

PT78ST100 Series

1.5 Amp Positive Step-Down
Integrated Switching Regulator



SLTS059A

(Revised 6/30/2000)

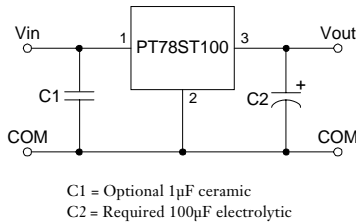
- Very Small Footprint
- High Efficiency > 85%
- Self-Contained Inductor
- Internal Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response
- Wide Input Range

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.

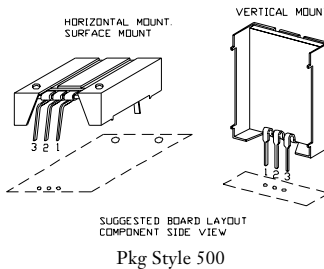
These 78 series regulators have excellent line and load regulation with internal short-circuit and over-temperature protection, and are offered in a variety of standard output voltages. These ISRs are very flexible and may be used in a wide variety of applications.

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 | | | Units |
|---|---------------------|--|------------------|----------------|----------------|--------------------------------------|
| | | | Min | Typ | Max | |
| 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.

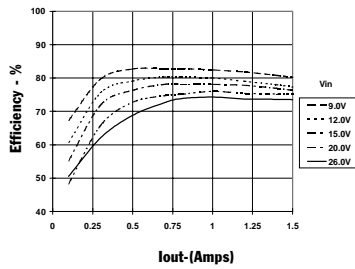
PT78ST100 Series

Typical Characteristics

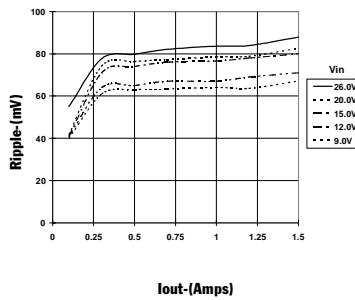
1.5 Amp Positive Step-Down
Integrated Switching Regulator

PT78ST133, 3.3 VDC (See Note 1)

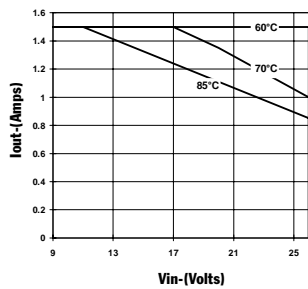
Efficiency vs Output Current



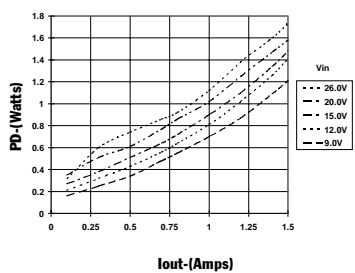
Ripple vs Output Current



Thermal Derating (Ta) (See Note 2)

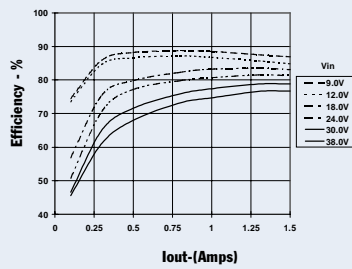


Power Dissipation vs Output Current

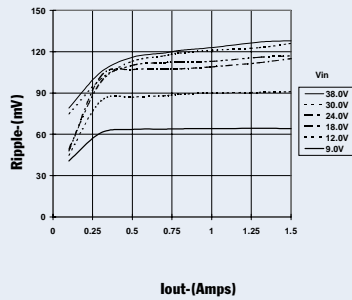


PT78ST105, 5.0 VDC (See Note 1)

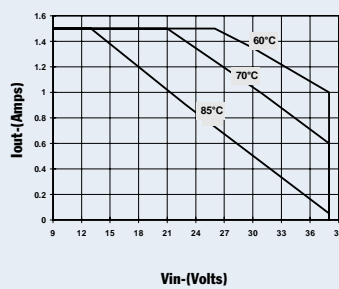
Efficiency vs Output Current



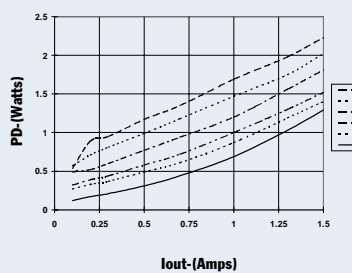
Ripple vs Output Current



Thermal Derating (Ta) (See Note 2)

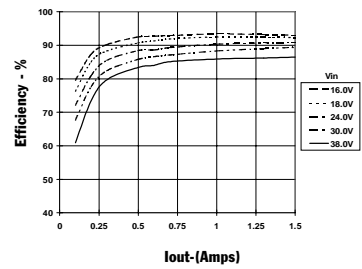


Power Dissipation vs Output Current

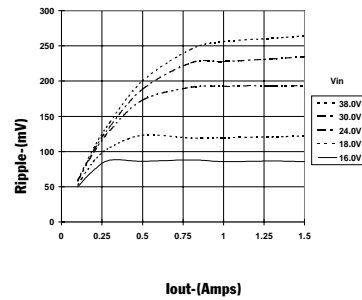


PT78ST112, 12.0 VDC (See Note 1)

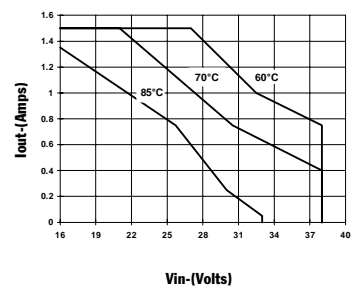
Efficiency vs Output Current



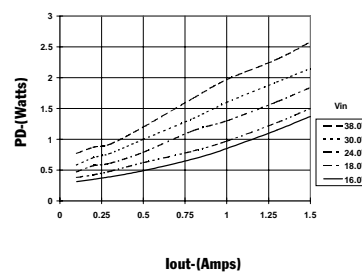
Ripple vs Output Current



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 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST105S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST105ST | ACTIVE | SIP MOD ULE | EFC | 3 | 200 | TBD | 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 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST106H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST106S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST106ST | ACTIVE | SIP MOD ULE | EFC | 3 | 200 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST106V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST107H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST107S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST107ST | ACTIVE | SIP MOD ULE | EFC | 3 | 200 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST108H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST108S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST108V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST109H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST109S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST109V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST110H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST110S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST110V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST112H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST112S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST112ST | ACTIVE | SIP MOD ULE | EFC | 3 | 200 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST112T | ACTIVE | SIP MOD ULE | EFT | 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⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| PT78ST112V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST114H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST114S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST114V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST115H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST115S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST115ST | ACTIVE | SIP MOD ULE | EFC | 3 | 200 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST115V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST133H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST133S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST133ST | ACTIVE | SIP MOD ULE | EFC | 3 | 200 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST133V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST136H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST136S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST151H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST151S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST151V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST153H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST153S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST153V | ACTIVE | SIP MOD ULE | EFD | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST165H | ACTIVE | SIP MOD ULE | EFA | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST165S | ACTIVE | SIP MOD ULE | EFC | 3 | 25 | TBD | Call TI | Level-1-215C-UNLIM |
| PT78ST165V | 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.

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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.

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

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