

PT6670 Series

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

Power Trends Products
from Texas Instruments

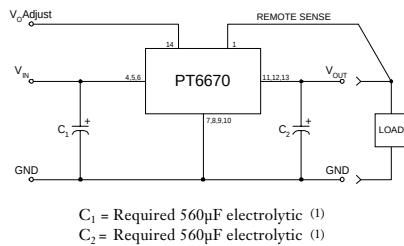
SLTS039A

(Revised 6/30/2000)

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

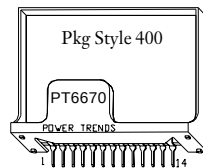
The PT6670 is a series of high-output Integrated Switching Regulators (ISRs) designed to provide a voltage boost function. Housed in a 14-Pin SIP (Single In-line Package), the PT6670 series incorporates regulators for either a +3.3V or +5.0V input and provide output voltages from +5V to +12V. Applications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



Note:
Back surface is
conducting metal.

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	P
Horizontal Through-Hole	D
Horizontal Surface Mount	E

Preliminary Specifications

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

(Continued)

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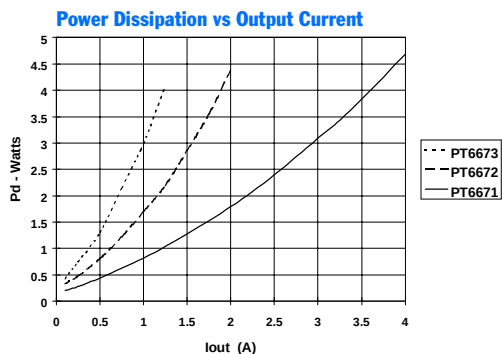
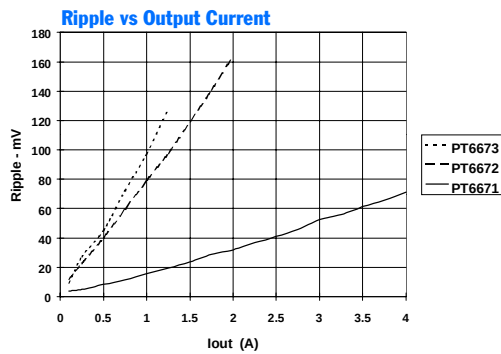
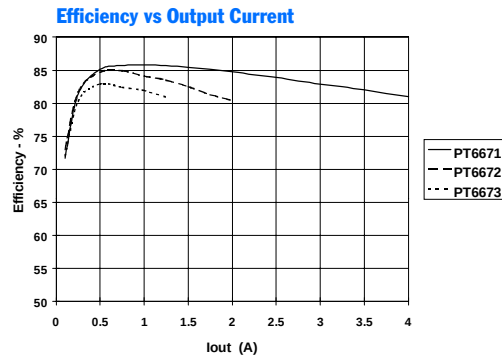
Preliminary Specifications (continued)

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 $0.1\text{A} \leq I_o \leq I_{omax}$	—	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

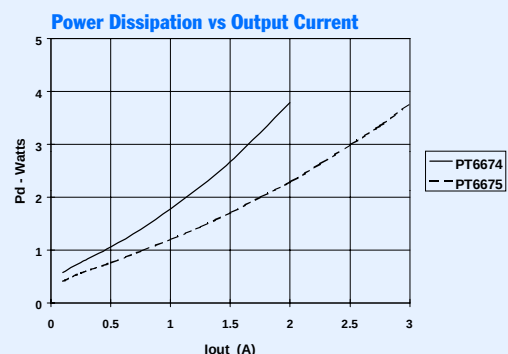
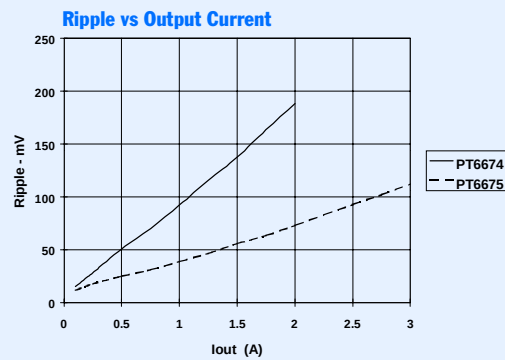
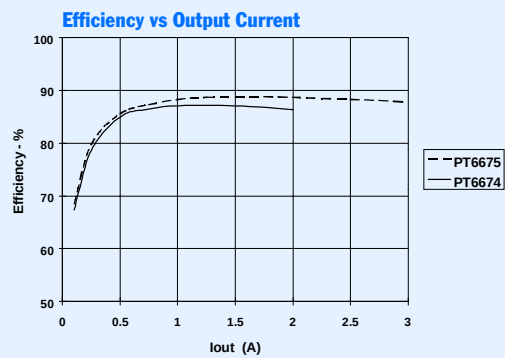
Notes: (1) The PT6670 Series requires two 560 μF electrolytic capacitors (input and output) for proper operation in all applications.
(2) This product does not include short circuit protection.

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°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 $V_a(\text{min})$ and $V_a(\text{max})$ 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

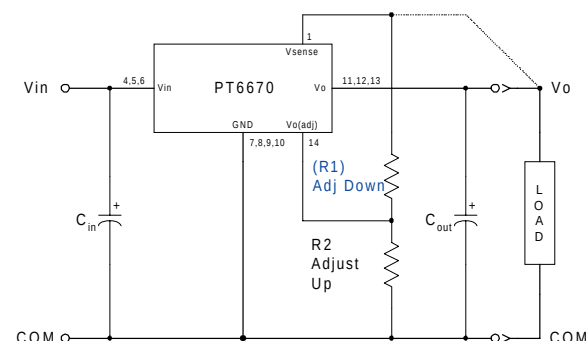


Table 1

PT6670 ADJUSTMENT RANGE AND FORMULA PARAMETERS

Series Pt #			
3.3V Bus	PT6671	PT6672	PT6673
5.0V Bus		PT6675	PT6674
$V_o(\text{nom})$	5.0V	9.0V	12.0V
$V_a(\text{min})$	3.8V	8.2V	9.6V
$V_a(\text{max})$	5.5V	9.2V	12.8V
K_o (V-k Ω)	25.0	48.75	47.41
R_s (k Ω)	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
$V_o(\text{nom})$	5.0V	9.0V	12.0V
$V_a(\text{req'd})$			
3.8	(5.8)k Ω	8.2	(58.3)k Ω
3.9	(7.7)k Ω	8.4	(111.0)k Ω
4.0	(10.0)k Ω	8.6	(217.0)k Ω
4.1	(12.8)k Ω	8.8	(534.0)k Ω
4.2	(16.3)k Ω	9.0	
4.3	(20.7)k Ω	9.2	163.0k Ω
4.4	(26.7)k Ω	9.4	
4.5	(35.0)k Ω	9.6	(1.2)k Ω
4.6	(47.5)k Ω	9.8	(8.0)k Ω
4.7	(68.3)k Ω	10.0	(16.2)k Ω
4.8	(110.0)k Ω	10.2	(26.2)k Ω
4.9	(235.0)k Ω	10.4	(38.7)k Ω
5.0		10.6	(54.8)k Ω
5.1	245.0k Ω	10.8	(76.3)k Ω
5.2	120.0k Ω	11.0	(106.0)k Ω
5.3	78.3k Ω	11.2	(151.0)k Ω
5.4	57.5k Ω	11.4	(226.0)k Ω
5.5	45.0k Ω	11.6	(376.0)k Ω
		11.8	(827.0)k Ω
		12.0	
		12.2	182.0k Ω
		12.4	63.3k Ω
		12.6	24.1k Ω
		12.8	4.4k Ω

R1 = (Blue)

R2 = Black

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