

# Power Management Solutions

## IN THIS ISSUE

**High Frequency Step-down DC/DC Converter**

XC9206/07/08

**Synchronous Step-down DC/DC Converter**

XC9211/12

**Synchronous DC/DC with built-in VR and VD**

XC9508/09

**Step-up Charge Pump Converter**

XC9801/02 Series

**Step-up DC/DC Controller with Vref input**

XC9106/07

**2-Channel DC/DC Controllers**

XC9501/02/03/04/05

**Chip-scale packages**

USP-6B, USP-8

**Ultra low Power LDO Voltage Regulator**

XC6206 Series

**High Speed, Low Noise LDO Voltage Regulators**

XC6204/05/09

**Dual LDO Voltage Regulator**

XC6401

**LDO Voltage Regulator with built-in Detector**

XC6403

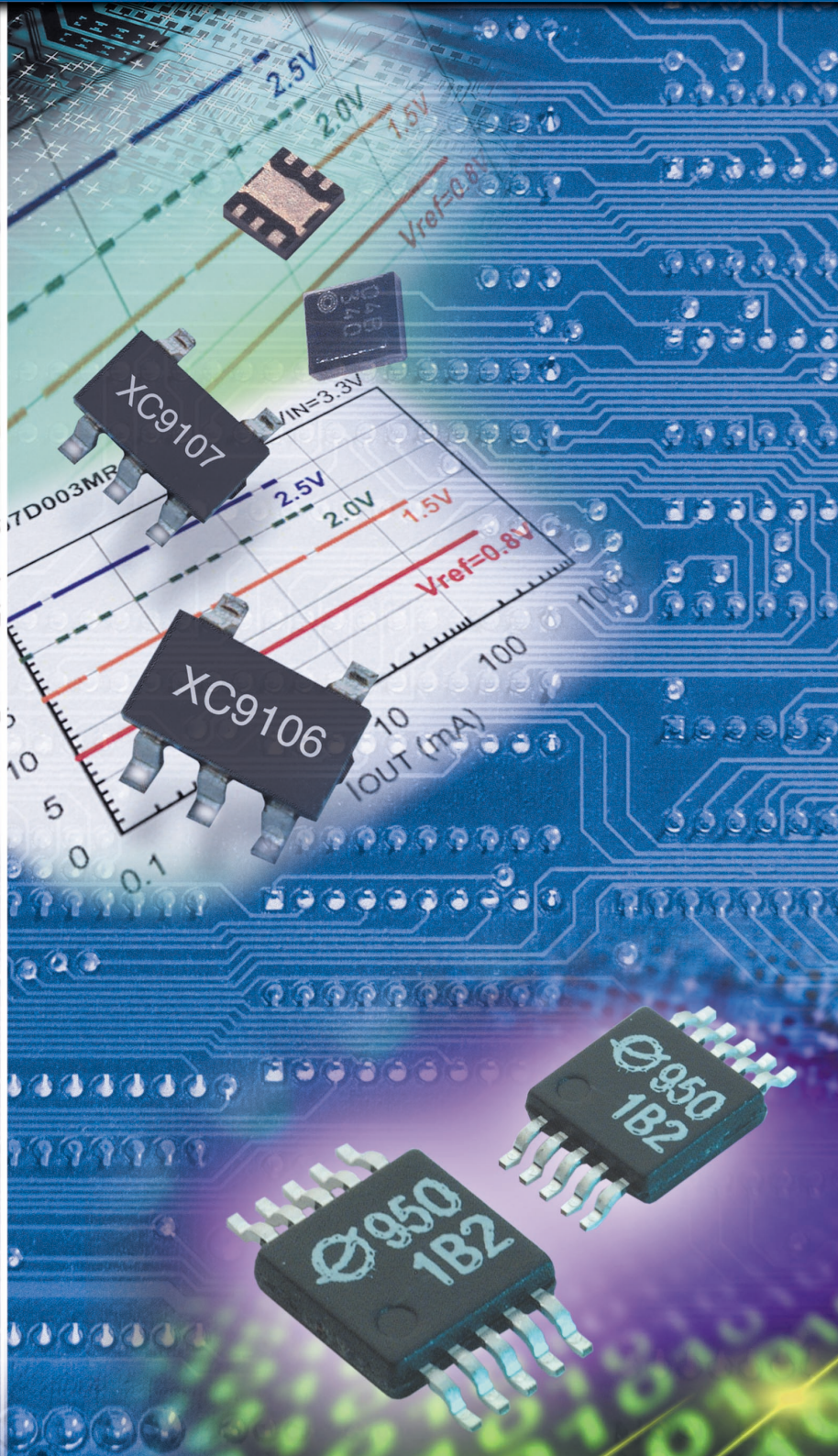
**Voltage Supervisors with manual RESET and Watch Dog**

XC6101

**PLL Clock Generator IC**

XC25BS3 & XC25BS5

**Product Selection Guide**



# Step-Down DCDC

## XC9206/07/08 High Frequency Step-down DC/DC Converter

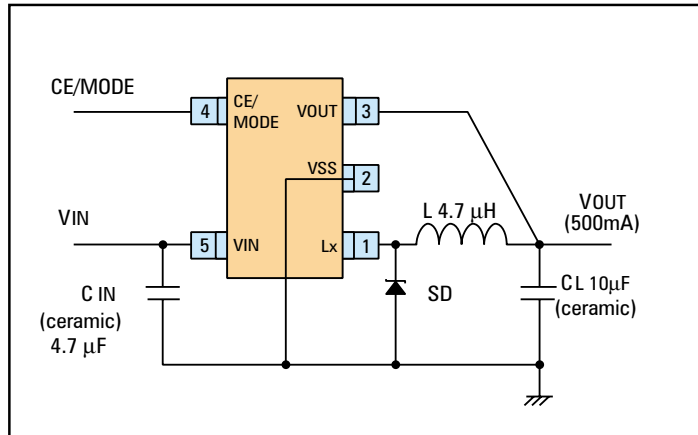
- XC9206 PWM Control
- XC9207 PWM/PFM auto-switching
- XC9208 PWM/PFM manual control



Demo PCB  
Actual Size

The XC9206/07/08 series is a family of DC/DC converters with built in  $0.4\Omega$  P-channel driver transistor for high efficiency operation at output currents up to 500mA. With switching frequencies up to 1.2MHz, small external parts can be used and the XC9206/7/8 is fully compatible with ceramic capacitors.

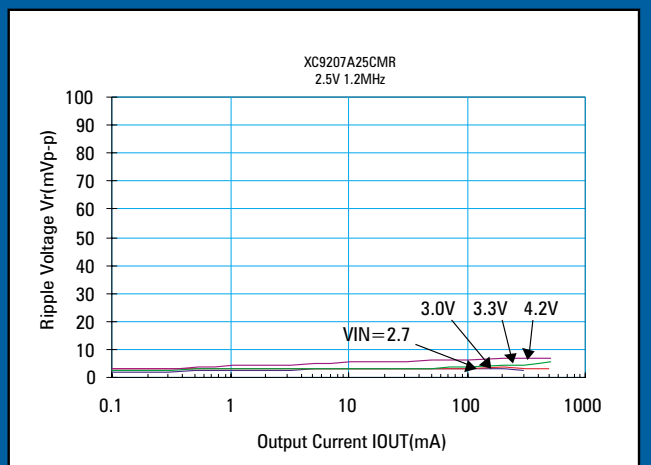
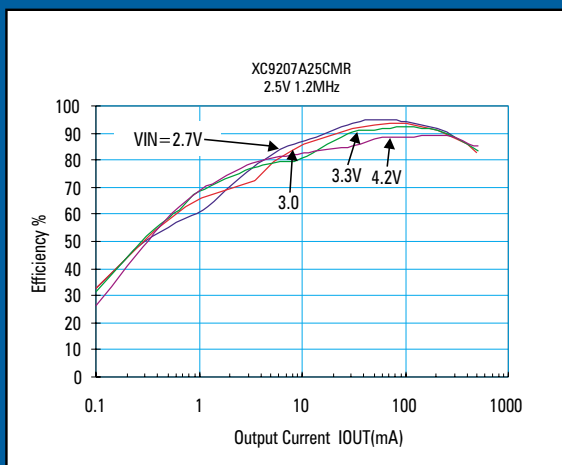
The designer can choose between fixed PWM operation (XC9206), PWM/PFM auto-switching (XC9207) and PWM/PFM manual switching (XC9208). The switching operation for the XC9208 is manually controlled using the CE/MODE pin.



Offering fast response, ultra low output ripple and high efficiencies over the full range of output loads, the XC9206/07/08 series is ideal for a wide range of applications.

- Input Voltage: 1.8V ~ 6.0V
- Output Voltage: 0.9V ~ 4.0V (0.1V steps)
- Output current: 500mA

- Oscillator Frequency: 300kHz, 600kHz or 1.2MHz
- Built-in current limit and soft start circuit
- Small SOT23-5 package
- Compatible with ceramic capacitors
- Standby current:  $0.5\mu\text{A}$  (max)
- U.V.L.O

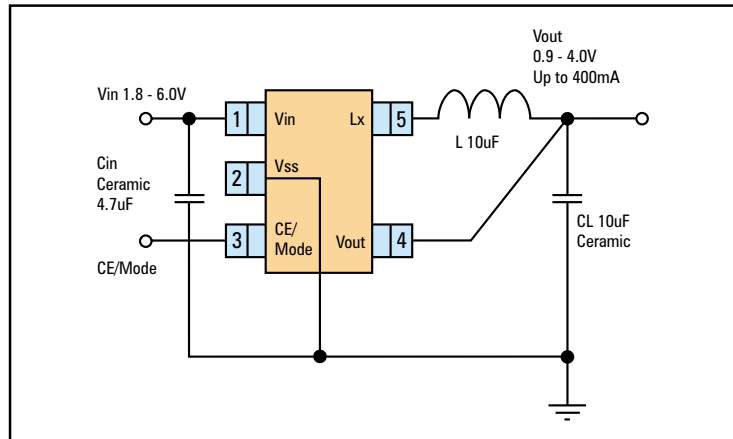


# Step-Down DCDC

## XC9211/12 Synchronous Step-down DC/DC Converter

- XC9211 Synchronous PWM only
- XC9212 Dual Mode operation
  - Synchronous PWM Control
  - Non-Synchronous PFM/PWM auto-switching

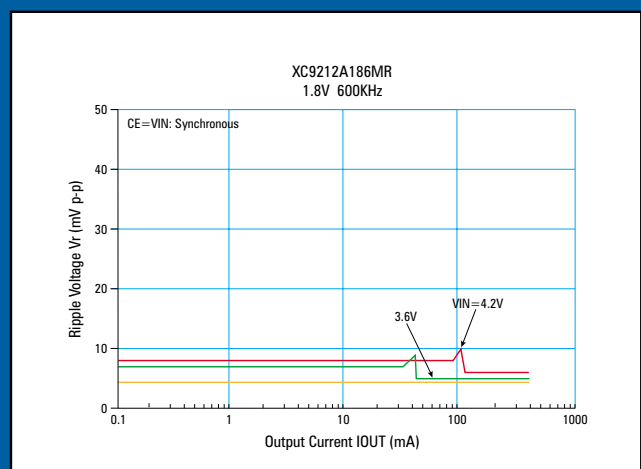
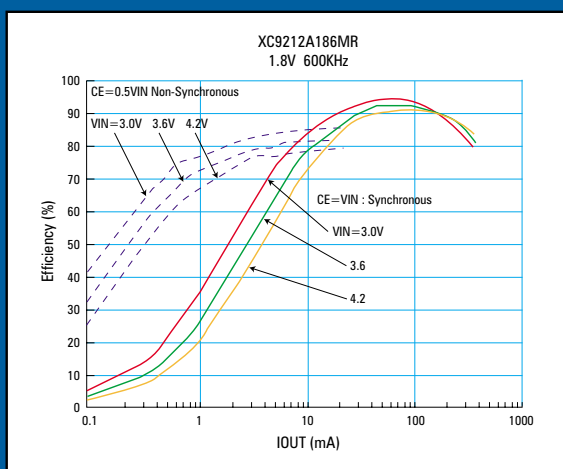
The XC9211/12 series are synchronous DC/DC converters with built in  $0.6\Omega$  P-channel driver transistor and N-channel switching transistor. The XC9211/12 is designed for use with ceramic capacitors and small chip inductors. Outputs of 400mA can be achieved at efficiencies over 90% due to the synchronous rectification topology. The XC9211 operates in synchronous PWM mode, whereas the switching operation of the XC9212 type can be manually controlled between synchronous PWM and non-synchronous PFM/PWM using the CE/MODE pin. The low output ripple performance makes the



XC9211/12 series an ideal choice for noise sensitive RF applications like Bluetooth and next generation mobile phones.

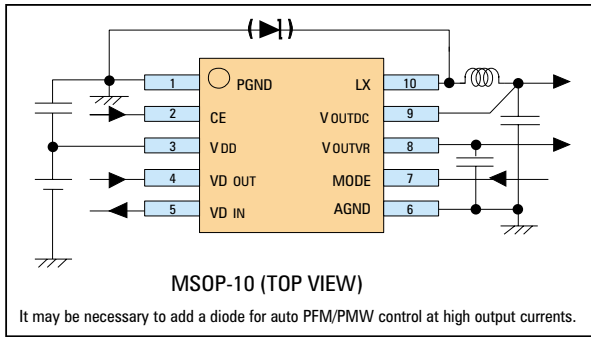
- Input Voltage: 1.8V ~ 6.0V
- Output Voltage: 0.9V ~ 4.0V (0.1V steps)
- Oscillator Frequency: 300kHz, 600kHz or 900kHz

- Output current: up to 400mA
- Compatible with ceramic capacitors
- Built-in soft start and current limit circuit
- Maximum Duty Ratio: 100%
- Small SOT23-5 or USP-6B chip scale package (2.0mm x 1.8mm x 0.65mm).
- Standby current:  $0.5\mu\text{A}$  (max)



# Power Management

## XC9508/09 Synchronous DC/DC with Built-in VR and VD



- XC9508 - VR input from DC/DC
- XC9509 - VR input from Vin

The XC9508/09 series is a family of synchronous rectification type DC/DC converters with a built in high speed, low noise, LDO voltage regulator and

an internal comparator for low voltage detection. The internal 0.6Ω P-channel driver transistor and N-channel switching transistor mean that efficiencies over 90% can be achieved without needing an external Schottky diode. The XC9508/09 series is designed for use with ceramic capacitors and small chip style inductors, making it ideal for space conscious applications. The XC9508/09 is available in MSOP-10 and USP-10 (chip-scale) packages.

- Input Voltage: 2.0V ~ 6.0V
- Output Voltage: 0.9V ~ 4.0V (0.1V steps)
- Switching Frequency: 300KHz, 600kHz or 1.2MHz
- Output Current: DC/DC 600mA  
VR 300mA
- VR Dropout Voltage: 300mV @ 300mA (typ)
- VD Function: N-Ch open Drain
- PWM or PWM/PMW auto-switch control, selectable via MODE pin.
- Compatible with Low ESR Ceramic Capacitors
- Built-in current limit and internal soft start circuit (set to 10ms)
- Under Voltage Lock Out Circuit

## XC9801/02 Series Step-up Charge Pump Converter

The XC9801/02 is a family of regulated step-up Charge Pump ICs aimed at white LED applications.

Using only three external ceramic capacitors the XC9801/02 provides a

very cost effective, simple step-up solution.

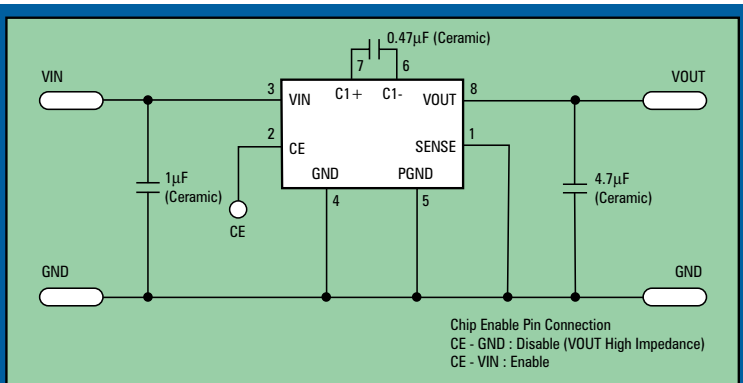
Regulation is achieved by control of the charge pump's gate voltage waveform so output ripple is minimized. By connecting

the SENSE pin to GND the XC9801/02 can also be used as voltage doubler.

The XC9802 switches to 'pulse skip' mode during light loads to maximize efficiency.

The XC9801/02 is available in MSOP-8 and USP-8 (chip-scale) packages.

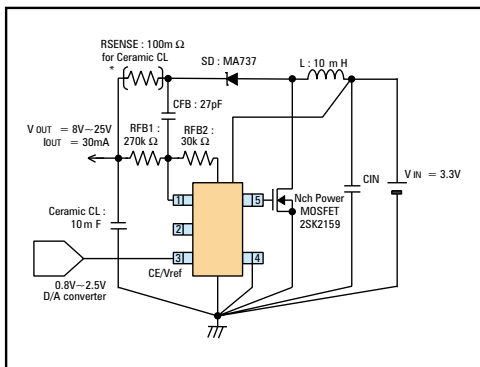
- Input Voltage: 1.8V ~ 5.5V
- Output Voltage: 2.5V ~ 5.2V (0.1V steps)
- Oscillator Frequency: 300KHz
- Max. Output Current: 100mA
- Current Consumption: 80μA (XC9802: no load)
- Standby Current: 2μA (max)



# DCDC Converters

## XC9106/07 Step-up DC/DC Controller with Vref input

- XC9106 - PWM control with Vref input
- XC9107 - PWM/PFM auto-switching with Vref Input



The XC9106~07 series are step-up DC/DC controller ICs with an externally applied reference voltage. The output voltage is set-up using two external resistors and the Vref value. This makes it easy to control the output voltage externally, using software. The XC9106/07 is ideally suited to applications that need to vary voltage, such as the power supply for an LCD. The XC9106/07 is designed for use with ceramic capacitors and maintains very low output ripple.



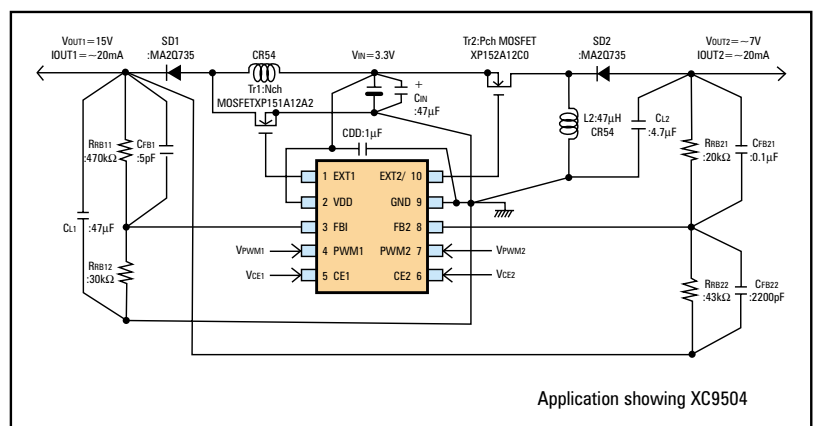
- Input Voltage: 0.9V ~ 10.0V
- Output Voltage: 1.8V ~ 30.0V
- VREF input: 0.8V ~ 2.5V
- Switching Frequency: 300KHz, or 100kHz
- Output current: > 30mA
- Standby Current: 1.0μA (max)

## XC9501/02/03/04/05 2-Channel DC/DC Controllers

- XC9501 - Dual Step-up
- XC9502 - Step-up + Step-down
- XC9502 - Dual Step-down
- XC9504 - Step-up + Inverter
- XC9505 - Step-down + Inverter

The X9501~05 are dual channel DC/DC controller ICs. Output voltages are individually set-up externally, using two resistors and the control of the XC9501~5 series can be switched between PWM and PFM/PWM auto-switching using the MODE pin.

Control switches from PWM to PFM during light loads when auto-switching is selected. This maximises the efficiency across all output loads. In PWM mode noise is easily reduced since the switching frequency is fixed.

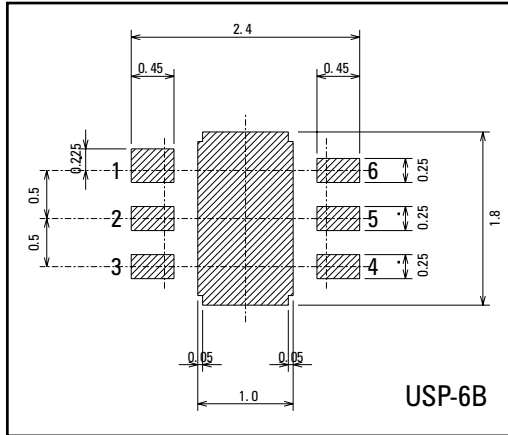
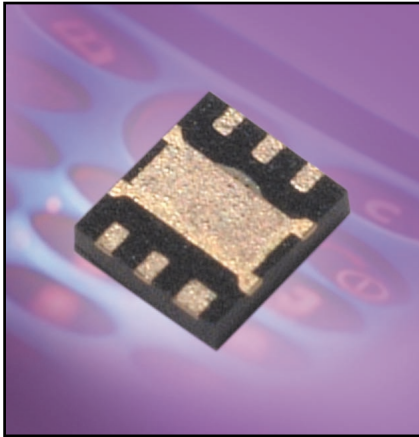


Application showing XC9504

- Input Voltage: 0.9V ~ 10.0V
- Output Voltage: 1.5V ~ 30.0V  
- 30.0V ~ 0.0V
- Switching Frequency: 180KHz or 300KHz
- Standby Current: 3.0μA (max)
- Soft Start internally set-up
- MSOP-10 package
- Output Voltage externally set-up
- PWM, PWM/PFM switching control

# Power Management

## USP-6B, USP-8 Chip-scale packages



8pin, USP-8 is 2.5mm x 2.7mm x 0.485mm (typ).

Both packages offer dramatic reductions in PCB space when compared with the traditional SOT23 and MSOP-8 packages.

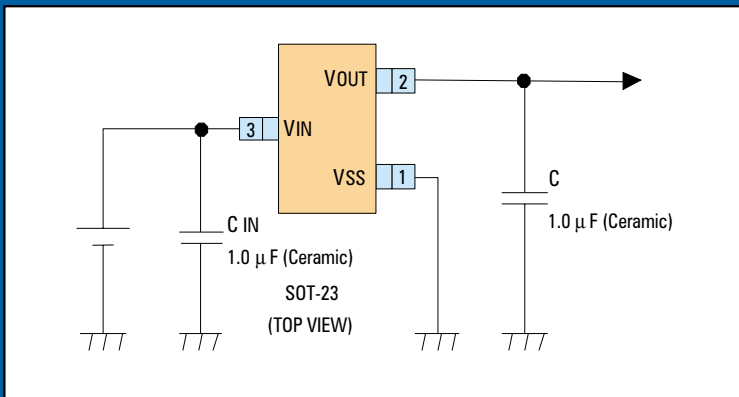
The PCB area taken by the USP-6B is 55% less than the SOT23.

The USP series are miniature chip-scale packages that use traditional production techniques to minimize the PCB area

required, in a very cost effective way. The 6pin, USP-6B measures only 2.0mm x 1.8mm and 0.65mm high, whereas the

A smaller, 4pin, USP-4 is also under development.

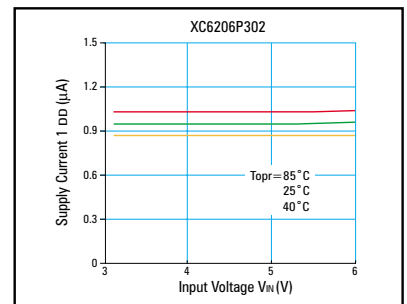
## XC6206 Series Ultra Low Power LDO Voltage Regulator



Very low quiescent current, only 1μA in operation, makes the XC6206 series ideal for power critical applications. Designed for use with low ESR ceramic capacitors, the XC6206 is capable of handling output

currents over 250mA. The low drop-out performance and built-in current limit circuit make the XC6206 ideal for a wide range of applications.

- Input Voltage: 1.8V ~ 7.0V
- Output Voltage: 1.2V ~ 5.0V (0.1V steps)
- Max Output Current: > 250mA
- Dropout Voltage: 160mV @ 100mA  
400mV @ 200mA
- Low Quiescent Current: 1μA
- Built-in Current Limiter
- Low ESR Ceramic Capacitors
- Op. Temp. Range: -40°C ~ 85°C
- Small Packages: SOT23 & SOT89



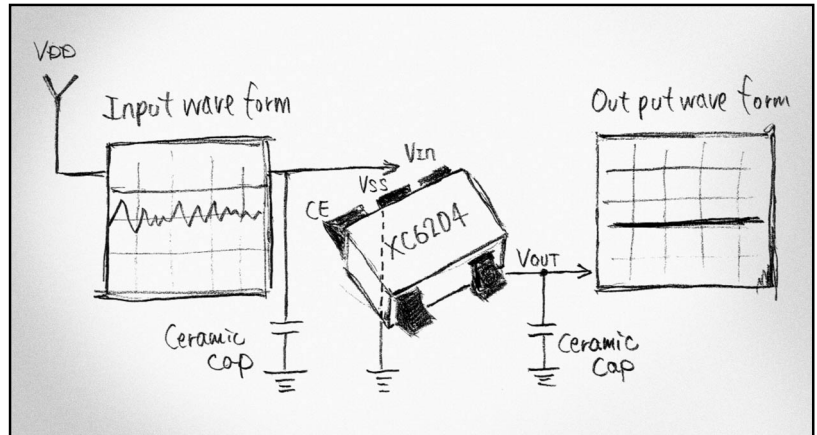
# Power Management

## XC6204/05/09 High Speed, Low Noise LDO Voltage Regulators

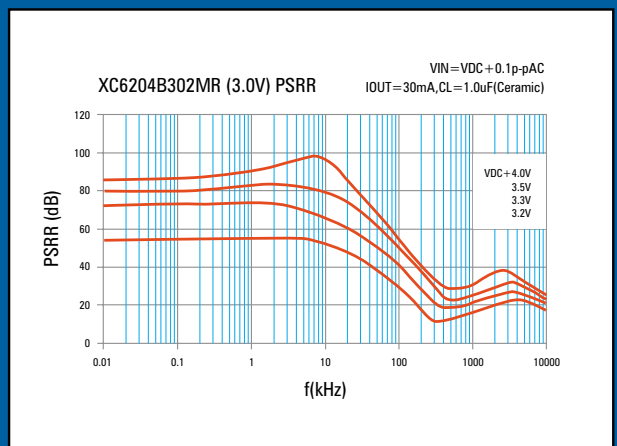
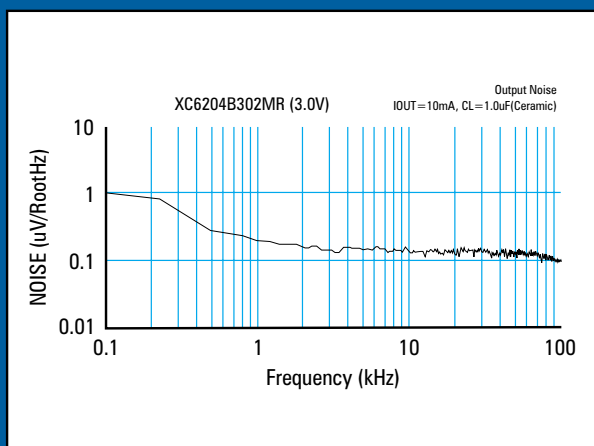
- XC6204 - Ultra Low Noise
- XC6205 - Lower Output Voltages
- XC6209 - Lower Quiescent Current

The XC6204/05/09 series' of LDO Voltage Regulators combine high speed operation with low output noise and low current consumption to offer ideal solutions for GPRS, Bluetooth and WLAN applications. The XC6204/05 offer the highest levels of performance and lowest output noise making them ideal for RF applications, whereas the XC6209 with its lower quiescent current is aimed at baseband/digital requirements. All three families offer very high ripple rejection, even at higher frequencies, and ultra fast transient response.

- Input Voltage: 2.0V ~ 10.0V
- Output Voltage range (0.05V steps):
  - XC6204: 1.8V ~ 6.0V
  - XC6205: 0.9V ~ 1.75V
  - XC6209: 0.9V ~ 6.0V
- Max output current: >200mA
- Low Output Noise:
  - XC6204/5: 30 $\mu$ Vrms
  - XC6209: <60 $\mu$ Vrms
- Low Drop-out Voltage:
  - 60mV @ 30mA
  - 200mV @ 100mA
- Low Operating Current:
  - XC6204/5: 70 $\mu$ A
  - XC6209: 25 $\mu$ A
- Standby Current: <0.1 $\mu$ A

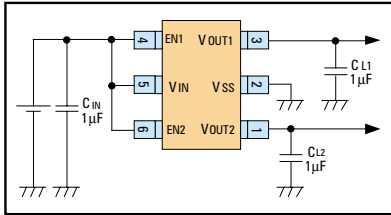


- Fast Turn-ON Time: <20 $\mu$ s
- CE = Active 'High' or Active 'Low'
- High Ripple Rejection: >70dB @ 10kHz
- Compatible with low ESR ceramic capacitors
- SOT25 or USP-6B (chip-scale) package



# Power Management

## XC6401 Dual LDO Voltage Regulator



The XC6401 comprises two high speed, low noise, LDO voltage regulators in a small SOT26W or USP-6B chip-scale package.

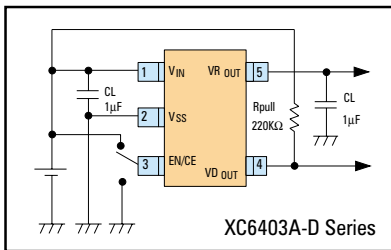
Each output can be set-up independently and offers high ripple rejection rates and low output noise.

The XC6401 also boasts a 'Power saving mode', where at lower output currents, the supply current reduces to 4.5µA/ch (typ).

- Input Voltage: 1.8V ~ 6.0V
- Output Voltage: 0.8V ~ 5.0V (0.1V steps)
- Max. Output current: >150mA/ch

- Drop-out Voltage: 100mV @ 100mA
- Ripple Rejection Rate: >70dB @ 10KHz
- Low supply current: 30µA/ch
- Power Saving Mode: 4.5µA/ch
- Standby current: <0.1µA
- Op. Temp Range: -40°C~85°C
- Built-in Current Limit Circuit
- Low ESR Ceramic Capacitor Compatible
- SOT26W & USP-6B packages

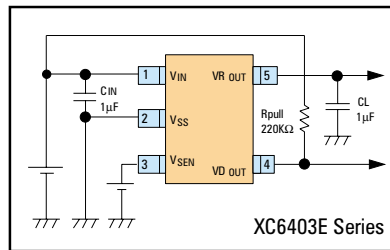
## XC6403 LDO Voltage Regulator with built-in Detector



The XC6403 family combines a high speed, low noise, voltage regulator with a built-in voltage detector / reset circuit.

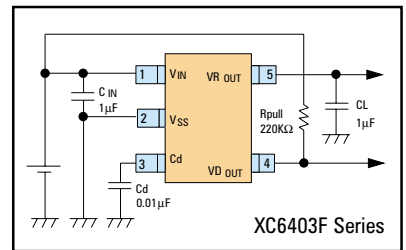
The XC6403 is very versatile and designers can select active high or low for the EN/CE logic, with or without a built-in pull up/down resistor. The voltage detector output can detect high or low and can be set to detect VIN, VOUT or another power source using VSEN.

Available in the USP-6B, SOT23-5 and SOT89-5 packages, the XC6403 is designed for use with ceramic output capacitors making it ideal for



space conscious applications.

- Input Voltage: 2.0V ~ 6.0V
- VR Output Voltage: 1.8V ~ 5.6V (0.1V steps)
- Max Output Current: 300mA
- Drop-out Voltage: 200mV @ 100mA



- Detect Voltage Range: 0.9V ~ 5.6V (0.1V steps)
- Standby current: <0.01µA
- Low Output Noise: 30µVrms
- High PSRR: 65dB @ 10kHz
- Current consumption: 30µA
- Built in current limit

The XC6403 series comes in six basic options as detailed below:

Series	Function	EN/CE Logic		Built-in Pull up/down Resistor		VD Sense Pin			VD Output Logic	VD Delay (Cd)
		Active High	Active Low	Yes	No	Vin	Vout	VSEN		
XC6403A	Toggle and EN function	✓	✓	✓	✓	✓	✓	✓	Detect High or Detect Low Available	×
XC6403B	Toggle and EN function with VD signal/VR OFF function	✓	✓	✓	✓	✓	✓	✓		×
XC6403C	EN Function	✓	✓	✓	✓	✓	✓	✓		×
XC6403D	CE Function	✓	✓	✓	✓	✓	✓	✓		×
XC6403E	VSEN pin (to monitor ext. powersource)	×	×	×	×	✓	✓	✓		✓
XC6403F	Cd Pin (Delay VD output)	×	×	×	×	✓	✓	✓		✓

EN function allows internal regulator circuit to be put into standby

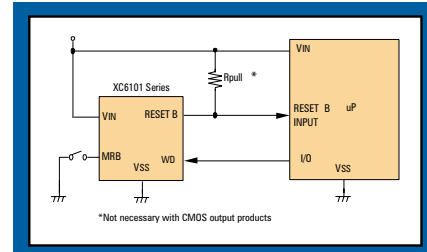
CE functions allows whole IC to be switched on/off

# Power Management

## XC6101 Voltage Supervisors with Manual RESET and Watch Dog

The XC6101x family of supervisors provides circuit initialisation and timing supervision, primarily for DSP and processor-based systems. The XC6101x series includes a built-in delay circuit and optional manual reset and watchdog functions

- Operating Voltage: 1.0V ~ 5.5V
- Detect voltage: up to 5.0V (0.1V steps)
- Low Power consumption: 15µA (typ)
- Output configuration: N-ch open drain or CMOS
- Active high or active low reset
- Selectable Watchdog timeout period
- Extended temp range -40°C to +85°C
- Small SOT25 package



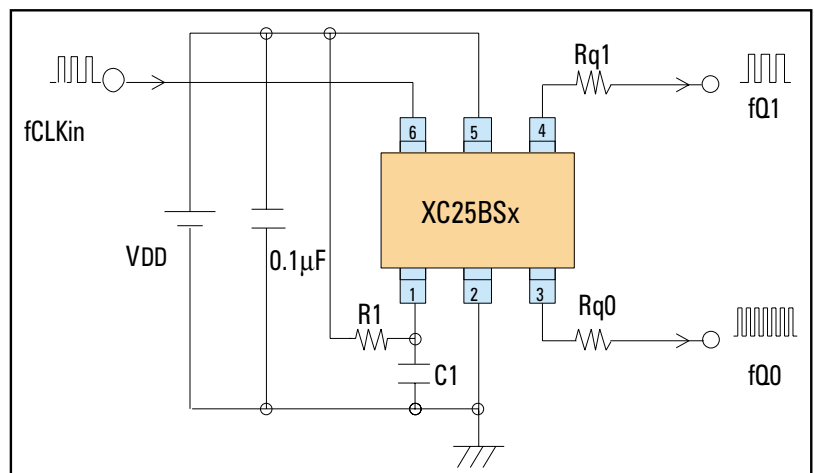
Series	Watchdog	Manual Reset	Reset Output	
			VDFL	VDFH
XC6101A	✓	✓	CMOS	-
XC6101B	✓	✓	N channel open drain	-
XC6101C	✓	✓	-	CMOS
XC6101D	✓	x	CMOS	CMOS
XC6101E	✓	x	N channel open drain	CMOS
XC6101F	x	✓	CMOS	CMOS
XC6101H	x	x	N channel open drain	CMOS

## XC25BS3 & XC25BS5 PLL Clock Generator IC

The XC25BSx family of PLL clock generators uses internal divider and multiplier circuits to create a wide range of output frequencies from standard clock signals. The XC25BSx series offers a low cost replacement to surface mount crystals and is available in the tiny SOT23-6 package.

$$Q0 = f_{CLKin} \times N/M$$

- Input frequency (fCLKin): 12kHz ~ 35MHz
- Output frequency (Q0): 3MHz ~ 80MHz
- Voltage: 2.97V ~ 5.5V
- Divider ratio (M): 1 ~ 2047
- Multiplier ratio (N): 6 ~ 2047
- Low Jitter
- Output: 3 state



Q1 output selectable from reference oscillation, GND, PLL output/2 or comparative frequencies/2.

# Selection Guide

## DC/DC Convertors & Controllers

### Step-up DC/DC Convertors

Part Number	Type	Efficiency	Operating Voltage Range	Output Voltage Range	High Accuracy	Max. Oscillator Frequency	Comments	Package
XC6381 Series	PFM	85%	0.9V ~ 10V	2.0V ~ 7.0V	+/-2.5%	155kHz +/-15%	Low output currents	SOT23 & SOT25 SOT89 & SOT89-5
XC6382 Series						Fixed Duty Ratio		
XC6383 Series						Switchable Duty Ratio		
XC6385 Series						Low Noise		
XC6371 Series	PWM	Typ. 85%	0.9V ~ 10V	2.0V ~ 7.0V	+/-2.5%	Selectable (+/-15%) 50kHz, 100kHz & 180kHz	Low Cost	SOT89 & SOT89-5
XC6372 Series	PFM / PWM							
XC6373 Series	PWM						Typ. 82%	

### Step-up DC/DC Controllers

Part Number	Type	Efficiency	Operating Voltage Range	Output Voltage Range	High Accuracy	Max. Oscillator Frequency	Comments	Package	
XC6367 Series	PFM	Typ. 85%	0.9V ~ 10V	1.5V ~ 30V (fixed or adjustable)		100kHz, 180kHz, 300kHz, 500kHz	Output > 500mA Standby Current 0.5µA Max	SOT25	
XC6368 Series	PWM								
XC9101 Series	PWM	Typ. 85%	20.0V max	1.5V ~ 30V (fixed or adjustable)	+/-2.5%	100kHz ~ 600kHz (user selectable)	Outputs upto 3A Low ESR ceramic caps	MSOP8	
XC9103 Series	PWM	Typ. 85%	0.9V ~ 10V	1.5V ~ 30V (fixed or adjustable)		100kHz, 300kHz, 500kHz		Auto PFM /PWM Manual Switching Mode V-Ref input, adj. Vout LCD application	SOT25 USP-6B
XC9104 Series	PFM / PWM								
XC9105 Series	PFM / PWM								
XC9106 Series	PWM								
XC9107 Series	PFM / PWM								

### Step-down DC/DC Convertors

Part Number	Type	Efficiency	Operating Voltage Range	Output Voltage Range	High Accuracy	Max. Oscillator Frequency	Comments	Package
XC6376 Series	PWM	Typ. 95%	1.8V ~ 10V	1.5V ~ 6.0V (fixed or adjustable)	+/-2.5%	180kHz, 300kHz, 500kHz	Built in P-Ch MOSFET Standby current 1.5µA	SOP-8
XC6377 Series	PFM / PWM							
XC9206 Series	PWM							
XC9207 Series	PFM / PWM	Typ. 90%	1.8V ~ 6.0V	0.9V ~ 4.0V	+/-2%	300kHz, 600kHz, 1.2MHz	Output upto 500mA Low ESR ceramic caps Switching mode externally selectable	USP-6B SOT25
XC9208 Series	PFM / PWM PFM disable mode							
XC9211 Series	Synchronous PWM	Typ. 94%	1.8V ~ 6.0V	0.9V ~ 4.0V	+/-2%	300kHz or 600kHz	Outputs upto 400mA Low ESR ceramic caps	USP-6B SOT25
XC9212 Series	Synchronous PWM or PFM / PWM							

### Step-down DC/DC Convertors with built-in Voltage Regulators and Detector

Part Number	Type	Efficiency	Operating Voltage Range	Output Voltage Range	High Accuracy	Max. Oscillator Frequency	Comments	Package
XC9508	Synchronous PWM or PFM / PWM	Typ. 94%	2.0V ~ 6.0V	0.9V ~ 4.0V	+/-2%	300kHz, 600kHz, 1.2MHz	DC/DC Iout > 600mA VR Iout > 300mA	MSOP-10 USP-10
XC9509								
XC9510							DC/DC Iout > 800mA VR Iout > 400mA	SOP-8
XC9511								

### Step-down DC/DC Controllers

Part Number	Type	Efficiency	Operating Voltage Range	Output Voltage Range	High Accuracy	Max. Oscillator Frequency	Comments	Package
XC6365 Series	PWM	Typ. 92%	1.8V ~ 10.0V	1.5V ~ 6.0V (fixed or adjustable)	+/-2.0%	180kHz, 300kHz, 500kHz	Output Current > 1A Standby Current 0.5µA Max	SOT25
XC6366 Series	PFM / PWM							
XC9201 Series	PWM	Typ. 90%	2.2V ~ 20.0V	1.2V ~ 16.0V (fixed or adjustable)	+/-2.5%	100kHz ~ 600kHz (user selectable)	Outputs upto 3A Low ESR ceramic caps	MSOP-8
XC9210 Series	Synchronous PFM/PWM	Typ. 90%	2.5V ~ 10.0V	1.5V ~ 6.0V	+/-2%	300kHz +/-15%	Outputs > 1.0A CE pin & internal soft-start	MSOP-8
XC9213 Series	Synchronous PFM/PWM	Typ. 93%	2.0V ~ 25.0V	1.0V ~ 15V	+/-2%	300kHz +/-15%	Outputs > 4.0A Boot strap method	TSSOP-16

# Selection Guide

## DC/DC Converters & Controllers continued

### Step-up & down DC/DC Controllers

Part Number	Type	Efficiency	Operating Voltage Range	Output Voltage Range	High Accuracy	Max. Oscillator Frequency	Comments	Package
XC9301 Series	PWM	Typ. 80%	2.0V ~ 10.0V	2.4V ~ 6.0V	+/-2.5%	180kHz or 300kHz (+/-15%)	Outputs >250mA CE pin & internal soft-start	SOT25
XC9302 Series	PFM/PWM							
XC9303 Series	Synchronous PFM/PWM	Typ. 80%	2.5V ~ 10.0V	1.5V ~ 6.0V	+/-2%	300kHz (+/-15%)	Outputs >400mA CE pin & internal softstart	MSOP-8

### Dual Channel DC/DC Controllers

Part Number	Type	Efficiency	Operating Voltage Range	Output Voltage Range	High Accuracy	Max. Oscillator Frequency	Comments	Package
XC9501 Series	Dual Step-up	Typ. 85%	0.9V ~ 10.0V	1.5V ~ 30.0V	+/-2%	180kHz or 300kHz (+/-15%)	Switching Mode Pin: PWM or PFM/PWM Low ESR Ceramic Caps 3.0µA in Standby	MSOP-10
XC9502 series	Step-up+Step-down							
XC9503 Series	Dual Step-down	Typ. 92%	2.0V ~ 10.0V	1.5V ~ 6.0V				
XC9504 Series	Step-up+Inverting	Typ. 82%	0.9V ~ 10.0V	1.5V ~ 30.0V				
XC9505 Series	Step-down+Inverting	Typ. 85%	2.0V ~ 10.0V	-30.0V ~ 0.0V				

## Charge Pump Converters

Part Number	Type	Efficiency	Operating Voltage Range	Output Voltage Range	Low Supply Current	Max. Oscillator Frequency	Comments	Package
XC6351A120MR	Inverting	Typ. 90%	1.2V ~ 5.0V	-1.2V to -5.0V	310µA typ.	120kHz	Standby current 2.0µA	SOT26
XC9801/02 Series	doubler / Regulated Step-up	Typ. 80%	1.8V ~ 5.5V	2.5V ~ 5.2V	80µA	300kHz	Standby current 2.0µA	USP-8 MSOP-8

## ASSP - Multi Power Supply

Part Number	Description	Output Voltage / Detect Voltage Range	Power Consumption	Output Voltage Temp. Characteristics	Package
XC641A Series	4 x LDO Voltage Regulators 2 x Voltage Detectors	2.0V ~ 5.0V (+/-2%)	25µA typical 6µA typical (EN pin disabled)	+/-100ppm/C	SSOP-16
XC651A Series	PFM Step-Up DC/DC Converter 5 level window comparator 2 x Voltage Detector	VD: 0.9V ~ 3.0V DC/DC: 2.0V ~ 3.0V	TBC	TBC	TSSOP-16

## Voltage Detectors / RESET IC

Part Number	Type	Detect Voltage	Accuracy	Operating Voltage	Power Consumption	Output Configuration	On-chip delay circuit	Comments	Package
XC61A Series	High Precision	0.8V	+/-2% (1%)	0.7V ~ 10.0V	Typ. 1.0µA	N-Channel Open Drain or CMOS	n/a		SOT23 SOT89
XC61C Series	Low Current	0.9V ~ 6.0V	+/-2%	0.7V ~ 10V	Typ. 0.7µA	N-Channel Open Drain or CMOS	n/a		SSOT24 SOT23 / 25 SOT89
XC61F Series	Built in Delay Circuit	1.6V ~ 6.0V	+/-2%	0.7V ~ 10V	Typ. 1.0µA	N-Channel Open Drain or CMOS	1ms to 50ms 50ms to 200ms (std) 80ms to 400ms		SOT23 SOT89
XC612 Series	Dual Channel	1.5V ~ 5.0V	+/-2%	1.0V ~ 10.0V	Typ. 3.0µA	N-Channel Open Drain or CMOS	n/a	VD levels set independently	SOT25
XC6101 Series	Manual RESET/ Watchdog	Up to 5.0V	+/-2%	1.0V ~ 5.5V	Typ. 15µA	N-Channel Open Drain or CMOS	User Selectable	RESET High or Low	SOT25

# Selection Guide

## CMOS LDO Voltage Regulators

### Positive Voltage Regulators

Part Number	Type	Input Voltage Range	Output Voltage	Max Output Current	Accuracy	Power Consumption		Dropout Voltage	Comments	Package
						Typical	Standby			
XC62FP Series	General Purpose	12V max	1.5V ~ 6.0V	>250mA	2% (1%)	2.0µA	n/a	120mV @ 100mA 380mV @ 200mA		SOT23 SOT89
XC62RP Series	Reference Source	6V max	1.5V ~ 3.5V	6mA	2% (1%)	3.2µA		140mV @ 300µA	Low output currents	SOT23 SOT89
XC6201 Series	Low ESR Caps	12V max	1.7V ~ 6.0V	>250mA	2%	2.0µA		200mV @ 80mA	Low ESR Ceramics Capacitors	USP-6B SOT25 SOT89
XC6202 Series	High Input Voltage	20V max	1.8V ~ 15V	>100mA		10.0µA		200mV @ 30mA		SOT23 SOT89 SOT223
XC6203 Series	High Output Current	12V max	1.8V ~ 6.0V	>600mA		8.0µA		150mV @ 100mA 300mV @ 200mA	SOT89 SOT223	
XC6206 Series	Low Quiescent Current	7V max	1.2V ~ 5.0V	>250mA		1.0µA		160mV @ 100mA 400mV @ 200mA	Low ESR Ceramics Capacitors	USP-6B SOT23 SOT89

### Positive Voltage Regulators with Output On/Off Control

Part Number	Type	Input Voltage Range	Output Voltage	Max Output Current	Accuracy	Power Consumption		Dropout Voltage	Comments	Package
						Typical	Standby			
XC62HR Series	Standard	12V max	2.0V ~ 6.0V (1.1V ~ 1.9V)	> 165mA	2% (1%)	3.0µA	0.1µA	180mV @ 60mA 580mV @ 160mV	Low Quiescent Current	JSP-6B SOT25 SOT89-5
XC62GR Series	High Speed		2.1V ~ 5.0V	> 150mA	2% (1%)	13.0µA		200mV @ 80mA 380mV @ 160mA	Higher Speed Version Available	SOT25 SOT89-5
XC6204 Series	Low Noise / High Speed		1.8V ~ 6.0V	2%	70µA	25µA		60mV @ 30mA 200mV @ 100mA	Low ESR Caps Noise 30µVrms typ. PSRR > 70dB Fast turn-on time	SOT25 USP-6B
XC6205 Series	Low Noise / High Speed		0.9V ~ 1.75V							
XC6209 Series	Low Noise / High Speed		0.9V ~ 6.0V							
XC6212 Series	TK112 pin-out compatible		1.8V ~ 6.0V							
XC6401 Series	Dual Channel Low Noise / High Speed	7V max	0.8V ~ 5.0V	> 100mA	2%	4.5µA/ch 30µA/ch	100mV @ 100mA	Low ESR Caps PSRR > 70dB Power saving mode	USP-6B SOT26W	
XC62E Series	Boosting	10V max	2.0V ~ 6.0V	> 1000mA	2%	50.0µA	0.2µA	100mV @ 100mA < 400mV @ 1A	Ext. Transistor required	SOT25

### Positive Voltage Regulators with built in Voltage Detector

Part Number	Type	Input Voltage Range	Output	Max Output Current	Accuracy	Power Consumption		Dropout Voltage	Detect Voltage Range	D.V. Ouput Configuration	Package
						Typical	Standby				
XC66D		12V max	2.0V ~ 6.0V	> 100mA	2%	3.2µA	n/a	260mV @ 60mA	1.8V ~ 6.0V	N-ch open drain or CMOS	SOT25
XC6402	Low V-Drop	7V max	0.9V ~ 5.6V	> 150mA		30µA	n/a	50mV @ 100mA	0.9V ~ 5.6V		USP-6B SOT25
XC6403	Semi-custom		1.8V ~ 5.6V	60mV @ 30mA 200mV @ 100mA		0.1µA	n/a	n/a			SOT25 SOT89-5
XC6404	Delay circuit built-in		1.8V ~ 5.0V								
XC6405	Delay circuit built-in		0.9V ~ 5.1V								
XC6407	Delay circuit built-in		1.8V ~ 5.5V								
			> 400mA	85µA	n/a	n/a	1.8V ~ 5.5V	SOT89-5			

### Negative Voltage Regulators

Part Number	Type	Input Voltage Range	Output	Max Output Current	Accuracy	Power Consumption		Dropout Voltage	Comments	Package
						Typical	Standby			
XC62KN Series	General Purpose	-10V max	-2.1V to -6.0V	100mA	2% (1%)	3.0µA	n/a	120mV @ 50mA 380mV @ 100mA		SOT23 SOT89

# Selection Guide

## Power MOSFET

### N-Channel

Type Number	Absolute Max. Rating			Electrical Characteristic										Driving Voltage (V)	Package	
	V <sub>dss</sub> (V)	V <sub>gss</sub> (V)	I <sub>d</sub> (A)	R <sub>ds(ON)</sub> (Ω)								V <sub>gs</sub> (off) (V)				C <sub>iss</sub> (pF)
				V <sub>gs</sub> =1.5V		V <sub>gs</sub> =2.5V		V <sub>gs</sub> =4.5V		V <sub>gs</sub> =10V		MIN	MAX			
TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX	MIN	MAX					
XP131A1145SR	30	±20	7	-	-	-	-	0.035	0.045	0.025	0.03	1.0	2.5	620	4.5	SOP-8 (Single)
XP131A1235SR	20	±12	7	-	-	0.035	0.048	0.025	0.035	-	-	0.5	1.2	760	2.5	
XP131A1330SR	20	±8	8	0.045	0.07	0.03	0.04	0.025	0.03	-	-	0.5	1.2	950	1.5	
XP131A1520SR	30	±20	10	-	-	-	-	0.016	0.02	0.012	0.015	1.0	2.5	1370	4.5	
XP131A1617SR	20	±12	10	-	-	0.013	0.019	0.01	0.014	-	-	0.7	1.4	1650	2.5	
XP131A1715SR	20	±8	10	0.017	0.025	0.011	0.015	0.009	0.012	-	-	0.5	1.2	2000	1.5	SOP-8 (Dual)
XP133A1145SR	30	±20	6	-	-	-	-	0.035	0.045	0.026	0.033	1.0	2.5	620	4.5	
XP133A1235SR	20	±12	6	-	-	0.035	0.048	0.026	0.035	-	-	0.5	1.2	760	2.5	
XP133A1330SR	20	±8	6	0.045	0.07	0.03	0.04	0.025	0.03	-	-	0.5	1.2	950	1.5	SOT-23 (Single)
XP151A11B0MR	30	±20	1	-	-	-	-	0.13	0.17	0.09	0.12	1.0	3.0	150	4.5	
XP151A12A2MR	20	±12	1	-	-	0.12	0.16	0.075	0.1	-	-	0.7	1.4	180	2.5	
XP151A13A0MR	20	±8	1	0.17	0.25	0.1	0.14	0.075	0.1	-	-	0.5	1.2	220	1.5	SOT-89 (Single)
XP161A11A1PR	30	±20	4	-	-	-	-	0.075	0.105	0.05	0.065	1.0	2.5	270	4.5	
XP161A1265PR	20	±12	4	-	-	0.07	0.095	0.042	0.055	-	-	0.7	1.4	320	2.5	
XP161A1355PR	20	±8	4	0.1	0.15	0.05	0.07	0.037	0.05	-	-	0.5	1.2	390	1.5	

### P-Channel

Type Number	Absolute Max. Rating			Electrical Characteristic										Driving Voltage (V)	Package	
	V <sub>dss</sub> (V)	V <sub>gss</sub> (V)	I <sub>d</sub> (A)	R <sub>ds(ON)</sub> (Ω)								V <sub>gs</sub> (off) (V)				C <sub>iss</sub> (pF)
				V <sub>gs</sub> =-2.5V		V <sub>gs</sub> =-4.5V		V <sub>gs</sub> =-5.0V		V <sub>gs</sub> =-10V		MIN	MAX			
TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX	MIN	MAX					
XP132A11A1SR	-30	±20	-5	-	-	0.095	0.11	-	-	0.055	0.065	-1.0	-2.5	680	-4.5	SOP-8 (Single)
XP132A1275SR	-20	±12	-5	0.092	0.115	0.05	0.075	-	-	-	-	-0.5	-1.2	770	-2.5	
XP132A1545SR	-30	±20	-8	-	-	0.038	0.045	-	-	0.025	0.03	-1.0	-2.5	1500	-4.5	
XP132A1635SR	-20	±12	-8	0.04	0.055	0.025	0.033	-	-	-	-	-0.5	-1.2	1700	-2.5	SOP-8 (Dual)
XP134A11A1SR	-30	±20	-4	-	-	0.09	0.11	-	-	0.055	0.065	-1.0	-2.5	680	-4.5	
XP134A1275SR	-20	±12	-4.5	0.095	0.115	0.062	0.075	-	-	-	-	-0.5	-1.2	770	-2.5	SOT-23 (Single)
XP152A11E5MR	-30	±20	-0.7	-	-	0.35	0.45	-	-	0.2	0.25	-1.0	-3.0	160	-4.5	
XP152A12C0MR	-20	±12	-0.7	0.37	0.5	0.23	0.3	-	-	-	-	-0.5	-1.2	180	-2.5	SOT-89 (Single)
XP162A11C0PR	-30	±20	-2.5	-	-	0.2	0.28	-	-	0.11	0.15	-1.0	-2.5	280	-4.5	
XP162A12A6PR	-20	±12	-2.5	0.22	0.3	0.13	0.17	-	-	-	-	-0.5	-1.2	310	-2.5	

### N-Channel & P-Channel (Complementary)

Type Number	Absolute Max. Rating			Electrical Characteristic										Driving Voltage (V)	Package	
	V <sub>dss</sub> (V)	V <sub>gss</sub> (V)	I <sub>d</sub> (A)	R <sub>ds(ON)</sub> (Ω)								V <sub>gs</sub> (off) (V)				C <sub>iss</sub> (pF)
				V <sub>gs</sub> =±1.5V		V <sub>gs</sub> =±2.5V		V <sub>gs</sub> =±4.5V		V <sub>gs</sub> =±10V		MIN	MAX			
TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX	MIN	MAX					
XP135A1145SR	30	±20	5	-	-	-	-	-	0.045	-	0.03	1	2.5	520	4.5	SOP-8
	-30	±20	-3.5	-	-	-	-	-	0.11	-	0.065	-1	-2.5	600	-4.5	

# Selection Guide

## CMOS Mini-Logic

Part Number	Type	Operating Voltage Range	Input Voltage Range	Speed (tpd)	Power Consumption	Package
XC74UL00AAxR	2-input NAND Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	5ns typ.	1.0µA Max	SOT25 SSOT25
XC74UL02AAxR	2-input NOR Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	5.2ns typ.	1.0µA Max	SOT25 SSOT25
XC74UL04AAxR	Inverter	2.0V ~ 5.5V	0.0V ~ 5.5V	4ns typ.	1.0µA Max	SOT25 SSOT25
XC74ULU04AAxR	Inverter (Unbuffered)	2.0V ~ 5.5V	0.0V ~ 5.5V	4.35ns typ.	1.0µA Max	SOT25 SSOT25
XC74UHU04WMR	Dual Inverter (Unbuffered)	2.0V ~ 6.0V	0.0V ~ VCC	12ns typ.	1.0µA Max	SOT26
XC74UL08AAxR	2-input AND Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	4.85ns typ.	1.0µA Max	SOT25 SSOT25
XC74UL14AAxR	Schmitt Inverter	2.0V ~ 5.5V	0.0V ~ 5.5V	4.35ns typ.	1.0µA Max	SOT25 SSOT25
XC74UL32AAxR	2-input OR Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	8ns typ.	1.0µA Max	SOT25 SSOT25
XC74UL86AAxR	2-input exclusive-OR Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	5.85ns typ.	1.0µA Max	SOT25 SSOT25
XC74UL4066MR	Analog Switch	2.0V ~ 5.5V	0.0V ~ 5.5V	3ns typ.	1.0µA Max	SOT25

Suitable for 5V ~ 3V level changes

Part Number	Function	Operating Voltage Range	Input Voltage Range	Speed (tpd)	Power Consumption	Package
XC74WL00AAS	Dual 2-input NAND Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	5ns typ.	1µA Max	MSOP-8
XC74WL02AAS	Dual 2-input NOR Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	5.2ns typ.	1µA Max	MSOP-8
XC74WL04AAS	Triple Inverter	2.0V ~ 5.5V	0.0V ~ 5.5V	4ns typ.	1µA Max	MSOP-8
XC74WL08AAS	Dual 2-input AND Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	4.85ns typ.	1µA Max	MSOP-8
XC74WL14AAS	Triple Schmitt Inverter	2.0V ~ 5.5V	0.0V ~ 5.5V	4.35ns typ.	1µA Max	MSOP-8
XC74WL32AAS	Dual 2-input OR Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	8ns typ.	1µA Max	MSOP-8
XC74WL34AAS	Triple Buffer	2.0V ~ 5.5V	0.0V ~ 5.5V	4ns typ.	1µA Max	MSOP-8
XC74WL74AAS	D-type Flip-Flop	2.0V ~ 5.5V	0.0V ~ 5.5V	fmax = 75MHz	1µA Max	MSOP-8
XC74WL86AAS	Dual 2-input exclusive OR Gate	2.0V ~ 5.5V	0.0V ~ 5.5V	5.85ns typ.	1µA Max	MSOP-8
XC74WL125AS	Dual Bus Buffer	2.0V ~ 5.5V	0.0V ~ 5.5V	8.1ns typ.	2µA Max	MSOP-8
XC74WL126AS	Dual Bus Buffer	2.0V ~ 5.5V	0.0V ~ 5.5V	8.1ns typ.	2µA Max	MSOP-8
XC74WL157AS	2-channel Multiplexer	2.0V ~ 5.5V	0.0V ~ 5.5V	8.7ns typ.	2µA Max	MSOP-8
XC74WL240AS	Dual Bus Buffer (Inverted 3-state outputs)	2.0V ~ 5.5V	0.0V ~ 5.5V	8.1ns typ.	2µA Max	MSOP-8
XC74WL241AS	Dual Bus Buffer (Non-inverted 3-state outputs)	2.0V ~ 5.5V	0.0V ~ 5.5V	8.1ns typ.	2µA Max	MSOP-8
XC74WL4053S	2-ch Analog Multiplexer/Demultiplexer	2.0V ~ 5.5V	0.0V ~ 5.5V	3ns typ.	1µA Max	MSOP-8
XC74WL4066S	Dual Analog Switch/Multiplexer	2.0V ~ 5.5V	0.0V ~ 5.5V	3ns typ.	2µA Max	MSOP-8
XC74WLU04AS	Triple Inverter (Unbuffered)	2.0V ~ 5.5V	0.0V ~ 5.5V	4.35ns typ.	1µA Max	MSOP-8

## Operational Amplifiers

Part Number	Description	Gain Margin	Slew Rate	Power Consumption	Operating Voltage	Package
XC221A1100MR	Rail to Rail CMOS Op Amp	210kHz	0.07V/µs	15µA typ.	1.2V ~ 10V (single cell) +/-0.6V ~ 5V (+ve/-ve supply)	SOT25
XC221A1200MR	Rail to Rail CMOS Op Amp	550kHz	0.5V/µs	100µA typ.	1.2V ~ 10V (single cell) +/-0.6V ~ 5V (+ve/-ve supply)	SOT25

# Selection Guide

## Analog Temperature Sensor

Part Number	Type	Temp. Range	Input Voltage Range	Output Voltage Range	Accuracy	Power Consumption		Output Voltage Temp. Coefficient	Package
						Typical	Standby		
XC31B Series	Bandgap Sensor	-30°C to +80°C	3.0V ~ 10V	2.0V ~ 6.0V	+/-3%	7µA	0.1µA	-3900ppm/°C typ.	SOT25

## Oscillator IC's

Part Number	Description	Oscillator Freq.	Op. Volt.	Divider Ratio	Multiplier Ratio	Output	Comments	Package
XC2141 Series	Divider / Buffer	20MHz ~ 40MHz	3.5V	f0/1, f0/2, f0/4, f0/8	n/a	3 state	Overtone	SOT26
XC2151 Series	Divider	4MHz ~ 70MHz	5.0V	f0/1, f0/2, f0/4, f0/8	n/a	3 state 10-TTL fanout	Fundamental & Overtone	SOT26
XC2163 Series	Divider / Buffer	20MHz ~ 125MHz (160MHz Buffer)	3.3V / 5.0V	f0/1, f0/2, f0/4, f0/8	n/a	3 state	3rd Overtone	SOT26
XC2164 Series	Divider / Buffer	4MHz ~ 125MHz	3.3V / 5.0V	f0/1, f0/2, f0/4, f0/8	n/a	3 state	Fundamental 3rd Overtone	SOT26 DIE
XC2173 Series	PLL / Divider	50MHz ~ 160MHz	3.3V / 5.0V	f0/2, f0/4, f0/8	f0 x 5,6,7,8	3 state		SOT26
XC2300 Series	Tri-State Buffer	70MHz (max)	3.3V / 5.0V	f0/1, f0/2, f0/4, f0/8	n/a	3 state	Fundamental 3rd Overtone	SOT26
XC2301 Series	Tri-State Buffer	160MHz (max)	3.3V	f0/1, f0/2, f0/4, f0/8	n/a	3 state	Fundamental 3rd Overtone	SOT26

Available with internal or external oscillation capacitors and feedback resistors

## PLL Clock Generator

Part Number	Output Freq. (Q0)	Internal Ratios		Input Freq. (f0)	Op. Volt.	Output	Comments	Package
		Divider (M)	Multiplier (N)					
XC25BS3 Series	9MHz ~ 80MHz (Q0 = f0 x N/M)	1 ~ 2047	20 ~ 2047	14kHz ~ 35MHz	2.97V ~ 5.5V	3 state	CE Pin	SOT26
XC25BS5 Series	3MHz ~ 30MHz (Q0 = f0 x N/M)	1 ~ 2047	6 ~ 2047	12kHz ~ 35MHz	2.97V ~ 5.5V	3 state	CE Pin	SOT26

Second output (Q1) selectable from reference oscillation, PLL output frequencies/2, comparative frequencies/2 or GND

## PIN Diode

Part Number	Type	Repetitive Peak Reverse Voltage	Power Dissipation	Maximum Reverse Current	Forward Current	Diode Capacitance	Package	Old Mitsubishi Part Number
XB15A105	VCR, Video Disk	30V	200mW	10µA (VR=30V) 0.5µA (VR=28V)	30mA min	0.36pF typ.	DO-34	MI105
XB15A204	RF Attenuator, RF Switch	30V	200mW	10µA (VR=30V) 0.5µA (VR=28V)	n/a	0.7pF typ.	DO-35	MI205
XB15A301	Antenna Switch	80V	350mW	150nA (VR=60V)	100mA min	2.0pF typ.	DO-35	MI301
XB15A303	Antenna Switch	180V	500mW	10µA (VR=180V) 150nA (VR=140V)	200mA min	3.0pF typ.	DO-35	MI303
XB15A308	High Power Antenna Switch (10W Output Two-Way Radio)	50V	500mW	10µA (VR=50V) 0.5µA (VR=45V)	100mA min	1.3pF typ.	DO-35	MI308
XB15A402	High Power Antenna Switch (25W Output Two-Way Radio)	270V	1000mW	10µA (VR=270V) 150nA (VR=200V)	500mA min	2.0pF typ.	DO-41	MI402
XB15A407	High Power Antenna Switch (25W Output Two-Way Radio)	50V	1000mW	10µA (VR=50V) 0.5µA (VR=45V)	100mA min	1.6pF typ.	DO41	MI407
XB15A709	High Power Antenna Switch (10W Output Two-Way Radio)	50V	1000mW	10µA (VR=50V)	n/a	1.2pF max	Ceramic SMD	MI809

## Temperature Compensating Zener Diode

Part Number	Zener Voltage	VZ Temp Coefficient	Power Dissipation	Dynamic Impedance	Max Current	Package
XB19A series	33V typ (IZ = 5mA) Suffix A=2%, B=1%, C=0.5%	0mV/C typ. (min -1mV/C ~ max +1mV/C)	400mW	10 Ohms typ.	10mA	DO-34 & DO-35

Application: Voltage Synthesised Tuning Circuit

# For more information

- For more detailed product information visit us at **www.torex.co.jp**
- For product samples and/or pricing quotations, complete this form and fax to **+44 1530 512400** or email: **sales@torexsemi.co.uk**
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 Additional comments

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