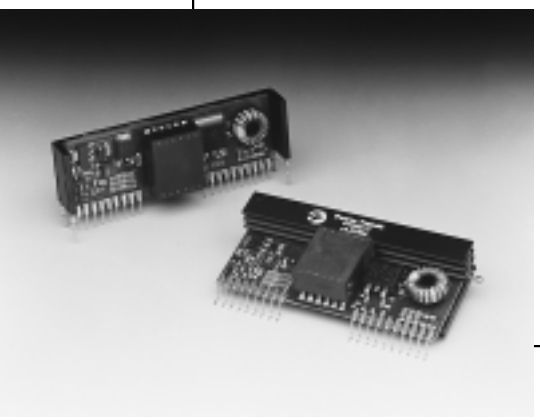
PT3300 Series

30 WATT POSITIVE STEP-DOWN INTEGRATED SWITCHING REGULATOR

Revised 5/15/98

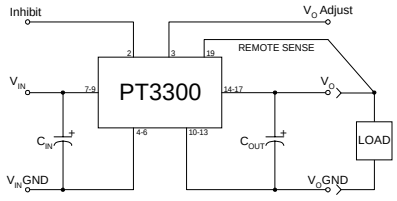


The PT3300 is a new series of high-input voltage, 30 Watt, non-isolated Integrated Switching Regulators (ISRs) housed in a 19-pin SIP package. The 20 to 60 V input range allows easy integration into many distributed power applications which utilize 24, 28, or 48V bus architechures.

The PT3300 series is available with 3.3, 5, 12, or 15V outputs. The output voltage is adjustable from 90 to 110% of nominal with the addition of an external resistor. Other easy to use features include an inhibit function and remote sense which automatically compensates for any voltage drop from the ISR to the load. As with other Power Trends' products, the PT3300 includes built in current limit, short circuit protection and over-temperature shutdown.

The PT3300 requires a 330µF output capacitor for proper operation.

Standard Application



C_{in} = Optional 100µF/100V electrolytic
C_{out} = Required 330µF electrolytic

Note: Pins 4,5,6 and pins 10,11,12,13 are connected internally.

Pin-Out Information

Pin	Function
1	Do Not Use
2	Inhibit
3	V_o Adjust
4	V_{in} GND
5	V_{in} GND
6	V_{in} GND
7	V_{in}
8	V_{in}
9	V_{in}
10	V_o GND
11	V_o GND
12	V_o GND
13	V_o GND
14	V_o
15	V_o
16	V_o
17	V_o
18	Do Not Use
19	Remote Sense

Ordering Information

PT3301☐ = +3.3 Volts
PT3302☐ = +5.0 Volts
PT3303☐ = +12.0 Volts
PT3304☐ = +15.0 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 820 and 830.)

Features

- 30W Output Power
- Input Voltage Range: 20V to 60V
- High Efficiency
- V_o Inhibit
- V_o Adjust
- Remote Sense
- Current Limit
- Short-Circuit Protection
- Over-Temperature Shutdown
- 19-pin SIP Package

Specifications

Characteristics (T_a = 25°C unless noted)	Symbols	Conditions		PT3300 SERIES Min	Typ	Max	Units
Output Current	I_o	Over V_{in} range	V_o = +3.3V	0.50*	—	8.0	A
			V_o = +5.0V	0.50*	—	6.0	A
			V_o = +12.0V	0.25*	—	2.5	A
			V_o = +15.0V	0.20*	—	2.0	A
Short Circuit Current	I_{sc}	V_{in} = +25V		—	2×I_{max}	—	—
Input Voltage Range	V_{in}	0.5 ≤ I_o ≤ I_{max}		20	—	60	V
Output Voltage Tolerance	ΔV_o	Over V_{in} range, I_o = I_{max} 0°C ≤ T_a ≤ +60°C		—	±1	±3	%V_o
Line Regulation	Reg_{line}	Over V_{in} range		—	±0.5	±1	%V_o
Load Regulation	Reg_{load}	0.5 ≤ I_o ≤ I_{max}		—	±0.5	±1	%V_o
V_o Adjust Range	$V_{o\ adj}$	Over V_{in} and I_o ranges		90	—	110	%V_o
V_o Ripple/Noise	V_n	V_{in} = +24V, I_o = I_{max}		—	2	3	%V_o
Transient Response	t_{tr}	25% load change		—	100	250	µSec
with C_{out} = 330µF	V_{os}	V_o over/undershoot		—	2	5	%V_o
Efficiency	η	V_{in} = +24V, I_o = 0.5×I_{max}	V_o = +3.3V	—	80	—	%
			V_o = +5.0V	—	85	—	%
			V_o = +12.0V	—	87	—	%
Switching Frequency	f_o	Over V_{in} and I_o ranges		600	750	900	kHz
Absolute Maximum Operating Temperature Range	T_a			-20	—	+85	°C
Recommended Operating Temperature Range	T_a	Free air convection Over V_{in} and I_o ranges		-20	—	+65**	°C
Storage Temperature	T_s	—		-40	—	+125	°C
Mechanical Shock	—	Per Mil-STD-883D, Method 2002.3		—	500	—	G's
Mechanical Vibration	—	Per Mil-STD-883D, Method 2007.2, 20-2000 Hz, soldered in a PC board		—	10	—	G's
Weight	—	—		—	35	—	grams

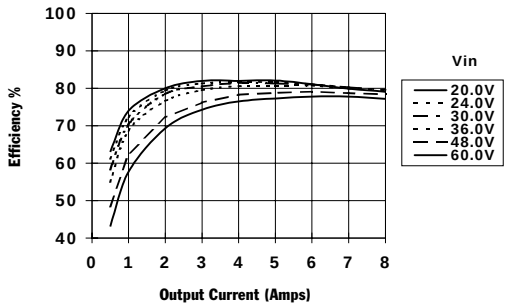
*ISR will operate down to no load with reduced specifications. ** See Thermal Derating Curve

Note: *The PT3300 Series requires a 330µF electrolytic or tantalum output capacitor for proper operation in all applications.*

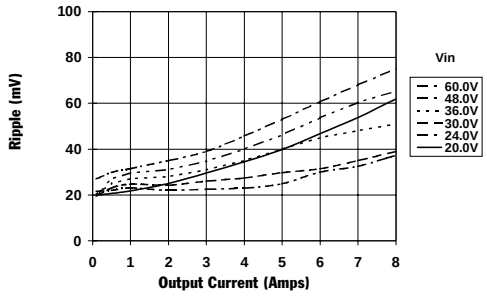
Power Trends, Inc. 27715 Diehl Road, Warrenville, IL 60555 **(800) 531-5782** Fax: (630) 393-6902 **http://www.powertrends.com**

PT3301, 3.3 VDC (See Note 1)

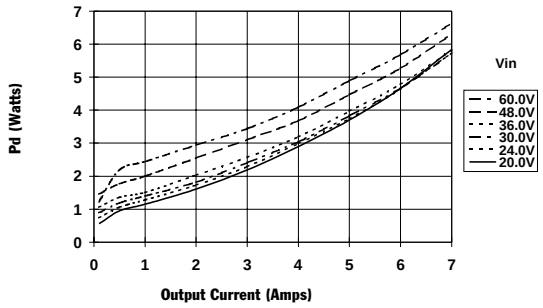
Efficiency vs Output Current



Ripple vs Output Current

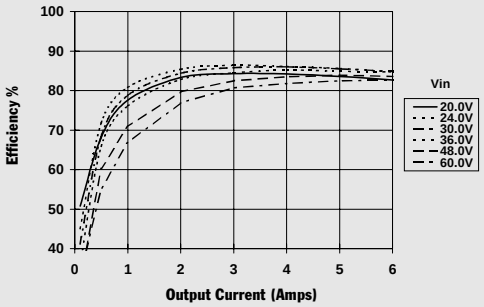


Power Dissipation vs Output Current

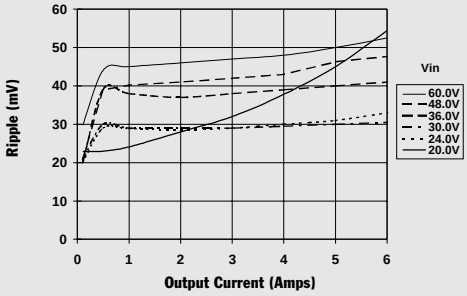


PT3302, 5.0 VDC (See Note 1)

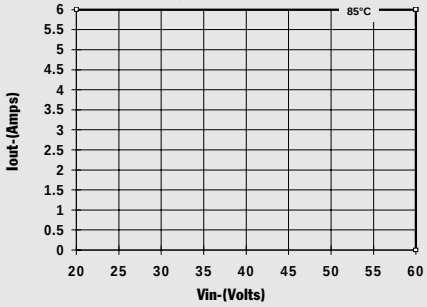
Efficiency vs Output Current



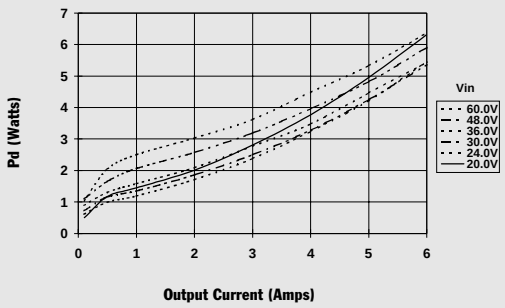
Ripple vs Output Current



Thermal Derating (T_a) (See Note 2)



Power Dissipation vs Output Current



Note 1: *All data listed in the above graphs, except for derating data, has been developed from actual products tested at 25°C. This data is considered typical data for the DC-DC converter.*
Note 2: *Thermal derating graphs are developed in free air convection cooling of 40-60 LFM. (See Thermal Application Notes.)*

Adjusting the Output Voltage of the PT3300 Wide Input Range Switching Regulator

The output voltage of the Power Trends PT3300 Series ISRs may be adjusted over a ±10% range from the factory trimmed pre-set voltage. This is accomplished with the addition of a single external resistor. Table 1 accordingly gives the allowable adjustment range for each model in the series as V_a (min) and V_a (max).

Adjust Up: An increase in the output voltage is obtained by adding a resistor R2, between pin 3 (V_o adjust) and pins 10-13 (V_o GND)

Adjust Down: Add a resistor (R1), between pin 3 (V_o adjust) and pins 14-17 (V_{out}).

Refer to Figure 1 and Table 2 for both the placement and value of the required resistor, either (R1) or R2 as appropriate.

Notes:

1. Use only a single 1% resistor in either the (R1) or R2 location. Place the resistor as close to the ISR as possible.
2. Never connect capacitors from V_o adjust to either GND or V_{out} . Any capacitance added to the V_o adjust pin will affect the stability of the ISR.
3. V_{in} GND and V_o GND are connected internally and may be treated as common on the PT3300 ISR series.
4. If the Remote Sense feature is being used, connecting the resistor (R1) between pin 3 (V_o adjust) and pin 19 (Remote Sense) can benifit load regulation.
5. Adjusting V_{out} higher than that defined for the model raises the minimum input voltage by the same percentage.

Figure 1

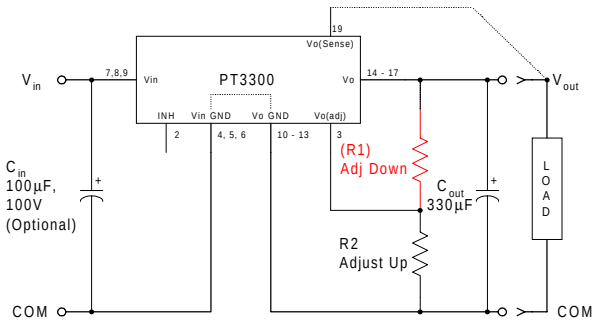


Table 1

PT3300 ADJUSTMENT AND FORMULA PARAMETERS

Series Pt #	PT3301	PT3302	PT3303	PT3304
V_o (nom)	3.3V	5.5V	12.0V	15.0V
V_a (min)	3.0V	4.5V	10.8V	13.5V
V_a (max)	3.6V	5.5V	13.2V	16.5Vs
R_o (kΩ)	23.7	13.7	4.99	3.65

The values of (R1) [adjust down], and R2 [adjust up], can also be calculated using the following formulae.

$$(R1) = \frac{R_o\,(V_o - 1)(V_a - 1)}{(V_o - V_a)} - 0.48 \quad k\Omega$$

$$R2 = \frac{R_o\,(V_o - 1)}{Va - V_o} - 0.48 \quad k\Omega$$

Where: V_o = Original output voltage
V_a = Adjustd output voltage
R_o = The value in Table 1

Table 2

PT3300 ADJUSTMENT RESISTOR VALUES

Series Pt #	PT3301	PT3302	PT3303	PT3304
Current	**8Adc**	**6Adc**	**2.5Adc**	**2Adc**
V_o(nom)	**3.3Vdc**	**5.0Vdc**	**12.0Vdc**	**15.0Vdc**
V_a(req'd)				
3.0	(363.0)kΩ			
3.1	(572.0)kΩ			
3.2	(1200.0)kΩ			
3.3				
3.4	545.0kΩ			
3.5	272.0kΩ			
3.6	181.0kΩ			
4.5		(383.0)kΩ		
4.6		(493.0)kΩ		
4.7		(675.0)kΩ		
4.8		(1040.0)kΩ		
4.9		(2140.0)kΩ		
5.0				
5.1		548.0kΩ		
5.2		274.0kΩ		
5.3		182.0kΩ		
5.4		137.0kΩ		
5.5		109.0kΩ		
10.8			(448.0)kΩ	
11.0			(548.0)kΩ	
11.2			(699.0)kΩ	
11.4			(951.0)kΩ	
11.6			(1450.0)kΩ	
12.0				
12.2			274.0kΩ	
12.4			137.0kΩ	
12.6			91.0kΩ	
12.8			68.1kΩ	
13.0			54.4kΩ	
13.2			45.3kΩ	
13.5				(425.0)kΩ
14.0				(664.0)kΩ
14.5				(1379.0)kΩ
15.0				
15.5				102.0kΩ
16.0				50.6kΩ
16.5				33.6kΩ

R1 = (Red) R2 = Black

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

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

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.