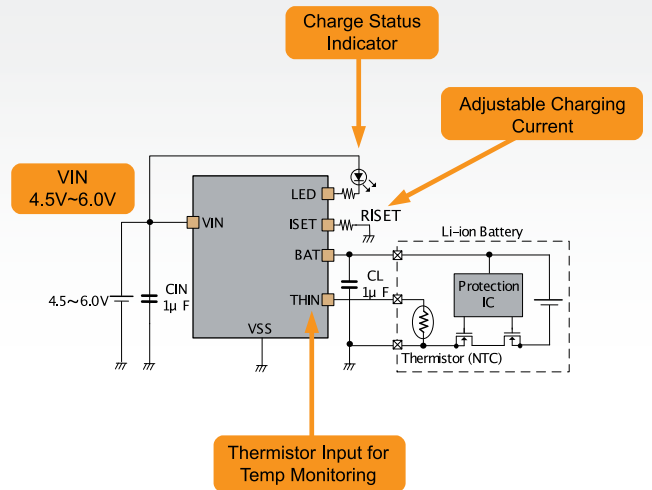
Withstands surge voltages of up to 46V for 400ms or less

### KEY FEATURES

Output Current	300mA
Dropout Voltage	350mV @ I <sub>OUT</sub> =100mA
Input Voltage	4.5V ~ 36V
Output Voltage	1.8V ~ 18V
Output Voltage Increments	0.1V (V <sub>OUT</sub> < 6V) 0.5V (V <sub>OUT</sub> ≥ 6V)
Output Accuracy :	±1%
Quiescent Current	40μA
Stand-by Current :	0.1μA
PSRR	65dB
Protection Circuits	Thermal Shutdown
	Current Limit
	Short Circuit Protection
Op. Ambient Temperature	-40°C ~ +125°C
Additional Features: Soft-start	
Low ESR Ceramic capacitor compatible	
Packages: USP-6C, SOT-89-5, SOP-8FD	

## XC6803/04/05 Li-Ion Battery Chargers with Temperature Monitoring

### TYPICAL APPLICATION CIRCUIT



### KEY FEATURES

SERIES	XC6803	XC6804	XC6805	
Input Voltage	4.5V ~ 6.0V			
Charge Current (Externally Set)	40mA ~ 300mA	200mA ~ 800mA	5mA ~ 30mA	
Charge Termination Voltage	4.2V			
Trickle Charge Voltage	2.9V			
Supply Current (Stand-by)	50μA			
<b>Charge Judgment Function</b>				
Short Battery Detection	✓	✓	✓	
Test Charge Mode	✓	✓	✓	
Trickle Charge Mode	✓	✓	✓	
Battery Temperature Monitor	✓	✓	Optional	
<b>Protection Circuits</b>				
Thermal Shutdown	✓	✓	✓	
Dropout Voltage Monitoring	✓	✓	✓	
Charging over-Voltage and over-Current monitoring	✓	✓	✓	
Safety Timer Function	Main Charge	5hrs	5hrs	3hrs
	Trickle Charge	0.5hrs	0.5hrs	0.5hrs
Packages	USP-6C	USP-6C or SOP-8FD	USP-6C	

# TOIREX

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