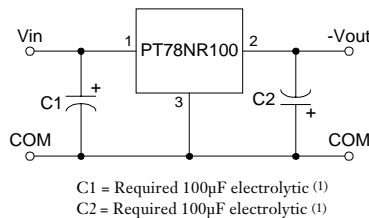


- Negative output from positive input
- Wide Input Range
- Self-Contained Inductor
- Short Circuit Protection
- Over-Temperature Protection
- Fast Transient Response

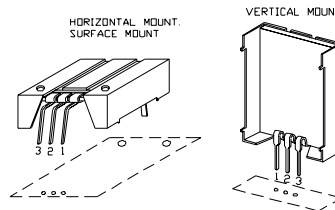
The PT78NR100 Series creates a negative output voltage from a positive input voltage greater than 7V. These easy-to-use, 3-terminal, Integrated Switching Regulators (ISRs) have maximum output power of 5 watts and a negative output voltage that is laser trimmed. They also have excellent line and load regulation.

Standard Application



Pin-Out Information

Pin	Function
1	+V _{in}
2	-V _{out}
3	GND



SUGGESTED BOARD LAYOUT
COMPONENT SIDE VIEW
Pkg Style 500

Ordering Information

PT78NR1XX Y

Output Voltage

03 = -3.0 Volts
05 = -5.0 Volts
52 = -5.2 Volts
06 = -6.0 Volts
07 = -7.0 Volts
08 = -8.0 Volts
09 = -9.0 Volts
10 = -10.0 Volts
12 = -12.0 Volts
14 = -13.9 Volts
15 = -15.0 Volts

Package Suffix

V = Vertical Mount
S = Surface Mount
H = Horizontal Mount

Specifications

Characteristics (T _a = 25°C unless noted)	Symbols	Conditions	PT78NR100 SERIES			Units
			Min	Typ	Max	
Output Current	I _O	Over V _{in} range V _O = -5V V _O = -6V V _O = -7, -8, -9V V _O = -10V V _O = -12V V _O = -13.9, -15V	0.05 (2) 0.05 (2) 0.05 (2) 0.05 (2) 0.05 (2) 0.05 (2)	— — — — — —	1.00 0.8 0.55 0.5 0.40 0.30	A
Short Circuit Current	I _{sc}	V _{in} = 10V	—	4 × I _{max}	—	A _{pk}
Inrush Current	I _{ir} t _{ir}	V _{in} = 10V On start-up	— —	4 0.5	—	A mSec
Input Voltage Range	V _{in}	0.1 ≤ I _O ≤ I _{max} V _O = -5V V _O = -6, -7, -8, -9V V _O = -10, -12V V _O = -13.9, -15V	7 7 7 7	— — — —	25 21 18 15	V V V V
Output Voltage Tolerance	ΔV _O	Over V _{in} range T _a = -20°C to +70°C	—	±1.0	±3.0	%V _O
Line Regulation	Reg _{line}	Over V _{in} range	—	±0.5	±1.0	%V _O
Load Regulation	Reg _{load}	0.1 ≤ I _O ≤ I _{max}	—	±0.5	±1.0	%V _O
V _O Ripple/Noise	V _n	V _{in} = 10V, I _O = I _{max}	—	±2	—	%V _O
Transient Response (with 100μF output cap)	t _{tr}	50% load change V _O over/undershoot	— —	100 5.0	250 —	μSec %V _O
Efficiency	η	V _{in} = 10V, I _O = 0.5 × I _{max} , V _O = -5V	—	75	—	%
Switching Frequency	f _O	Over V _{in} and I _O ranges	600	650	700	kHz
Absolute Maximum Operating Temperature Range	T _a	Free Air Convection, (40-60LFM) Over V _{in} Range	-40	—	+85 (3)	°C
Thermal Resistance	θ _{ja}	Free Air Convection, (40-60LFM)	—	45	—	°C/W
Storage Temperature	T _s	—	-40	—	+125	°C
Mechanical Shock	—	Per Mil-STD-883D, Method 2002.3	—	500	—	G's
Mechanical Vibration	—	Per Mil-STD-883D, Method 2007.2, 20-2000 Hz, soldered in a PC board	—	5	—	G's
Weight	—	—	—	6.5	—	Grams

Notes: (1) The PT78NR100 Series requires a 100μF electrolytic or tantalum capacitor at both the input and output for proper operation in all applications. The input capacitor, C1, must have a ripple current rating ≥600 mA_{rms}, and an ESR ≤0.2Ω.

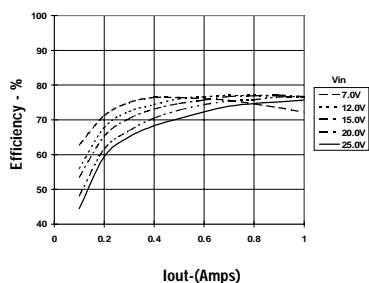
(2) The ISR will operate down to no load with reduced specifications.

(3) See Thermal Derating chart.

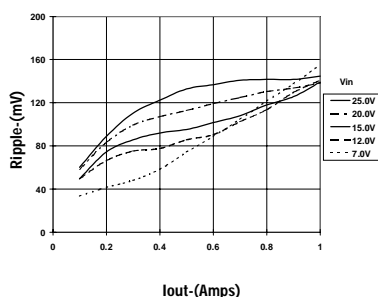
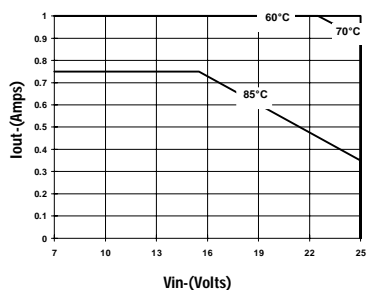
1 Amp Plus to Minus Voltage
Integrated Switching Regulator

PT78NR105 -5.0 VDC (See Note A)

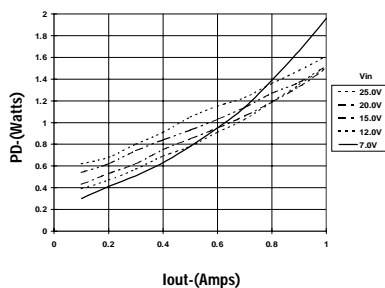
Efficiency vs Output Current



Ripple vs Output Current

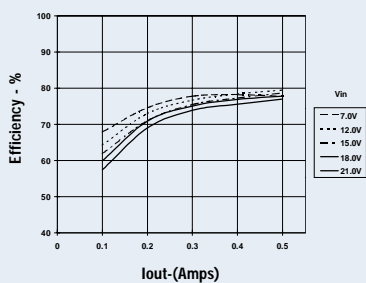
Thermal Derating (T_a) (See Note B)

Power Dissipation vs Output Current

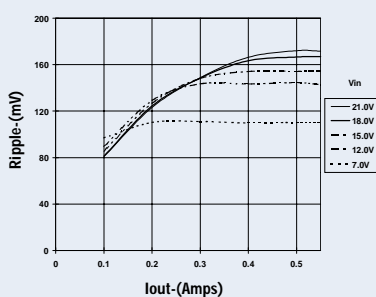
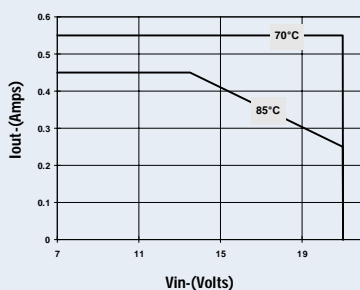


PT78NR109 -9.0 VDC (See Note A)

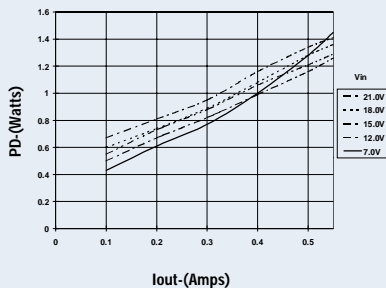
Efficiency vs Output Current



Ripple vs Output Current

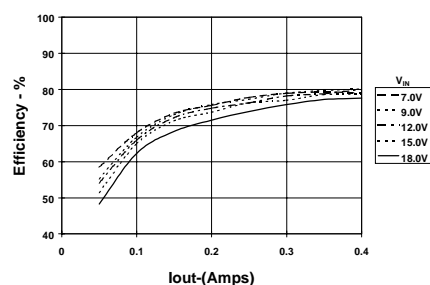
Thermal Derating (T_a) (See Note B)

Power Dissipation vs Output Current

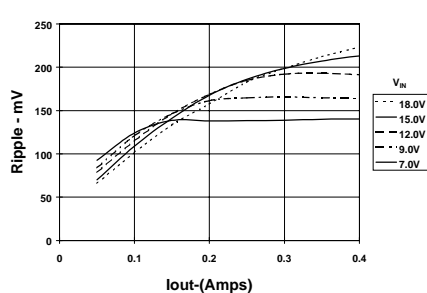
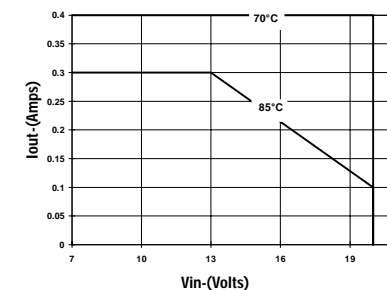


PT78NR112 -12.0 VDC (See Note A)

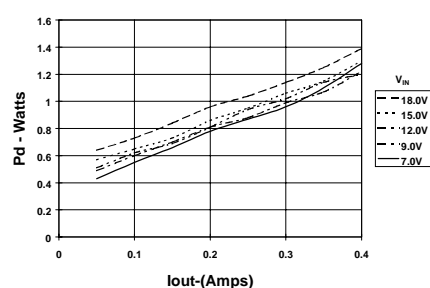
Efficiency vs Output Current



Ripple vs Output Current

Thermal Derating (T_a) (See Note B)

Power Dissipation vs Output Current



Note A: All data listed in the above graphs, except for derating data, has been developed from actual products tested at 25°C. This data is considered typical data for the ISR.

Note B: Thermal derating graphs are developed in free air convection cooling of 40-60 LFM. (See Thermal Application Notes.)

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
PT78NR103H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR103S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR103ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR103V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR105H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR105S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR105ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR105V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR106H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR106S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR106ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR106V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR107H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR107S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR107ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR107V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR108H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR108S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR108ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR108V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR109H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR109S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR109ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR109V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR110H	ACTIVE	SIP MOD ULE	EFA	3	25	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⁾
PT78NR110S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR110ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR110V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR112H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR112S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR112ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR112V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR114H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR114S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR114ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR114V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR115H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR115S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR115ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR115V	ACTIVE	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR152H	ACTIVE	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR152S	ACTIVE	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
PT78NR152ST	ACTIVE	SIP MOD ULE	EFC	3	200	TBD	Call TI	Level-1-215C-UNLIM
PT78NR152V	ACTIVE	SIP MOD ULE	EFD	3	25	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.

OBSELETE: 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.

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 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.

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

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

Copyright © 2005, Texas Instruments Incorporated