

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

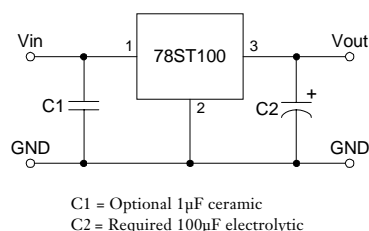
Revised 6/30/98



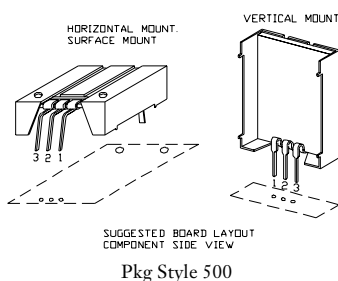
- Very Small Footprint
- High Efficiency > 85%
- Self-Contained Inductor
- Internal Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response
- Wide Input Range

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 <sub>in</sub>
2	GND
3	V <sub>out</sub>

**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

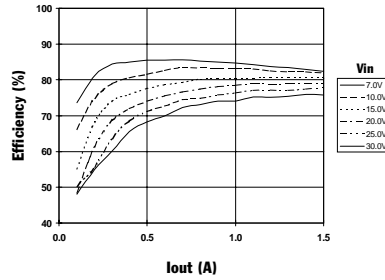
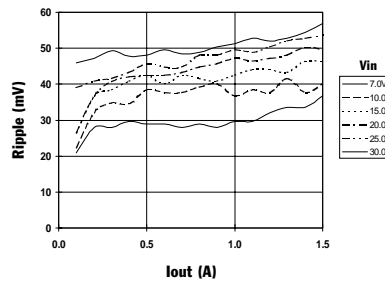
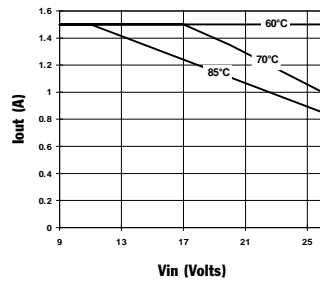
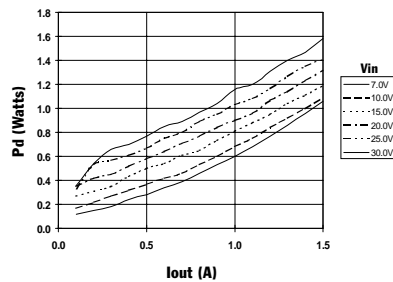
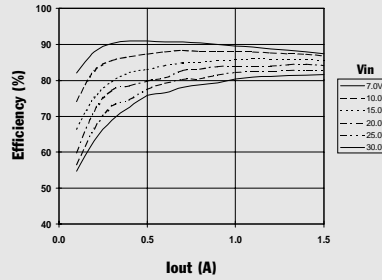
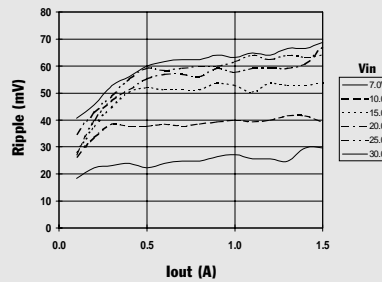
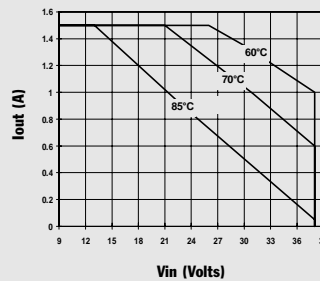
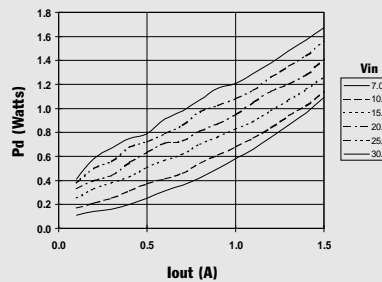
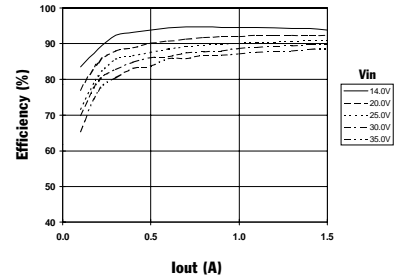
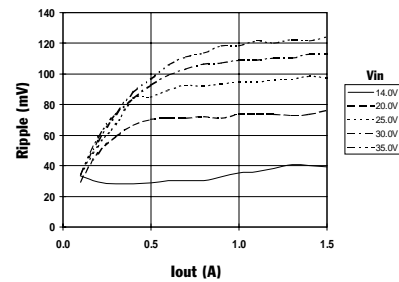
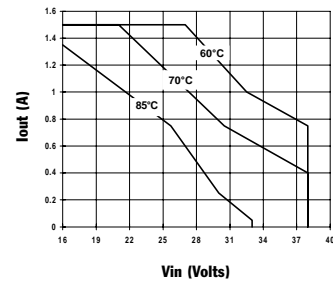
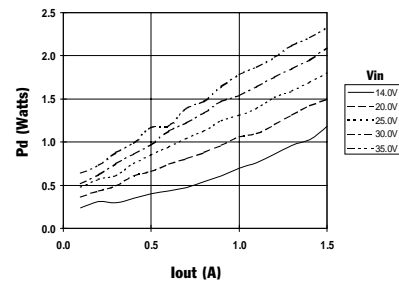
**Specifications**

Characteristics (T <sub>a</sub> = 25°C unless noted)	Symbols	Conditions	78ST100 SERIES			
			Min	Typ	Max	Units
Output Current	I <sub>o</sub>	Over V <sub>in</sub> range	0.1*	—	1.5	A
Short Circuit Current	I <sub>sc</sub>	V <sub>in</sub> = V <sub>in</sub> min	—	3.5	—	A <sub>pk</sub>
Input Voltage Range	V <sub>in</sub>	0.1 ≤ I <sub>o</sub> ≤ 1.5A V <sub>o</sub> = 3.3V V <sub>o</sub> = 5V V <sub>o</sub> = 12V	7 7 14.5	—	26 30 30	V V V
Output Voltage Tolerance	ΔV <sub>o</sub>	Over V <sub>in</sub> range, I <sub>o</sub> = 1.5A T <sub>a</sub> = 0°C to +60°C	—	±1.0	±2.0	%V <sub>o</sub>
Line Regulation	Reg <sub>line</sub>	Over V <sub>in</sub> range	—	±0.2	±0.4	%V <sub>o</sub>
Load Regulation	Reg <sub>load</sub>	0.1 ≤ I <sub>o</sub> ≤ 1.5A	—	±0.1	±0.2	%V <sub>o</sub>
V <sub>o</sub> Ripple/Noise	V <sub>n</sub>	V <sub>in</sub> = 9V, I <sub>o</sub> = 1.5A V <sub>in</sub> = 16V, I <sub>o</sub> = 1.5A V <sub>o</sub> = 5V V <sub>o</sub> = 12V	—	65 90	—	mV <sub>pp</sub> mV <sub>pp</sub>
Transient Response (with 100µF output cap)	t <sub>tr</sub>	50% load change V <sub>o</sub> over/undershoot	— —	100 5	—	µSec %V <sub>o</sub>
Efficiency	η	V <sub>in</sub> = 10V, I <sub>o</sub> = 1A V <sub>in</sub> = 10V, I <sub>o</sub> = 1A V <sub>in</sub> = 17V, I <sub>o</sub> = 1A V <sub>o</sub> = 3.3V V <sub>o</sub> = 5V V <sub>o</sub> = 12V	— — —	80 85 90	—	% % %
Switching Frequency	f <sub>o</sub>	Over V <sub>in</sub> range, I <sub>o</sub> = 1.5A	600	650	700	kHz
Absolute Maximum Operating Temperature Range	T <sub>a</sub>	—	-40	—	+85	°C
Recommended Operating Temperature Range	T <sub>a</sub>	Free Air Convection, (40-60LFM) At V <sub>in</sub> = 24V, I <sub>o</sub> = 1.0A	-40	—	+80**	°C
Thermal Resistance	θ <sub>ja</sub>	Free Air Convection, (40-60LFM)	—	45	—	°C/W
Storage Temperature	T <sub>s</sub>	—	-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		

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

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

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

<sup>(5)</sup> 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.

<sup>(6)</sup> 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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