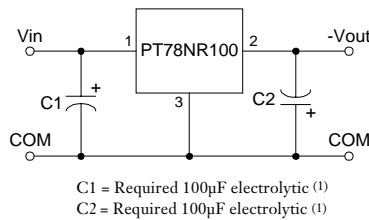


- Negative output from positive input
- Wide Input Range
- Self-Contained Inductor
- Short Circuit Protection
- Over-Temperature Protection
- Fast Transient Response

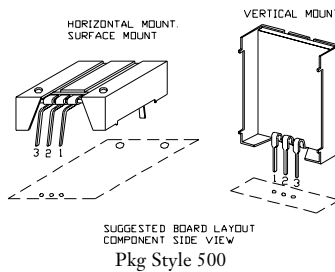
The PT78NR100 Series creates a negative output voltage from a positive input voltage greater than 7V. These easy-to-use, 3-terminal, Integrated Switching Regulators (ISRs) have maximum output power of 5 watts and a negative output voltage that is laser trimmed. They also have excellent line and load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

### Standard Application



### Pin-Out Information

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



### Ordering Information

PT78NR1 XX 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

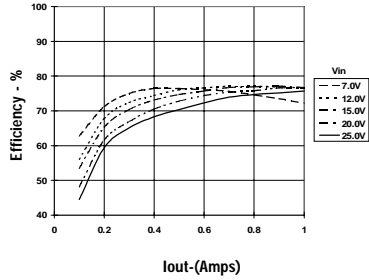
Characteristics (T <sub>a</sub> = 25°C unless noted)	Symbols	Conditions	PT78NR100 SERIES			Units
			Min	Typ	Max	
Output Current	I <sub>o</sub>	Over V <sub>in</sub> range V <sub>o</sub> = -5V V <sub>o</sub> = -6V V <sub>o</sub> = -7, -8, -9V V <sub>o</sub> = -10V V <sub>o</sub> = -12V V <sub>o</sub> = -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 <sub>sc</sub>	V <sub>in</sub> = 10V	—	4 × I <sub>max</sub>	—	A <sub>pk</sub>
Inrush Current	I <sub>ir</sub> t <sub>ir</sub>	V <sub>in</sub> = 10V On start-up	— —	4 0.5	— —	A mSec
Input Voltage Range	V <sub>in</sub>	0.1 ≤ I <sub>o</sub> ≤ I <sub>max</sub> V <sub>o</sub> = -5V V <sub>o</sub> = -6, -7, -8, -9V V <sub>o</sub> = -10, -12V V <sub>o</sub> = -13.9, -15V	7 7 7 7	— — — —	25 21 18 15	V V V V
Output Voltage Tolerance	ΔV <sub>o</sub>	Over V <sub>in</sub> range T <sub>a</sub> = -20°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>	0.1 ≤ 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> = 10V, I <sub>o</sub> = 0.5 × I <sub>max</sub> , V <sub>o</sub> = -5V	—	75	—	%
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>	Free Air Convection, (40-60LFM) Over V <sub>in</sub> Range	-40	—	+85 (3)	°C
Thermal Resistance	θ <sub>ja</sub>	Free Air Convection, (40-60LFM)	—	45	—	°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	—	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<sub>rms</sub>, and an ESR ≤0.2Ω.  
(2) The ISR will operate down to no load with reduced specifications.  
(3) See Thermal Derating chart.

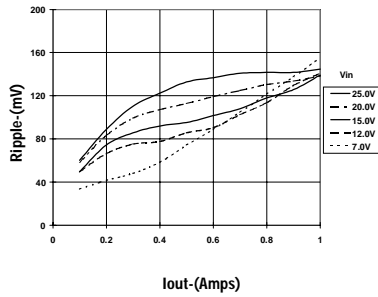
1 Amp Plus to Minus Voltage  
Integrated Switching Regulator

PT78NR105 -5.0 VDC (See Note A)

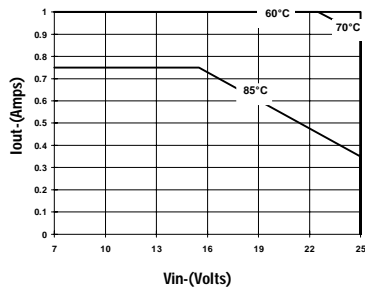
Efficiency vs Output Current



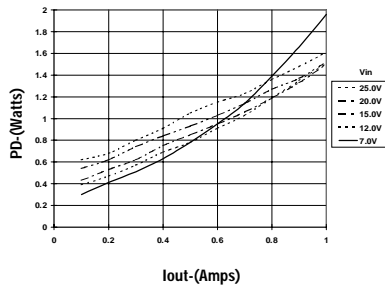
Ripple vs Output Current



Thermal Derating ( $T_a$ ) (See Note B)

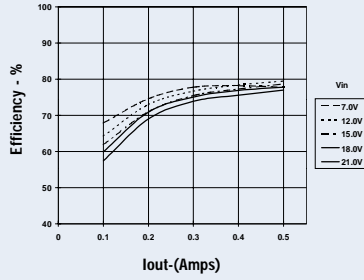


Power Dissipation vs Output Current

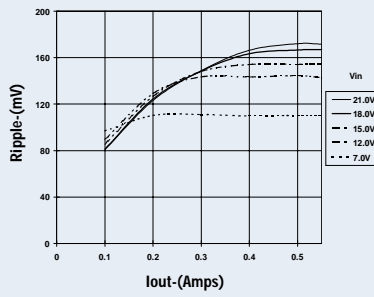


PT78NR109 -9.0 VDC (See Note A)

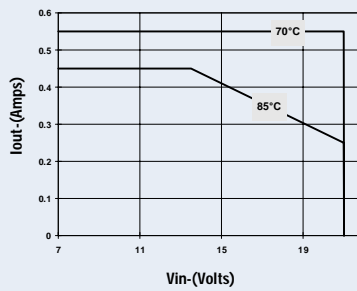
Efficiency vs Output Current



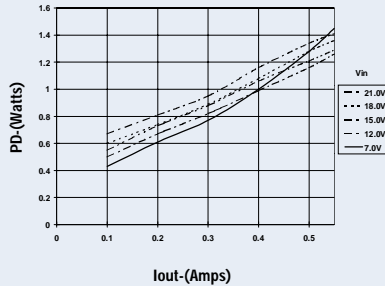
Ripple vs Output Current



Thermal Derating ( $T_a$ ) (See Note B)

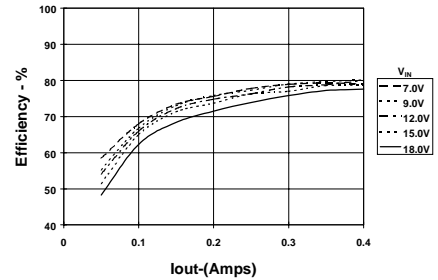


Power Dissipation vs Output Current

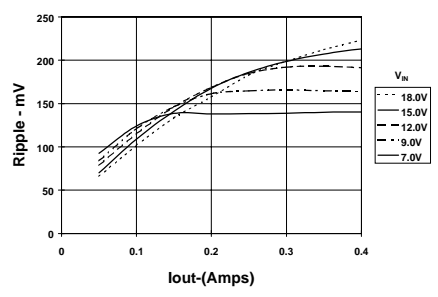


PT78NR112 -12.0 VDC (See Note A)

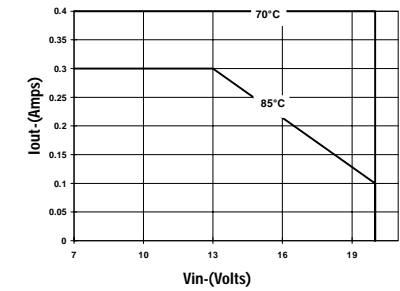
Efficiency vs Output Current



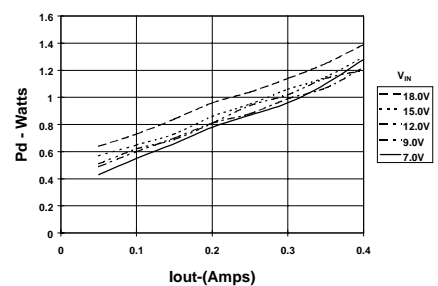
Ripple vs Output Current



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 LEM. (See Thermal Application Notes.)

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
PT78NR103H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR103S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR103V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR105H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR105S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR105V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR106H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR106S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR106V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR107H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR107S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR107V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR108S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR109H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR109S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR109V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR112H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR112S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR112ST	ACTIVE	SIP MOD ULE	EFC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR112V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR115H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR115S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78NR115V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR152H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78NR152S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
PT78NR152V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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