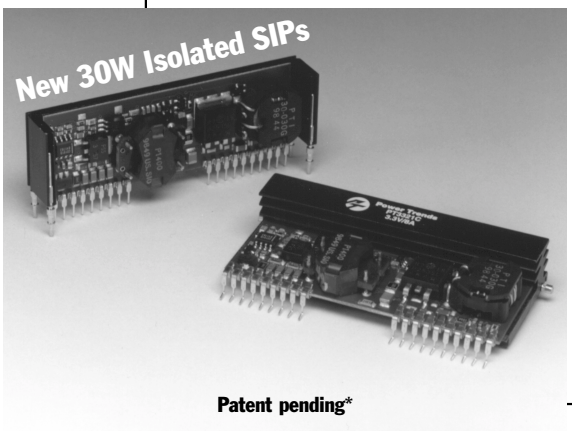
PT3320 Series

30 WATT ISOLATED DC/DC CONVERTER

Application Notes
Mechanical Outline
Product Selector Guide



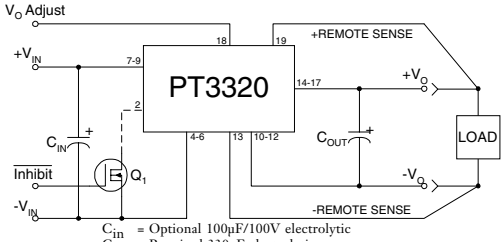
Patent pending*

The PT3320 is a new series of high-input voltage, 30 Watt, isolated DC to DC converters housed in a unique vertical or horizontal 19-pin SIP package. The 36 to 75V input range allows easy integration into many distributed power applications which utilize 48V bus architectures.

The PT3320 series is available with output voltages from 2V to 15V. The output voltage is adjustable from 90 to 110% of nominal with the addition of an external resistor. Other easy to use features include an inhibit function and differential remote sense which automatically compensates for any voltage drop from the converter to the load. The PT3320 includes built in current limit, short circuit protection and over-temperature shutdown.

The PT3320 requires a 330µF output capacitor for proper operation.

Standard Application



C_{in} = Optional 100µF/100V electrolytic
C_{out} = Required 330µF electrolytic
Q_1 = NFET

Pin-Out Information

Pin	Function	Pin	Function
1	Do Not Use	10	-V_o
2	Inhibit	11	-V_o
3	Do Not Use	12	-V_o
4	-V_{in}	13	-Remote Sense
5	-V_{in}	14	+V_o
6	-V_{in}	15	+V_o
7	+V_{in}	16	+V_o
8	+V_{in}	17	+V_o
9	+V_{in}	18	V_o Adjust
		19	+Remote Sense

Features

- 30W Output Power
- Input Voltage Range: 36V to 75V
- 1500 VDC Isolation
- V_o Inhibit
- V_o Adjust
- Differential Remote Sense
- Current Limit
- Short-Circuit Protection
- Over-Temperature Shutdown
- Undervoltage Lockout
- Flexibile SIP Package
- UL 1950, CSA 22.2 950 approval pending
- Meets EN60950

Preliminary Specifications

Characteristics (T_a = 25°C unless noted)	Symbols	Conditions	PT3320 SERIES Min	Typ	Max	Units
Output Current	I_o	Over V_{in} range V_o = 3.3V	0.25	—	8.0	A
		V_o = 5V	0.25	—	6.0	A
		V_o = 12V	0.1	—	2.5	A
On/Off Standby Current	$I_{in\ standby}$	V_{in} = 48V, Pin 1 = -V_{in}	—	8	16	mA
Short Circuit Current	I_{sc}	V_{in} = 48V	—	2xI_{omax}	—	A
Input Voltage Range	V_{in}	Over I_o Range	36.0	48.0	75.0	V
Output Voltage Tolerance	ΔV_o	Over V_{in} Range T_A= -40°C to +85°C	—	±1.0	—	%V_o
Line Regulation	Reg_{line}	Over V_{in} range @ max I_o	—	±0.5	—	%V_o
Load Regulation	Reg_{load}	10% to 100% of I_o max	—	±0.5	—	%V_o
V_o Ripple/Noise	V_n	V_{in}=48V, I_o=I_o max, V_o≥5V	—	1.0	—	%V_o
		V_{in}=48V, I_o=I_o max, V_o<5V	—	50	—	mV_{pp}
Transient Response	t_{tr}	50% load change, 1A/µSec	—	100	—	µSec
		V_o over/undershoot, V_o≥5V	—	3.0	—	%V_o
Efficiency	η	V_{in}=48V, I_o=6A, V_o=3.3V	—	80	—	%
		V_{in}=48V, I_o=6A, V_o=5V	—	84	—	%
		V_{in}=48V, I_o=2.5A, V_o=12V	—	85	—	%
Switching Frequency	f_o	Over V_{in} and I_o V_o<10V	600	750	900	kHz
		V_o≥10V	400	500	600	kHz
Recommended Operating Temperature Range	T_a	V_{in} = 48V @ max I_o Airflow = 200 LFM	-40*	—	+85	°C
Storage Temperature	T_s	—	-40	—	+125	°C
Mechanical Shock	—	Per Mil-Std-883D, method 2002.3, 1mS, half-sine, mounted to a fixture	—	500	—	G's
Mechanical Vibration	—	Per Mil-Std-883D, method 2007.2, 20-2000Hz, soldered in a PC board	—	10	—	G's
Weight	—	—	—	40	—	grams
Input/Output Isolation	—	—	1500	—	—	VDC
Capacitance	—	—	—	1200	—	pF
Resistance	—	—	10	—	—	MΩ
Flammability	—	Materials meet UL 94V-0				
Inhibit (pin 2)	On**	Referenced to -V_{in}	2.5	—	15	VDC
	Off		0	—	0.8	VDC

* At temperatures below 0°C, the PT3320 series requires output capacitors with temperature stable dielectrics such as tantalum or Oscon.

** If pin 2 is left open, the PT3320 will operate when input power is applied.

Ordering Information

PT3321☐ = 3.3V/8A
PT3322☐ = 5.0V/6A
PT3323☐ = 12.0V/2.5A
PT3324☐ = 15.0V/2A
PT3325☐ = 2.0V/8A
PT3326☐ = 2.5V/8A
PT3327☐ = 1.8V/8A
PT3328☐ = 5.2V/6A

PT Series Suffix (PT1234X)

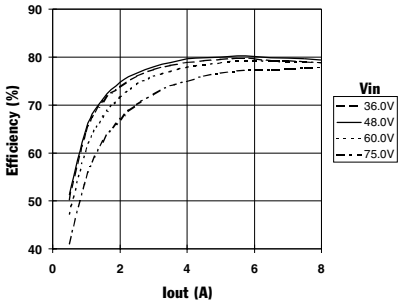
Case/Pin Configuration	
Vertical Through-Hole	**N**
Horizontal Through-Hole	**A**
Horizontal Surface Mount	**C**

(For dimensions and PC board layout, see Package Styles 840 and 850.)

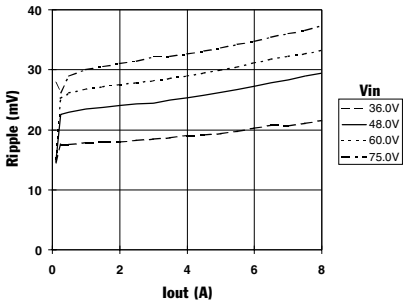
* **Note:** This product is the subject of one or more patents. Other patents pending.

PT3321, 3.3 VDC (See Note 1)

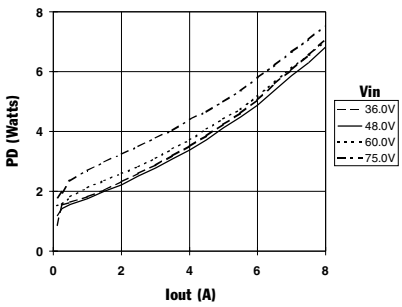
Efficiency vs Output Current



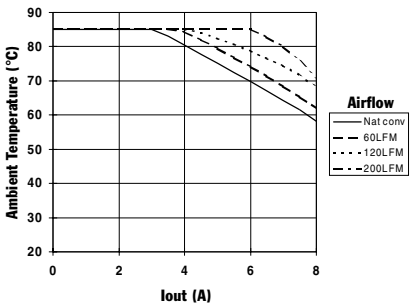
Ripple vs Output Current



Power Dissipation vs Output Current

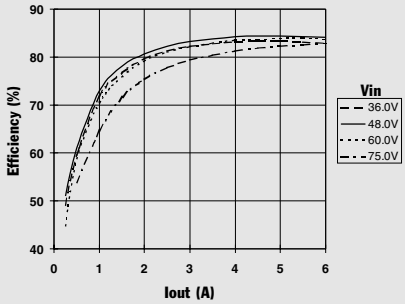


Safe Operating Area (@Vin=48V)

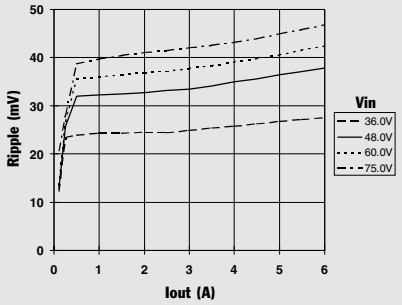


PT3322, 5.0 VDC (See Note 1)

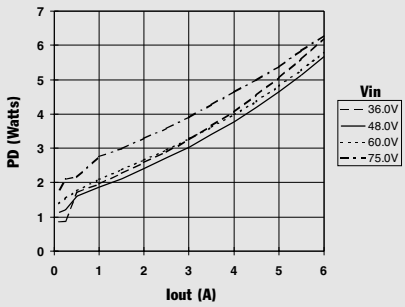
Efficiency vs Output Current



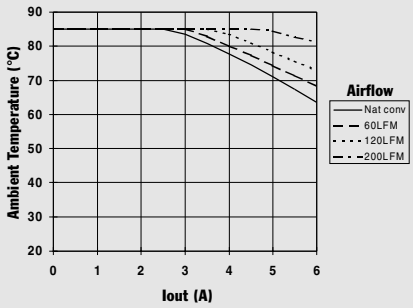
Ripple vs Output Current



Power Dissipation vs Output Current

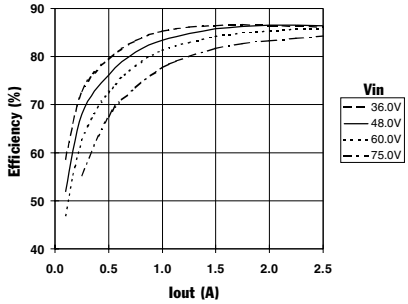


Safe Operating Area (@Vin=48V)

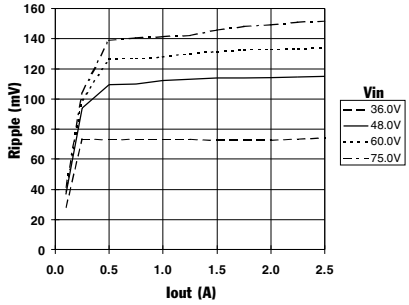


PT3323, 12.0 VDC (See Note 1)

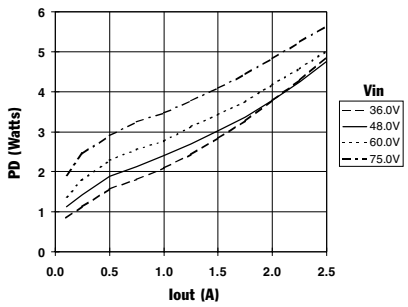
Efficiency vs Output Current



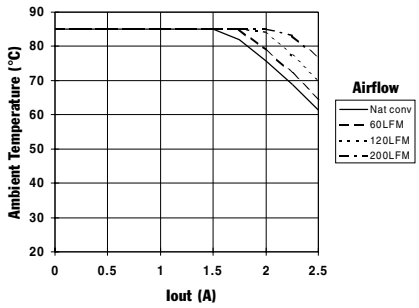
Ripple vs Output Current



Power Dissipation vs Output Current



Safe Operating Area (@Vin=48V)



Note 1: *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 DC-DC Converter.*

Adjusting the Output Voltage of the PT3320 / PT3340 Series of Isolated DC-DC Converters

The factory pre-set output voltage of Power Trends' PT3320 and PT3340 series DC-DC converters may be adjusted within a nominal ±10% range. This is accomplished with the addition of a single external resistor. For the input voltage range specified in the data sheet, Table 1 gives the allowable adjustment range for each model as V_o (min) and V_o (max).

Adjust Up: An increase in the output voltage is obtained by adding a resistor, R2 between pin 18 (V_o adjust), and pin 13 (-Remote Sense). *See note 4.*

Adjust Down: Add a resistor (R1), between pin 18 (V_o adjust) and pin 19 (+Remote Sense).

Refer to Figure 1 and Table 2 for both the placement and value of the required resistor, (R1) or R2.

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 to V_o adjust. Any capacitance added to the V_o adjust control pin will affect the stability of the ISR.
3. If the remote sense pins are not being used, the resistors (R1) and R2 can be connected to $+V_{out}$ or $-V_{out}$ respectively.
4. The adjusted output voltage V_a effectively sets the voltage across pins 13 and 19 (±Remote Sense). When using the remote sense pins, V_{out} (measured directly across pins 10–12, and 14–17) can be significantly higher than V_a, and may exceed V_o (max). If V_a is adjusted upward, the alternative is to increase the minimum input voltage by the same percentage as V_{out} exceeds V_o(max).

The values of (R1) [adjust down], and R2 [adjust up], can also be calculated using the following formulas.

$$(R1) = \frac{R_o (V_o - V_r)(V_a - V_r)}{V_r (V_o - V_a)} - R_s \quad k\Omega$$

$$R2 = \frac{R_o (V_o - V_r)}{(V_a - V_o)} - R_s \quad k\Omega$$

Where
V_o = Original output voltage
V_a = Adjusted output voltage
V_r = Reference voltage (Table 1)
R_o = Multiplier resistance (Table 1)
R_s = Series resistance (Table 1)

Table 1

DC-DC CONVERTER ADJUSTMENT RANGE AND FORMULA PARAMETERS

Series Pt #						
24V Bus			**PT3341**	**PT3342**	**PT3343**	**PT3344**
48V Bus	**PT3325**	**PT3326**	**PT3321**	**PT3322**	**PT3323**	**PT3324**
V_o(nom)	2.0V	2.5	3.3	5.0	12.0	15.0
Vo(min)	1.8V	2.25	2.95	4.5	10.8	13.5
Vo(max)	2.2	2.75	3.65	5.5	13.2	16.5
V_r	1.225	1.225	1.225	1.225	2.5	2.5
R_o (kΩ)	80.6	33.2	33.2	18.2	14.3	11.0
R_S (kΩ)	150.0	121.0	150.0	121.0	90.9	80.6

Figure 1

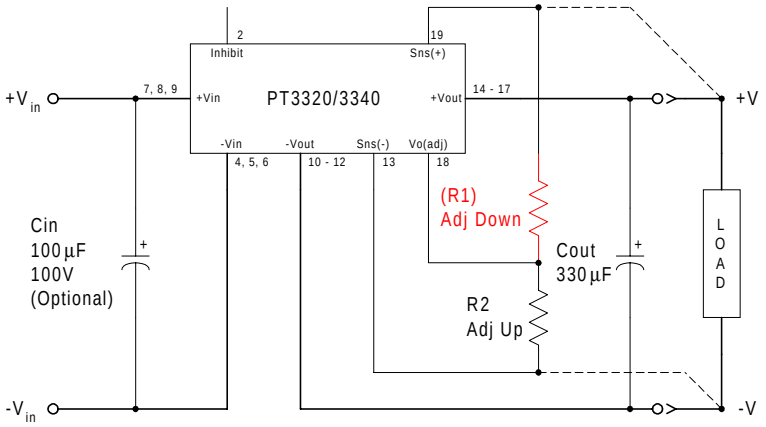


Table 2

PT3320 / PT3340 ADJUSTMENT RESISTOR VALUES

Series Pt #								
24V Bus			**PT3341**		**PT3342**		**PT3343**	**PT3344**
48V Bus	**PT3325**	**PT3326**	**PT3321**		**PT3322**		**PT3323**	**PT3324**
Current	**8Adc**	**8Adc**	**8Adc**		**6adc**		**2.5Adc**	**2.0Adc**
V_o(nom)	**2.0Vdc**	**2.5Vdc**	**3.3Vdc**		**5.0Vdc**		**12.0Vdc**	**15.0Vdc**
V_a(req'd)				**V_a(req'd**		**V_a(req'd)**		
1.8	0.0kΩ			4.5	(246.0)kΩ	10.8	(285.0)kΩ	
1.85	(62.5)kΩ			4.55	(293.0)kΩ	11.0	(371.0)kΩ	
1.9	(194.0)kΩ			4.6	(352.0)kΩ	11.2	(500.0)kΩ	
1.95	(589.0)kΩ			4.65	(428.0)kΩ	11.4	(715.0)kΩ	
2.0				4.7	(529.0)kΩ	11.6	(1150.0)kΩ	
2.05	1100.0kΩ			4.75	(670.0)kΩ	11.8		
2.1	475.0kΩ			4.8	(882.0)kΩ	12.0		
2.15	266.0kΩ			4.85	(1230.0)kΩ	12.2	588.0kΩ	
2.2	162.0kΩ			4.9	(1940.0)kΩ	12.4	249.0kΩ	
2.25		(20.7)kΩ		4.95		12.6	136.0kΩ	
2.3		(64.7.0)kΩ		5.0		12.8	78.9kΩ	
2.35		(138.0)kΩ		5.05		13.0	45.0kΩ	
2.4		(285.0)kΩ		5.1	566.0kΩ	13.2	22.3kΩ	
2.45		(726.0)kΩ		5.15	337.0kΩ			
2.5				5.2	223.0kΩ	13.5		(323.0)kΩ
2.55		726.0kΩ		5.25	154.0kΩ	13.6		(355.0)kΩ
2.6		302.0kΩ		5.3	108.0kΩ	13.8		(437.0)kΩ
2.65		161.0kΩ		5.35	75.3kΩ	14.0		(522.0)kΩ
2.7		90.6kΩ		5.4	50.8kΩ	14.2		(724.0)kΩ
2.75		48.3kΩ		5.45	31.7kΩ	14.4		(1010.0)kΩ
2.95			(127.0)kΩ	5.5	16.4kΩ	14.6		(1580.0)kΩ
3.0			(183.0)kΩ			14.8		
3.05			(261.0)kΩ			15.0		
3.1			(377.0)kΩ			15.2		607.0kΩ
3.15			(572.0)kΩ			15.4		263.0kΩ
3.2			(961.0)kΩ			15.6		149.0kΩ
3.25			(2130.0)kΩ			15.8		91.3kΩ
3.3						16.0		56.9kΩ
3.35			1230.0kΩ			16.5		11.1kΩ
3.4			539.0kΩ					
3.45			309.0kΩ					
3.5			194.0kΩ					
3.55			126.0kΩ					
3.6			79.6kΩ					
3.65			46.8kΩ					

R1 = (Red) R2 = Black

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