PT6420 Series

3 Amp 5V Input Adjustable Integrated Switching Regulator

Power Trends Products from Texas Instruments

SLTS033A

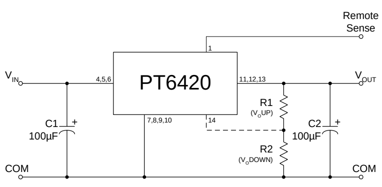
(Revised 6/30/2000)

- Adjustable Output Voltage
- 85% Efficiency
- Small SIP Footprint
- Input Voltage Range: 4.5V to 5.5V
- Remote Sense Capability

The PT6420 series from Power Trends is a high performance +5V to +3.3V, 3Amp family of 14-Pin SIP (Single In-line Package) Integrated Switching Regulators (ISRs). Only two external capacitors are required for proper operation.

Please note that this product does not include short circuit protection.

Standard Application



C_1 = Required 100µF electrolytic
C_2 = Required 100µF electrolytic

Pin-Out Information

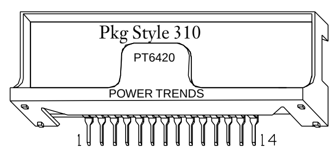
Pin	Function
1	Remote Sense
2	Do not connect
3	Do not connect
4	V_{in}
5	V_{in}
6	V_{in}
7	GND
8	GND
9	GND
10	GND
11	V_{out}
12	V_{out}
13	V_{out}
14	V_{out} Adjust

Ordering Information

PT6424 = +1.5 Volts
PT6425 = +3.3 Volts
PT6426 = +1.8 Volts
PT6427 = +2.1 Volts
PT6428 = +1.2 Volts
PT6429 = +2.5 Volts

PT Series Suffix (PT1234X)

Case/Pin Configuration	
Vertical Through-Hole	P
Horizontal Through-Hole	D
Horizontal Surface Mount	E



Note: Back surface of product is conducting metal.

Specifications

Characteristics (T_a = 25°C unless noted)	Symbols	Conditions	PT6420 SERIES Min	Typ	Max	Units
Output Current	I_o	$4.5V \le V_{in} \le 5.5V$	0	—	3.0	A
Current Limit	I_{cl}	V_{in} = +5V	—	3.6	5.0	A
Input Voltage Range	V_{in}	$0.1A \le I_o \le 3.0A$	4.5	—	5.5	V
Output Voltage Tolerance	ΔV_o	V_{in} = +5V, I_o = 3.0A $0°C \le T_a \le +70°C$	Vo-0.05	3.3	Vo+0.05	V
Line Regulation	Reg_{line}	$4.5V \le V_{in} \le 5.5V$, I_o = 3.0A	—	±10	±25	mV
Load Regulation	Reg_{load}	V_{in} = +5V, $0.3 \le I_o \le 3.0A$	—	±10*	±25*	mV
V_o Ripple/Noise	V_n	V_{in} = 5V, I_o = 3.0A	—	66	165	mVpp
Transient Response with C_2 = 100µF	t_{tr} V_{os}	I_o step between 1.5A and 3.0A V_o over/undershoot	— —	200 200	— —	µSec mV
Efficiency	η	V_{in} = +5V, I_o = 1.5A Vo= 3.3V Vo= 1.8V Vo= 2.1V Vo= 1.2V	— — — —	85 74 77 63	— — — —	% % % %
Switching Frequency	f_o	$4.5V \le V_{in} \le 5.5V$ $0.3A \le I_o \le 3.0A$	500	650	800	kHz
Absolute Maximum Operating Temperature Range	T_a		0	—	+85	°C
Recommended Operating Temperature Range	T_a	Free Air Convection (40-60 LFM) At Vin= 5V, Io=2.5A	0	—	+70**	°C
Thermal Resistance	θ_{ja}	Free Air Convection (40-60 LFM)	—	25	—	°C/W
Storage Temperature	T_s	—	-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	—	15	—	G's
Weight	—	—	—	6.5	—	grams

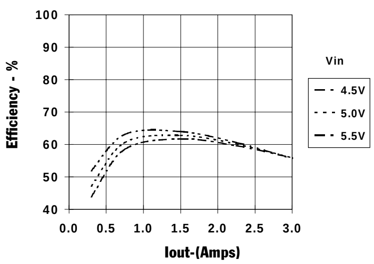
*When used with remote sense function.

**See Thermal Derating chart.

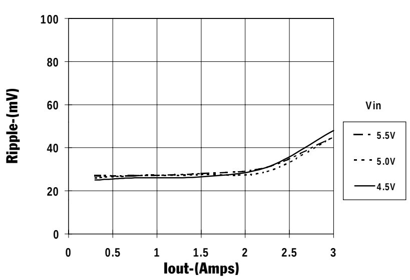
Note: *The PT6420 Series requires two 100µF electrolytic or tantalum capacitors for proper operation in all applications.*

PT6428 1.2 VDC (See Note 1)

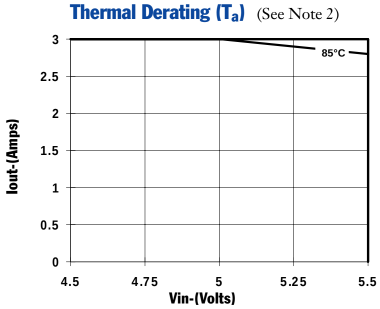
Efficiency vs Output Current



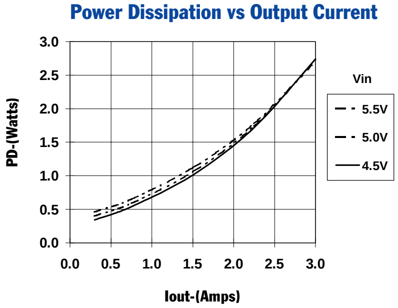
Ripple vs Output Current



Thermal Derating (T_a) (See Note 2)

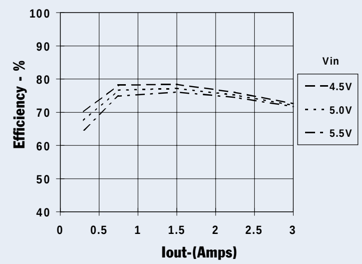


Power Dissipation vs Output Current

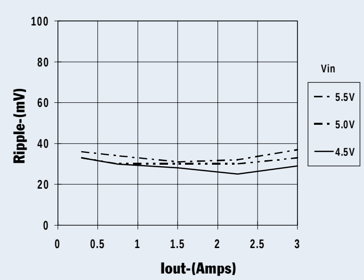


PT6427, 2.1 VDC (See Note 1)

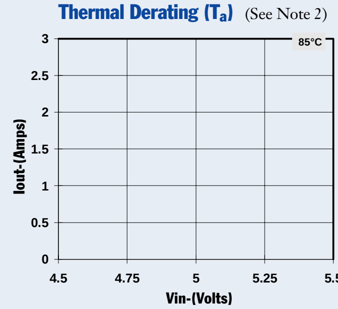
Efficiency vs Output Current



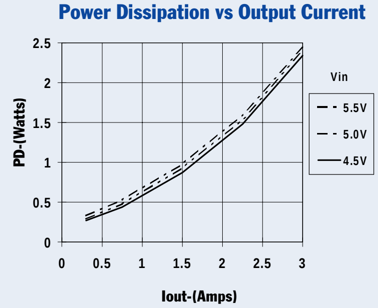
Ripple vs Output Current



Thermal Derating (T_a) (See Note 2)

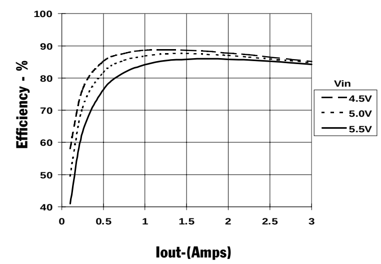


Power Dissipation vs Output Current

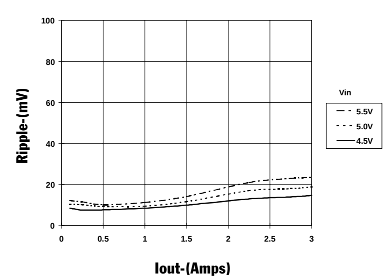


PT6425, 3.3 VDC (See Note 1)

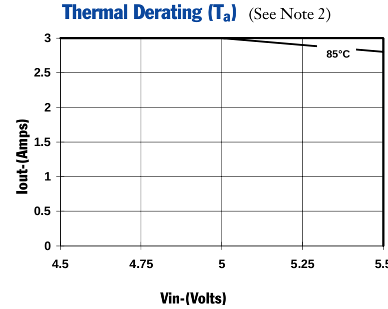
Efficiency vs Output Current



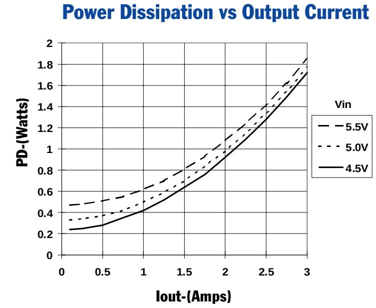
Ripple vs Output Current



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 ISR.*
Note 2: *Thermal derating graphs are developed in free air convection cooling of 40-60 LFM. (See Thermal Application Notes.)*

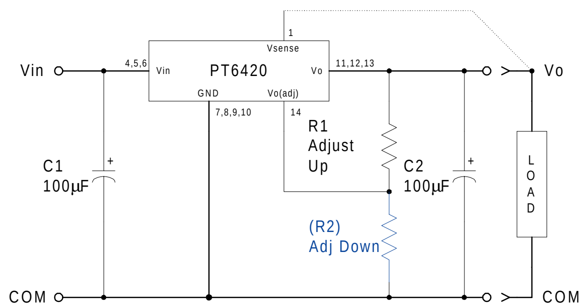
Adjusting the Output Voltage of the PT6420 Series 3AMP 5V Bus Converters

The output voltage of the Power Trends PT6420 Series ISRs may be adjusted higher or lower than the factory trimmed pre-set voltage 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: (See note 1) An increase in the output voltage is obtained by adding a resistor R1, between pin 14 (V_o adjust) and pins 11-13 (V_{out}).

Adjust Down: (See note 1) Add a resistor (R2), between pin 14 (V_o adjust) and pins 7-10 (GND).

Figure 1



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. The direction in which each resistor adjusts the output of the PT6420 series differs from many other Power Trends products. These output voltage adjustment notes are therefore specific only to the PT6420 models.
2. Use only a single 1% resistor in either the R1 or (R2) location. Place the resistor as close to the ISR as possible.
3. Never connect capacitors from V_o adjust to either GND, V_{out}, or the Remote Sense pin. Any capacitance added to the V_o adjust pin will affect the stability of the ISR.
4. The PT6420 incorporates a Remote Sense (See Figure 1). If this feature is being used, connecting the resistor R1 between pin 14 (V_o adjust) and pin 1 (Remote Sense) can benefit load regulation.
5. An increase in the output voltage may place additional limits on the input voltage range of the part. The revised minimum input voltage will be (V_{out} + 1.2) or 4.5V, whichever is higher. Do not exceed 5.5Vdc.

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

$$R1 = \frac{12.45\,V_o}{(V_a - V_o)} - 49.9 \quad k\Omega$$

$$(R2) = \frac{12.45\,(2V_a - V_o)}{V_o - V_a} - 49.9 \quad k\Omega$$

Where: V_o = Original output voltage
V_a = Adjusted output voltage

Table 1

PT6420 ADJUSTMENT RANGE

Series Pt #	PT6428	PT6424	PT6426	PT6427	PT6429	PT6425
V_o (nom)	1.2	1.5	1.8	2.1	2.5	3.3
V_a (min)	1.1	1.3	1.5	1.8	2.1	2.8
V_a (max)	1.4	1.8	2.2	2.6	3.1	3.8

Table 2

PT6420 ADJUSTMENT RESISTOR VALUES

Series Pt #	PT6428	PT6424	PT6426	PT6427	PT6429	PT6425
V_o (nom)	1.2	1.5	1.8	2.1	2.5	3.3
V_a (req'd)						
1.1	(74.6)kΩ					
1.15	(224.0)kΩ					
1.2						
1.25	249.0kΩ					
1.3	99.5kΩ	(18.6)kΩ				
1.35	49.7kΩ	(49.7)kΩ				
1.4	24.8kΩ	(112.0)kΩ				
1.45		(299.0)kΩ				
1.5			(0.0)kΩ			
1.55		324.0kΩ	(14.8)kΩ			
1.6		137.0kΩ	(37.3)kΩ			
1.65		74.6kΩ	(74.6)kΩ			
1.7		43.5kΩ	(149.0)kΩ			
1.75		24.8kΩ	(373.0)kΩ			
1.8		12.4kΩ		(12.4)kΩ		
1.85			398.0kΩ	(29.8)kΩ		
1.9			174.0kΩ	(55.9)kΩ		
1.95			99.5kΩ	(99.5)kΩ		
2.0			62.2kΩ	(187.0)kΩ		
2.05			39.7kΩ	(448.0)kΩ		
2.1			24.8kΩ		(3.0)kΩ	
2.15			14.1kΩ	473.0kΩ	(14.1)kΩ	
2.2			6.1kΩ	212.0kΩ	(29.0)kΩ	
2.25				124.0kΩ	(49.7)kΩ	
2.3				80.8kΩ	(80.8)kΩ	
2.35				54.7kΩ	(133.0)kΩ	
2.4				37.3kΩ	(236.0)kΩ	
2.45				24.8kΩ	(548.0)kΩ	
2.5				15.5kΩ		
2.55				8.2kΩ	573.0kΩ	
2.6				2.4kΩ	261.0kΩ	
2.65					158.0kΩ	
2.7					106.0kΩ	
2.75					74.6kΩ	
2.8					53.9kΩ	(7.4)kΩ
2.85					39.0kΩ	(16.5)kΩ
2.9					27.9kΩ	(27.9)kΩ
2.95					19.3kΩ	(42.6)kΩ
3.0					12.4kΩ	(62.2)kΩ
3.1					2.0kΩ	(131.0)kΩ
3.2						(336.0)kΩ
3.3						
3.4						361.0kΩ
3.5						156.0kΩ
3.6						87.0kΩ
3.7						52.8kΩ
3.8						32.3kΩ

R1 = Black R2 = (Blue)

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