

PT78ST100 Series

1.5 Amp Positive Step-Down
Integrated Switching Regulator

Power Trends Products
from Texas Instruments

SLTS059A

(Revised 6/30/2000)

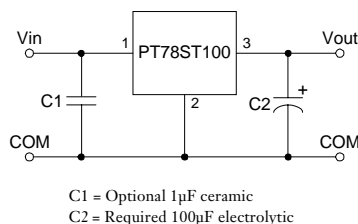
- Very Small Footprint
- High Efficiency > 85%
- Self-Contained Inductor
- Internal Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response
- Wide Input Range

The PT78ST100 is a series of wide-input range, 3-terminal regulators.

These ISRs have a maximum output current of 1.5 Amps and an output voltage that is laser trimmed to a variety of industry standard voltages.

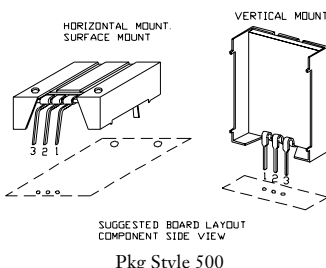
These 78 series regulators have excellent line and load regulation with internal short-circuit and over-temperature protection, and are offered in a variety of standard output voltages. These ISRs are very flexible and may be used in a wide variety of applications.

Standard Application



Pin-Out Information

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



Ordering Information

PT78ST1 XX Y

Output Voltage

33 = 3.3 Volts
36 = 3.6 Volts
05 = 5.0 Volts
51 = 5.1 Volts
53 = 5.25 Volts
06 = 6.0 Volts
65 = 6.5 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	PT78ST100 SERIES			
			Min	Typ	Max	Units
Output Current	I _o	Over V _{in} range	0.1*	—	1.5	A
Short Circuit Current	I _{sc}	V _{in} = V _{in} min	—	3.5	—	Apk
Input Voltage Range	V _{in}	0.1 ≤ I _o ≤ 1.5A V _o = 3.3V V _o = 5V V _o = 12V	9 9 16	— — —	26 38 38	V V V
Output Voltage Tolerance	ΔV _o	Over V _{in} range, I _o = 1.5A T _a = 0°C to +60°C	—	±1.0	±2.0	%V _o
Line Regulation	Reg _{line}	Over V _{in} range	—	±0.2	±0.4	%V _o
Load Regulation	Reg _{load}	0.1 ≤ I _o ≤ 1.5A	—	±0.1	±0.2	%V _o
V _o Ripple/Noise	V _n	V _{in} = 9V, I _o = 1.5A V _{in} = 16V, I _o = 1.5A V _o = 5V V _o = 12V	— — —	65 90 —	— — —	mV _{pp} mV _{pp} —
Transient Response (with 100µF output cap)	t _{tr}	50% load change V _o over/undershoot	— —	100 5	— —	µSec %V _o
Efficiency	η	V _{in} = 10V, I _o = 1A V _{in} = 10V, I _o = 1A V _{in} = 17V, I _o = 1A V _o = 3.3V V _o = 5V V _o = 12V	— — —	80 85 90	— — —	% % %
Switching Frequency	f _o	Over V _{in} range, I _o = 1.5A	600	650	700	kHz
Absolute Maximum Operating Temperature Range	T _a	—	-40	—	+85	°C
Recommended Operating Temperature Range	T _a	Free Air Convection, (40-60LFM) At V _{in} = 24V, I _o = 1.0A	-40	—	+80**	°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

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

**See Thermal Derating chart.

Note: The PT78ST100 Series requires a 100µF electrolytic or tantalum output capacitor for proper operation in all applications.

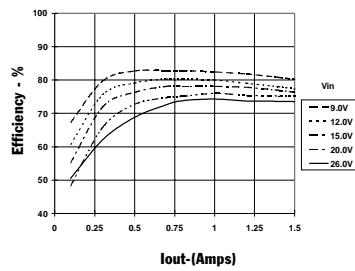
PT78ST100 Series

1.5 Amp Positive Step-Down
Integrated Switching Regulator

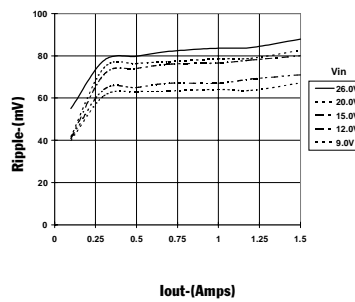
Typical Characteristics

PT78ST133, 3.3 VDC (See Note 1)

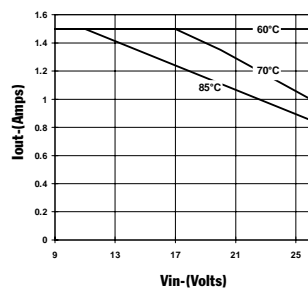
Efficiency vs Output Current



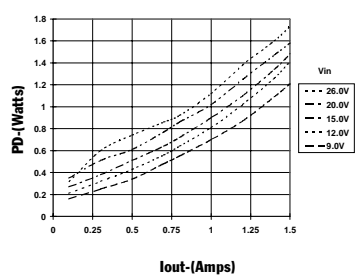
Ripple vs Output Current



Thermal Derating (Ta) (See Note 2)

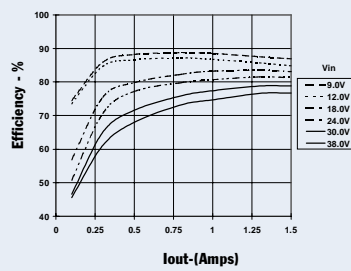


Power Dissipation vs Output Current

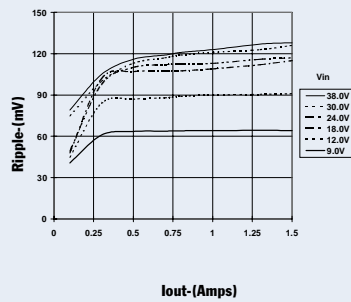


PT78ST105, 5.0 VDC (See Note 1)

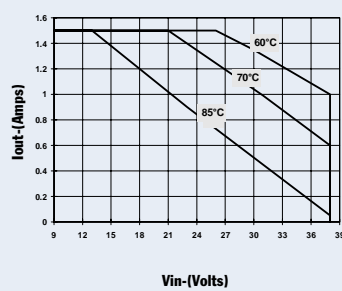
Efficiency vs Output Current



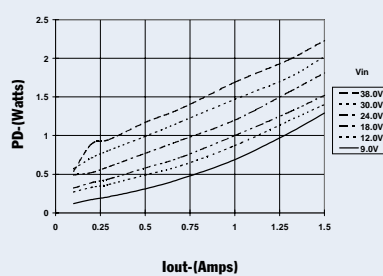
Ripple vs Output Current



Thermal Derating (Ta) (See Note 2)

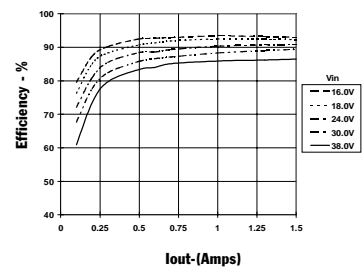


Power Dissipation vs Output Current

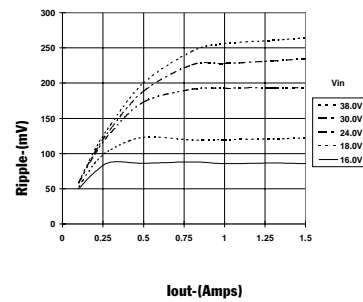


PT78ST112, 12.0 VDC (See Note 1)

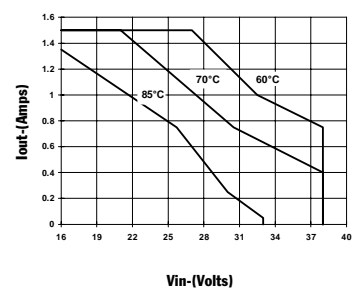
Efficiency vs Output Current



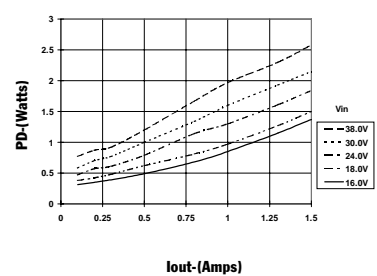
Ripple vs Output Current



Thermal Derating (Ta) (See Note 2)



Power Dissipation vs Output Current



Note 1: 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 2: Thermal derating graphs are developed in free air convection cooling of 40-60 LFM. (See Thermal Application Notes.)

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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
PT78ST105H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST105S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST105ST	ACTIVE	SIP MOD ULE	EFC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST105U	NRND	SIP MOD ULE	EFU	3		TBD	Call TI	Call TI
PT78ST105V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST106H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST106S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST106ST	ACTIVE	SIP MOD ULE	EFC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST106V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST107H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST107S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST107ST	ACTIVE	SIP MOD ULE	EFC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST108H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST108S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST108V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST109H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST109S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST109V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST110H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST110S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST110V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST112H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST112S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST112T	ACTIVE	SIP MOD ULE	EFT	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST112V	ACTIVE	SIP MOD ULE	EFD	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⁾
PT78ST114H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST114S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST114V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST115H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST115S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST115ST	ACTIVE	SIP MOD ULE	EFC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST115V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST133H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST133S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST133V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST136H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST151H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST151S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST153H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST153S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST153V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST165H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78ST165S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78ST165V	ACTIVE	SIP MOD ULE	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.

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)

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

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