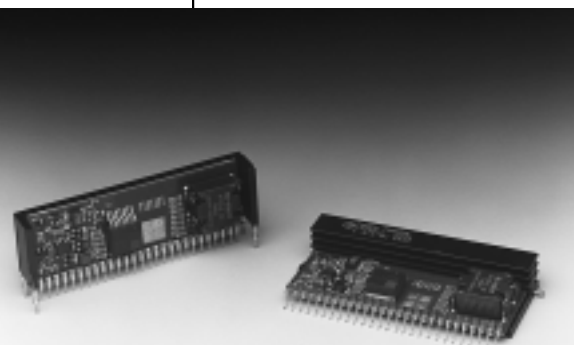


# PT7600 Series

## 10 AMP PROGRAMMABLE INTEGRATED SWITCHING REGULATOR

Revised 5/15/98



### Features

- Single-Device: +5V input
- 5-bit Programmable:  
1.3V to 3.5V@10A
- High Efficiency
- Input Voltage Range:  
4.5V to 5.5V
- Differential Remote Sense
- 27-pin SIP Package

The PT7600 is a new series of high-performance, 10 Amp Integrated Switching

Regulators (ISRs) housed in a 27-pin SIP package. The 10A capability allows easy integration of the latest high-speed, low-voltage  $\mu$ P's and bus drivers into existing 5V systems.

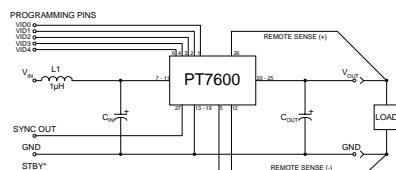
The output voltage of the PT7600 is easily programmed with a 5 bit input compatible with Intel's Pentium® II Processor from 1.3V to 3.5V. A differential remote sense is also provided which automatically compensates for any voltage drop from the ISR to the load.

1200 $\mu$ F of output capacitance are required for proper operation.

### Pin-Out Information

Pin	Function	Pin	Function	Pin	Function
1	VID0	10	V <sub>in</sub>	19	GND
2	VID1	11	V <sub>in</sub>	20	V <sub>out</sub>
3	VID2	12	Remote Sense Gnd	21	V <sub>out</sub>
4	VID3	13	GND	22	V <sub>out</sub>
5	STBY* - Stand-by	14	GND	23	V <sub>out</sub>
6	VID4	15	GND	24	V <sub>out</sub>
7	V <sub>in</sub>	16	GND	25	V <sub>out</sub>
8	V <sub>in</sub>	17	GND	26	Remote Sense V <sub>out</sub>
9	V <sub>in</sub>	18	GND	27	Do not connect

### Standard Application



C<sub>in</sub> = Required 1200 $\mu$ F electrolytic  
 C<sub>out</sub> = Required 1200 $\mu$ F electrolytic  
 L1 = Optional 1 $\mu$ H input choke

For STBY\* pin; open = output enabled; ground = output disabled.

### Specifications

Characteristics (T <sub>a</sub> = 25°C unless noted)	Symbols	Conditions	PT7600 SERIES			
			Min	Typ	Max	Units
Output Current	I <sub>o</sub>	T <sub>a</sub> = +60°C, 200 LFM, pkg N T <sub>a</sub> = +25°C, natural convection	0.1*	—	10	A
Input Voltage Range	V <sub>in</sub>	0.1A $\leq$ I <sub>o</sub> $\leq$ 10A	4.5**	—	5.5	V
Output Voltage Tolerance	$\Delta$ V <sub>o</sub>	V <sub>in</sub> = +5V, I <sub>o</sub> = 10A 0°C $\leq$ T <sub>a</sub> $\leq$ +55°C	V <sub>o</sub> -0.03	—	V <sub>o</sub> +0.03	V
Line Regulation	Reg <sub>line</sub>	4.5V $\leq$ V <sub>in</sub> $\leq$ 5.5V, I <sub>o</sub> = 10A	—	$\pm$ 10	—	mV
Load Regulation	Reg <sub>load</sub>	V <sub>in</sub> = +5V, 0.1 $\leq$ I <sub>o</sub> $\leq$ 10A	—	$\pm$ 10	—	mV
V <sub>o</sub> Ripple/Noise pk-pk	V <sub>n</sub>	V <sub>in</sub> = +5V, I <sub>o</sub> = 10A	—	50	—	mV
Transient Response with C <sub>out</sub> = 1200 $\mu$ F	t <sub>tr</sub> V <sub>os</sub>	I <sub>o</sub> step between 5A and 10A V <sub>o</sub> over/undershoot	—	100 200	—	$\mu$ Sec mV
Efficiency	$\eta$	V <sub>in</sub> = +5V, I <sub>o</sub> = 10A	V <sub>o</sub> = 3.3V V <sub>o</sub> = 2.9V V <sub>o</sub> = 2.5V V <sub>o</sub> = 1.8V V <sub>o</sub> = 1.5V	— 80 78 75 69 65	— — — — —	% % % % %
Switching Frequency	f <sub>o</sub>	4.5V $\leq$ V <sub>in</sub> $\leq$ 5.5V 0.1A $\leq$ I <sub>o</sub> $\leq$ 10A	650	700	750	kHz
Absolute Maximum Operating Temperature Range	T <sub>a</sub>		0	—	+85	°C
Recommended Operating Temperature Range	T <sub>a</sub>	Forced Air Flow = 200 LFM Over V <sub>in</sub> and I <sub>o</sub> Ranges	0	—	+65***	°C
Storage Temperature	T <sub>s</sub>		-40	—	+125	°C
Mechanical Shock		Per Mil-STD-883D, Method 2002.3 1 msec, Half Sine, mounted to a fixture	—	500	—	G's
Mechanical Vibration		Per Mil-STD-883D, Method 2007.2, 20-2000 Hz, Soldered in a PC board	—	10	—	G's
Weight	—	Vertical/Horizontal	—	31/41	—	grams

\* ISR-will operate down to no load with reduced specifications. Please note that this product is not short-circuit protected.

\*\* The minimum input voltage is 4.5V or V<sub>out</sub>+1.2V, whichever is greater.

\*\*\* See SOA curves.

**Output Capacitors:** The PT7600 series requires a minimum output capacitance of 1200 $\mu$ F for proper operation. Do not use Oscon type capacitors. The maximum allowable output capacitance is 7,500 $\mu$ F. See Capacitor Application Note.

**Input Filter:** An input filter is optional for most applications. The input inductor must be sized to handle 10ADC with a typical value of 1 $\mu$ H. The input capacitance must be rated for a minimum of 1.0 Arms of ripple current. For transient or dynamic load applications, additional capacitance may be required.

# PT7600 Series

## Programming Information

VID3	VID2	VID1	VID0	VID4=1 Vout	VID4=0 Vout
1	1	1	1	2.0V	1.30V
1	1	1	0	2.1V	1.35V
1	1	0	1	2.2V	1.40V
1	1	0	0	2.3V	1.45V
1	0	1	1	2.4V	1.50V
1	0	1	0	2.5V	1.55V
1	0	0	1	2.6V	1.60V
1	0	0	0	2.7V	1.65V
0	1	1	1	2.8V	1.70V
0	1	1	0	2.9V	1.75V
0	1	0	1	3.0V	1.80V
0	1	0	0	3.1V	1.85V
0	0	1	1	3.2V	1.90V
0	0	1	0	3.3V	1.95V
0	0	0	1	3.4V	2.00V
0	0	0	0	3.5V	2.05V

Logic 0 = Pin 12 (remote sense gnd) potential  
Logic 1 = Open circuit (no pull-up resistors)

## Ordering Information

PT7601□ = 1.3 to 3.5 Volts

(For dimensions and PC board layout, see Package Styles 800 & 810.)

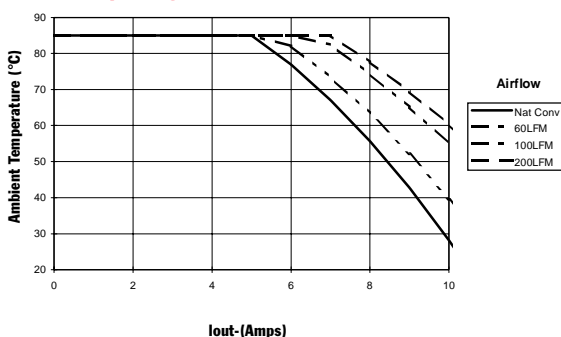
## PT Series Suffix (PT1234X)

### Case/Pin Configuration

Vertical Through-Hole	<b>N</b>
Horizontal Through-Hole	<b>A</b>
Horizontal Surface Mount	<b>C</b>

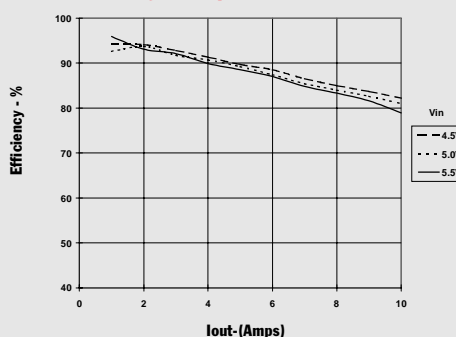
## CHARACTERISTIC DATA

Safe Operating Area Curve (@V<sub>in</sub>=+5V)

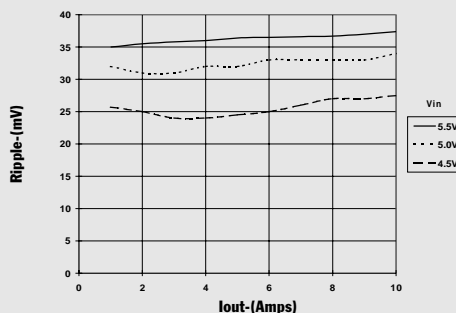


PT7601, 3.3 VDC (See Note 1)

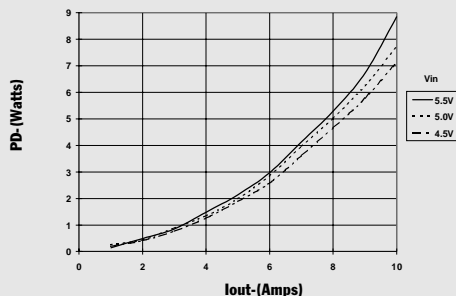
Efficiency vs Output Current



Ripple vs Output Current



Power Dissipation vs Output Current



Note 1: SOA curves represent operating conditions at which internal components are at or below manufacturer's maximum rated operating temperatures.

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
PT7601A	NRND	SIP MOD ULE	EHA	27	8	TBD	Call TI	Level-1-215C-UNLIM
PT7601C	NRND	SIP MOD ULE	EHC	27	8	TBD	Call TI	Level-1-215C-UNLIM
PT7601N	NRND	SIP MOD ULE	EHD	27	10	TBD	Call TI	Level-1-215C-UNLIM

<sup>(1)</sup> 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.

**OBSELETE:** TI has discontinued the production of the device.

<sup>(2)</sup> 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)

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

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