

78ST200 Series

2 AMP POSITIVE STEP-DOWN INTEGRATED SWITCHING REGULATOR

Revised 6/30/98

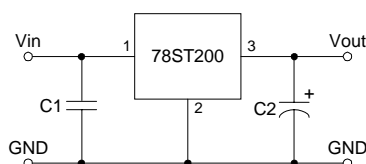


- High Efficiency > 82%
- Wide Input Range
- Self-Contained Inductor
- Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response

The 78ST200 is a series of wide input voltage, 3 terminal Integrated Switching Regulators (ISRs). Employing a ceramic substrate, these ISRs have a maximum output current of 2A. The output voltage is laser trimmed for high accuracy.

The 78ST200 series regulators have internal short-circuit and over-temperature protection and may be used in a wide variety of applications.

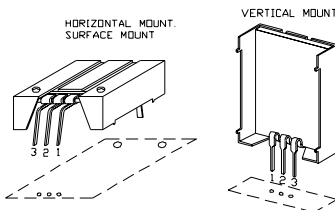
Standard Application



C1 = Optional 1 μ F ceramic
C2 = Required 100 μ F electrolytic

Pin-Out Information

Pin No.	Function
1	V _{in}
2	GND
3	V _{out}



SUGGESTED BOARD LAYOUT COMPONENT SIDE VIEW

Ordering Information

78ST2 **XX** **Y** **C**

Output Voltage

33 = 3.3 Volts
35 = 3.45 Volts
05 = 5.0 Volts

Package Suffix

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

(For dimensions and PC board layout see Package Style 500.)

Specifications

Characteristics (T _a = 25°C unless noted)	Symbols	Conditions	78ST200 SERIES			
			Min	Typ	Max	Units
Output Current	I _o	Over V _{in} range	0.1*	—	2.0	A
Input Voltage Range	V _{in}	I _o = 0.1 to 3.0A V _o < 3.5V V _o = 5.0V	7 8	—	15 20	V V
Output Voltage Tolerance	ΔV _o	Over V _{in} range, I _o = 2.0A T _a = 0°C to +60°C	—	±1.0	±2.0	%V _o
Line Regulation	Reg _{line}	Over V _{in} range	—	±0.4	±0.8	%V _o
Load Regulation	Reg _{load}	0.1 ≤ I _o ≤ 2.0A	—	±0.2	±0.4	%V _o
Ripple/Noise	V _n	V _{in} = V _{in} min, I _o = 2.0A	—	1	—	%V _o
Transient Response (with 100 μ F output cap)	t _{tr}	50% load change V _o over/undershoot	—	100 5.0	—	μ Sec %V _o
Efficiency	η	V _{in} = 9V, I _o = 2.0A, V _o = 5V	—	82	—	%
Switching Frequency	f _o	Over V _{in} and I _o ranges	0.95	1.0	1.05	MHz
Absolute Maximum Operating Temperature Range	T _a	—	-40	—	+85	°C
Recommended Operating Temperature Range	T _a	Free Air Convection, (40-60LFM) Over V _{in} and I _o ranges	-40	—	+85**	°C
Thermal Resistance	θ _{ja}	Free Air Convection, (40-60LFM)	—	38	—	°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	—	—	—	7	—	Grams

* ISR will operate down to no load with reduced specifications.

** See Thermal Derating chart.

Note: The 78ST200 Series requires a 100 μ F electrolytic or tantalum output capacitor for proper operation in all applications.

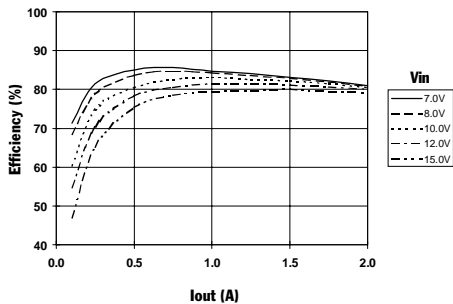
78ST200 Series

CHARACTERISTIC DATA

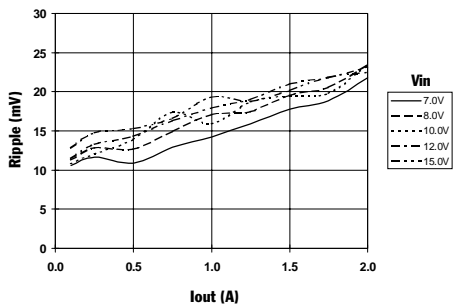
78ST233_ 3.3 VDC

(See Note 1)

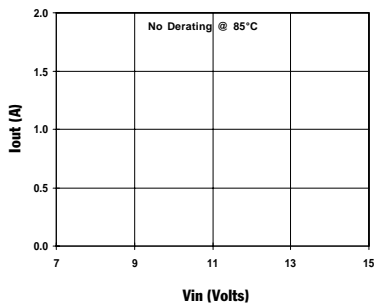
Efficiency vs Output Current



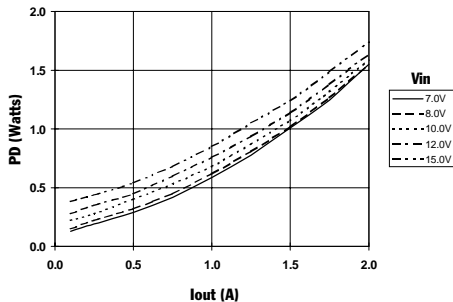
Ripple vs Output Current



Thermal Derating (T_a) (See Note 2)



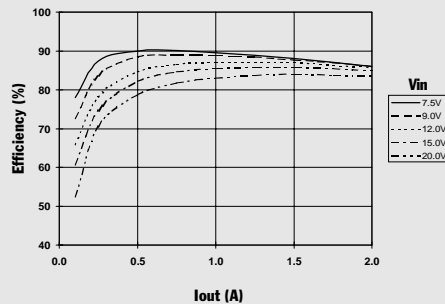
Power Dissipation vs Output Current



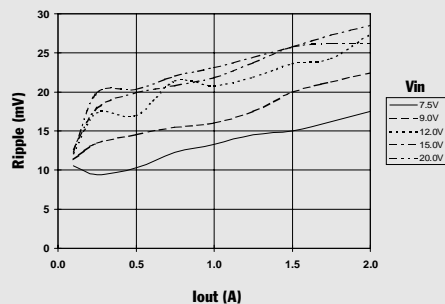
78ST205_ 5.0 VDC

(See Note 1)

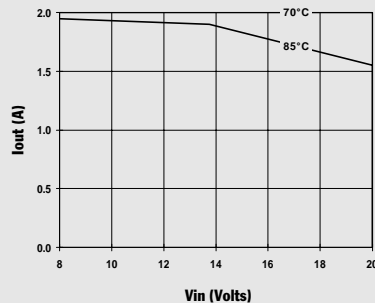
Efficiency vs Output Current



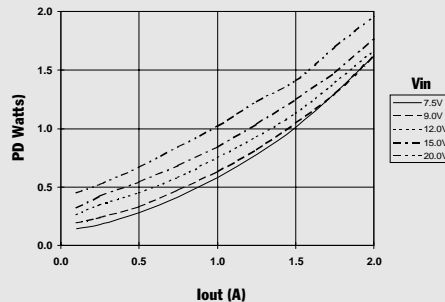
Ripple vs Output Current



Thermal Derating (T_a) (See Note 2)



Power Dissipation vs Output Current



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 Note)

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
78ST205HC	NRND	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
78ST205SC	NRND	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
78ST205SCT	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST205VC	NRND	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
78ST233HC	NRND	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
78ST233SC	NRND	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
78ST233VC	NRND	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
78ST235HC	NRND	SIP MOD ULE	EFA	3		TBD	Call TI	Call TI
78ST235SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78ST235VC	OBSOLETE	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) 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.

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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