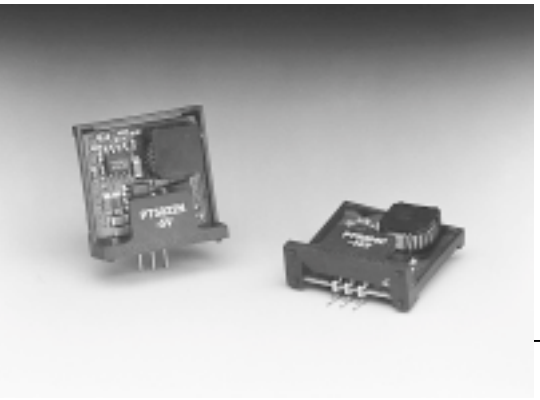
PT5020 Series

Positive Input/Negative Output Integrated Switching Regulator

SLTS025B

(Revised 12/19/2001)



Features

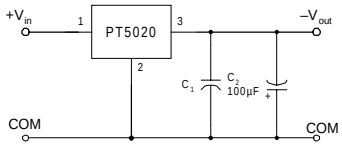
- Negative Output
- Input Voltage Range: +4.75 to +7 Volts
- Laser-Trimmed
- Small Footprint
- Soft Start
- 5-Pin Mount Option (Suffixes L & M)

Description

The PT5020 series of integrated switching regulators (ISRs) convert a positive input voltage, typically +5V, to a negative output voltage for a wide range of analog and datacom applications.

These Plus to Minus ISRs incorporate a "Buck-Boost" topology and are packaged in the 3-pin, single in-line pin (SIP) package configuration.

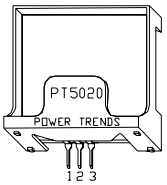
Standard Application



C_1 = Optional ceramic (1-5µF)
C_2 = Required Electrolytic (100µF)

Pin-Out Information

Pin	Function
1	V_{in}
2	GND
3	V_{out}



Ordering Information

PT5021 ☐ = -3.3 Volts
PT5022 ☐ = -5 Volts
PT5023 ☐ = -9 Volts
PT5024 ☐ = -12 Volts
PT5025 ☐ = -15 Volts
PT5026 ☐ = -5.2 Volts
PT5027 ☐ = -8.0 Volts
PT5028 ☐ = -6.5 Volts
PT5029 ☐ = -5.5 Volts
PT5030 ☐ = -6.0 Volts
PT5031 ☐ = -1.7 Volts

PT Series Suffix (PT1234x)

Case/Pin Configuration	Order Suffix	Package Code *
Vertical	**N**	(EAD)
Horizontal	**A**	(EAA)
SMD	**C**	(EAC)
Horizontal, 2-pin Tab	**M**	(EAM)
SMD, 2-Pin Tab	**L**	(EAL)

** Previously known as package styles 100/110.*

(Reference the applicable package code drawing for the dimensions and PC board layout)

NOTE: PT5020 ISRs are not Short-Circuit Protected.

Specifications (Unless otherwise stated, T_a =25°C, V_{in} =5V, I_o =$I_o$max, C_2 =100µF)

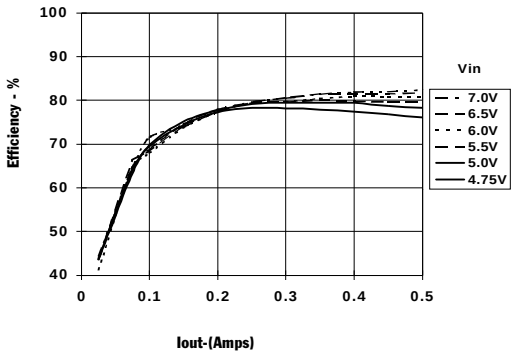
Characteristics	Symbol	Conditions	PT5020 SERIES Min	Typ	Max	Units
Output Current	I_o	Over V_{in} range, V_o= –1.7V to –6.5V	0.25 (1)	—	1.0	A
		V_o= –9V	0.10 (1)	—	0.60	
		V_o= –12V	0.10 (1)	—	0.50	
		V_o= –15V	0.10 (1)	—	0.30	
Input Voltage Range	V_{in}	Over I_o range	4.75	—	7 (2)	V
Output Voltage Tolerance	ΔV_o	Over V_{in} Range, T_a = -20°C to SOA limit (3)	—	±1.5	±3	%V_o
Line Regulation	Reg_{line}	Over V_{in} range	—	±0.5	±1	%V_o
Load Regulation	Reg_{load}	$I_o$min ≤ I_o ≤ $I_o$max	—	±0.5	±1	%V_o
Efficiency	η	I_o =0.5 $I_o$max	—	75	—	%
V_o Ripple (pk-pk)	V_r	20MHz bandwidth	—	±2	±5	%V_o
Transient Response	t_{tr}	25% load change	—	500	—	µSec
		V_o over/undershoot	—	3.0	5.0	%V_o
Current Limit	I_{lim}		—	150	—	%$I_o$max
Inrush Current	I_{ir}	On start up	—	1.0 (3)	—	A
	t_{ir}		—	1.0	—	mSec
Switching Frequency	f_s	Over I_o range, $\lvert V_o \rvert$ =1.7 to 8V	0.8	1	1.2	MHz
		$\lvert V_o \rvert$ ≥8 V	500	650	800	kHz
Operating Temperature Range	T_a	—	-20	—	+85 (4)	°C
Thermal Resistance	θ_{ja}	Free Air Convection (40-60LFM)	—	50	—	°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, 20-2000 Hz		Suffixes N, A, & C	—	5	—	G's
		Suffixes L & M	—	20	—	
Weight		Suffixes N, A, & C	—	4.5	—	grams
		Suffixes L & M	—	6.5 (5)	—	

Notes: *(1) The ISR will operate at no load with reduced specifications.*
(2) For applications with input voltages greater than 7 VDC, use the PT78NR100 Series.
(3) The inrush current stated is above the normal input current for the associated output load.
(4) See Safe Operating Area curves or consult the factory for the appropriate derating
(5) The tab pins on the 5-pin mount package types (suffixes L & M) must be soldered. For more information see the applicable package outline drawing.

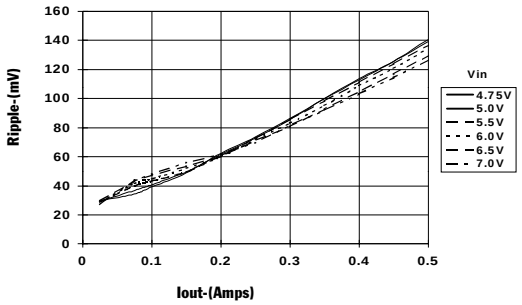
Typical Characteristics

PT5024 (-12VDC) (See Note A)

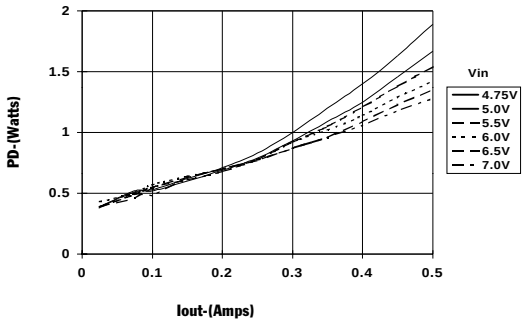
Efficiency vs Output Current



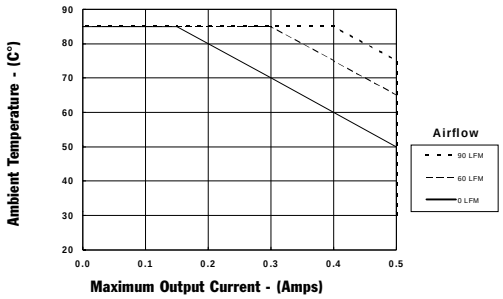
Ripple Voltage vs Output Current



Power Dissipation vs Output Current

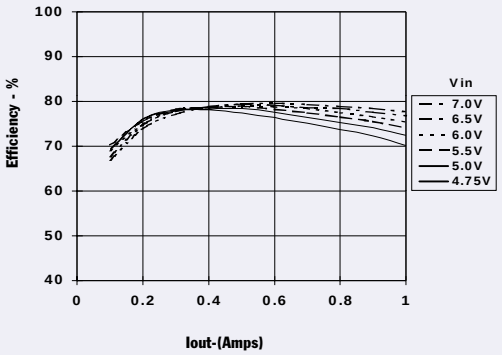


Safe Operating Area (V_{IN}=5V) (See Note B)

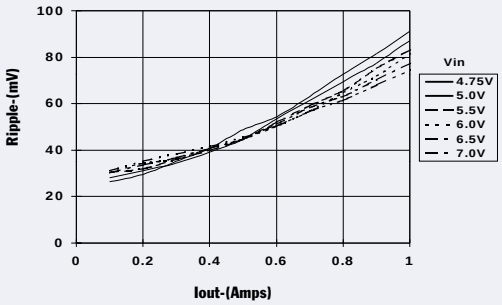


PT5022 (-5VDC) (See Note A)

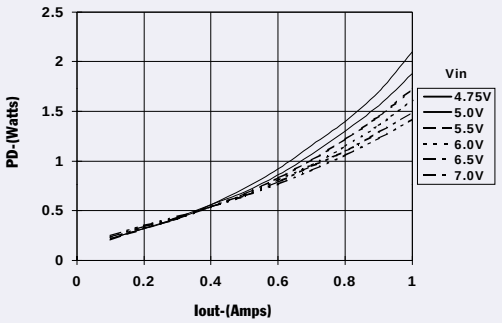
Efficiency vs Output Current



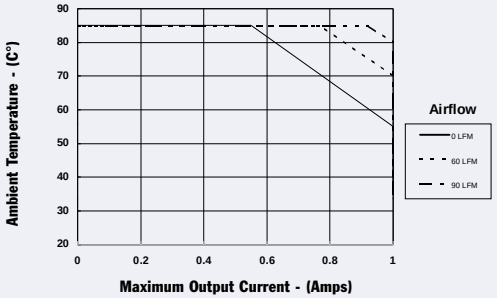
Ripple Voltage vs Output Current



Power Dissipation vs Output Current



Safe Operating Area (V_{IN}=5V) (See Note B)



Note A: *Characteristic data has been developed from actual products tested at 25°C. This data is considered typical data for the Converter.*
Note B: *Thermal derating graphs are developed in free-air convection cooling, which corresponds to approximately 40–60LFM of airflow.*

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third–party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

Copyright © 2001, Texas Instruments Incorporated