



Features

- 60A Output Current
- Multi-Phase Topology
- +5V Input
- 5-bit Programmable:
1.3V to 3.5V
1.075V to 1.850V
- High Efficiency
- Differential Remote Sense
- Short Circuit Protection
- Output Tracking Feature
- Over-Temp Shutdown
- Power Good & OV Flag
- Low-Profile Package
- Solderable Copper Case
- “Current Booster”
Compatible

Ordering Information

PT8001□ = 1.3 to 3.5 Volts
PT8002□ = 1.075 to 1.850 Volts

PT Series Suffix (PT1234X)

Case/Pin Configuration

Vertical Through-Hole	N
Horizontal Through-Hole	A
Horizontal Surface Mount	C

For dimensions and PC board layout, see
Package Styles 1600, 1610 and 1615

Description

The PT8000 series is a 60 A high-performance, Integrated Switching Regulator (ISR) housed in a single low-profile 44-pin SIP package. Operating from an input voltage of +5V, the PT8000 series offers a state-of-the-art “Plug-in Power” solution for highly-integrated digital systems that demand high power supply currents at low voltages.

The output voltage from these modules is programmable over a preset range via a 5-bit input. The PT8001 may be set from 1.3V to 3.5V, which is compatible with Intel’s Pentium Pro® μ -processors. The output voltage of the PT8002 is programmable from 1.075V to 1.85V.

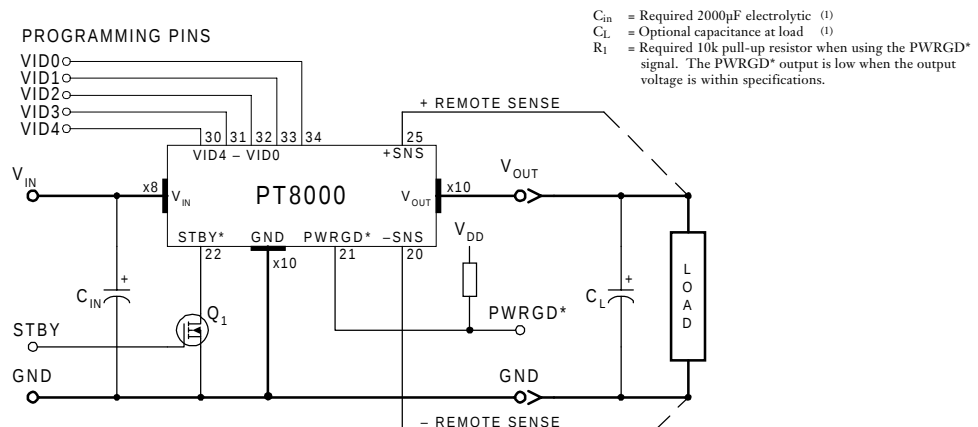
The PT8000 series incorporates many features to facilitate system

integration. Output short-circuit protection and over-temperature shutdown enables these modules to survive any load fault. Two self-diagnostic signals, “Power Good” (PWRGD*) and “Over-Voltage Flag” (OVF*) are provided. And a unique tracking feature allows the output to be synchronized to a master ramp voltage during power-up.

Other features include a standby input, and a differential remote sense to compensate for voltage drop between the ISR and load.

A low ESR capacitance of 2000 μ F is required at the input for proper operation.

Standard Application



Pin-Out Information

Pin	Function	PinFunction
1	V _{out}	16 GND
2	V _{in}	17 GND
3	V _{in}	18 GND
4	GND	19 V _{out}
5	GND	20 Remote Sense Gnd
6	V _{in}	21 PWRGD*
7	V _{in}	22 STBY*
8	V _{out}	23 OVF*
9	V _{out}	24 Track
10	V _{out}	25 Remote Sense V _{out}
11	Synch 1	26 V _{out}
12	Synch 2	27 GND
13	Synch 3	28 GND
14	Synch 4	29 GND
15	Do Not Connect	30 VID4

For STBY* pin; Open = output enabled
Gnd = output disabled.

PinFunction
31 VID3
32 VID2
33 VID1
34 VID0
35 V _{out}
36 V _{out}
37 V _{out}
38 V _{in}
39 V _{in}
40 GND
41 GND
42 V _{in}
43 V _{in}
44 V _{out}

Programming Information

PT8001						PT8002	
VID3	VID2	VID1	VID0	VID4=1 Vo	VID4=0 Vo	VID4=1 Vo	VID4=0 Vo
1	1	1	1	2.0V	1.30V	1.075V	1.475V
1	1	1	0	2.1V	1.35V	1.100V	1.500V
1	1	0	1	2.2V	1.40V	1.125V	1.525V
1	1	0	0	2.3V	1.45V	1.150V	1.550V
1	0	1	1	2.4V	1.50V	1.175V	1.575V
1	0	1	0	2.5V	1.55V	1.200V	1.600V
1	0	0	1	2.6V	1.60V	1.225V	1.625V
1	0	0	0	2.7V	1.65V	1.250V	1.650V
0	1	1	1	2.8V	1.70V	1.275V	1.675V
0	1	1	0	2.9V	1.75V	1.300V	1.700V
0	1	0	1	3.0V	1.80V	1.325V	1.725V
0	1	0	0	3.1V	1.85V	1.350V	1.750V
0	0	1	1	3.2V	1.90V	1.375V	1.775V
0	0	1	0	3.3V	1.95V	1.400V	1.800V
0	0	0	1	3.4V	2.00V	1.425V	1.825V
0	0	0	0	3.5V	2.05V	1.450V	1.850V

Logic 0 = Pin 20 potential (remote sense gnd)

Logic 1 = Open circuit (no pull-up resistors)

VID3 and VID4 may not be changed while the unit is operating.

Specifications

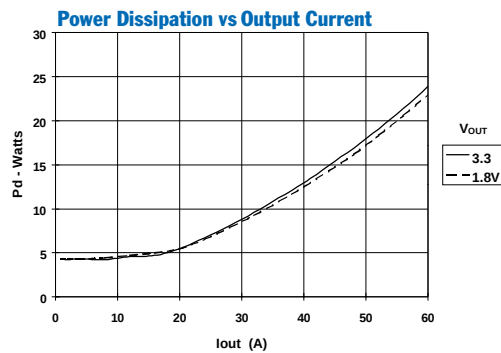
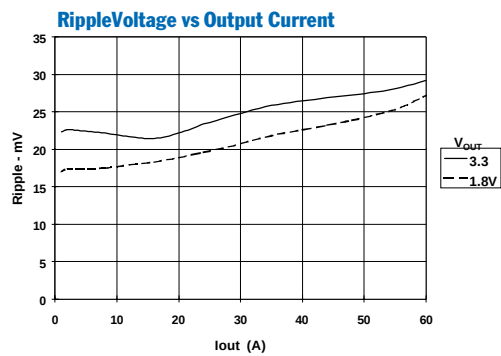
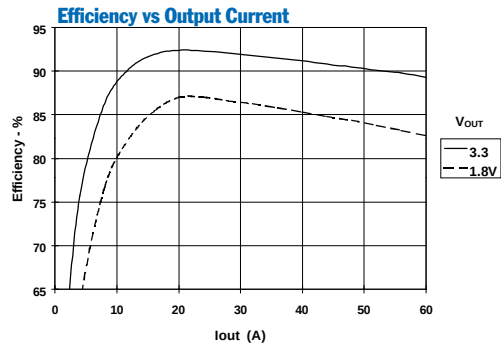
Characteristics (T _a = 25°C unless noted)	Symbols	Conditions	PT8000 SERIES			
			Min	Typ	Max	Units
Output Current	I _o	T _a = +50°C, 400 LFM, pkg N T _a = +25°C, natural convection	0.1 (1) 0.1 (1)	—	60 (2) 30 (2)	A
Input Voltage Range	V _{in}	0.1A ≤ I _o ≤ 60A	4.5	—	5.5	V
Output Voltage Tolerance	ΔV _o	Over V _{in} range, I _o = I _o max 0°C ≤ T _a ≤ +60°C	V _o -0.03	—	V _o +0.03	V
Line Regulation	Reg _{line}	Over V _{in} range, I _o = I _o max	—	±1.0	±10	mV
Load Regulation	Reg _{load}	V _{in} = 5V, 0.1 ≤ I _o ≤ I _o max	—	±1.0	±10	mV
V _o Ripple/Noise pk-pk	V _n	V _{in} = 5V, I _o = 60A	—	50	—	mV
Transient Response (no external capacitance)	t _{tr} V _{os}	I _o step from 30A to 60A in 6μs V _o over/undershoot	— —	50 100	— —	μs mV
Efficiency	η	V _{in} = +5V, I _o = 30A, V _o = 3.3V V _o = 1.8V	— —	92 86	— —	%
Switching Frequency	f _o	Over V _{in} and I _o ranges	1.3	—	1.5	MHz
STBY* (pin 22)	Off On		0 Note (2)	—	0.8	V
PWRGD* (pin 21)	On Off	85% < V _{out} < 115% of VID set point V _{out} < 85%, or V _{out} > 125% of VID set point	— —	500 500	— —	Ω kΩ
OVF* (pin 23)	On Off	V _{out} > 125% of VID set point V _{out} < 115% of VID set point	— —	500 500	— —	Ω kΩ
Over-temperature Shutdown Point	OTP	Case temperature -Auto reset	—	105	—	°C
Absolute Maximum Operating Temperature Range	T _a	—	-40	—	+85 (3)	°C
Storage Temperature	T _s	—	-40	—	+125	°C
Weight	—	Vertical/Horizontal	—	110	—	grams

Notes: (1) The ISR will operate down to no load with reduced specifications.

(2) Specified as “Open-Circuit.” Either an “open-collector” bipolar transistor, or “open-drain” MOSFET is recommended for controlling this input.

(3) See Safe Operating Area curves or contact the factory to determine the appropriate derating.

Input Filter: To facilitate the high output fast transient performance, a high quality 2,000μF input capacitor(s) is required for the PT8000 series. Use either tantalum or Oscon® type capacitors with a maximum ESR (equivalent series resistance) of 20mΩ.

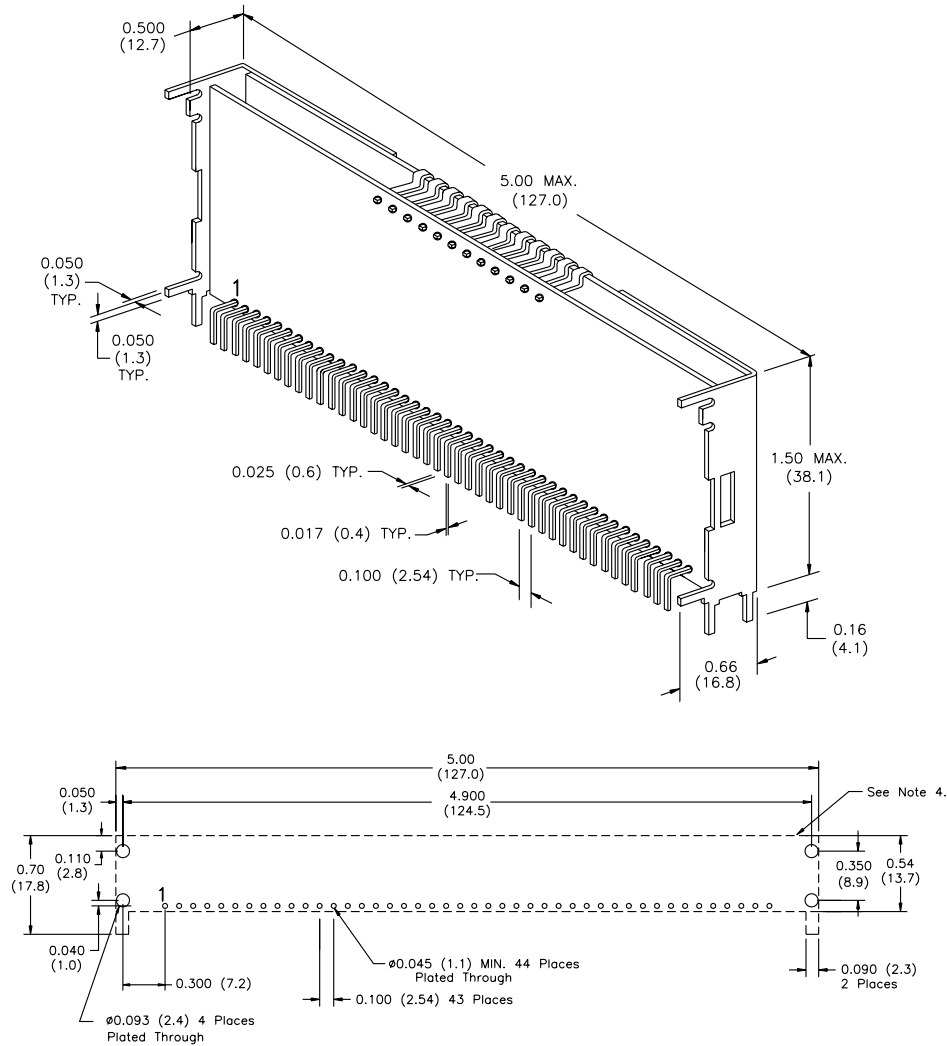
Performance Characteristics, $V_{in} = 5.0V$ (See Note A)

Note A: Characteristic data has been developed from actual products tested at 25°C. This data is considered typical for the regulator.

Note B: Safe Operating Area curves represent conditions at which internal components are at or below manufacturer's rated operating temperatures.

PACKAGE INFORMATION AND DIMENSIONS

Vertical Through-Hole Mount (Suffix N)



PC Layout

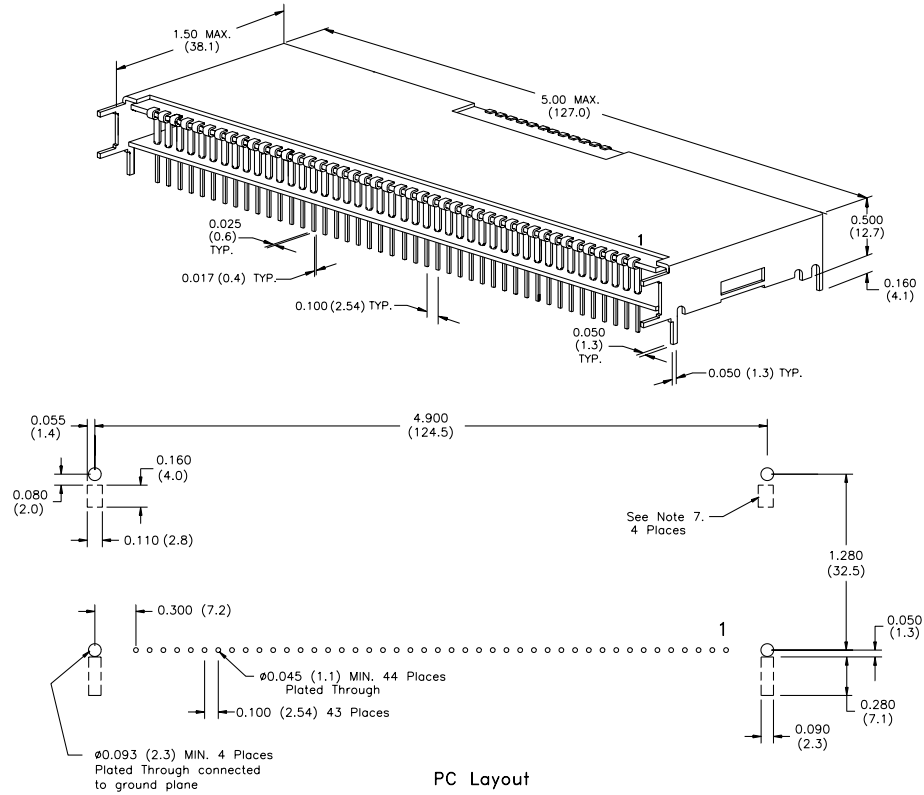
Notes: (Rev. A)

- 1: All dimensions are in inches (mm).
- 2: 2 place decimals are ± 0.030 (± 0.8 mm).
- 3: 3 place decimals are ± 0.010 (± 0.3 mm).
- 4: Recommended mechanical keep out area (dotted line).

**Power Trends proprietary package design.
All rights reserved. Patent pending.**

PACKAGE INFORMATION AND DIMENSIONS

Horizontal Through-Hole Mount (Suffix A)

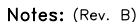


Notes: (Rev. A)

- 1: All dimensions are in inches (mm).
- 2: 2 place decimals are ± 0.030 (± 0.8 mm).
- 3: 3 place decimals are ± 0.010 (± 0.3 mm).
- 4: Recommended mechanical keep out area (dotted lines).

**Power Trends proprietary package design.
All rights reserved. Patent pending.**

Horizontal Surface Mount (Suffix C)



- 1: All dimensions are in inches (mm).
- 2: 2 place decimals are ± 0.030 ($\pm 0.8\text{mm}$).
- 3: 3 place decimals are ± 0.010 ($\pm 0.3\text{mm}$).
- 4: Vias are recommended to improve copper adhesion.
- 5: Power pin connections should utilize two or more vias per input, ground and output pin.
- 6: Solder mask openings to copper island for solder joints to mechanical pins.
- 7: Recommended mechanical keep out area (dotted lines).
- 8: Electrically connected case to ground plane.

For technical support and more information, see inside back cover or visit www.ti.com/powerrends

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
PT8002A	NRND	SIP MOD ULE	ERA	44		TBD	Call TI	Call TI
PT8002C	NRND	SIP MOD ULE	ERC	44		TBD	Call TI	Call TI
PT8002N	NRND	SIP MOD ULE	ERD	44		TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBsolete: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2009, Texas Instruments Incorporated