PT78NR100 Series
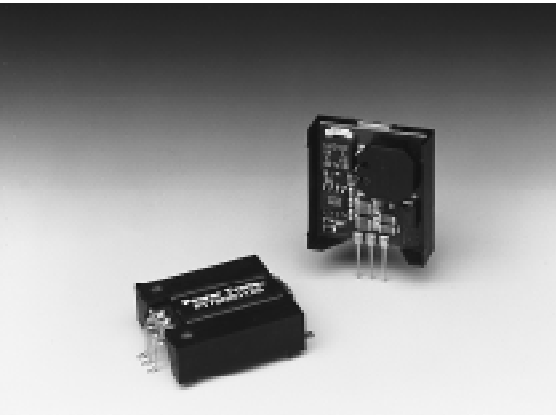
Power Trends Products from Texas Instruments

1 Amp Plus to Minus Voltage Integrated Switching Regulator
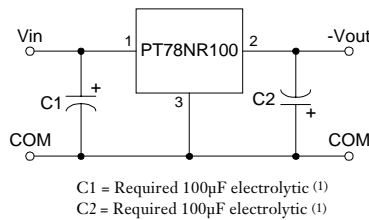
SLTS058B

(Revised 8/31/2000)

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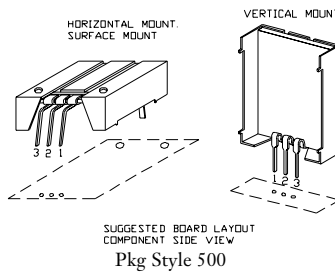- Fast Transient Response

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

HORIZONTAL MOUNT, SURFACE MOUNT

VERTICAL MOUNT

SUGGESTED BOARD LAYOUT COMPONENT SIDE VIEW
Pkg Style 500

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_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		—	$4 \times I_{max}$	—	Apk
Inrush Current	I_{ir}	V_{in}=10V		—	4	—	A
	t_{ir}	On start-up		—	0.5	—	mSec
Input Voltage Range	V_{in}	$0.1 \le I_o \le I_{max}$	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}	$0.1 \le I_o \le I_{max}$		—	±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 Temperaturte 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.*
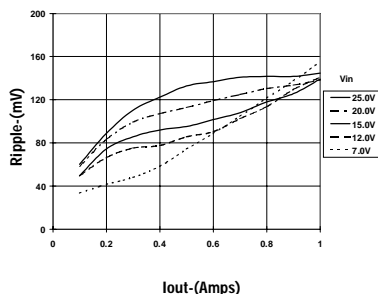(3) *See Thermal Derating chart.*

TEXAS INSTRUMENTS

PT78NR100 Series

Typical Characteristics

1 Amp Plus to Minus Voltage Integrated Switching Regulator

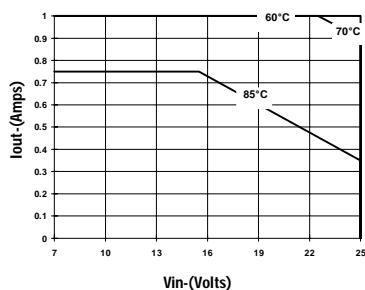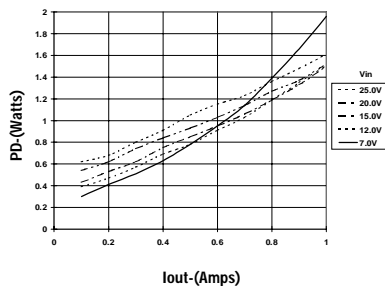### PT78NR105 -5.0 VDC (See Note A)

Efficiency vs Output Current
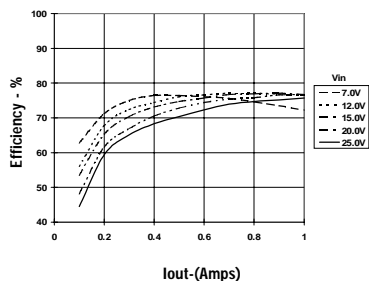
Ripple vs Output Current

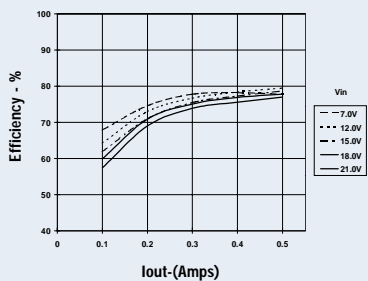**Thermal Derating (T$_a$)** (See Note B)

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)

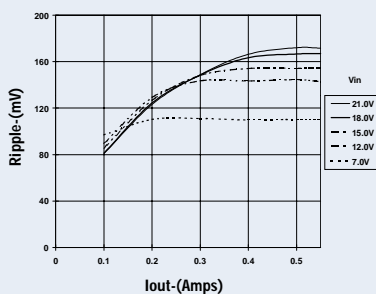**Power Dissipation vs Output Current**

PT78NR112 -12.0 VDC (See Note A)
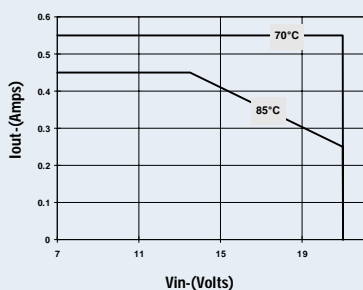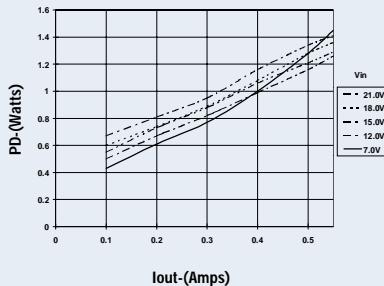
Efficiency vs Output Current
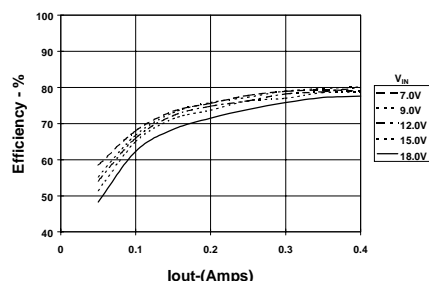
Ripple vs Output Current
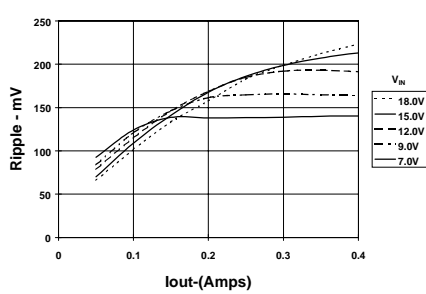
Thermal Derating (T$_a$) (See Note B)
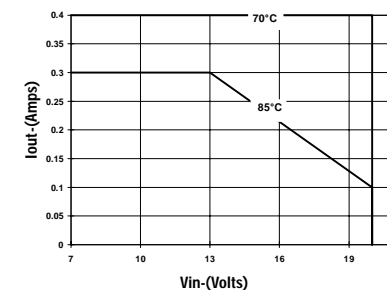
Power Dissipation vs Output Current

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

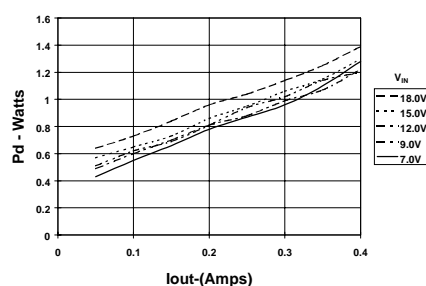| Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
PT78NR103H	OBSOLETE	SIP MODULE	EFA	3		TBD	Call TI	Call TI	-40 to 85		
PT78NR103S	LIFEBUY	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM	-40 to 85		
PT78NR103V	OBSOLETE	SIP MODULE	EFD	3		TBD	Call TI	Call TI	-40 to 85		
PT78NR105H	LIFEBUY	SIP MODULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR105S	ACTIVE	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			Samples
PT78NR105V	LIFEBUY	SIP MODULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR106H	LIFEBUY	SIP MODULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR106S	LIFEBUY	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			
PT78NR106V	OBSOLETE	SIP MODULE	EFD	3		TBD	Call TI	Call TI			
PT78NR107H	LIFEBUY	SIP MODULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR107S	LIFEBUY	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			
PT78NR107V	LIFEBUY	SIP MODULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR108S	LIFEBUY	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			
PT78NR108ST	LIFEBUY	SIP MODULE	EFC	3		TBD	Call TI	Call TI			
PT78NR108V	LIFEBUY	SIP MODULE	EFD	3		TBD	Call TI	Call TI			
PT78NR109H	LIFEBUY	SIP MODULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR109S	LIFEBUY	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			
PT78NR109V	LIFEBUY	SIP MODULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR112H	LIFEBUY	SIP MODULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
PT78NR112S	LIFEBUY	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			
PT78NR112ST	LIFEBUY	SIP MODULE	EFC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			
PT78NR112V	LIFEBUY	SIP MODULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR115H	LIFEBUY	SIP MODULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR115S	LIFEBUY	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			
PT78NR115V	LIFEBUY	SIP MODULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR152H	LIFEBUY	SIP MODULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			
PT78NR152S	LIFEBUY	SIP MODULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM			
PT78NR152V	LIFEBUY	SIP MODULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type			

(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), 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.
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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)

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

(4) Only one of markings shown within the brackets will appear on the physical device.

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