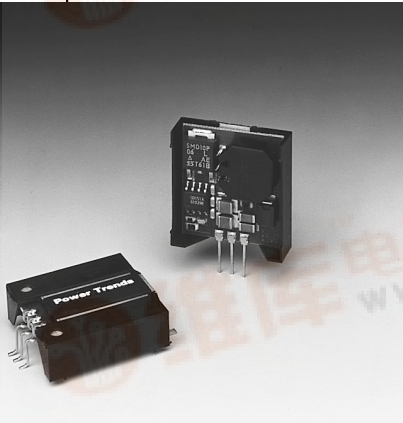
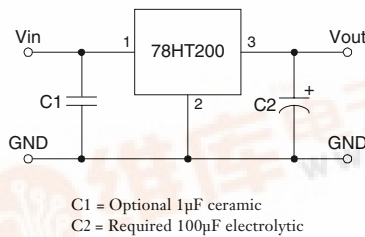


**78HT200 Series****2 AMP POSITIVE STEP-DOWN  
INTEGRATED SWITCHING REGULATOR****Revised 9/22/99**

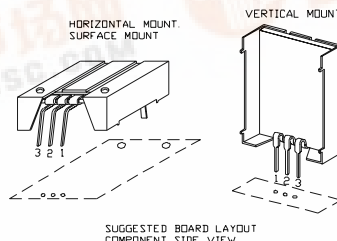
- High Efficiency > 82%
- Wide Input Range
- Self-Contained Inductor
- Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response

The 78HT200 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 78HT200 series regulators have internal short-circuit and over-temperature protection and may be used in a wide variety of applications.

**Standard Application****Pin-Out Information**

Pin No.	Function
1	V <sub>in</sub>
2	GND
3	V <sub>out</sub>

**Ordering Information****78HT2 XX Y C****Output Voltage**

**33** = 3.3 Volts  
**46** = 4.6 Volts  
**05** = 5.0 Volts  
**53** = 5.25 Volts  
**65** = 6.5 Volts  
**75** = 7.5 Volts  
**10** = 10.0 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 <sub>a</sub> = 25°C unless noted)	Symbols	Conditions	78HT200 SERIES			
			Min	Typ	Max	Units
Output Current	I <sub>o</sub>	Over V <sub>in</sub> range	0.1*	—	2.0	A
Input Voltage Range	V <sub>in</sub>	I <sub>o</sub> = 0.1 to 2.0A V <sub>o</sub> < 4.6V V <sub>o</sub> ≥ 4.6V	7 V <sub>o</sub> +2V	—	15 28	V
Output Voltage Tolerance	ΔV <sub>o</sub>	Over V <sub>in</sub> range, I <sub>o</sub> = 2.0A 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	—	±0.4	±0.8	%V <sub>o</sub>
Load Regulation	Reg <sub>load</sub>	0.1 ≤ I <sub>o</sub> ≤ 2.0A	—	±0.2	±0.4	%V <sub>o</sub>
Ripple/Noise	V <sub>n</sub>	V <sub>in</sub> = V <sub>in</sub> min, I <sub>o</sub> = 2.0A	—	1	—	%V <sub>o</sub>
Transient Response (with 100 $\mu$ F output cap)	t <sub>tr</sub>	50% load change V <sub>o</sub> over/undershoot	—	100 5.0	—	$\mu$ Sec %V <sub>o</sub>
Efficiency	$\eta$	V <sub>in</sub> = 9V, I <sub>o</sub> = 2.0A, V <sub>o</sub> = 5V	—	82	—	%
Switching Frequency	f <sub>o</sub>	Over V <sub>in</sub> and I <sub>o</sub> ranges V <sub>o</sub> ≥ 4.6V V <sub>o</sub> = 3.3V	700 0.95	750 1.0	800 1.05	kHz MHz
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) Over V <sub>in</sub> and I <sub>o</sub> ranges	-40	—	+85**	°C
Thermal Resistance	$\theta_{ja}$	Free Air Convection, (40-60LFM)	—	38	—	°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	—	—	—	7	—	Grams

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

\*\* See Thermal Derating chart.

Note: The 78HT200 Series requires a 100 $\mu$ F electrolytic or tantalum output capacitor for proper operation in all applications.



For assistance or to order, call **(800) 531-5782**

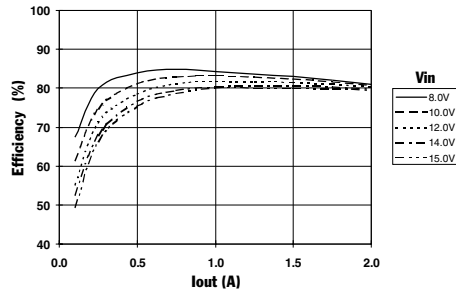
## CHARACTERISTIC DATA

# 78HT200 Series

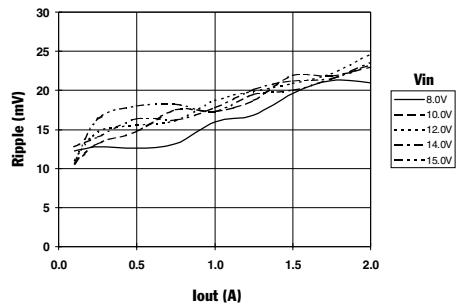
### 78HT233\_ 3.3 VDC

(See Note 1)

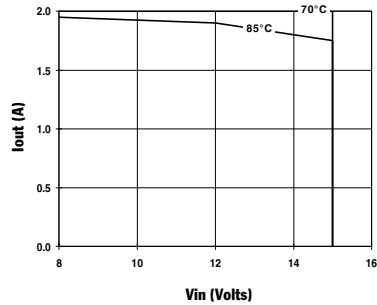
#### Efficiency vs Output Current



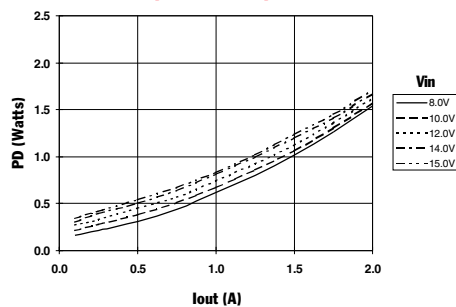
#### Ripple vs Output Current



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



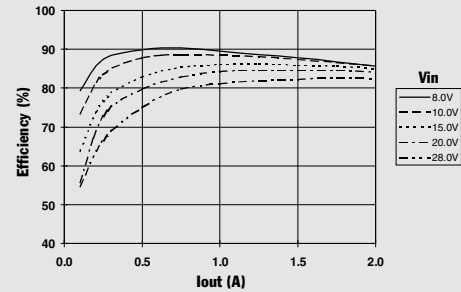
#### Power Dissipation vs Output Current



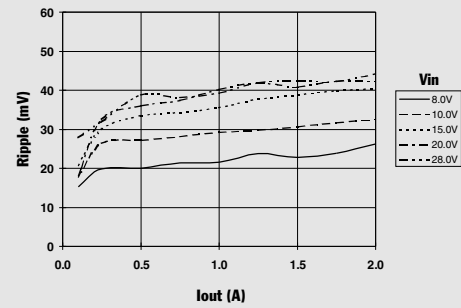
### 78HT205\_ 5.0 VDC

(See Note 1)

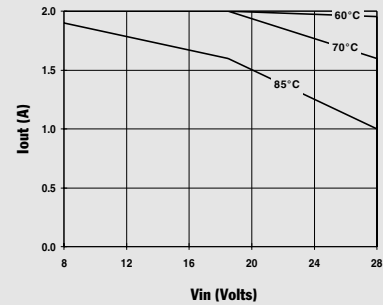
#### Efficiency vs Output Current



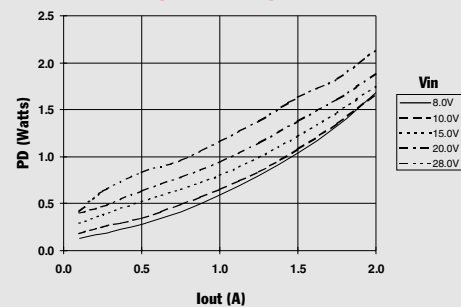
#### Ripple vs Output Current



#### 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 <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
78HT205HC	NRND	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT205SC	NRND	SIP MOD ULE	EFC	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT205TC	NRND	SIP MOD ULE	EFT	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT205VC	NRND	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT210HC	OBSOLETE	SIP MOD ULE	EFA	3		TBD	Call TI	Call TI
78HT210SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78HT210VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI
78HT210WC	NRND	SIP MOD ULE	EFW	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT233HC	NRND	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT233SC	NRND	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78HT233VC	NRND	SIP MOD ULE	EFD	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT246HC	OBSOLETE	SIP MOD ULE	EFA	3		TBD	Call TI	Call TI
78HT246SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78HT246VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI
78HT253HC	NRND	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT253SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78HT253VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI
78HT265HC	NRND	SIP MOD ULE	EFA	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT265SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78HT265TC	NRND	SIP MOD ULE	EFT	3	25	TBD	Call TI	Level-1-215C-UNLIM
78HT265VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI
78HT275HC	OBSOLETE	SIP MOD ULE	EFA	3		TBD	Call TI	Call TI
78HT275SC	OBSOLETE	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78HT275VC	OBSOLETE	SIP MOD ULE	EFD	3		TBD	Call TI	Call TI

<sup>(1)</sup> The marketing status values are defined as follows:

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**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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