

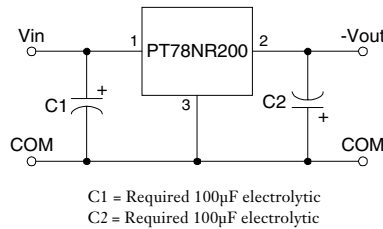
- Negative output from positive input
- Wide Input Range
- Self-Contained Inductor
- Short Circuit Protection
- Over-Temperature Protection
- Fast Transient Response

tive input voltage greater than 9V. These easy-to-use, 3-terminal, Integrated Switching Regulators (ISRs) have maximum output power of 10 to 12 watts and a negative output voltage that is laser trimmed. They also have excellent line and load regulation.

The PT78NR200 series creates negative output voltage from a posi-

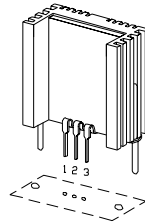
The PT78NR200 requires 100 LFM of airflow at its maximum output current.

### Standard Application



### Pin-Out Information

Pin	Function
1	+V <sub>in</sub>
2	-V <sub>out</sub>
3	GND



SUGGESTED BOARD LAYOUT  
COMPONENT SIDE VIEW  
Pkg Style 600

### Ordering Information

PT78NR2 **XX** **Y**

Output Voltage

- 52** = -5.2 Volts
- 06** = -6.0 Volts
- 12** = -12.0 Volts
- 15** = -15.0 Volts

Package Suffix

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

(For dimensions and PC board layout, see Package Styles 600 and 610.)

### Specifications

Characteristics (T <sub>a</sub> = 25°C unless noted)	Symbols	Conditions	PT78NR200 SERIES			Units
			Min	Typ	Max	
Output Current	I <sub>o</sub>	Over V <sub>in</sub> range	V <sub>o</sub> = -5.2V 0.1*	—	2.0	A
			V <sub>o</sub> = -12.0V 0.1*	—	1.0	A
Short Circuit Current	I <sub>sc</sub>	V <sub>in</sub> = 10V	—	4 × I <sub>max</sub>	—	A <sub>pk</sub>
Inrush Current	I <sub>ir</sub>	V <sub>in</sub> = 10V	—	4	—	A
	t <sub>ir</sub>	On start-up	—	0.5	—	mSec
Input Voltage Range	V <sub>in</sub>	0.1 ≤ I <sub>o</sub> ≤ I <sub>max</sub>	9	—	15	V
Output Voltage Tolerance	ΔV <sub>o</sub>	Over V <sub>in</sub> range T <sub>a</sub> = 0°C to +70°C	—	±1.0	±3.0	%V <sub>o</sub>
Line Regulation	Reg <sub>line</sub>	Over V <sub>in</sub> range	—	±0.5	±1.0	%V <sub>o</sub>
Load Regulation	Reg <sub>load</sub>	0.3 ≤ I <sub>o</sub> ≤ I <sub>max</sub>	—	±0.5	±1.0	%V <sub>o</sub>
V <sub>o</sub> Ripple/Noise	V <sub>n</sub>	V <sub>in</sub> = 10V, I <sub>o</sub> = I <sub>max</sub>	—	±2	—	%V <sub>o</sub>
Transient Response (with 100µF output cap)	t <sub>tr</sub>	50% load change V <sub>o</sub> over/undershoot	—	100 5.0	250 —	µSec %V <sub>o</sub>
Efficiency	η	V <sub>in</sub> = 9V, I <sub>o</sub> = 0.5 × I <sub>max</sub> , V <sub>o</sub> = -12V	—	78	—	%
Switching Frequency	f <sub>o</sub>	Over V <sub>in</sub> and I <sub>o</sub> ranges	600	650	700	kHz
Absolute Maximum Operating Temperature Range	T <sub>a</sub>	100 LFM airflow Over V <sub>in</sub> and I <sub>o</sub> Ranges	0	—	+85	°C
Recommended Operating Temperature Range	T <sub>a</sub>	100 LFM airflow Over V <sub>in</sub> and I <sub>o</sub> Ranges	0	—	+60**	°C
Thermal Resistance	θ <sub>ja</sub>	100 LFM airflow	—	35	—	°C/W
Storage Temperature	T <sub>s</sub>	—	-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	—	10	—	G's
Weight	—	—	—	11	—	Grams

\*ISR will operate down to no load with reduced specifications.

\*\*See Thermal Derating chart.

**Note:** The PT78NR200 series requires a 100µF electrolytic or tantalum output capacitor for proper operation in all applications.

## 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

Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>

### Applications

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2009, Texas Instruments Incorporated