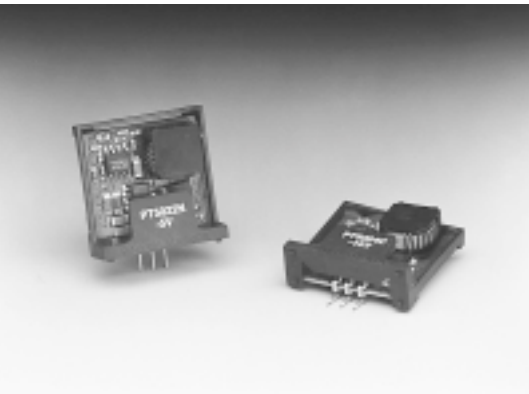


PT5020 Series

Positive Input/Negative Output
Integrated Switching Regulator

SLTS025B

(Revised 12/19/2001)



Features

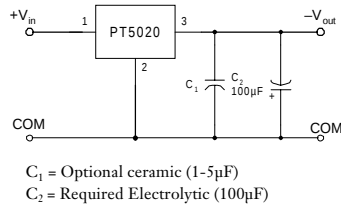
- Negative Output
- Input Voltage Range: +4.75 to +7 Volts
- Laser-Trimmed
- Small Footprint
- Soft Start
- 5-Pin Mount Option (Suffixes L & M)

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.

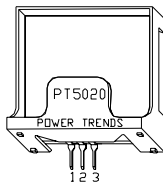
These Plus to Minus ISRs incorporate a “Buck-Boost” topology and are packaged in the 3-pin, single in-line pin (SIP) package configuration.

Standard Application



Pin-Out Information

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



Ordering Information

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

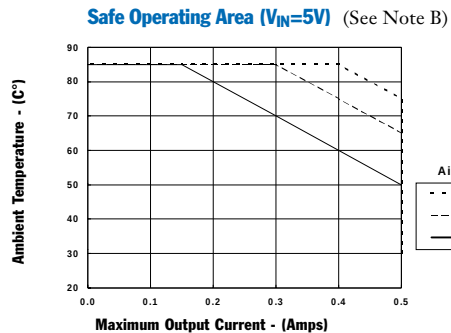
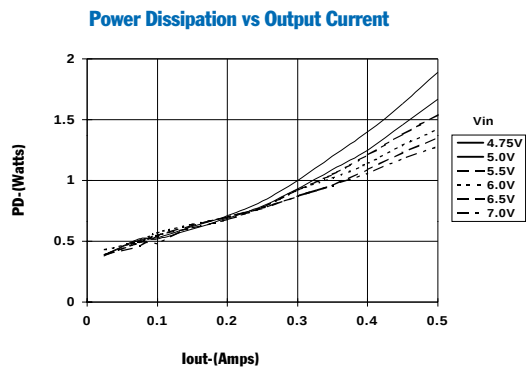
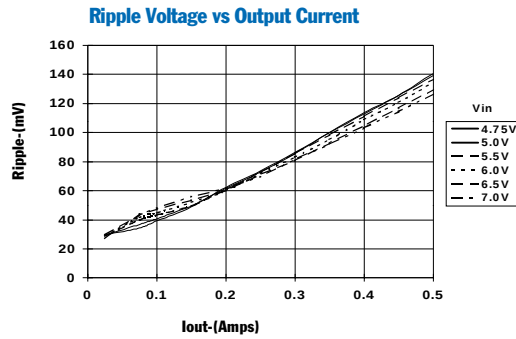
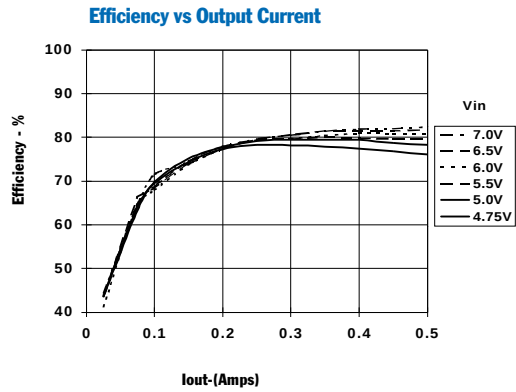
NOTE: PT5020 ISRs are not Short-Circuit Protected.

Specifications (Unless otherwise stated, $T_a = 25^\circ\text{C}$, $V_{in} = 5\text{V}$, $I_o = I_{o,max}$, $C_2 = 100\mu\text{F}$)

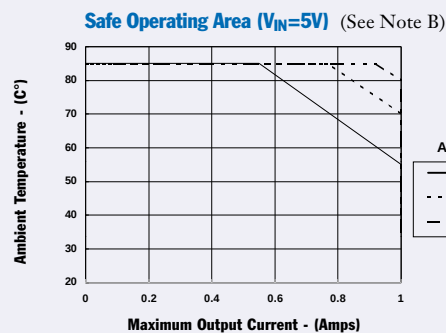
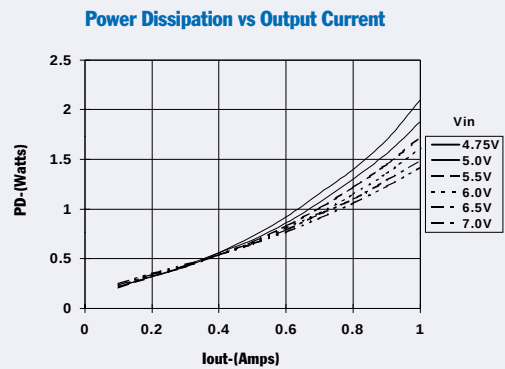
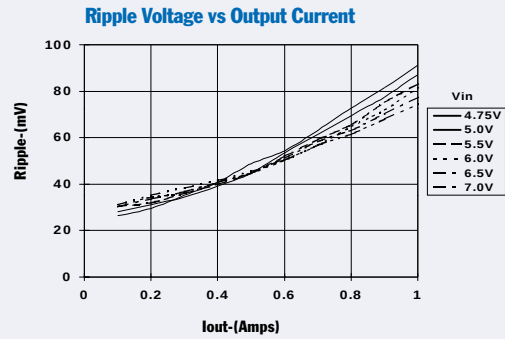
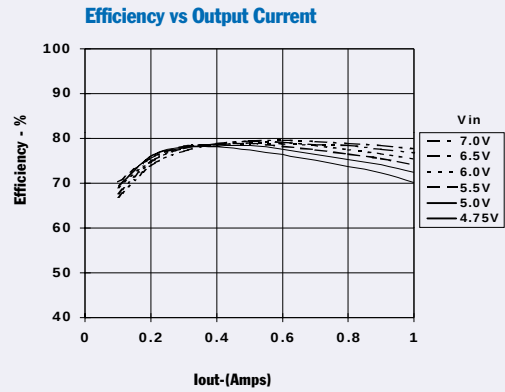
Characteristics	Symbol	Conditions	PT5020 SERIES			Units
			Min	Typ	Max	
Output Current	I_o	Over V_{in} range $V_o = -1.7\text{V to } -6.5\text{V}$ $V_o = -9\text{V}$ $V_o = -12\text{V}$ $V_o = -15\text{V}$	0.25 (1) 0.10 (1) 0.10 (1) 0.10 (1)	— — — —	1.0 0.60 0.50 0.30	A
Input Voltage Range	V_{in}	Over I_o range	4.75	—	7 (2)	V
Output Voltage Tolerance	ΔV_o	Over V_{in} Range $T_a = -20^\circ\text{C to SOA limit } (3)$	—	± 1.5	± 3	% V_o
Line Regulation	Reg_{line}	Over V_{in} range	—	± 0.5	± 1	% V_o
Load Regulation	Reg_{load}	$I_{o,min} \leq I_o \leq I_{o,max}$	—	± 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 V_o over/undershoot	— —	500 3.0	— 5.0	μSec % V_o
Current Limit	I_{lim}		—	150	—	% $I_{o,max}$
Inrush Current	I_{ir} t_{ir}	On start up	— —	1.0 (3) 1.0	— —	A mSec
Switching Frequency	f_s	Over I_o range $ V_o = 1.7 \text{ to } 8\text{V}$ $ V_o \geq 8\text{V}$	0.8 500	1 650	1.2 800	MHz kHz
Operating Temperature Range	T_a	—	-20	—	+85 (4)	$^\circ\text{C}$
Thermal Resistance	θ_{ja}	Free Air Convection (40-60LFM)	—	50	—	$^\circ\text{C/W}$
Storage Temperature	T_s		-40	—	+125	$^\circ\text{C}$
Mechanical Shock		Per Mil-STD-883D, Method 2002.3 1 msec, Half Sine, mounted to a fixture	—	500	—	G's
Mechanical Vibration		Suffixes N, A, & C Suffixes L & M	— —	5 20	— —	G's
Weight		Suffixes N, A, & C Suffixes L & M	— —	4.5 6.5 (5)	— —	grams

- 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.

PT5024 (-12VDC) (See Note A)



PT5022 (-5VDC) (See Note A)



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 40–60 LFM of airflow.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
PT5021C	LIFEBUY	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5021J	OBSOLETE	SIP MODULE	EAJ	3		TBD	Call TI	Call TI	
PT5021N	LIFEBUY	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5022A	LIFEBUY	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5022C	LIFEBUY	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5022H	LIFEBUY	SIP MODULE	EAH	3	16	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5022L	LIFEBUY	SIP MODULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5022M	LIFEBUY	SIP MODULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5022N	LIFEBUY	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5023A	OBSOLETE	SIP MODULE	EAA	3		TBD	Call TI	Call TI	
PT5023C	LIFEBUY	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5024A	LIFEBUY	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5024C	LIFEBUY	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5024L	LIFEBUY	SIP MODULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5024M	LIFEBUY	SIP MODULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5024N	LIFEBUY	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5025A	LIFEBUY	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5025C	LIFEBUY	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
PT5025L	LIFEBUY	SIP MODULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5025N	LIFEBUY	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5026A	LIFEBUY	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5026C	LIFEBUY	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5026H	LIFEBUY	SIP MODULE	EAH	3	16	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5026L	LIFEBUY	SIP MODULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5026LT	OBSOLETE	SIP MODULE	EAL	3		TBD	Call TI	Call TI	
PT5026M	LIFEBUY	SIP MODULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5026N	LIFEBUY	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5027A	OBSOLETE	SIP MODULE	EAA	3		TBD	Call TI	Call TI	
PT5027C	LIFEBUY	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5029A	LIFEBUY	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5029M	LIFEBUY	SIP MODULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5030A	LIFEBUY	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5030N	LIFEBUY	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5031L	LIFEBUY	SIP MODULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM	

(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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license 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 significant portions of TI 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. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com