

## PT6500 Series

8 Amp 5V/3.3V Input Adjustable ISR  
with Short-Circuit Protection

**Power Trends Products**  
from Texas Instruments

SLTS034A

(Revised 8/23/2000)

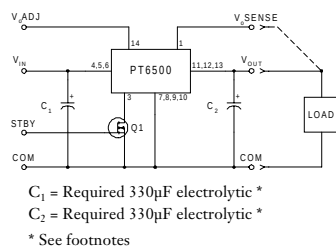


- 8A Single Device Power
- Up to 90% efficiency (PT6501)
- Small SIP Footprint
- Standby Function
- Internal Short Circuit Protection
- Over-Temperature Protection
- Adjustable Output Voltage

The PT6500 series is a high performance +3.1 to 6V input, 8 Amp, 14-Pin SIP (Single In-line-Package) Inte-

grated Switching Regulator (ISR). This ISR allows the integration of high-speed, low-voltage Pentium processors and their support logic into existing 3.3V or 5V systems without redesigning the central power supply. The PT6502 (1.5V) provides the low terminating voltages required by BTL/Futurebus+, CTT, HP, and GTL Buses from existing 3.3V or 5V power rails.

### Standard Application



### Pin-Out Information

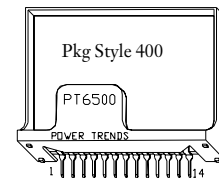
| Pin | Function         |
|-----|------------------|
| 1   | Remote Sense     |
| 2   | Do not connect   |
| 3   | STBY*-Standby    |
| 4   | $V_{in}$         |
| 5   | $V_{in}$         |
| 6   | $V_{in}$         |
| 7   | GND              |
| 8   | GND              |
| 9   | GND              |
| 10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

### Ordering Information

|                         |             |
|-------------------------|-------------|
| PT6501!                 | = 3.3 Volts |
| † PT6502!               | = 1.5 Volts |
| PT6503!                 | = 2.5 Volts |
| PT6504!                 | = 3.6 Volts |
| † PT6505!               | = 1.2 Volts |
| † PT6506!               | = 1.8 Volts |
| † PT6507!               | = 1.3 Volts |
| † PT6508!               | = 1.7 Volts |
| †3.3V Input Bus Capable |             |

### PT Series Suffix (PT1234X)

| Case/Pin Configuration   | Heat Tab Configuration |      |
|--------------------------|------------------------|------|
|                          | None                   | Side |
| Vertical Through-Hole    | N                      | R    |
| Horizontal Through-Hole  | A                      | G    |
| Horizontal Surface Mount | C                      | B    |



### Specifications

| Characteristics<br>( $T_a = 25^\circ\text{C}$ unless noted) | Symbols              | Conditions                                                                                                                                                                                               | PT6500 SERIES                                                                                                      |                       |                                  |                           |
|-------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------|---------------------------|
|                                                             |                      |                                                                                                                                                                                                          | Min                                                                                                                | Typ                   | Max                              | Units                     |
| Output Current                                              | $I_o$                | Over $V_{in}$ range                                                                                                                                                                                      | 0.1 (1)                                                                                                            | —                     | 8.0                              | A                         |
| Current Limit                                               | $I_{cl}$             | $V_{in} = +5\text{V}$                                                                                                                                                                                    | —                                                                                                                  | 13.0                  | 20.0                             | A                         |
| Short Circuit Current                                       | $I_{sc}$             | $V_{in} = +5\text{V}$                                                                                                                                                                                    | —                                                                                                                  | 15.0                  | —                                | Apk                       |
| Input Voltage Range                                         | $V_{in}$             | $0.1 \leq I_o \leq 8.0\text{A}$<br>$V_o = 2.5\text{V}$ and 3.3V<br>$V_o \leq 1.8\text{V}$<br>$V_o = 3.6\text{V}$                                                                                         | 4.5<br>3.1<br>4.8                                                                                                  | —<br>—<br>—           | 6<br>6<br>6                      | V                         |
| Output Voltage Tolerance                                    | $\Delta V_o$         | $V_{in} = +5\text{V}$ , $I_o = 8.0\text{A}$<br>$T_a = 0$ to $+70^\circ\text{C}$                                                                                                                          | $V_o - 0.1$                                                                                                        | —                     | $V_o + 0.1$                      | V                         |
| Line Regulation                                             | $\text{Reg}_{line}$  | $4.5\text{V} \leq V_{in} \leq 6.0\text{V}$ , $I_o = 8.0\text{A}$<br>$3.1\text{V} \leq V_{in} \leq 6.0\text{V}$ , $I_o = 8.0\text{A}$<br>$4.5\text{V} \leq V_{in} \leq 6.0\text{V}$ , $I_o = 8.0\text{A}$ | $V_o \geq 3.3\text{V}$<br>$V_o \leq 1.8\text{V}$<br>$V_o = 2.5\text{V}$                                            | —<br>—<br>—           | $\pm 7$<br>$\pm 3$<br>$\pm 7$    | mV                        |
| Load Regulation                                             | $\text{Reg}_{load}$  | $0.1 \leq I_o \leq 8.0\text{A}$ , $V_{in} = +5\text{V}$                                                                                                                                                  | $V_o \geq 3.3\text{V}$<br>$V_o \leq 1.8\text{V}$<br>$V_o = 2.5\text{V}$                                            | —<br>—<br>—           | $\pm 17$<br>$\pm 12$<br>$\pm 13$ | mV                        |
| $V_o$ Ripple/Noise                                          | $V_n$                | $V_{in} = +5\text{V}$ , $I_o = 8.0\text{A}$                                                                                                                                                              | —                                                                                                                  | 50                    | —                                | mVpp                      |
| Transient Response<br>with $C_o = 330\mu\text{F}$           | $t_{tr}$<br>$V_{os}$ | $I_o$ step from 4A to 8.0A<br>$V_o$ over/undershoot                                                                                                                                                      | —<br>—                                                                                                             | 100<br>150            | —<br>—                           | $\mu\text{sec}$<br>mV     |
| Efficiency                                                  | $\eta$               | $V_{in} = +5\text{V}$ , $I_o = 3.0\text{A}$                                                                                                                                                              | $V_o \geq 3.3\text{V}$<br>$V_o = 2.5\text{V}$<br>$V_o = 1.8\text{V}$<br>$V_o = 1.5\text{V}$<br>$V_o = 1.2\text{V}$ | —<br>—<br>—<br>—<br>— | 90<br>85<br>78<br>76<br>67       | %                         |
|                                                             |                      | $V_{in} = +5\text{V}$ , $I_o = 8.0\text{A}$                                                                                                                                                              | $V_o \geq 3.3\text{V}$<br>$V_o = 2.5\text{V}$<br>$V_o = 1.8\text{V}$<br>$V_o = 1.5\text{V}$<br>$V_o = 1.2\text{V}$ | —<br>—<br>—<br>—<br>— | 83<br>76<br>74<br>68<br>65       | %                         |
| Switching Frequency                                         | $f_o$                | Over $V_{in}$ and $I_o$ ranges                                                                                                                                                                           | 475                                                                                                                | 600                   | 725                              | kHz                       |
| Absolute Maximum<br>Operating Temperature Range             | $T_a$                |                                                                                                                                                                                                          | -40 (3)                                                                                                            | —                     | +85 (4)                          | $^\circ\text{C}$          |
| Thermal Resistance                                          | $\theta_{ja}$        | Free Air Convection (40-60LFM)                                                                                                                                                                           | —                                                                                                                  | 15                    | —                                | $^\circ\text{C}/\text{W}$ |

Continued

# PT6500 Series

8 Amp 5V/3.3V Input Adjustable ISR  
with Short-Circuit Protection

## Specifications (continued)

| Characteristics<br>(T <sub>a</sub> =25°C unless noted) | Symbols        | Conditions                                                            | PT6500 SERIES |     |      | Units |
|--------------------------------------------------------|----------------|-----------------------------------------------------------------------|---------------|-----|------|-------|
|                                                        |                |                                                                       | Min           | Typ | Max  |       |
| Storage Temperature                                    | T <sub>s</sub> | —                                                                     | -40           | —   | +125 | °C    |
| Mechanical Shock                                       | —              | Per Mil-STD-883D, Method 2002.3, 1msec, half sine, fixture mounted    | —             | 500 | —    | G's   |
| Mechanical Vibration                                   | —              | Per Mil-STD-883D, Method 2007.2, 20-20,000 Hz, soldered in a PC board | —             | 7.5 | —    | G's   |
| Weight                                                 | —              | —                                                                     | —             | 23  | —    | grams |

- Notes: (1) ISR will operate down to no load with reduced specifications.  
 (2) The minimum input voltage required by the part is V<sub>out</sub> + 1.2V or 3.1V, whichever is greater.  
 (3) For operation below 0°C, use tantalum capacitors. For more information see the related application note, "PT6000/7000 Series Capacitor Recommendations."  
 (4) See Thermal Derating charts.

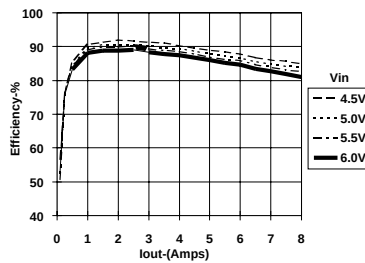
Input/Output Capacitors: The PT6500 series requires a 330µF electrolytic or tantalum input and output capacitor for proper operation in all applications. C<sub>1</sub> (input) must be rated for 1.2Arms and 100mΩ max. ESR. C<sub>2</sub> (output) must be rated for 400mArms ripple current and 0.2Ω max. ESR.

## TYPICAL CHARACTERISTICS

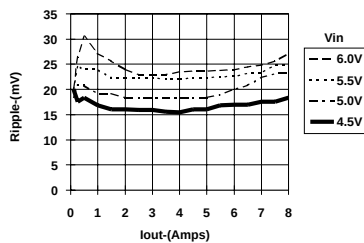
PT6501, 3.3 VDC, V<sub>in</sub>=5.0V

(See Note A)

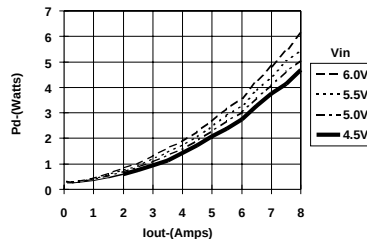
### Efficiency vs Output Current



### Ripple vs Output Current



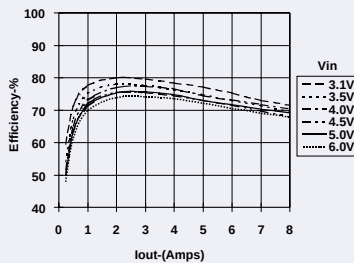
### Power Dissipation vs Output Current



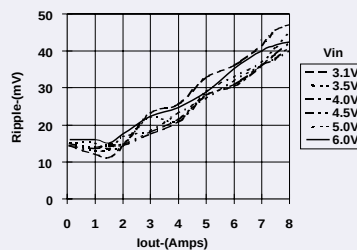
PT6502, 1.5 VDC, V<sub>in</sub>=5.0V

(See Note A)

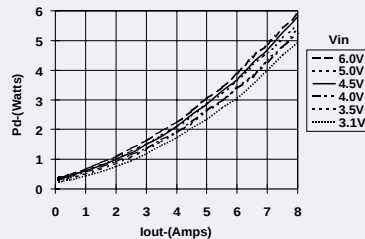
### Efficiency vs Output Current



### Ripple vs Output Current



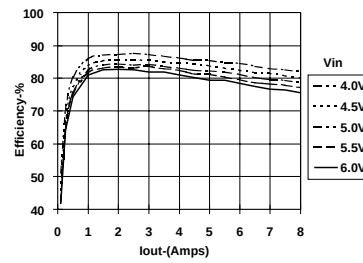
### Power Dissipation vs Output Current



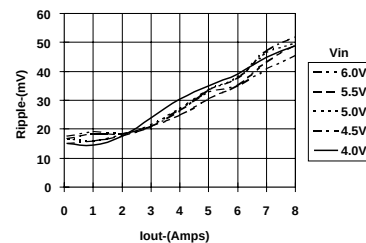
PT6503, 2.5 VDC, V<sub>in</sub>=5.0V

(See Note A)

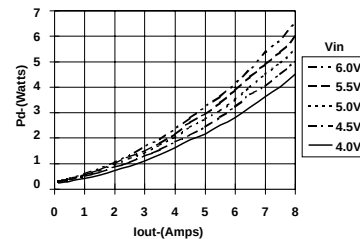
### Efficiency vs Output Current



### Ripple vs Output Current



### Power Dissipation vs Output Current



Note A: 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.

## THERMAL DERATING CURVES

Air Flow (LFM)

60

200

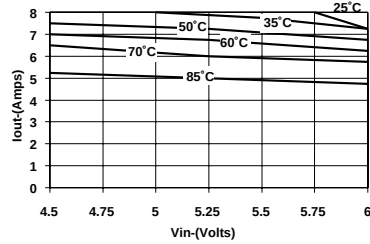
300

PT6501

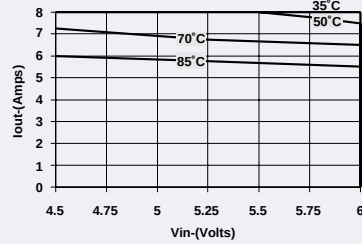
No Heat Tab

Thermal Derating ( $T_a$ )

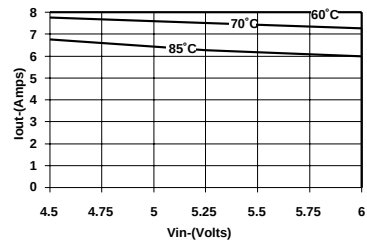
(See Note B)

Thermal Derating ( $T_a$ )

(See Note B)

Thermal Derating ( $T_a$ )

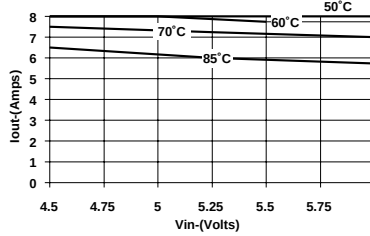
(See Note B)



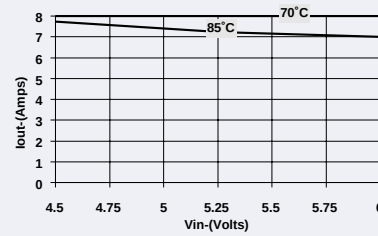
Heat Tab

Thermal Derating ( $T_a$ )

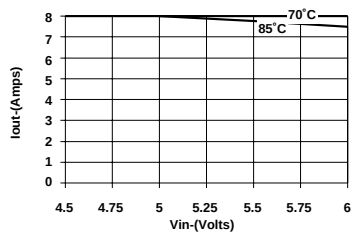
(See Note B)

Thermal Derating ( $T_a$ )

(See Note B)

Thermal Derating ( $T_a$ )

(See Note B)

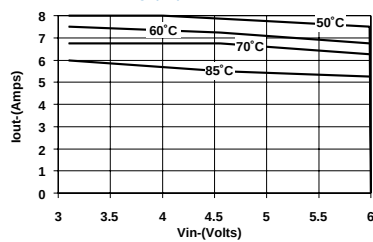


PT6502

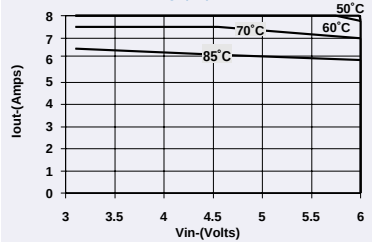
No Heat Tab

Thermal Derating ( $T_a$ )

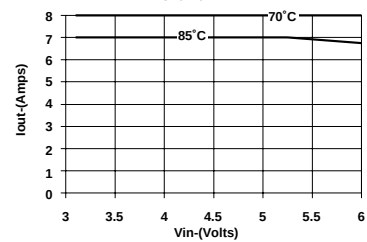
(See Note B)

Thermal Derating ( $T_a$ )

(See Note B)

Thermal Derating ( $T_a$ )

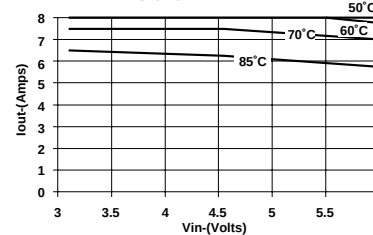
(See Note B)



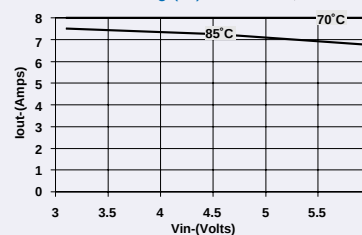
Heat Tab

Thermal Derating ( $T_a$ )

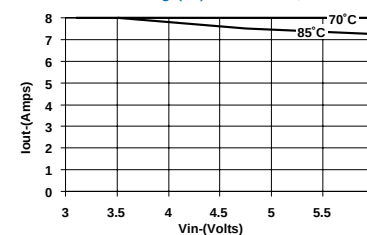
(See Note B)

Thermal Derating ( $T_a$ )

(See Note B)

Thermal Derating ( $T_a$ )

(See Note B)



Note B: Thermal derating graphs are developed in different air flow rates as indicated on each graph, with or without the heat tab, soldered in a printed circuit board.

## THERMAL DERATING CURVES

Air Flow (LFM)  
60

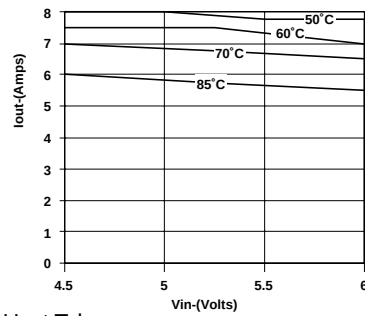
200

300

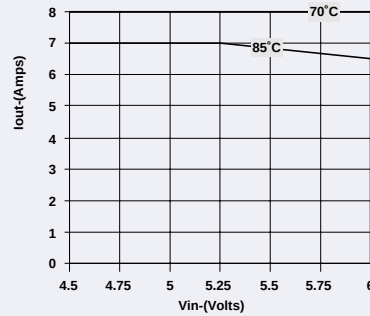
PT6503

No Heat Tab

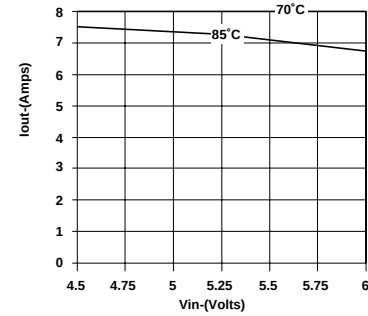
Thermal Derating (Ta) (See Note B)



Thermal Derating (Ta) (See Note B)

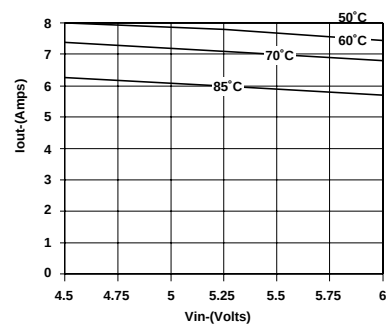


Thermal Derating (Ta) (See Note B)

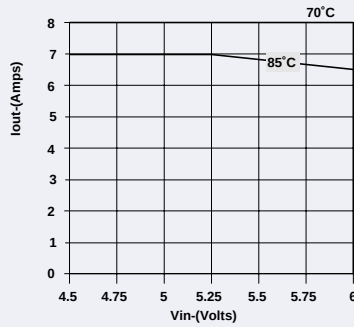


Heat Tab

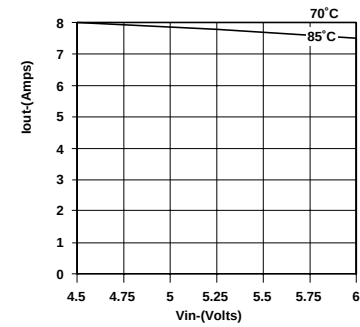
Thermal Derating (Ta) (See Note B)



Thermal Derating (Ta) (See Note B)



Thermal Derating (Ta) (See Note B)



Note B: Thermal derating graphs are developed in different air flow rates as indicated on each graph, with or without the heat tab, soldered in a printed circuit board.

## PT6500 Series

### Adjusting the Output Voltage of the PT6500 5V/3.3V Bus Converters

The output voltage of the Power Trends PT6500 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).

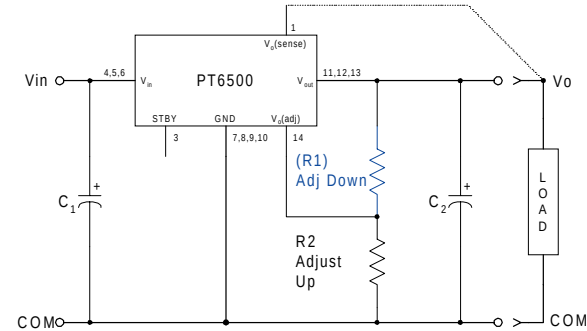
**Adjust Down:** Add a resistor (R1), between pin 14 ( $V_o$  adjust) and pins 11-13 ( $V_o$  adjust).

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  $V_{in(min)}$  from Table 1, 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 ADJUSTMENT AND FORMULA PARAMETERS

| Series Pt #         | PT6505 | PT6507 | PT6502 | PT6508 | PT6506 | PT6503 | PT6501 | PT6504 |
|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| $V_o$ (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 $\Omega$ ) | 2.49   | 2.49   | 2.49   | 2.49   | 2.49   | 4.99   | 12.1   | 10.0   |
| $R_s$ (k $\Omega$ ) | 2.0    | 2.0    | 2.0    | 2.0    | 2.0    | 4.22   | 12.1   | 12.1   |
| $V_{in(min)}$       | 3.1    | 3.1    | 3.1    | 3.1    | 3.1    | 4.5    | 4.5    | 4.5    |

## PT6500 Series

Table 2

PT6500 ADJUSTMENT RESISTOR VALUES

| Series Pt #            | PT6505                                                          | PT6507   | PT6502   | PT6508   | PT6506   | PT6503    | PT6501    | PT6504    |
|------------------------|-----------------------------------------------------------------|----------|----------|----------|----------|-----------|-----------|-----------|
| V <sub>O</sub> (nom)   | 1.2                                                             | 1.3      | 1.5      | 1.7      | 1.8      | 2.5       | 3.3       | 3.6       |
| V <sub>A</sub> (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    | 6.9kΩ    | 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 <sub>out</sub> >3.8Vdc requires V <sub>in</sub> >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 = (Blue) R2 = Black

## PT6500 Series

### Using the Standby Function on the PT6500 5V/3.3V Bus Converters

For applications requiring output voltage On/Off control, the 14-pin PT6500 ISR series incorporates a standby function. This function may be used in applications that require power-up/shutdown sequencing, and wherever there is a requirement for the output status of the module to be controlled by external circuitry.

The standby function is provided by the *STBY*\* control, pin 3. If pin 3 is left open-circuit the regulator operates normally, and provides a regulated output when a valid supply voltage is applied to  $V_{in}$  (pins 4, 5, & 6) with respect to GND (pins 7-10). If a low voltage<sup>2</sup> is then applied to pin-3 the regulator output will be disabled and the input current drawn by the ISR will drop to less than 50mA<sup>4</sup>. The standby control may also be used to hold-off the regulator output during the period that input power is applied.

The standby control pin is ideally controlled using an open-collector (or open-drain) discrete transistor (See Figure 1). It may also be driven directly from a dedicated TTL<sup>3</sup> compatible gate. Table 1 provides details of the threshold requirements.

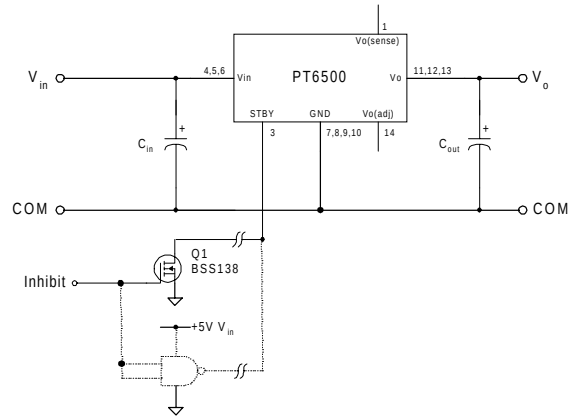
Table 1 Inhibit Control Thresholds <sup>(2,3)</sup>

| Parameter            | Min   | Max   |
|----------------------|-------|-------|
| Enable ( $V_{IH}$ )  | 1V    | 5V    |
| Disable ( $V_{IL}$ ) | -0.1V | 0.35V |

#### Notes:

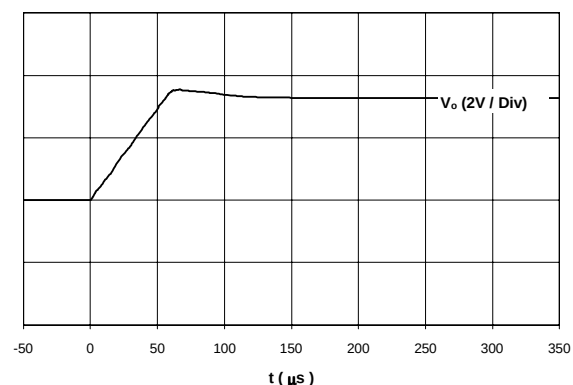
1. The Standby/Inhibit control logic is similar for all Power Trends' modules, but the flexibility and threshold tolerances will be different. For specific information on this function for other regulator models, consult the applicable application note.
2. The Standby control pin is ideally controlled using an open-collector (or open-drain) discrete transistor and requires no external pull-up resistor. The control input has an open-circuit voltage of about 1Vdc. To disable the regulator output, the control pin must be pulled to less than 0.35Vdc with a low-level 0.5mA sink to ground.
3. The Standby input on the PT6500 series may be driven by a differential output device, making it compatible with TTL logic. A standard TTL logic gate will meet the 0.35V  $V_{IL(max)}$  requirement (Table 1) at 0.5mA  $I_{OL}$ . Do not use devices that can drive the Standby control input above 5Vdc.
4. When the regulator output is disabled the current drawn from the input source is reduced to approximately 30–40mA (50mA maximum).

Figure 1



**Turn-On Time:** In the circuit of Figure 1, turning  $Q_1$  on applies a low voltage to the Standby control (pin 3) and disables the regulator output. Correspondingly, turning  $Q_1$  off releases the low-voltage signal and enables the output. The PT6500 ISR series regulators have a fast response and will provide a fully regulated output voltage within 250  $\mu$ sec. The actual turn-on time will vary with load and the total amount of output capacitance. The waveform of Figure 2 shows the typical output voltage response of a PT6501 (3.3V) following the turn-off of  $Q_1$  at time  $t = 0.0$  secs. The waveform was measured with a 5Vdc input voltage, and 0.6 $\Omega$  load.

Figure 2



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