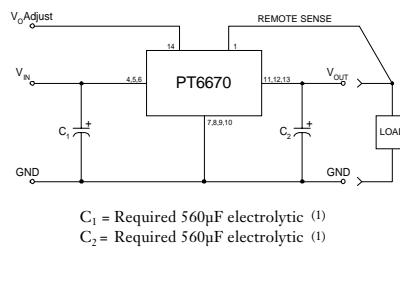


- Input Voltage Range: 3.1 to 3.6V  
4.5 to 5.5V
- Adjustable Output Voltage
- 85% Efficiency
- Remote Sense Capability
- Soft Start

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.

**Pin-Out Information**

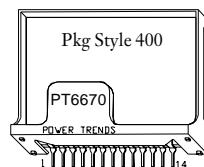
Pin	Function	Pin	Function
1	Remote Sense	8	GND
2	Do not connect	9	GND
3	Do not connect	10	GND
4	V <sub>in</sub>	11	V <sub>out</sub>
5	V <sub>in</sub>	12	V <sub>out</sub>
6	V <sub>in</sub>	13	V <sub>out</sub>
7	GND	14	V <sub>out</sub> Adjust

**Standard Application**

**Ordering Information**

+3.3V Input	+5V Input	V <sub>out</sub>
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>


**Preliminary Specifications**

Characteristics (T <sub>a</sub> = 25°C unless noted)	Symbols	Conditions	PT6670 SERIES			Units
			Min	Typ	Max	
Output Current	I <sub>o</sub>	T <sub>a</sub> = 60°C, 200 LFM, pkg P T <sub>a</sub> = 25°C, natural convection	PT6671 PT6672/5 PT6673 PT6674 PT6675	0.1	—	TBD
				0.1	—	4.0
				0.1	—	1.67
				0.1	—	1.25
				0.1	—	2.0
Input Voltage Range	V <sub>in</sub>	Over V <sub>o</sub> and I <sub>o</sub> range	PT6671/2/3 PT6674/5	3.1	3.3	3.6
				4.5	5.0	5.5
Inrush Current	I <sub>ir</sub>	On start-up	—	—	—	TBD
Output Voltage Tolerance	ΔV <sub>o</sub>	V <sub>in</sub> = V <sub>in</sub> (TYP), I <sub>o</sub> = I <sub>omax</sub> T <sub>a</sub> = 0°C to 65°C	—	1.5	—	%V <sub>o</sub>
Output Voltage Adjust Range	V <sub>oadj</sub>	Pin 14 to V <sub>o</sub> or ground	PT6671 PT6672/5 PT6673/4	3.8	—	5.5
				8.2	—	9.2
				9.6	—	12.8
Line Regulation	Reg <sub>line</sub>	Over V <sub>in</sub> range, I <sub>o</sub> = I <sub>omax</sub>	—	±0.25	±0.5	%V <sub>o</sub>
Load Regulation	Reg <sub>load</sub>	V <sub>in</sub> = V <sub>in</sub> (TYP), 0.1 ≤ I <sub>o</sub> ≤ I <sub>omax</sub>	—	±0.25	±0.5	%V <sub>o</sub>
V <sub>o</sub> Ripple/Noise	V <sub>r</sub>	V <sub>in</sub> = V <sub>in</sub> (TYP), I <sub>o</sub> = I <sub>omax</sub>	—	3	—	%V <sub>o</sub>
Transient Response with C <sub>1</sub> = C <sub>2</sub> = 560µF	t <sub>tr</sub> V <sub>os</sub>	I <sub>o</sub> step between $\frac{1}{2}I_{omax}$ and I <sub>omax</sub> V <sub>o</sub> over/undershoot	—	500	—	µSec
			—	5	—	%V <sub>o</sub>
Efficiency	η	V <sub>in</sub> = V <sub>in</sub> (TYP), I <sub>o</sub> = $\frac{1}{2}I_{omax}$	PT6671 PT6672 PT6673 PT6675 PT6674	85	—	—
				84	—	—
				83	—	—
				88	—	—
				87	—	—
		V <sub>in</sub> = V <sub>in</sub> (TYP), I <sub>o</sub> = I <sub>omax</sub>	PT6671 PT6672 PT6673 PT6675 PT6674	82	—	—
				80	—	—
				82	—	—
				87	—	—
				86	—	—

(Continued)

## PT6670 Series

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

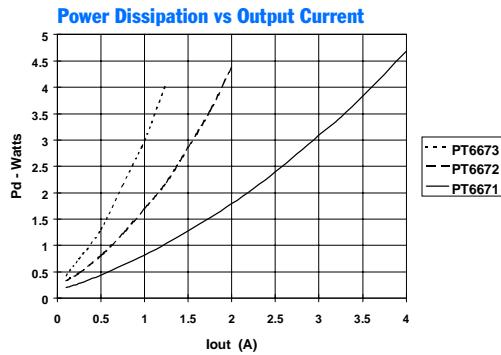
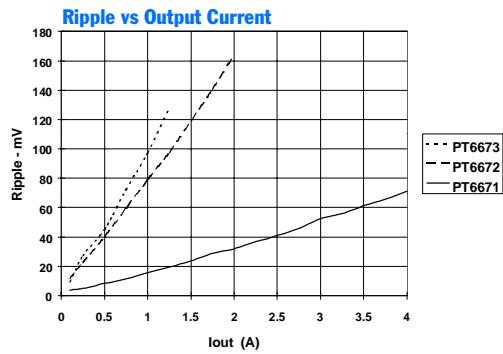
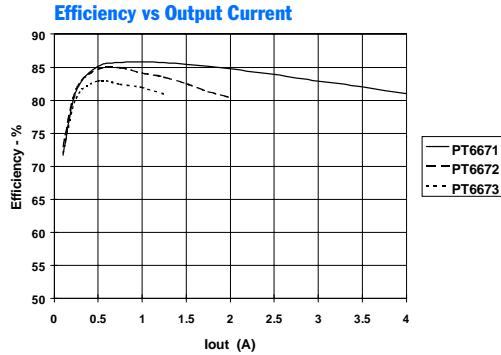
### Preliminary Specifications (continued)

Characteristics ( $T_a = 25^\circ\text{C}$ unless noted)	Symbols	Conditions	PT6670 SERIES			
			Min	Typ	Max	
					Units	
Switching Frequency	$f_o$	Over $V_{in}$ range $0.1\text{A} \leq I_o \leq I_{omax}$	—	300	—	kHz
Absolute Maximum Operating Temperature Range	$T_a$		-40	—	+85	°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	°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	—	7.5	—	G's
Weight	—	—	—	14	—	grams

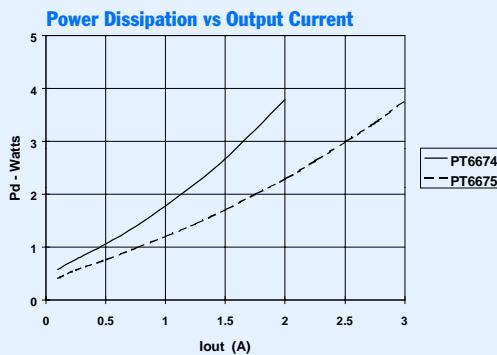
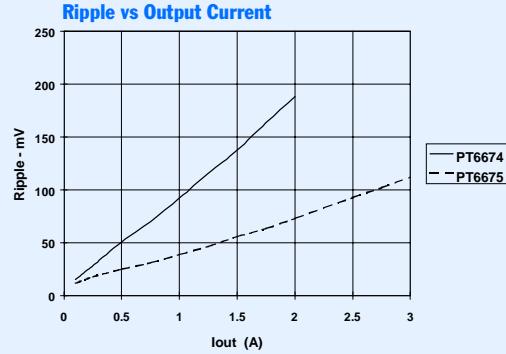
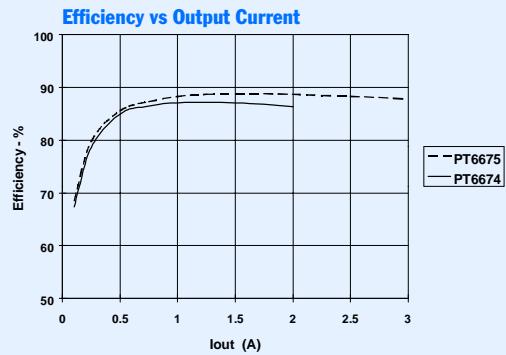
**Notes:** (1) The PT6670 Series requires two  $560\mu\text{F}$  electrolytic capacitors (input and output) for proper operation in all applications.  
(2) This product does not include short circuit protection.

### T Y P I C A L C H A R A C T E R I S T I C S

#### 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.

### 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  $(V_o - 0.5)V$ .

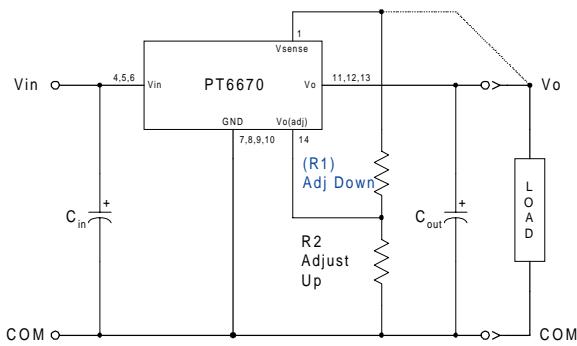
The adjust up and adjust down resistor values can also be calculated using the following formulas. Be sure to select the correct formula parameters from Table 1 for the model being adjusted.

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

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

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 #

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

**Table 2**

#### PT6670 ADJUSTMENT RESISTOR VALUES

##### Series Pt #

3.3V Bus	PT6671	PT6672	PT6673
5.0V Bus	PT6675	PT6674	
<b><math>V_o(\text{nom})</math></b>	5.0V	9.0V	12.0V
<b><math>V_a(\text{req'd})</math></b>		<b><math>V_a(\text{req'd})</math></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

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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>
PT6671D	ACTIVE	SIP MOD ULE	EEA	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6671E	ACTIVE	SIP MOD ULE	EEC	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6671L	ACTIVE	SIP MOD ULE	EEL	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6671M	ACTIVE	SIP MOD ULE	EEM	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6671P	ACTIVE	SIP MOD ULE	EED	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6673E	ACTIVE	SIP MOD ULE	EEC	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6673F	ACTIVE	SIP MOD ULE	EEF	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6673P	ACTIVE	SIP MOD ULE	EED	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6674D	ACTIVE	SIP MOD ULE	EEA	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6674E	ACTIVE	SIP MOD ULE	EEC	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6674P	ACTIVE	SIP MOD ULE	EED	14	12	TBD	Call TI	Level-1-215C-UNLIM
PT6675L	ACTIVE	SIP MOD ULE	EEL	14	12	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.

**OBsolete:** 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.

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**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.

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<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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