

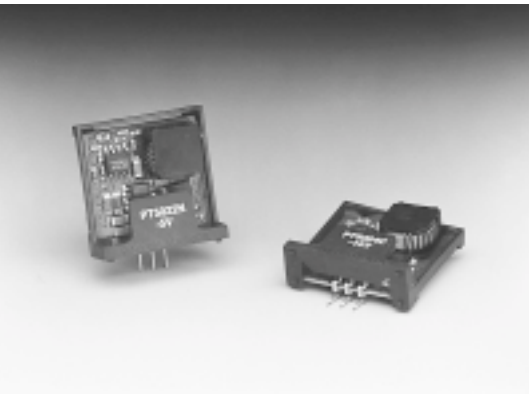
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Features

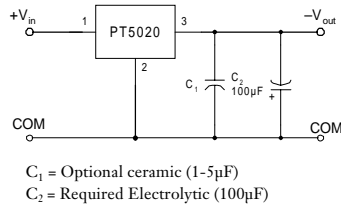
- Negative Output
- Input Voltage Range: +4.75 to +7 Volts
- Laser-Trimmed
- Small Footprint
- Soft Start
- 5-Pin Mount Option (Suffixes L & M)

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.

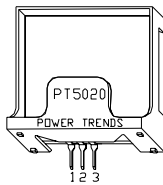
These Plus to Minus ISRs incorporate a “Buck-Boost” topology and are packaged in the 3-pin, single in-line pin (SIP) package configuration.

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)

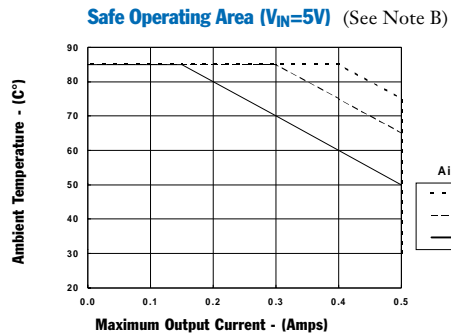
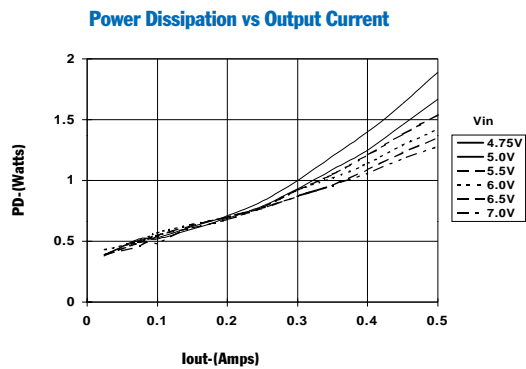
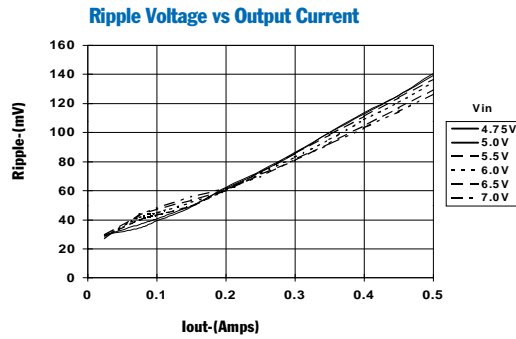
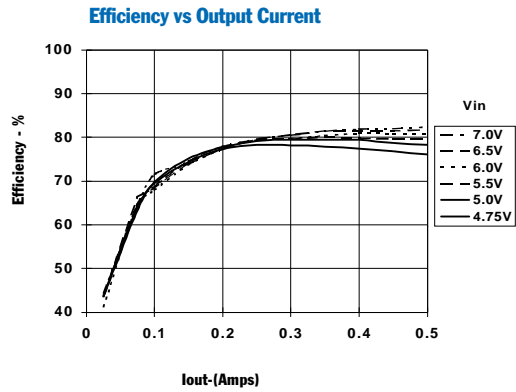
NOTE: PT5020 ISRs are not Short-Circuit Protected.

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

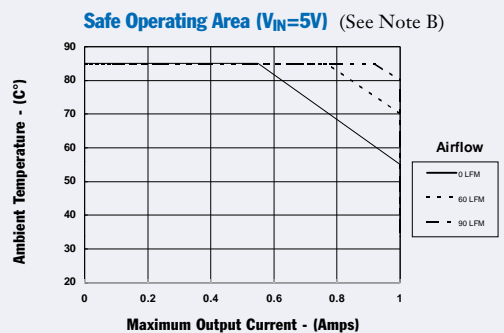
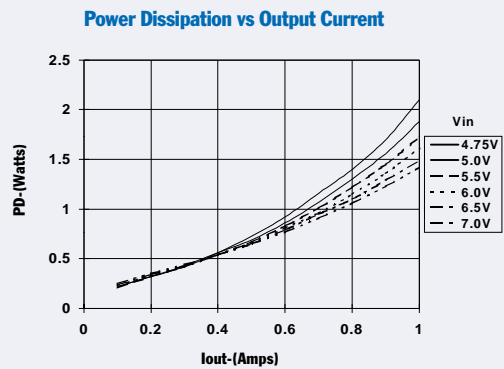
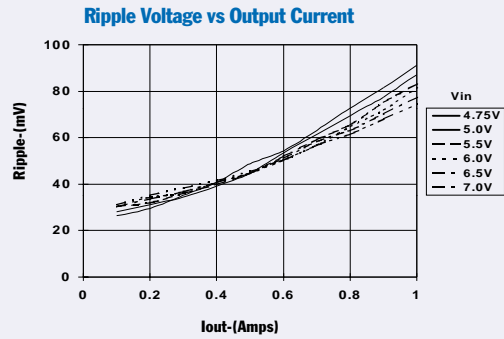
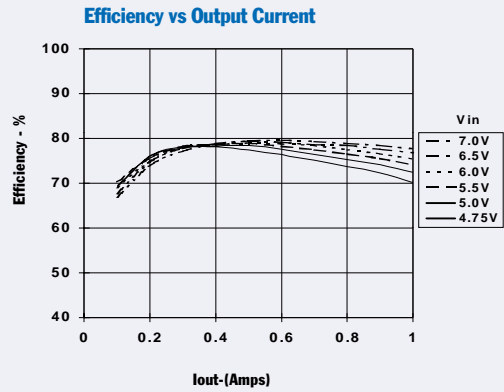
Characteristics	Symbol	Conditions	PT5020 SERIES			Units
			Min	Typ	Max	
Output Current	I_o	Over V_{in} range	$V_o = -1.7\text{V to } -6.5\text{V}$ 0.25 (1)	—	1.0	A
			$V_o = -9\text{V}$ 0.10 (1)	—	0.60	
			$V_o = -12\text{V}$ 0.10 (1)	—	0.50	
			$V_o = -15\text{V}$ 0.10 (1)	—	0.30	
Input Voltage Range	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⁾
PT5021A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5021C	ACTIVE	SIP MOD ULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5021J	ACTIVE	SIP MOD ULE	EAJ	3	16	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5021L	ACTIVE	SIP MOD ULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5021N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5022A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5022C	ACTIVE	SIP MOD ULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5022CT	ACTIVE	SIP MOD ULE	EAC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5022H	ACTIVE	SIP MOD ULE	EAH	3	16	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5022L	ACTIVE	SIP MOD ULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5022M	ACTIVE	SIP MOD ULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5022N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5022S	ACTIVE	SIP MOD ULE	EAF	3	16	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5023A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5023C	ACTIVE	SIP MOD ULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5023N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5024A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5024C	ACTIVE	SIP MOD ULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5024CT	ACTIVE	SIP MOD ULE	EAC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5024J	ACTIVE	SIP MOD ULE	EAJ	3	16	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5024L	ACTIVE	SIP MOD ULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5024M	ACTIVE	SIP MOD ULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5024N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5025A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5025C	ACTIVE	SIP MOD ULE	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⁾
PT5025H	ACTIVE	SIP MOD ULE	EAH	3	16	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5025L	ACTIVE	SIP MOD ULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5025N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5026A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5026C	ACTIVE	SIP MOD ULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5026CT	ACTIVE	SIP MOD ULE	EAC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5026H	ACTIVE	SIP MOD ULE	EAH	3	16	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5026L	ACTIVE	SIP MOD ULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5026LT	ACTIVE	SIP MOD ULE	EAL	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5026M	ACTIVE	SIP MOD ULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5026N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5027A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5027C	ACTIVE	SIP MOD ULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5027N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5028A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5028N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5029A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5029C	ACTIVE	SIP MOD ULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5029M	ACTIVE	SIP MOD ULE	EAM	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5030A	ACTIVE	SIP MOD ULE	EAA	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5030C	ACTIVE	SIP MOD ULE	EAC	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5030L	ACTIVE	SIP MOD ULE	EAL	3	35	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT5030N	ACTIVE	SIP MOD ULE	EAD	3	35	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT5031C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5031L	ACTIVE	SIP MOD ULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5031N	ACTIVE	SIP MOD ULE	EAD	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.

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