PT4210 Series —48V

5-7 Watt Low-Profile Isolated DC-DC Converter

SLTS137A

(Revised 4/19/2001)

Features

- Wide Input Voltage Range: 38V to 75V
- 1,500 VDC Isolation
- 6 Pin DIP Package
- Low-Profile (8mm)
- Pin-compatible with PT4200 Series
- No External Components Required [2]
- Safety Approvals —Pending

Description

The PT4210 series of low-power isolated DC-DC converters are pin-compatible with Power Trends' popular PT4200 series. The PT4210 series has improved load regulation over the PT4200, and is a compatible alternative for both new and existing designs. Applications include Telecom and Datacom systems where both board space and height are a premium.

The PT4210 series is offered in both through-hole or SMD-DIP package types with single non-adjustable output voltages of 3.3V, 5V, and 12V.

Ordering Information

PT4212❑ = 3.3V/1.5A
PT4213❑ = 5V/1.2A
PT4214❑ = 12V/0.6A

Package Suffix (PT1234X)

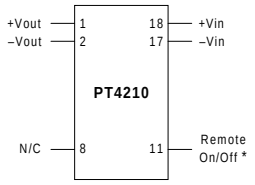
Case/Pin Configuration	
Through-Hole	**A**
Surface Mount	**C**

(For dimensions and PC board layout, see Package Style 910)

Pin-Out Information

Pin	Function
1	$+V_{out}$
2	$-V_{out}$
8	N/C
11	Remote On/Off *
17	$-V_{in}$
18	$+V_{in}$

Package Top View



Specifications

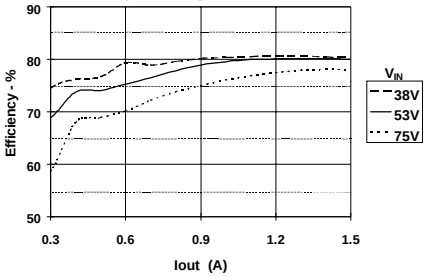
Characteristics (T_a = 25°C unless noted)	Symbols	Conditions		PT4210 SERIES Min	Typ	Max	Units
Output Current	I_o	Over V_{in} range	PT4212 (3.3V) PT4213 (5.0V) PT4214 (12V)	0 0 0	— — —	1.5 1.2 0.6	A
Output Voltage Tolerance	ΔV_o	Over Vin range, 10%$I_o$max ≤ I_o ≤$I_o$max, –40°C < T_a <85°C	PT4212 PT4213 PT4214	3.17 4.85 11.5	— — —	3.5 5.25 12.5	V
Idling Voltage	V_o	I_o = 0A	PT4212 PT4213 PT4214	— — —	3.7 5.4 12.7	3.9 5.9 17	V
Line Regulation	Reg_{line}	Over V_{in} range @ max I_o	PT4212/4213 PT4214	— —	±20 ±45	— —	mV
Load Regulation	Reg_{load}	V_{in} =53V 10%$I_o$max ≤ I_o ≤$I_o$max	PT4212/13 PT4214	— —	±100 ±150	— —	mV
Current Limit	I_{lim}	Over V_{in} range	PT4212 PT4213 PT4214	— — —	3.0 3.0 1.5	— —	A
Short Circuit Current	I_{sc}	Over V_{in} range	PT4212 PT4213 PT4214	— — —	2.4 1.5 1.0	— — —	A
Inrush Current Input Voltage Range	I_{ir} t_{ir} V_{in}	V_{in} = 53V @ max I_o On start-up Over I_o range		— — 38	0.5 1.0 —	— — 75	A mSec V
V_o Ripple/Noise	V_n	V_{in}= 53V, I_o=I_o max		—	30	70	mV_{pp}
Transient Response	t_{tr}	V_{in} =53V, 10%..100%$I_o$max, 50% load step V_o over/undershoot:	PT4212/4213 PT4214	— — —	200 +150/–250 +250/–500	— — —	µSec mV
Efficiency	η	V_{in}=53V, I_o=1.5A, V_{in}=53V, I_o=1.2A, V_{in}=53V, I_o=0.6A,	PT4212 PT4213 PT4214	— — —	80 82 84	— — —	%
Switching Frequency	f_o	Over V_{in} and I_o ranges		400	—	500	kHz
Operating Temperature	T_a	Over V_{in} range		-40	—	+85 (1)	°C
Storage Temperature	T_s	—		-40	—	+125	°C
Mechanical Shock	—	Per Mil-STD-202F, Method 213B, 6mS half-sine, mounted to a PCB		—	TBD	—	G's
Mechanical Vibration	—	Per Mil-STD-202F, Method 204D, 10-500Hz, mounted to a PCB		—	TBD	—	G's
Weight	—	—		—	10	—	grams
Isolation	—	—		1500	—	—	VDC
Flammability	—	Materials meet UL 94V-0					

Notes: *(1) See SOA curves or consult the factory for the appropriate derating.*
(2) The maximum output capacitance must not exceed 150µF for the PT4212, 120µF for the PT4213, and 47µF for the PT4214.

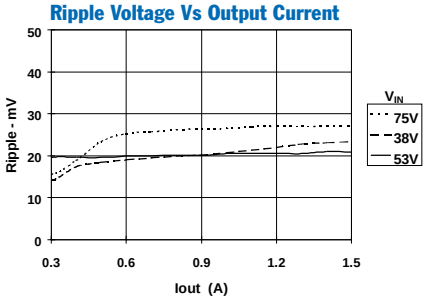
Typical Characteristics

PT4212 Performance (See Note A)

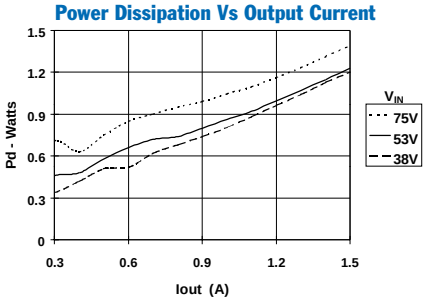
Efficiency Vs Output Current



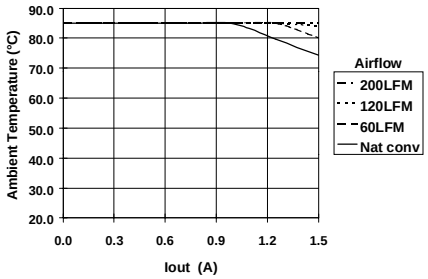
Ripple Voltage Vs Output Current



Power Dissipation Vs Output Current

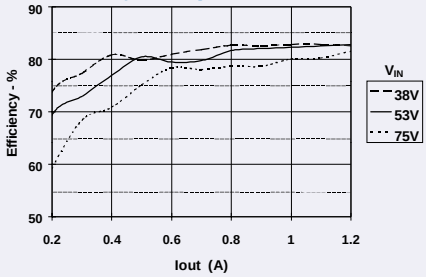


Safe Operating Area, V_{in} =36–60V

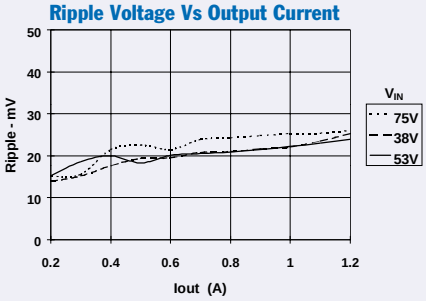


PT4213 Performance (See Note A)

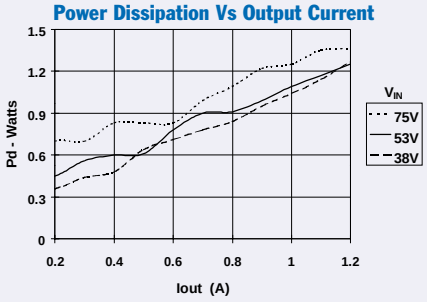
Efficiency Vs Output Current



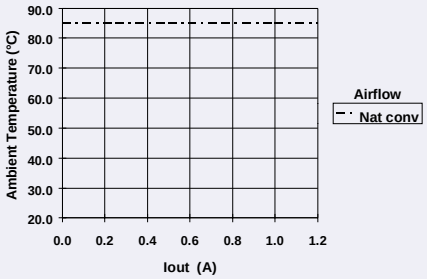
Ripple Voltage Vs Output Current



Power Dissipation Vs Output Current

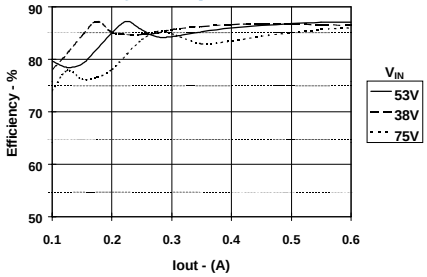


Safe Operating Area, V_{in} =36–60V

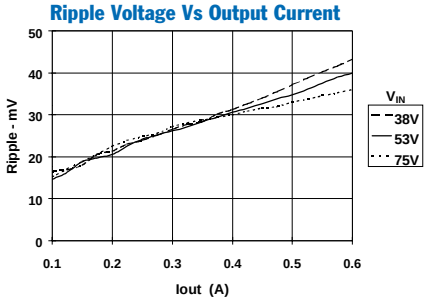


PT4214 Performance (See Note A)

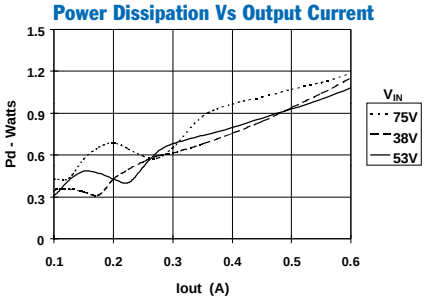
Efficiency Vs Output Current



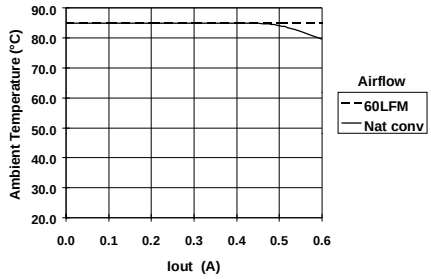
Ripple Voltage Vs Output Current



Power Dissipation Vs Output Current



Safe Operating Area, V_{in} =36–60V



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 converter.*
Note B: *SOA curves represent operating conditions at which internal components are at or below manufacturer's maximum rated operating temperatures.*

Using the Remote On/Off Function on the PT4210 Isolated 7W DC/DC Converters

Applications requiring output voltage On/Off control, the PT4210 DC/DC converter series incorporates a "*Remote On/Off*" control (pin 11). This feature can be used when there is a requirement for the module to be switched off without removing the applied input source voltage.

The converter functions normally with Pin 11 open-circuit, providing a regulated output voltage when a valid source voltage is applied to $+V_{in}$ (pin 18), with respect to $-V_{in}$ (pin 17). When a low-level [1] ground signal is applied to pin 11, the converter output will be turned off.

Figure 1 shows an application schematic, which details the typical use of the *Remote On/Off* function. Note the discrete transistor (Q1). The control pin has its own internal pull-up, and must be controlled with an open-collector or open-drain device (See notes 2 & 3). Table 1 gives the input requirements.

When placed in the "Off" state, the standby current drawn from the input source is typically reduced to less than 1mA.

Table 1; Remote On/Off Control Requirements [1]

Parameter	Min	Typ	Max
Disable	-0.1V	—	1.0V
Enable	5.0V [3]	—	Open-Circuit [2]
$V_{o/c}$ [Open-Circuit]	—	—	10V
I_{in} [pin 11 at $-V_{in}$]	—	–100µA	—

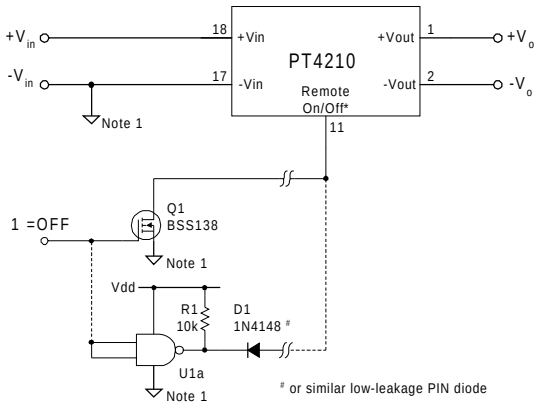
Notes:

1. The *Remote On/Off* control uses $-V_{in}$ (pin 17) as its ground reference. All voltages specified are with respect to $-V_{in}$.
2. Use an open-collector device (preferably a discrete transistor) for the *Remote On/Off* input. Do not connect a pull-up resistor directly to pin 11.
3. The *Remote On/Off* pin may be controlled with devices that have a totem-pole output providing that a blocking diode is used (See Figure 1). The blocking diode is required to prevent current from being injected into On/Off control pin. *Note: For TTL devices a pull-up may be required on the cathode side of the blocking diode. This is to guarantee a minimum enable voltage at pin 11 (See Figure 1).*
4. The PT4210 converters incorporate an "Under-Voltage Lockout" (UVLO). The UVLO will keep the module off when the input voltage to the converter is low, regardless of the state of the *Remote On/Off* control. Table 2 gives the UVLO input voltage thresholds.

Table 2; UVLO Thresholds [4]

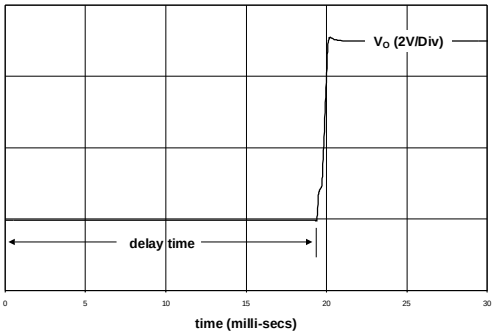
Series	V_{in} Range	UVLO Threshold
PT4210	38 – 75V	36V ±2V

Figure 1



Turn-On Time: In the circuit of Figure 1, turning Q_1 on applies a low-voltage to pin 11 and disables the converter output. Correspondingly, turning Q_1 off allows pin 11 to be pulled high by an internal pull-up resistor. The converter produces a regulated output voltage within 50ms. Although the rise-time of the output is short (<1ms), the delay time will vary depending upon the input voltage and the module's internal timing. Figure 2 shows shows an example of the output response for a PT4213 (5.0V), following the turn-off of Q_1 at time t =0. The waveform was measured with a 48Vdc input voltage, and 1.2Adc resistive load.

Figure 2



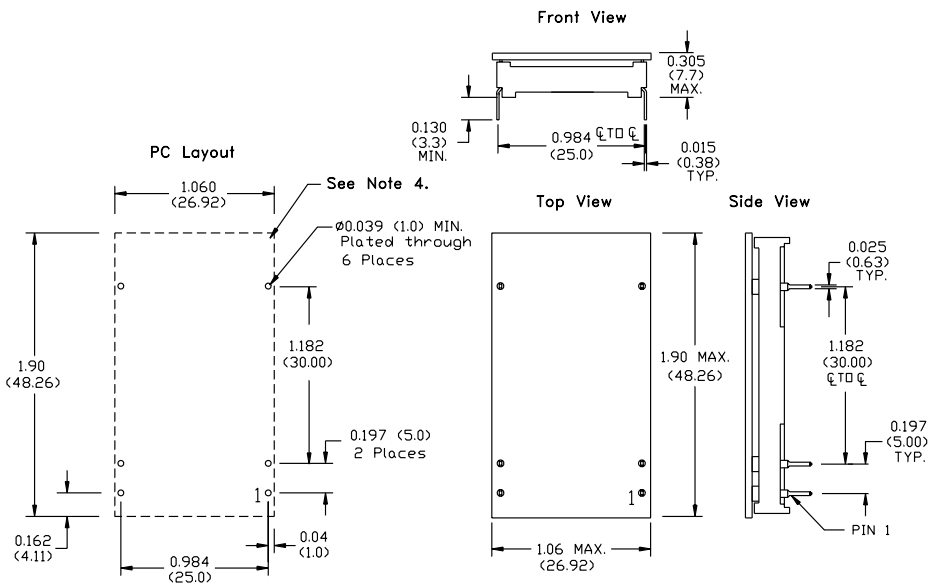
Package Style 910

Suffix A, C

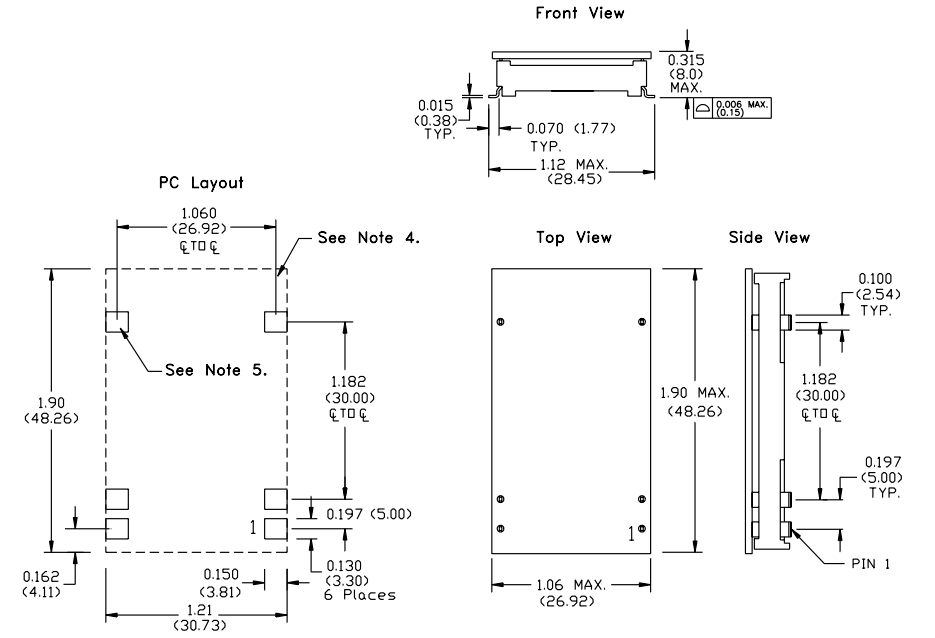
(Revised 12/1/2000)

PACKAGE INFORMATION AND DIMENSIONS

Horizontal Through–Hole Mount (Suffix A)



Surface Mount (Suffix C)



Notes: (Rev.A)

1: All dimensions are in inches (mm).
2: 2 place decimals are ±.030 (±0.8mm).
3: 3 place decimals are ±.010 (±0.3mm).
4: Recommnended mechanical keep out area.
5: Power pin connections should utilize two or more vias per input, ground and output pin.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
PT4212A	OBSOLETE	DIP MODULE	EGH	6		TBD	Call TI	Call TI	-40 to 85		
PT4212C	LIFEBUY	DIP MODULE	EGJ	6	16	TBD	Call TI	Level-1-215C-UNLIM	-40 to 85		
PT4213A	LIFEBUY	DIP MODULE	EGH	6	16	TBD	Call TI	Level-1-215C-UNLIM	-40 to 85		
PT4213C	LIFEBUY	DIP MODULE	EGJ	6	16	TBD	Call TI	Level-1-215C-UNLIM	-40 to 85		
PT4214A	OBSOLETE	DIP MODULE	EGH	6		TBD	Call TI	Call TI	-40 to 85		
PT4214C	LIFEBUY	DIP MODULE	EGJ	6	18	TBD	Call TI	Level-1-215C-UNLIM	-40 to 85		

(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.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
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.

(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

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