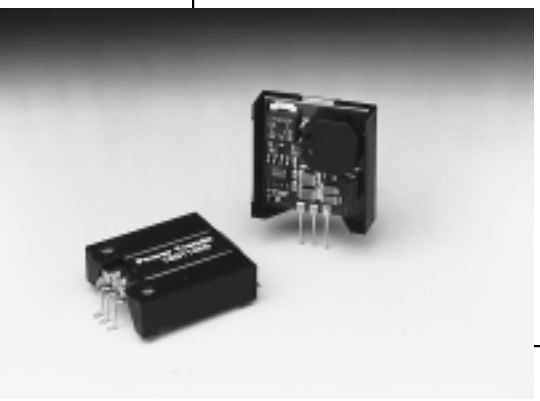
# 78ST100 Series

## 1.5 AMP POSITIVE STEP-DOWN INTEGRATED SWITCHING REGULATOR

**Revised 6/30/98**

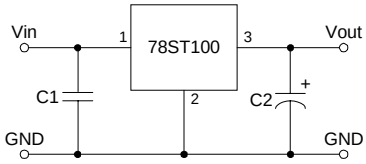


- Very Small Footprint
- High Efficiency > 85%
- Self-Contained Inductor
- Internal Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response
- Wide Input Range

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.

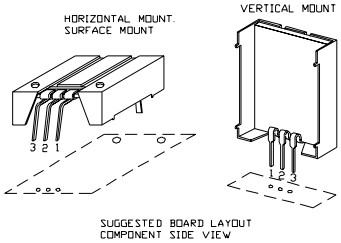
### Standard Application




C1 = Optional 1µF ceramic
C2 = Required 100µF electrolytic

### Pin-Out Information

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




Pkg Style 500

### Ordering Information

**78ST1 XX Y** C

| Output Voltage | Package Suffix |
|---|---|
| **33** = 3.3 Volts | **V** = Vertical Mount |
| **36** = 3.6 Volts | **S** = Surface Mount |
| **05** = 5.0 Volts | **H** = Horizontal Mount |
| **51** = 5.1 Volts | |
| **65** = 6.5 Volts | |
| **07** = 7.0 Volts | |
| **08** = 8.0 Volts | |
| **09** = 9.0 Volts | |
| **12** = 12.0 Volts | |

### 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<br>$V_o$= 5V<br>$V_o$= 12V | 7<br>7<br>14.5 | —<br>—<br>— | 26<br>30<br>30 | V<br>V<br>V |
| Output Voltage Tolerance | $\Delta V_o$ | Over $V_{in}$ range, $I_o$=1.5A<br>$T_a$ = 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 $V_o$= 5V<br>$V_{in}$= 16V, $I_o$= 1.5A $V_o$= 12V | — | 65<br>90 | — | $mV_{pp}$<br>$mV_{pp}$ |
| Transient Response (with 100µF output cap) | $t_{tr}$ | 50% load change<br>$V_o$ over/undershoot | —<br>— | 100<br>5 | —<br>— | µSec<br>$\%V_o$ |
| Efficiency | η | $V_{in}$= 10V, $I_o$= 1A $V_o$= 3.3V<br>$V_{in}$= 10V, $I_o$= 1A $V_o$= 5V<br>$V_{in}$= 17V, $I_o$= 1A $V_o$= 12V | —<br>—<br>— | 80<br>85<br>90 | —<br>—<br>— | %<br>%<br>% |
| 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)<br>At $V_{in}$= 24V, $I_o$=1.0A | -40 | — | +80** | °C |
| Thermal Resistance | $\theta_{ja}$ | 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.*



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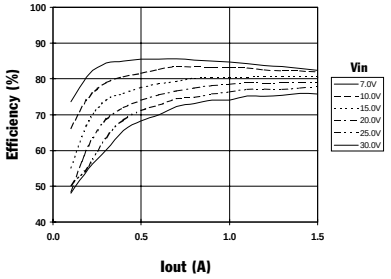
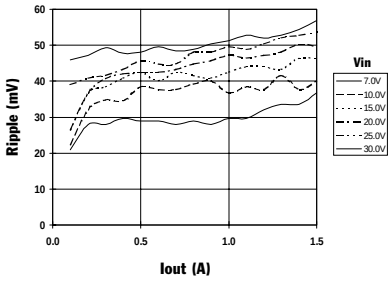
## 78ST133_ 3.3 VDC (See Note 1)

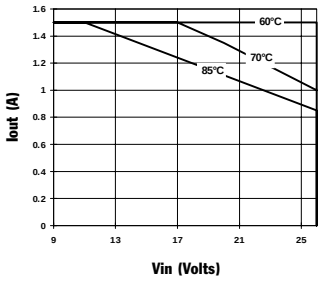
### Efficiency vs Output Current



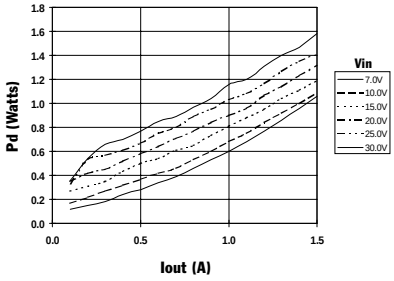

### Ripple vs Output Current




### Thermal Derating ($T_a$) (See Note 2)

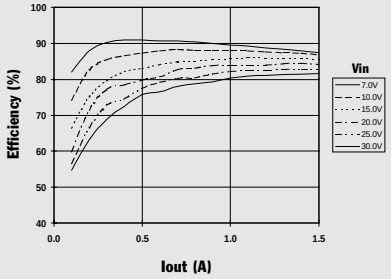



### Power Dissipation vs Output Current

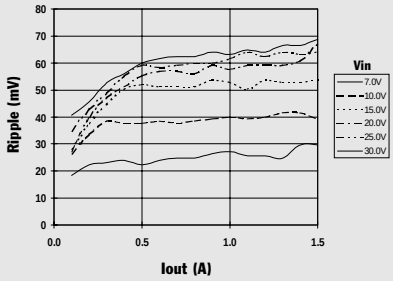



## 78ST105_ 5.0 VDC (See Note 1)

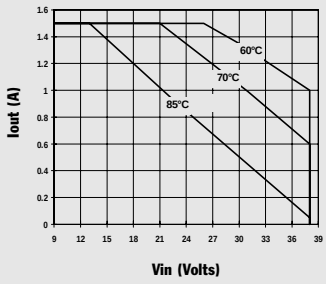
### Efficiency vs Output Current



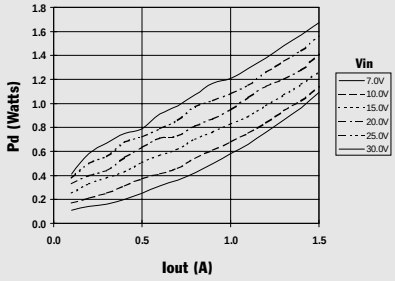

### Ripple vs Output Current




### Thermal Derating ($T_a$) (See Note 2)

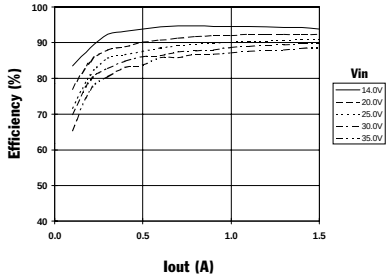



### Power Dissipation vs Output Current

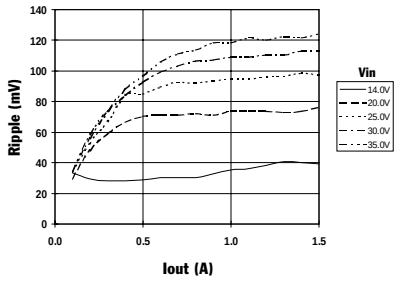



## 78ST112_ 12.0 VDC (See Note 1)

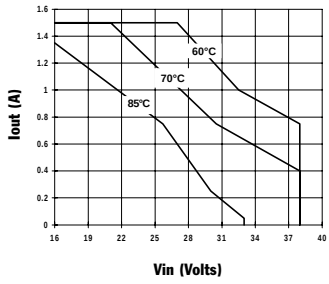
### Efficiency vs Output Current



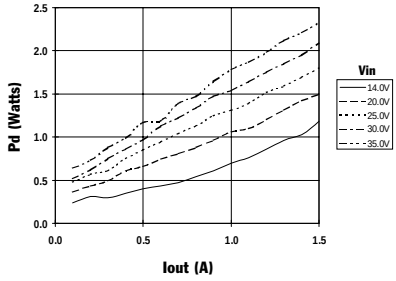

### Ripple vs Output Current




### Thermal Derating ($T_a$) (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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