

TI POWER Management

Isolated and Non-Isolated Converter Solutions

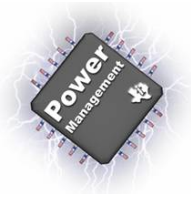
Agenda:

- Overview***
- Where do we go in POWER?***
- Some Product highlights***
- Tools and Support***

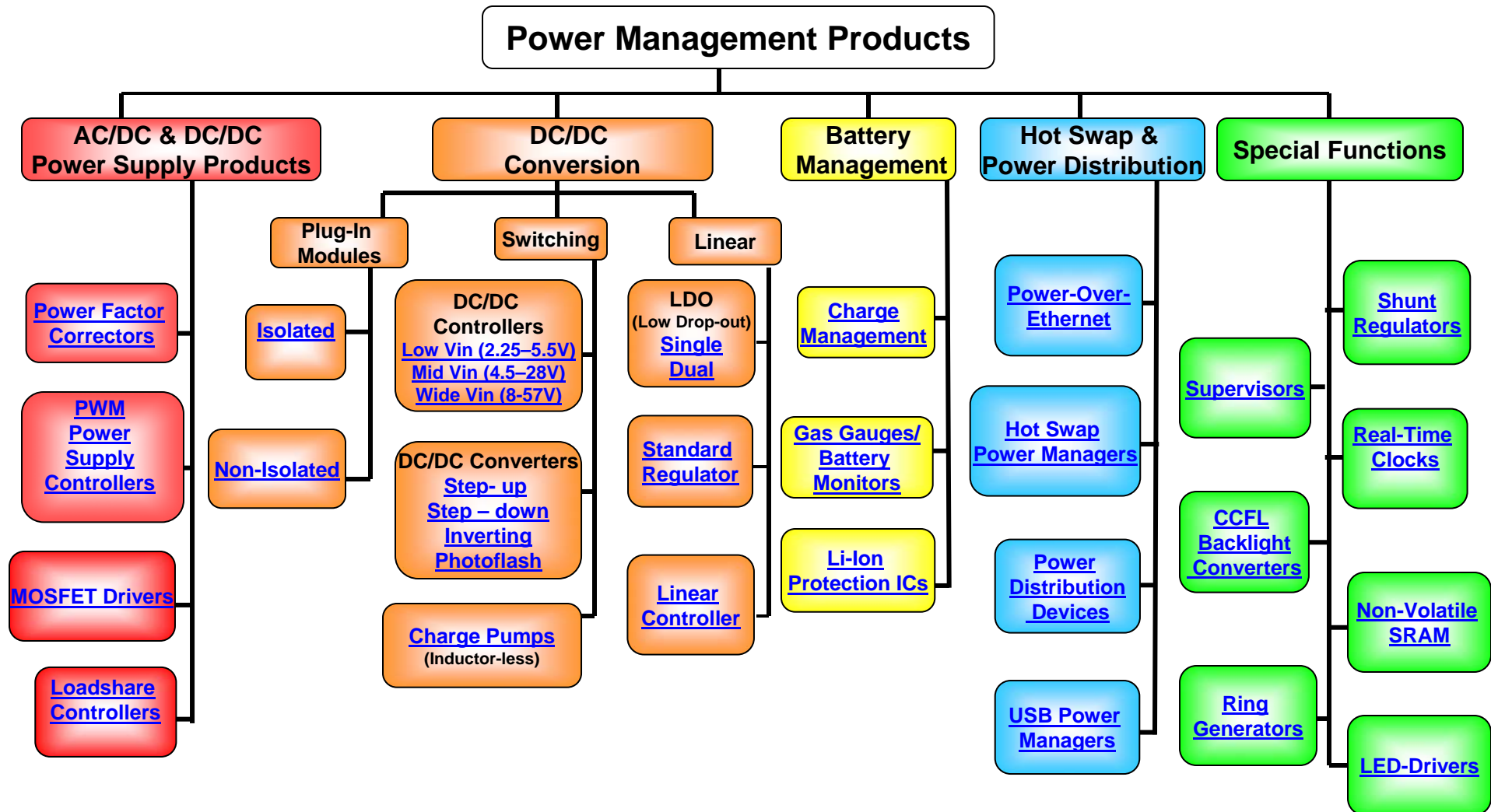
presented by

Juergen Schneider

Systems Engineer Power Solutions

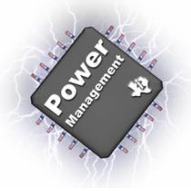


Power Management Products

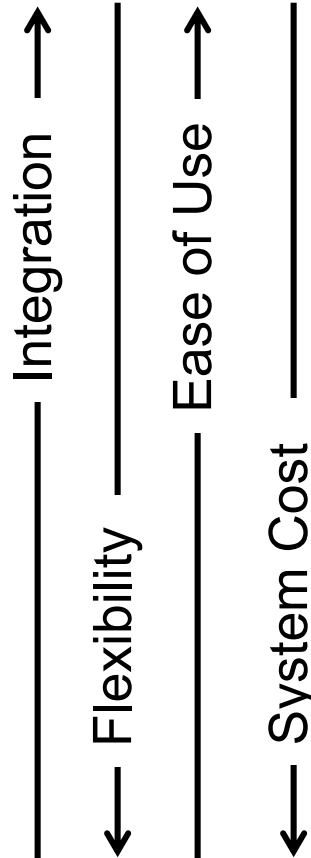
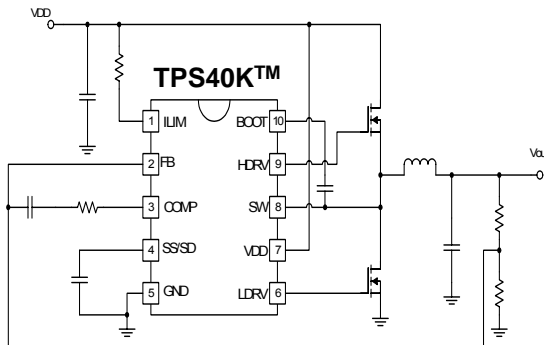
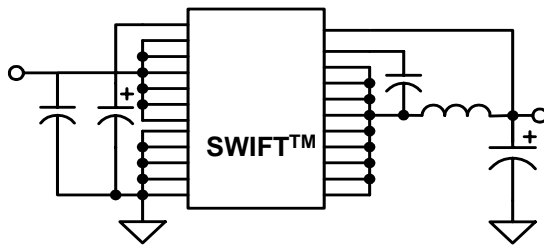
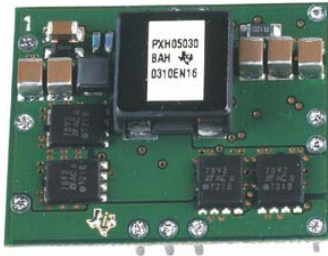


power.ti.com





DC/DC Conversion Products for Every Need



Plug In Power Modules - PTH series

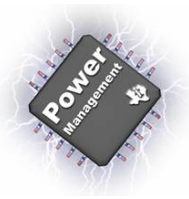
- Complete DC/DC solution
- Second sourced footprint and functionality – POLA alliance
- Fastest time to market

DC/DC Converters (integrated FETs): SWIFT/ TPS62k family

- Integrated power MOSFETs simplify design
- less board space needed
- Fewer components reduce bill of material
- Easy-to-use software tool

DC/DC Controllers (External FETs): TPS40k™

- Application and design flexibility
- Excellent total systems cost/value
- Easy-to-use software tool



Where do we go in POWER?

Portable Power: <3A

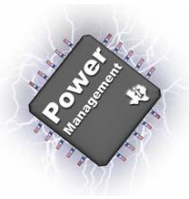
- ***ImpedanceTrack™ : highest accuracy in battery monitoring***
- ***Display and Lighting solutions***
- ***Power for FPGAs and INTEL Scale™***

System Power: >3A

- ***Higher Voltage IN***
- ***Power over Ethernet (PoE)***
- ***Digital Power, using DSPs for higher flexibility and efficiency***

Power Modules:

- ***Industrial applications with higher Vin: PTN78 Series***
- ***Miniaturization***



Product highlights:

**Low-power $<3A$
and battery management**



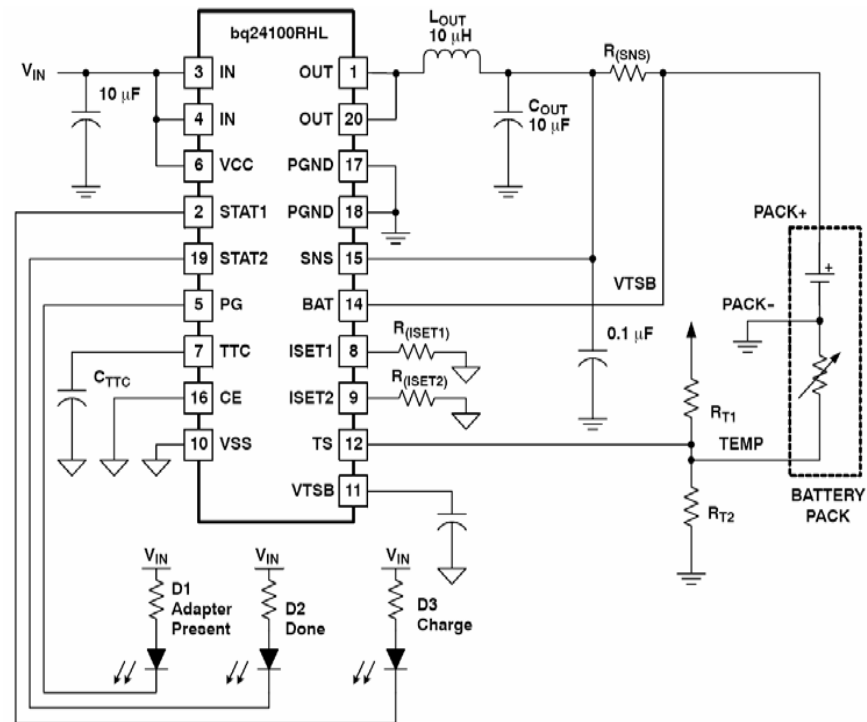
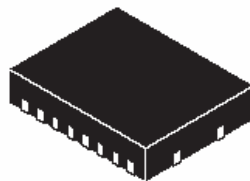
Most Integrated Synchronous Switch-Mode Charger with integrated FETs for 1,2,3-cell Li-Ion cells

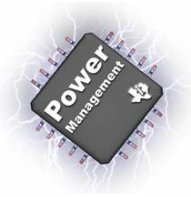
- 3.5 ... 16V input voltage
- 1.1 MHz PWM
- 2-A FETs, up to 2A charge current
- 3.5x4.5 mm² QFN (RHL)

bq2410x / bq2411x bq SWITCHER™

bq24100	1 cell (4.2V)	Standalone
bq24103	1 or 2 cell	Standalone
bq24105	Externally Programmable	Standalone
bq24108	1 cell (4.2V)	Standalone
bq24113	1 or 2 cell	System-controlled
bq24115	Externally Programm.	System-controlled

**bq24115 / bq2002
based
NiMH Charger**



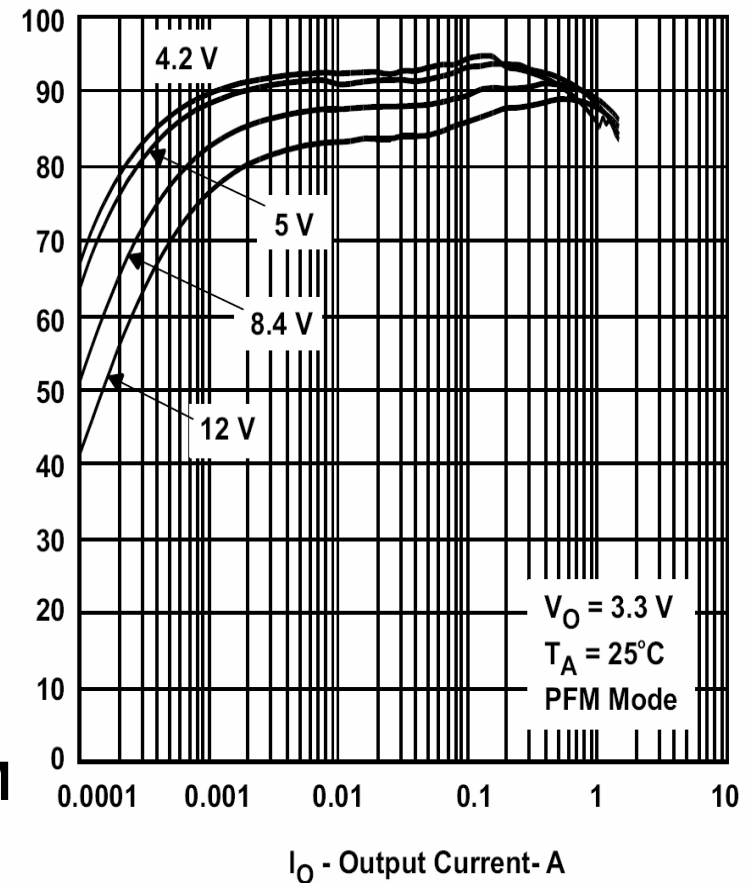
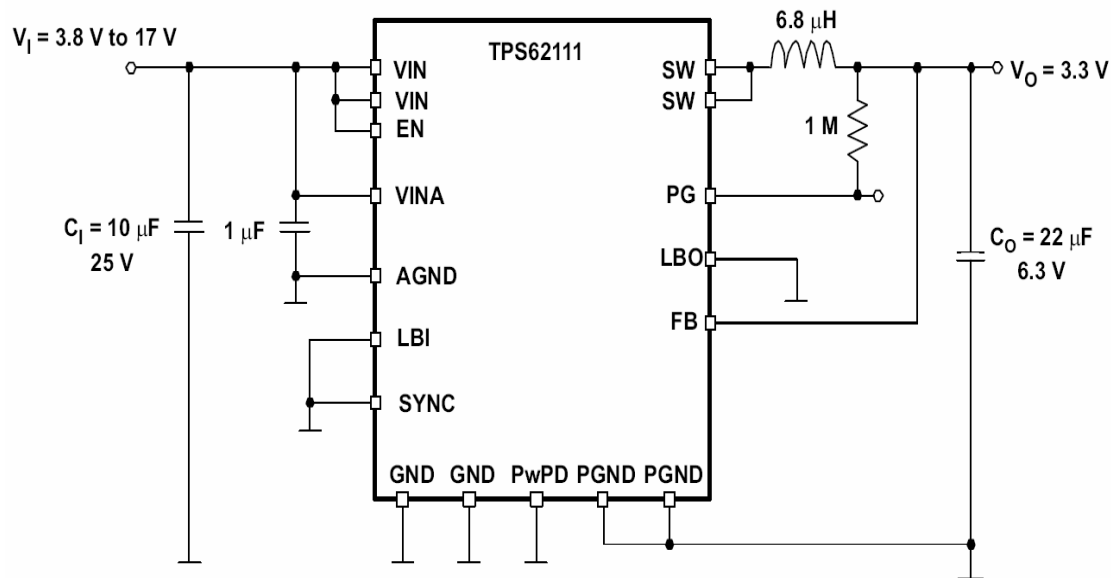


Synchronous Buck Converters

TPS62110 1.5A; 1MHz; Adjustable 1.2 ... 16V; QFN16

TPS62111 1.5A; 1MHz; 3.3V Output; QFN16

TPS62112 1.5A; 1MHz; 5V Output; QFN16



- 3.1 – 17V Input
- 20μA Quiescent Current
- Automatic PWM / PFM and Forced PWM
- 100% Max Dutycycle

6/22/2006



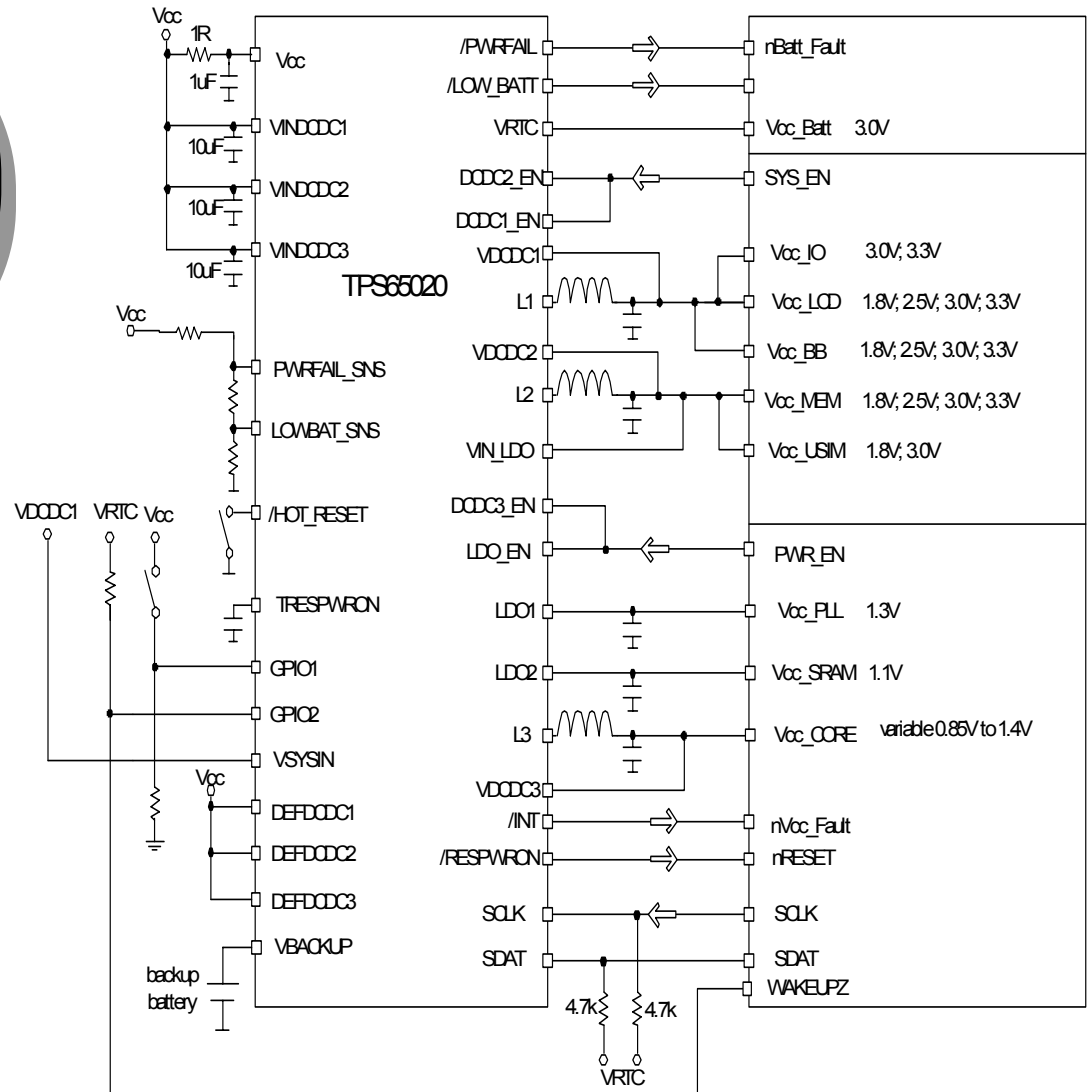
Highly integrated Buck Converters

TPS65020 / 21

Complete Power Management for

- Intel XScale Bulverde (PXA270)
- TI's OMAP1610, OMAP1710
- Samsung S3C2440, S3C2410A
- and other uP

- **5 Voltage Rails**
 - 3 x Step Down Converters (1.2A / 1A / 0.8A)
 - 2 x 50mA (200mA) LDOs
- **High Speed I2C Bus Control and Processor Support Functions**
- **Complete Backup Battery Support**





Product highlights:

Medium/high-power, 3A-20A



Inductive Buck Controller for 5V to 15V Busses

TPS40100

Inductive Buck Controller for 5V to 15V Busses

Power good

Frequency Synch

Output Margining
(+/- 5%; +/-3%)

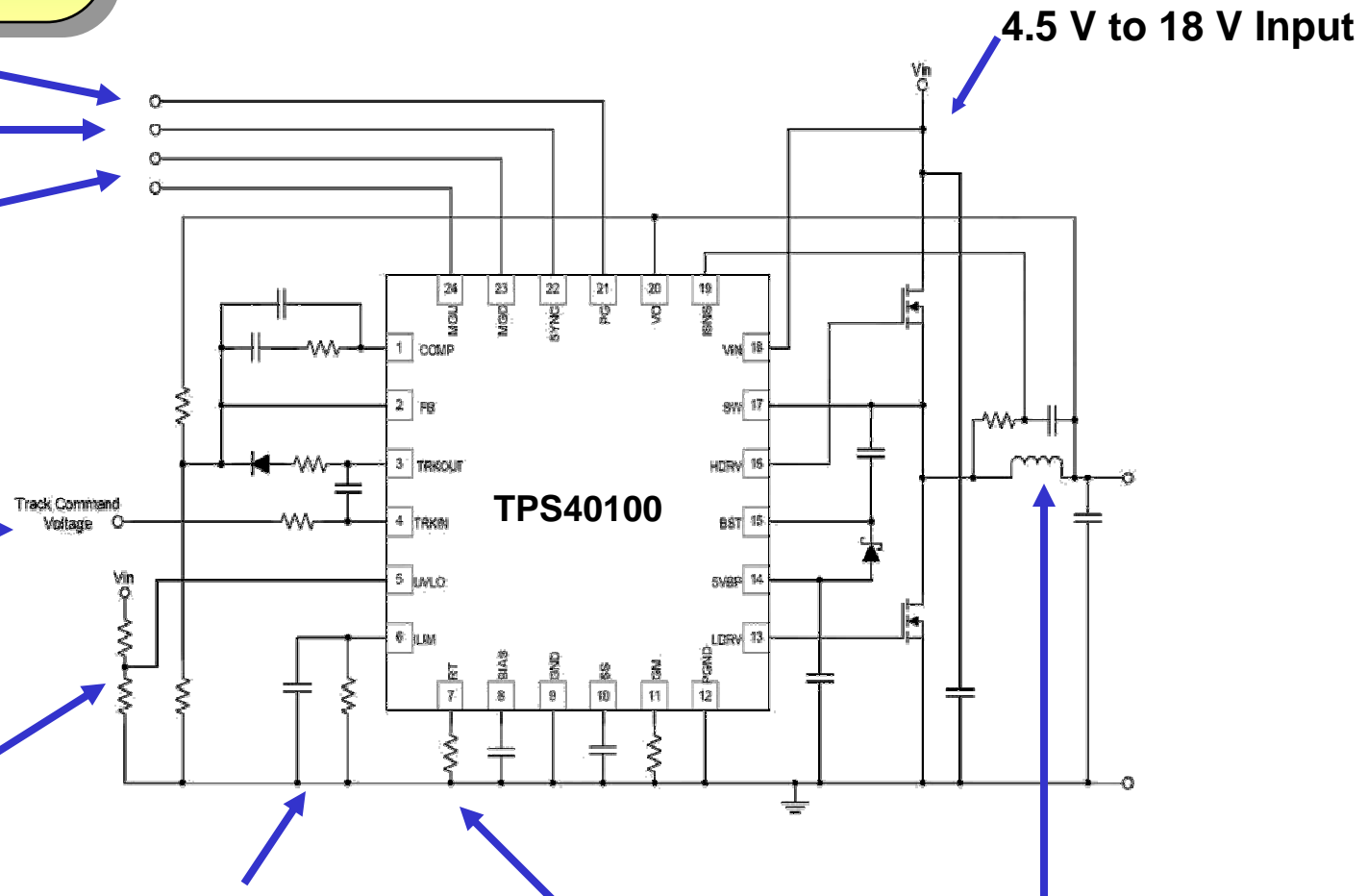
Voltage Tracking
for Simultaneous
Power up / down
Sequencing

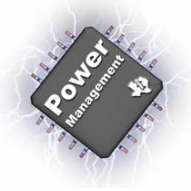
Programmable
UVLO & Hysteresis

Accurate
Overcurrent
Protection

Adjustable
Frequency
(100KHz-600KHz)

Peak Current Feedback
w/ Lossless DCR
Current Sensing





Wide Input Voltage Range Non-Synchronous Buck Controller

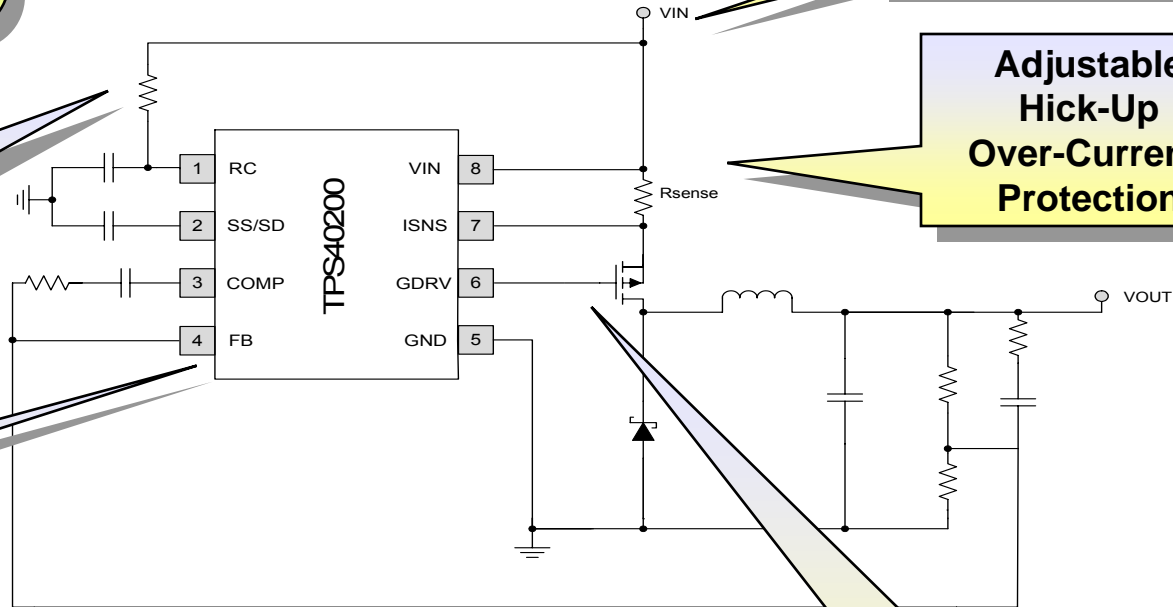
TPS40200 SO8

Programmable
and **Synchronizable**
Fixed Frequency
35 – 500kHz

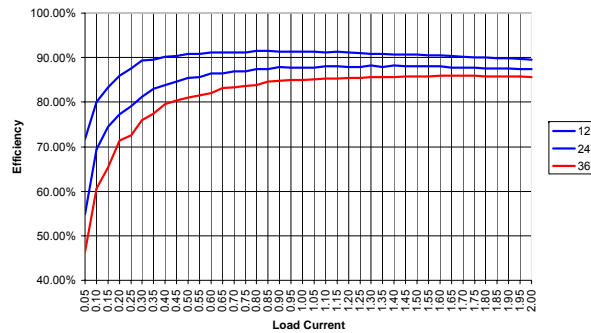
700mV / 2%
Reference

4.5 – 52V Input

Adjustable
Hick-Up
Over-Current
Protection

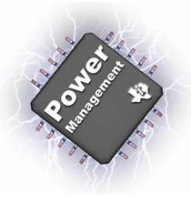


Efficiency over Line & Load, 5V Output Voltage:
12V, 24V and 36V Input



Integrated
Driver
for roughly
up to 3A
converter
output current

- Input Voltage Feed-Forward Compensation
- Closed Loop Soft-Start



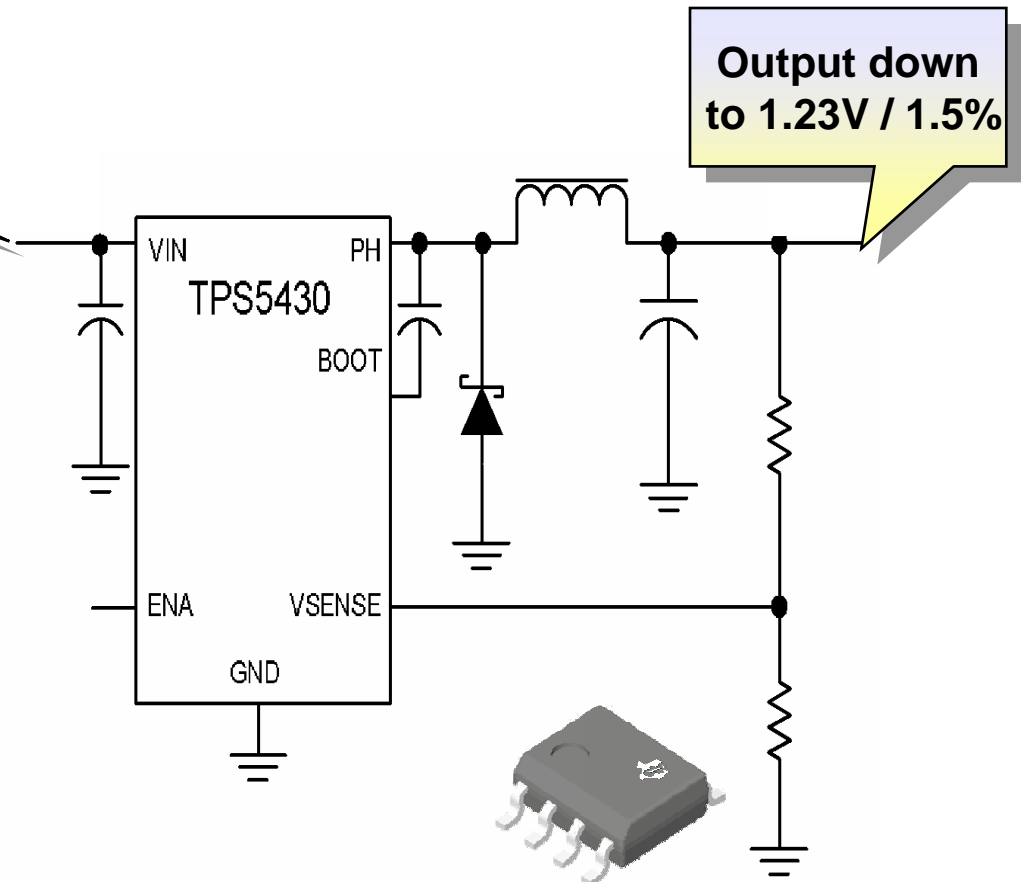
Wide VIN - Non-Synchronous SWiFTs

TPS5420 2000mA SO8 (PREVIEW)
TPS5430 3000mA SO8 PowerPAD

5.5 - 36V
Input

Output down
to 1.23V / 1.5%

- Small External Components due to **500kHz Switching** Frequency
- Reduced Power Dissipation Ensured **110mΩ Rds(on)**
- **Voltage Feed-Forward-Compensation** to Cover Line Variations
- Only **17μA Quiescent Current** when Disabled
- Overcurrent and Short-Circuit Protection by **Pulse-by-Pulse and Modified Hicup Mode**





PoE – Solutions for Both Ends of the Cable



48V / up to 13W Power
+ Data over up to 100m



**Wall Plug Adapter
not Longer Required !**

TPS2383B

8-Port **PSE** Power Manager

TPS2384

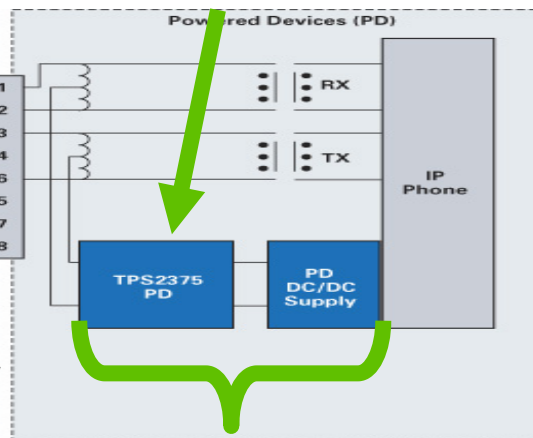
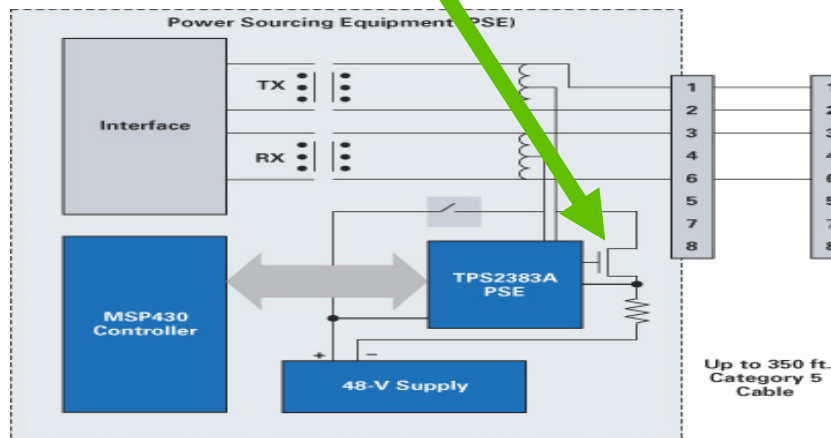
4-Port **PSE** Power Manager
with integrated Power-FETs

TPS2375 / 75-1 / 76 / 77 / 77-1

PD Interface Switch

TPS23750 / 70

PD Interface Switch + PWM Controller



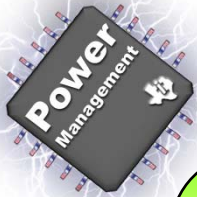
PD – Powered Device

- VoIP Phones
- WLAN Access Points
- Security Cameras
- Internet Appliances
- POS Terminals
- ...

PSE – Power Sourcing Equipment

Routers, Hubs, Switches, Mid-Span Injectors

PTB48540A / B / C **PD** Plug-In Module with
TVS, EMI-Filter, Interface Switch TPS2375,
Bridge Rectifiers, 10W Isolated DC/DC Converter



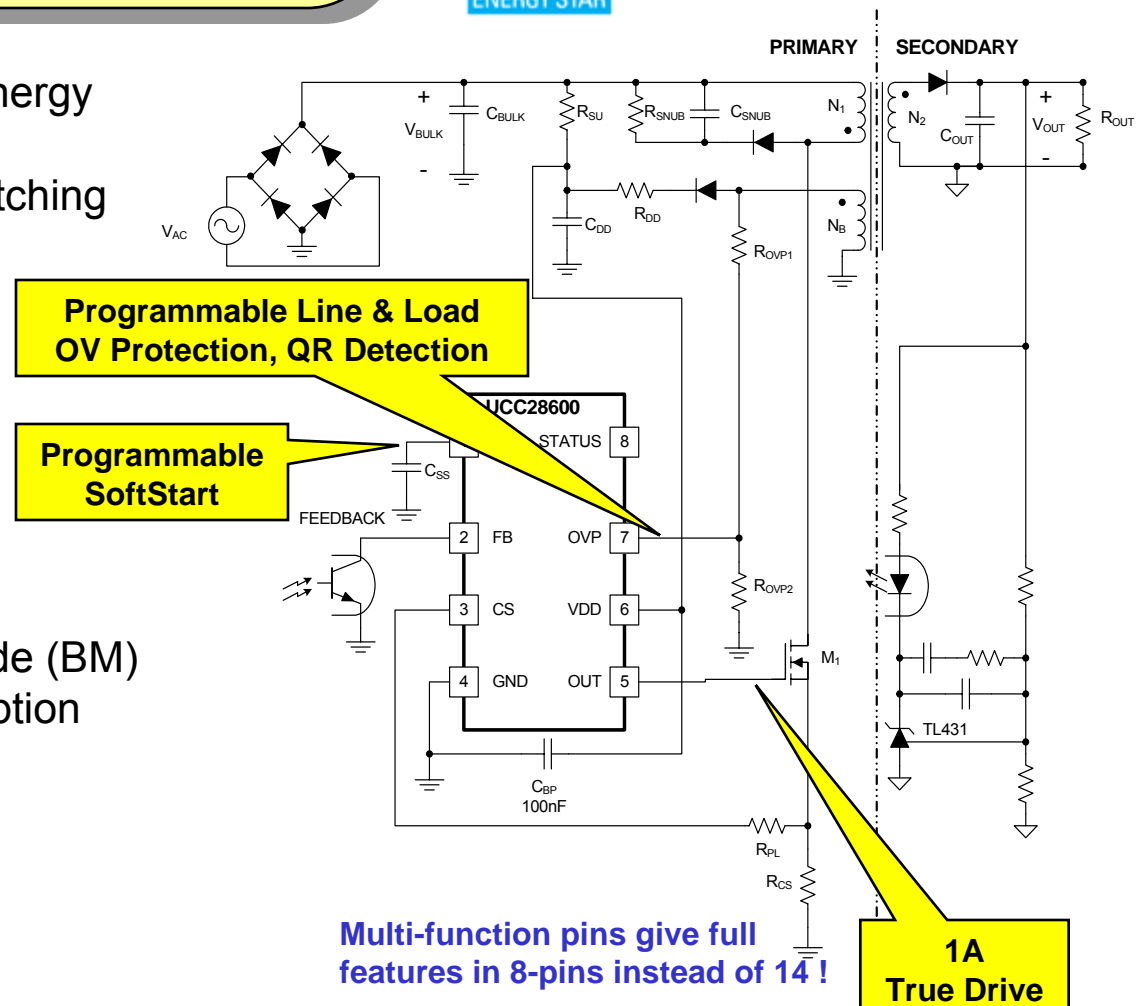
Green Mode PWM Controller

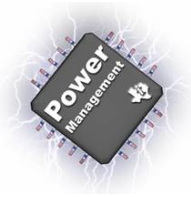
UCC28600

8-pin Quasi-Resonant
Green Mode PWM Controller



- Multi-Mode operation for advanced energy saving capability
 - Quasi Resonant (QR) / Valley Switching
 - Highest Efficiency
 - Lowest EMI / Inherent Spectral Spreading
 - Small Size Lower Cost Transformer by Improved Core Utilization
 - Minimizes Audio Noise
 - Frequency Foldback (FFB)
 - Low Frequency (40kHz) Burst Mode (BM)
- Only 150mW No-load power consumption
- Advanced current limit protection
 - Cycle by cycle power limit
 - Over-current hiccup restart mode

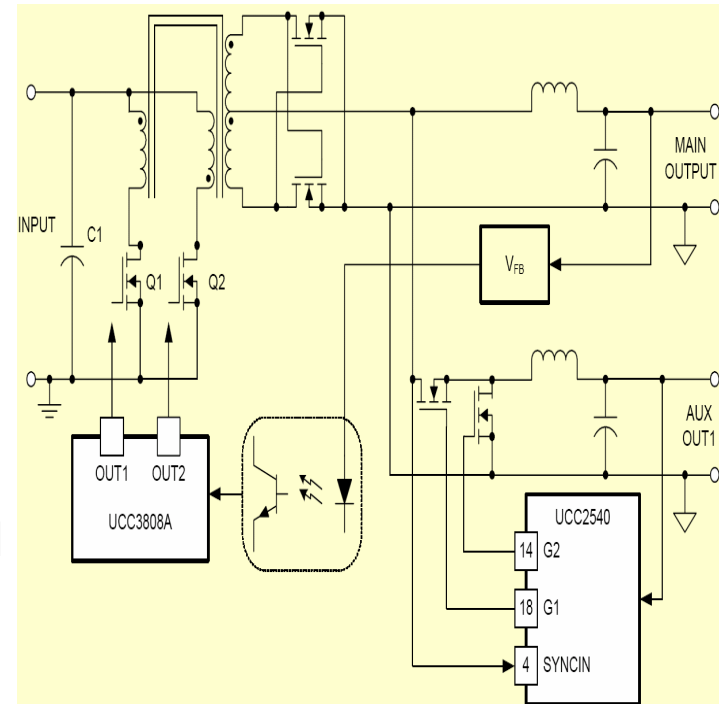


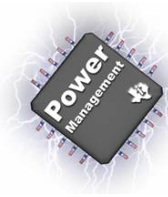


UCC2540 Secondary Side Synchronous Buck PWM with Predictive Gate Drive

For **Secondary Side Post Regulation** or **Use in Cascaded Topologies**

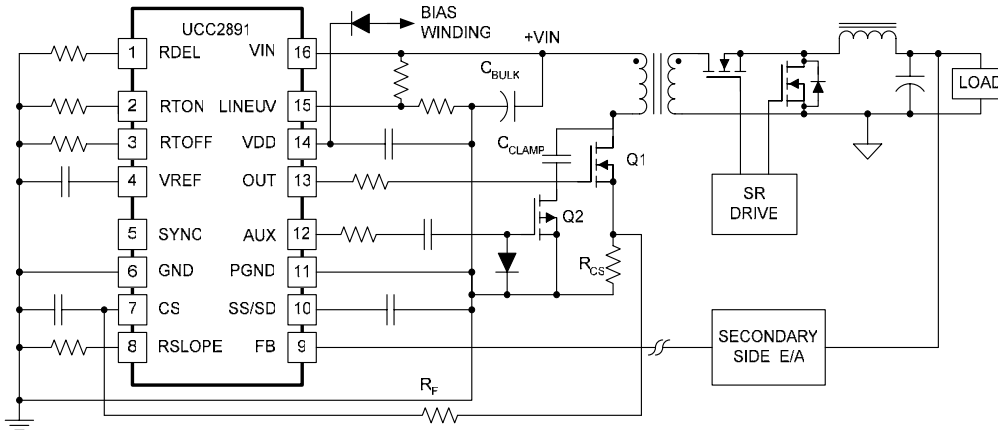
- Ideal solution for multiple output voltages
- Facilitates two-stage conversion with regulation complete on secondary side
- Leading Edge Modulation for optimized PWM regulation
- **“Predictive” Gate Drive for high efficiency**
- **Tracking Input for easy Power Sequencing**
- Voltage or Average Current Mode control
- Also works as stand-alone S/R Buck PWM Controller
- **3A TrueDrive for applications up to 50A**
- HTSSOP-20 PowerPad package





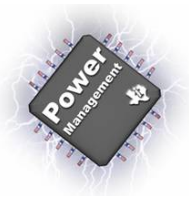
UCC2891/2/3/4/7

Current Mode Active Clamp PWM Controllers for High Efficiency Power Supplies



- **Re-Use of Magnetizing Energy**
- **Loss - Less Switching (ZVS at ON)**
- **Switch-Voltage Clamping**
- **Reduced EMI**
- **Duty Cycle > 50%**

Feature	Benefit
For Active Clamp Forward or Flyback topologies using Peak Current Mode Control	High Efficiency and Low EMP/RFI Operation with Cycle-by-Cycle Current Limit
1MHz Synchronizable Oscillator with Programmable Slope Compensation	Reduced Power Stage Size and Fewer External Components
Programmable Maximum Duty Cycle Clamp from 55% to 85%	Duty Cycle Limit For Protecting the Power Stage
Line Monitoring with Programmable OV, UV and Hysteresis	Accurate LINE Monitoring for System Protection
Integrated 2A Gate Drivers and Programmable Delay	Can Drive Large Main and SR MOSFETs and Allows ZVS of both Switches
UCC2891 and UCC2893 contains a 110-V Internal High Voltage Start-up JFET	Easy System Startup from a Wide Input Range Telecom Source

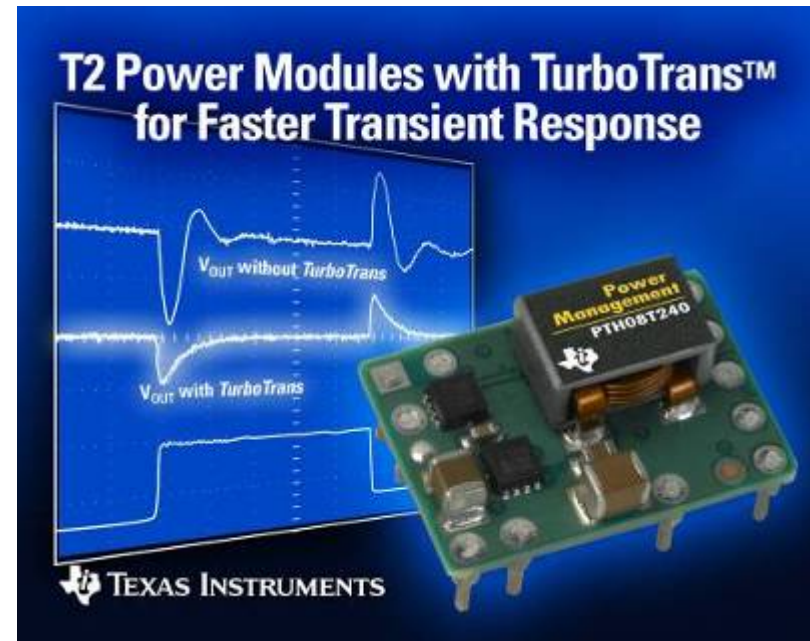


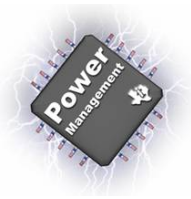
Product highlights:

Power Modules for Industrial Appl.

TurboTrans™ - T2 Modules

- *TurboTrans™* Technology
- Smart Sync
- 1.5% Regulation
- 50% Smaller Footprint
- Wide Input Voltage
 - 4.5V-14V
- Auto-Track™ Sequencing
- Pb Free and RoHS





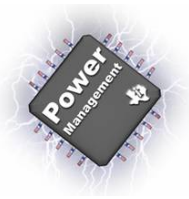
Power for Industrial Applications

PTN78 Series Wide Input Modules



Model	Input Voltage	Output Voltage	Output Current	Description	Package	Release Status
PTN78000W	$V_{OUT} < 10V = V_{OUT} + 2V \text{ to } 36V$ $V_{OUT} > 10V = V_{OUT} + 2.5V \text{ to } 36V$	2.5V to 12.6V	1.5A	Step-Down	Through Hole Surface Mount	Released
PTN78060W	$V_{OUT} < 10V = V_{OUT} + 2V \text{ to } 36V$ $V_{OUT} > 10V = V_{OUT} + 2.5V \text{ to } 36V$	2.5V to 12.6V	3A	Step-Down	Through Hole Surface Mount	Released
PTN78020W	$V_{OUT} < 10V = V_{OUT} + 2V \text{ to } 36V$ $V_{OUT} > 10V = V_{OUT} + 2.5V \text{ to } 36V$	2.5V to 12.6V	6A	Step-Down	Through Hole Surface Mount	Released
PTN78000H	$V_{OUT} \leq 18V = V_{OUT} + 3 \text{ to } 36V$ $V_{OUT} > 18V = V_{OUT} + 4 \text{ to } 36V$	12V to 22V	1.5A	Step-Down	Through Hole Surface Mount	Released
PTN78060H	$V_{OUT} \leq 18V = V_{OUT} + 3 \text{ to } 36V$ $V_{OUT} > 18V = V_{OUT} + 4 \text{ to } 36V$	12V to 22V	3A	Step-Down	Through Hole Surface Mount	Released
PTN78020H	$V_{OUT} \leq 18V = V_{OUT} + 3 \text{ to } 36V$ $V_{OUT} > 18V = V_{OUT} + 4 \text{ to } 36V$	12V to 22V	6A	Step-Down	Through Hole Surface Mount	Released
PTN78000A	7V to $(32 - V_{OUT})$	-3 to -15V	1.5A	Positive to Negative	Through Hole Surface Mount	Released
PTN78060A	9V to $(32 - V_{OUT})$	-3 to -15V	3A	Positive to Negative	Through Hole Surface Mount	Released
PTN78020A	9V to $(32 - V_{OUT})$	-3 to -15V	4A	Positive to Negative	Through Hole Surface Mount	Released
PTN04050A	2.90V to 7V	-3.3V to -15V	6W	Positive to Negative	Through Hole Surface Mount	Samples: Available Release: 3Q05
PTN04050C	2.95V to 5.5V	5V to 15V	10W	Boost	Through Hole Surface Mount	Samples: Available Release: 2Q05

6/22/2000

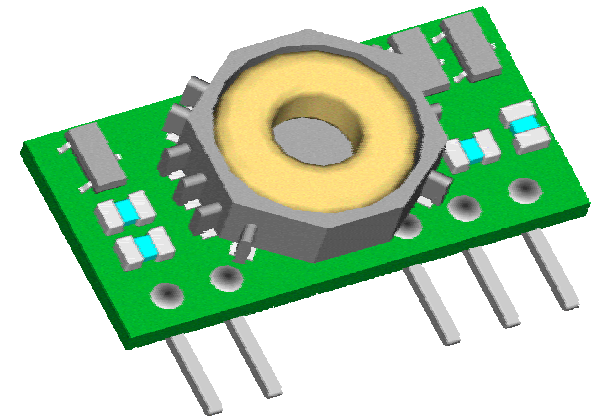
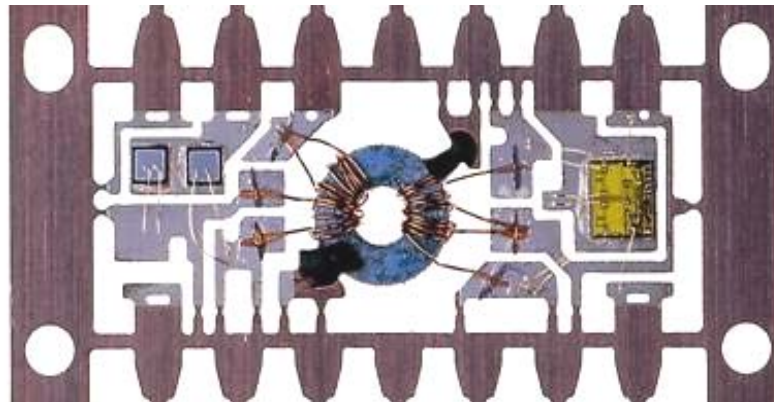


Miniature Isolated DC/DC Converters

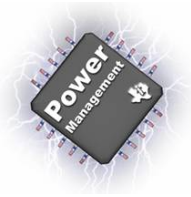
- Power range from **1W to 2W**
- Designed for analog circuitry in **industrial, medical and communications applications**
- Use as **low power isolated PoL converters** and for **removal of earth loops** in noisy or noise sensitive applications
- Unique **lead-frame based assembly process** or **open-frame technology**
- Standard DIL, Gull-Wing, SO and SIP packaging



1kV / 1.5kV Isolation



3kV Isolation



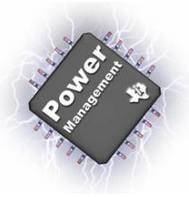
Tools and design software

TI's Power Landing Page
www.power.ti.com

The screenshot shows the Texas Instruments Power Management website. The header includes the TI logo and navigation links for Products, Applications, and Support. A search bar is present. The main content area is titled 'Power Management' and features a 'Product Tree' with categories like AC/DC and DC/DC Power Supplies, Battery Management, Hot Swap and Power Distribution, Linear Regulators, Plug-In Power Modules, Power Management Special Functions, Supervisory Circuits, Non-Isolated Switching DC/DC Regulators, Application Specific Multi-Output Solutions, Fusion Digital Power(TM) Control Solutions, Lighting and Display Solutions, and References. A 'Quick Search' section allows users to input parameters like Nominal Vin (V), Vout (V), and Iout (A). A 'Resources' section highlights the 'SWIFT Designer Software' and provides links to design guides, catalogs, and product news.

Designer Software for
SWIFTs / TPS40k / TPS62k

The screenshot displays the SWIFT Designer 2.0 software interface. The top menu bar includes File, Edit, Analysis, Design, Format, and Help. The main workspace shows a circuit schematic for a TPS54610 converter. The schematic includes components like capacitors (C1, C2, C3, C4, C5, C6, C7, C8), resistors (R1, R2, R3, R4, R5), and inductors (L1, L2). The output is labeled Vo. The left sidebar contains a 'Design Name' field (Design1) and a 'Required Inputs' table with values for Vout (V), Iout (A), Min Vin (V), and Max Vin (V). Below this is an 'Advanced/Optional' section with parameters like Vo Ripple (mV-p-p), Slow Start Time (ms), Sw Freq (kHz), Input Ripple (mV-p-p), Min. Gain Margin (dB), and Min. Phase Margin. The bottom status bar shows the Texas Instruments logo and the text 'SWIFT Designer 2.0'.



Summary:

- Overview***
- Where do we go in POWER?***
- Some Product highlights***
- Tools and Support***