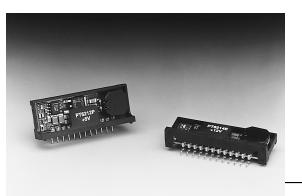
1 10210 301103

2 Amp Adjustable Positive Step-down Integrated Switching Regulator



SLTS030B

(Revised 9/30/2000)



- 90% Efficiency
- Adjustable Output Voltage
- Internal Short Circuit Protection
- Over-Temperature Protection
- On/Off Control (Ground Off)
- Small SIP Footprint
- Wide Input Range

GND

GND

Vou

 V_{out}

Vout Adj (5)

8

9

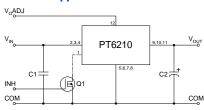
10

11

12

The PT6210 Series is a line of High-Performance 2 Amp, 12-Pin SIP (Single In-line Package) Integrated Switching Regulators (ISRs) designed to meet the on-board power conversion needs of battery powered or other equipment requiring high efficiency and small size. This high performance ISR family offers a unique combination of features combining 90% typical efficiency with open-collector on/off control and adjustable output voltage. Quiescent current in the shutdown mode is typically less than 100µA.

Standard Application



- C₁ = Optional 1µF ceramic
- C_2 = Required 100 μ F electrolytic (1)
- $Q_1 = NFET$

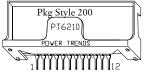
Pin-Out Information Ordering Information

		3
Pin	Function	PT6211 = +5.1 Volts
1	Inhibit (30V max)	PT6212 □ = +5.0 Volts
2	Vin	PT6213 \square = +3.3 Volts PT6214 \square = +12 Volts
3	V_{in}	$PT6214\Box = +1.5 \text{ Volts}$ $PT6216\Box = +1.5 \text{ Volts}$
1	V_{in}	1 10210 = +1.5 voits
5	GND	_
5	GND	

PT Series Suffix (PT1234X)

Case/Pin Configuration

Vertical Through-Hole	P
Horizontal Through-Hole	D
Horizontal Surface Mount	F



Note: Heat spreaders are not electrically connected to product.

Note: Back surface of product is conducting metal.

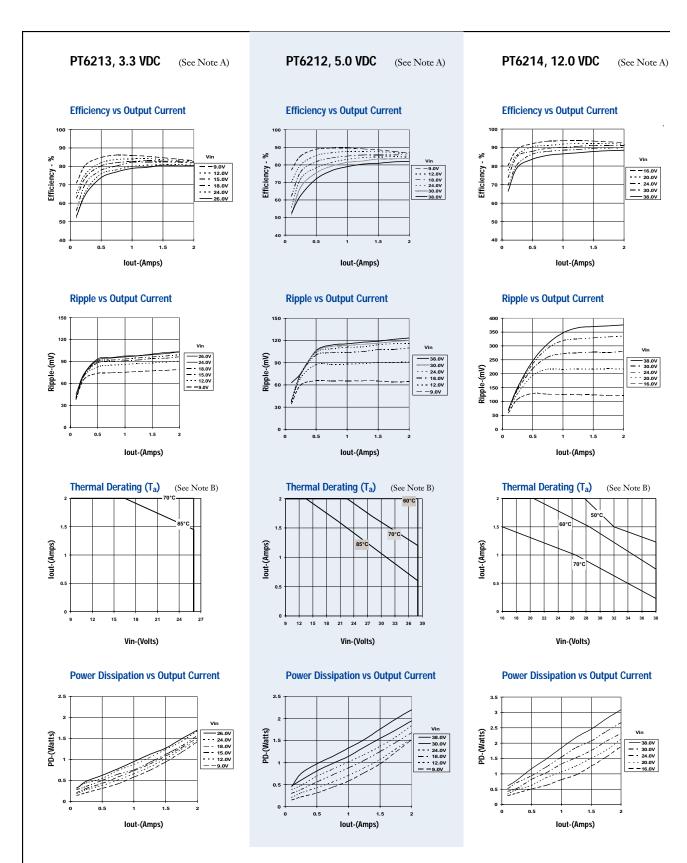
Specifications

Characteristics			ŀ			
(T _a = 25°C unless noted)	Symbols	Conditions	Min	Тур	Max	Units
Output Current	I_{o}	Over V _{in} range	0.1 (2)	_	2.0	A
Short Circuit Current	I_{sc}	$V_{in} = V_{in \ min}$	_	5.0	_	Apk
Input Voltage Range (Note: inhibit function cannot be used with Vin above 30V.)	$ m V_{in}$	$\begin{array}{ccc} 0.1 \leq I_{o} \leq 2.0 \; \mathrm{A} & V_{o} = \; 12 \mathrm{V} \\ V_{o} = 5.0 \mathrm{V} \\ V_{o} = 3.3 \mathrm{V} \\ V_{o} = 1.5 \mathrm{V} \end{array}$	7 9 7 9		30/38 (3) 30/38 (3) 26 17	V
Output Voltage Tolerance	$\Delta { m V_o}$	Over V_{in} Range, $I_o = 2.0$ A $T_a = 0$ °C to $+60$ °C	_	±1.0	±2.0	$%V_{o}$
Line Regulation	Regline	Over V _{in} range	_	±0.25	±0.5	$%V_{o}$
Load Regulation	Regload	$0.1 \le I_o \le 2.0 \text{ A}$	_	±0.25	±0.5	$%V_{o}$
V _o Ripple/Noise	V_n	$V_{in} = V_{in} min$	_	±2	_	$%V_{o}$
Transient Response with C _o = 100μF	$egin{array}{c} t_{ m tr} \ V_{ m os} \end{array}$	50% load change V _o over/undershoot	_	100 5.0	<u>200</u>	μSec %V _o
Efficiency	η	$\begin{array}{cccc} V_{jn}\!=\!16V\!,I_{o}\!=\!0.5A & V_{o}\!=\!12V\\ V_{jn}\!=\!9V\!,I_{o}\!=\!0.5A & V_{o}\!=\!5.0V\\ V_{jn}\!=\!9V\!,I_{o}\!=\!0.5A & V_{o}\!=\!3.3V\\ V_{in}\!=\!9V\!,I_{o}\!=\!0.5A & V_{o}\!=\!1.5Y \end{array}$	/ <u> </u>	91 89 84 72		%
Switching Frequency	f_{o}	Over V_{in} and I_o ranges $V_o \ge 3.3 V_o = 1.5 V_o$			900 500	kHz
Shutdown Current	I_{sc}	$V_{\rm in}$ = $16V$	_	100	_	μA
Quiescent Current	I_{nl}	$I_{o} = 0A, V_{in} = 10V$	_	10	_	mA
Absolute Maximum Operating Temperature Range	T_a	Over V _{in} range	-40	_	+85 (4)	°C
Thermal Resistance	θ_{ja}	Free Air Convection (40-60LFM)	_	40	_	°C/W
Storage Temperature	T_s	_	-40	_	+125	°C
Mechanical Shock	_	Per Mil-STD-883D, Method 2002.3, 1 msec, Half Sine, mounted to a fixture	_	500	—	G's
Mechanical Vibration	_	Per Mil-STD-883D, Method 2007.2, 20-2000 Hz, Soldered in a PC board	_	10	_	G's
Weight	_	_	_	6	_	grams

- Notes: (1) The PT6210 Series requires a 100µF electrolytic or tantalum output capacitor for proper operation in all applications.
 - (2) The ISR will operate to no load with reduced specifications.
 - (3) Input voltage cannot exceed 30V when the inhibit function is used.
 - (4) See Thermal Derating charts.
 - (5) Consult the related application note for guidance on adjusting the output voltage.



2 Amp Adjustable Positive Step-down Integrated Switching Regulator



Note A: The characteristic 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 B: Thermal derating graphs are developed in free air convection cooling of 40-60 LFM. (See Thermal Application Notes).





Adjusting the Output Voltage of Power Trends' Wide Input Range Bus ISRs

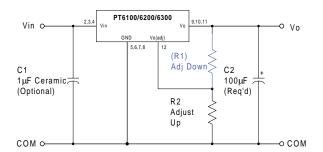
The output voltage of the Power Trends' Wide Input Range Series ISRs may be adjusted higher or lower than the factory trimmed pre-set voltage with the addition of a single external resistor. Table 1 accordingly gives the allowable adjustment range for each model for either series as $V_{\rm a}$ (min) and $V_{\rm a}$ (max).

Adjust Up: An increase in the output voltage is obtained by adding a resistor R2, between pin 12 (V_o adjust) and pins 5-8 (GND).

Adjust Down: Add a resistor (R1), between pin 12 (V_o adjust) and pins 9-11(V_{out}).

Figure 1

Table 1



The values of (R1) [adjust down], and R2 [adjust up], can also be calculated using the following formulas. Refer to Figure 1 and Table 2 for both the placement and value of the required resistor; either (R1) or R2 as appropriate.

(R1) =
$$\frac{R_o (V_a - 1.25)}{V_o - V_a}$$
 kΩ

$$R2 = \frac{1.25 R_o}{V_a - V_o} k\Omega$$

Where: V_o = Original output voltage

 V_a = Adjusted output voltage R_o = The resistance value from Table 1

 $R_0 = 1$ He resistance value

ISR ADJUSTMENT RANGE AND FORMULA PARAMETERS 1Adc Rated PT6102 PT6101 PT6103 2Adc Rated PT6216 PT6213 PT6212 PT6214 3Adc Rated PT6314 PT6303 PT6302 PT6304 1.5 Vo (nom) 3.3 5.0 5.0 12.0 1.3 1.8 1.88 2.18 2.43 Va (min) Va (max) 1.9 6.07 11.25 8.5 22.12 $R_0 (k\Omega)$ 8.25 66.5 150.0 90.9 243.0

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 or V_{out} . Any capacitance added to the V_o adjust pin will affect the stability of the ISR.
- 3. Adjustments to the output voltage may place additional limits on the maximum and minimum input voltage for the part. The revised maximum and minimum input voltage limits must comply with the following requirements. The limits are model dependant.

PT6216/PT6314:

 V_{in} (max) = (10 x V_a)V or 17V, whichever is less.

 V_{in} (min) = 9.0V

All other models:

 V_{in} (max) = $(8 \times V_a)V$ or as specified.

 V_{in} (min) = $(V_a + 4)V$ or 9V, whichever is greater.

Application Notes continued

PT6100/6210/6300 Series

Table 2

$\begin{array}{c} 2.6 & (128.0) k\Omega & (84.4) k\Omega & (51.1) k\Omega & (34.9) kd \\ 2.7 & (161.0) k\Omega & (94.6) k\Omega & (57.3) k\Omega & (37.9) kd \\ 2.8 & (206.0) k\Omega & (106.0) k\Omega & (64.0) k\Omega & (40.9) kd \\ 2.9 & (274.0 kΩ & (118.0) kΩ & (71.4) kΩ & (44.1) kd \\ 3.0 & (388.0) kΩ & (131.0) kΩ & (79.5) kΩ & (47.3) kd \\ 3.1 & (615.0) kΩ & (146.0) kΩ & (88.5) kΩ & (50.5) kd \\ 3.2 & (1300.0) kΩ & (163.0) kΩ & (98.5) kΩ & (53.8) kd \\ 3.3 & (181.0) kΩ & (110.0) kΩ & (57.3) kΩ & (60.8) kd \\ 3.5 & 416.0 kΩ & (222.0) kΩ & (122.0) kΩ & (60.8) kd \\ 3.5 & 416.0 kΩ & (225.0) kΩ & (153.0) kΩ & (68.0) kd \\ 3.6 & 227.0 kΩ & (252.0) kΩ & (153.0) kΩ & (71.7) kd \\ 3.8 & 166.0 kΩ & (319.0) kΩ & (171.0) kΩ & (71.7) kd \\ 3.8 & 166.0 kΩ & (319.0) kΩ & (193.0) kΩ & (75.6) kd \\ 3.9 & 139.0 kΩ & (413.0) kΩ & (250.0) kΩ & (83.5) kd \\ 4.0 & 119.0 kΩ & (413.0) kΩ & (250.0) kΩ & (83.5) kd \\ 4.1 & 104.0 kΩ & (475.0) kΩ & (288.0) kΩ & (87.7) kd \\ 4.2 & 92.4 kΩ & (533.0) kΩ & (335.0) kΩ & (91.9) kd \\ 4.3 & 83.1 kΩ & (654.0) kΩ & (396.0) kΩ & (96.3) kd \\ 4.4 & 75.6 kΩ & (788.0) kΩ & (477.0) kΩ & (101.0) kd \\ 4.5 & 69.3 kΩ & (75.0) kΩ & (396.0) kΩ & (96.3) kd \\ 4.6 & 63.9 kΩ & (126.0) kΩ & (705.0) kΩ & (105.0) kd \\ 4.7 & 59.4 kΩ & (1730.0) kΩ & (105.00) kΩ & (115.0) kd \\ 4.8 & 55.4 kΩ & (1610.0) kΩ & (105.00) kΩ & (115.0) kd \\ 4.9 & 52.0 kΩ & (126.00) kΩ & (705.00) kΩ & (115.00) kd \\ 5.1 & 46.2 kΩ & 1880.0 kΩ & 1140.0 kΩ & (136.00) kd \\ 5.2 & 43.8 kΩ & 937.0 kΩ & 568.0 kΩ & (141.00) kd \\ 5.3 & 41.6 kΩ & 625.0 kΩ & 379.0 kΩ & (147.00) kd \\ 5.5 & 43.8 kΩ & 937.0 kΩ & 284.0 kΩ & (130.00) kd \\ 5.5 & 43.8 kΩ & 937.0 kΩ & 284.0 kΩ & (130.00) kd \\ 5.5 & 43.8 kΩ & 937.0 kΩ & 284.0 kΩ & (130.00) kd \\ 5.6 & 36.1 kΩ & 313.0 kΩ & 189.0 kΩ & (165.00) kd \\ 5.7 & 34.6 kΩ & 268.0 kΩ & 162.0 kΩ & (172.00) kd \\ 5.8 & 33.3 kΩ & 234.0 kΩ & 142.0 kΩ & (172.00) kd \\ 5.9 & 32.0 kΩ & 208.0 kΩ & 126.0 kΩ & (172.00) kd \\ 5.9 & 32.0 kΩ & 208.0 kΩ & 126.0 kΩ & (185.00) kd \\ 5.9 & 32.0 kΩ & 208.0 kΩ & 126.0 kΩ & (185.00) kd \\ 5.9 & 32.0 kΩ & 208.0 kΩ & 126.0 kΩ & (185.00) kd \\ 5.9 & 32.0 kΩ & 208.0 kΩ & 126.$	ISR ADJUSTMENT RESISTOR VALUES							
3Adc Rated PT6314 PT6303 PT6302 PT6304 V ₀ (norm) 1.5 3.3 5.0 5.0 12.0	1Adc Rated		PT6102	PT6101		PT6103		
V ₀ (nom) 1.5 3.3 5.0 5.0 12.0 1.3 (2.1kΩ) (2.1kΩ) (3.1kΩ) (3.2kΩ) <	2Adc Rated	PT6216	PT6213		PT6212	PT6214		
1.3	3Adc Rated	PT6314	PT6303		PT6302	PT6304		
1.3 (2.1kΩ) 1.4 (12.4kΩ) 1.5 1.6 103.0kΩ 1.7 51.6kΩ 1.8 34.4kΩ (24.4)kΩ 1.9 25.8kΩ (30.9)kΩ (31.5)kΩ 2.0 (38.4)kΩ (75.5)kΩ 2.1 (47.1)kΩ (440)kΩ 2.2 (57.4)kΩ (50.9)kΩ (30.8)kΩ 2.3 (69.8)kΩ (58.3)kΩ (35.4)kΩ 2.4 (85.0)kΩ (66.3)kΩ (40.2)kΩ 2.5 (104.0)kΩ (75.0)kΩ (35.4)kΩ 2.6 (128.0)kΩ (76.0)kΩ (57.3)kΩ (37.9)kΩ 2.7 (161.0)kΩ (76.0)kΩ (57.3)kΩ (37.9)kΩ 2.8 (266.0)kΩ (106.0)kΩ (64.0)kΩ (40.9)kΩ 2.9 (274.0)kΩ (118.0)kΩ (77.9)kΩ (44.0)kΩ (47.3)kΩ 3.0 (388.0)kΩ (131.0)kΩ (79.5)kΩ (30.5)kΩ (30.5)kΩ 3.1 (615.0)kΩ (146.0)kΩ (88.5)kΩ (50.5)kΩ (30.5)kΩ 3.2 (1300.0)kΩ (163.0)kΩ (98.5)kΩ (53.8)kΩ 3.3 (181.0)kΩ (110.0)kΩ (57.3)kΩ (53.8)kΩ 3.3 (181.0)kΩ (110.0)kΩ (57.3)kΩ (68.8)kΩ 3.5 4416.0kΩ (225.0)kΩ (136.0)kΩ (66.8)kΩ 3.7 208.0kΩ (225.0)kΩ (136.0)kΩ (66.8)kΩ 3.8 166.0kΩ (319.0)kΩ (171.0)kΩ (77.5)kΩ 3.8 166.0kΩ (319.0)kΩ (171.0)kΩ (77.5)kΩ 4.0 119.0kΩ (413.0)kΩ (20.0)kΩ (33.0)kΩ (68.0)kΩ 4.1 104.0kΩ (475.0)kΩ (210.0)kΩ (79.5)kΩ 4.2 92.4kΩ (33.0)kΩ (33.0)kΩ (33.0)kΩ (79.5)kΩ 4.1 104.0kΩ (475.0)kΩ (210.0)kΩ (79.5)kΩ 4.2 92.4kΩ (33.0)kΩ (33.0)kΩ (33.0)kΩ (79.5)kΩ 4.3 83.1kΩ (654.0)kΩ (210.0)kΩ (79.5)kΩ 4.4 75.6kΩ (788.0)kΩ (370.0)kΩ (100.0)kΩ (V _o (nom)	1.5	3.3	5.0	5.0	12.0		
1.4 (12.4kΩ) 1.5 1.6 103.0kΩ 1.7 51.6kΩ 1.8 34.4kΩ (24.4)kΩ 1.9 25.8kΩ (30.9)kΩ (31.5)kΩ 2.0 (38.4)kΩ (37.5)kΩ 2.1 (47.1)kΩ (44.0)kΩ 2.2 (57.4)kΩ (50.9)kΩ (30.8)kΩ 2.3 (66.8)kΩ (68.3)kΩ (35.4)kΩ 2.4 (85.0)kΩ (66.3)kΩ (40.2)kΩ 2.5 (104.0)kΩ (75.0)kΩ (45.5)kΩ (32.0)kΩ 2.6 (128.0)kΩ (84.4)kΩ (57.3)kΩ (37.9)kΩ 2.7 (161.0)kΩ (94.6)kΩ (57.3)kΩ (37.9)kΩ 2.8 (206.0)kΩ (106.0)kΩ (64.0)kΩ (40.9)kΩ 2.9 (274.0)kΩ (118.0)kΩ (71.4)kΩ (41.1)k3 3.0 (388.0)kΩ (131.0)kΩ (79.5)kΩ (47.3)k3 3.1 (615.0)kΩ (146.0)kΩ (88.5)kΩ (53.8)k3 3.3 (181.0)kΩ (110.0)kΩ	V _a (req.d)							
1.5 1.6 103.0 kΩ 1.7 51.6 kΩ 1.8 34.4 kΩ (24.4) kΩ 1.9 25.8 kΩ (30.9) kΩ (31.5) kΩ 2.0 (38.4) kΩ (37.5) kΩ 2.1 (47.1) kΩ (44.0) kΩ 2.2 (57.4) kΩ (50.9) kΩ (35.8) kΩ (35.8) kΩ 2.2 (57.4) kΩ (58.3) kΩ (35.4) kΩ 2.3 (69.8) kΩ (58.3) kΩ (35.4) kΩ 2.4 (85.0) kΩ (66.3) kΩ (40.2) kΩ 2.5 (104.0) kΩ (75.0) kΩ (45.5) kΩ (32.0) kΩ 2.6 (128.0) kΩ (84.4) kΩ (51.1) kΩ (34.9) kΩ 2.7 (161.0) kΩ (94.6) kΩ (57.3) kΩ (37.9) kΩ 2.8 (206.0) kΩ (106.0) kΩ (46.0) kΩ (40.9) kΩ 2.9 (274.0 kΩ (118.0) kΩ (71.4) kΩ (41.1) kΩ (44.1) kΩ 3.0 (388.0) kΩ (131.0) kΩ (79.5) kΩ (47.3) kΩ 3.1 (615.0) kΩ (146.0) kΩ (88.5) kΩ (50.5) kΩ 3.2 (1300.0) kΩ (166.0) kΩ (88.5) kΩ (50.5) kΩ 3.3 (181.0) kΩ (110.0) kΩ (57.3) kΩ (50.5) kΩ 3.3 (181.0) kΩ (110.0) kΩ (57.3) kΩ (50.5) kΩ 3.4 831.0 kΩ (202.0) kΩ (122.0) kΩ (60.8) kΩ 3.5 416.0 kΩ (225.0) kΩ (136.0) kΩ (68.0) kΩ 3.6 227.0 kΩ (252.0) kΩ (136.0) kΩ (68.0) kΩ 3.7 208.0 kΩ (283.0) kΩ (171.0) kΩ (77.5) kΩ (77.5) kΩ 3.8 166.0 kΩ (225.0) kΩ (136.0) kΩ (68.0) kΩ 3.8 166.0 kΩ (319.0) kΩ (193.0) kΩ (75.6) kΩ 3.9 139.0 kΩ (361.0) kΩ (292.0) kΩ (293.0) kΩ (75.6) kΩ 4.0 119.0 kΩ (413.0) kΩ (292.0) kΩ (293.0) kΩ (75.6) kΩ 4.1 104.0 kΩ (475.0) kΩ (292.0) kΩ (290.0) kΩ (75.6) kΩ 4.1 104.0 kΩ (475.0) kΩ (290.0) kΩ (290.0) kΩ (77.0) kΩ (77.5) kΩ 4.1 104.0 kΩ (475.0) kΩ (290.0) kΩ (99.5) kΩ 4.2 92.4 kΩ (533.0) kΩ (190.0) kΩ (75.0) kΩ (99.5) kΩ 4.4 75.6 kΩ (788.0) kΩ (477.0) kΩ (100.0) kΩ (477.0) kΩ (100.0) kΩ 4.5 60.3 kΩ (1260.0) kΩ (761.0) kΩ (175.0) kΩ (175.0) kΩ 4.7 5.6 kΩ (178.0) kΩ (170.0) kΩ (175.0) kΩ (175.0) kΩ 5.0 48.9 kΩ (160.0) kΩ (170.0) kΩ (175.0) kΩ (175.0) kΩ 5.1 46.2 kΩ 188.0 kΩ (160.0) kΩ (175.0) kΩ (175.0) kΩ 5.2 43.8 kΩ (160.0) kΩ (175.0) kΩ (175.0) kΩ (175.0) kΩ 5.3 41.6 kΩ (292.0) kΩ (292.0) kΩ (292.0) kΩ (175.0) kΩ (175.0) kΩ 5.4 39.6 kΩ (160.0) kΩ (170.0) kΩ (175.0) kΩ 5.5 37.8 kΩ 37.0 kΩ 227.0 kΩ (175.0) kΩ (175.0) kΩ 5.6 36.1 kΩ 313.0 kΩ 1140.0 kΩ (175.0) kΩ 5.7 34.6 kΩ 232.0 kΩ 227.0 kΩ (175.0) kΩ 5.8 33.3 kΩ 234.0 kΩ 142.0 kΩ (175.0) kΩ 5.9 32.0 kΩ 230.0 kΩ 240.0 kΩ 142.0 kΩ (175.0) kΩ 5.9 3	1.3	$(2.1k\Omega)$						
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1.7	1.5							
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ISR ADJUSTMENT RESISTOR VALUES (Cont)							
1Adc Rated	PT6101		PT6103				
2Adc Rated		PT6212	PT6214				
3Adc Rated		PT6302	PT6304				
V _o (nom)	5.0	5.0	12.0				
I _a (req.d)							
6.2	156.0kΩ	94.7kΩ	(207.0) k Ω				
6.4	134.0kΩ	81.2kΩ	(223.0)kΩ				
6.6	117.0kΩ	71.0kΩ	(241.0)kΩ				
6.8	104.0kΩ	63.1kΩ	(259.0)kΩ				
7.0	93.8kΩ	56.8kΩ	(279.0)kΩ				
7.2	85.2kΩ	51.6kΩ	(301.0)kΩ				
7.4	78.1kΩ	47.3kΩ	(325.0) k Ω				
7.6	72.1kΩ	$43.7 \mathrm{k}\Omega$	(351.0) k Ω				
7.8	$67.0 \mathrm{k}\Omega$	40.6kΩ	(379.0) k Ω				
8.0	$62.5 \mathrm{k}\Omega$	$37.9 \mathrm{k}\Omega$	(410.0) k Ω				
8.2	58.6kΩ	$35.5 \mathrm{k}\Omega$	(444.0) k Ω				
8.4	$55.1 \mathrm{k}\Omega$	33.4kΩ	(483.0)kΩ				
8.6	$52.1\mathrm{k}\Omega$		(525.0) k Ω				
8.8	$49.3k\Omega$		(573.0)kΩ				
9.0	46.9kΩ		(628.0)kΩ				
9.5	41.7kΩ		(802.0)kΩ				
10.0	37.5kΩ		(1060.0)kΩ				
10.5	34.1kΩ		(1500.0)kΩ				
11.0	31.3kΩ						
11.5							
12.0							
12.5			608.0kΩ				
13.0			304.0kΩ				
13.5			203.0kΩ				
14.0			152.0kΩ				
14.5			122.0kΩ				
15.0			101.0kΩ				
15.5			86.8kΩ				
16.0			75.9kΩ				
16.5			67.5kΩ				
17.0			60.8kΩ				
17.5			55.2kΩ				
			50.6kΩ				
18.0			30.6kΩ 46.7kΩ				
19.0			43.4kΩ				
19.5			40.5kΩ				
20.0			38.0kΩ				
20.5			35.7kΩ				
21.5			33.8kΩ				
21.5			32.0kΩ				
22.0			30.4kΩ				

R1 = (Blue) R2 = Black





Using the Inhibit Function on Power Trends' Wide Input Range Bus ISRs

For applications requiring output voltage On/Off control, the 12pin ISR products incorporate an inhibit function. The function has uses in areas such as battery conservation, power-up sequencing, or any other application where the regulated output from the module is required to be switched off. The On/Off function is provided by the Pin 1 (*Inhibit*) control.

The ISR functions normally with Pin 1 open-circuit, providing a regulated output whenever a valid source voltage is applied to $V_{\rm in}$, (pins 2, 3, & 4). When a low-level² ground signal is applied to Pin 1, the regulator output will be disabled.

Figure 1 shows an application schematic, which details the typical use of the Inhibit function. Note the discrete transistor (Q1). The Inhibit control has its own internal pull-up with a maximum open-circuit voltage of 8.3VDC. Only devices with a true open-collector or open-drain output can be used to control this pin. A discrete bipolar transistor or MOSFET is recommended.

Equation 1 may be used to determine the approximate current drawn by Q1 when the inhibit is active.

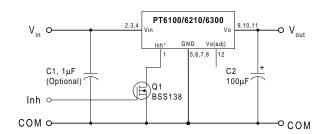
Equation 1

$$I_{stbv}$$
 = $V_{in} \div 155k\Omega$ ± 20%

Notes:

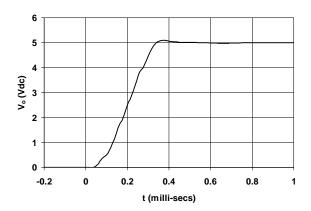
- The Inhibit control logic is similar for all Power Trends' modules, but the flexibility and threshold tolerances will be different. For specific information on the inhibit function of other ISR models, consult the applicable application note.
- 2. Use only a true open-collector device (preferably a discrete transistor) for the Inhibit input. <u>Do Not</u> use a pull-up resistor, or drive the input directly from the output of a TTL or other logic gate. To disable the output voltage, the control pin should be pulled low to less than +1.5VDC.
- 3. When the Inhibit control pin is active, i.e. pulled low, the maximum allowed input voltage is limited to $+30{
 m Vdc}$.
- Do not control the Inhibit input with an external DC voltage. This will lead to erratic operation of the ISR and may over-stress the regulator.
- Avoid capacitance greater than 500pF at the Inhibit control pin. Excessive capacitance at this pin will cause the ISR to produce a pulse on the output voltage bus at turn-on.
- Keep the On/Off transition to less than 10µs. This
 prevents erratic operation of the ISR, which can cause a
 momentary high output voltage.

Figure 1



Turn-On Time: The output of the ISR is enabled automatically when external power is applied to the input. The *Inbibit* control pin is pulled high by its internal pull-up resistor. The ISR produces a fully regulated output voltage within 1-msec of either the release of the Inhibit control pin, or the application of power. The actual turn-on time will vary with the input voltage, output load, and the total amount of capacitance connected to the output Using the circuit of Figure 1, Figure 2 shows the typical rise in output voltage for the PT6101 following the turn-off of Q1 at time t =0. The waveform was measured with a 9Vdc input voltage, and 5-Ohm resistive load.

Figure 2



PACKAGE OPTION ADDENDUM

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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
PT6211P	NRND	SIP MOD ULE	EBD	12	12	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT6212D	NRND	SIP MOD ULE	EBA	12	12	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT6212E	NRND	SIP MOD ULE	EBC	12	12	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT6212P	NRND	SIP MOD ULE	EBD	12	12	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT6213D	NRND	SIP MOD ULE	EBA	12	12	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT6213E	NRND	SIP MOD ULE	EBC	12	12	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT6213P	NRND	SIP MOD ULE	EBD	12	12	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT6214D	NRND	SIP MOD ULE	EBA	12	12	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT6214E	NRND	SIP MOD ULE	EBC	12	12	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT6214P	NRND	SIP MOD ULE	EBD	12	12	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT6216E	NRND	SIP MOD ULE	EBC	12	12	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT6216P	NRND	SIP MOD ULE	EBD	12	12	Pb-Free (RoHS)	Call TI	N / A for Pkg Type

(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.

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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.

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.

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