

Features

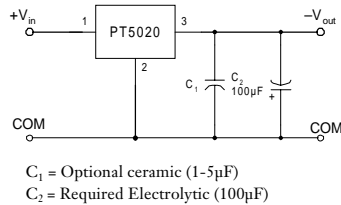
- Negative Output
- Input Voltage Range: +4.75 to +7 Volts
- Laser-Trimmed
- Small Footprint
- Soft Start
- 5-Pin Mount Option (Suffixes L & M)

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.

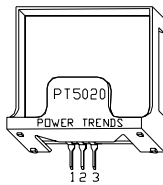
These Plus to Minus ISRs incorporate a “Buck-Boost” topology and are packaged in the 3-pin, single in-line pin (SIP) package configuration.

Standard Application



Pin-Out Information

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



Ordering Information

- PT5021 □ = -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)

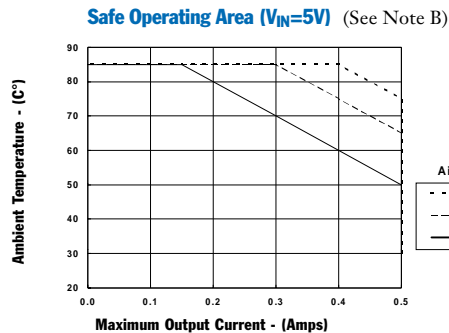
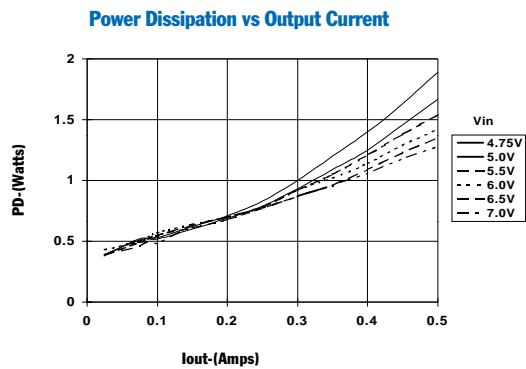
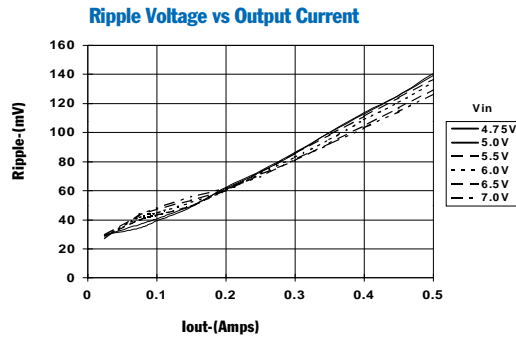
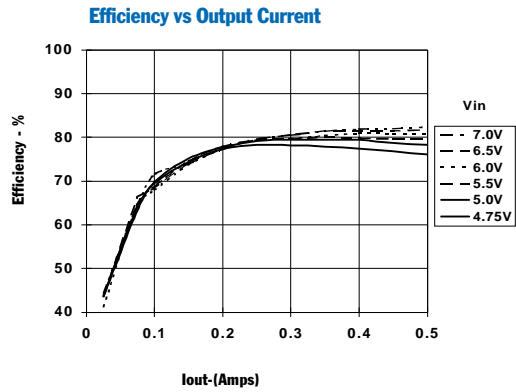
NOTE: PT5020 ISRs are not Short-Circuit Protected.

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

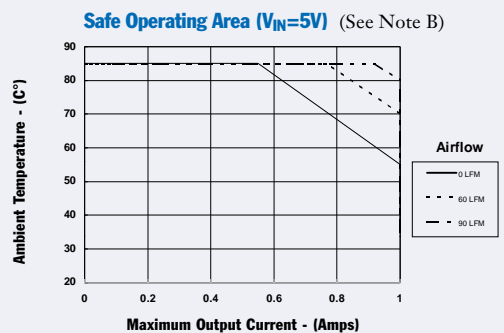
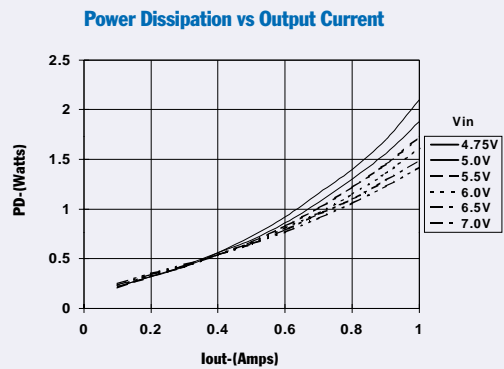
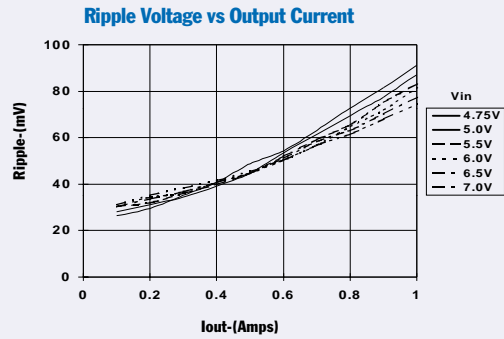
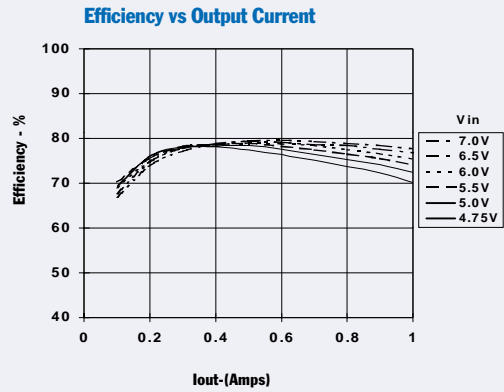
Characteristics	Symbol	Conditions	PT5020 SERIES			Units
			Min	Typ	Max	
Output Current	I_o	Over V_{in} range	$V_o = -1.7\text{V to } -6.5\text{V}$ 0.25 (1)	—	1.0	A
			$V_o = -9\text{V}$ 0.10 (1)	—	0.60	
			$V_o = -12\text{V}$ 0.10 (1)	—	0.50	
			$V_o = -15\text{V}$ 0.10 (1)	—	0.30	
Input Voltage Range	V_{in}	Over I_o range	4.75	—	7 (2)	V
Output Voltage Tolerance	ΔV_o	Over V_{in} Range $T_a = -20^\circ\text{C to SOA limit}^{(3)}$	—	± 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	—	μSec
			—	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	$ V_o = 1.7 \text{ to } 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	—	5	—	G's
Per Mil-STD-883D, 20-2000 Hz		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.

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 40–60LFM 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)
PT5021A	OBSOLETE	SIP MODULE	EAA	3		TBD	Call TI	Call TI	
PT5021C	NRND	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5021J	NRND	SIP MODULE	EAJ	3	16	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5021N	NRND	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5022A	NRND	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5022C	NRND	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5022CT	OBSOLETE	SIP MODULE	EAC	3		TBD	Call TI	Call TI	
PT5022H	NRND	SIP MODULE	EAH	3	16	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5022L	NRND	SIP MODULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5022M	NRND	SIP MODULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5022N	NRND	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5023A	NRND	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5023C	NRND	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5023N	OBSOLETE	SIP MODULE	EAD	3		TBD	Call TI	Call TI	
PT5024A	NRND	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5024C	NRND	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5024L	NRND	SIP MODULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5024M	NRND	SIP MODULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5024N	NRND	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5025A	NRND	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5025C	NRND	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5025L	NRND	SIP MODULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5025N	NRND	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5026A	NRND	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5026C	NRND	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5026H	NRND	SIP MODULE	EAH	3	16	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5026L	NRND	SIP MODULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5026LT	NRND	SIP MODULE	EAL	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5026M	NRND	SIP MODULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5026N	NRND	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
PT5027A	NRND	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5027C	NRND	SIP MODULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	
PT5029A	NRND	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5029M	NRND	SIP MODULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5030A	NRND	SIP MODULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5030C	OBSOLETE	SIP MODULE	EAC	3		TBD	Call TI	Call TI	
PT5030L	OBSOLETE	SIP MODULE	EAL	3		TBD	Call TI	Call TI	
PT5030N	NRND	SIP MODULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5031C	OBSOLETE	SIP MODULE	EAC	3		TBD	Call TI	Call TI	
PT5031L	NRND	SIP MODULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM	
PT5031N	OBSOLETE	SIP MODULE	EAD	3		TBD	Call TI	Call TI	

⁽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, 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 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. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

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
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

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
Transportation and Automotive	www.ti.com/automotive
Video and Imaging	www.ti.com/video
Wireless	www.ti.com/wireless-apps

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated