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.
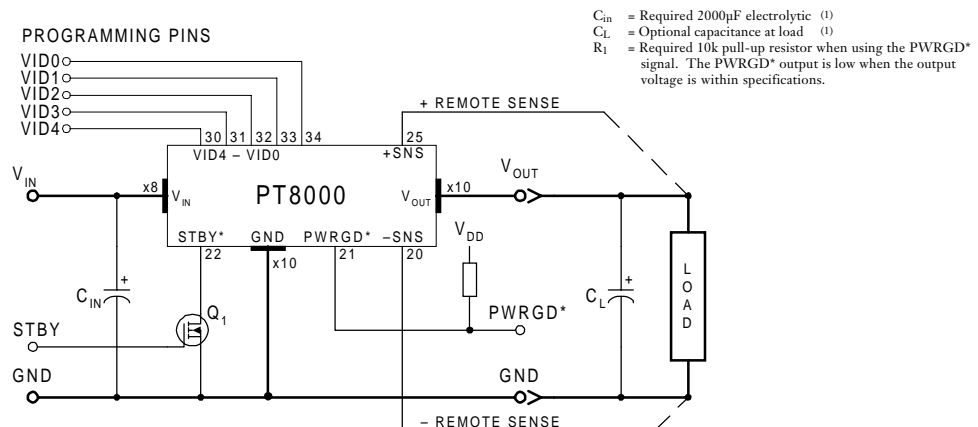
The PT8000 series incorporates many features to facilitate system integration. Output short-circuit protection and over-temperature shutdown enables these modules to survive any load fault. Two self-diagnosotic signals, "Power Good" (PWRGD*) and "Over-Voltage Flag" (OVF*) are provided. And a unique tracking 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 2000μF is required at the input for proper operation.

Standard Application

C_{in} = Required 2000μF electrolytic (1)
C_L = Optional capacitance at load (1)
R_1 = Required 10k pull-up resistor when using the PWRGD* signal. The PWRGD* output is low when the output voltage is within specifications.

PROGRAMMING PINS

VID0
VID1
VID2
VID3
VID4

+ REMOTE SENSE

30 31 32 33 34   25

VID4 – VID0   +SNS

V_{IN} x8 V_{IN} PT8000 V_{OUT} x10 V_{OUT}

STBY*   GND   PWRGD*   –SNS
22   x10   21   20

V_{DD}

C_{IN} Q_1
STBY

GND

PWRGD*

C_L

LOAD

GND

– REMOTE SENSE

PT8000—5V

60 Amp High-Performance Programmable ISR

Pin-Out Information

Pin	Function
1	V_{out}
2	V_{in}
3	V_{in}
4	GND
5	GND
6	V_{in}
7	V_{in}
8	V_{out}
9	V_{out}
10	V_{out}
11	Synch 1
12	Synch 2
13	Synch 3
14	Synch 4
15	Do Not Connect

Pin	Function
16	GND
17	GND
18	GND
19	V_{out}
20	Remote Sense Gnd
21	PWRGD*
22	STBY*
23	OVF*
24	Track
25	Remote Sense V_{out}
26	V_{out}
27	GND
28	GND
29	GND
30	VID4

Pin	Function
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}

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

Programming Information

VID3	VID2	VID1	VID0	PT8001 VID4=1 Vo	PT8001 VID4=0 Vo	PT8002 VID4=1 Vo	PT8002 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

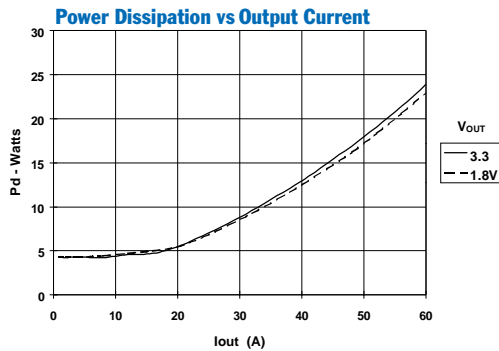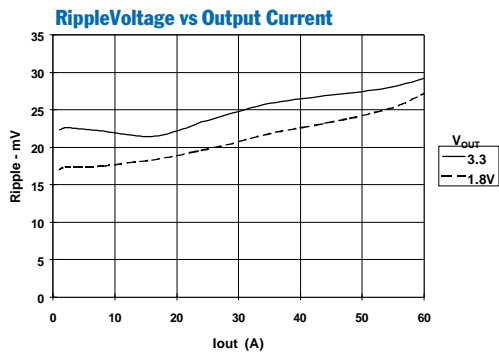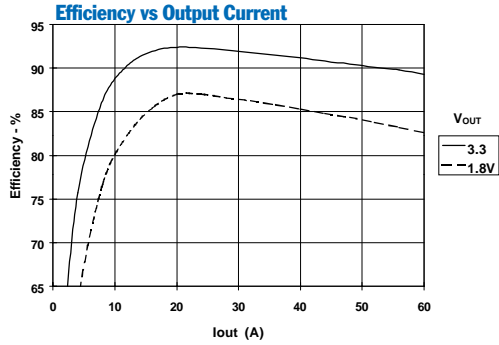| Characteristics (T$_a$= 25°C unless noted)	Symbols	Conditions	PT8000 SERIES Min	PT8000 SERIES Typ	PT8000 SERIES Max	Units
Output Current	I_o	T_a = +50°C, 400 LFM, pkg N / T_a = +25°C, natural convection	0.1 (1) / 0.1 (1)	— / —	60 (2) / 30 (2)	A
Input Voltage Range	V_{in}	$0.1A \le I_o \le 60A$	4.5	—	5.5	V
Output Voltage Tolerance	ΔV_o	Over V_{in} range, $I_o = Io_{max}$ / $0°C \le T_a \le +60°C$	V_o-0.03	—	V_o+0.03	V
Line Regulation	Reg_{line}	Over V_{in} range, $I_o = I_{max}$	—	±1.0	±10	mV
Load Regulation	Reg_{load}	V_{in} =5V, $0.1 \le I_o \le I_o$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	Off / On		0 / Note (2)	—	0.8	V
PWRGD* (pin 21) On / Off	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	On / Off	Vout > 125% of VID set point / Vout < 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 trqansient 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.
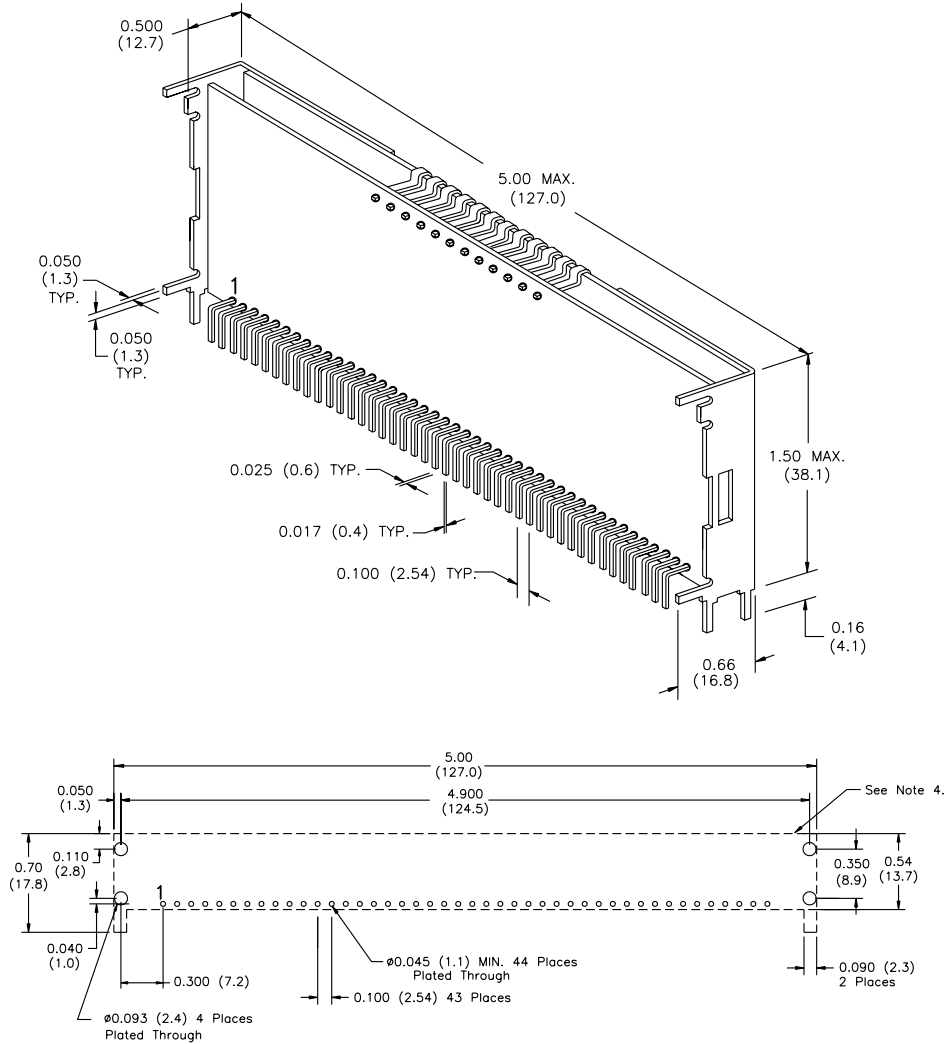
Performance Characteristics, V$_{in}$ =5.0V   (See Note A)

Efficiency vs Output Current

Efficiency - %

Iout (A)

V$_{OUT}$
3.3
1.8V

RippleVoltage vs Output Current

Ripple - mV

Iout (A)

V$_{OUT}$
3.3
1.8V

Power Dissipation vs Output Current

Pd - Watts

Iout (A)

V$_{OUT}$
3.3
1.8V

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 beow manufacturer's rated operating temperatures.*

TEXAS INSTRUMENTS

PACKAGE INFORMATION AND DIMENSIONS

Vertical Through–Hole Mount (Suffix N)

0.500 (12.7)

5.00 MAX. (127.0)

0.050 (1.3) TYP.

0.050 (1.3) TYP.

1

0.025 (0.6) TYP.

0.017 (0.4) TYP.

0.100 (2.54) TYP.

1.50 MAX. (38.1)

0.16 (4.1)

0.66 (16.8)

5.00 (127.0)

4.900 (124.5)

See Note 4.

0.050 (1.3)

0.110 (2.8)

0.70 (17.8)

1

0.350 (8.9)

0.54 (13.7)

0.040 (1.0)

0.300 (7.2)

Ø0.045 (1.1) MIN. 44 Places Plated Through

0.090 (2.3) 2 Places
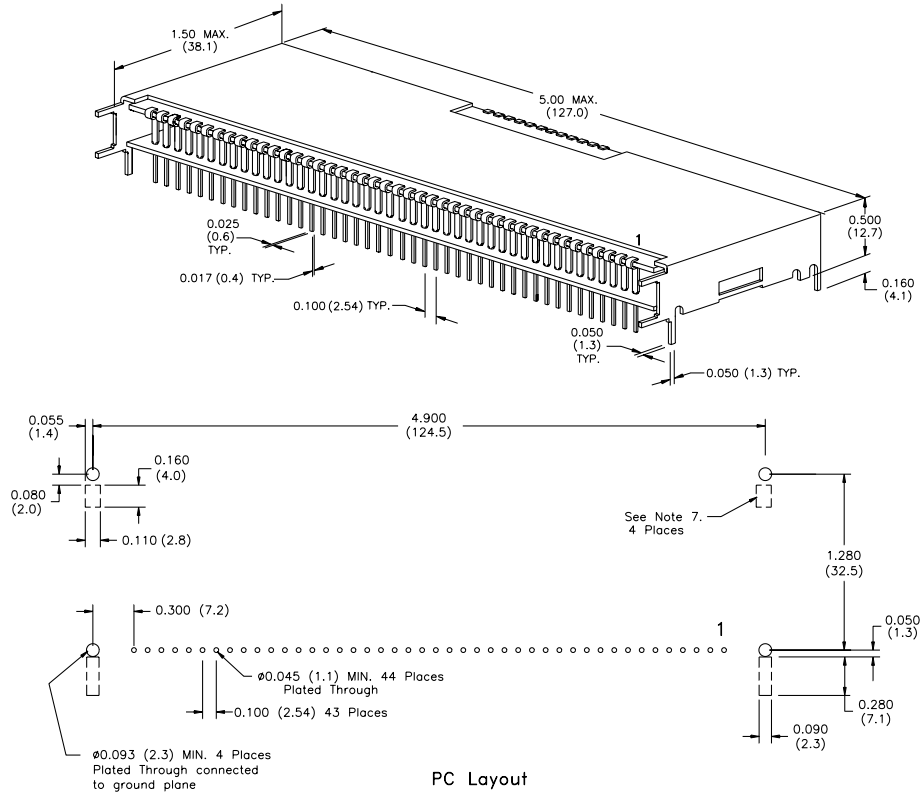
Ø0.093 (2.4) 4 Places Plated Through

0.100 (2.54) 43 Places

PC Layout

Notes: (Rev. A)
1: All dimensions are in inches (mm).
2: 2 place decimals are ±.030 (±0.8mm).
3: 3 place decimals are ±.010 (±0.3mm).
4: Recommended mechanical keep out area (dotted line).

**Power Trends proprietary package design.
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PACKAGE INFORMATION AND DIMENSIONS
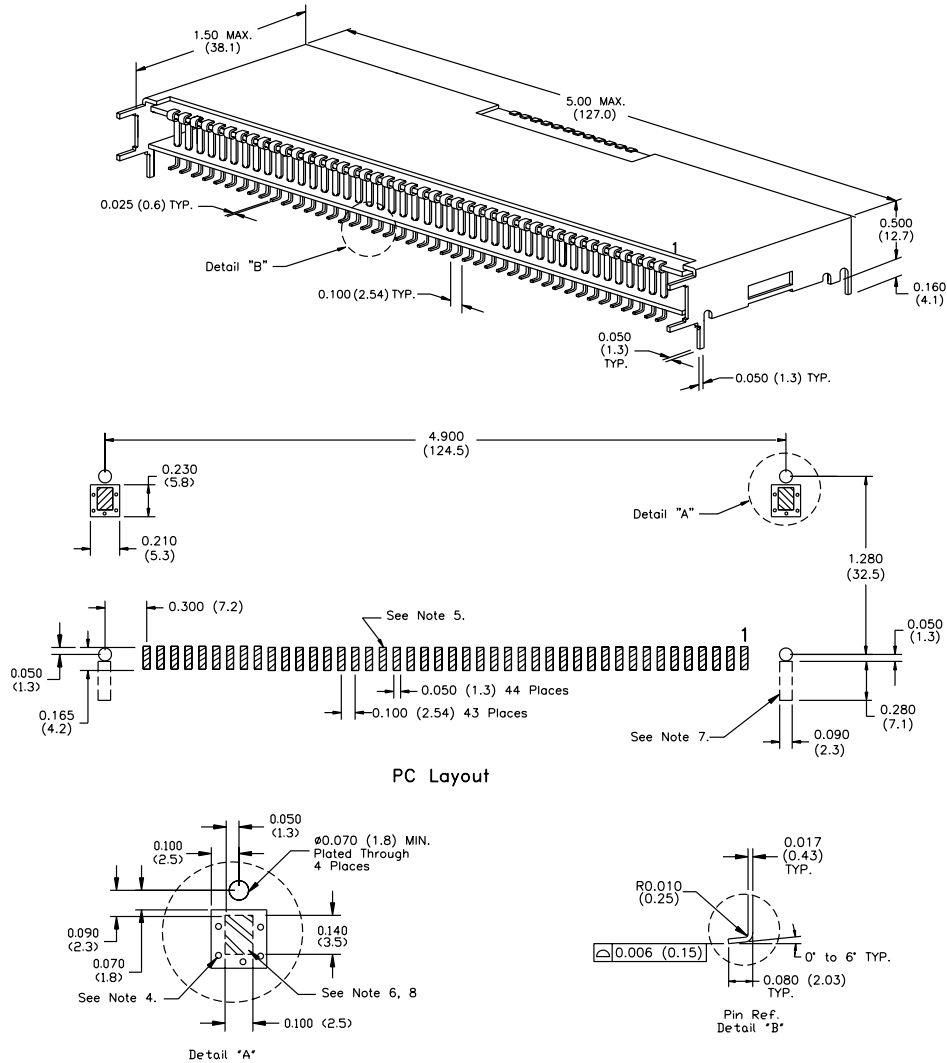
Horizontal Through—Hole Mount (Suffix A)

1.50 MAX. (38.1)

5.00 MAX. (127.0)

0.500 (12.7)

0.160 (4.1)

0.025 (0.6) TYP.

0.017 (0.4) TYP.

0.100 (2.54) TYP.

0.050 (1.3) TYP.

0.050 (1.3) TYP.

0.055 (1.4)

0.080 (2.0)

0.160 (4.0)

0.110 (2.8)

See Note 7. 4 Places

1.280 (32.5)

0.300 (7.2)

Ø0.045 (1.1) MIN. 44 Places Plated Through

0.100 (2.54) 43 Places

Ø0.093 (2.3) MIN. 4 Places Plated Through connected to ground plane

0.050 (1.3)

0.280 (7.1)

0.090 (2.3)

PC Layout

Notes: (Rev. A)
1: All dimensions are in inches (mm).
2: 2 place decimals are ±.030 (±0.8mm).
3: 3 place decimals are ±.010 (±0.3mm).
4: Recommended mechanical keep out area (dotted lines).

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PACKAGE INFORMATION AND DIMENSIONS

Horizontal Surface Mount (Suffix C)

1.50 MAX.
(38.1)

5.00 MAX.
(127.0)

0.025 (0.6) TYP.

Detail "B"

0.100 (2.54) TYP.

0.500
(12.7)

0.160
(4.1)

0.050
(1.3)
TYP.

0.050 (1.3) TYP.

1

4.900
(124.5)

0.230
(5.8)

0.210
(5.3)

Detail "A"

1.280
(32.5)

0.300 (7.2)

See Note 5.

0.050
(1.3)

0.050
(1.3)

1

0.050 (1.3) 44 Places

0.100 (2.54) 43 Places

See Note 7.

0.280
(7.1)

0.090
(2.3)

0.165
(4.2)

PC Layout

0.050
(1.3)

0.100
(2.5)

Ø0.070 (1.8) MIN.
Plated Through
4 Places

0.090
(2.3)

0.140
(3.5)

0.070
(1.8)

See Note 4.

See Note 6, 8

0.100 (2.5)

Detail "A"

0.017
(0.43)
TYP.

R0.010
(0.25)

0.006 (0.15)

0° to 6° TYP.

0.080 (2.03)
TYP.

Pin Ref.
Detail "B"

Notes: (Rev. B)
1: All dimensions are in inches (mm).
2: 2 place decimals are ±.030 (±0.8mm).
3: 3 place decimals are ±.010 (±0.3mm).
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.

Power Trends proprietary package design.
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