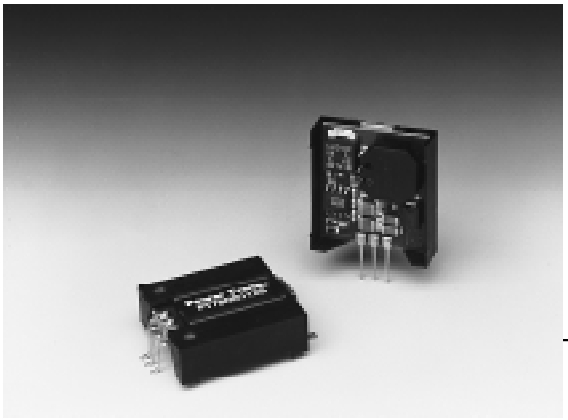
PT78NR100 Series

1 Amp Plus to Minus Voltage Integrated Switching Regulator

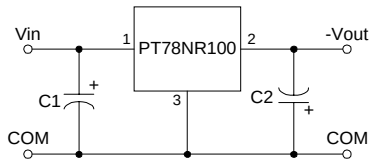
SLTS058B
(Revised 8/31/2000)



- 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.

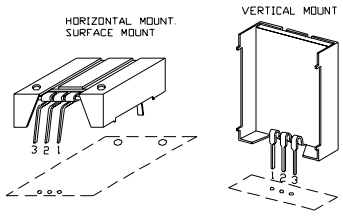
Standard Application



C1 = Required 100µF electrolytic (1)
C2 = Required 100µF electrolytic (1)

Pin-Out Information

Pin	Function
1	$+V_{in}$
2	$-V_{out}$
3	GND



Pkg Style 500

Ordering Information

PT78NR1 XX Y

Output Voltage	Package Suffix
03 = -3.0 Volts	**V** = Vertical Mount
05 = -5.0 Volts	**S** = Surface Mount
52 = -5.2 Volts	**H** = Horizontal Mount
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	

Specifications

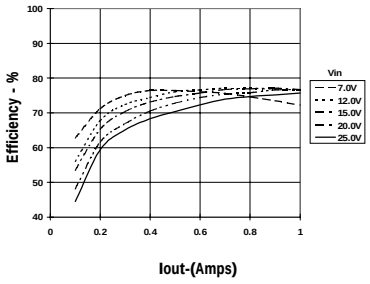
Characteristics (T_a= 25°C unless noted)	Symbols	Conditions	PT78NR100 SERIES Min	Typ	Max	Units
Output Current	I_o	Over V_{in} range V_o=-5V	0.05 (2)	—	1.00	A
		V_o=-6V	0.05 (2)	—	0.8	
		V_o=-7, -8, -9V	0.05 (2)	—	0.55	
		V_o=-10V	0.05 (2)	—	0.5	
		V_o=-12V	0.05 (2)	—	0.40	
		V_o=-13.9, -15V	0.05 (2)	—	0.30	
Short Circuit Current	I_{sc}	V_{in}=10V	—	4×I_{max}	—	Apk
Inrush Current	I_{ir}	V_{in}=10V	—	4	—	A
	t_{ir}	On start-up	—	0.5	—	mSec
Input Voltage Range	V_{in}	0.1 ≤ I_o ≤ I_{max} V_o=-5V	7	—	25	V
		V_o=-6, -7, -8, -9V	7	—	21	V
		V_o=-10, -12V	7	—	18	V
		V_o=-13.9, -15V	7	—	15	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	—	100	250	µSec
		V_o over/undershoot	—	5.0	—	%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, C_1 must have a ripple current rating ≥600 mArms, and an ESR ≤0.2Ω.*
(2) The ISR will operate down to no load with reduced specifications.
(3) See Thermal Derating chart.

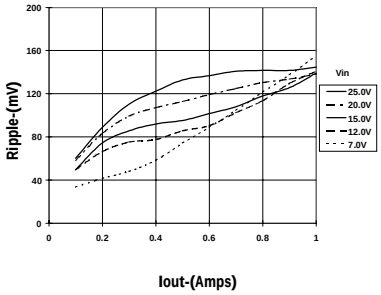
Typical Characteristics

PT78NR105 -5.0 VDC (See Note A)

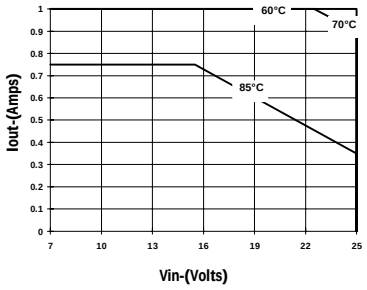
Efficiency vs Output Current



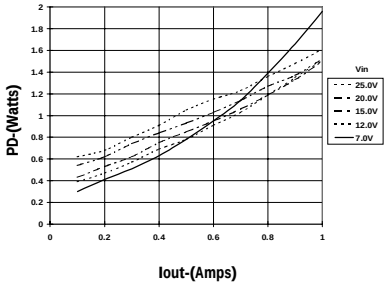
Ripple vs Output Current



Thermal Derating (T_a) (See Note B)

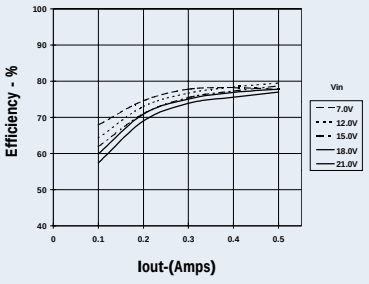


Power Dissipation vs Output Current

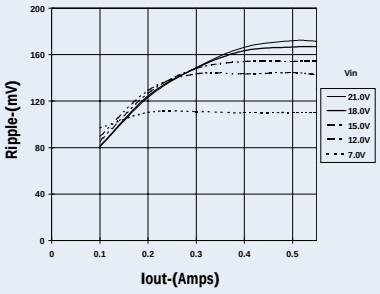


PT78NR109 -9.0 VDC (See Note A)

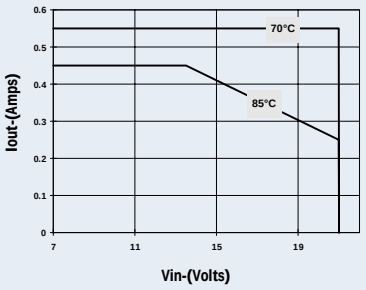
Efficiency vs Output Current



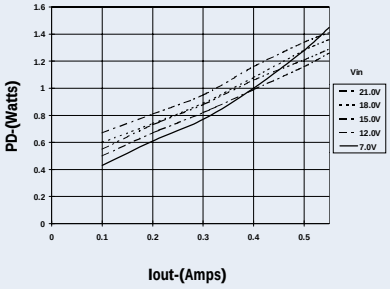
Ripple vs Output Current



Thermal Derating (T_a) (See Note B)

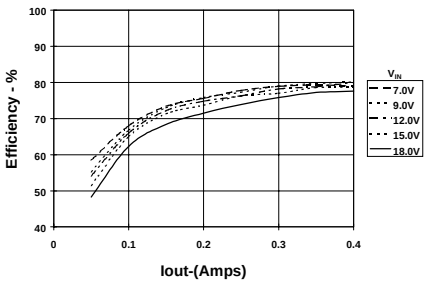


Power Dissipation vs Output Current

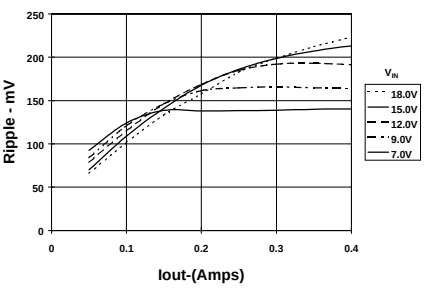


PT78NR112 -12.0 VDC (See Note A)

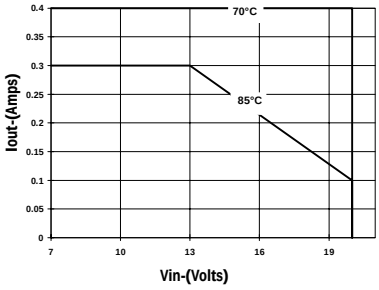
Efficiency vs Output Current



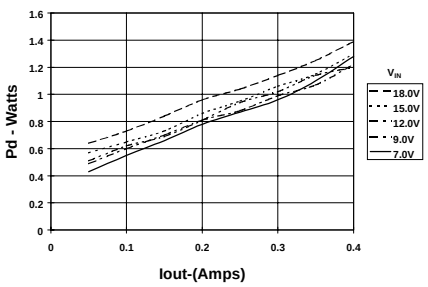
Ripple vs Output Current



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.
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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