

78ST100 Series**1.5 AMP POSITIVE STEP-DOWN
INTEGRATED SWITCHING REGULATOR**

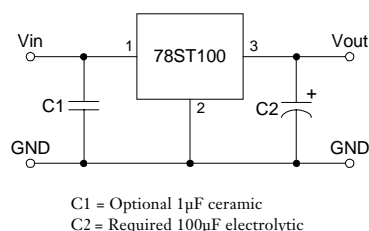
Revised 6/30/98



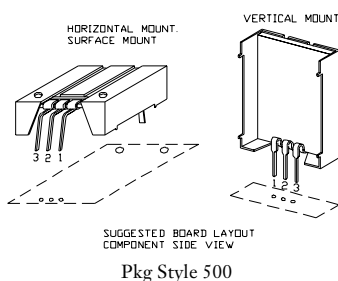
- Very Small Footprint
- High Efficiency > 85%
- Self-Contained Inductor
- Internal Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response
- Wide Input Range

The 78ST100 is a series of wide input voltage, 3-terminal Integrated Switching Regulators (ISRs). These ISRs have a maximum output current of 1.5A 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, 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****78ST1 XX Y C****Output Voltage**

33 = 3.3 Volts
36 = 3.6 Volts
05 = 5.0 Volts
51 = 5.1 Volts
65 = 6.5 Volts
07 = 7.0 Volts
08 = 8.0 Volts
09 = 9.0 Volts
12 = 12.0 Volts

Package Suffix

V = Vertical Mount
S = Surface Mount
H = Horizontal Mount

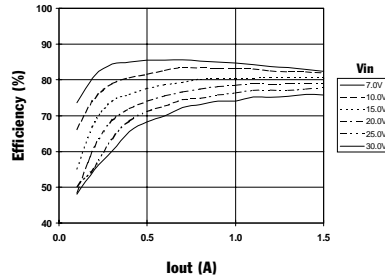
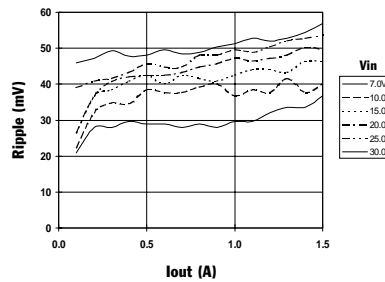
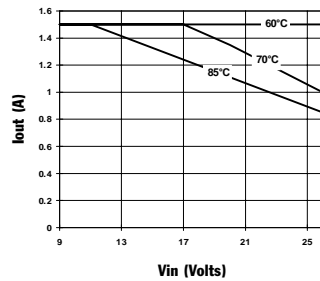
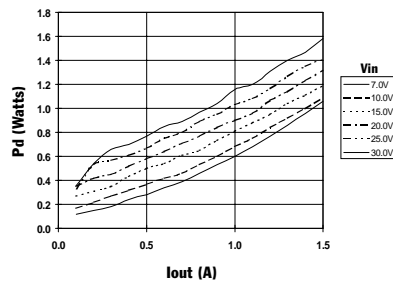
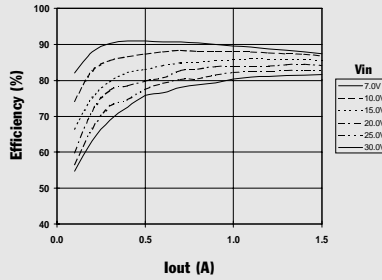
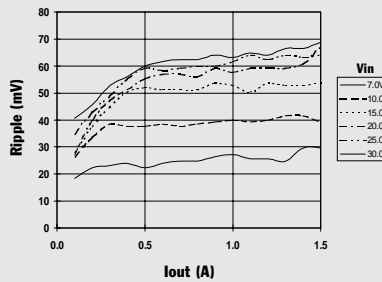
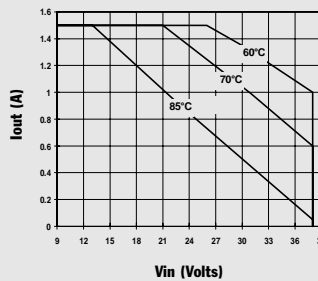
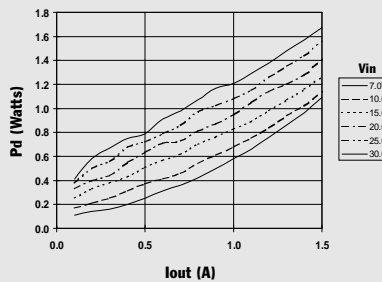
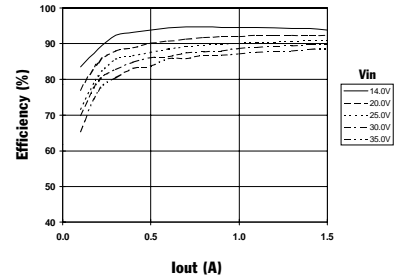
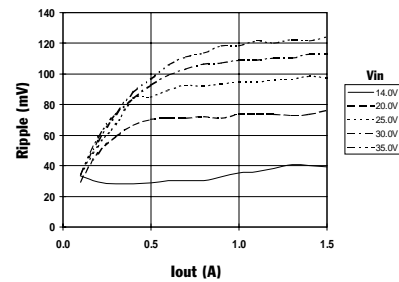
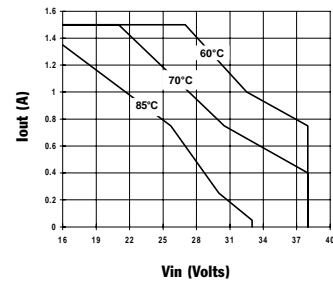
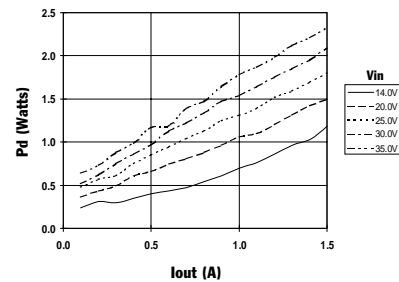
Specifications

| Characteristics (T _a = 25°C unless noted) | Symbols | Conditions | 78ST100 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 | 7 7 14.5 | — — — | 26 30 30 | 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 78ST100 Series requires a 100µF electrolytic or tantalum output capacitor for proper operation in all applications.

78ST100 Series**CHARACTERISTIC DATA****78ST133_ 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****78ST105_ 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****78ST112_ 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.)

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|-----------------|-------------------------|----------------------|--------------|-------------------------|---------|
| 78ST105SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST107HC | OBSOLETE | SIP MODULE | EFA | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST107SC | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST107SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST107VC | OBSOLETE | SIP MODULE | EFD | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST108HC | OBSOLETE | SIP MODULE | EFA | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST108SC | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST108SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST108VC | OBSOLETE | SIP MODULE | EFD | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST109SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST109TC | OBSOLETE | SIP MODULE | EFT | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST112SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST112TC | OBSOLETE | SIP MODULE | EFT | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST133SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST136SC | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST136SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST136VC | OBSOLETE | SIP MODULE | EFD | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST151HC | OBSOLETE | SIP MODULE | EFA | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST151SC | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST151SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST151VC | OBSOLETE | SIP MODULE | EFD | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST165SCT | OBSOLETE | SIP MODULE | EFC | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |
| 78ST165VC | NRND | SIP MODULE | EFD | 3 | | TBD | Call TI | Call TI | -40 to 85 | | |

⁽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.

⁽⁴⁾ There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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