

PT6600 Series

**9 AMP ADJUSTABLE
INTEGRATED SWITCHING REGULATOR**

[Application Notes](#)
[Mechanical Outline](#)
[Product Selector Guide](#)

- Single Device 9A Output
- Input Voltage Range: 3.1V to 6.0V
- Adjustable Output Voltage
- 90% Efficiency
- Remote Sense Capability
- Standby Function
- Over-Temperature Protection

performance family of 14-Pin SIP (Single In-line Package) Integrated Switching Regulators (ISRs), designed for stand alone operation in applications requiring as much as 9A of output current (10A with a side heat tab).

Only two external capacitors are required for proper operation. Please note that this product does not include short circuit protection.

The PT6600 series is a new addition to the Power Trends' high

Pin-Out Information

Pin	Function
1	Remote Sense
2	Do not connect
3	STBY*-Standby
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

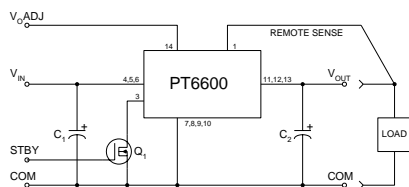
Ordering Information

- PT6601□ = +3.3 Volts
 - †PT6602□ = +1.5 Volts
 - PT6603□ = +2.5 Volts
 - PT6604□ = +3.6 Volts
 - †PT6605□ = +1.2 Volts
 - †PT6606□ = +1.8 Volts
- †3.3V Input Bus Capable

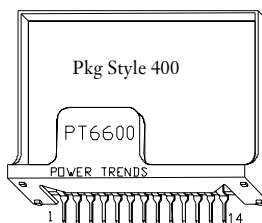
PT Series Suffix (PT1234X)

Case/Pin Configuration	Heat Spreader	Heat Spreader with Side Tabs
Vertical Through-Hole	P	R
Horizontal Through-Hole	D	G
Horizontal Surface Mount	E	B

Standard Application



C₁ = Required 330µF electrolytic
C₂ = Required 330µF electrolytic
Q₁ = NFET-or Open Collector Gate



Note: Back surface of product is conducting metal.

Specifications

Characteristics (T _a = 25°C unless noted)	Symbols	Conditions	PT6600 SERIES			Units
			Min	Typ	Max	
Output Current	I _o	T _a = 60°C, 200 LFM, pkg P T _a = 25°C, natural convection	0.1*	—	9.0**	A
Input Voltage Range	V _{in}	0.1A ≤ I _o ≤ 8.0A	4.5 3.1 4.8	—	6.0 6.0 6.0	V
Output Voltage Tolerance	ΔV _o	V _{in} = +5V, I _o = 8.0A T _a = 0°C to 65°C	V _o -0.1	—	V _o +0.1	V
Output Voltage Adjust Range	V _{oadj}	Pin 14 to V _o or ground V _{in} min = +3.1V or V _o + 1.2V (whichever is greater)	2.25 1.27 1.80 2.50	—	4.20 2.65 3.50 4.30	V
Line Regulation	Reg _{line}	4.5V ≤ V _{in} ≤ 6.0V, I _o = 8.0A 3.1V ≤ V _{in} ≤ 6.0V, I _o = 8.0A 4.5V ≤ V _{in} ≤ 6.0V, I _o = 8.0A	—	±7 ±3 ±7	±17 ±8 ±13	mV
Load Regulation	Reg _{load}	V _{in} = +5V, 0.1 ≤ I _o ≤ 8.0A	—	±17 ±12 ±13	±33 ±23 ±25	mV
V _o Ripple/Noise	V _n	V _{in} = 5V, I _o = 8.0A	—	50	—	mVpp
Transient Response with C ₂ = 330µF	t _{tr} V _{os}	I _o step between 4.0A and 8.0A V _o over/undershoot	—	100 150	—	µSec mV
Efficiency	η	V _{in} = +5V, I _o = 3.0A V _{in} = +5V, I _o = 8.0A	—	90 76 85 83 68 76	—	% % % % % %

* ISR will operate down to no load with reduced specifications.

** See SOA curves

Note: The PT6600 Series requires two 330µF electrolytic capacitors (input and output) for proper operation in all applications.
See PT6000/7000 Series Capacitor application note.

PT6600 Series

Specifications (continued)

Characteristics ($T_a = 25^\circ\text{C}$ unless noted)	Symbols	Conditions	PT6600 SERIES			Units
			Min	Typ	Max	
Switching Frequency	f_o	$3.1\text{V} \leq V_{in} \leq 6.0\text{V}$ $0.1\text{A} \leq I_o \leq 8.0\text{A}$	475	600	725	kHz
Absolute Maximum Operating Temperature Range	T_a		0	—	+85	$^\circ\text{C}$
Recommended Operating Temperature Range	T_a	Free Air Convection (40-60 LFM) Over V_{in} and I_o ranges with heat tab	0	—	65**	$^\circ\text{C}$
Thermal Resistance	θ_{ja}	Free Air Convection (40-60 LFM)	—	25	—	$^\circ\text{C}/\text{W}$
Storage Temperature	T_s	—	-40	—	+125	$^\circ\text{C}$
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	—	7.5	—	G's
Weight	—	—	—	14	—	grams

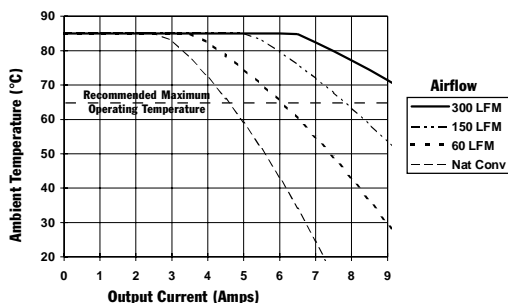
** See SOA curves

Note: The PT6600 Series requires two 330 μF electrolytic capacitors (input and output) for proper operation in all applications.

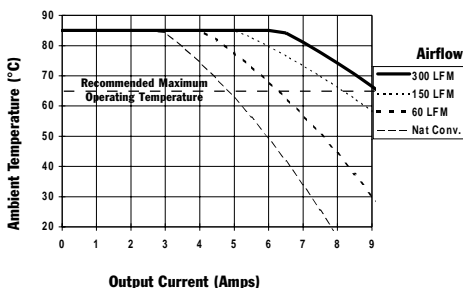
CHARACTERISTIC DATA

Safe Operating Area Curves (@ $V_{in}=+5.0\text{V}$) (See Note 2)

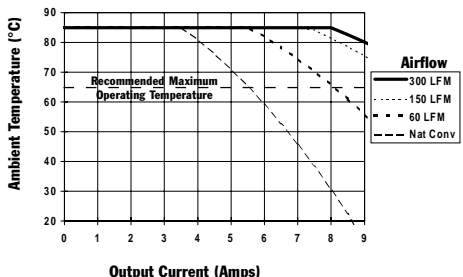
PT6601P (Vertical)



PT6601D (Horizontal)

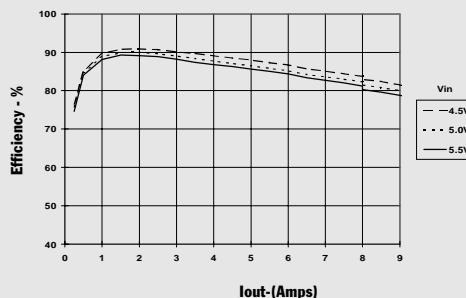


PT6601R (Vertical with Side Tab)

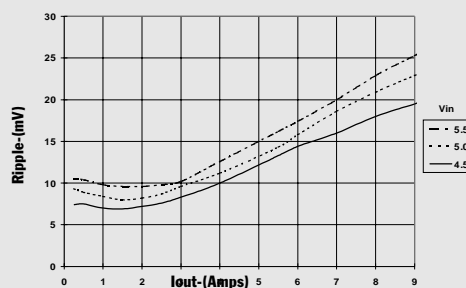


PT6601, 3.3 VDC (See Note 1)

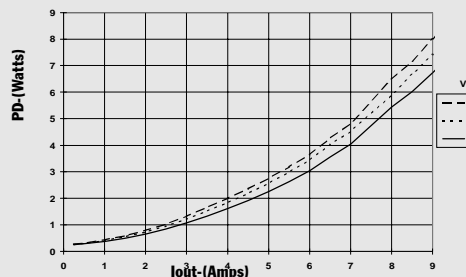
Efficiency vs Output Current



Ripple vs Output Current



Power Dissipation vs Output Current



Note 1: All data listed in the above graphs has been developed from actual products tested at 25°C. This data is considered typical data for the ISR.

Note 2: SOA curves represent operating conditions at which internal components are at or below manufacturer's maximum rated operating temperatures.

Adjusting the Output Voltage of the PT6500 and PT6600 5V Bus Converters

The output voltage of the Power Trends PT6500/PT6600 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: An increase in the output voltage is obtained by adding a resistor R2, between pin 14 (V_o adjust) and pins 7-10 (GND).

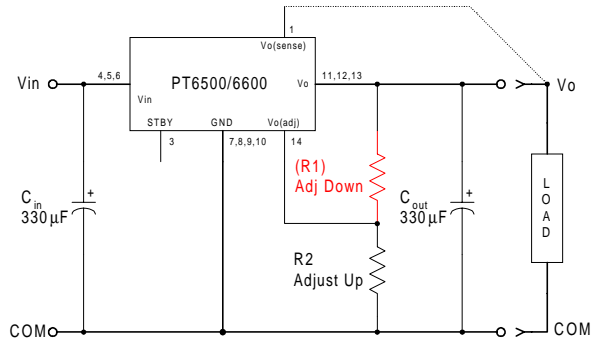
Adjust Down: Add a resistor (R1), between pin 14 (V_o adjust) and pins 11-13 (V_{out}).

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, V_{out} , or the Remote Sense pin. Any capacitance added to the V_o adjust pin will affect the stability of the ISR.
3. If the Remote Sense feature is being used, connecting the resistor (R1) between pin 14 (V_o adjust) and pin 1 (Remote Sense) can benefit load regulation.
4. The minimum input voltage required by the part is $V_{out} + 1.2$ or $3.1V$, whichever is higher.

Figure 1



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

$$(R1) = \frac{R_o (V_a - 1.0)}{(V_o - V_a)} - R_s \text{ k}\Omega$$

$$R2 = \frac{R_o}{V_a - V_o} - R_s \text{ k}\Omega$$

Where: V_o = Original output voltage
 V_a = Adjusted output voltage
 R_o = The resistance value in Table 1
 R_s = The series resistance from Table 1

Table 1

PT6500/6600 ADJUSTMENT AND FORMULA PARAMETERS

Series Pt #	PT6505	PT6507	PT6502	PT6508	PT6506	PT6503	PT6501	PT6504
	PT6605	PT6607	PT6602	PT6608	PT6606	PT6603	PT6601	PT6604
V_o (nom)	1.2	1.3	1.5	1.7	1.8	2.5	3.3	3.6
V_a (min)	1.14	1.19	1.27	1.36	1.4	1.8	2.25	2.5
V_a (max)	2.35	2.45	2.65	2.85	2.95	3.5	4.2	4.3
R_o (k Ω)	2.49	2.49	2.49	2.49	2.49	4.99	12.1	10.0
R_s (k Ω)	2.0	2.0	2.0	2.0	2.0	4.22	12.1	12.1

PT6500/PT6600 Series	Application	Notes
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Table 2

PT6500/PT6600 ADJUSTMENT RESISTOR VALUES

Series Pt #	PT6505	PT6507	PT6502	PT6508	PT6506	PT6503	PT6501	PT6504	
Series Pt #	PT6605	PT6607	PT6602	PT6608	PT6606	PT6603	PT6601	PT6604	
V₀ (nom)	1.2	1.3	1.5	1.7	1.8	2.5	3.3	3.6	
V_a (req'd)									
1.15	(5.5)kΩ								
1.2		(3.0)kΩ							
1.25	47.8kΩ	(10.5)kΩ							
1.3	22.9kΩ		(1.7)kΩ						
1.35	14.6kΩ	47.8kΩ	(3.8)kΩ						
1.4	10.5kΩ	22.9kΩ	(8.0)kΩ	(1.3)kΩ	(0.5)kΩ				
1.45	8.0kΩ	14.6kΩ	(20.4)kΩ	(2.5)kΩ	(1.2)kΩ				
1.5	6.3kΩ	10.5kΩ		(4.2)kΩ	(2.2)kΩ				
1.55	5.1kΩ	8.0kΩ	47.8kΩ	(7.1)kΩ	(3.5)kΩ				
1.6	4.2kΩ	6.3kΩ	22.9kΩ	(12.9)kΩ	(5.5)kΩ				
1.65	3.5kΩ	4.1kΩ	14.6kΩ	(30.4)kΩ	(8.8)kΩ				
1.7	3.0kΩ	4.2kΩ	10.5kΩ		(15.4)kΩ				
1.75	2.5kΩ	3.5kΩ	8.0kΩ	47.8kΩ	(35.4)kΩ				
1.8	2.2kΩ	3.0kΩ	6.3kΩ	22.9kΩ		(1.5)kΩ			
1.85	1.8kΩ	2.5kΩ	5.1kΩ	14.6kΩ	47.8kΩ	(2.3)kΩ			
1.9	1.6kΩ	2.2kΩ	4.2kΩ	10.5kΩ	22.9kΩ	(3.3)kΩ			
1.95	1.3kΩ	1.8kΩ	3.5kΩ	8.0kΩ	14.6kΩ	(4.4)kΩ			
2.0	1.1kΩ	1.6kΩ	3.0kΩ	6.3kΩ	10.5kΩ	(5.8)kΩ			
2.05	0.9kΩ	1.3kΩ	2.5kΩ	5.1kΩ	8.0kΩ	(7.4)kΩ			
2.1	0.8kΩ	1.1kΩ	2.2kΩ	4.2kΩ	6.3kΩ	(9.5)kΩ			
2.15	0.6kΩ	0.9kΩ	1.8kΩ	3.5kΩ	5.1kΩ	(12.2)kΩ			
2.2	0.5kΩ	0.8kΩ	1.6kΩ	3.0kΩ	4.2kΩ	(15.7)kΩ			
2.25	0.4kΩ	0.6kΩ	1.3kΩ	2.5kΩ	3.5kΩ	(20.7)kΩ	(2.3)kΩ		
2.3	0.3kΩ	0.5kΩ	1.1kΩ	2.2kΩ	3.0kΩ	(28.2)kΩ	(3.6)kΩ		
2.35	0.2kΩ	0.4kΩ	0.9kΩ	1.8kΩ	2.5kΩ	(40.7)kΩ	(5.1)kΩ		
2.4		0.3kΩ	0.8kΩ	1.6kΩ	2.2kΩ	(65.6)kΩ	(6.7)kΩ		
2.45		0.2kΩ	0.6kΩ	1.3kΩ	1.8kΩ	(140.0)kΩ	(8.5)kΩ		
2.5			0.5kΩ	1.1kΩ	1.6kΩ		(10.6)kΩ	(1.5)kΩ	
2.55			0.4kΩ	0.9kΩ	1.3kΩ	95.6kΩ	(12.9)kΩ	(2.7)kΩ	
2.6			0.3kΩ	0.8kΩ	1.1kΩ	45.7kΩ	(15.6)kΩ	(3.9)kΩ	
2.65			0.2kΩ	0.6kΩ	0.9kΩ	29.0kΩ	(18.6)kΩ	(5.3)kΩ	
2.7				0.5kΩ	0.8kΩ	20.7kΩ	(22.2)kΩ	(6.8)kΩ	
2.75				0.4kΩ	0.6kΩ	15.7kΩ	(26.4)kΩ	(8.5)kΩ	
2.8				0.3kΩ	0.5kΩ	12.4kΩ	(31.5)kΩ	(10.4)kΩ	
2.85				0.2kΩ	0.4kΩ	10.0kΩ	(37.6)kΩ	(12.6)kΩ	
2.9					0.3kΩ	8.3kΩ	(45.4)kΩ	(15.0)kΩ	
2.95					0.2kΩ	0.9kΩ	(55.3)kΩ	(17.9)kΩ	
3.0						5.8kΩ	(68.6)kΩ	(21.2)kΩ	
3.1						4.1kΩ	(115.0)kΩ	(29.9)kΩ	
3.2						2.9kΩ	(254.0)kΩ	(42.9)kΩ	
3.3						2.0kΩ		(64.6)kΩ	
3.4						1.3kΩ	109.0kΩ	(108.0)kΩ	
3.5						0.8kΩ	48.4kΩ	(238.0)kΩ	
3.6							28.2kΩ		
3.7							18.2kΩ	87.9kΩ	
3.8							12.1kΩ	37.9kΩ	
3.9	4/. V _{out} >3.8Vdc requires V _{in} >5.0Vdc !							8.1kΩ	21.2kΩ
4.0							5.2kΩ	12.9kΩ	
4.1							3.0kΩ	7.9kΩ	
4.2							1.3kΩ	4.6kΩ	
4.3								2.2kΩ	

R1 = (Red) R2 = Black

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