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Power Management Selection Guide

2Q 2001, Issue 2

Table of Contents

Introduction

With the performance miniaturization and digitalization of today's electronics, the power management sector is not only the fastest growing segment of the analog market, but also the most dynamically changing and increasingly complex. At Texas Instruments (TI), we have been rapidly growing our portfolio of power management devices to be the supplier you look to first for premier power management products.

Regardless of your design expertise or time constraints, TI can provide you with an ideal power management solution. Whether you require a plug-in power module to optimize your time-to-market, you need an application note and evaluation module (EVM) to help in your design, or you require a highly integrated, complex IC with which to design your own power supply, TI has a solution for you.

This selection guide is designed to help you quickly sort through the broad product offering of TI's premier Power Management portfolio.[A] There are 15 sections representing the many different categories of power management products offered by TI.

Each section is designed to provide you with:

- Key topics to consider
- Graphical representation of the portfolio
- Table of the key parameters of the devices
- Available resource information

For more information or technical assistance, please see the back cover, or visit TI's web site at **power.ti.com**

Note: Military and industrial versions of some Power Management products are available. Please visit **www.ti.com/sc/docs/msp/dsps.htm**

[A] TI's standard commodity power management products can be found on our web site and in other product literature.

Plug-In Power Solutions

Things to Consider

PRIMARY

Input Voltage (V_{IN}) — Plug-in power solutions are designed to work from specific input voltage ranges built around industry-standard DC bus voltages.

Output Current (I_{OUT}) — Plug-in power solutions are rated to provide a maximum amount of DC current. A converter should match the application's maximum current needs.

Output Voltage (V_{OUT}) — Choose a fixed- or adjustable-output voltage that meets the requirements of the circuit design.

Isolation — Some circuit applications require electrical input to output isolation. Isolated converters are usually more complex and more expensive.

Single/Multiple Outputs — In some cases, designers need two or more DC voltages. Designers should weigh the flexibility and cost of several single output converters vs. a multiple output converter.

SECONDARY

Features — Adjustable/programmable output voltage, remote sense, over-temperature, over-current, output inhibit are some of the many features offered.

Package — All products are available in surface mount and horizontal through-hole configurations. Vertical mounting uses the smallest footprint and is available in most product series.

Airflow Requirements — The maximum current of converters often depends on airflow. Safe Operating Area (SOA) curves determine the airflow needs of converters at specific currents.

Protection — Fault protection may be a requirement of an application. Fault protection can include short circuit, over-temperature, over-current and over-voltage protection.

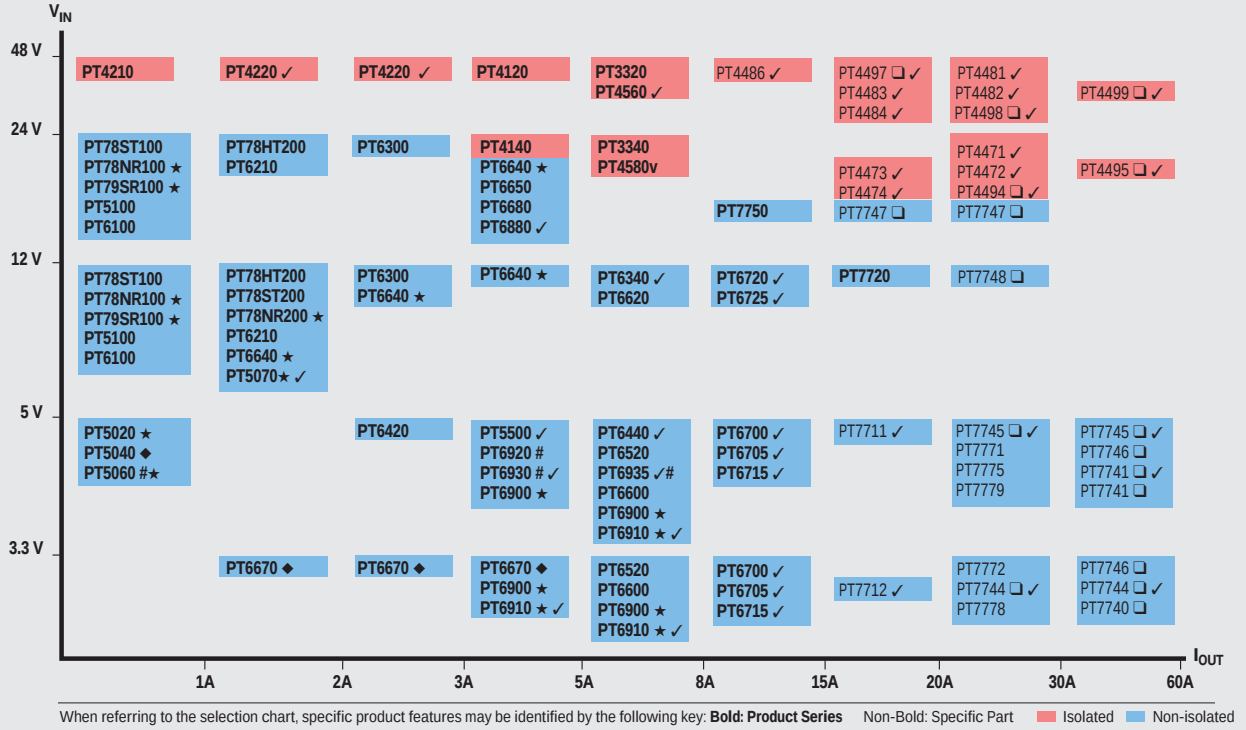
Technical Information

- Board-mounted switched-mode topologies provide high efficiency and low-loss power conversion over a wide range of input voltages.
- Completely integrated regulator designs require only one or two external components.

Package Options

- Vertical through-hole, horizontal through-hole, and horizontal SMD.
- Package features vary with each product series. They include:
  - Space-Saving Copper Case SIP
  - Standard Aluminum SIP
  - Plastic Case (3-pin modules)
- Dual-output regulators with different output voltages designed for µPs, DSPs and MPUs.
- High current, adjustable, low voltage outputs. Control features include Inhibit/Shutdown, Remote Sensing, Current Limit, and Short-Circuit Protection.

Plug-In Power Family of Products



When referring to the selection chart, specific product features may be identified by the following key: **Bold: Product Series** Non-Bold: Specific Part Isolated Non-isolated

❑ Current booster module # Multiple output voltages ◆ Special function; boost ★ Special function; negative output ✓ Space-Saving Copper case SIP

Plug-In Power Solutions Selection Guide

Device	Input Bus Voltage	Description	P_{OUT} or I_{OUT}	Isolated Outputs	V_O Range (V)	V_O Adjustable	1ku Suggested Resale
PT5100	Wide Input	1 A, Wide Input Positive Step-Down ISR	1 A	No	3.3 to 15	No	$7.10
PT6100	Wide Input	1 A, Wide Input Adjustable Step-Down ISR	1 A	No	1.9 to 22	Yes	$7.30
PT6210	Wide Input	2 A, Wide Input Adjustable Step-Down ISR	2 A	No	1.9 to 22	Yes	$10.25
PT6300	Wide Input	3 A, Wide Input Adjustable Step-Down ISR	3 A	No	1.9 to 22	Yes	$11.50
PT78HT200	Wide Input	5 V_{OUT}, 2 A, Wide-Input Positive Step-Down ISR	2 A	No	3.3 to 6.5	No	$10.45
PT78NR100	Wide Input	1 A, Wide-Input Plus-to-Minus Voltage ISR	-1 A	No	-3.0 to -15	No	$8.35
PT78NR200	Wide Input	2 A, Wide-Input Plus-to-Minus Voltage ISR	-2 A	No	-5.2 to -15	No	$15.75
PT78ST100	Wide Input	1.5 A, Wide-Input Positive Step-Down ISR	1.5 A	No	3.3 to 15	No	$8.35
PT78ST200	Wide Input	2 A, Wide-Input Positive Step-Down ISR	2 A	No	12	No	$10.45
PT79SR100	Wide Input	1.5 A, Wide-Input Negative Step-Down ISR	-1.5 A	No	-5 to -15	No	$10.45
PT6670	3.3 V	3.3-V_{IN}, 20 W Boost ISR	20 W	No	3.8 to 12.8	Yes	$18.40
PT6702	3.3 V	1.3 to 2.05 V_{OUT}, 3.3-V_{IN} 13A Programmable ISR	13 A	No	1.3 to 2.05	4-bit Programmable	$20.50
PT7706	3.3 V	1.3 to 2.05 V_{OUT}, 18 A 3.3-V_{IN} "Big Hammer" ISR	18 A	No	1.3 to 2.05	4-bit Programmable	$31.00
PT7712	3.3 V	1.3 to 2.05 V_{OUT}, 20 A 3.3-V_{IN} ISR	20 A	No	1.3 to 2.05	4-bit Programmable	$31.00
PT7778	3.3 V	1.3 to 2.05 V_{OUT}, 32 A 3.3-V_{IN} "Sledge Hammer" ISR	32 A	No	1.3 to 2.05	4-bit Programmable	$46.20
PT5500	3.3 V/5 V	3.3-V/5-V_{IN}, 3 A Adjustable ISR	3 A	No	1.0 to 3.6	Yes	$10.45
PT6520	3.3 V/5 V	3.3-V/5-V_{IN}, 8 A Adjustable ISR with Short-Circuit Protection	8 A	No	1.5 to 3.7	Yes	$18.40
PT6600	3.3 V/5 V	3.3-V/5-V_{IN}, 9 A Adjustable ISR	9 A	No	1.2 to 4.2	Yes	$16.90
PT6705/6715	3.3 V/5 V	3.3-V/5-V_{IN}, 13 A Adjustable ISR	13 A	No	1.5 to 3.3	Yes	$18.90
PT6910	3.3 V/5 V	3.3-V/5-V_{IN}, 12 W Adjustable Plus-to-Minus Voltage Converter	12 W	No	-1.2 to -6.5	Yes	$25.40
PT5020	5 V	1 A, 5-V_{IN} Positive-to-Negative ISR	-1 A	No	-1.7 to -15	No	$9.20
PT5040	5 V	1 A, 5-V_{IN} Step-Up ISR	1 A	No	8 to 18	No	$9.20
PT5060	5 V	5 to ±12/15 V_{OUT}, 9 W Dual-Output Adjustable ISR	9 W	No	±8 to ±20	Yes	$10.45
PT6440	5 V	3.3-V/5-V_{IN}, 6A Adjustable ISR	6 A	No	1.0 to 3.6	Yes	$18.00
PT6700	5 V	1.3 to 3.5 V_{OUT}, 5-V_{IN} 13 A Programmable ISR	13 A	No	1.3 to 3.5	5-bit Programmable	$20.50
PT6920	5 V	25 W, 5-V_{IN}, Adjustable Dual Output ISR	25 W	No	1.3 to 3.6	Yes	$25.40
PT6930	5 V	25 W, 5-V_{IN}, Adjustable Dual Output ISR	25 W	No	1.3 to 3.6	Yes	$25.40
PT6935	5 V	35 W, 5-V_{IN}, Adjustable Dual Output ISR	35 W	No	1.3 to 3.6	Yes	$26.40
PT7711	5 V	1.3 to 3.5 V_{OUT}, 20 A 5-V_{IN}, Next-Generation ISR	20 A	No	1.3 to 3.5	5-bit Programmable	$31.00
PT7779	5 V	1.3 to 3.5 V_{OUT}, 32 A 5-V_{IN}, Next-Generation "Sledge Hammer" ISR	32 A	No	1.3 to 3.5	5-bit Programmable	$46.20
PT5070	12 V	7- to 16-V_{IN}, 2 A/12 V Output Step-Up/Down Converter	2A	No	12	Yes	$20.50
PT6340	12 V	12-V_{IN}, 6 A Adjustable ISR	6A	No	1.5 to 5	Yes	$17.50
PT6620	12 V	6 A, 12-V_{IN}, Adjustable ISR	6A	No	1.6 to 10	Yes	$18.40
PT6640	12 V	24 W Adjustable Plus-to-Minus Voltage Converter	24 W	No	-1.8 to -17	Yes	$18.40
PT6720	12 V	12-V_{IN}, 13 A Programmable ISR	14 A	No	1.3 to 3.5 V	5-bit Programmable	$20.50
PT7720	12 V	17 A, 12-V_{IN} "Big-Hammer II" , Programmable ISR	17 A	No	1.3 to 7.6	5-bit Programmable	$34.65
PT6650	24 V	5 A, 24-V_{IN} Adjustable ISR	5A	No	1.8 to 17	Yes	$18.40
PT6880	24 V	5 A, 18- to 36-V_{IN} Adjustable ISR	5A	No	1.8 to 17	Yes	$18.40
PT7750	24 V	15 A, 24-V_{IN} "Big-Hammer III", Programmable ISR	15A	No	2.5 to 12.8	5-bit Programmable	$38.35
PT4140	24 V	20 W, 24-V_{IN} Isolated DC/DC Converter	20 W	Yes	1.7 to 16.5	Yes	$31.40
PT4470	24 V	100 W, 24-V_{IN} Isolated DC/DC Converter	100 W/30 A	Yes	1.3 to 3.5, 5, 12	5-bit Programmable	$89.00
PT4580	24 V	30 W, 24-V_{IN} Isolated DC/DC Converter	30 W	Yes	1.8 to 15	Yes	$37.30
PT4120	48 V	20 W, 48-V_{IN} Isolated DC/DC Converter	20 W	Yes	1.7 to 16.5	Yes	$31.40
PT4210	48 V	3-7 W, 48-V_{IN} Isolated DC/DC Converter	3-7 W	Yes	3.3 to 12	No	$22.50
PT4220	48 V	10 W, 48-V_{IN} Isolated DC/DC Converter	10 W	Yes	1.5 to 12	Yes	$26.00
PT4480	48 V	100 W, 48-V_{IN} Isolated DC/DC Converter	100 W/30 A	Yes	1.3 to 3.5, 5, 12	5-bit Programmable	$89.00
PT4560	48 V	30 W, 48-V_{IN} Isolated DC/DC Converter	30 W	Yes	1.8 to 15	Yes	$37.30

Integrated Power Solutions

Things to Consider

PRIMARY

Input Voltage — All integrated power solutions are designed to work from industry standard DC input voltages ranging from 5 V to 75 V.

Power — Power output from the DC/DC converters is a constant for the low power (<2 W) families, so output current varies according to the output voltage provided. Higher power devices are rated at a given maximum output current. Rated power or current is available over the whole temperature range of the product.

Isolation Voltage — Isolation voltage requirements are often defined by International Standard Agencies. TI integrated power solutions are tested to UL standards and are rated at 1000 V_{rms} or 1500 V_{rms}.

Packaging — Standard Integrated Circuit (IC) packaging is used for all integrated power solutions with standard IC outlines, including Dual In-Line (DIL) and Small Outline (SO) packages.

SECONDARY

Reliability — The use of semiconductor manufacturing techniques enables a very high level of reliability.

Device Protection — Short circuit and thermal protection are provided on all integrated power solutions, other protection may also be provided depending on product type.

Operating Temperature — There is no de-rating of performance with temperature; and for all operating temperature ranges there is no assumed airflow. Most products are specified over the –40° C to +85° C range.

Technical Information

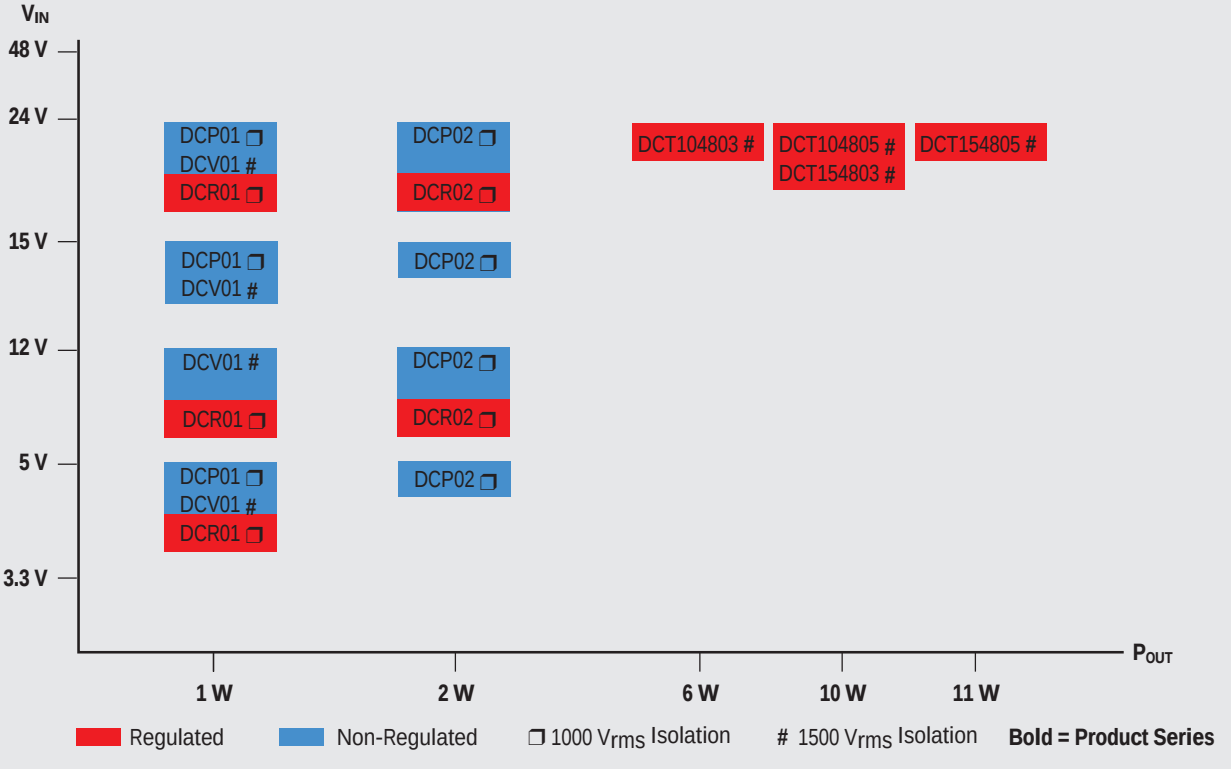
Integrated power solutions use an IC lead-frame as the medium to interconnect silicon devices and magnetic components within the IC package. This provides the following advantages to users:

- High reliability
- Excellent thermal management
- Small size
- Compatibility with standard board assembly processes

Package Options

- 14-pin DIL and Gull Wing
- 18-pin DIL and Gull Wing
- 28-pin SO
- 28-pin DIL and Gull Wing
- 32-pin DIL and Gull Wing

Integrated Power Solutions Family of Products



Integrated Power Solutions Selection Guide

Device	Input Bus Voltage (V)	Package Type	Description	P_{OUT} or I_{OUT}	V_O (V) Range	Isolation Voltage (V_{rms})	V_O Adjustable	1ku Suggested Resale
DCP010505B	5	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	5	1000	No	$5.01
DCP010505DB	5	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±5	1000	No	$5.51
DCP010512B	5	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	12	1000	No	$5.01
DCP010512DB	5	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±12	1000	No	$5.51
DCP010515B	5	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	15	1000	No	$5.01
DCP010515DB	5	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±15	1000	No	$5.51
DCP011512DB	15	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±12	1000	No	$5.51
DCP011515DB	15	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±15	1000	No	$5.51
DCP012405B	24	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	5	1000	No	$5.01
DCP012415DB	24	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±15	1000	No	$5.01
DCP020503	5	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	3.3	1000	No	$6.50
DCP020505	5	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	5	1000	No	$6.50
DCP020507	5	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	7	1000	No	$6.50
DCP020509	5	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	9	1000	No	$6.50
DCP020515D	5	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	±15	1000	No	$6.50
DCP021205	12	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	5	1000	No	$6.50
DCP021212	12	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	12	1000	No	$6.50
DCP021212D	12	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	±12	1000	No	$6.50
DCP021515	15	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	15	1000	No	$6.50
DCP022405	24	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	5	1000	No	$6.50
DCP022405D	24	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	±5	1000	No	$6.50
DCP022415D	24	DIL-14, SO-28	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	±15	1000	No	$6.50
DCR010503	5 V	DIL-18, SO-28	Isolated, Regulated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	3.3	1000	No	$5.60
DCR010505	5 V	DIL-18, SO-28	Isolated, Regulated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	5	1000	No	$5.60
DCR011203	12 V	DIL-18, SO-28	Isolated, Regulated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	3.3	1000	No	$5.60
DCR011205	12 V	DIL-18, SO-28	Isolated, Regulated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	5	1000	No	$5.60
DCR012403	24 V	DIL-18, SO-28	Isolated, Regulated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	3.3	1000	No	$5.60
DCR012405	24 V	DIL-18, SO-28	Isolated, Regulated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	5	1000	No	$5.60
DCR021205	12 V	DIL-18, Gull Wing	Isolated, Regulated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	5	1000	No	$6.85
DCR022405	24 V	DIL-18, Gull Wing	Isolated, Regulated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	2 W	5	1000	No	$6.85
DCV010505	5 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	5	1500	No	$8.00
DCV010505D	5 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±5	1500	No	$8.50
DCV010512	5 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	12	1500	No	$8.00
DCV010512D	5 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±12	1500	No	$8.50
DCV010515	5 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	15	1500	No	$8.00
DCV010515D	5 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±15	1500	No	$8.50
DCV011512D	15 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1W	±12	1500	No	$8.50
DCV011515D	15 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±15	1500	No	$8.50
DCV012405	24 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	5	1500	No	$8.00
DCV012415D	24 V	DIL-14, Gull Wing	Isolated, Thermal/Short-Circuit Protection, Device-to-Device Synchronization	1 W	±15	1500	No	$8.00
DCT104805	48 V	DIL-28, Gull Wing	Telecom, Isolated DC/DC Converter, Soft Start, Remote Sensing, Under-Voltage Lockout, Basic Insulation	2 A	5	1500	±10%	$23.00
DCT104803	48 V	DIL-28, Gull Wing	Telecom, Isolated DC/DC Converter, Soft Start, Remote Sensing, Under-Voltage Lockout, Basic Insulation	2 A	3	1500	±10%	$23.00
DCT154805	48 V	DIL-32, Gull Wing	Telecom, Isolated DC/DC Converter, Soft Start, Remote Sensing, Under-Voltage Lockout, Basic Insulation	3 A	5	1500	±10%	$28.00
DCT154803	48 V	DIL-32, Gull Wing	Telecom, Isolated DC/DC Converter, Soft Start, Remote Sensing, Under-Voltage Lockout, Basic Insulation	3 A	3	1500	±10%	$28.00

Supervisors

Things to Consider

PRIMARY

System Voltages — The version of supervisor you require is dependent on the voltage rail(s) within the system. For example, supervisors designed to support a processor need to be selected according to the voltage driving the processor.

Number of Channels — Typically the number of supervisor functions required in a system is dependent on the processor and peripheral(s) voltages. For example, split-voltage processors may require supervision of both rails, while the memory in the system may also require supervision and be operating on a third (different) voltage rail.

Manual Reset (MR) — This feature allows the user to manually reset the circuit or control the supervisory circuit by another device of the application.

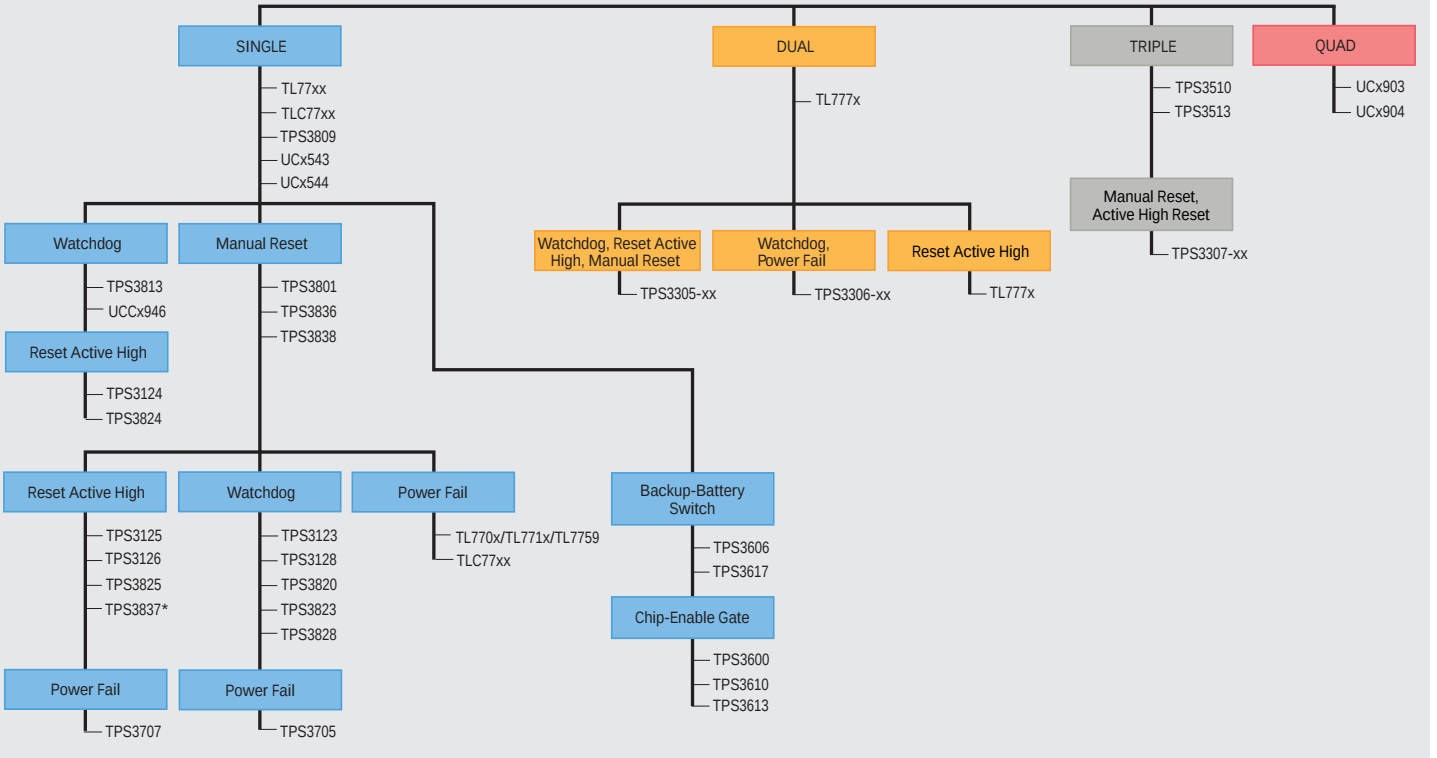
SECONDARY

Watchdog Input (WDI) — In situations where the system processor may not be functioning properly, its on-board watchdog feature may fail to reset. Supervisors with integrated watchdog functionality increase system reliability by being able to trigger a reset.

Technical Information

- Active High Output — Allows the use of processors with active high reset input without additional components.
- PowerFail Input/Output (PFI/PFO) — Allows for more flexibility by using this comparator, e.g., for long-term battery observation and pre-warning.
- Delay Time — Allows the voltage and other components in the circuit to stabilize first before the normal operation starts again.

Supervisors Family of Products



* Note: All devices feature an active low output except TPS3837

Supervisors Selection Guide

Device	Number of Supervisors	Supervised Voltages	Packages	I_{DD} (µA) type	Time Delay (ms)	Manual Reset Input/MR	Active-High Reset Output	Power-Fail PFI &/PFO	Over-Voltage Detection	Over-Current Detection	Watchdog Timer WDI	Backup-Battery Switchover	Chip-Enable Gating	1ku Suggested Resale
TL770x	1	Adj./5.0	SO-8, DIP-8	1.8 mA	Prog		x							$0.33
TL7757	1	5.0	SO-8, SOT-89, TO-226	1.4 mA	5 µs									$0.22
TL7759	1	5.0	SO-8, DIP-8, SSOP-8	1.4 mA	5 µs		x							$0.25
TL7770-5	2	5.0	SO-16, DIP-16	5 mA	Prog		x		x					$0.59
TL770xA	1	Adj./5.0/9.0/12.0/15.0	SO-8, DIP-8	1.8 mA	Prog		x							$0.27
TLC77xx	1	Adj./2.5/3.3/3.0/5.0	SO-8, DIP-8, TSSOP-8	9	Prog		x							$0.57
TPS3123	1	1.2/1.5/1.8	SOT-23	14	180	x					x			$0.78
TPS3124	1	1.2/1.5/1.8	SOT-23	14	180		x				x			$0.78
TPS3125	1	1.2/1.5/1.8/3.0	SOT-23	14	180	x	x							$0.72
TPS3126	1	1.2/1.5/1.8	SOT-23	14	180	x	x							$0.72
TPS3128	1	1.2/1.5/1.8	SOT-23	14	180	x					x			$0.78
TPS3305-xx	3	1.8/2.5/3.3/5.0	SO-8, MSOP-8	15	200	x	x				x			$0.90
TPS3306-xx	2	1.5/1.8/2.0/2.5/3.3/5.0	SO-8, MSOP-8	15	100			x	x		x			$0.98
TPS3307-xx	3	Adj./1.8/2.5/3.3/5.0	SO-8, MSOP-8	15	200	x	x							$0.98
TPS3510	3	3.3/5.0/12.0	SO-8, DIP-8	1 mA	300			x	x					$0.51
TPS3513	3	3.3/5.0/12.0	SO-14, DIP-14	1 mA	300			x	x	x				$0.77
TPS3600	1	1.8/2.5/3.3/5.0	TSSOP-14	20	100	x		x			x	x	x	$2.35
TPS3606-33	1	3.3	MSOP-10	20	100	x		x			x	x		$1.84
TPS3610	1	1.8/5.0	TSSOP-14	20	100			x			x	x	x	$2.15
TPS3613-01	1	Adj.	MSOP-10	20	100	x	x					x	x	$1.67
TPS3617-50	1	5.0	MSOP-8	20	100			x			x	x		$1.25
TPS3705-xx	1	3.0/3.3/5.0	SO-8, MSOP-8	30	200	x		x	x		x			$0.73
TPS3707-xx	1	2.5/3.0/3.3/5.0	SO-8, MSOP-8	20	200	x	x	x	x					$0.69
TPS3801	1	Adj./1.8/2.5/3.0/3.3/5.0	SC-70	9	200	x								$0.47
TPS3809	1	2.5/3.0/3.3/5.0	SOT-23	9	200									$0.36
TPS3813	1	2.5/3.0/3.3/5.0	SOT-23	9	25						x			$0.82
TPS3820-xx	1	2.5/3.0/3.3/5.0	SOT-23	15	25	x					x			$0.58
TPS3823-xx	1	2.5/3.0/3.3/5.0	SOT-23	15	200	x					x			$0.58
TPS3824-xx	1	2.5/3.0/3.3/5.0	SOT-23	15	200		x				x			$0.58
TPS3825-xx	1	2.5/3.0/3.3/5.0	SOT-23	15	200	x	x							$0.52
TPS3828-xx	1	2.5/3.0/3.3/5.0	SOT-23	15	200	x					x			$0.58
TPS3836	1	1.8/2.5/3.0/3.3	SOT-23	0.25	10 / 200	x								$0.93
TPS3837	1	1.8/2.5/3.0/3.3	SOT-23	0.25	10 / 200	x	x							$0.93
TPS3838	1	1.8/2.5/3.0/3.3	SOT-23	0.25	10 / 200	x								$0.93
UCx543	1	Adjustable	TSSOP-16, SOIC-16	7 mA	Prog									$4.53
UCx544	1	Adjustable	TSSOP-18, SOIC-18	7 mA	Prog									$5.04
UCCx903	4	Adjustable	SOIC-18, TSSOP-18	7 mA	Prog									$5.20
UCCx904	4	Adjustable	SOIC-18, TSSOP-18	7 mA	Prog									$4.72
UCCx946	1	Adjustable	SO-8, DIL-8, TSSOP-8	10	Prog						x			$2.46

NOTE: All devices feature an Active Low Reset Output except TPS3837

Resources

For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Evaluation Modules (EVM)

Part Number	Description	Price
TPS3600EVM	Battery-Backup Supervisor	$50

Application Notes

Literature Number	Part Number	Description
SPRA431A		Reset Circuit for the TMS320C6000™ DSP
SLVA077	TPS312x	TPS312x Series Supervisory Circuits in Ultra-Low-Voltage Applications
SLVA056	TPS330x	TPS3305 and TPS3307 Supervising DSP and Processor Applications
SLVA082		Powering the TMS320VC5402 DSP Using the TPS60100, TPS76918, and the TPS3305-18
SLVA039	TPS382x	TPS382x Microprocessor Supervisory Circuits with Watchdog Function in SOT-23 Package
SLUA168	UCx1901, UCx1903	DN33: Optocoupler Feedback Drive Techniques Using the UC3901 and UC3903

Low Dropout Regulators (LDOs)

Things to Consider

PRIMARY

Input Voltage — LDOs have certain operating parameters. One of these is the input voltage. Input voltage is important because most of today's LDOs are defined as stepping down a voltage by less than 2V from that of the input voltage. Stepping down more than 2V typically means that efficiency is not at all important and, therefore, another alternative may be more cost effective.

Output Voltage — An LDO's primary function is to provide a lower regulated voltage from that of the input voltage. This is the most important piece of information to know when beginning your search for the proper LDO. Output voltage is also important in conjunction with the input voltage and output current to determine the power dissipated by the LDO.

More than 2V differential may mean a potential thermal issue or that efficiency is not at all important.

Output Current — The current that the LDO is capable of sourcing is known as the output current, and it is another critical element in determining the appropriate LDO. The output voltage must be at a usable current level in order to support the system components on the regulated lower voltage.

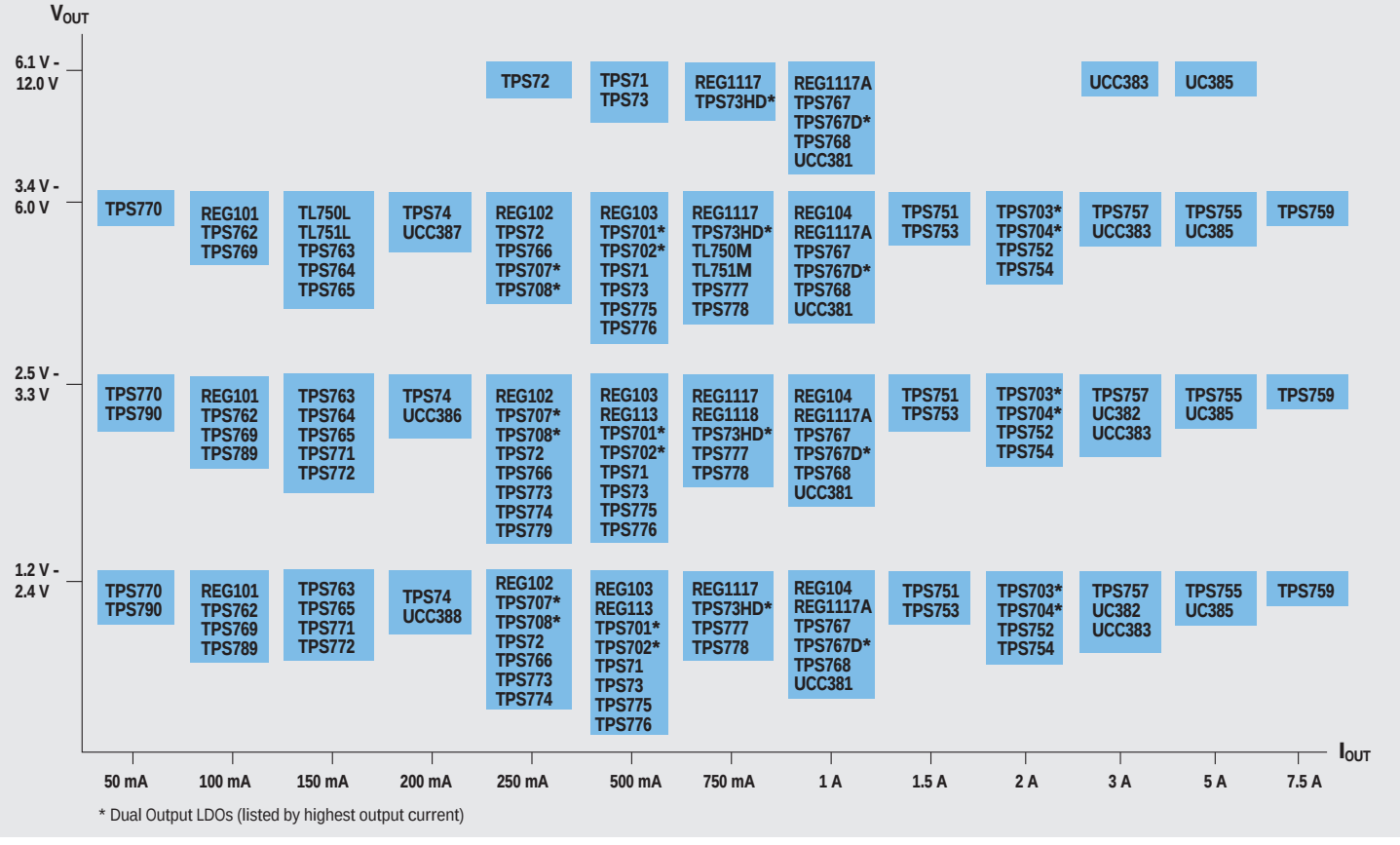
SECONDARY

Integrated Features — LDOs can add value to the system (and reduce overall system cost) by integrating features such as voltage supervision, dual independent outputs and power up/down sequencing. Consider the *needs of your system* before selecting an LDO.

Technical Information

- BiCMOS process — Results in very low Iq compared to bipolar process which yields lower costs.
- PowerPAD™ — Package provides high current with very small surface mount.
- Dual-output regulators with different output voltages — Designed for DSPs, FPGAs and MPUs.

Low Dropout Regulators Family of Products



* Dual Output LDOs (listed by highest output current)

Low Dropout Regulators Selection Guide

Positive Output Voltages

Device	Single Output Current (mA)	V_{DROP} Typ (mV)	I quiescent Typ (mA)	V_{IN} Max (v)	V_{OUT} Options (V)	SVS/ PG	Enable	1ku Suggested Resale
TPS770xx	50	48	0.017	13.5	Adj. 1.2 - 5.5, 1.2, 1.5, 1.8. 2.5, 2.7, 2.8, 3.0, 3.3, 5.0	No	Yes	$0.38
TPS790x	50	57	0.017	13.5	1.5, 1.8, 2.5, 2.8, 3.0	No	Yes	$0.38
TPS76201	100	98	0.023	10.0	Adj. 0.7 to 5.5	No	Yes	$0.45
REG101	100	60	0.400	10.0	Adj., 2.5, 2.8, 2.85, 3.0, 3.3, 5.0	No	Yes	$0.59
TPS769xx	100	98	0.017	13.5	Adj. 1.2 - 15, 1.2, 1.5, 1.8. 2.5, 2.7, 2.8, 3.0, 3.3, 5.0	No	Yes	$0.39
TPS789xx	100	115	0.017	13.5	1.5, 1.8, 2.5, 2.8, 3.0	No	Yes	$0.39
TPS763xx	150	300	0.085	10	Adj. 1.5 - 6.5, 1.6, 1.8, 2.5, 2.7, 2.8, 3.0, 3.3, 3.8, 5.0	No	Yes	$0.35
TPS764xx	150	300	0.085	10	2.5, 2.7, 2.8, 3.0, 3.3	No	Yes	$0.35
TPS765xx	150	140	0.035	13.5	Adj. 1.25 - 5.5, 1.5, 1.8, 2.5, 2.7, 2.8, 3.0, 3.3, 5.0	PG	Yes	$0.55
TPS772xx	150	115	0.092	13.5	Adj. 1.5 - 5.5, 1.8, 2.7, 2.8, 3.3	PG	Yes	$0.60
TPS74xx	200	180	1.3	7	1.5, 1.8, 2.5, 3.0, 3.3	No	Yes	$0.55
UCC386/387/388	200	200	0.02	9	3.3, 5.0, Adj. 1.25 to 5.0	No	No	$1.41
REG102	250	150	0.400	10.0	Adj., 2.5, 2.8, 2.85, 3.0, 3.3, 5.0	No	Yes	$0.75
TPS72xx	250	190	0.18	11	Adj. 1.2 - 9.75, 2.5, 3.0, 3.3, 4.85, 5.0	PG	Yes	$0.55
TPS766xx	250	230	0.035	13.5	Adj. 1.25 - 5.5, 1.5, 1.8, 2.5, 2.7, 2.8, 3.3, 5.0	PG	Yes	$0.60
TPS773xx	250	200	0.092	13.5	Adj. 1.5 - 5.5, 1.8, 2.7, 2.8, 3.3	SVS	Yes	$0.64
TPS774xx	250	200	0.092	13.5	Adj. 1.5 - 5.5, 1.8, 2.7, 2.8, 3.3	PG	Yes	$0.64
REG113	450	230	0.400	10.0	Adj., 2.5, 2.8, 3.0, 3.3	No	Yes	$0.85
REG103	500	115	0.500	15.0	Adj., 2.5, 2.7, 3.0, 3.3, 5.0	No*	Yes	$1.29
TPS775xx	500	169	0.085	13.5	Adj. 1.5 to 5.5, 1.5, 1.8, 2.5, 3.3	SVS	Yes	$1.16
TPS776xx	500	169	0.085	13.5	Adj. 1.5 to 5.5, 1.5, 1.8, 2.5, 3.3	PG	Yes	$1.16
TPS777xx	750	260	0.085	13.5	Adj. 1.5 to 5.5, 1.5, 1.8, 2.5, 3.3	SVS	Yes	$1.25
TPS778xx	750	260	0.085	13.5	Adj. 1.5 to 5.5, 1.5, 1.8, 2.5, 3.3	SVS	Yes	$1.25
REG1117	800	1100	4.0	15.0	Adj., 1.25 - 13.5, 2.85, 3.3, 5.0	No	No	$0.80
REG104	1000	230	0.500	15.0	Adj., 2.5, 2.7, 3.0, 3.3, 5.0	No	Yes	$1.59
TPS767xx	1000	230	0.085	13.5	Adj. 1.5 - 5.5, 1.5, 1.8. 2.5, 2.7, 2.8, 3.0, 3.3, 5.0	SVS	Yes	$1.40
TPS768xx	1000	230	0.085	13.5	Adj. 1.5 - 5.5, 1.5, 1.8. 2.5, 2.7, 2.8, 3.0, 3.3, 5.0	PG	Yes	$1.40
UCC381-x	1000	600	0.4	9	Adj. 1.22 - 8.85, 3.3, 5.0	No	Yes	$2.27
TPS751xx	1500	160	0.075	5.5	Adj. 1.2 - 5.0, 1.5, 1.8, 2.5, 3.3	PG	Yes	$1.95
TPS753xx	1500	160	0.075	5.5	Adj. 1.2 - 5.0, 1.5, 1.8, 2.5, 3.3	SVS	Yes	$1.95
TPS752xx	2000	210	0.075	5.5	Adj. 1.2 - 5.0, 1.5, 1.8, 2.5, 3.3	SVS	Yes	$2.05
TPS754xx	2000	210	0.075	5.5	Adj. 1.2 - 5.0, 1.5, 1.8, 2.5, 3.3	PG	Yes	$2.05
TPS757	3000	150	0.125	6.0	Adj. 1.22 - 5.0, 1.5, 1.8, 2.5, 3.3	PG	Yes	$3.31
UC382-x	3000	350	18	13	Adj. 1.2 to 6, 2.1, 2.5	No	No	$4.08
UCC383-x	3000	500	0.4	9	Adj. 1.22 - 8.85, 3.3, 5.0	No	Yes	$3.24
TPS755	5000	230	0.125	6.0	Adj. 1.22 - 5.0, 1.5, 1.8, 2.5, 3.3	PG	Yes	$3.68
UC385-x	5000	350	40	7.5	Adj. 1.2 to 6, 1.2, 2.1, 2.5	No	No	$4.95
TPS759xx	7500	400	0.125	6.0	Adj. 1.22 - 5.0, 1.5, 1.8, 2.5, 3.3	PG	Yes	$5.10
Dual Voltage Outputs								
TPS707xx/708xx	125 and 250	83	0.190	7	Adj./Adj. 1.22 - 5.5, 3.3/1.2, 3.3/1.5, 3.3/1.8, 3.3/2.5	SVS	Yes	$1.95
TPS701xx/702xx	250 and 500	170	0.190	7	Adj./Adj. 1.22 - 5.5, 3.3/1.2, 3.3/1.5, 3.3/1.8, 3.3/2.5	SVS	Yes	$2.30
TPS73HD3xx	Two @ 750	353	0.680	11	3.3/Adj. 1.2 - 9.75, 3.3/2.5, 3.3/1.8	SVS	Yes	$2.85
TPS767D3xx	Two @ 1000	230	0.170	13.5	3.3/Adj. 1.5 - 5.5, 3.3/2.5, 3.3/1.8	SVS	Yes	$2.50
TPS703xx/704xx	1000 and 2000	160	0.185	7	Adj./Adj. 1.22 - 5.5, 3.3/1.2, 3.3/1.5, 3.3/1.8, 3.3/2.5	SVS	Yes	$3.50
Negative Output Voltage								
UCC384-x	500	200	0.2	-16	Adj. -1.25 to -15, -5.0, -12.0	No	Yes	$1.84

Resources

For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Evaluation Modules (EVM)

Part Number	Description	Price
TPS70115EVM-152	Dual-output LDO, 500 mA and 250 mA , variable loads	$99
TPS76918EVM-127	SOT-23 LDO, 5 V to 1.8 V, 100 mA	No charge
TPS76933EVM-127	SOT-23 LDO, 5 V to 3.3 V, 100 mA	No charge

Application Notes

Literature Number	Description
SLVA068	Fundamental Theory of PMOS Low Dropout Voltage Regulators
SLVA079	Understanding the Terms and Definitions of LDO Voltage Regulators
SLVA076	Supply Voltage Drop on Fast Current Demand

Evaluation Modules (EVM)

Part Number	Description	Price
TPS76901EVM-127	SOT-23 LDO, 5 V to 1.0 V, 100 mA	No charge
TPS76xxxEVM-125	Universal SOT-23 LDO evaluator	$50

Application Notes

Literature Number	Description
SLVA072	Technical Review of Low Dropout Voltage Regulator Operation and Performance
SLMA002	PowerPAD Thermally Enhanced Package Application Report

Switching DC/DC Controllers (non-isolated application)
(General Purpose & Processor Power)

Things to Consider

PRIMARY

Input Voltage — More than one voltage may be available on the circuit board. One voltage can operate the controller IC, while another voltage can be used in the power conversion section. Choose the most suitable voltage that can handle the amount of current needed by the system.

Output Voltage — The output voltage can be adjusted down to the reference voltage of the controller by using a voltage divider.

Output Current — Output current is often set by external power MOSFETs. Paralleling multiple power MOSFETs can control higher currents, as long as the MOSFET drivers can adequately drive the external FETs.

Efficiency — Higher efficiency will help with thermal issues, since wasted power is converted into heat. Higher currents quickly generate more heat, so airflow and board space must be considered.

SECONDARY

Accuracy — Today's advanced processors need better accuracy to support lower core voltages. There is a cost trade-off when a more accurate controller is needed.

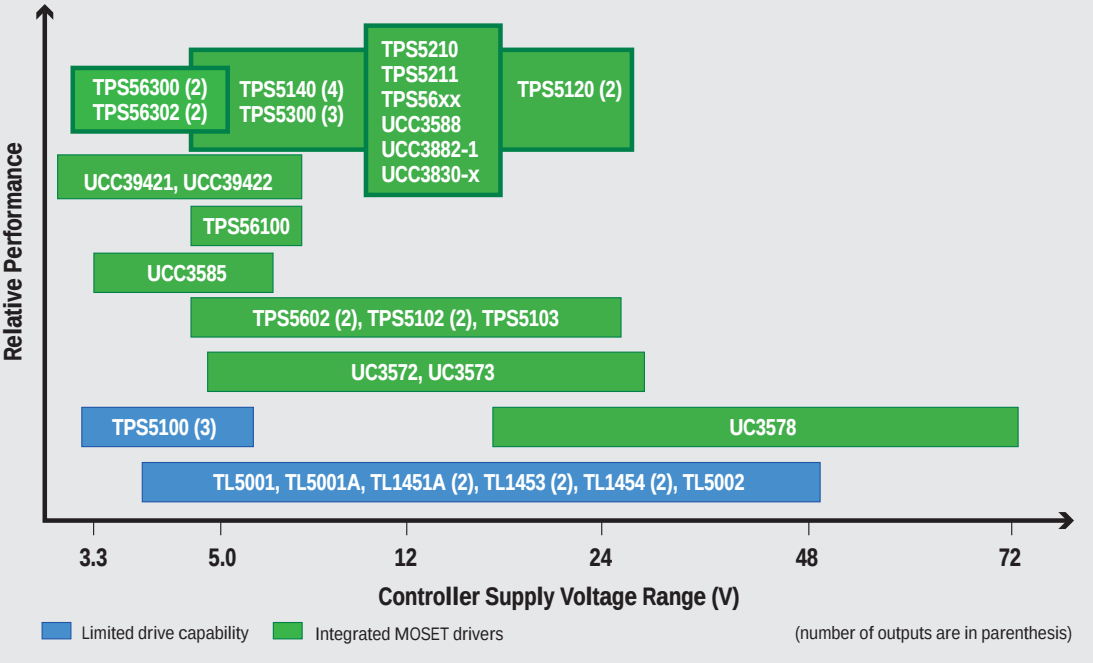
System Costs — A fast transient response time reduces the output capacitance. For higher currents, this can save considerable cost. Also, reducing the number of external passive components in the power section can save cost.

Protection Features — Applications that use many expensive processors and peripheral ICs on a single board can benefit from the long-term reliability ensured by implementing the controller's protection features.

Technical Information

- Voltage and current PWM controllers offer fixed frequency operation.
- Hysteretic control mode features a fast transient response time to changing load conditions. The operating frequency is determined mainly by the output filter characteristics. However, a fixed frequency is achieved by adding a small resistor and capacitor at the inputs to the controller's comparator.
- On-chip MOSFET drivers enable higher output currents for paralleling inexpensive n-channel MOSFETs. TI implements a BiCMOS process where bipolar and MOS gate drivers are put in parallel, achieving fast turn-on times and higher peak-current capability.
- PowerPAD packaging, an exposed pad on the bottom side of the IC, allows high currents to be controlled in a small TSSOP package, eliminating bulky heat sinks.

Switching DC/DC Controllers Family of Products



Switching DC/DC Controllers Selection Guide

Device	V_{IN} (V)	V_O (max) (V)	V_O (min) (V)	V_{ref} Tol(%)	Driver Current (A)	Output Current (A)[2]	Multiple Outputs	Adaptive Voltage Positioning	Protection[3]	Comments	1ku Suggested Resale
Performance Processor Power Supply Controllers											
TPS5210	12	3.5	1.3	1	2.4	40	No	Yes	OCP, OVP, UVLO, PG	High current server CPU applications	$3.43
TPS5211	12	3.5	1.3	1.5	2.4	40	No	Yes	OCP, OVP, UVLO, PG	High current desktop CPU applications	$3.31
TPS5300*	4.3 - 28	26	0.925	1	2	30	Yes	Yes	OCP, UVLO, PG, OVP	DC/DC controller and 2 linear regulators with Speedstep for Notebook PCs	$3.69
TPS5602	4.5 - 25	24	1.2	2	1	15 (each)	Yes	No	OCP, UVLO	Powering core and I/O of processors	$3.75
TPS56100	5	4.5	1.3	1.5	2	30	No	No	OCP, OVP, UVLO, PG	5V input, high current applications	$3.43
TPS5615	12	1.5	1.5	1	2.4	40	No	No	OCP, OVP, UVLO, PG	12V input, high current applications	$3.43
TPS5618	12	1.8	1.8	1	2.4	40	No	No	OCP, OVP, UVLO, PG	12V input, high current applications	$3.43
TPS5625	12	2.5	2.5	1	2.4	40	No	No	OCP, OVP, UVLO, PG	12V input, high current applications	$3.43
TPS5633	12	3.3	3.3	1	2.4	40	No	No	OCP, OVP, UVLO, PG	12V input, high current applications	$3.43
TPS56300	2.8 - 5.5	3.3	1.3	1.5	2	30	Yes	Yes	OCP, OVP, UVLO, PG	Switcher for core(s), LDO for I/O power	$4.05
TPS56302	2.8 - 5.5	3.3	1.3	1.5	2	30	Yes	Yes	OCP, OVP, UVLO, PG	LDO for core, switcher for I/O and rest of system power	$4.05
UCC3880-4/5/6	5	3.5	2	1	1.5	20	No	Yes[1]	OCP, UVLO, PG, OVP	PWM for Desktop CPUs	$2.37
UCC3588	5 or 12	3.5	1.3	1	1	10	No	Yes[1]	OCP, UVLO, PG, OVP	PWM for Desktop CPUs	$1.95
UCC3830-4/5/6	5 or 12	3.5	1.8	1	1.5	20	No	Yes[1]	OCP, UVLO, PG, OVP	PWM for Desktop CPUs	$2.42
UCC3882	5 or 12	3.5	1.8	1	1.5	20	No	Yes[1]	OCP, UVLO, PG, OVP	PWM for Desktop CPUs	$3.24
Performance Portable and System Power Supply Controllers											
TPS5100	2.7 - 7.0	Depends on FETs	1.25	1	0.02	Depends on FET driver	Yes	No	OCP, UVLO	Dual PWM boost and one PWM buck/invert	$1.44
TPS5102	4.5 - 25	24	1.2	1.5	1.5	15 (each)	Yes	No	OCP, UVLO	Dual controller for Notebook system power	$3.57
TPS5103	4.5 - 25	24	1.2	1.5	1.5	20	No	No	OCP, UVLO	Wide Input voltage controller	$2.46
TPS5120*	4.5 - 28	26	0.9	1.5	1500	15 (each)	Yes	No	OCP, UVLO, PG, OVP	Dual 180 degree out-of-phase operation	$3.89
TPS5140*	4.5 - 28	26	1.2	1.5	500	Varies	Yes	No	OCP, UVLO, PG, OVP	4 channel (3 buck/1 boost) controller	$5.83
General-Purpose Power Supply Controllers											
TL1451A	3.6 - 50	50	2.5	4	0.02	Depends on FET driver	Yes	No	UVLO, SCP	Dual PWM Buck/Boost	$0.84
TL1453	3.6-40	50	2.5	4	0.02	Depends on FET driver	Yes	No	UVLO, SCP	Dual PWM Buck/Boost	$0.84
TL1454	3.6 - 20	20	1.25	2.5	0.02	Depends on FET driver	Yes	No	UVLO, SCP	Step up or flyback converter (ch. 1) and step-down or inverting controller (ch. 2)	$0.98
TL5001	3.6 - 40	50	1	5	0.02	Depends on FET driver	No	No	UVLO, SCP	PWM Buck/Boost	$0.41
TL5001A	3.6 - 40	50	1	3	0.02	Depends on FET driver	No	No	UVLO, SCP	PWM Buck/Boost	$0.49
TL5002*	3.6 - 40	50	1	3	0.02	Depends on FET driver	No	No	UVLO	Voltage tracking termination regulator for Double Data Rate Memory	$0.95
UC3572	4.75 - 30	0	-48	2	0.5	5	No	No	OCP, UVLO	Inverting	$1.50
UC3573	4.75 - 30	24	1.5	2	0.5	5	No	No	OCP, UVLO	PWM Simple Buck	$1.60
UC3578*	14 - 72	60	2	-	0.5	5	No	No	OCP,UVLO	PWM Simple Buck	$2.90
UC3585*	3 - 6	5	0.9	1	1	7	No	Yes	OCP, UVLO	Low Output Voltage Application	$1.87
UCC39421/2*	1.5 - 8	8	2.5	2.4	0.3	7	No	No	OCP, POR, UV	Battery Powered and Low Voltage Applications	$2.86

(1) Through Voltage Amp Programming
(2) Current levels of this magnitude and beyond can be supported
(3) Over-current protection (OCP), under-voltage lockout (UVLO), short-circuit protection (SCP), power good (PG), over-voltage protection (OVP)
** New Product*

Resources For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Evaluation Modules (EVM)

Part Number	Description	Price
TL5001AEVM-108	5 V to 3.3 V, 3 A synchronous buck converter with 3% reference voltage tolerance	$50
TPS5102EVM-135	Dual controller with 3.3 V/3.5 A and 5 V/3.5 A outputs	$50
TPS5103EVM-136	Single PWM/hysteretic controller with 1.8 V/4 A output	$50
TPS5602EVM-121	Dual DSP power supply controller with 1.8 V/4 A and 3.3 V/3 A outputs	$50
TPS56100EVM-128	5 V to 1.3-2.6 V, 6 A DSP power supply controller	$50
TPS56302EVM-163	TPS5630x universal evaluation board with sequencing for low voltage DSPs	$50

Application Notes

Literature Number	Part Number	Description
SLVA034A	TL5001	Designing with the TL5001 PWM Controller
SLVA036	TL1454	Designing with the TL1454 PWM Controller Application Report
SLVA083A	TPS5633/25/18/15	Using the TPS56xx to Power DSPs

Application Notes

Literature Number	Part Number	Description
SLVA073	TPS56300	Power Supply Sequencing Solutions for Dual Supply Voltage DSPs
SLVA078A	TPS5602	Using the TPS5602 to Power DSPs

PWM Power Supply Controllers (single output)

Things to Consider

Control Method

Voltage Mode — Simple, noise-free control method for wide input and output range requirements.

Peak Current Mode — Fast transient response with built-in current limiting.

Performance

- The voltage mode controllers have input voltage feedforward for instantaneous response to input line changes.
- All controllers have on-board high output current drive capability without external MOSFET drivers.
- Lower start-up current for off-line applications (for BiCMOS products with UCC prefix).
- Low operating current (for BiCMOS products with UCC prefix) for light-load efficiency.
- Additional programmable minimum duty cycle clamp for light load efficiency (UCC3581).

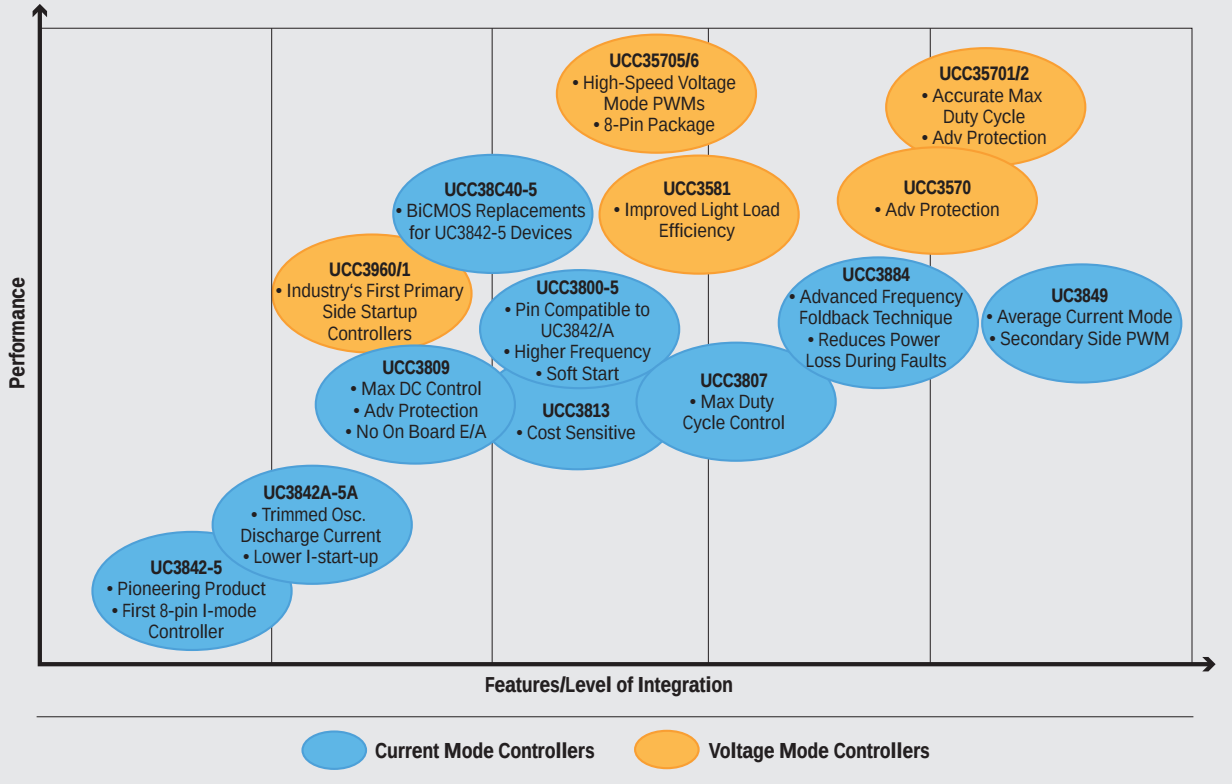
Level of Integration

- Integrated soft-start (programmable) provides predictable start-up after a fault.
- Internal leading edge blanking to suppress switching spike from MOSFET turn-on.

Technical Information

- 10 W to 350 W off-line and DC/DC power supplies.
- Single-ended topology power supplies.

PWM Power Supply Controllers Family of Products (single output)



PWM Power Supply Controllers Selection Guide (single output)

Device	Typical Power Level (W)	Max Practical Freq	Start-up Current	Operating Current	Supply Voltage (V)	UVLO: On/Off (V)	V_{ref} (V)	V_{ref} Tol. (%)	Max Duty Cycle (%)	Soft Start	E/A	Shutdown	Output Voltage Feed-forward	Internal Drive (Sink/ Source) (A)	Leading Edge Blanking	Available Packages	1ku Suggested Resale
Voltage Mode Controllers																	
UCC3570	25 - 250	500 kHz	85u µA	1 mA	9.0 - 15	13.0 / 9	5	2.0	Prog.	Yes	No	Yes	Yes	1.2 / 1.2	No	SOIC14, PDIP14	$2.24
UCC35701	25 - 250	700 kHz	130 µA	750 µA	9.0 - 15	13.0 / 9	5	1.5	Prog. VS Clamp	Yes	No	Yes	Yes	1.2 / 1.2	No	TSSOP14, SOIC14, PDIP14	$1.91
UCC35702	25 - 250	700 kHz	130 µA	750 µA	8.8 - 15	9.6 / 8.8	5	1.5	Prog. VS Clamp	Yes	No	Yes	Yes	1.2 / 1.2	No	TSSOP14, SOIC14, PDIP14	$1.91
UCC35705	25 - 250	4 MHz	50 µA	2.5 mA	8.2 - 15	8.8 / 8.2	-	-	93	No	No	No	No	0.1 / 0.1	No	SOIC8, PDIP8, MSOP8	$0.99
UCC35706	25 - 250	4 MHz	50 µA	2.5 mA	8.0 - 15	12 / 8	-	-	93	No	No	No	No	0.1 / 0.1	No	SOIC8, PDIP8, MSOP8	$0.99
UCC3581	5 - 75	100 kHz	85 µA	300 µA	6.8 - 15	7.3 / 6.8	4	1.5	Prog.	Yes	No	Yes	No	1 / 1	No	SOIC14, PDIP14	$1.59
UCC3960	25 - 250	400 kHz	150 µA	2.3 mA	8.0 - 19	10/8	-	-	72	Yes	No	No	No	0.1 / 0.1	No	SOIC8, PDIP8	$1.18
UCC3961	25 - 250	400 kHz	150 µA	2.3 mA	8.0 - 19	10/8	-	-	72	Yes	No	No	No	0.1 / 0.1	No	SOIC14, PDIP14	$1.28
Peak Current Mode Controllers																	
UCC3800	10 - 200	1 MHz	100 µA	500 µA	7.2 - 15	7.2 / 6.9	5	1.5	100	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.56
UCC3801	10 - 200	1 MHz	100 µA	500 µA	9.4 - 15	9.4 / 7.4	5	1.5	50	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.56
UCC3802	10 - 200	1 MHz	100 µA	500 µA	12.5 - 15	12.5 / 8.3	5	1.5	100	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.56
UCC3803	10 - 200	1 MHz	100 µA	500 µA	4.1 - 15	4.1 / 3.6	4	1.5	100	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.56
UCC3804	10 - 200	1 MHz	100 µA	500 µA	12.5 - 15	12.5 / 8.3	5	1.5	50	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.56
UCC3805	10 - 200	1 MHz	100 µA	500 µA	4.1 - 15	4.1 / 3.6	4	1.5	50	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.56
UCC3807-1	10 - 200	1 MHz	100 µA	1.3 mA	6.9 - 15	7.2 / 6.9	2 V (Int)	-	Prog.	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.74
UCC3807-2	10 - 200	1 MHz	100 µA	1.3 mA	8.3 - 15	12.5 / 8.3	2 V (Int)	-	Prog.	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.74
UCC3807-3	10 - 200	1 MHz	100 µA	1.3 mA	4.1 - 15	4.3 / 4.1	2 V (Int)	-	Prog.	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.74
UCC3809-1	10 - 200	1 MHz	50 µA	500 µA	8 - 19	10.0 / 8.0	5	5.0	Yes	Yes	No	Yes	Yes	0.8 / 0.4	No	MSOP8, TSSOP8, SOIC8, PDIP8	$0.78
UCC3809-2	10 - 200	1 MHz	50 µA	500 µA	8 - 19	15.0 / 8.0	5	5.0	Yes	Yes	No	Yes	Yes	0.8 / 0.4	No	MSOP8, TSSOP8, SOIC8, PDIP8	$0.78
UCC3813-0	10 - 200	1 MHz	100 µA	500 µA	7.2 - 15	7.2 / 6.9	5	2.0	100	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.09
UCC3813-1	10 - 200	1 MHz	100 µA	500 µA	9.4 - 15	9.4 / 7.4	5	2.0	50	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.09
UCC3813-2	10 - 200	1 MHz	100 µA	500 µA	12.5 - 15	12.5 / 8.3	5	2.0	100	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.09
UCC3813-3	10 - 200	1 MHz	100 µA	500 µA	4.1 - 15	4.1 / 3.6	4	2.0	100	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.09
UCC3813-4	10 - 200	1 MHz	100 µA	500 µA	12.5 - 15	12.5 / 8.3	5	2.0	50	Yes	Yes	No	No	11 / 1	100 ns	SOIC8, PDIP8	$1.09
UCC3813-5	10 - 200	1 MHz	100 µA	500 µA	4.1 - 15	4.1 / 3.6	4	2.0	50	Yes	Yes	No	No	1 / 1	100 ns	SOIC8, PDIP8	$1.09
UC3842	30 - 350	500 kHz	0.5 mA	11 mA	10 - 30	16.0 / 10.0	5	1.5	100	No	Yes	No	Yes	1 / 1	No	SOIC8, SOIC14, PDIP8	$0.88
UC3843	30 - 350	500 kHz	0.5 mA	11 mA	7.6 - 30	8.4 / 7.6	5	1.5	100	No	Yes	No	Yes	1 / 1	No	SOIC8. SOIC14. PDIP8	$0.88
UC3844	30 - 350	500 kHz	0.5 mA	11 mA	10 - 30	16.0 / 10.0	5	1.5	50	No	Yes	No	Yes	1 / 1	No	SOIC8, SOIC14, PDIP8	$0.88
UC3845	30 - 350	500 kHz	0.5 mA	11 mA	7.6 - 30	8.4 / 7.6	5	1.5	50	No	Yes	No	Yes	11 / 1	No	SOIC8. SOIC14. PDIP8	$0.88
UC3842A	30 - 350	500 kHz	0.3 mA	11 mA	10 - 30	16.0 / 10.0	5	1.5	100	No	Yes	No	Yes	1 / 1	No	SOIC8, SOIC14, PDIP8	$0.94
UC3843A	30 - 350	500 kHz	0.3 mA	11 mA	7.9 - 30	8.5 / 7.9	5	1.5	100	No	Yes	No	Yes	1 / 1	No	SOIC8, SOIC14. PDIP8	$0.94
UC3844A	30 - 350	500 kHz	0.3 mA	11 mA	10 - 30	16.0 / 10.0	5	1.5	50	No	Yes	No	Yes	1 / 1	No	SOIC8, SOIC14, PDIP8	$0.94
UC3845A	30 - 350	500 kHz	0.3 mA	11 mA	7.9 - 30	8.5 / 7.9	5	1.5	50	No	Yes	No	Yes	1 / 1	No	SOIC8. SOIC14. PDIP8	$0.94
UCC38C40	10 - 250	1 MHz	50 µA	2.3 mA	6.6 - 20	7.0 / 6.6	5	2	100	No	Yes	No	Yes	1/1	No	SOIC8, PDIP8, MSOP8	n/a
UCC38C41	10 - 250	1 MHz	50 µA	2.3 mA	6.6 - 20	7.0 / 6.6	5	2	50	No	Yes	No	Yes	1/1	No	SOIC8, PDIP8, MSOP8	n/a
UCC38C42	10 - 250	1 MHz	50 µA	2.3 mA	9 - 20	14.5 / 9	5	2	100	No	Yes	No	Yes	1/1	No	SOIC8, PDIP8, MSOP8	n/a
UCC38C43	10 - 250	1 MHz	50 µA	2.3 mA	7.6 - 20	8.4 / 7.6	5	2	100	No	Yes	No	Yes	1/1	No	SOIC8, PDIP8, MSOP8	n/a
UCC38C44	10 - 250	1 MHz	50 µA	2.3 mA	9 - 20	14.5 / 9	5	2	50	No	Yes	No	Yes	1/1	No	SOIC8, PDIP8, MSOP8	n/a
UCC38C45	10 - 250	1 MHz	50 µA	2.3 mA	7.6 - 20	8.4 / 7.6	5	2	50	No	Yes	No	Yes	1/1	No	SOIC8, PDIP8, MSOP8	n/a
UC3849	50 - 250	1 MHz		21	8.4 - 20	8.4 / 8	5	2.0	Prog	Yes	Yes	No	No	1 / 1	Yes	DIL24, SOIC24, PLCC28	$3.58
UCC3884	50 - 250	1 MHz	200 µA	5	8.9 - 15	8.9 / 8.3	5	2..5	Yes	Yes	Yes	No	Yes	0.5 / 1	Yes	DIL16, SOIC16, PLCC20	$3.51

The one extra "C" in the UCC means BiCMOS technology; therefore, UC3842 is BiPolar and UCC3800 is BiCMOS.

PWM Power Supply Controllers (multiple outputs)

Things to Consider

Current Mode — Optimal control technique featuring fast transient response with inherent cycle-by-cycle current limiting

Voltage Mode — Versatile, noise-free control method for wide duty cycle ranges

Soft Switching

- Zero Voltage Transition (ZVT) soft switching techniques minimize power loss at turn-on
- Phase shifted, ZVT controllers maximize efficiency in Full-Bridge converters

Performance

- High gain bandwidth product error amplifiers
- Internal high speed circuitry with minimal propagation delays delivers quick response

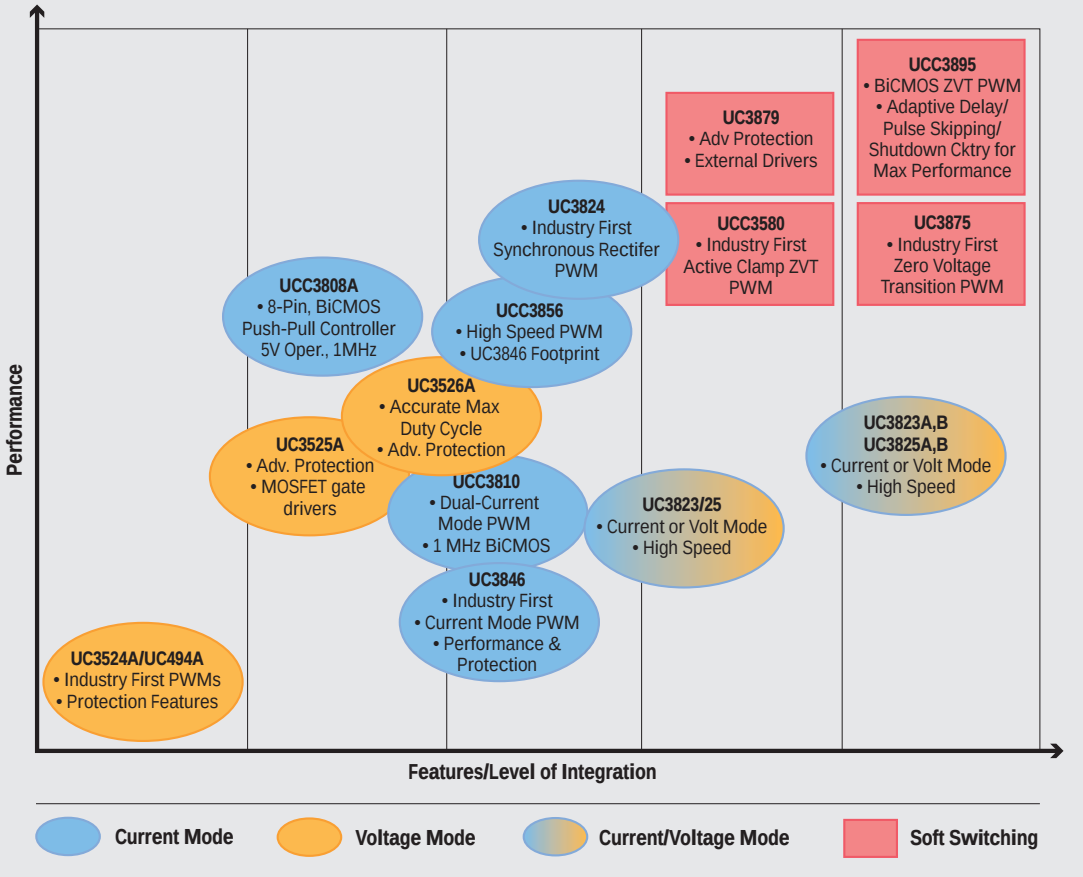
Protection

- Flexible over-current limiting circuitry provides programmable fault protection modes
- High speed, cycle-by-cycle current limiting
- Programmable soft-start executes predictable start up upon initialization and after faults
- Maximum duty cycle clamp to prevent transformer saturation
- Programmable deadtime control to prevent cross conduction of power switches

Technical Information

- 150 W to 2 kW off-line and DC/DC power supplies
- High-performance, high-power density modular DC power supplies
- Dual- and multiple-switch topology power supplies

PWM Power Supply Controllers Family of Products



PWM Power Supply Controllers Selection Guide (multiple outputs)

Device	Typical Power Level	Maximum Practical Frequency	Start-up Current	Operating Current (mA)	Supply Voltage (V)	UVLO: On/Off (V)	V_{ref} (V)	V_{ref} Tol. (%)	Max Duty Cycle	Soft Start	E/A	Shut-down Pin	Voltage Feed-Forward	Output Drive (Sink/ Source)(A)	Sync. Pin	Available Packages	1ku Suggested Resale
Voltage Mode Controllers																	
UC3524A	50 W - 500 W	250 kHz	4 mA	5	8 - 40	7.5/7	5	2.0	Prog.	Yes	Yes	Yes	No	0.2 / 0.2	Yes	DIL16, SOIC16, PLCC20	$1.15
UC3525A/B	50 W - 500 W	250 kHz	n/a	14	8 - 40	7/7	5	2.0	Prog.	Yes	Yes	Yes	No	0.2 / 0.2	Yes	DIL16, SOIC16, PLCC20	$1.46
UC3526A	50 W - 500 W	250 kHz	n/a	14	8 - 35	n/a	5.1	1.3	Prog.	Yes	Yes	Yes	No	0.2 / 0.2	Yes	DIL18, SOIC18, PLCC20	$2.87
UCC3580	50 W - 500 W	500 kHz	100 µA	1.5	7 - 15	15/8.5, 9/8.5	5	1.0	Prog.	Yes	Yes	Yes	Yes	0.5 / 1, 0.3 0.3	No	DIL16, SOIC16, PLCC20	$3.37
UC3823	50 W - 750 W	1 MHz	1.1 mA	22	9 - 30	9.2/8.4	5.1	1.0	Prog.	Yes	Yes	No	No	1.5 / 1.5	Yes	DIL16, SOIC16, PLCC20	$3.31
UC3823A/B	50 W - 750 W	1 MHz	100 µA	28	9 - 22	16/10 9.2/8.4	5.1	1.5	Prog.	Yes	Yes	No	No	2 / 2	Yes	DIL16, SOIC16, PLCC20	$4.60
UC3824	50 W - 250 W	1 MHz	1.1 mA	22	9 - 30	9.2/8.4	5.1	1.0	Prog.	Yes	Yes	No	No	1.5 / 1.5	Yes	DIL16, SOIC16, PLCC20	$4.26
UC3825	50 W - 750 W	1 MHz	1.1 mA	22	9 - 30	9.2/8.4	5.1	1.0	Prog.	Yes	Yes	No	No	1.5 / 1.5	Yes	DIL16, SOIC16, PLCC20	$3.35
UC3825A/B	50 W - 750 W	1 MHz	100 µA	28	9 - 22	16/10 9.2/8.4	5.1	1.5	Prog.	Yes	Yes	No	No	2 / 2	Yes	DIL16, SOIC16, PLCC20	$4.80
Current Mode Controllers																	
UCC3806	50 W - 750 W	350 kHz	100 µA	1.4	7 - 15	7.5 / 6.7	5.1	3.0	Prog.	Yes	Yes	Yes	No	1 / 1	Yes	DIL16, SOIC16, PLCC20	$3.84
UCC3808A	50 W - 500 W	1 MHz	130 µA	1	4.3 - 15	12.5/8.3 4.3/4.1	n/a	n/a	Prog.	Yes	Yes	Yes	No	1 / 1	No	DIL8, SOIC8	$1.49
UCC3810	50 W - 500 W	1 MHz	150 µA	2	8.3 - 11	11.3/8.3	5	2	50%	No	Yes	Yes	Yes	1/1	Yes	DIL16, SOIC16	$2.99
UC3823	50 W - 750 W	1 MHz	1.1 mA	22	9 - 30	9.2/8.4	5.1	1.0	Prog.	Yes	Yes	No	No	1.5 / 1.5	Yes	DIL16, SOIC16, PLCC20	$3.31
UC3823A/B	50 W - 750 W	1 MHz	100 µA	28	9 - 22	16/10 9.2/8.4	5.1	1.5	Prog.	Yes	Yes	No	No	2 / 2	Yes	DIL16, SOIC16, PLCC20	$4.60
UC3824	50 W - 250 W	1 MHz	1.1 mA	22	9 - 30	9.2/8.4	5.1	1.0	Prog.	Yes	Yes	No	No	1.5 / 1.5	Yes	DIL16, SOIC16, PLCC20	$4.26
UC3825	50 W - 750 W	1 MHz	1.1 mA	22	9 - 30	9.2/8.4	5.1	1.0	Prog.	Yes	Yes	No	No	1.5 / 1.5	Yes	DIL16, SOIC16, PLCC20	$3.35
UC3825A/B	50 W - 750 W	1 MHz	100 µA	28	9 - 22	16/10 9.2/8.4	5.1	1.5	Prog.	Yes	Yes	No	No	2A/ 2	Yes	DIL16, SOIC16, PLCC20	$4.80
UC3846	50 W - 750 W	500 kHz	1.5 mA	17	8 - 40	7.7/7	5	2.0	Prog.	Yes	Yes	No	No	0.5 / 0.5	Yes	DIL16, SOIC16, PLCC20	$1.85
UC3856	50 W - 750 W	1 MHz	1.5 mA	18	8 - 40	7.7/7	5	2.0	Prog.	Yes	Yes	No	No	1.5 / 1.5	Yes	DIL16, SOIC16, PLCC20	$3.93
UC3875-8	200 W - 2 kW	1+ MHz	150 µA	45	10.7 - 20	10.7/9.3 15 / 9	5	2.0	Prog.	Yes	Yes	No	No	Four @ 2 / 2	Yes	DIL20, SIOC20, PLCC28	$6.94
UC3879	200 W - 2 kW	500 kHz	150 µA	27	11- 20	15.2/9 10.7/ 9	5	2.5	Prog.	Yes	Yes	No	No	Four@ 0.1 / 0.1	Yes	DIL20, SIOC20, PLCC28	$5.46
UCC3895	200 W - 2 kW	1 MHz	150 µA	5	11 - 17	11V/ 9	5	3.0	Yes	Yes	Yes	Yes	No	Four @ 0.1 / 0.1	Yes	DIL20, SIOC20, PLCC20	$4.05

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Resources For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Application Notes

Literature Number	Description
SLUA101	Modeling, analysis and compensation of the current mode converter
SLUA053	1.5 MHz current mode controlled 50 W power supply
SLUA110	Practical considerations in current mode power supplies
SLUA125	The UC3823A,B & UC3825A,B enhanced generation of PWM controllers
SLUA107	Phase shifted, zero voltage transition design considerations and the UC3875 PWM controller
SLUA159	Zero voltage switching resonant power conversion
SLUA079	Average current mode control of switching power supplies
SLUA150	UCC3806 BiCMOS current mode control IC
SLUA122	The new UC3879 phase shifted PWM controller simplifies the design of zero voltage transition full-bridge converters

Design Notes

Literature Number	Description
SLUA170	UC3525B/27B Devices — comparison to UC1525A/27A devices
SLUA178	UC3846, UC3856 and UCC3806 push pull PWM current mode control ICs
SLUA183	Programming the UCC3806 features DN-62: switching power supply topology: voltage mode vs. current mode
SLUA121	The current doubler rectifier: an alternative rectification technique for push-pull and bridge converters

Power Factor Correctors

Things to Consider

Control Method

Average Current Mode CCM — Optimum control method to achieve PFC and low harmonic distortion

Transition Mode — Simpler control with high peak currents and filtering requirements

ZVT Mode — A type of soft switching technique, which reduces EMI and allows for higher frequency operations

Protection

- Soft-start (programmable) provides controlled start-up
- Over-current protection (OCP) protects against short circuit and other catastrophic failures
- Over-voltage protection (OVP) prevents output capacitor, switches and load from overcharge condition

Performance

- Voltage feed-forward for linearized performance and faster transient response over wide line voltage range
- Multiplier linearity and zero power detect functions improve light load operation
- On-board high output current drive capability without external MOSFET drivers

Flexibility

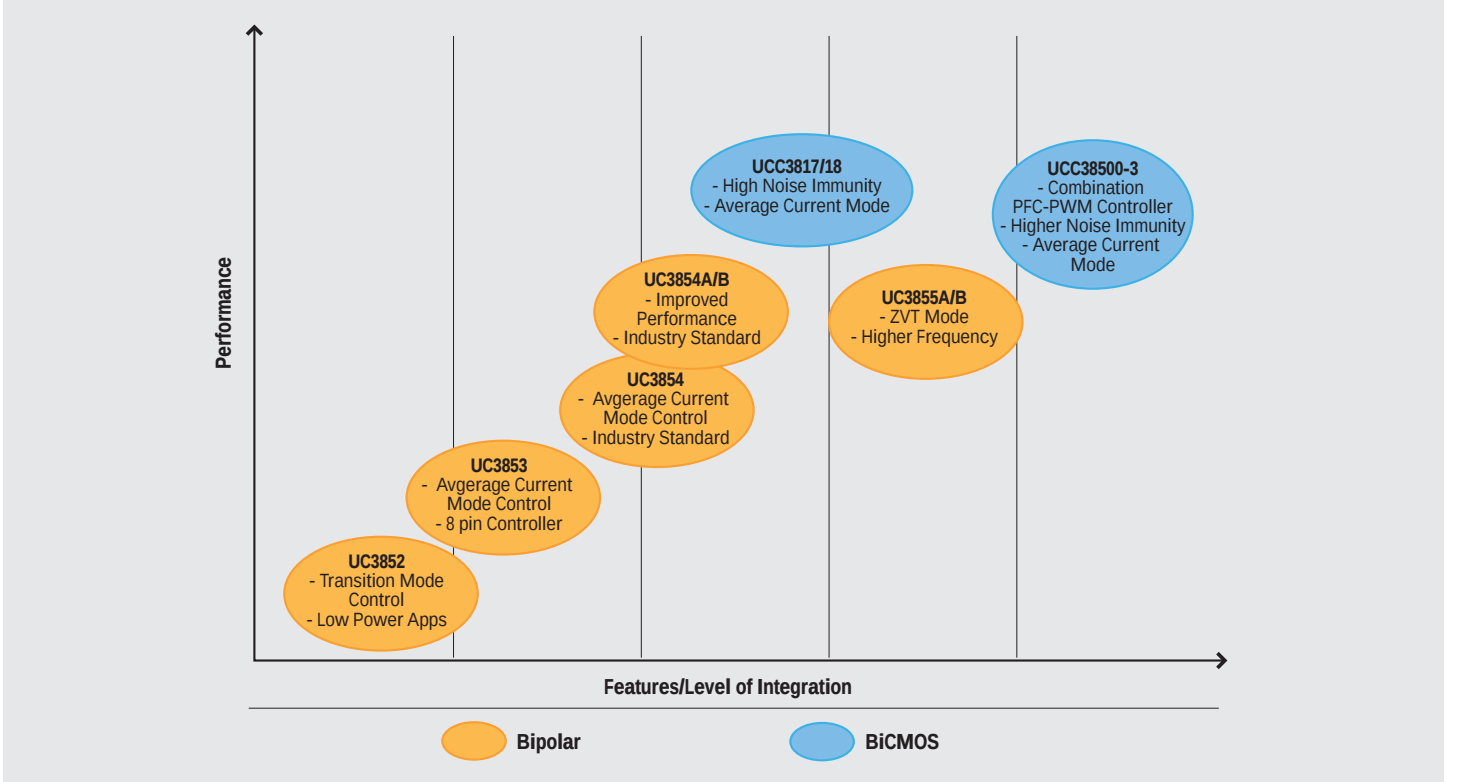
- Ability to work with a wide line voltage range
- Different levels of under-voltage lockout thresholds for self bias and auxiliary bias applications
- Ability to synchronize controllers to eliminate noise issues

Technical Information

Power Level

- IEC requirements are applicable to all power supplies above 150 W
- Higher power converters may require ZCT/ZVT techniques to achieve high efficiencies
- Some of the simpler control techniques not usable at high power levels

Power Factor Correctors Family of Products



Power Factor Correctors Selection Guide

Device	Typical Power Level	Soft Switching	Max Freq. (kHz)	Current Amp BW (MHz)	Voltage Feedforward Technique	Start-up Current (mA)	UVLO Thresholds (V)	OVP	1ku Suggested Resale
UC3852	<150 W	Zero Current Transition	Variable	–	–	1	16.3/11.5	No	$1.59
UC3853	75 W to 300 W	–	125	1	Proportional Bias Voltage	0.25	11.5/9.5	Yes	$1.45
UC3854	200 W to 2 kW+	–	200	1	Yes	1.5	16/10	No	$2.17
UC3854A/B	200 W to 2 kW+	–	200	5	Yes	0.3	16/10 ('54A) 10.5/10 ('54B)	No	$2.49
UCC3817/18	75 W to 2 kW+	–	250	3	Improved (Mirrored Iac)	0.1	16/10 (3817) 10.5/10 (3818)	Yes	$2.05
UCC38500/01/02/03	75 W to 1 kW+	–	250	3	Improved (Mirrored Iac)	0.1	16/10 ('500, '502) 10.5/10 ('501, 503)	Yes	$2.21
UC3855A/B	400 W to 2 kW+	Zero Voltage Transition	500	5	Yes	0.15	16/10 ('55A) 10.5/10 ('55B)	Yes	$5.19

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Application Notes

Literature Number	Part Number	Description
SLUA108	UC3852	Power factor correction using the UC3852 controlled on-time zero current switching technique
SLUA080	UC3853	Boost power factor corrector design with the UC3853
SLUA047	UC3853	Overcurrent shutdown with the UC3853
SLUA144	UC3854, UC3854A/B	Controlled power factor correction circuit design
SLUA172	UC3854, UC3854A/B	Optimizing performance in UC3854 power factor correction applications
SLUA177	UC3854A/B,	UC3854A and UC3854B advanced power factor correction control ICs
SLUA196	UC3854A/B, UC3855A/B	UC3854A/B and UC3855A/B provide power limiting with sinusoidal input current for PFC front ends
SLUA146	UC3855A/B	High-performance power factor preregulator

DC/DC Converters (Integrated Switch)

(Charge Pumps; Boost and Buck Converters; SEPIC Converters and Inverters)

Things to Consider

PRIMARY

Input Voltage — The input voltage of DC/DC converters used in portable equipment typically changes over a wide range while the battery is being discharged. For this reason it is best if the converter is optimized for a given battery set or technology.

Output Voltage — In most cases, fixed output voltage device options are used to avoid the cost and leakage current associated with an external resistor divider. For additional flexibility, an adjustable output voltage device option is typically available.

Output Current — Output current is typically limited by the size of the integrated MOSFETs and is rated for the minimum input voltage, which is the EODV of the battery in portable applications.

Efficiency — Higher efficiency will directly translate into additional operating time from your battery, resulting in more operating time between charges (when rechargeable batteries are being used).

SECONDARY

Package — Devices are available in TSSOP and MSOP.

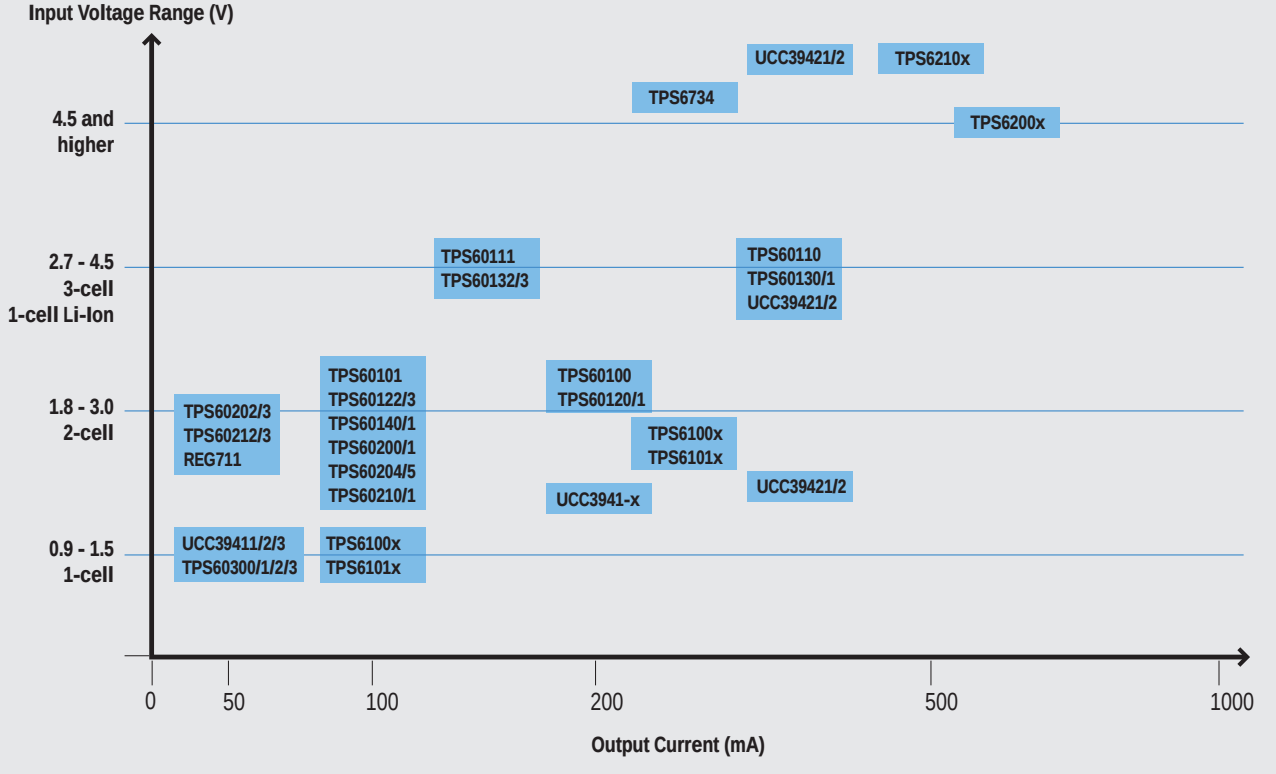
Total Cost — A minimum number of external components plus the flexibility to choose from a variety of high-quality and low-cost components helps to optimize the DC/DC converter design.

Quiescent Current — Lowest quiescent current is important in applications that spend most of the time in a standby mode. An additonal disable pin allows a complete shutdown of the converter.

Technical Information

- Synchronous Rectifier Converters — Not only replace the cost of an external Schottky rectifier diode, but also increase the converter efficiency by up to 10%. At supply voltages of 1.8V and lower, this improvement directly translates into significantly longer operating time of battery powered products.
- Pulse-Skip Mode/Regulation — Is used to reduce operating current at small load currents. Because the controller skips switching cycles, the losses associated with switching the power MOSFETs on and off are being reduced.
- The “Zero-Ripple” Topology — Used in TI charge pumps reduces output voltage ripple to a minimum and hence helps to avoid the cost of additional filtering at the output. The “zero-ripple” is achieved by two charge pumps operating with a phase shift of 180 degrees.

DC/DC Converters Family of Products



DC/DC Converters (Integrated Switch) Selection Guide

Device	V_{CC} (V) (min - max)	V_O (V)	V_O Accuracy (%)	Output Current (mA)	Switching Frequency (kHz)	Quiescent Current (typ) (µA)	Shutdown Current (typ) (µA)	Efficiency (typ) (%)	Power Good	Low-Battery Warning	Shut-down	Under-voltage Lockout	1ku Suggested Resale
Boost Converters													
TPS6100x	0.8 - 3.6	1.5 - 3.3	3	100	500	50	1	80		X	X	X	$2.13
TPS6101x	0.8 - 3.6	1.5 - 3.3	3	200	840	50	1	92		X	X	X	$1.95
TPS6734	5 - 12	12	4	225	170	1200	3	86			X	X	$1.23
UCC2941-x	0.8 - V_{OUT}+0.5	3.3, 5, Adj.	3	200	300	80	8	85			X		$3.62
UCC29411	1 - V_{OUT}+0.5	Adj.	3	60	500	48	6	85			X		$2.69
UCC29412	1 - 3.8	3.3	3	60	500	48	6	85			X		$2.69
UCC29413	1 - 5.5	5	3	60	500	48	6	85			X		$2.69
UCC3941-x	0.8 - V_{OUT}+0.5	3.3, 5, Adj.	3	200	300	80	8	85			X		$2.75
UCC39411	1 - V_{OUT}+0.5	Adj.	3	60	500	48	6	85			X		$2.27
UCC39412	1 - 3.8	3.3	3	60	500	48	6	85			X		$2.27
UCC39413	1 - 5.5	5	3	60	500	48	6	85			X		$2.27
Buck Converters													
TPS6200x	1.8 - 5.5	0.9 - 5.0	3	600	1000	50	1	95	X		X	X	$2.05
TPS6210x	2.5 - 9.0	0.8 - 8.0	3	500	600 - 2500	164	1	92			X	X	$2.81
SEPIC Converter & Inverters													
TPS6735	4 - 6.2	-5	4	200	160	1900	10	78			X	X	$1.23
TPS6755	2.7 - 9	Adj.	4	200	160	1900	10	78			X		$1.23
UCC39421	1.5 - 8	Adj.	2.5 (V_{ref})	up to 7A	2000	635	1.5	90			X		$2.86
UCC39422	1.5 - 8	Adj.	2.5 (V_{ref})	up to 7A	2000	635	1.5	90		X	X		$3.19
Charge Pumps													
REG711	1.8 - 5.5	2.5 - 5.0	5	50	1000	60	0.01	90			X		$1.25
TPS60100	1.8 - 3.6	3.3	4	200	300	50	1	75			X		$2.50
TPS60101	1.8 - 3.6	3.3	4	100	300	50	1	75			X		$1.99
TPS60110	2.7 - 5.4	5	4	300	300	50	1	75			X		$2.50
TPS60111	2.7 - 5.4	5	4	150	300	50	1	75			X		$1.99
TPS60120	1.8 - 3.6	3.3	4	200	300	55	1	85		X	X		$2.50
TPS60121	1.8 - 3.6	3.3	4	200	300	55	1	85	X		X		$2.50
TPS60122	1.8 - 3.6	3.3	4	100	300	55	1	85		X	X		$1.99
TPS60123	1.8 - 3.6	3.3	4	100	300	55	1	85	X		X		$1.99
TPS60130	2.7 - 5.4	5	4	300	300	60	1	85		X	X		$2.50
TPS60131	2.7 - 5.4	5	4	300	300	60	1	85	X		X		$2.50
TPS60132	2.7 - 5.4	5	4	150	300	60	1	85		X	X		$1.99
TPS60133	2.7 - 5.4	5	4	150	300	60	1	85	X		X		$1.99
TPS60140	1.8 - 3.6	5	4	100	300	55	1	75		X	X		$1.94
TPS60141	1.8 - 3.6	5	4	100	300	55	1	75	X		X		$1.94
TPS60200	1.8 - 3.6	3.3	4	100	350	40	1	75		X	X		$1.99
TPS60201	1.8 - 3.6	3.3	4	100	350	40	1	75	X		X		$1.99
TPS60202	1.8 - 3.6	3.3	4	50	350	40	1	75		X	X		$1.65
TPS60203	1.8 - 3.6	3.3	4	50	350	40	1	75	X		X		$1.65
TPS60210	1.8 - 3.6	3.3	4	100	300	35	-	75		X			$1.95
TPS60211	1.8 - 3.6	3.3	4	100	300	35	-	75	X				$1.95
TPS60212	1.8 - 3.6	3.3	4	50	300	35	-	75		X			$1.73
TPS60213	1.8 - 3.6	3.3	4	50	300	35	-	75	X				$1.73

Resources For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Evaluation Modules (EVM)

Part Number	Description	Price
TPS60100EVM-131	3.3-V/200-mA “zero-ripple” charge pump	$50
TPS60110EVM-132	5-V/300-mA “zero-ripple” charge pump	$50
TPS60120EVM-142	3.3-V/200-mA high-efficiency charge pump	$50
TPS60130EVM-143	5-V/300-mA high-efficiency charge pump	$50
TPS60140EVM-144	5-V/300-mA voltage tripler charge pump	$50

Evaluation Modules (EVM)

Part Number	Description	Price
TPS61006EVM-156	Single-cell boost converter with fixed 3.3-V V_{OUT}	$50
TPS62000EVM-168	High-efficiency buck converter with adj. V_{OUT}	$50
TPS61015EVM-157	High-efficiency boost converter with fixed 3.0-V V_{OUT}	$50
TPS61013EVM-157	High-efficiency boost converter with fixed 2.5-V V_{OUT}	$50
TPS60200EVM-145	1.8-V to 3.6-V V_{IN} to 3.3-V V_{OUT} charge pump	$50

MOSFET Drivers

Things to Consider

PRIMARY

Supply Voltage Range — Due to internal voltage regulators, MOSFET drivers can operate over a wide input voltage range, making them flexible for many applications.

Peak Current Output — High peak current capability allows multiple power MOSFETs to control higher currents, since external MOSFETs can be paralleled.

Numbers of Outputs — Single and dual drivers are available to complement DC/DC switching and motor control applications.

Output Configuration — Inverting and non-inverting configurations are available.

SECONDARY

Protection Features — Undervoltage lockout, overvoltage protection and thermal shutdown protect the system. High currents greatly benefit from such protection features.

Packaging — Innovative packaging, such as TI's TSSOP PowerPAD, reduces board space requirements while improving thermal performance. Many packaging styles are available in a single device.

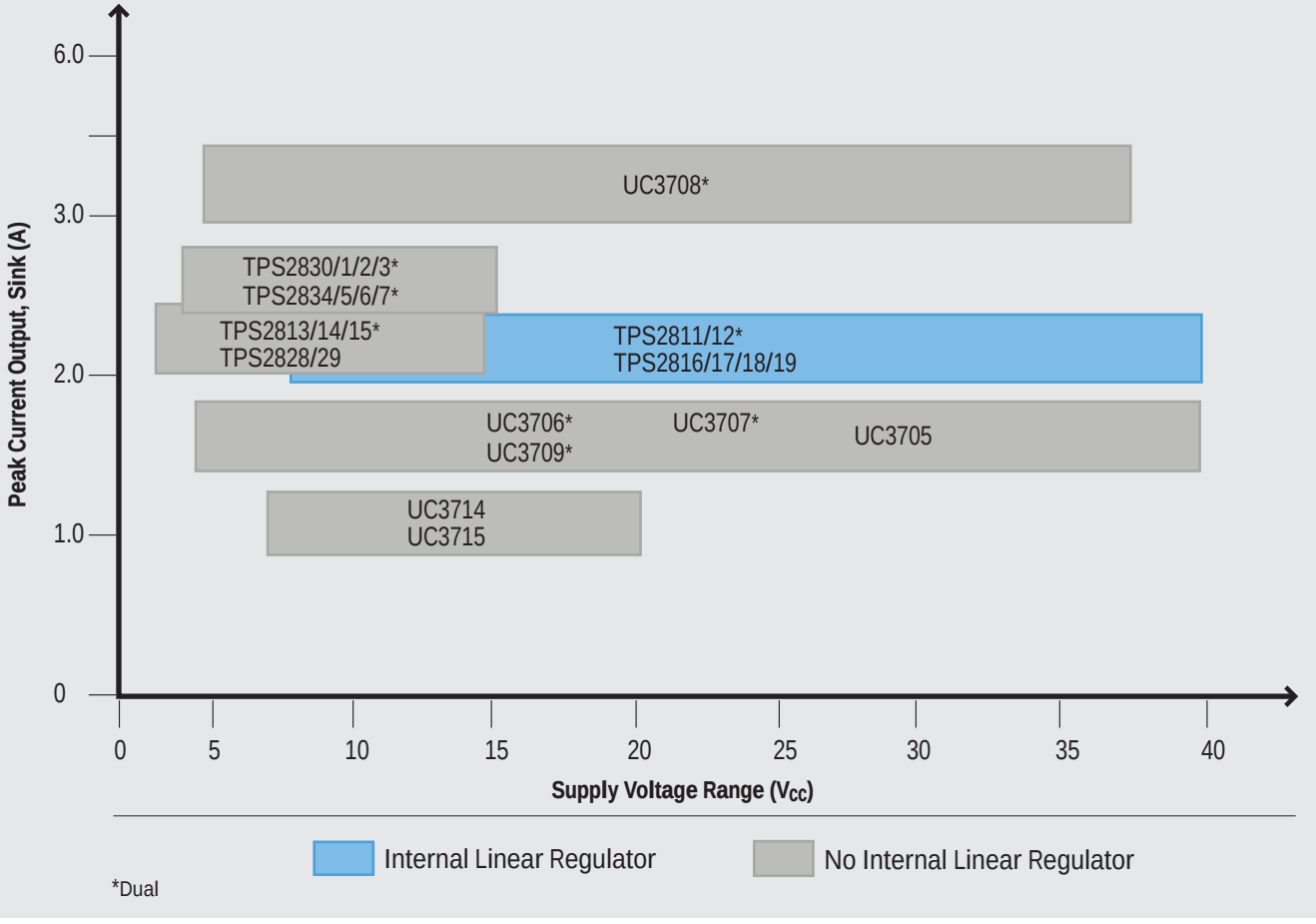
Technical Information

Rise/Fall/Propagation Delay Times — Faster turn on/off times enable switching times to be minimized, and higher efficiency.

Dead-Time Control — Shoot-through currents in the power MOSFETs can be eliminated, thereby increasing efficiency.

- Linear BiCMOS process enables MOSFET drivers to implement bipolar and MOS gate drive transistors in parallel. High peak current and fast switching speeds are possible.
- A high-speed, high-voltage Schottky process interfaces low-level control functions with high-power switching devices, particularly power MOSFETs.

MOSFET Drivers Family of Products



MOSFET Drivers Selection Guide

Device	No. of Outputs	Output Configuration	I_O Source/ Sink (A)	Rise/Fall Time (ns)	V_{CC} Range (V)	Prop Delay (ns)	Input Threshold	Enable	Dead Time	Protection Features (*)	Internal Regulator	1ku Suggested Resale
TPS2811	2	Inverting	2.0/2.0	25/25	8.0-40	40	CMOS	No	Yes		Yes	$0.77
TPS2812	2	Non-inverting	2.0/2.0	25/25	8.0-40	40	CMOS	No	Yes		Yes	$0.77
TPS2813	2	One inverting One non-inverting	2.0/2.0	25/25	4.0-14	40	CMOS	No	Yes		No	$0.77
TPS2814	2	Dual 2-input AND; One inverted	2.0/2.0	25/25	4.0-14	40	CMOS	No	Yes		No	$0.77
TPS2815	2	2-input NAND	2.0/2.0	25/25	4.0-14	40	CMOS	No	Yes		No	$0.77
TPS2816	1	Inverting	2.0/2.0	25/25	8.0-40	40	CMOS	No	Yes		Yes	$0.54
TPS2817	1	Non-inverting	2.0/2.0	25/25	8.0-40	40	CMOS	No	Yes		Yes	$0.54
TPS2818	1	Inverting	2.0/2.0	25/25	8.0-40	40	CMOS	No	Yes		Yes	$0.54
TPS2819	1	Non-inverting	2.0/2.0	25/25	8.0-40	40	CMOS	No	Yes		Yes	$0.54
TPS2828	1	Inverting	2.0/2.0	25/25	4.0-14	40	CMOS	No	Yes		No	$0.54
TPS2829	1	Non-inverting	2.0/2.0	25/25	4.0-14	40	CMOS	No	Yes		No	$0.54
TPS2830	2	Non-inverting	2.4/2.4	50/50	4.5-15	75	CMOS	Yes	Yes	OVP	No	$1.22
TPS2831	2	Inverting	2.4/2.4	50/50	4.5-15	75	CMOS	Yes	Yes	OVPC	No	$1.22
TPS2832	2	Non-inverting	2.4/2.4	50/50	4.5-15	75	CMOS	No	Yes		No	$1.16
TPS2833	2	Inverting	2.4/2.4	50/50	4.5-15	75	CMOS	No	Yes		No	$1.16
TPS2834	2	Non-inverting	2.4/2.4	30/30	4.5 - 15	70	TTL	Yes	Yes	OVP	No	$1.22
TPS2835	2	Inverting	2.4/2.4	30/30	4.5 - 15	70	TTL	Yes	Yes	OVP	No	$1.22
TPS2836	2	Non-inverting	2.4/2.4	30/30	4.5 - 15	70	TTL	No	Yes		No	$1.16
TPS2837	2	Inverting	2.4/2.4	30/30	4.5 - 15	70	TTL	No	Yes		No	$1.16
UC3705	1	Non-inverting	1.5/1.5	40/40	5 - 40	100	TTL	No	No	TSD	No	$2.14
UC3706	2	Configurable	1.5/1.5	40/40	5 - 40	100	TTL	No	No	TSD, OCP	No	$2.15
UC3707	2	Non-inverting	1.5/1.5	40/40	5 - 40	100	TTL	No	No	TSD	No	$2.37
UC3708	2	Non-inverting	3.0/3.0	25/25	5 - 35	25	TTL/CMOS	Yes	No	UVLO, TSD	No	$2.90
UC3709	2	Inverting	1.5/1.5	40/40	5 -40	25	TTL	No	No	TSD	No	$2.72
UC3714	1	Non-inverting	0.5/1.0	30/25	7 - 20	50	TTL/PWM	Yes	Yes		No	$2.33
UC3715	1	One inverting One non-inverting	1.0/2.0	30/25	7 - 20	50	TTL/PWM	Yes	Yes		No	$2.33

**Thermal Shutdown (TSD), over-voltage protection (OVP), under-voltage lockout (UVLO).*

Resources For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Evaluation Modules (EVM)

Part Number	Description	Price
TPS2817	Power Supply Evaluation Module with TPS2817 MOSFET Driver	$50

Data Sheets

Literature Number	Part Number	Description
SLVS132D	TPS2811/12/13/14/15	Dual High-Speed MOSFET Drivers
SLVS160A	TPS2816/17/18/19/28/29	Single-Channel High-Speed MOSFET Drivers
SLVS195C	TPS2832/33	Synchronous-Buck MOSFET Drivers with Deadtime Control
SLVS196C	TPS2830/31	Synchronous-Buck MOSFET Drivers with Deadtime Control
SLVS223A	TPS2834/35	Synchronous-Buck MOSFET Drivers with Deadtime Control and TTL Inputs
SLVS224A	TPS2835/36	Synchronous-Buck MOSFET Drivers with Deadtime Control and TTL Inputs

Application Notes

Literature Number	Part Number	Description
SLUA054	UC3705/6/7/9	New Driver ICs Optimize High-Speed Power MOSFET Switching Characteristics
SLUA105	UC3705/6/7/8/9	Practical Considerations in High Performance MOSFET, IGBT and MCT Gate

Chargers (Battery Management)

Things to Consider

PRIMARY

Battery Chemistry — Each battery chemistry has unique requirements for its charge algorithm, which is critical for maximizing its safety and cycle life.

Control Topology — A linear topology is simpler and is best suited for smaller battery packs. The switch-mode topology is best suited for larger packs and higher charge currents. Gating topology connects or disconnects an already existing linear or switchmode current source to the battery. Such current sources typically lack any battery management features. This topology is typically used in cost-sensitive applications.

SECONDARY *(see notes below)*

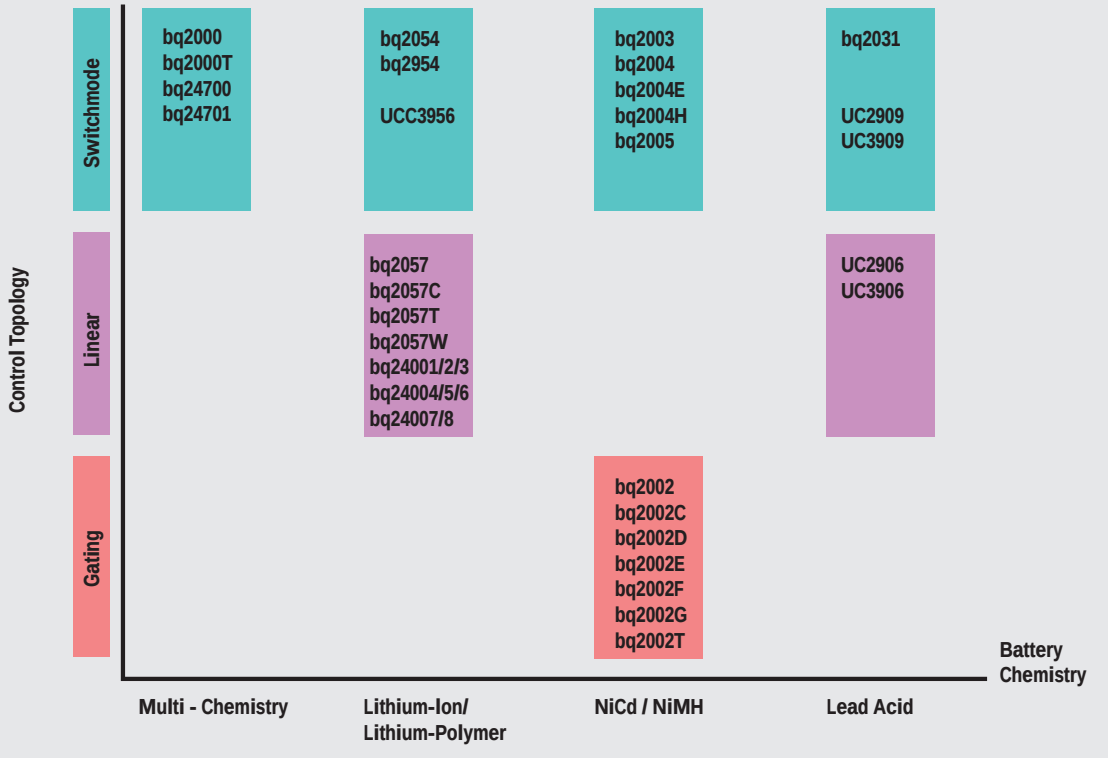
- Charge termination method [1]
- Charge regulation voltage [2]
- Safety timer [3]
- Temperature monitoring [4]
- Number of LEDs for charge status display [5]
- Package [6]

Technical Information

Compared with other solutions using DC/DC coverters and microcontrollers TI chargers feature:

- Fast, safe and reliable **chemistry-specific** charge and charge termination methods for Lithium-Ion, Lithium-Polymer, Nickel-Cadmium, Nickel-Metal-Hydride and Lead-Acid batteries
- Dedicated battery management features including temperature monitoring, safety timer, pre-charge testing and conditioning
- Direct LED outputs that display battery and charge status
- Integrated, accurate current or voltage regulation control to maximize battery capacity

Chargers Family of Products



Notes:

[1] Depends on system's design requirements.
[2] Applies to Li-Ion. It is 4.2 V for cells with graphite anode and 4.1 V for hard carbon anode.
[3] The timer is a safety backup that terminates charge if the primary termination does not happen.
[4] Temperature monitoring is an additional safety feature and requires a thermistor in the battery pack.
[5] Depends on the type of information that needs to be displayed for the end-user.
[6] Depends on the limitation on available space.

Chargers Selection Guide

Device	Control Topology	Description	Charge Termination Method		Safety Charge Timer	Temperature Monitoring	Charge Status Outputs	Smallest Package Option	1ku Suggested Resale
			Primary	Secondary					
Multi-Chemistry									
bq2000	Switchmode	Complete charge management for NiCd, NiMH, Li-Ion, Li-Polymer, pre-charge conditioning, chemistry-specific charge termination	PVD, min current	max temp, time	Yes	Yes	1	8-pin TSSOP	$1.75
bq2000T	Switchmode	(same as bq2000, but rate of temp. change termination)	ΔT/Δt, min current	max temp, time	Yes	Yes	1	8-pin TSSOP	$1.75
bq24700	Switchmode	Programmable triple loop PWM, Dynamic Power Mgmt., maintain battery select on depleted battery condition	host controlled	host controlled	No	No	1	24-pin TSSOP	$1.89
bq24701	Switchmode	(same as bq24700 but switch to AC on depleted battery condition)	host controlled	host controlled	No	No	1	24-pin TSSOP	$1.89
Lithium-Ion, Lithium-Polymer Chemistry									
bq2054	Switchmode	Integrated high-frequency switching controller	Min current	time	Yes	Yes	3	16-pin SOIC	$2.31
bq2057	Linear (4.1 V)	Low-dropout linear charger for single-cell applications, AutoComp™ charge-rate compensation	Min current	max temp	No	Yes	1	8-pin MSOP	$1.25
bq2057C	Linear (4.2 V)	(same as bq2057, single cell)	Min current	max temp	No	Yes	1	8-pin SOIC/TSSOP	$1.25
bq2057T	Linear (8.2 V)	(same as bq2057, two cells)	Min current	max temp	No	Yes	1	8-pin SOIC/TSSOP	$1.25
bq2057W	Linear (8.4 V)	(same as bq2057, two cells)	Min current	max temp	No	Yes	1	8-pin SOIC/TSSOP	$1.25
bq24001	Linear (4.1 V or 4.2 V)	Integrated FET and Schottky diode, one LED	Min current	max temp, time	Yes	Yes	1	20-pin TSSOP	$1.75
bq24002	Linear (4.1 V or 4.2 V)	Integrated FET and Schottky diode, two LEDs	Min current	max temp, time	Yes	Yes	2	20-pin TSSOP	$1.75
bq24003	Linear (4.1 V or 4.2 V)	Integrated FET and Schottky diode, one bi-color LED	Min current	max temp, time	Yes	Yes	1	20-pin TSSOP	$1.75
bq24004	Linear (8.2 V or 8.4 V)	Integrated FET and Schottky diode, one LED	Min current	max temp, time	Yes	Yes	1	20-pin TSSOP	$1.75
bq24005	Linear (8.2 V or 8.4 V)	Integrated FET and Schottky diode, two LEDs	Min current	max temp, time	Yes	Yes	2	20-pin TSSOP	$1.75
bq24006	Linear (8.2 V or 8.4 V)	Integrated FET and Schottky diode, one bi-color LED	Min current	max temp, time	Yes	Yes	1	20-pin TSSOP	$1.75
bq24007	Linear (4.1 V or 4.2 V)	Integrated FET and Schottky diode, timer-enable function, one LED	Min current	max temp, time	Yes	Yes	1	20-pin TSSOP	$1.75
bq24008	Linear (4.1 V or 4.2 V)	Integrated FET and Schottky diode, timer-enable function, one bi-color LED	Min current	max temp, time	Yes	Yes	1	20-pin TSSOP	$1.75
bq2954	Switchmode	Advanced dual-LED charge status display with three user-selectable modes	Min current	max temp, time	Yes	Yes	2	16-pin DIP/SOIC	$2.31
UCC2956/ 3956	Switchmode	Integrated pulse-width modulation control for current and voltage regulation, programmable charge termination	Min current	time	Yes	No	2	20-pin SOIC	$1.89
NiCd/NiMH Chemistry									
bq2002/C/E/F/G	Gating*	Gated control of an external current source; simple low-cost charger implementation; sleep mode for low power consumption	-ΔV, PVD	max temp, time	Yes	Yes	1	8-pin SOIC	$1.14
bq2002D/T	Gating	(same as bq2002, but rate of temp. change termination)	ΔT/Δt	max temp, time	Yes	Yes	1	8-pin SOIC	$1.14
bq2003	Switchmode	Discharge-before-charge option for conditioning NiCd batteries	-ΔV, ΔT/Δt	max temp, time	Yes	Yes	2	16-pin SOIC	$2.50
bq2004/E/H	Switchmode	Advanced dual-LED charge status display with three user-selectable modes	-ΔV, PVD, ΔT/Δt	max temp, time	Yes	Yes	2	16-pin SOIC	$2.35
bq2005	Switchmode	Sequential safe management of fast charge for two NiCd and NiMH battery packs	-ΔV, ΔT/Δt	max temp, time	Yes	Yes	4	20-pin SOIC	$2.30
Lead-Acid Chemistry									
bq2031	Switchmode	Three user-selectable charge algorithms to accommodate cyclic and stand-by applications	Max voltage, -Δ²V, min current	time	Yes	Yes	3	16-pin SOIC	$2.63
UC2906/3906	Linear	Temperature-compensated internal reference	Max voltage, min current		No	No	1	16-pin SOIC	$3.18
UC2909/3909	Switchmode	Differential current sense input	Max voltage, min current		No	Yes	2	20-pin SOIC	$4.99

Notes: *PVD: Peak Voltage Detection*
-ΔV: Negative Delta Voltage
*ΔT/Δt: Rate of Temperature Rise*Gating: Gating Control of External Regulator, current*
Δ²V: Second Difference of Cell Voltage source is switched on during the complete charge cycle

Resources For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Evaluation Modules (EVM)

Part Number	Description	Price
bq24001EVM	bq24001 Evaluation Module for Li-Ion, One Cell	$50
DV2000S1	bq2000 Evaluation Module for Multi-Chemistry, Switchmode	$50
DV2000TS1	bq2000T Evaluation Module for Multi-Chemistry, Switchmode	$50
DV2002L2	bq2002 Evaluation Module NiCd/NiMH, Linear With -dV or Peak Voltage Dete	$50

Application Notes

Literature Number	Description
SLUA115	Improved charging methods for lead-acid batteries using the UC3906
SLUA058	An off-line lead acid charger based on the UC3909
SLUA064A	Using the bq2000/T to control fast charge

Evaluation Modules (EVM)

Part Number	Description	Price
DV2004S1	bq2004 Evaluation Module for NiCd/NiMH, Switchmode, Up to 3A	$50
DV2031S1	bq2031 Evaluation Module for Lead Acid, Switchmode	$50
DV2057	bq2057 Evaluation Module for Li-Ion, Linear (4.1 V), One Cell	$50
DV2057C	bq2057C Evaluation Module for Li-Ion, Linear (4.2 V), One Cell	$50

Application Notes

Literature Number	Description
SLUA007	Step-down switching current — regulation using the bq2003 fast-charge IC
SLUA015	Using NiMH and Li-Ion batteries in portable applications

Gas Gauges and Battery Monitors (Battery Management)

Things to Consider

PRIMARY

Battery Chemistry — Each battery chemistry has different operating characteristics, such as discharge profiles and self-discharge rate. Gas gauge ICs are developed by chemistry to account for these differences to accurately calculate remaining energy in the battery.

Charge/Discharge Relationship — The charge and discharge rates dictate the sense resistor value. Most of the gas gauge ICs are programmed for the capacity/sense resistor combination.

SECONDARY

- Number of LEDs for capacity illustration
- Communication protocol
- Li-Ion pack safety enhancements
- Smart Battery System (SBS) compatibility
- Package
- Cost

Technical Information

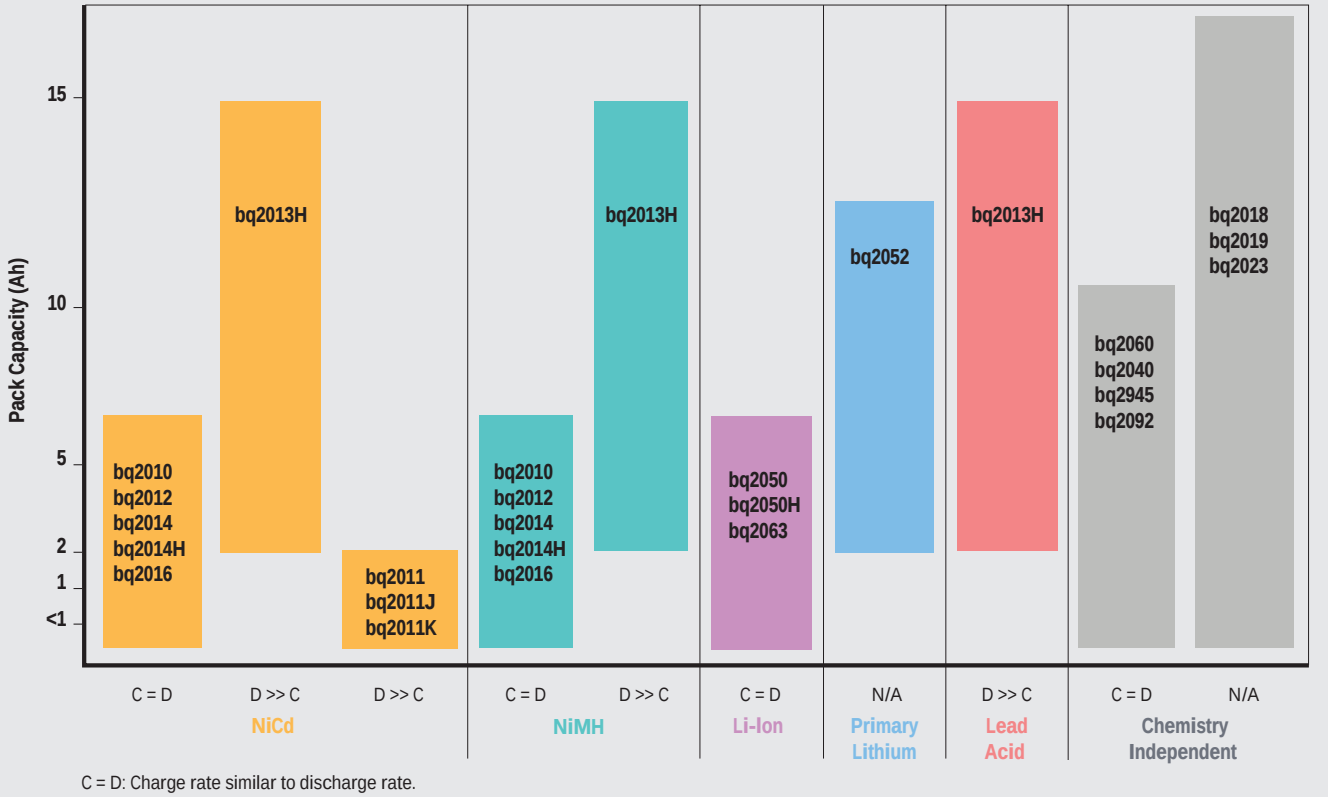
TI Gas Gauges and Battery Monitors feature:

- Integrated time base, reference, ADC, VFC and temperature sensor
- Accurately calculate remaining battery capacity using battery-specific models (for Battery Monitors, calculation is performed by the host)

Compared with other solutions, TI Gas Gauges:

- Consume less than 150 µA of operating current
- Resolve charge/discharge signals down to 3.125 µV
- Work with low value sense resistors (5 - 50 mΩhm)

Gas Gauges and Battery Monitors Family of Products



C = D: Charge rate similar to discharge rate.
D>>C: Discharge rate much greater than charge rate.
N/A: Not Applicable.

Gas Gauges and Battery Monitors Selection Guide

Device	Approx. Battery Capacity (mAh)	Charge/Discharge Relationship	Number of LEDs	Communication Protocol	Other Features	Safety Enhancement	Package	1ku Suggested Resale
NiCd Chemistry								
bq2010	500-6000	C = D	5 or 6	DQ	–	No	16-pin SOIC	$3.60
bq2011/J/K	800-2000	D >> C	5	DQ	–	No	16-pin SOIC	$3.50
bq2012	500-6000	C = D	5 or 6	DQ	Slow charge control	No	16-pin SOIC	$3.60
bq2013H	2000-15000	D >> C	5	HDQ	Programmable offset error compensation	No	16-pin SOIC	$3.45
bq2014	500-6000	C = D	5	DQ	Works with bq2004	No	16-pin SOIC	$3.60
bq2014H	500-6000	C = D	5	HDQ	Register compatible with bq2050H	No	16-pin SOIC	$3.45
bq2016	1000-4500	D>>C	5	HDQ	Automatic offset calibration	No	28-pin SSOP	$3.13
NiMH Chemistry								
bq2010	500-6000	C = D	5 or 6	DQ	–	No	16-pin SOIC	$3.60
bq2012	500-6000	C = D	5 or 6	DQ	Slow charge control	No	16-pin SOIC	$3.60
bq2013H	2000-15000	D >> C	5	HDQ	Programmable offset error compensation	No	16-pin SOIC	$3.45
bq2014	500-6000	C = D	5	DQ	Works with bq2004	No	16-pin SOIC	$3.60
bq2014H	500-6000	C = D	5	HDQ	Register compatible with bq2050H	No	16-pin SOIC	$3.45
bq2016	1000-4500	D>>C	5	HDQ	Automatic offset calibration	No	28-pin SSOP	$3.13
Lithium-Ion, Lithium-Polymer Chemistry								
bq2050	500-6000	C = D	5	DQ	–	No	16-pin SOIC	$3.60
bq2050H	500-6000	C = D	5	HDQ	Register compatible with bq2014H	Yes	16-pin SOIC	$3.45
bq2063	800-1000	C=D	4 or 5	SMBus or HDQ16	SBS version 1.1 compliant with protector interface	Yes	28-pin SSOP	$3.80
Primary Lithium Chemistry								
bq2052	1000-12000	NA	2, 4 or 5	HDQ	Automatic discharge compensation	No	16-pin SOIC	$3.75
Lead Acid Chemistry								
bq2013H	2000-15000	D >> C	5	HDQ	Programmable offset error compensation	No	16-pin SOIC	$3.45
Multi-Chemistry								
bq2018	Any	NA	None	HDQ	Automatic offset error calculation	No	8-pin SOIC/TSSOP	$1.75
bq2040	800-10000	C = D	4	SMBus	SBS version 1.0 compliant	No	16-pin SOIC	$3.60
bq2060	800-10000	C = D	4 or 5	SMBus or HDQ16	SBS version 1.1 compliant	Yes	28-pin SSOP	$3.75
bq2092	800-10000	C = D	4	SMBus	SBS version 0.95 compliant	No	16-pin SOIC	$3.50
bq2945	800-10000	C = D	5	SMBus	SBS version 1.0 compliant	No	16-pin SOIC	$3.60

Device	VFC Resolution (µVh)	Temperature Measurement Resolution (°C)	Communication Protocol	ID-ROM (Bits)	Memory	Program Output Ports	Other Features	Package	1ku Suggested Resale
Battery Monitors									
bq2018	12.5	10	HDQ		RAM	1		8-pin SOIC/TSSOP	$1.75
bq2019	3.05	1	HDQ	64	RAM, FLASH	1	Non-volatile memory	8-pin TSSOP	$1.80
bq2023	3.05	0.25	SDQ	64	RAM, FLASH	1	Automatic offset error compensation	8-pin TSSOP	$1.85

Notes:
C=D: Charge rate similar to discharge rate.
D>>C: Discharge rate much greater than charge rate.
NA: Not applicable.
Battery capacity ratings provide an approximate range for each Gas Gauge.

DQ = 1-wire 8-bit at 333 bps
HDQ = 1-wire 8-bit at 2 kbps
HDQ16 = 1-wire 16-bit at 2 kbps
SDQ = Single-wire serial interface
SMBus = 2-wire 100 kHz

Resources For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Evaluation Modules (EVM)

Part Number	Description	Price
bq2013HEVM-001	bq2013H Evaluation Kit for NiCd, 16.8 V	$99
bq2018EVM-001	bq2018 Evaluation Kit for Multi-Chemistry	$99
bq2019EVM-001	bq2019 Evaluation Kit for Multi-Chemistry	$99
bq2040EVM-001	bq2040 Evaluation Kit for NiMH, 10.8 V	$99

Evaluation Modules (EVM)

Part Number	Description	Price
bq2050HEVM-002	bq2050H Evaluation Kit for Li-Ion, 10.8 V	$99
bq2052EVM-001	bq2052 Evaluation Kit for Primary Lithium, 15 V	$99
bq2060EVM-001	bq2060 Evaluation Kit for Li-Ion	$99

Application Notes

Literature Number	Description
SLUA016	Designed To Go Universal battery monitor using the bq2018 Power Minder IC
SLUA233	Using the bq2040 smart battery system gas gauge IC
SLUA014	Using the bq2010 — a tutorial for gas gauging
SLUA021	Using the bq2050 to monitor lead-acid batteries

Protection ICs (Battery Management)

Things to Consider

PRIMARY

Number of Series Cells — A battery is constructed from a string of series and parallel cells. Each series cell, or group of paralleled cells, requires protection from overcharge, overdischarge and short-circuit conditions.

Cost — The cost of the battery pack electronics is paramount. Reduced external component count and small size are key to this.

Threshold Voltage — Lithium-Ion and Lithium-Polymer cells are produced by many manufacturers. Some manufacturers' technologies create cells of different maximum stress voltages, otherwise known as the "over-voltage threshold." This data is available from the cell supplier.

SECONDARY

Threshold Tolerance — The over-voltage threshold has a tolerance that needs to be accounted for in the design for safety reasons.

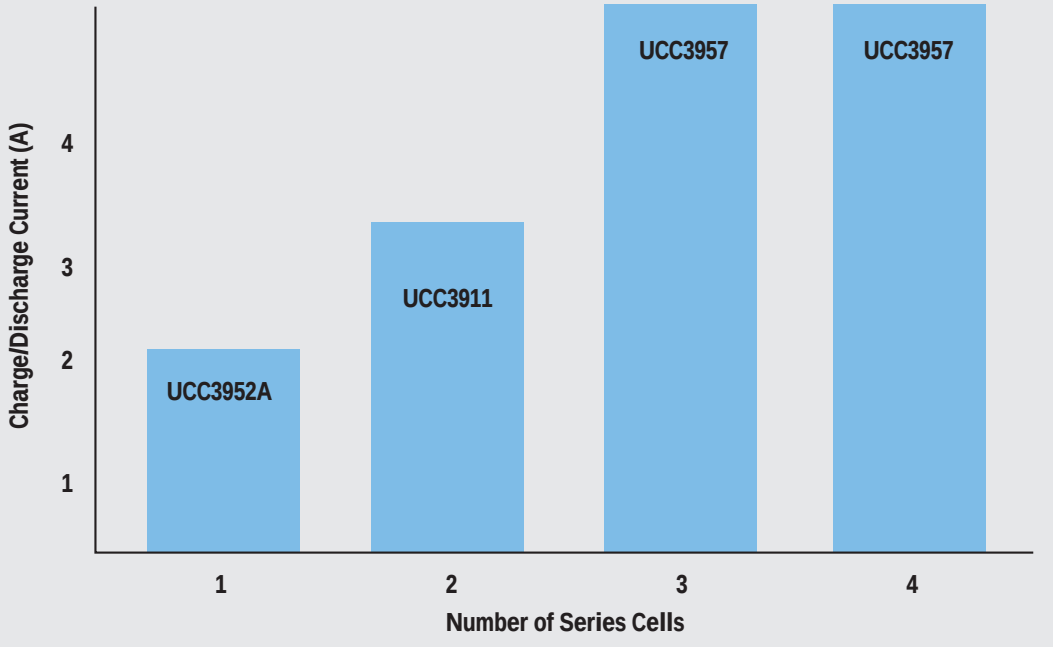
Shutdown Current — In battery pack applications, constant current draw needs to be very low to preserve battery life.

Charge/Discharge Current — The pass element associated with each protection IC is rated for maximum current whether it be an internal or external FET.

Technical Information

- BiCMOS process results in lower current consumption, but still suitable for high-voltage systems.
- Package options of 16-lead SOIC, TSSOP, SSOP and BCC offer a very compact solution ideal for battery pack integration.
- Drop-in replacable devices offer different over-voltage thresholds allowing one design to use with several cell suppliers.
- Sleep current consumption of less than 3.5 µA enables extended battery life.
- 50 mV precision internally trimmed thresholds give good flexibility along with maximum safety.
- Short-circuit protection eliminates the need for an external fuse.

Protection ICs Family of Products



Notes: Current rating limit above 3 A is a function of the external MOSFETs used.

Protection ICs Selection Guide

Device	Number of Cells	Charge/Discharge Current (A)	Threshold Voltage (V_{OV})	Shutdown Current (µA)	Other Features	Package	1ku Suggested Resale
UCC3911-1	2	3	4.20	3.5	User controllable delay for tripping short circuit current protection	16-pin SOIC	$2.69
UCC3911-2	2	3	4.25	3.5	User controllable delay for tripping short circuit current protection	16-pin SOIC	$2.69
UCC3911-3	2	3	4.30	3.5	User controllable delay for tripping short circuit current protection	16-pin SOIC	$2.69
UCC3911-4	2	3	4.35	3.5	User controllable delay for tripping short circuit current protection	16-pin SOIC	$2.69
UCC3952-1	1	2	4.20	2.5	Thermal and reverse charge protection	16-pin SOIC, 16-pin TSSOP	$1.63
UCC3952-2	1	2	4.25	2.5	Thermal and reverse charge protection	16-pin SOIC, 16-pin TSSOP	$1.63
UCC3952-3	1	2	4.30	2.5	Thermal and reverse charge protection	16-pin SOIC, 16-pin TSSOP	$1.63
UCC3952-4	1	2	4.35	2.5	Thermal and reverse charge protection	16-pin SOIC, 16-pin TSSOP	$1.63
UCC3952A-1	1	2	4.20	2.5	Same as UCC3952, bump-chip carrier package	18-pin BCC	$1.89
UCC3952A-2	1	2	4.25	2.5	Same as UCC3952, bump-chip carrier package	18-pin BCC	$1.89
UCC3952A-3	1	2	4.30	2.5	Same as UCC3952, bump-chip carrier package	18-pin BCC	$1.89
UCC3952A-4	1	2	4.35	2.5	Same as UCC3952, bump-chip carrier package	18-pin BCC	$1.89
UCC3957-1	3 or 4	External FET	4.20	3.5	Detection of loss of cell sense connections	16-pin SSOP	$1.88
UCC3957-2	3 or 4	External FET	4.25	3.5	Detection of loss of cell sense connections	16-pin SSOP	$1.88
UCC3957-3	3 or 4	External FET	4.30	3.5	Detection of loss of cell sense connections	16-pin SSOP	$1.88
UCC3957-4	3 or 4	External FET	4.35	3.5	Detection of loss of cell sense connections	16-pin SSOP	$1.88

Notes: See individual data sheets for full details.

Resources For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

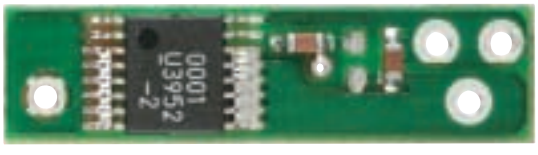
Evaluation Modules (EVM)

Part Number	Description	Price
UCC3952EVM-008	Evaluation Module for Li-Ion with 4.20 V, V_{OV}, one cell	$50
UCC3952EVM-009	Evaluation Module for Li-Ion with 4.25 V, V_{OV}, one cell	$50

The EVMs include a typical protection circuit module that connects directly to a battery for in-system evaluation. Some EVMs combine the pack protection circuitry with a TI gas gauge device for full battery monitoring system evaluation.

One such evaluation system is the UCC3952EVM for the UCC3952 used in single-cell battery packs.

The UCC3952EVM has connections for the single-cell and pack+ and pack- for quick connection and evaluation.



UCC3952 Evaluation Module

Dimensions L 23mm x W 6mm x H 2mm

(photo not to scale)

Other

Literature Number	Description
SLUM001A	Battery Management Product Catalog

The product catalog can be found at **www.ti.com/sc/sineon**

Power Distribution Devices (PCMCIA/CardBus, USB, Current-Limited Power Switch ICs; Power Mux ICs; USB Hub Power Contollers)

Things to Consider

USB & Current-Limiting Power Switch ICs

- When the output load exceeds the current-limit threshold, **I_{OS} (min)**, or a short is present, the devices limit the output current to a safe level by switching into a constant current mode. The devices with fault reporting also assert an over-current logic output for the respective channel.
- Duals, triples and quads feature independent over-current and thermal protection for each channel, allowing uninterrupted performance on non-faulted outputs. For information on ganging ports, see application note SLVA049.
- UL and Nemko recognition reduces compliance testing requirements.

PCMCIA/CardBus Power Matrix ICs

- The output voltages required are application dependent. Standard PC Cards require switching ground, 3.3 V and 5 V to V_{CC}, and ground, 3.3 V, 5 V and 12 V to the V_{PP} input. Some new applications no longer require 12 V or V_{PP}. Some end equipment require both USB and PCMCIA support.
- TI's serial interface switches are compatible with TI and other industry standard CardBus controllers. The TPS2205 has a parallel interface for compatibility with microcontrollers from Cirrus, Ricoh, O2Micro, and Intel.

Power Mux ICs — Auxiliary power switches transition from a main power supply to an auxiliary when the main shuts down. The current demanded from either power supply is application dependent.

USB Hub Power Controllers — TI has a complete power manager for a 4-port USB hub in a single IC, reducing board space up to 20%. The TPS207x supports bus and/or self-powered hubs and incorporates: power switches, a 3.3-V LDO, a DPO line control to signal an attach to the host, and a 5-V LDO controller for a 6- to 9-V self-powered mode input supply.

Technical Information

- USB & Current-Limiting Power Switch ICs — To minimize voltage drop, select devices with the lowest $r_{DS}(on)$, or on-resistance. Calculate the drop using $V_{drop}=IR$, where I is the output current and R is the switch $r_{DS}(on)$.
- PCMCIA/CardBus Power Matrix ICs — TPS2206, TPS2216, and TPS2216A are pin compatible. TPS2216(A), available in 30-pin SSOP or 32-pin TSSOP, and TPS2214(A), in 24-pin SSOP, differ only in packaging.
- Power Mux ICs — The TPS21xx are designed without parasitic diodes, thus preventing backflow current to the input supplies in the event the input supply turns off or drops to a potential lower than the switch output.
- USB Hub Power Controllers — TI offers hub controllers compatible with TPS207x. A complete hub reference design/evaluation module (TPS2071EVM-159) using TPS2071 and hub controller TUSB2046B, including Gerber file, is available to simplify implementation.

Power Distribution Devices Family of Products

USB & Current-Limiting Power Switches

USB & Fault Reporting	Quad USB		TPS2048A/58A	TPS2048/58*		TPS2044/54** TPS2044A/54A			
	Quad		TPS2095/6/7			TPS2085/6/7			
	Triple USB		TPS2047A/57A	TPS2047/57*		TPS2043/53** TPS2043A/53A			
	Dual USB		TPS2046A/56A	TPS2046/56*		TPS2042A/52** TPS2042A/52A			
	Dual		TPS2090/1/2			TPS2080/1/2			
	Single USB	TPS2020/30*	TPS2045A/55A	TPS2045/55*	TPS2021/31*	TPS2041A/51** TPS2041A/51A	TPS2022/32	TPS2023/33	TPS2024/34
No Fault Reporting	Single	TPS2010A			TPS2011A		TPS2012A	TPS2013A	
	I_{OS} (min) (A)	0.22	0.3	0.345	0.66	0.7	1.1	1.65	2.2

* *Nemko Recognized* * *UL & Nemko Recognized*

PCMCIA/CardBus Power Switch Matrix ICs

3.3 V, 5 V, 12 V, V_{PP}	Dual			TPS2214(A) TPS2216(A) TPS2206 TPS2205
	Single	TPS2212		TPS2211(A)
No V_{PP}	Dual		TPS2044A/54A	
No V_{PP} w/ USB	Single		TPS2043A/53A	
V_{PP}, No 12 V	Single		TPS2044A/54A	
	I_{OS} (min) (A)	0.3	0.7	1

Power Mux ICs

Configuration	Active-Low Devices	Active-High Devices	Combination Active-L/H Devices	Feature
IN1, IN2	TPS2100	TPS2101		SOT-23
	TPS2102	TPS2103		SOT-23
	TPS2104	TPS2105		SOT-23
	TPS2082	TPS2080	TPS2081	700 mA
	TPS2092	TPS2090	TPS2091	300 mA
IN1, IN2	TPS2087	TPS2085	TPS2086	700 mA
IN3	TPS2097	TPS2095	TPS2096	300 mA

4-Port USB Hub Power Controllers

Device	5-V LDO Controller	BPMODE Indicator
TPS2070	Yes	Active low
TPS2071	Yes	Active high
TPS2074	No	Active low
TPS2075	No	Active high

Power Distribution Devices Selection Guide

Device	Number of FETs	I_{OS} (min) (A)	$r_{DS(on)}$ (mΩ)	V_{IN} Range (V)	Supply Current (µA)	OC Logic Output	OT Logic Output	Enable	Predecessor	1ku Suggested Resale
Current-Limited Power Distribution Switch ICs for USB and General-Purpose Applications										
TPS2010A	1	0.22	30	2.7–5.5	73	No	No	L	TPS2010	$0.96
TPS2011A	1	0.66	30	2.7–5.5	73	No	No	L	TPS2011	$1.04
TPS2012A	1	1.1	30	2.7–5.5	73	No	No	L	TPS2012	$0.96
TPS2013A	1	1.65	30	2.7–5.5	73	No	No	L	TPS2013	$1.04
TPS2020/30	1	0.22	33	2.7–5.5	73	Yes	Yes	L/H	-	$1.11
TPS2021/31	1	0.66	33	2.7–5.5	73	Yes	Yes	L/H	TPS2014	$1.11
TPS2022/32	1	1.1	33	2.7–5.5	73	Yes	Yes	L/H	TPS2015	$1.11
TPS2023/33	1	1.65	33	2.7–5.5	73	Yes	Yes	L/H	-	$1.11
TPS2024/34	1	2.2	33	2.7–5.5	73	Yes	Yes	L/H	-	$1.11
TPS2041A/51A	1	0.7	80	2.7–5.5	80	Yes	Yes	L/H	TPS2041/51	$0.67
TPS2042A/52A	2	0.7 ea	80	2.7–5.5	80	Each	Yes	L/H	TPS2042/52	$0.86
TPS2043A/53A	3	0.7 ea	80	2.7–5.5	160	Each	Yes	L/H	TPS2043/53	$1.25
TPS2044A/54A	4	0.7 ea	80	2.7–5.5	160	Each	Yes	L/H	TPS2044/54	$1.61
TPS2045A/55A	1	0.3	80	2.7–5.5	80	Yes	Yes	L/H	TPS2045/55	$0.66
TPS2046A/56A	2	0.3 ea	80	2.7–5.5	80	Each	Yes	L/H	TPS2046/56	$0.86
TPS2047A/57A	3	0.3 ea	80	2.7–5.5	160	Each	Yes	L/H	TPS2047/57	$1.25
TPS2048A/58A	4	0.3 ea	80	2.7–5.5	160	Each	Yes	L/H	TPS2048/58	$1.61
TPS2080	2	0.7 ea	80	2.7-5.5	85	Yes	Yes	2H	-	$1.40
TPS2081	2	0.7 ea	80	2.7-5.5	85	Yes	Yes	1L/1H	-	$1.40
TPS2082	2	0.7 ea	80	2.7-5.5	85	Yes	Yes	2L	-	$1.40
TPS2085	4	0.7 ea	80	2.7-5.5	85	Yes	Yes	4H	-	$2.36
TPS2086	4	0.7 ea	80	2.7-5.5	85	Yes	Yes	2L/2H	-	$2.36
TPS2087	4	0.7 ea	80	2.7-5.5	85	Yes	Yes	4L	-	$2.36
TPS2090	2	0.3 ea	80	2.7-5.5	85	Yes	Yes	2H	-	$1.40
TPS2091	2	0.3 ea	80	2.7-5.5	85	Yes	Yes	1L/1H	-	$1.40
TPS2092	2	0.3 ea	80	2.7-5.5	85	Yes	Yes	2L	-	$1.40
TPS2095	4	0.3 ea	80	2.7-5.5	85	Yes	Yes	4H	-	$2.36
TPS2096	4	0.3 ea	80	2.7-5.5	85	Yes	Yes	2L/2H	-	$2.36
TPS2097	4	0.3 ea	80	2.7-5.5	85	Yes	Yes	4L	-	$2.36

Device	Interface	Number of Ports	3.3-V $r_{DS(on)}$ (mΩ) Typ	5.0-V $r_{DS(on)}$ (mΩ) Typ	I_{OS} (min) (A)	Predecessor	1ku Suggested Resale
PCMCIA/CardBus Switch Matrix ICs							
TPS2205	8-line Parallel	2	70	100	1	-	$3.10
TPS2211A	4-line Parallel	1	70	57	1	TPS2211	$1.59
TPS2212	4-line Parallel	1	160	160	0.3	-	$1.56
TPS2214A	3-line Serial w/Reset	2	60	140	1	TPS2214	$3.10
TPS2216A	3-line Serial w/Reset	2	60	140	1	TPS2206/TPS2216	$3.10
TPS2043A or 53A	Parallel	1	80	80	0.7	-	$1.40
TPS2044A or 54A	Parallel	1 or 2	80	80	0.7	-	$1.77

Device	Number of Inputs	IN1 r_{DS} (on) (mΩ)	IN2 r_{DS} (on) (Ω)	IN1 Output Current (mA)	IN2 Output Current (mA)	IN1 Supply Current (µA)	IN2 Supply Current (µA)	IN1, IN2 Input Voltage Range (V)	Transition Time IN1 to IN2 (µs)	Transition Time IN2 to IN1 (ms)	Enable	1ku Suggested Resale
Power Mux ICs*												
TPS2100	2	250	1.3	500	10	10	0.75	2.7 to 4.0	4	0.9	L	$0.69
TPS2101	2	250	1.3	500	10	10	0.75	2.7 to 4.0	4	0.9	H	$0.69
TPS2102	2	250	1.3	500	100	14	0.75	2.7 to 4.0	3	0.7	L	$0.71
TPS2103	2	250	1.3	500	100	14	0.75	2.7 to 4.0	3	0.7	H	$0.71
TPS2104	2	250	1.3	500	100	18	0.75	2.7 to 5.5	3	0.7	L	$0.94
TPS2105	2	250	1.3	500	100	18	0.75	2.7 to 5.5	3	0.7	H	$0.94

* *TPS208x and TPS209x (shown in the 'Current-Limited Power Distribution Switch ICs for USB and General Purpose Applications' Table) can be configured as Power Mux ICs.*

Device	Number of FETs	r_{DS} (on) per FET(typ) (mΩ)	Current Limit (min)(A)	V_{IN} Min (V)	V_{IN} Max (V)	Over-Current Reporting	Over-Temp Reporting	Enable	BPMODE Indicator	5 V, 3 A LDO Controller	3.3V, 100 mA LDO	1ku Suggested Resale
USB Hub Power Controllers												
TPS2070	8	560 (BP), 107 (SP)	0.12 (BP), 0.6 (SP)	4.5	5.5	Yes	Yes	L	L	Yes	Yes	$3.70
TPS2071	8	560 (BP), 107 (SP)	0.12 (BP), 0.6 (SP)	4.5	5.5	Yes	Yes	L	H	Yes	Yes	$3.70
TPS2074	8	500 (BP), 100 (SP)	0.12 (BP), 0.6 (SP)	4.5	5.5	Yes	Yes	L	L	No	Yes	$2.99
TPS2075	8	500 (BP), 100 (SP)	0.12 (BP), 0.6 (SP)	4.5	5.5	Yes	Yes	L	H	No	Yes	$2.99

BP = Bus-powered mode, SP = Self-powered mode

Hot Swap

Things to Consider

Overview — Hot Swap power manager ICs support the insertion and removal of electronic boards and modules from live powered systems. TI offers two types of Hot Swap power manager ICs, Hot Swap Controllers and Hot Swap Switches, for applications including Infiniband, 48V Telecomm, and Universal Serial Bus (USB). Hot Swap switches (TPS20xx) are covered in detail on page 30.

Input Voltage (V_{IN}) — Consider whether the application requires support for single, dual, negative floating or positive floating power supplies.

Output Current (I_{OUT}) — The output current desired determines whether a Hot Swap power switch IC (integrated power FET) can be used, or whether a Hot Swap power controller IC (customer provides external power FET) is needed. Controllers are used when I_{OUT} > 4 A, to minimize the size and cost of the total solution.

Inrush Current Control — Is accomplished by ramping the input voltage (dv/dt) or input current (di/dt) to the hot-swapped board. The di/dt control permits high-speed current regulation to overcurrent and fault conditions. The dv/dt control is a more cost-effective solution for applications not requiring the di/dt control.

Automatic Retry — Devices with this feature continue to try to start up a board until it is successful, avoiding service calls for problems that resolve themselves. When not selected or available, the faulted output latches off.

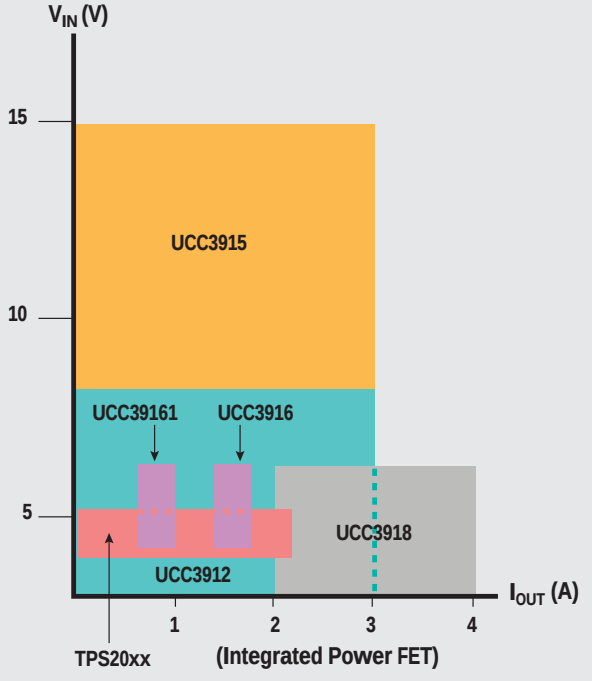
Average Power Limiting — Pertaining to Hot Swap power controllers, this feature provides peak load capability while limiting FET power dissipation during fault conditions, if latch-off-on-fault is not selected.

Technical Information

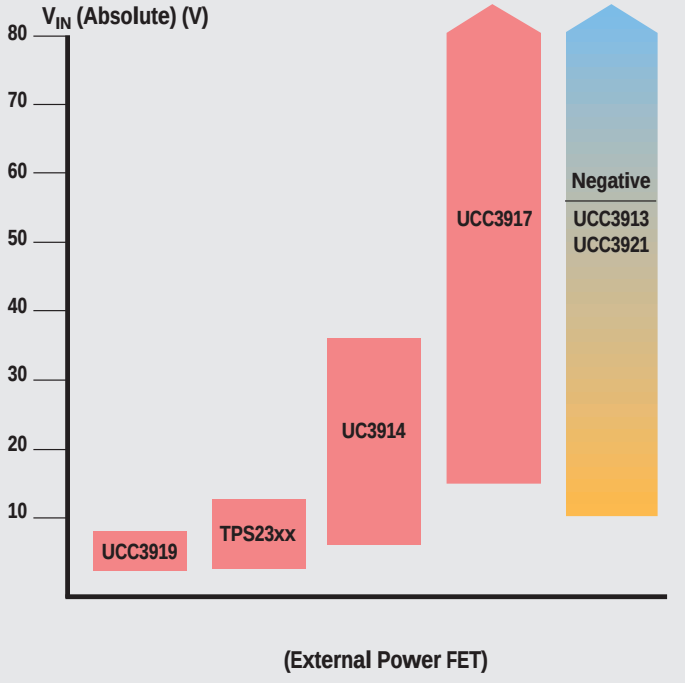
- V_{IN} to V_{OUT} Voltage Drop — The $r_{DS(on)}$ of the FET, whether integrated into the Hot Swap power manager, or external to it, causes a voltage drop that lowers the amount of power delivered to the load. Calculate the drop using V_{drop}=IR, where I is the output current and R is the $r_{DS(on)}$ of the switch.
- Output Gate Drive — Provided by a Hot Swap power controller should be great enough to allow multiple external power FETs to be driven by a single channel.
- Temperature Range —
  UCC or UC39xx = commercial
  UCC or UC29xx = industrial
  UCC19xx = military.
- Sequencing — TPS2306 allows power-up and power-down sequencing control of two supplies.

Hot Swap Family of Products

Hot Swap Power Switch ICs



Hot Swap Power Controller ICs



Hot Swap Selection Guide

Controllers

Device	Description	V_{IN} Range (V)	Fault Reporting	Average Power Limiting	Supply Current (mA)	Enable / Shutdown	1ku Suggested Resale
UCC3921	Negative Floating, di/dt control	< -10.5	Yes	Yes	1	SH: Active-High	$1.37
UCC3919	Single, di/dt control	3 to 8	Yes	Yes	1	SH: Active-Low	$2.15
UCC3917	Positive Floating, di/dt control	> 15	Yes	Yes	5	SH: Active-Low	$1.66
UCC3913	Negative Floating, di/dt control	< -10.5	Yes	Yes	1	SH: Active-High	$1.37
UC3914	Single High Voltage, di/dt control	5 to 35	Yes	Yes	8	SH: Active-Low	$4.35
TPS2331	Single, dv/dt control	3 to 13	Yes	No	0.5	EN: Active-High	$2.00
TPS2330	Single, dv/dt control	3 to 13	Yes	No	0.5	EN: Active-Low	$2.00
TPS2321	Dual, dv/dt control	3 to 13 / 3 to 5.5	No	No	0.5	EN: Active-High	$2.76
TPS2320	Dual, dv/dt control	3 to 13 / 3 to 5.5	No	No	0.5	EN: Active-Low	$2.76
TPS2311	Dual, dv/dt control	3 to 13 / 3 to 5.5	Yes	No	0.5	EN: Active-High	$3.50
TPS2310	Dual, dv/dt control	3 to 13 / 3 to 5.5	Yes	No	0.5	EN: Active-Low	$3.50
TPS2301	Dual, dv/dt control	3 to 13 / 3 to 5.5	Yes	No	0.5	EN: Active-High	$3.50
TPS2300	Dual, dv/dt control	3 to 13 / 3 to 5.5	Yes	No	0.5	EN: Active-Low	$3.50
TPS2306	Dual, di/dt control, sequencing	2.75 to 13.6	Yes	No	2	EN: Active-High	$4.00

Switches

Device	Description	V_{IN} Range (V)	Current Limit (min) (A)	$r_{DS(on)}$ (mΩhm)	Programmable Fault Threshold	Automatic Retry Mode	Supply Current (mA)	Enable / Shutdown	1ku Suggested Resale
UCC3918	Single, Low $R_{DS(on)}$, di/dt control	3 to 6	0 to 4	75	Yes	Yes	1	SH: Active-Low	$3.06
UCC39161	Single, Fixed Low Current, di/dt control	4 to 6	0.6	220	No	Yes	1	SH: Active-Low	$2.66
UCC3916	Single, Fixed Low Current, SCSI, di/dt control	4 to 6	1.65	220	No	Yes	1	SH: Active-Low	$2.26
UCC39151	Single, di/dt control	7 to 15	0 to 3	150	Yes	Yes	1	SH: Active-Low	$5.09
UCC3915	Single, di/dt control	7 to 15	0 to 3	150	Yes	Yes	1	SH: Active-Low	$3.44
UCC3912	Single, di/dt control	3 to 8	0 to 3	150	Yes	Yes	1	SH: Active-Low	$3.37
TPS20xx	Singles to Quads, dv/dt control	2.7 to 5.5	0.22 to 2.2	33 to 80	No	No	< 2	EN: High or Low	$1.11

Note: Values are typical, unless indicated otherwise.

Resources For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Evaluation Modules (EVM)

Part Number	Description	Price
TPS2301EVM-153	Dual Hot Swap Power Controller Evaluation Module & Interface Board	$50
TPS2306EVM-001	Dual Sequencing Hot Swap Power Controller Evaluation Module	$50
TPS2330EVM-184	48V Hot Swap Evaluation Module	$50
TPS2330EVM-185	Infiniband Bulk Power Evaluation Module & Interface Board	$99

Application Notes

Literature Number	Part Number	Description
SLUA187	UCC3912/15	Programmable Hot Swap Power Manager
SLUA198	UCC3912	Electronic Circuit Breaker ICs
SLUA131	UCC3912	Integrated Electronic Circuit Breaker IC for Hot Swap
SLUA197A	UCC3913/21	Hot Swap Power Manager for Negative Voltage
SLUA222	UCC3919	Controlling a -5 V Rail
SLUA219	UCC3919	Hot Swap Power Manager Evaluation Circuit and Materials
SLUA241	UCC3917	Positive Floating Hot Swap Power Manager
SLUA221	UCC3917	Positive Floating Hot Swap Power Manager Evaluation Kit
SLUA211	UCC3918	Hot Swap Power Manager Evaluation Board and Schematic
SVA093	TPS2330	Power Management Solutions for Infiniband (SM) I/O Modules

(100 MHz)	3.3V I/O		UCC39412	TPS77033		TPS61006	TPS77033		TPS76533		TPS76633		or TPS5120	TPS62007	TPS77633		UCC3585	or TPS5120
TMS320VC5409	1.8V core	TPS3306-18	TPS61002	TPS76918	TPS70751	UCC3941-ADJ	TPS76618	TPS70151	TPS77618	TPS767D318	TPS77818	TPS767D318	TPS56302	TPS62005	TPS75318	PT6931	UCC3585	TPS56302
(100 MHz)	3.3V I/O		UCC39412	TPS77033		TPS61006	TPS76933		TPS76633		TPS77633		or TPS5120	TPS62007	TPS76833		UCC3585	or TPS5120
TMS320VC5410	2.5Vcore	TPS3306-25	UCC3941-ADJ	TPS76625	TPS70758	-	TPS77425	TPS70158	TPS77825	TPS767D325	TPS75325	TPS767D325	TPS56302	-	TPS75725	PT6931	UCC3585	TPS56302
(100 MHz)	3.3VI/O		TPS61006	TPS76933		UCC3941-3	TPS76533		TPS76633		TPS77633		or TPS5120	TPS62007	TPS76833		UCC3585	or TPS5120
TMS320VC5416	1.5Vcore	TPS3306-15	TPS61001	TPS76915	TPS70748	UCC3941-ADJ	TPS76515	TPS70148	TPS77615	TPS70158	TPS77815	TPS767D315	TPS56302	TPS62004	TPS75315	PT6931	UCC3585	TPS56302
(160 MHz)	3.3VI/O		UCC39412	TPS77033		TPS60200	TPS76933		TPS76633		TPS77633		or TPS5120	TPS62007	TPS77833		UCC3585	or TPS5120
TMS320VC5420	1.8V core	TPS3306-18	UCC3941-ADJ	TPS76618	TPS70151	-	TPS77618	TPS767D318	TPS76818	TPS767D318	TPS75418	-	TPS56302	-	TPS75518	PT6931	UCC3585	TPS56302
(100 MHz)	3.3V I/O		TPS61006	TPS76933		UCC3941-3	TPS76633		TPS77633		TPS76833		or TPS5120	TPS62007	TPS75433		UCC3585	or TPS5120
TMS320C5421	1.8V core	TPS3306-18	-	TPS76618	TPS70151	-	TPS77618	TPS767D318	TPS77818	TPS767D318	TPS77818	-	TPS56302		TPS75718	PT6931	UCC3585	TPS56302
(100 MHz)	3.3V I/O		UCC39412	TPS77033		UCC39412	TPS77033		TPS76933		TPS76633		or TPS5120	TPS62007	TPS77633		UCC3585	or TPS5120
TMS320C5441	1.5Vcore	TPS3306-15	-	TPS77615	TPS70158	-	TPS76815	TPS767D315	TPS75415	-	TPS75515	-	TPS56302	-	-	PT6935	UCC3585	TPS56302
(133 MHz)	3.3VI/O		UCC39421	TPS77033		REG711-33	TPS76933		TPS77633		TPS77633		or TPS5120	TPS62007	TPS77833		UCC3585	or TPS5120
TMS320C5510	1.6V core	TPS3707-33	TPS61000	TPS76901	TPS70702	TPS61000	TPS76316	TPS70702	TPS76601	TPS70102	TPS77601	TPS767D301	TPS56302	TPS62000	TPS76801	PT6937	UCC3585	TPS56302
(200 Mhz)	3.3VI/O	dual config.	TPS60202	TPS77033		TPS61006	TPS76933		TPS76633		TPS77633		or TPS5120	TPS62007	TPS76833		UCC3585	or TPS5120

The following single output devices are available if additional system current at 3.3 V is needed

	<150 mA	<250 mA	<500 mA	<750 mA	<1 A	<1.5 A	<2 A	<3 A	5 A or more
Low Dropout Regulator	TPS76333	TPS76633	TPS77633	TPS77833	TPS76833	TPS75133	TPS75433	TPS75733	TPS75533
DC/DC Converter	TPS62007	TPS62007	TPS62007	-	-	-	-	-	-
DC/DC Controller	N/A	N/A	N/A	N/A	UCC3585	UCC3585	UCC3585	UCC3585	UCC3585
Plug-In Power Module	N/A	N/A	N/A	N/A	N/A	PT6405	PT6405	PT6405	PT6601

Note 1: Does not include other system current requirements in the application.
See **power.ti.com** for a complete product offering

	3.3V I/O		TPS62007	TPS76533		UCC3585	or TPS56300		TPS76633	UCC3585	or TPS56300		TPS77633	UCC3585	or TPS56300	
TMS320C64x	1.2V core	TPS3124J12	-	TPS75301	TPS70445	UCC3585	TPS5120	PT6931	-	UCC3585	TPS5120	PT6931	-	UCC3585	TPS5120	PT6931
(@ 500 MHz)	3.3V I/O	TPS3801K33	TPS62007	TPS77633		UCC3585			TPS76833	UCC3585			TPS75433	UCC3585		
TMS320C6701	1.8V core	TPS3306-15	-	TPS75318	TPS70351	UCC3585	TPS5120	PT6931	TPS75718	UCC3585	TPS5120	PT6931	TPS75518	UCC3585	TPS5120	PT6931
	3.3V I/O		TPS62007	TPS77333		UCC3585	or TPS56300		TPS77533	UCC3585	or TPS56300		TPS77733	UCC3585	or TPS56300	
TMS320C6701	1.9V core	TPS3707-33	-	TPS75301	TPS70302	UCC3585	TPS5120	PT6931	TPS75701	UCC3585	TPS5120	PT6935	TPS75501	UCC3585	TPS5120	PT6931
(167 MHz)	3.3V I/O	dual config.	TPS62007	TPS76533		UCC3585	or TPS56300		TPS77633	UCC3585	or TPS56300		TPS77833	UCC3585	or TPS56300	
TMS320C6711	1.8Vcore	TPS3306-18	-	TPS76818	TPS767D318	UCC3585	TPS5120	PT6931	TPS75418	UCC3585	TPS5120	PT6931	TPS75518	UCC3585	TPS5120	PT6931
	3.3V I/O		TPS62007	TPS76933		UCC3585	or TPS56300		TPS76633	UCC3585	or TPS56300		TPS77633	UCC3585	or TPS56300	
TMS320C6712	1.8Vcore	TPS3306-18	-	TPS77818	TPS767D318	UCC3585	TPS5120	PT6931	TPS75318	UCC3585	TPS5120	PT6931	TPS75718	UCC3585	TPS5120	PT6931
	3.3V I/O		TPS62007	TPS76933		UCC3585	or TPS56300		TPS76533	UCC3585	or TPS56300		TPS76633	UCC3585	or TPS56300	

The following devices are available if additional system current at 3.3 V is needed.							
	<500 mA	**<750 mA**	**<1 A**	**<1.5 A**	**<3 A**	**<5 A**	**>10 A**
Low Dropout Regulator	TPS77633	TPS77833	TPS76833	TPS75133	TPS75733	TPS75533	N/A
DC/DC Controller	N/A	N/A	UCC3585	UCC3585	UCC3585	UCC3585	TPS56100
Plug-In Power Module	N/A	N/A	N/A	PT6405	PT6405	PT6521	PT7705

Note (1): Does not include other system current requirements in the application.
See **power.ti.com** for the complete device offering.

DSP Power Selection Matrix
(by specific DSP)

		Supply Current for System Including One or More DSPs										
				Low Dropout Regulator				Switching Regulator			Plug-In	
				Single				Single		Dual	Single	
DSP Family	Typical DSP Supply Voltage/Current	SVS	Powering DSP Only	<250 mA	<500 mA	<750 mA	<1 A	<8 A	<12 A		<8 A	<12 A
C2000 Platform												
TMS320C203-80	5 V @ 76 mA	TPS3823-50	TPS76950	TPS76650	TPS77601	TPS77801	TPS76850	TPS5103	UC3572		PT6625	PT6724
TMS320F206	5 V @ 76 mA	TPS3823-50	TPS76950	TPS76650	TPS77601	TPS77801	TPS76850	TPS5103	UC3572	N/A	PT6625	PT6724
TMS320C209-57	5 V @ 76 mA	TPS3823-50	TPS76950	TPS76650	TPS77601	TPS77801	TPS76850	TPS5103	UC3572		PT6625	PT6724
TMS320LC203-40	3.3 V @ 40 mA	TPS3823-33	TPS76933	TPS76633	TPS77633	TPS7833	TPS76833	UCC3585	UC3572		PT6621	PT6721
TMS320LC206-40	3.3 V @ 50 mA	TPS3822-33	TPS76933	TPS76633	TPS77633	TPS7833	TPS76833	UCC3585	UC3572	N/A	PT6621	PT6721
TMS320C206-40	3.3 V Core @ 45 mA 5 V I/O @ 10 mA	TPS3305-33	TPS76933 TPS76950	TPS76633 TPS76650	TPS77633 TPS77601	TPS7833 TPS77801	TPS76833 TPS76850	UCC3585 TPS5103	UC3572 UC3572	TPS5120	PT6621 PT6625	PT6721 PT6724
TMS320C240	5 V @ 80 mA	TPS3823-50	TPS76950	TPS76650	TPS77601	TPS77801	TPS76850	TPS5103	UC3572		PT6625	PT6724
TMS320F240	5 V @ 80 mA	TPS3823-50	TPS76950	TPS76650	TPS77601	TPS77801	TPS76850	TPS5103	UC3572	N/A	PT6625	PT6724
TMS320F241	5 V @ 90 mA	TPS3823-50	TPS76950	TPS76650	TPS77601	TPS77801	TPS76850	TPS5103	UC3572		PT6625	PT6724
TMS320C242	5 V @ 90 mA	TPS3823-50	TPS76950	TPS76650	TPS77601	TPS77801	TPS76850	TPS5103	UC3572		PT6625	PT6724
TMS320F243	5 V @ 120 mA	TPS3823-50	TPS76550	TPS76650	TPS77601	TPS77801	TPS76850	TPS5103	UC3572		PT6625	PT6724
TMS320LC2402A	3.3 V @ 75 mA	TPS3823-33	TPS76933	TPS76633	TPS77633	TPS7833	TPS76833	UCC3585	UC3572		PT6621	PT6721
TMS320LC2404A	3.3 V @150 mA	TPS3823-33	TPS76533	TPS76633	TPS77633	TPS7833	TPS76833	UCC3585	UC3572		PT6621	PT6721
TMS320LC2406A	3.3 V @ 150 mA	TPS3823-33	TPS76533	TPS76633	TPS77633	TPS7833	TPS76833	UCC3585	UC3572	N/A	PT6621	PT6721
TMS320LF2402A	3.3 V @ 75 mA	TPS3823-33	TPS76933	TPS76633	TPS77633	TPS7833	TPS76833	UCC3585	UC3572		PT6621	PT6721
TMS320LF2406A	3.3 V @150 mA	TPS3823-33	TPS76533	TPS76633	TPS77633	TPS7833	TPS76833	UCC3585	UC3572		PT6621	PT6721
TMS320LF2407A	3.3 V @ 150 mA	TPS3823-33	TPS76533	TPS76633	TPS77633	TPS7833	TPS76833	UCC3585	UC3572		PT6621	PT6721

Device Selection Matrix
(by specific V_{IN} and I_{OUT})

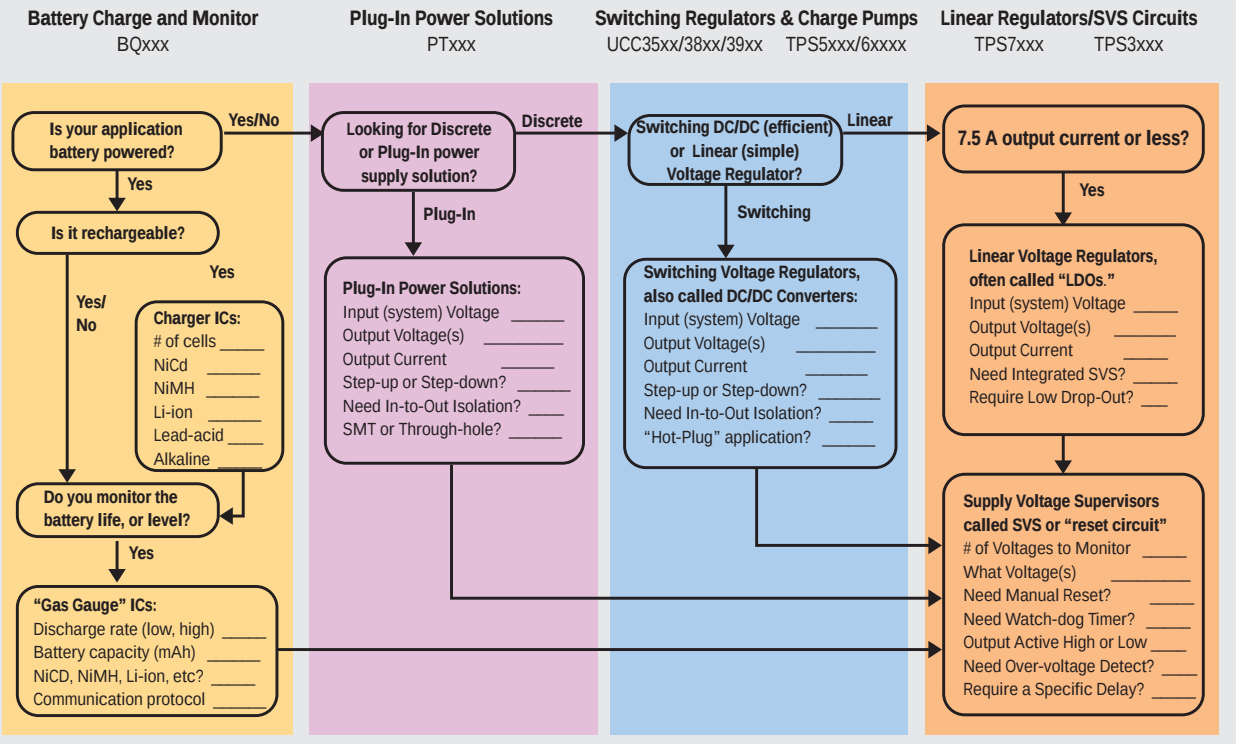
Input Voltage	System Current	Solution Type	Output Voltage for Processor Power Applications						
			Single Voltage		Split Rail Voltages with 3.3 V I/O				
			5 V	3.3 V	2.5 V Core	1.8 V Core	1.5 V Core	1.2 V Core	0.9 V Core
1 AA[2] cell 0.9 V min.	<200 mA	Boost Converter	UCC3941-5	UCC3941-3	UCC3941-ADJ	UCC3941-ADJ	UCC3941-ADJ	Use LDO[2]	-
	<100 mA	Boost Converter	UCC3941-5	TPS61006	TPS61003	TPS61002	TPS61001	Use LDO[2]	Use LDO[2]
	<50 mA	Boost Converter	UCC39413	UCC39412	UCC39411	UCC39411	UCC39411	Use LDO[2]	Use LDO[2]
2 AA[2] cells 1.8 V min.	<200 mA	Boost Converter	UCC3941-5	UCC3941-3	UCC3941-ADJ	UCC3941-ADJ	UCC3941-ADJ	Use LDO[2]	-
		Buck Converter	-	TPS62007	TPS62006	TPS62005	TPS62004	TPS62003	TPS62000
		Charge Pump	-	TPS60120/1	-	Use LDO[2]	Use LDO[2]	Use LDO[2]	Use LDO[2]
	<100 mA	Charge Pump	TPS60140	TPS60200/1	-	Use LDO[2]	Use LDO[2]	Use LDO[2]	Use LDO[2]
	<50 m A	Charge Pump	REG711-50	REG711-33	REG711-25	Use LDO[2]	Use LDO[2]	Use LDO[2]	Use LDO[2]
		Boost Converter	UCC39413	UCC39412	UCC39411	Use LDO[2]	Use LDO[2]	Use LDO[2]	Use LDO[2]
1 Lith-Ion 1.8-8.0 V	<3 A	Buck/Boost Controller	UCC39421	UCC39421	UCC39421/2	Use LDO[2]	Use LDO[2]	Use LDO[2]	Use LDO[2]
Devices accept 3.3 V_{IN} and 5 V_{IN}	<12 A	DC/DC Controller & LDO	-	TPS56300	TPS56300	TPS56300	TPS56300	-	-
		Plug-In Solution	-	-	PT7712	PT7712	PT7712	PT7703	PT7775
	<8 A	DC/DC Controller	UCC3585	UCC3585	UCC3585	UCC3585	UCC3585	UCC3585	UCC3585
		Dual Plug-In Solution	-	-	PT6935	PT6935	PT6935	PT6935	-
		Plug in Solution	-	-	PT6702	PT6702	PT6702	PT6605	-
	<5 A	LDO	TPS75501	TPS75533	TPS75525	TPS75518	TPS75515	TPS75501	-
		Plug-In Solution	PT6671	-	PT6523	PT6526	PT6522	PT6605	-
		Dual Plug-In Solution	-	-	PT6931	PT6931	PT6931	PT6931	-
	<3 A	Plug-In Solution	-	PT5501	PT5502	PT5504	PT5505	PT5506	-
		LDO	TPS75701	TPS75733	TPS75725	TPS75718	TPS75715	-	-
	<2 A	LDO	TPS75401	TPS75433	TPS75425	TPS75418	TPS75415	TPS75401	-
		Dual LDO	-	-	-	TPS70451	TPS70448	TPS70445	-
	<1.5 A	LDO	TPS75301	TPS75333	TPS75325	TPS75318	TPS75315	TPS75301	-
	<1 A	Dual LDO	-	-	TPS767D325	TPS767D318	TPS767D315	TPS767D301	-
		LDO	TPS76850	TPS76833	TPS76825	TPS76818	TPS76815	TPS76801	-
	<750 mA	LDO	TPS77801	TPS77833	TPS77825	TPS77818	TPS77815	TPS77801	-
	<500 mA	DC/DC Converter	TPS62100	TPS62100	TPS62100	TPS62100	TPS62100	TPS62100	TPS62100
		LDO	TPS77601	TPS77633	TPS77625	TPS77618	TPS77615	TPS77601	-
	<250 mA	LDO	TPS76650	TPS76633	TPS76625	TPS76618	TPS76615	TPS76601	-
		Dual LDO	-	-	TPS70158	TPS70151	TPS70148	TPS70145	-
	<150 mA	LDO	TPS76550	TPS76533	TPS76525	TPS76518	TPS76515	TPS76501	-
	<125 mA	Dual LDO	-	-	TPS70758	TPS70751	TPS70748	TPS70745	-
	<100 mA	LDO	TPS76950	TPS76933	TPS76925	TPS76918	TPS76915	TPS76912	TPS76201
	<50 mA	LDO	TPS77050	TPS77033	TPS77025	TPS77018	TPS77015	TPS77012	TPS76201
5 V_{IN} (see above row for more devices)	<12 A	Dual DC/DC Controller	TPS5120	TPS5120	TPS5120	TPS5120	TPS5120	TPS5120	TPS5120
		DC/DC Controller	-	TPS5103	TPS56100	TPS56100	TPS56100	TPS5103	-
		Plug-In Solution	-	PT6701	PT6701	PT6701	PT6701	PT7703	PT7775
	<8 A	DC/DC Controller	TPS5103	UCC3585	UCC3585	UCC3585	UCC3585	UCC3585	UCC3585
		Plug-In Solution	-	PT6935-37	PT6936/PT6931	PT6937	PT6932/PT6937	PT6933	-
		Dual Plug-In Solution	-	PT6521	PT6523	PT6526	PT6522	PT6605	-
12 V_{IN}	<12 A	DC/DC Controller	TPS5103	TPS5633	TPS5625	TPS5618	TPS5615	TPS5103	-
		Dual DC/DC Controller	TPS5120	TPS5120	TPS5120	TPS5120	TPS5120	TPS5120	TPS5120
		Plug-In Solution	PT6724	PT6721	PT6721	PT6721	PT6721	-	-
	<8 A	Plug-In Solution	PT6625	PT6621	PT6623	PT6622	PT6622	-	-
	<5 A	Plug-In Solution	PT6341	PT6342	PT6343	PT6344	PT6345	-	-
	<3 A	Plug-In Solution	PT6302	PT6303	PT6303	PT6303	PT6314	-	
24 V_{IN}	<12 A	DC/DC controller	UC3572	UC3572	UC3572	UC3572	UC3572	-	-
		Plug-In Solution	PT7751	PT7751	PT7751	PT4472	PT4472	-	-
	<8 A	Plug-In Solution	PT7751	PT7751	PT7751	PT4472	PT4472	-	-
	<5 A	Plug-In Solution	PT6653	PT6651	PT6652	PT4587	-	-	-
	<3 A	Plug-In Solution	PT6302	PT6303	PT6303	-	-	-	
48 V_{IN}	<12 A	Plug-In Solution	PT4484	PT4482	PT4482	PT4482	PT4482	PT4480	-
		DC/DC Controller	UC3578	UC3578	UC3578	-	-	-	-
	<8 A	Plug-In Solution	PT4562	PT4561	PT4564	PT4567	-	-	-
	<5 A	Plug-In Solution	PT4122	PT4121	PT4120	PT4120	PT4120	-	-
Supervisory Circuits			TPS3801I50	TPS3801K33	TPS3801J25	TPS3124J18	TPS3123G15	TPS3123J12	-
			-	-	TPS3305-25	TPS3305-18	TPS3306-15	-	-

(1) All devices shown operate with 3.3 V or 5 V. V_{IN} headroom may be needed to accommodate voltage drops .

(2) Select an LDO that can step down from a 3.3 V boost converter output voltage. 3.3 V is needed to power the I/O anyway.

See **power.ti.com** for the complete device offering.

Power Supply Decision Tree



This basic decision tree was designed to assist designers in quickly identifying the type of device(s) required.

To use this chart, start from the top left-hand portion (in yellow) and begin answering the questions. Based on your answers, follow the direction of the arrows given.

Please note that because of the many segments within power management, your decision often extends into other areas. For example, once you have determined that you require a switching voltage regulator, you may also need a supply voltage supervisor. Thus, you are directed to that area of the decision tree. It's that simple.

Notes