



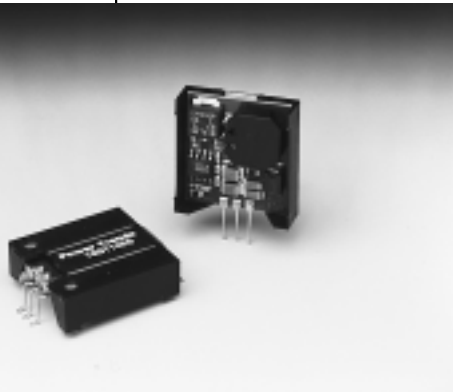
**THE DATASHEET OF
78ST165SC**



78ST100 Series

1.5 AMP POSITIVE STEP-DOWN INTEGRATED SWITCHING REGULATOR

Revised 6/30/98

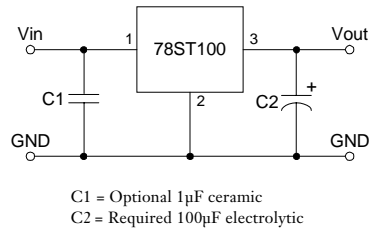


- Very Small Footprint
- High Efficiency > 85%
- Self-Contained Inductor
- Internal Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response
- Wide Input Range

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.

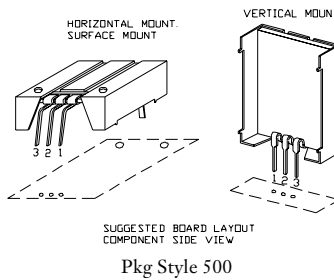
These 78 series regulators have excellent line and load regulation with internal short-circuit and over-temperature protection, are very flexible, and may be used in a wide variety of applications.

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			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	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 100 μ F output cap)	t _{tr}	50% load change V _o over/undershoot	—	100 5	—	μ Sec %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.

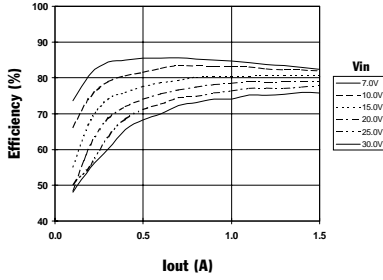
**See Thermal Derating chart.

Note: The 78ST100 Series requires a 100 μ F electrolytic or tantalum output capacitor for proper operation in all applications.

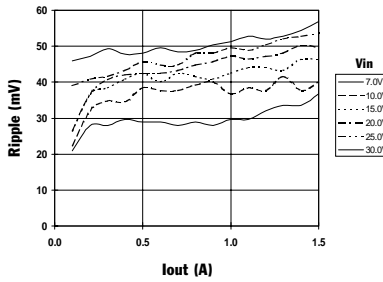
CHARACTERISTIC DATA

78ST133_ 3.3 VDC (See Note 1)

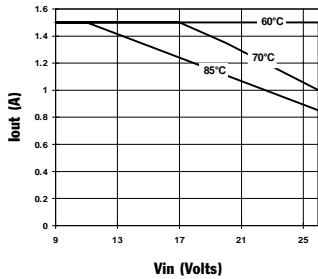
Efficiency vs Output Current



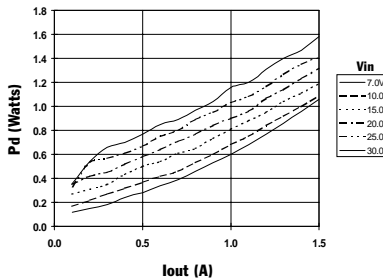
Ripple vs Output Current



Thermal Derating (Ta) (See Note 2)

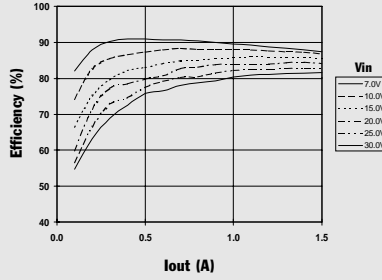


Power Dissipation vs Output Current

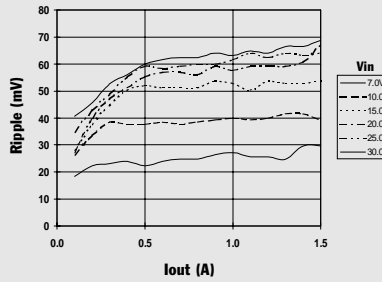


78ST105_ 5.0 VDC (See Note 1)

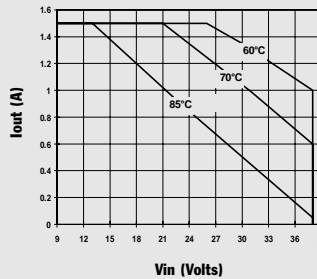
Efficiency vs Output Current



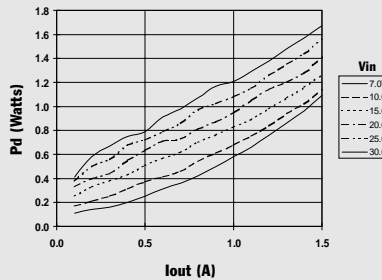
Ripple vs Output Current



Thermal Derating (Ta) (See Note 2)

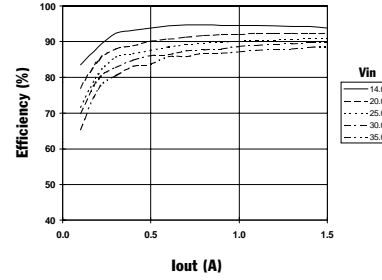


Power Dissipation vs Output Current

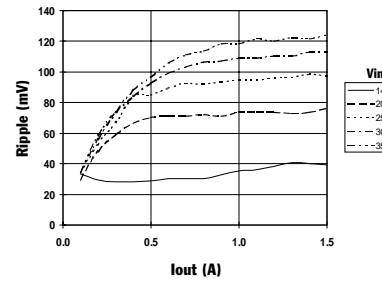


78ST112_ 12.0 VDC (See Note 1)

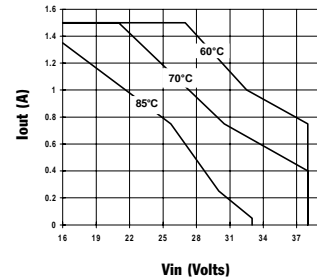
Efficiency vs Output Current



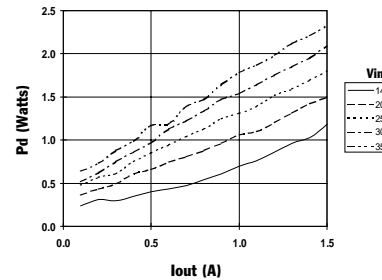
Ripple vs Output Current



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	MSL Peak Temp ⁽³⁾
78ST105HC	NRND	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST105SC	NRND	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
78ST105SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST105VC	NRND	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST107HC	OBSOLETE	SIP MOD ULE	EFA	3		TBD	Call TI	Call TI
78ST107SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST107SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST107VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI
78ST108HC	OBSOLETE	SIP MOD ULE	EFA	3		TBD	Call TI	Call TI
78ST108SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST108SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST108VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI
78ST109HC	NRND	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST109SC	NRND	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST109SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST109TC	OBSOLETE	SIP MOD ULE	EFT	3		TBD	Call TI	Call TI
78ST109VC	NRND	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST112HC	NRND	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST112SC	NRND	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
78ST112SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST112TC	NRND	SIP MOD ULE	EFT	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
78ST112VC	NRND	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST133HC	NRND	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST133SC	NRND	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
78ST133SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
78ST133VC	NRND	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST136SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST136SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST136VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI
78ST151HC	OBSOLETE	SIP MOD ULE	EFA	3		TBD	Call TI	Call TI
78ST151SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST151SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST151VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI
78ST165HC	NRND	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78ST165SC	NRND	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
78ST165SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST165VC	NRND	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI

⁽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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