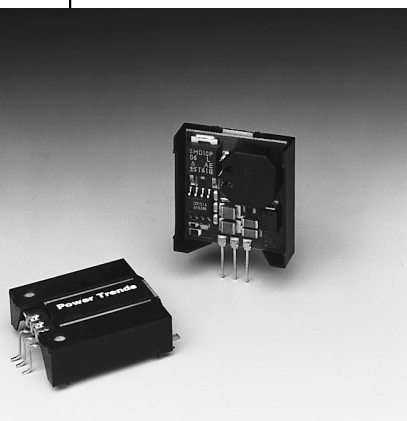
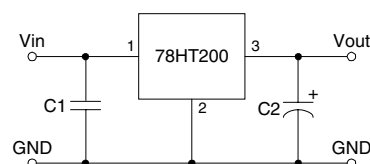


78HT200 Series**2 AMP POSITIVE STEP-DOWN
INTEGRATED SWITCHING REGULATOR****Revised 9/22/99**

- 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.

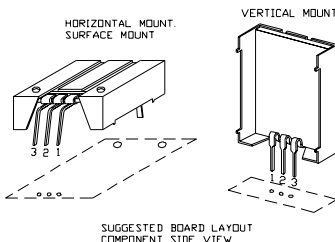
The 78HT200 series regulators have internal short-circuit and over-temperature protection and may be used in a wide variety of applications.

Standard Application

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****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 ($T_a = 25^\circ\text{C}$ unless noted)	Symbols	Conditions	78HT200 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 2.0A $V_o < 4.6\text{V}$ $V_o \geq 4.6\text{V}$	7 $V_o + 2\text{V}$	—	15 28	V V
Output Voltage Tolerance	ΔV_o	Over V_{in} range, $I_o = 2.0\text{A}$ $T_a = 0^\circ\text{C}$ to $+60^\circ\text{C}$	—	± 1.0	± 2.0	% V_o
Line Regulation	Reg_{line}	Over V_{in} range	—	± 0.4	± 0.8	% V_o
Load Regulation	Reg_{load}	$0.1 \leq I_o \leq 2.0\text{A}$	—	± 0.2	± 0.4	% V_o
Ripple/Noise	V_n	$V_{in} = V_{in\text{ min}}$, $I_o = 2.0\text{A}$	—	1	—	% V_o
Transient Response (with 100 μF output cap)	t_{tr}	50% load change V_o over/undershoot	—	100 5.0	—	μSec % V_o
Efficiency	η	$V_{in} = 9\text{V}$, $I_o = 2.0\text{A}$, $V_o = 5\text{V}$	—	82	—	%
Switching Frequency	f_o	Over V_{in} and I_o ranges $V_o \geq 4.6\text{V}$ $V_o = 3.3\text{V}$	700 0.95	750 1.0	800 1.05	kHz MHz
Absolute Maximum Operating Temperature Range	T_a	—	-40	—	+85	$^\circ\text{C}$
Recommended Operating Temperature Range	T_a	Free Air Convection, (40-60LFM) Over V_{in} and I_o ranges	-40	—	+85**	$^\circ\text{C}$
Thermal Resistance	θ_{ja}	Free Air Convection, (40-60LFM)	—	38	—	$^\circ\text{C}/\text{W}$
Storage Temperature	T_s	—	-40	—	+125	$^\circ\text{C}$
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 μF electrolytic or tantalum output capacitor for proper operation in all applications.

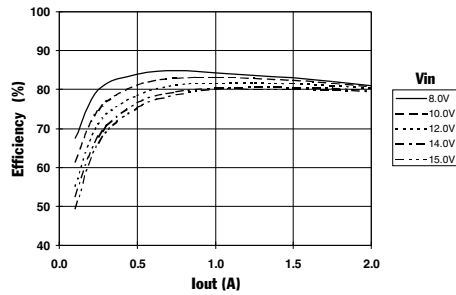
78HT200 Series

CHARACTERISTIC DATA

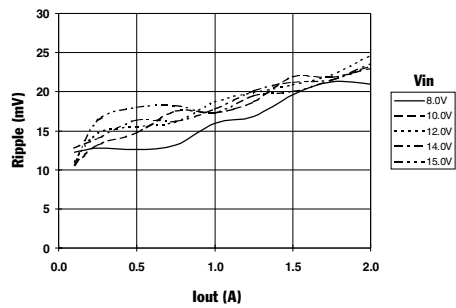
78HT233_ 3.3 VDC

(See Note 1)

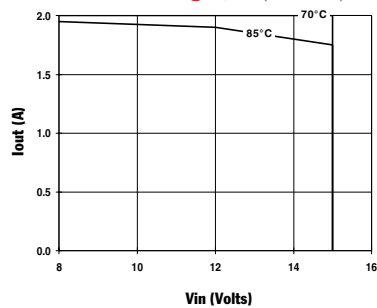
Efficiency vs Output Current



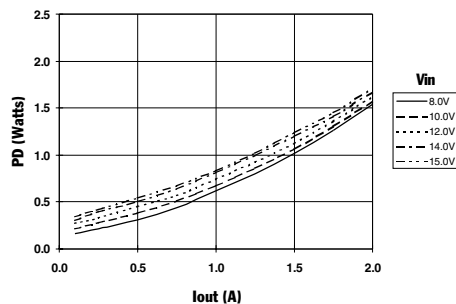
Ripple vs Output Current



Thermal Derating (T_A) (See Note 2)



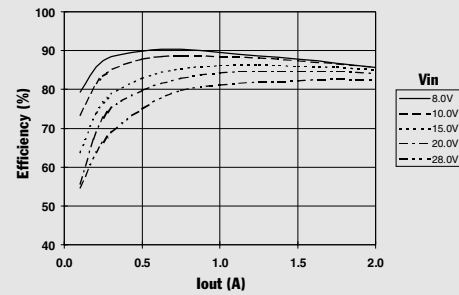
Power Dissipation vs Output Current



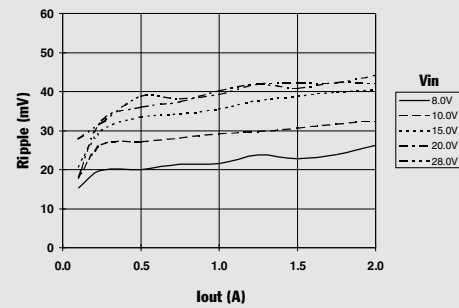
78HT205_ 5.0 VDC

(See Note 1)

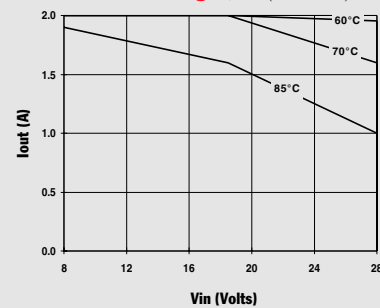
Efficiency vs Output Current



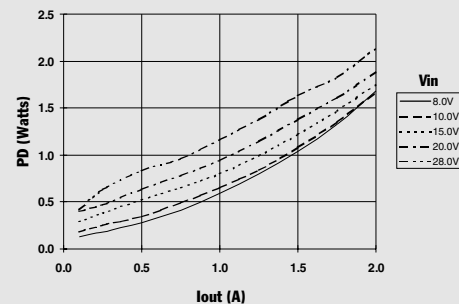
Ripple vs Output Current



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 ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
78HT205HC	NRND	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78HT205SC	NRND	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
78HT205TC	NRND	SIP MOD ULE	EFT	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
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	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
78HT233HC	NRND	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
78HT233SC	NRND	SIP MOD ULE	EFC	3		TBD	Call TI	Call TI
78HT233VC	NRND	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
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

⁽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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