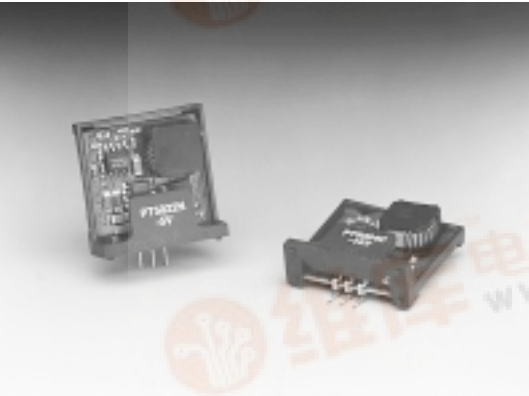


PT5020 Series

Positive Input/Negative Output
Integrated Switching Regulator

SLTS025B

(Revised 12/19/2001)



Features

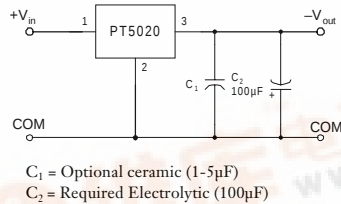
- Negative Output
- Input Voltage Range: +4.75 to +7 Volts
- Laser-Trimmed
- Small Footprint
- Soft Start
- 5-Pin Mount Option (Suffixes L & M)

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.

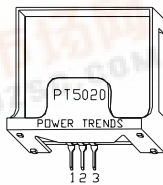
These Plus to Minus ISRs incorporate a "Buck-Boost" topology and are packaged in the 3-pin, single in-line pin (SIP) package configuration.

Standard Application



Pin-Out Information

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



Ordering Information

PT5021 □ = -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, $T_a = 25^\circ\text{C}$, $V_{in} = 5\text{V}$, $I_o = I_{o\text{max}}$, $C_2 = 100\mu\text{F}$)

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}	$I_{o\text{min}} \leq I_o \leq I_{o\text{max}}$	—	± 0.5	± 1	% V_o
Efficiency	η	$I_o = 0.5 I_{o\text{max}}$	—	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	—	% $I_{o\text{max}}$
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_{pa}	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	—	G's
Weight	—	Suffixes N, A, & C	—	4.5	—	grams
		Suffixes L & M	—	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

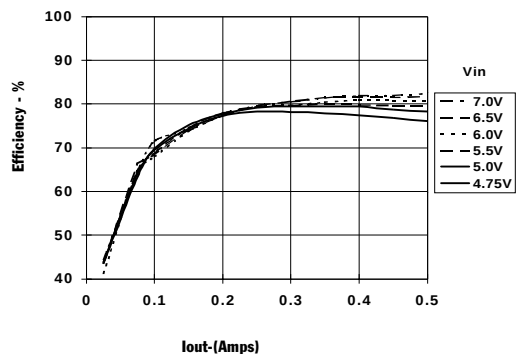
(5) The tab pins on the 5-pin mount package types (suffixes L & M) must be soldered. For more information see the applicable package outline drawing.



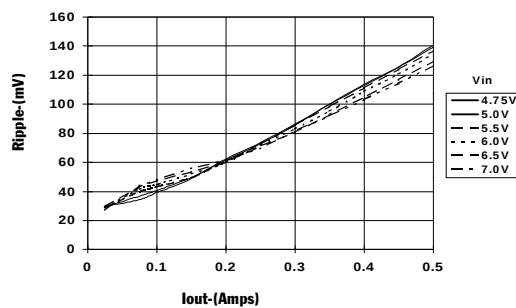
Positive Input/Negative Output
Integrated Switching Regulator

PT5024 (-12VDC) (See Note A)

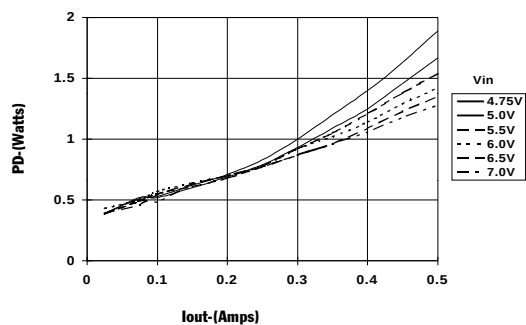
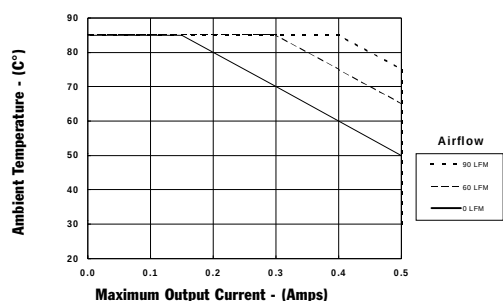
Efficiency vs Output Current



Ripple Voltage vs Output Current

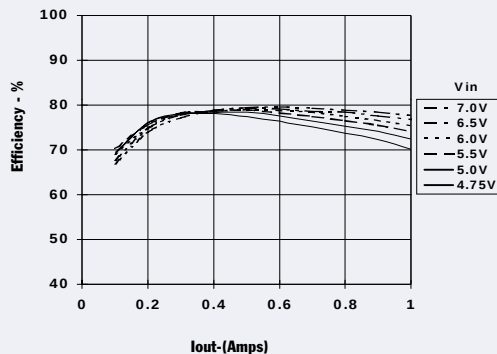


Power Dissipation vs Output Current

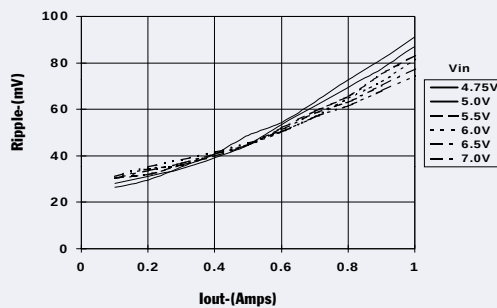
Safe Operating Area ($V_{IN}=5V$) (See Note B)

PT5022 (-5VDC) (See Note A)

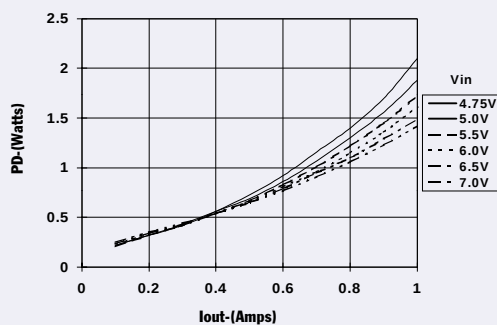
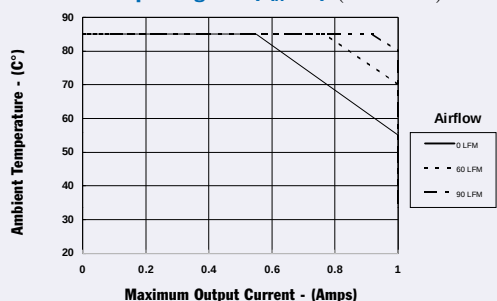
Efficiency vs Output Current



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 40–60 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⁾
PT5021A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5021C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5021J	ACTIVE	SIP MOD ULE	EAJ	3	16	TBD	Call TI	Level-1-215C-UNLIM
PT5021L	ACTIVE	SIP MOD ULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5021N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5022A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5022C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5022CT	ACTIVE	SIP MOD ULE	EAC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT5022H	ACTIVE	SIP MOD ULE	EAH	3	16	TBD	Call TI	Level-1-215C-UNLIM
PT5022J	ACTIVE	SIP MOD ULE	EAJ	3	16	TBD	Call TI	Level-1-215C-UNLIM
PT5022L	ACTIVE	SIP MOD ULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5022M	ACTIVE	SIP MOD ULE	EAM	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5022N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5022S	ACTIVE	SIP MOD ULE	EAF	3	16	TBD	Call TI	Level-1-215C-UNLIM
PT5023A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5023C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5023N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5024A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5024C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5024CT	ACTIVE	SIP MOD ULE	EAC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT5024J	ACTIVE	SIP MOD ULE	EAJ	3	16	TBD	Call TI	Level-1-215C-UNLIM
PT5024L	ACTIVE	SIP MOD ULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5024M	ACTIVE	SIP MOD ULE	EAM	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5024N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5024S	ACTIVE	SIP MOD ULE	EAF	3	16	TBD	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⁾
PT5025A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5025C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5025H	ACTIVE	SIP MOD ULE	EAH	3	16	TBD	Call TI	Level-1-215C-UNLIM
PT5025L	ACTIVE	SIP MOD ULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5025N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5026A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5026C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5026CT	ACTIVE	SIP MOD ULE	EAC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT5026H	ACTIVE	SIP MOD ULE	EAH	3	16	TBD	Call TI	Level-1-215C-UNLIM
PT5026J	ACTIVE	SIP MOD ULE	EAJ	3	16	TBD	Call TI	Level-1-215C-UNLIM
PT5026L	ACTIVE	SIP MOD ULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5026LT	ACTIVE	SIP MOD ULE	EAL	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT5026M	ACTIVE	SIP MOD ULE	EAM	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5026N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5027A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5027C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5027N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5028A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5028N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5029A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5029C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5029M	ACTIVE	SIP MOD ULE	EAM	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5030A	ACTIVE	SIP MOD ULE	EAA	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5030C	ACTIVE	SIP MOD ULE	EAC	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5030L	ACTIVE	SIP MOD ULE	EAL	3	35	TBD	Call TI	Level-1-215C-UNLIM
PT5030N	ACTIVE	SIP MOD ULE	EAD	3	35	TBD	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⁾
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) 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.

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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