

# Power Management

**Programmable Power**  
Universal PMICs

**Power Conversion**  
Power Modules  
Switching Regulators  
Smart Power Stages  
Switching Controllers  
DDR Termination  
LDOs & Regulators

**System Controls**  
USB Power Switches  
Voltage References  
Supervisors

**LED Lighting**  
AC Step Drivers  
Switching Regulators



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# Power Management Portfolio

Programmable Power			
Triple PMICs		Quad PMICs	
XRP7713		XRP7704	XRP7724
XR77103		XRP7714	XR77128
		XRP7740	MxL7704-B

Power Conversion										
Power Modules	Switching Regulators				Smart Power Stage	Switching Controllers	Linear			
	AEC-Q100 Qualified	Step-Down >20V	Step-Down	Step-Up			Step-Down	LDOs & Regulators		DDR Termination
XR79110	XR76203-Q	SP7650	SP6654	SP6641	XR78021	SP6123	LP2951	SPX1117	SPX2941	XRP2997
XR79115	XR76205-Q	SP7651	SP6669	SP6661		SP6128	SP6201	SPX1582	SPX2945	
XR79120	XR76208-Q	SP7652	XRP6657	SP6648		SP6132	SP6203	SPX1587	SPX2954	
XR79103		SP7662	XRP6658	SP34063		SP6133	SP6205	SPX2815	SPX3819	
XR79106		XRP7662	SP34063			SP6134	SP6213	SPX29150	SPX3940	
XR79203		XR76108	XRP6670			XRP6124	SP6260	SPX29152	SPX5205	
XR79206		XR76112	XRP7659			XRP6141		SPX29300	XRP29302	
MxL7204		XR76115	XRP7675			XR75100		SPX29301	XRP6272	
MxL7213		XR76117	XRP7664					SPX29302		
MxL7218		XR76121	XRP7665							
MxL7225		XR76201	XR77103-A0R5							
MxL7225-1		XR76203	XR77103-A1R0							
		XR76205	XR77103-G1R2							
		XR76208								

System Controls						
Power Switches		Voltage References		Supervisors		
Single	Dual					
SP2525A	SP2526A	SPX1431	SPX2431	SP690	SP691	SP705
SP619	XRP2526	SPX385	SPX431L	SP706	SP707	SP708
		SPX432	SPX431A	SP813	SP809	

LED Lighting					
AC Step Drivers		Switching Regulators			
		Step-Down	Step-Up/Down	Step-Up	
XR46203	XR46084	XRP7613	SP6686	SP6699	
XR46110	XR46083		SP7685		
XR46073	XR46010				
XR46050	XR46014				
XR46701	XR46000				

MaxLinear's universal PMICs with programmable power technology offer advanced dynamic control, telemetry and remote reconfigurability. PowerArchitect design and configuration software speeds development and significantly reduces overall time to market compared to legacy analog power solutions. An I<sup>2</sup>C interface and multiple GPIO pins ensure easy system integration. Configurable warning and fault levels, fault behavior and power up and down sequencing ensure that any load can be properly powered and protected.

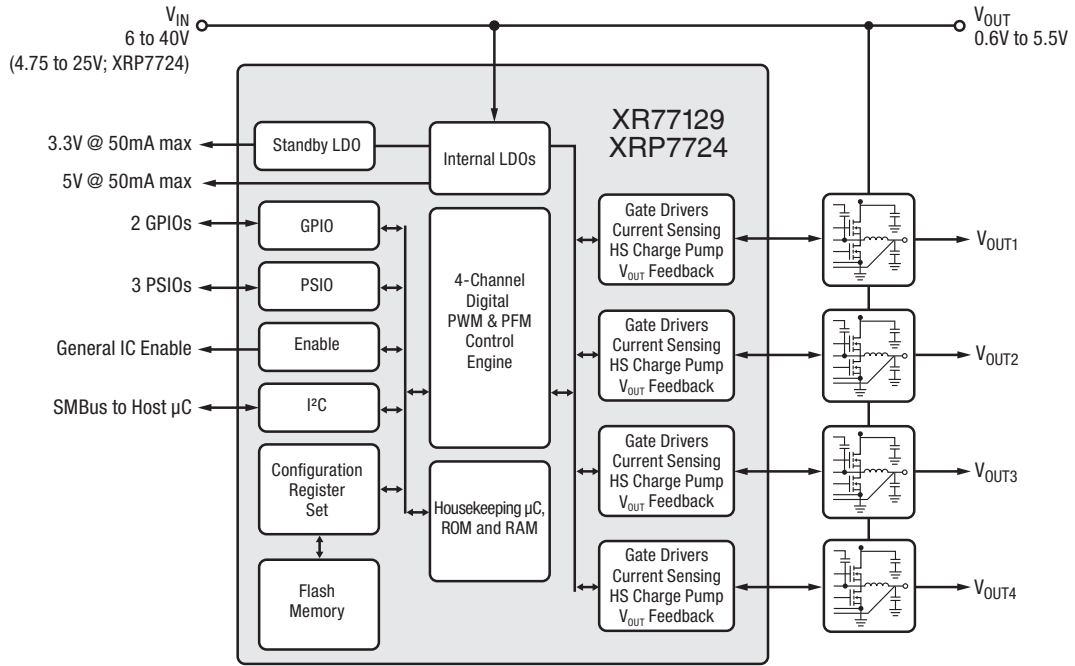
## Applications

- **FPGA, DSP and ASIC power systems**
- **Base stations**
- **x86 and ARM servers**
- **Networking**
- **Telecommunications**
- **Industrial and embedded systems**

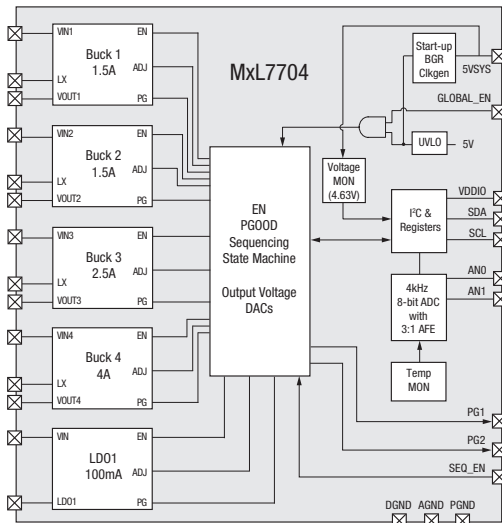
## Universal PMICs

Part Number	Ch.	Gate Drive Resistance Up/Down (Ω)	Operating Voltage (V)		Min Output Voltage (V)	Quiescent Current (mA)	Programmable Frequency Range (MHz)	Package	Features
			Min	Max					
XR77103	3	Integrated MOSFETs	4.5	14	0.8	1.5	0.3 to 2.2	TQFN-32	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ UVLO, OTP, soft-start</li> <li>▪ Light load efficiency - PFM and PWM mode</li> <li>▪ Overcurrent and output overvoltage protection</li> <li>▪ I<sup>2</sup>C reconfigurable</li> </ul>
MxL7704-B*	4	1.5A 1.5A 2.5A 4A	4.5	5.5	3.0 1.3 0.8 0.6	8	1 to 2.1	QFN32	<ul style="list-style-type: none"> <li>▪ Two configurable power good outputs</li> <li>▪ LDO and 2-input 8-bit ADC</li> <li>▪ Temperature monitoring</li> <li>▪ Supported by Excel configuration tool</li> </ul>
XR77129	4	4/2	6	40	0.6	4	0.1 to 1.2	TQFN-44	<ul style="list-style-type: none"> <li>▪ 40V digital PWM/PFM controller</li> <li>▪ I<sup>2</sup>C reconfigurable</li> <li>▪ Built-in 3.3V/5V LDO</li> <li>▪ Integrated MOSFET drivers</li> </ul>
XR77128	4	<sup>4/2</sup> DrMOS output	4.75	25					<ul style="list-style-type: none"> <li>▪ Updated fault management and GPIO functionality, with the ability to drive MOSFETs and DrMOS</li> </ul>
XRP7724	4	4/2	4.75	25	0.6	4	0.1 to 1.2	TQFN-44	<ul style="list-style-type: none"> <li>▪ Digital PWM controller with DPFM mode</li> <li>▪ I<sup>2</sup>C reconfigurable</li> <li>▪ Built-in 3.3V/5V LDO</li> <li>▪ Integrated MOSFET drivers</li> <li>▪ Full protection</li> </ul>
XRP7725			4.75	25					<ul style="list-style-type: none"> <li>▪ Intel® Node Manager compatible</li> <li>▪ Programmable power system</li> <li>▪ XRP7724 pin and function compatible</li> </ul>
XRP7713	3	6/3	4.75	25	0.9	9	0.3 to 1.5	TQFN-32	<ul style="list-style-type: none"> <li>▪ Digital PWM controller</li> <li>▪ Faults, warnings, sequencing, GPIOs and PID compensation are all I<sup>2</sup>C reconfigurable</li> <li>▪ 3.3V or 5V selectable LDO</li> <li>▪ Integrated MOSFET drivers</li> </ul>
XRP7714	4								
XRP7704	4	- / -	6.5	20	0.9	9	0.3 to 1.5	TQFN-40	
XRP7740	4	3/1.8							

\*Preliminary



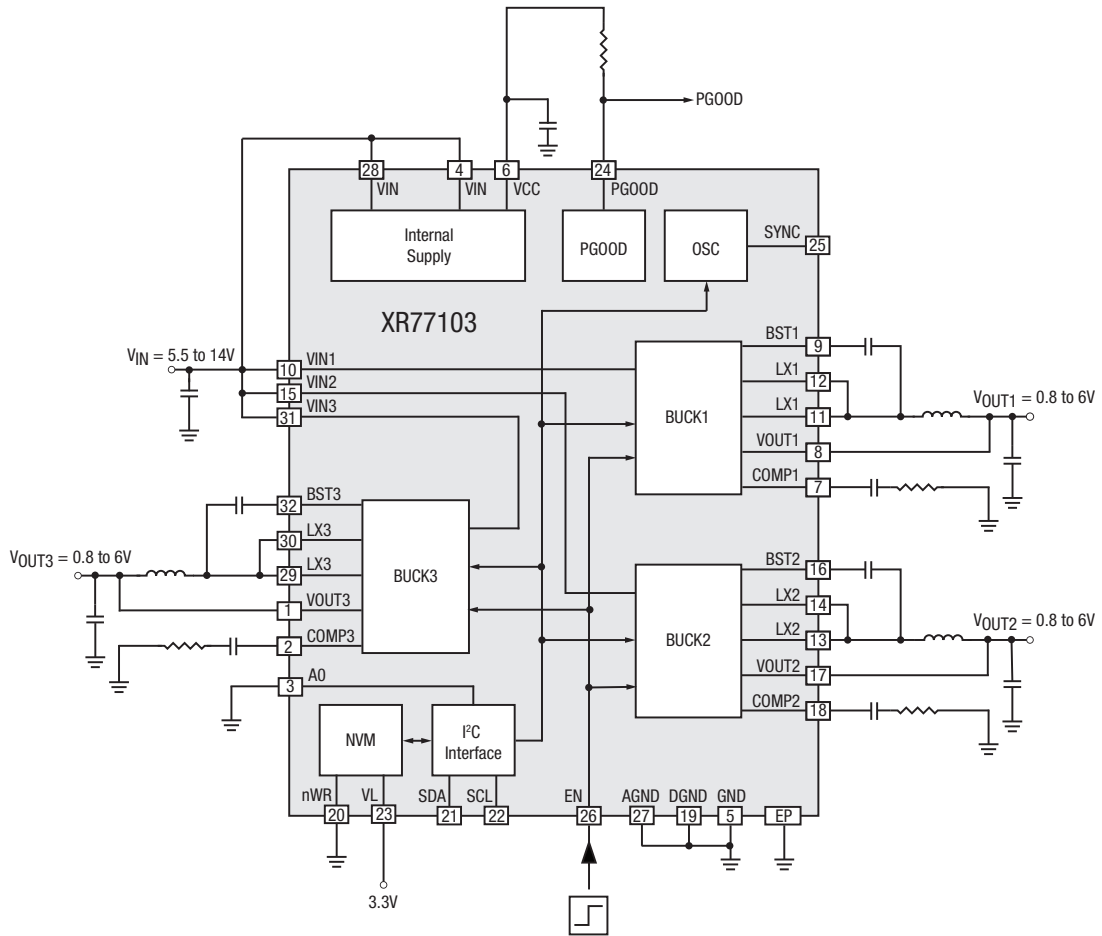
Functional Block Diagram



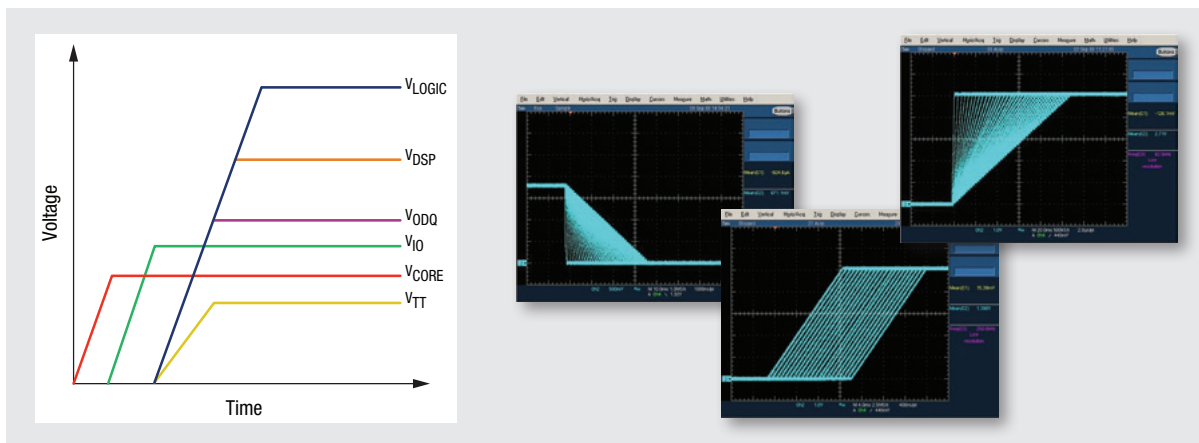
MxL7704 Functional Block Diagram







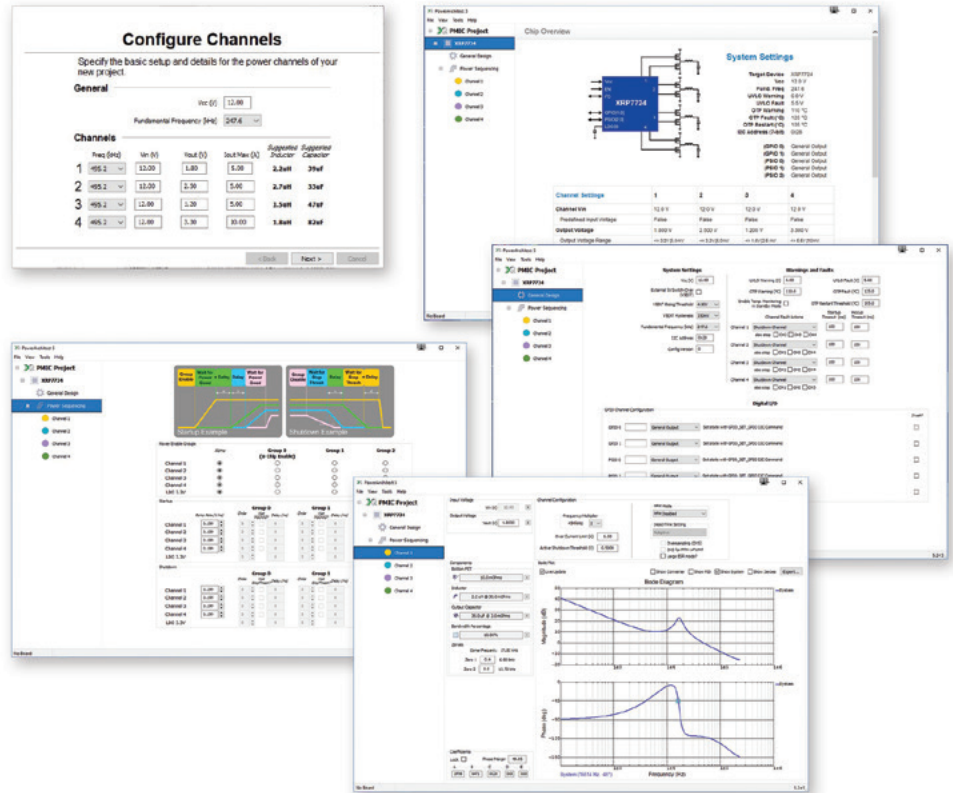
**Universal PMIC 3-Output Programmable Buck Regulator Typical Application**



**Control Power Up/Down Sequencing with Different Delays and Slopes**

## PowerArchitect – Configuration Software

MaxLinear's PowerArchitect interactive design tool enables you to create a complete 4- to 6-channel optimized power supply design with complex sequencing and advanced power management features, all with a few clicks of the mouse. A free download of PowerArchitect is available at [powerxr.exar.com](http://powerxr.exar.com)



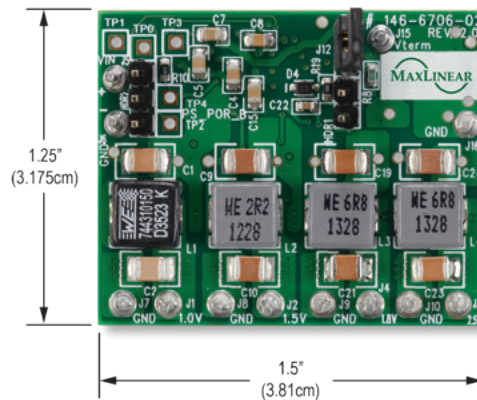
## Evaluation Boards

Evaluation boards for all programmable power management devices are available, along with their user manuals.

### Complete Programmable Power Kits Available



### Zynq-7000 Power System Featuring XRP7714



Ready-made configurations for:

- Zynq-7XXX
- i.MX5 and i.MX6
- Smartfusion2
- Cyclone IV
- Cyclone V SOC
- Intel Wellsburg

## Power Management Solutions for Xilinx® Zynq® UltraScale+™ MPSoC

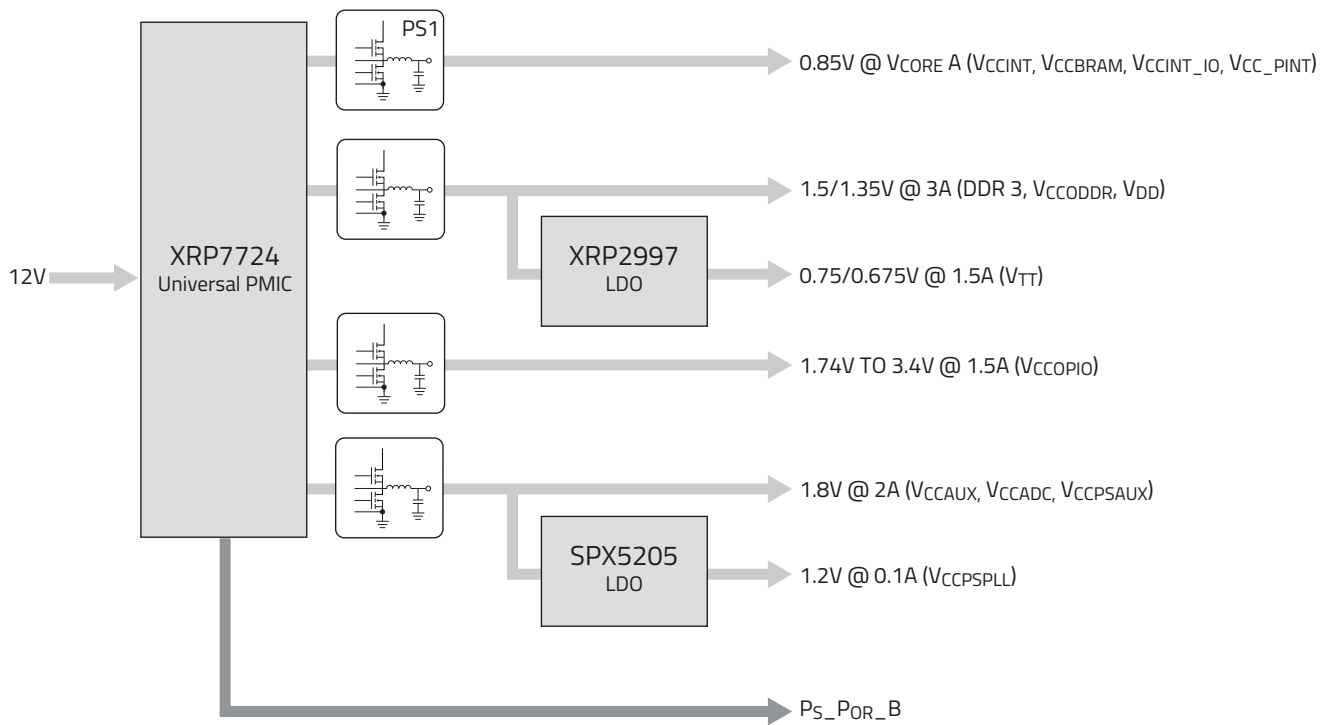
MaxLinear offers two power management solutions for use with Xilinx Zynq UltraScale+ MPSoC. These solutions reduce rails to as few as possible yet still meet the UltraScale+ spec. These flexible solutions use internal digital control to easily manage sequencing requirements and allow max current to be adjusted quickly and easily. Visit [www.exar.com/xilinx](http://www.exar.com/xilinx) for additional information.

### Supported Xilinx UltraScale+ Zynq Devices:

ZU2CG, ZU2EG (A), ZU3CG, ZU3EG, ZU4CG, ZU4EG, ZU4EV, ZU5CG, ZU5EG, ZU5EV, ZU6CG, ZU6EG, ZU7CG, ZU7EG, ZU7EV, ZU9CG, ZU9EG, ZU11EG, ZU15EG, ZU17EG, ZU19EG.

### Features

- **Manages sequence and dependency**
- **Provides correctly timed Ps\_Por\_B**
- **Allows PSU Telemetry**
- **Scalable to meet full Zynq UltraScale+ Family**
- **Optimized to power FPGAs in any system**



### Scalable Zynq UltraScale+ Always on Solution (No MGTs)

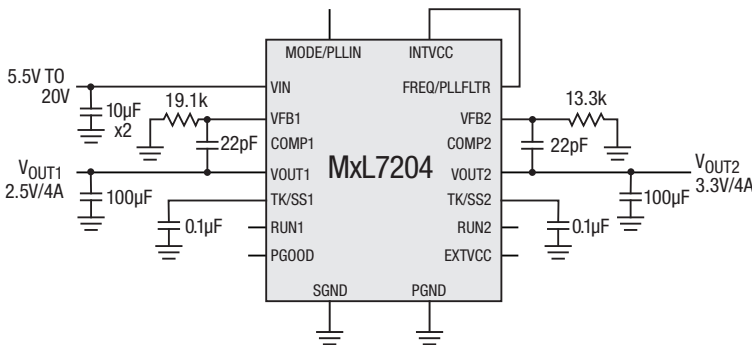
Device	Icore (max)	Imgtavtt	Imgtavcc	PS1			
				Qh	Ql	L	C
Zu2, Zu3	8A	3A	3A	FDP8014S (dual)		0.56µH 18A	600µF 3mΩ esr
Zu4, Zu5	16A	3A	3A	FDM3620S (dual)		0.22µH 33A	1200µF 1.6mΩ esr
Zu6, Zu7, Zu9	25A	3A	3A	CSD17304Q3	BSC009NE2LS	0.18µH 50A	1850µF 1.2mΩ esr
Zu11, Zu15, Zu17, Zu19	35A	10A	10A	CSD17304Q4	BSC009NE2LS	0.15µH 80A	2600µF 0.9mΩ esr



## Power Modules

MaxLinear's power modules address high-current solutions for various end applications. These synchronous step-down power modules are complete system-in-package power management solutions with fully integrated power converters including MOSFETs, inductors and internal input and output capacitors. Our XR79xxx modules utilize a patented emulated current mode Constant On-Time (COT) control that provides exceptional full range 0.1% line regulation and 1% output accuracy over the full temperature range. This COT control loop enables operation with ceramic output capacitors, eliminating loop compensation components.

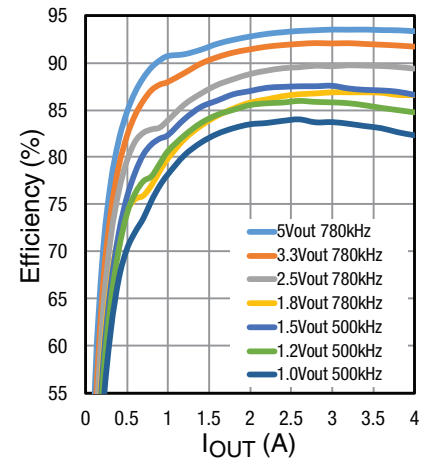
Our QFN modules provide superior thermal performance and manufacturability, all in the smallest footprint. The QFN package makes visual inspection of solder joints possible and eases electrical debugging. At 85°C with no airflow, no thermal de-ratings are required for output voltages of 1.8V and below.



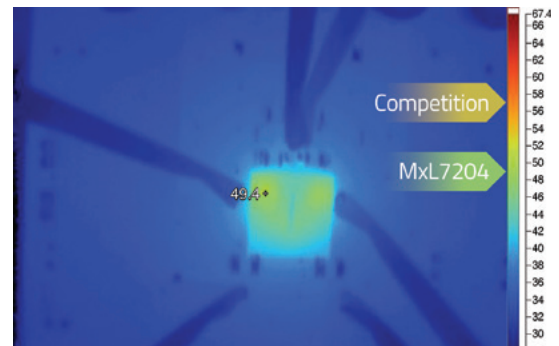
Typical Application

## Applications

- FPGA, DSP and ASIC power systems
- Base stations
- Repeaters
- Networking
- Telecommunications
- Industrial and embedded systems



MxL7204 Efficiency 12V<sub>IN</sub>



MxL7204 Thermal Image

Part Number	Ch.	Output Current (A)	V <sub>IN</sub> Range (V)	V <sub>OUT</sub> Range (V)	Frequency (kHz)	Efficiency (%)	X-Y Dimension (mm)	Z Dimension (mm)	Package	Features
XR79203	1	3	3 to 40	0.6 to 13.2	400 to 800	95	8 x 8	4	QFN	<ul style="list-style-type: none"> <li>▪ Patented COT control</li> <li>▪ UVLO, OTP, soft-start, adjustable hiccup current limit and short-circuit protection</li> <li>▪ PG00D</li> </ul>
XR79206		6	3 to 40	0.6 to 13.2	400 to 800	95	10 x 10			
XR79103		3	3 to 22	0.6 to 5.5	600 to 800	95	6 x 6			
XR79106		6	3 to 22	0.6 to 5.5	600 to 800	95	8 x 8			
XR79110		10	3 to 22	0.6 to 5.5	400 to 800	96	10 x 10			
XR79115		15	3 to 22	0.6 to 5.5	400 to 600	96	12 x 12			
XR79120		20	3 to 22	0.6 to 5.5	400 to 600	93	12 x 14			
MxL7204	2	4	4.5 to 20	0.6 to 5.0	250 to 780	93	15 x 15	2.82	LGA	<ul style="list-style-type: none"> <li>▪ PFM</li> <li>▪ Adjustable frequency and soft start</li> <li>▪ UVLO, OTP, and over current/over voltage/short-circuit protection</li> <li>▪ Frequency synchronization</li> <li>▪ PG00D</li> </ul>
MxL7213	2	13	4.5 to 16	0.6 to 5.3	250 to 780	95	15 x 15	4.41 5.01	LGA BGA	
MxL7218	2	18	4.5 to 15	0.6 to 1.8	400 to 780	95	16 x 16	5.01	BGA	
MxL7225/ MxL7225-1	2	25	4.5 to 15	0.6 to 1.8	400 to 780	93	16 x 16	5.01	BGA	

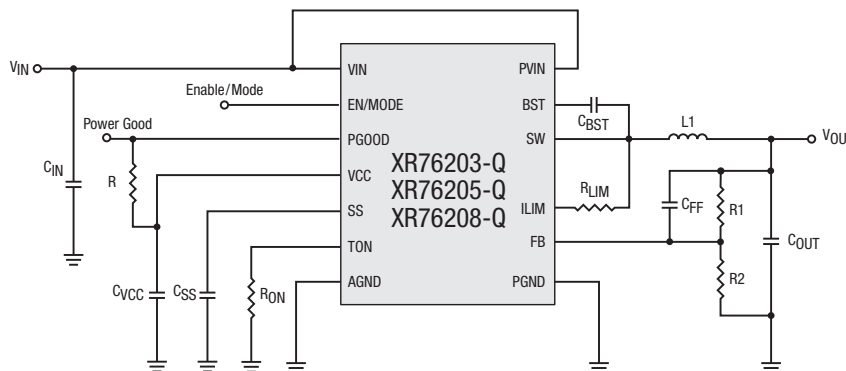
**AEC-Q100 Qualified Step-Down Switching Regulators**

This family of synchronous step-down regulators combine the controller, drivers, bootstrap diode and MOSFETs in a single package for point-of-load supplies well suited for automotive applications.

**Applications**

- Automotive infotainment
- Advanced Driver Assistance Systems (ADAS)
- GPS / Navigation systems
- Event data recorders
- Automotive systems

Part Number	Output Current (A)	Frequency (kHz)	Operating Voltage (V)		Output Voltage	Output Voltage Range (V)		Accuracy (%)	Efficiency (%)	Package (mm)	Features
			Min	Max		Min	Max				
XR76203-Q	3	100 to 800	3	40	Adj.	0.6	30	0.5	95	5x5 QFN	<ul style="list-style-type: none"> <li>▪ AEC-Q100 Qualified Automotive</li> <li>▪ Patented COT control</li> <li>▪ UVLO, OTP, soft-start, hiccup, PGOOD</li> <li>▪ Current limit and short protection</li> </ul>
XR76205-Q	5								96		
XR76208-Q	8								96		



3A, 5A, 8A Step-Down Regulator

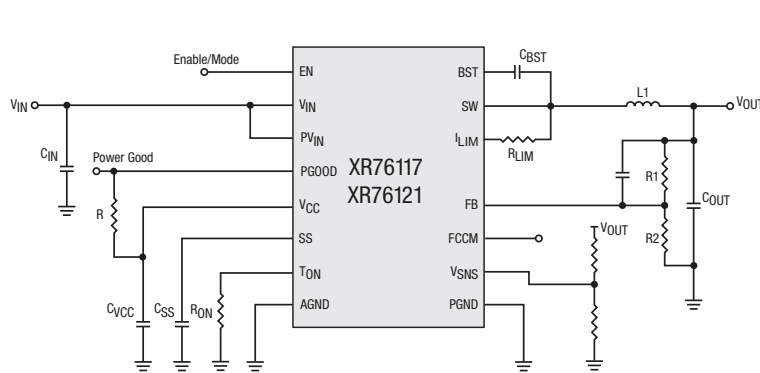
## Step-Down Regulators >20V

Exar's family of synchronous and non-synchronous step-down regulators provides a fully integrated single-chip solution for Point-of-Load (POL) applications with high current output requirements. With high input voltage range and operating switching frequency options, these regulators fit in a wide range of applications and power architectures by enabling step-down DC/DC conversions from various intermediate power bus levels and providing a highly efficient and high performing solution in the most compact footprint.

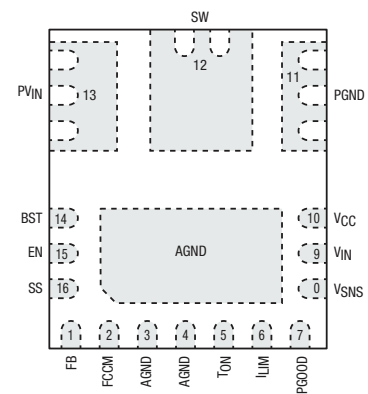
### Applications

- Distributed power architectures
- Point-of-Load (POL) converters
- Point-of-Load (POL) modules
- FPGAs, DSPs and processor power supplies

Part Number	Output Current (A)	Frequency (kHz)	Operating Voltage (V)		Output Voltage	Output Voltage Range (V)		Accuracy (%)	Efficiency (%)	Package (mm)	Features
			Min	Max		Min	Max				
XR76201	1.5	400 to 800	3	40	Adj.	0.6	30	0.5	95	5 x 5 QFN	<ul style="list-style-type: none"> <li>▪ Patented COT control</li> <li>▪ UVLO, OTP, soft-start, hiccup, PGOOD</li> <li>▪ Current limit and short protection</li> </ul>
XR76203	3	100 to 800									
XR76205	5										
XR76208	8										
SP7650	3	300	2.5	28	Adj.	0.8	27	1	95	7 x 4 DFN	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ UVLO, OTP, soft-start</li> <li>▪ Short-circuit protection/auto-restart</li> </ul>
SP7652	6	600	2.5	28	Adj.	0.8	27	1	92	7 x 4 DFN	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ UVLO, OTP, soft-start</li> <li>▪ Short-circuit protection/auto-restart</li> </ul>
SP7662/ XRP7662	12	300	3	22	Adj.	0.8	20.2	1	93	7 x 4 DFN	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ UVLO, OTP, soft-start, current limiting</li> <li>▪ Short-circuit protection/auto-restart</li> </ul>
XR76108	8	200 to 800	3	22	Adj.	0.6	18	0.5	96	5 x 5 QFN	<ul style="list-style-type: none"> <li>▪ Patented COT control</li> <li>▪ UVLO, OTP, soft-start, hiccup, PGOOD</li> <li>▪ Current limit and short protection</li> </ul>
XR76112	12										
XR76115	15									6 x 6 QFN	
XR76117	15	200 to 800	4.5	22	Adj.	0.6	18	0.5	97	5 x 6 QFN	<ul style="list-style-type: none"> <li>▪ Patented COT control</li> <li>▪ UVLO, OTP, soft-start, hiccup, PGOOD</li> <li>▪ Current limit and short protection</li> </ul>
XR76121	20	200 to 800	4.5	22	Adj.	0.6	18	0.5	97	5 x 6 QFN	<ul style="list-style-type: none"> <li>▪ Patented COT control</li> <li>▪ UVLO, OTP, soft-start, hiccup, PGOOD</li> <li>▪ Current limit and short protection</li> </ul>
SP7651	3	900	2.5	20	Adj.	0.8	19	1	92	7 x 4 DFN	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ UVLO, OTP, soft-start</li> <li>▪ Short-circuit protection/auto-restart</li> </ul>



15A and 20A Step-Down Regulator



XR76121 Pin Assignment

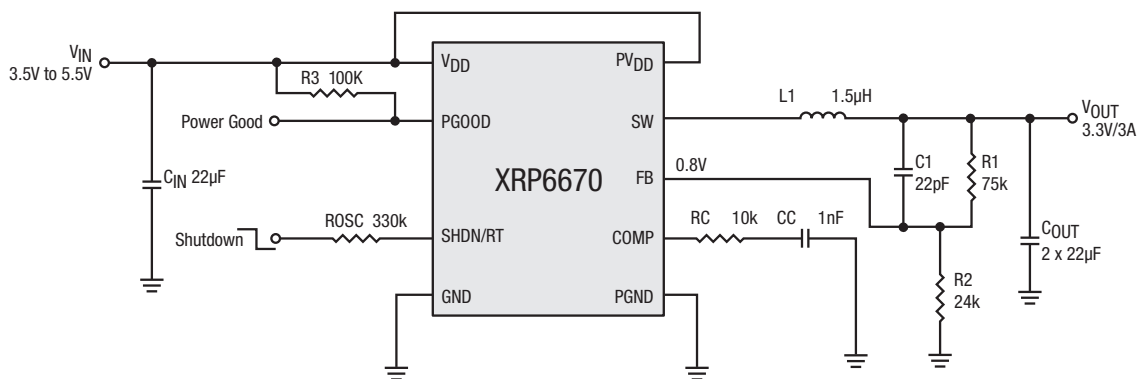
Step-Down Regulators

Step-down regulators, also known as buck regulators, are used to lower the input voltage to the desired output level with higher efficiency than an LDO. A step-down regulator integrates power FET ICs, providing a monolithic power converter.

Applications

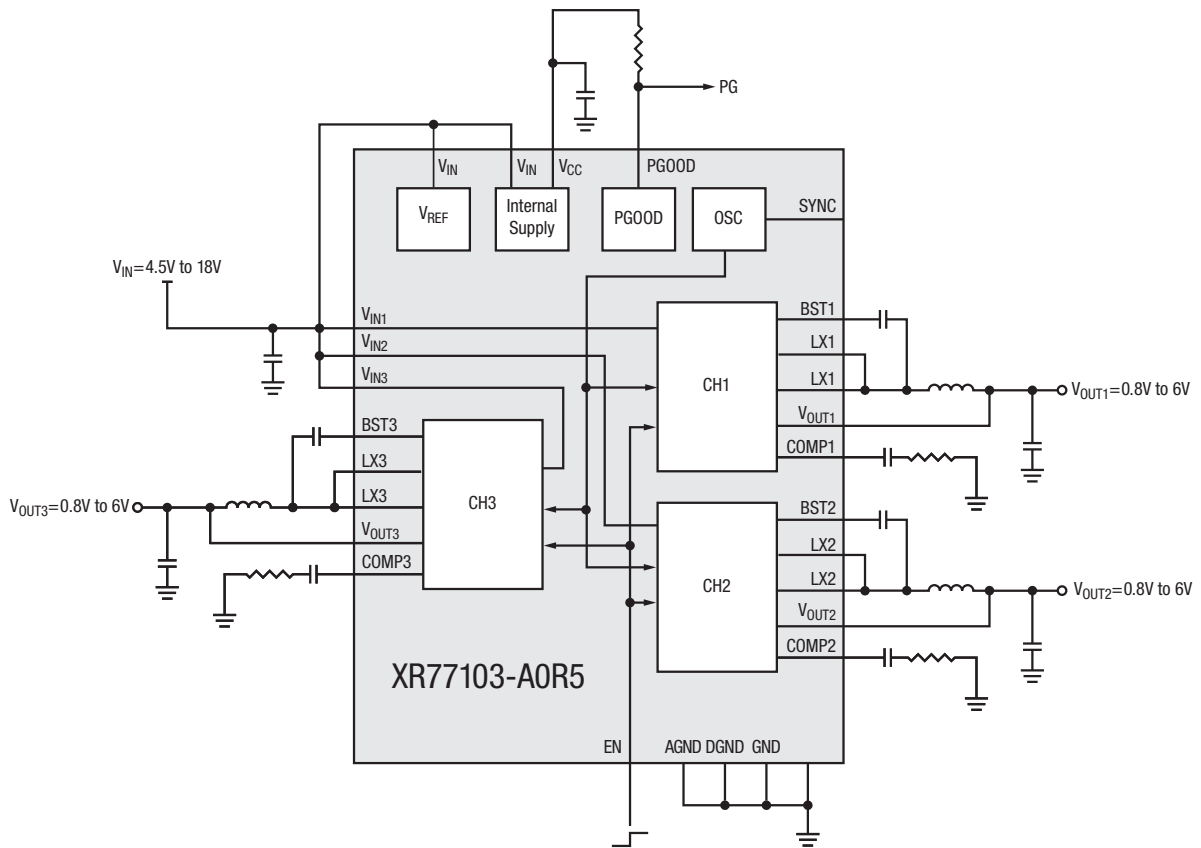
- Distributed power architectures
- Point-of-Load (POL) converters
- Point-of-Load (POL) modules
- FPGAs, DSPs and processor power supplies

Part Number	Ch.	Output Current	Switching Frequency (MHz)	Operating Voltage (V)		Output Voltage	Output Voltage Range (V)		Quiescent Current (µA)	Efficiency (%)	Package	Features
				Min	Max		Min	Max				
SP6669	1	800mA	1.5	2.5	6.0	Adj.	0.6	5	18	95	SOT23-5	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ Enable pin</li> <li>▪ Pulse skipping at light load</li> <li>▪ Over temperature protection</li> </ul>
SP6654	1	800mA	PFM	2.7	5.5	Adj.	0.8	5	20	98	DFN-10	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ Enable pin</li> <li>▪ Power good indicator</li> <li>▪ Adjustable UVLO, over temperature protection</li> </ul>
XRP6658	1	1A	1.5	2.5	5.5	Adj.	0.6	5	15	97	SOT23-5	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ Light load efficiency, PFM and PWM mode</li> <li>▪ Enable pin</li> <li>▪ UVLO and over temperature protection</li> </ul>
SP34063	1	Adj. <1.5A	0.11	3	36	Adj.	1	27	4mA	80	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Can be implemented in buck, boost or inverting topologies</li> </ul>
XRP6657	1	1.5A	1.3	2.5	5.5	Adj.	0.6	5	240	95	DFN-6	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ Enable pin</li> <li>▪ Pulse skipping at light load</li> <li>▪ Over temperature protection</li> </ul>
XRP7659	1	1.5A	1.4	4.5	18	Adj.	0.81	15	800	92	SOT23-6	<ul style="list-style-type: none"> <li>▪ Non synchronous</li> <li>▪ Enable pin, soft-start</li> <li>▪ Internal compensation</li> <li>▪ Overcurrent, over temperature and UVLO protection</li> </ul>
XRP7664	1	2A	0.3	4.5	18	Adj.	0.925	16	1.2mA	95	SOIC-8	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ UVLO, OTP, soft-start</li> <li>▪ Light load efficiency and PWM mode</li> <li>▪ Overcurrent and output overvoltage protection</li> </ul>
XRP6670	1	3A	Prog. 0.3 to 2.5	2.6	5.5	Adj.	0.8	5	460	95	DFN-10	<ul style="list-style-type: none"> <li>▪ Synchronous, programmable frequency</li> <li>▪ Enable pin, Power Good flag</li> <li>▪ OTP, OCP and UVLO protection</li> </ul>



3A Synchronous Step-Down Regulator

Part Number	Ch.	Output Current	Switching Frequency (MHz)	Operating Voltage (V)		Output Voltage	Output Voltage Range (V)		Quiescent Current ( $\mu$ A)	Efficiency (%)	Package	Features
				Min	Max		Min	Max				
XRP7665	1	3A	0.34	4.5	18	Adj.	0.925	16	1.2mA	95	HSOIC-8	<ul style="list-style-type: none"> <li>Synchronous</li> <li>UVLO, OTP, soft-start</li> <li>Light load efficiency, PFM and PWM mode</li> <li>Overcurrent and output overvoltage protection</li> </ul>
XRP7675	1	3A	0.34	4.5	18	Adj.	0.925	16	1.2mA	95	HSOIC-8	<ul style="list-style-type: none"> <li>Synchronous</li> <li>UVLO, OTP, soft-start</li> <li>Light load efficiency, PFM and PWM mode</li> <li>Overcurrent and output overvoltage protection</li> </ul>
XR77103-A1R0	3	2A	1	4.5	14	Adj.	0.8	6	2.8mA	93	TQFN-32	<ul style="list-style-type: none"> <li>Synchronous</li> <li>UVLO, OTP, soft-start</li> <li>Light load efficiency, PSM and PWM mode</li> <li>Overcurrent and output overvoltage protection</li> </ul>
XR77103-A0R5	3	2A	0.5	4.5	14	Adj.	0.8	6	2.6mA	93	TQFN-32	<ul style="list-style-type: none"> <li>Synchronous</li> <li>UVLO, OTP, soft-start</li> <li>Light load efficiency, PSM and PWM mode</li> <li>Overcurrent and output overvoltage protection</li> </ul>
XR77103-G1R2	3	2A	1.14	4.5	14	Fixed	1.1 1.5 3.3		2.6mA	90	TQFN-32	<ul style="list-style-type: none"> <li>Synchronous</li> <li>UVLO, OTP, soft-start</li> <li>Light load efficiency, PSM and PWM mode</li> <li>Overcurrent and output overvoltage protection</li> </ul>



**3-Output Synchronous Buck Regulator**



Step-Up Regulators

Step-up regulators, also known as boost regulators, are used to step up an input voltage to the desired higher output level. They are typically used in portable equipment where the power supply is provided by a battery.

Applications

- Handheld and portable equipment
- Bias supplies

Part Number	Output Current	Operating Voltage (V)		Startup Voltage (V)	Output Voltage	Output Voltage Range (V)		Quiescent Current (µA)	Efficiency (%)	Package	Features
		Min	Max			Min	Max				
SP6641A	100mA	0.9	4.5	0.85	Fixed	3.3		10	87	SOT23-5	<ul style="list-style-type: none"> <li>▪ Non synchronous</li> <li>▪ Enable pin</li> <li>▪ Current limiting</li> </ul>
					Fixed	5					
SP6661	200mA	1.5	5.3	n/a	Inverter	-5	-1.5	3mA	89	SOIC-8 MSOP-8	<ul style="list-style-type: none"> <li>▪ Charge pump topology</li> <li>▪ Selectable oscillator</li> <li>▪ External oscillator input</li> </ul>
		2.5	5.3		Doubler	5	10		94		
SP6648	400mA	0.7	4.5	0.85	Adj.	2.5	5.5	13	94	MSOP-10	<ul style="list-style-type: none"> <li>▪ Synchronous</li> <li>▪ Enable pin</li> <li>▪ Programmable low battery detection</li> <li>▪ Undervoltage lockout protection</li> </ul>
SP6641B	500mA	0.9	4.5	0.85	Fixed	3.3		10	87	SOT23-5	<ul style="list-style-type: none"> <li>▪ Non synchronous</li> <li>▪ Enable pin</li> <li>▪ Current limiting</li> </ul>
					Fixed	5					
SP34063	Adj. <1.5A	3	36	n/a	Adj.	1	27	4mA	80	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Can be implemented in buck, boost or inverting topologies</li> </ul>

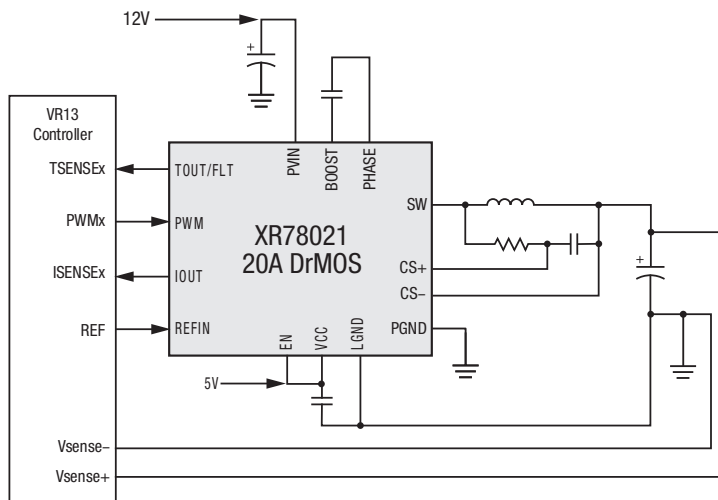
Smart Power Stage

This integrated power stage contains a synchronous buck gate driver packaged with both half bridge MOSFETs. Also known as DrMOS (Driver plus MOSFETs), this package design provides very low thermal impedance and minimizes parasitic inductances resulting in excellent EMI performance.

Applications

- Servers
- Networking equipment
- Industrial PC

Part Number	I <sub>out</sub> (A)	V <sub>IN</sub> MIN (V)	V <sub>IN</sub> MAX (V)	V <sub>OUT</sub> MAX (V)	Minimum On-Time (ns)	Switching Frequency (kHz)	Efficiency (%) [V <sub>IN</sub> =12V, V <sub>OUT</sub> = 1V, full load, 600kHz]	Junction Temp Range (°C)	Package	Features
XR78021	20A	4.5	17	3.3	30	1500	84	-40 to 125	QFN	<ul style="list-style-type: none"> <li>▪ UVLO, TMON, IMON</li> </ul>



XR78021 Typical Application

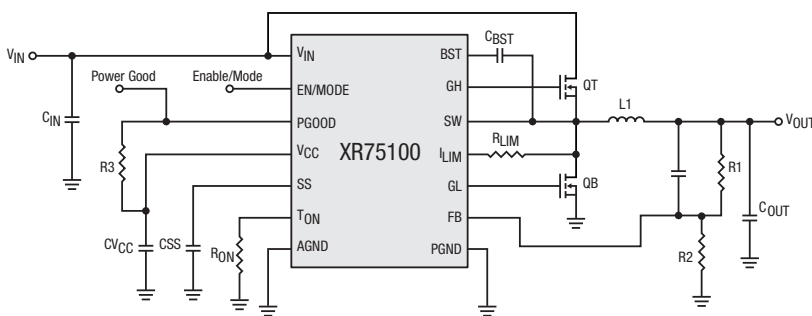
## Switching Controllers

Switching controllers, also known as buck controllers or Step-down, are the basic building blocks for high efficiency and high power point-of-loads. Step-down controllers allow maximum flexibility and customization for high performance conversions.

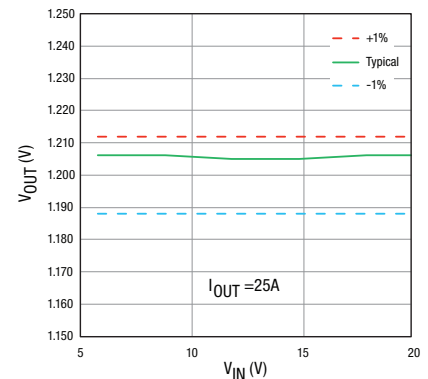
### Applications

- Distributed power architectures
- Point-of-Load (POL) converters/modules
- Set-top boxes

Part Number	Rec. Output Current (A)	Operating Voltage (V)		Min. Output Voltage (V)	Quiescent Current ( $\mu$ A)	Frequency (kHz)	Efficiency (%)	Package	Features
		Min	Max						
XR75100	<20	3	40	0.6	700	200 to 800	96	QFN-16	<ul style="list-style-type: none"> <li>▪ Proprietary emulated current mode constant on-time architecture</li> <li>▪ No external compensation</li> <li>▪ Adjustable frequency</li> <li>▪ Precision enable, soft-start, force PWM</li> <li>▪ Adjustable temperature compensated current limit</li> </ul>
XRP6124	<5	3	18	1.2	500	200 to 1000	92	SOT23-5	<ul style="list-style-type: none"> <li>▪ Non synchronous, 500ns constant on-time</li> <li>▪ Enable pin, soft-start</li> <li>▪ UVLO and output short-circuit protection</li> </ul>
XRP6124HV		4.5	30						
SP6134H	<15	3	28	0.8	1.5mA	600	94	MSOP-10	<ul style="list-style-type: none"> <li>▪ Synchronous voltage mode PWM</li> <li>▪ Programmable soft-start</li> <li>▪ UVLO, over temperature and output short-circuit protection</li> </ul>
SP6132H	<20	3	28			300	95		
SP6133	<30	3	24	0.8	1.5mA	300	95	QFN-16	<ul style="list-style-type: none"> <li>▪ Synchronous voltage mode PWM</li> <li>▪ Enable pin, Power Good flag indicator</li> <li>▪ Programmable soft-start, current limiting</li> <li>▪ UVLO, over temperature and output short-circuit protection</li> </ul>
XRP6141	<35	3	22	0.6	700	200 to 800	95	QFN-16	<ul style="list-style-type: none"> <li>▪ Proprietary emulated current mode constant on-time architecture</li> <li>▪ No external compensation</li> <li>▪ Adjustable frequency</li> <li>▪ Precision enable, soft-start, force PWM</li> <li>▪ Adjustable temperature compensated current limit</li> </ul>
SP6123	<10	3	5.5	0.8	500	300	95	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Synchronous voltage mode PWM</li> <li>▪ Soft-start, on/off mode</li> <li>▪ UVLO and overcurrent protection</li> </ul>
SP6128A	<10	3	5.5	0.8	500	300	95	TSSOP-14	<ul style="list-style-type: none"> <li>▪ Synchronous voltage mode PWM</li> <li>▪ Soft-start, on/off mode</li> <li>▪ UVLO and overcurrent protection</li> </ul>



40V Synchronous Step-Down COT Controller



XR75100 Line Regulation

DDR Termination

Part Number	Output Current	Output Voltage	Accuracy (%)	Operating Voltage (V)		Quiescent Current (µA)	Package	Features
				Min	Max			
XRP2997	2A	Adjustable	1	1.1	5.5	2	HSOIC-8	<ul style="list-style-type: none"> <li>▪ DDR I/II/III/IV bus termination</li> <li>▪ Over temperature protection</li> <li>▪ Overcurrent protection</li> </ul>

LDOs & Linear Regulators

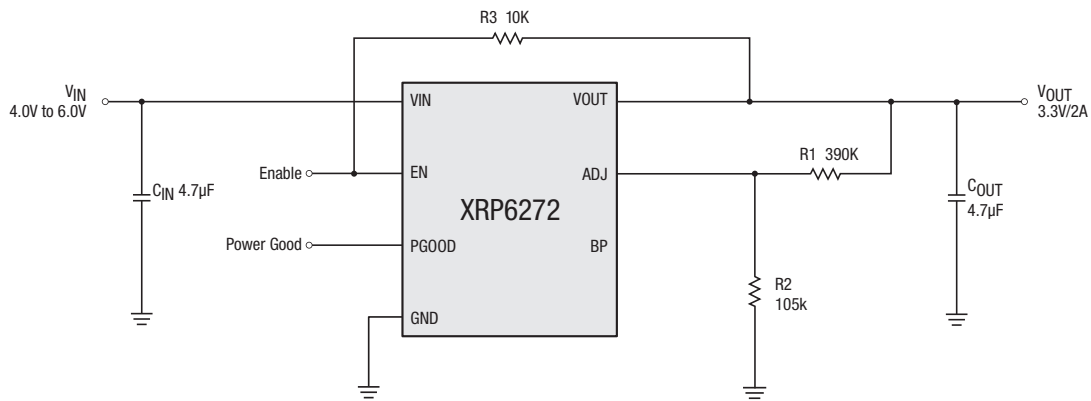
Exar manufactures a broad line of low dropout linear regulators (LDO). The simplest and lowest cost technique for stepping down a DC voltage, LDOs offer a quiet, well-regulated DC voltage supply with excellent transient response.

Applications

- Portable equipment
- Handheld devices
- Mobile phones and PDAs
- Medical and industrial instrumentation

Part Number	Output Current	Output Voltage (V)	V <sub>OUT</sub> (V) Adjustable		Accuracy (%)	Typical Dropout Voltage (mV)	Operating Voltage (V)		Quiescent Current (µA)	Package	Features
			Min	Max			Min	Max			
SP6213	100mA	3.3			2.5	250	2.5	7	65	SC70-5	<ul style="list-style-type: none"> <li>▪ Enable pin</li> <li>▪ Current limiting and thermal protection</li> </ul>
LP2951	100mA	3.3, 5			0.5, 1	380	2.4	30	150	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Enable pin</li> <li>▪ Output error flag indicator</li> <li>▪ Current limiting and thermal protection</li> </ul>
SPX5205	150mA	Adj., 1.8, 3, 3.3, 5	1.24	15.725	1	210	2.5	16	70	SOT23-5	<ul style="list-style-type: none"> <li>▪ Reverse battery protection</li> <li>▪ Current limiting and thermal protection</li> </ul>
SP6201	200mA	1.8, 3, 3.3, 5			2	320	2.5	7	28	SOT23-5	<ul style="list-style-type: none"> <li>▪ Enable pin</li> <li>▪ Power good indicator</li> </ul>
SP6260	200mA	3.3			2	200	2	6	25	SOT23-5	<ul style="list-style-type: none"> <li>▪ Low noise: 30µV<sub>RMS</sub>, no bypass cap needed</li> <li>▪ Enable pin</li> <li>▪ Current limiting and thermal protection</li> </ul>
SPX2954	250mA	5			0.5	310	2.4	30	150	NSOIC-8 SOT223-3	<ul style="list-style-type: none"> <li>▪ Enable pin</li> <li>▪ Output error flag indicator</li> <li>▪ Current limiting and thermal protection</li> </ul>
		3.3, 5			1					NSOIC-8 SOT223-3	
SP6203	300mA	2.8			2	180	2.7	6	45	SOT23-5	<ul style="list-style-type: none"> <li>▪ Low noise: 12µV<sub>RMS</sub></li> <li>▪ Enable pin</li> <li>▪ Current limiting and thermal protection</li> </ul>
SPX2945	400mA	3.3			0.5, 1	420	4.1	30	100	SOT223-3	<ul style="list-style-type: none"> <li>▪ Enable pin</li> <li>▪ Output error flag indicator</li> <li>▪ Current limiting and thermal protection</li> </ul>
SP6205	500mA	Adj., 3, 3.3	2.7	5.7	2	300	2.7	6	45	SOT23-5	<ul style="list-style-type: none"> <li>▪ Low noise: 12µV<sub>RMS</sub> (fixed voltage version)</li> <li>▪ Enable pin</li> <li>▪ Current limiting</li> <li>▪ Over temperature protection</li> </ul>
		Adj.								DFN-8	
SPX3819	500mA	Adj., 1.2, 1.5, 1.8, 2.5, 3, 3.3, 5	1.235	15.45	1	340	2.5	16	90	SOT23-5	<ul style="list-style-type: none"> <li>▪ Enable pin</li> <li>▪ Reverse battery protection</li> <li>▪ Current limiting and thermal protection</li> </ul>
		Adj., 1.2								DFN-8	
		Adj., 5								NSOIC-8	
SPX1117	800mA	Adj., 1.5, 1.8, 2.5, 3.3, 5	1.25	15	1	1100	2.6	15	5mA	SOT223-3	<ul style="list-style-type: none"> <li>▪ Current limiting and thermal protection</li> </ul>
SPX2941	1A	Adj.	1.24	15.45	3	280	3	16	12mA	TO263-5	<ul style="list-style-type: none"> <li>▪ Enable pin</li> <li>▪ Reverse battery protection</li> <li>▪ Current limiting and thermal protection</li> </ul>
SPX3940A	1A	3.3, 5			1	280	3.1	16	18mA	SOT223-3	<ul style="list-style-type: none"> <li>▪ Reverse battery protection</li> <li>▪ Current limiting and thermal protection</li> </ul>
		3.3								TO263-3	
2.5, 5				2	SOT223-3						
3.3					TO263-3						

Part Number	Output Current	Output Voltage (V)	V <sub>OUT</sub> (V) Adjustable		Accuracy (%)	Typical Dropout Voltage (mV)	Operating Voltage (V)		Quiescent Current (μA)	Package	Features
			Min	Max			Min	Max			
SPX2815	1.5A	Adj., 3.3	1.25	8.8	1, 2	1100	2.5	10	4mA	TO263-3	<ul style="list-style-type: none"> <li>Current limiting and thermal protection</li> </ul>
SPX29150	1.5A	3.3			1	390	2.5	16	12mA	TO263-3	<ul style="list-style-type: none"> <li>Reverse battery protection</li> <li>Current limiting and thermal protection</li> </ul>
SPX29152	1.5A	Adj.	1.25	15.4	1	390	2.5	16	12mA	TO263-5	<ul style="list-style-type: none"> <li>Enable pin</li> <li>Current limiting and thermal protection</li> </ul>
XRP6272	2A	Adj., 5	0.7	5.3	2	550	1.8	6	30	TO252-5 HSOIC-8	<ul style="list-style-type: none"> <li>Enable and power good functions</li> <li>Current limiting and thermal protection</li> </ul>
SPX1582	3A	Adj.	1.25	6	2	400	1.8	5.5	5mA	TO263-5	<ul style="list-style-type: none"> <li>Enable pin</li> <li>External sense pin</li> <li>Current limiting and thermal protection</li> </ul>
SPX1587	3A	Adj., 2.5, 3.3	1.25	8.8	1	1100	2.8	10	4mA	TO263-3	<ul style="list-style-type: none"> <li>Current limiting</li> <li>Over temperature protection</li> </ul>
SPX29300	3A	2.5, 3.3, 5			1	600	2.5	16	37mA	TO263-3	<ul style="list-style-type: none"> <li>Current limiting and thermal protection</li> <li>Reverse battery protection</li> </ul>
SPX29301	3A	5			1	600	4	16	37mA	TO263-5	<ul style="list-style-type: none"> <li>Enable pin</li> <li>Output error flag indicator</li> <li>Current limiting and thermal protection</li> </ul>
SPX29302/ XRP29302	3A	Adj.	1.25	16	1	600	2.8	16	37mA	TO263-5	<ul style="list-style-type: none"> <li>Enable pin</li> <li>Current limiting and thermal protection</li> <li>Reverse battery protection</li> </ul>



**XRP6272 Typical Application**



## Power Switches

Power switches provide low loss, high efficiency power management, monitoring and fault handling capabilities for any power distribution network. Use of these compact devices results in safer, more stable and more reliable interconnecting systems.

### Applications

- USB  $V_{BUS}$  power management
- Set-top boxes
- USB peripherals
- Battery charger circuits

Part Number	Channel(s)	Output Current	Current Limit	Operating Voltage (V)		Quiescent Current ( $\mu$ A)	Package	Features
				Min	Max			
SP2525A	1	500mA	850mA	3	5.5	75	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Active high or low enable pin(s)</li> <li>▪ USB 2.0 compliant</li> <li>▪ Current limiting</li> <li>▪ Fault flag indicator(s)</li> <li>▪ Over temperature protection</li> <li>▪ Undervoltage lock out protection</li> </ul>
SP2526A	2	500mA	850mA	3	5.5	110	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Active high enable pin</li> <li>▪ Current limiting</li> <li>▪ Short-circuit protection</li> <li>▪ Over temperature protection</li> </ul>
SP619	1	600mA	800mA	2.5	5.5	350	SOT23-6	<ul style="list-style-type: none"> <li>▪ Active high or low enable pin(s)</li> <li>▪ USB 3.0 compliant</li> <li>▪ Current limiting</li> <li>▪ Blanking fault flag indicator(s)</li> <li>▪ Over temperature/reverse current protection</li> <li>▪ Undervoltage lock out protection</li> </ul>
XRP2526	2	900mA	1.15A	1.8	5.5	65	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Active high or low enable pin(s)</li> <li>▪ USB 2.0 compliant</li> <li>▪ Current limiting</li> <li>▪ Fault flag indicator(s)</li> <li>▪ Over temperature protection</li> <li>▪ Undervoltage lock out protection</li> </ul>

## Voltage References

Voltage references provide a precise and stable output voltage over a wide range of conditions such as input voltage fluctuations and/or operating temperature change. These devices guarantee system accuracy and performance.

### Applications

- Power supplies
- Mother boards
- Medical and industrial instrumentation

Part Number	$V_{REF}$ (V)	Accuracy (%)	Operating Current (mA)	Max Operating Voltage (V)	$I_{REF}$ ( $\mu$ A)	Operating Temperature Range ( $^{\circ}$ C)	Temperature Coefficient (ppm/ $^{\circ}$ C)	Package	Features
SPX385	2.5 5	1	0.01 to 20	–	–	-40 to 85	80	SOT23-3	<ul style="list-style-type: none"> <li>▪ Shunt reference</li> <li>▪ Replacement for LM285/385</li> </ul>
SPX431A	2.5	0.5	1 to 150	36	0.7	-40 to 125	30	SOT89-3	<ul style="list-style-type: none"> <li>▪ <math>V_{REF}</math> adjustable up to 36V</li> <li>▪ Replaces TL431 and AS431</li> </ul>
SPX431L	2.5	1	1 to 100	20	0.7	0 to 105	30	SOT89-3	<ul style="list-style-type: none"> <li>▪ <math>V_{REF}</math> adjustable up to 20V</li> <li>▪ Replaces TL431 and AS431</li> </ul>
SPX432	1.24	1	1 to 80	15	3	0 to 105	50	SOT23-3	<ul style="list-style-type: none"> <li>▪ <math>V_{REF}</math> adjustable to 15V</li> <li>▪ Replaces TLV431 and AS432</li> </ul>
SPX1431	2.5	0.4	1 to 150	36	0.7	-55 to 125	30	SOT89-3	<ul style="list-style-type: none"> <li>▪ <math>V_{REF}</math> adjustable up to 36V</li> <li>▪ Replaces TL1431</li> </ul>
SPX2431	2.5	0.5, 1	1 to 100	20	0.7	0 to 105	30	SOT23-3	<ul style="list-style-type: none"> <li>▪ <math>V_{REF}</math> adjustable up to 20V</li> <li>▪ Replaces TL2431 and AS2431</li> </ul>

## Supervisors

Supervisory circuits ensure safe operating conditions for microprocessor and memory-based systems. By monitoring one or more system supplies, supervisory circuits provide basic protection such as power-on reset as well as fault monitoring during power-up, power down and undervoltage (brownout) conditions. Additional functions typically include a watchdog timer, a manual reset and battery backup supply switching.

### Applications

- **Mother boards**
- **Telecom and datacom equipment**
- **Medical and industrial instrumentation**

Part Number	Channel(s)	Reset Threshold (V)	Reset Accuracy	Reset Active	Operating Voltage(V)		Quiescent Current (µA)	Package	Features
					Min	Max			
SP690A	1	4.65	125mV	Low	1	5.5	35	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Watchdog timer</li> <li>▪ Back-up battery switchover</li> <li>▪ Power fail, low battery indicator</li> </ul>
SP690S	1	2.925	75mV	Low	1	5.5	25	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Watchdog timer</li> <li>▪ Back-up battery switchover</li> <li>▪ Power fail, low battery indicator</li> </ul>
SP691	1	4.65	125mV	Low/High	1	5.5	35	NSOIC-16 WSOIC-16	<ul style="list-style-type: none"> <li>▪ Programmable watchdog timer</li> <li>▪ Back-up battery switchover</li> <li>▪ Power fail, low battery indicator</li> <li>▪ Chip enable gating</li> </ul>
SP705	1	4.65	150mV	Low	1.1	5.5	40	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Watchdog timer</li> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP706	1	4.40	150mV	Low	1.1	5.5	40	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Watchdog timer</li> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP706R	1	2.63	80mV	Low	1.1	5.5	25	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Watchdog timer</li> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP706S	1	2.93	80mV	Low	1.1	5.5	25	NSOIC-8 MSOP-8	<ul style="list-style-type: none"> <li>▪ Watchdog timer</li> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP706T	1	3.08	80mV	Low	1.1	5.5	25	NSOIC-8 MSOP-8	<ul style="list-style-type: none"> <li>▪ Watchdog timer</li> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP707	1	4.65	150mV	Low/High	1.1	5.5	40	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP708	1	4.40	150mV	Low/High	1.1	5.5	40	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP708S	1	2.93	80mV	Low/High	1.1	5.5	25	NSOIC-8 MSOP-8	<ul style="list-style-type: none"> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP708T	1	3.08	80mV	Low/High	1.1	5.5	25	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Power fail, low battery indicator</li> <li>▪ Manual reset</li> </ul>
SP809	1	2.3, 2.6, 2.9	1.50%	Low	0.9	6	1	SOT23-3	<ul style="list-style-type: none"> <li>▪ 140ms reset pulse width</li> <li>▪ Push-pull output</li> </ul>
SP809N	1	3.1	1.50%	Low	0.9	6	1	SOT23-3	<ul style="list-style-type: none"> <li>▪ 140ms reset pulse width</li> <li>▪ Open drain output</li> </ul>
SP813	1	4.65	150mV	High	1.1	5.5	40	NSOIC-8	<ul style="list-style-type: none"> <li>▪ Watchdog timer</li> <li>▪ Manual reset</li> </ul>

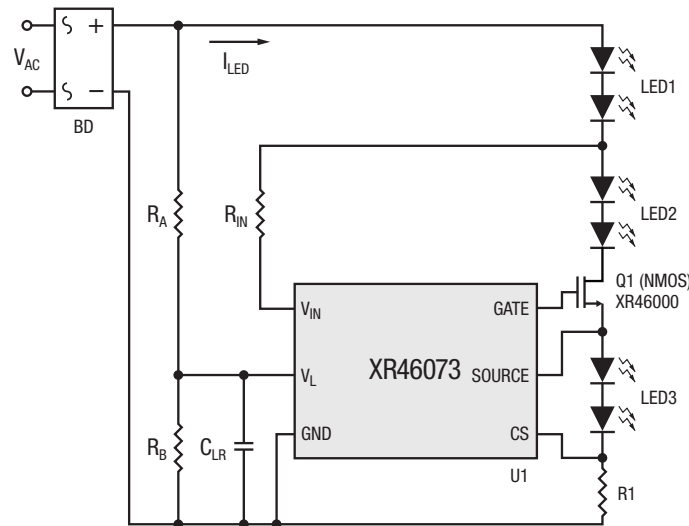
## AC Step Drivers

Exar is the world leader in AC step driver solutions for LED bulbs, tubes, troffers, downlights and decorative LED applications. Our patented distributed architecture eliminates the need for magnetics, MOVs and electrolytic capacitors providing robust, cost effective and extremely small solutions with low flicker, high power factor and low THD.

### Applications

- Downlight
- High bay
- Specialty
- Architectural

Part Number	Steps	Max Voltage (V)	I <sub>OUT</sub> MAX (mA)	Power Line Regulation	Dimming	Package	Features
XR46203	2	78	180	Y	Y; Triac	TDFN-8	<ul style="list-style-type: none"> <li>▪ 2-step integrated driver</li> <li>▪ Better thermal performance</li> <li>▪ Built in thermal foldback and VIN pin clamp</li> </ul>
XR46110	1	78	180	Y	Y; Triac	TDFN-6	<ul style="list-style-type: none"> <li>▪ 1-step driver</li> <li>▪ Improved line regulation</li> <li>▪ Built in thermal foldback and VIN pin clamp</li> </ul>
XR46073	2	78	180	Y	Y; Triac	TDFN-6	<ul style="list-style-type: none"> <li>▪ 2-step integrated driver</li> <li>▪ Improved line regulation</li> <li>▪ Built in thermal foldback and VIN pin clamp</li> </ul>
XR46050	2	78	180	N	Y; Triac	TDFN-6	<ul style="list-style-type: none"> <li>▪ 2-step integrated driver</li> <li>▪ Smallest footprint solution</li> <li>▪ Built in thermal foldback and VIN pin clamp</li> </ul>
XR46084	1	80	130	N	Y; Triac	TDFN-6, SOT-89-5	<ul style="list-style-type: none"> <li>▪ 1-step driver</li> <li>▪ For use in non-dimmable applications</li> </ul>
XR46083	1	80	130	N	N	TDFN-6, SOT-89-5	<ul style="list-style-type: none"> <li>▪ 1-step driver</li> <li>▪ For use in non-dimmable applications</li> </ul>
XR46010	1	80	60	-	Y; Improved Triac	SOT23-3	<ul style="list-style-type: none"> <li>▪ Improves TRIAC dimmable performance when used with other AC step drivers</li> </ul>
XR46014	1	80	250	N	Y; Triac	SOT223-3	<ul style="list-style-type: none"> <li>▪ 1-step driver</li> <li>▪ For use in dimmable applications and full balance systems</li> </ul>
XR46000	-	600	-	-	-	SOT223-3	<ul style="list-style-type: none"> <li>▪ N-Channel Power MOSFET</li> <li>▪ Use with all Exar step driver solutions</li> <li>▪ Provides &gt; 750V native surge capability</li> </ul>
XR46701	1	40	-	Y	Y; Analog/PWM	TDFN-8, MSOP-8	<ul style="list-style-type: none"> <li>▪ Supports dual voltage range lighting engines and low power smart lighting</li> </ul>
XR46004-Q	1	75	600	N	PWM	TO-252-5	<ul style="list-style-type: none"> <li>▪ Internal pass device</li> </ul>



Two-Step LED Current Controller

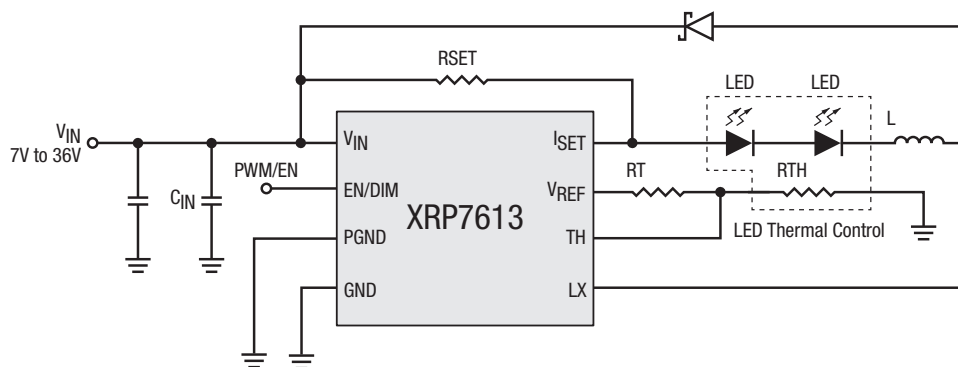
Switching Regulators

Efficiency, performance, size and reliability are rapidly imposing LEDs as the lighting solution of choice in space-constrained portable electronic equipment as well as in architectural and accent lighting fixtures. Exar's LED lighting products offer compact and efficient solutions for line and battery-operated devices and are capable of driving multiple LEDs in various series or parallel topologies.

Applications

- General lighting and display
- Medical and industrial instrumentation
- Keypad and signage backlighting

Part Number	Ch.	Max Current/Ch.	LEDs/Ch.	Operating Voltage (V)		Ref. Voltage (mV)	Freq. (MHz)	Max Output Voltage (V)	Quiescent Current ( $\mu$ A)	Efficiency (%)	Package	Application	Features
				Min	Max								
XRP7613	1	1.2A	8	7	36	100	<1	36	35	95	SOIC-8	High-powered LED	<ul style="list-style-type: none"> <li>▪ Hysteretic PFM control</li> <li>▪ Enable and soft-start functions</li> <li>▪ Analog and PWM dimming</li> <li>▪ Dynamic LED current thermal control</li> </ul>
SP7685	1	1.2A	1	2.7	5.5	50	2.4	5.5	500	94	DFN-10	Flash	<ul style="list-style-type: none"> <li>▪ Charge pump topology</li> <li>▪ Enable pin, flash/torch mode</li> <li>▪ Adjustable flash current, soft-start</li> <li>▪ Flash timeout protection</li> <li>▪ Overvoltage, overcurrent and temperature protection</li> </ul>
SP6686	1	400mA	1	2.7	5.5	50	2.4	5.5	500	94	DFN-10	Flash	<ul style="list-style-type: none"> <li>▪ Charge pump topology</li> <li>▪ Enable pin, flash/torch mode</li> <li>▪ Adjustable flash current, soft-start</li> <li>▪ Overvoltage, overcurrent and temperature protection</li> </ul>
SP6699	1	20mA	6	2.5	16	200	1.2	27	3.2	84	SOT23-6	Backlight	<ul style="list-style-type: none"> <li>▪ Integrated Schottky diode</li> <li>▪ Enable pin, PWM dimming</li> <li>▪ Soft-start</li> </ul>



1.2A 36V Step-Down LED Driver

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