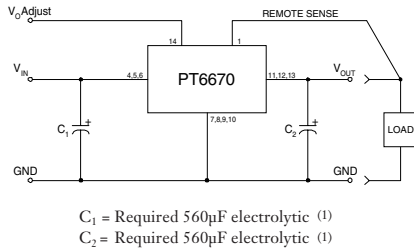


- Input Voltage Range:  
3.1 to 3.6V  
4.5 to 5.5V
- Adjustable Output Voltage
- 85% Efficiency
- Remote Sense Capability
- Soft Start

The PT6670 is a series of high-output Integrated Switching Regulators (ISRs) designed to provide a voltage boost function. Housed in a 14-Pin SIP (Single In-line Package), the PT6670 series incorporates regulators for either a +3.3V or +5.0V input and provide output voltages from +5V to +12V. Applications include power for auxiliary circuits requiring up to 20W.

### Standard Application



### Pin-Out Information

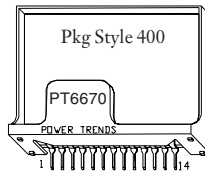
Pin	Function	Pin	Function
1	Remote Sense	8	GND
2	Do not connect	9	GND
3	Do not connect	10	GND
4	$V_{in}$	11	$V_{out}$
5	$V_{in}$	12	$V_{out}$
6	$V_{in}$	13	$V_{out}$
7	GND	14	$V_{out}$ Adjust

### Ordering Information

+3.3V Input	+5V Input	Vout
PT6671□	—	+5.0 Volts
PT6672□	PT6675□	+9.0 Volts
PT6673□	PT6674□	+12.0 Volts

### PT Series Suffix (PT1234X)

Case/Pin Configuration	Heat Spreader
Vertical Through-Hole	<b>P</b>
Horizontal Through-Hole	<b>D</b>
Horizontal Surface Mount	<b>E</b>



Note:  
Back surface is  
conducting metal.

### Preliminary Specifications

Characteristics ( $T_a = 25^\circ\text{C}$ unless noted)	Symbols	Conditions	PT6670 SERIES			Units	
			Min	Typ	Max		
Output Current	$I_o$	$T_a = 60^\circ\text{C}$ , 200 LFM, pkg P $T_a = 25^\circ\text{C}$ , natural convection	PT6671 0.1 PT6672 0.1 PT6673 0.1 PT6674 0.1 PT6675 0.1	— — — — — —	TBD 4.0 1.67 1.25 2.0 3.0	A	
Input Voltage Range	$V_{in}$	Over $V_o$ and $I_o$ range	PT6671/2/3 PT6674/5	3.1 4.5	3.3 5.0	3.6 5.5	V
Inrush Current	$I_{ir}$	On start-up		—	—	TBD	A
Output Voltage Tolerance	$\Delta V_o$	$V_{in} = V_{in}(\text{TYP})$ , $I_o = I_{o\text{max}}$ $T_a = 0^\circ\text{C}$ to $65^\circ\text{C}$		—	1.5	—	% $V_o$
Output Voltage Adjust Range	$V_{oadj}$	Pin 14 to $V_o$ or ground	PT6671 PT6672/5 PT6673/4	3.8 8.2 9.6	— — —	5.5 9.2 12.8	V
Line Regulation	$Reg_{line}$	Over $V_{in}$ range, $I_o = I_{o\text{max}}$		—	$\pm 0.25$	$\pm 0.5$	% $V_o$
Load Regulation	$Reg_{load}$	$V_{in} = V_{in}(\text{TYP})$ , $0.1 \leq I_o \leq I_{o\text{max}}$		—	$\pm 0.25$	$\pm 0.5$	% $V_o$
$V_o$ Ripple/Noise	$V_n$	$V_{in} = V_{in}(\text{TYP})$ , $I_o = I_{o\text{max}}$		—	3	—	% $V_o$
Transient Response with $C_1 = C_2 = 560\mu\text{F}$	$t_{rr}$ $V_{os}$	$I_o$ step between $1/2 I_{o\text{max}}$ and $I_{o\text{max}}$ $V_o$ over/undershoot		— —	500 5	— —	$\mu\text{Sec}$ % $V_o$
Efficiency	$\eta$	$V_{in} = V_{in}(\text{TYP})$ , $I_o = 1/2 I_{o\text{max}}$	PT6671 PT6672 PT6673 PT6675 PT6674	— — — — —	85 84 83 88 87	— — — — —	%
		$V_{in} = V_{in}(\text{TYP})$ , $I_o = I_{o\text{max}}$	PT6671 PT6672 PT6673 PT6675 PT6674	— — — — —	82 80 82 87 86	— — — — —	%

(Continued)

# PT6670 Series

5V/3.3V Input 20W Boost  
Integrated Switching Regulator

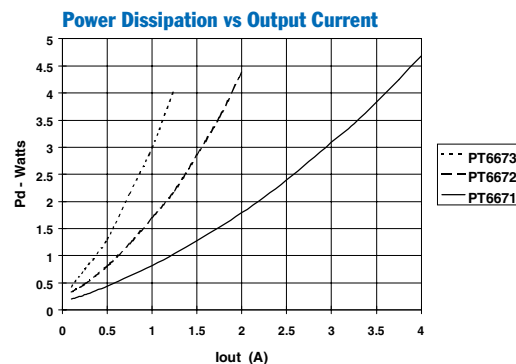
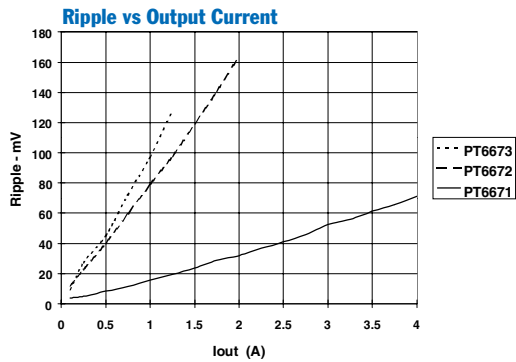
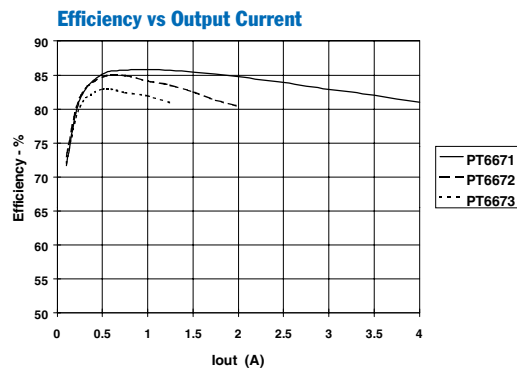
## Preliminary Specifications (continued)

Characteristics ( $T_a = 25^\circ\text{C}$ unless noted)	Symbols	Conditions	PT6670 SERIES			Units
			Min	Typ	Max	
Switching Frequency	$f_o$	Over $V_{in}$ range $0.1\text{A} \leq I_o \leq I_{o\text{max}}$	—	300	—	kHz
Absolute Maximum Operating Temperature Range	$T_a$		-40	—	+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	-40	—	+65	$^\circ\text{C}$
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

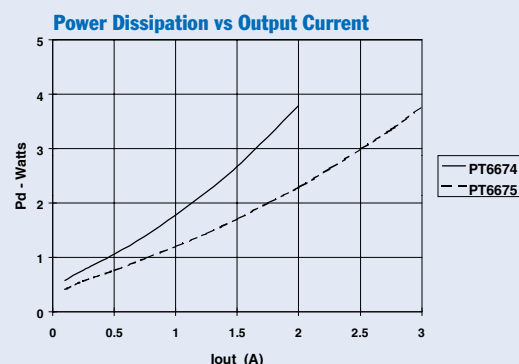
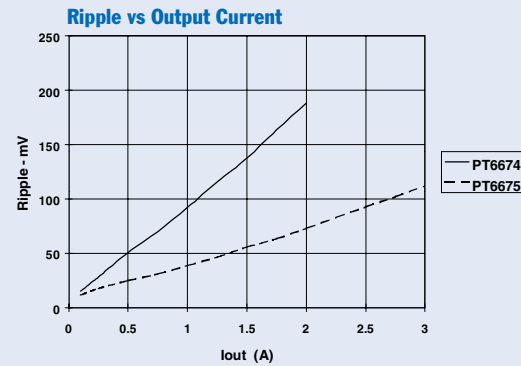
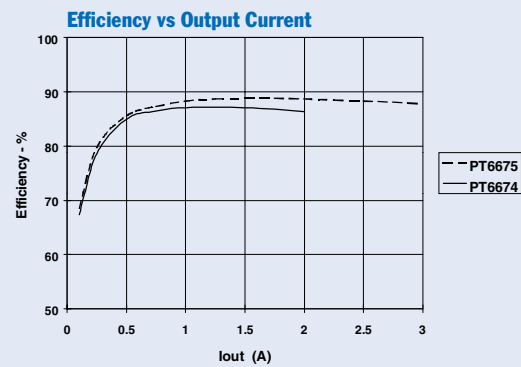
**Notes:** (1) The PT6670 Series requires two 560 $\mu\text{F}$  electrolytic capacitors (input and output) for proper operation in all applications.  
(2) This product does not include short circuit protection.

## TYPICAL CHARACTERISTICS

PT6671/2/3 (@  $V_{in}=+3.3\text{V}$ ) (See Note A)



PT6674/5 Series (@  $V_{in}=+5.0\text{V}$ ) (See Note A)



**Note A:** All characteristic data in the above graphs has been developed from actual products tested at 25 $^\circ\text{C}$ . This data is considered typical data for the ISR.

## PT6670 Series

### Adjusting the Output Voltage of the PT6670 Series Boost Voltage ISR

The Power Trends PT6670 ISRs are a series of converters that operate from a 3.3V or 5V input bus voltage. In each case, the output voltage can be adjusted higher or lower than the factory trimmed pre-set voltage. Adjustment requires the addition of a single external resistor. Table 1 gives the permissible adjustment range for each model in the series as  $V_a$ (min) and  $V_a$ (max) respectively.

**Adjust Up:** To increase the output, add 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 pin 1 (Remote Sense).

Refer to Figure 1 and Table 2 for both the placement and value of the required resistor.

#### 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. Do not exceed the maximum advised adjustment voltage. Doing so could over stress the part.
3. Never connect capacitors to the  $V_o$  Adjust control pin. Any capacitance added to this pin will affect the stability of the ISR.
4. In the case of the PT6671, when the output is adjusted lower than the pre-trimmed output, the maximum input voltage to the ISR should not exceed  $(V_o - 0.5)V$ .

The adjust up and adjust down resistor values can also be calculated using the following formulas. Be sure to select the correct formula parameters from Table 1 for the model being adjusted.

$$(R1) = \frac{K_o (V_a - 2.5)}{2.5 (V_o - V_a)} - R_s \text{ k}\Omega$$

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

Where:  $V_o$  = Original output voltage  
 $V_a$  = Adjusted output voltage  
 $K_o$  = The multiplier constant in Table 1  
 $R_s$  = The series resistance from Table 1

Figure 1

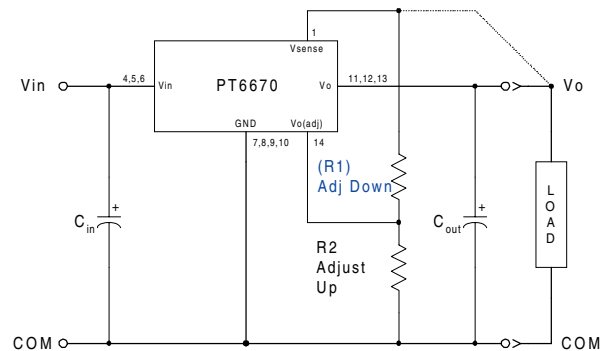


Table 1

#### PT6670 ADJUSTMENT RANGE AND FORMULA PARAMETERS

Series Pt #	PT6671	PT6672	PT6673
<b>3.3V Bus</b>			
<b>5.0V Bus</b>		PT6675	PT6674
<b><math>V_o</math>(nom)</b>	5.0V	9.0V	12.0V
<b><math>V_a</math>(min)</b>	3.8V	8.2V	9.6V
<b><math>V_a</math>(max)</b>	5.5V	9.2V	12.8V
<b><math>K_o</math> (V-k<math>\Omega</math>)</b>	25.0	48.75	47.41
<b><math>R_s</math> (k<math>\Omega</math>)</b>	4.99	80.6	54.9

Table 2

#### PT6670 ADJUSTMENT RESISTOR VALUES

Series Pt #	PT6671	PT6672	PT6673
<b>3.3V Bus</b>			
<b>5.0V Bus</b>		PT6675	PT6674
<b><math>V_o</math>(nom)</b>	5.0V	9.0V	12.0V
<b><math>V_a</math>(req'd)</b>			
3.8	(5.8)k $\Omega$	8.2	(58.3)k $\Omega$
3.9	(7.7)k $\Omega$	8.4	(111.0)k $\Omega$
4.0	(10.0)k $\Omega$	8.6	(217.0)k $\Omega$
4.1	(12.8)k $\Omega$	8.8	(534.0)k $\Omega$
4.2	(16.3)k $\Omega$	9.0	
4.3	(20.7)k $\Omega$	9.2	163.0k $\Omega$
4.4	(26.7)k $\Omega$	9.4	
4.5	(35.0)k $\Omega$	9.6	(1.2)k $\Omega$
4.6	(47.5)k $\Omega$	9.8	(8.0)k $\Omega$
4.7	(68.3)k $\Omega$	10.0	(16.2)k $\Omega$
4.8	(110.0)k $\Omega$	10.2	(26.2)k $\Omega$
4.9	(235.0)k $\Omega$	10.4	(38.7)k $\Omega$
5.0		10.6	(54.8)k $\Omega$
5.1	245.0k $\Omega$	10.8	(76.3)k $\Omega$
5.2	120.0k $\Omega$	11.0	(106.0)k $\Omega$
5.3	78.3k $\Omega$	11.2	(151.0)k $\Omega$
5.4	57.5k $\Omega$	11.4	(226.0)k $\Omega$
5.5	45.0k $\Omega$	11.6	(376.0)k $\Omega$
		11.8	(827.0)k $\Omega$
		12.0	
		12.2	182.0k $\Omega$
		12.4	63.3k $\Omega$
		12.6	24.1k $\Omega$
		12.8	4.4k $\Omega$

R1 = (Blue) R2 = Black

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
PT6671P	OBSOLETE	SIP MODULE	EED	14		TBD	Call TI	Call TI	-40 to 85		

(1) 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.

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

(2) 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)

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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