PT78HT200 Series

2 Amp Positive Step-Down Integrated Switching Regulator

Power Trends Products from Texas Instruments

SLTS057B

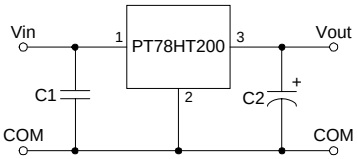
(Revised 10/15/2000)

- High Efficiency: Up to 90%
- Wide Input Range
- Self-Contained Inductor
- Short-Circuit Protection
- Over-Temperature Protection
- Fast Transient Response

The PT78HT200 is a series of fixed output, wide-input range, 3-terminal Integrated Switching Regulators (ISRs). These ISRs have a maximum output current of 2A. The output voltage is also laser trimmed for high accuracy. Features include excellent line and load regulation, internal short-circuit and over-temperature protection.

The PT78HT200 series is available in three package outlines, including horizontal SMD. Their small size and output voltage selection makes these regulators ideal for use in a variety of applications.

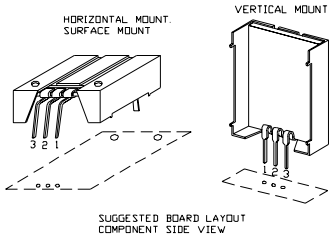
Standard Application



C1 = Optional 1µF ceramic
C2 = Required 100µF electrolytic (1)

Pin-Out Information

Pin	Function
1	V_{in}
2	GND
3	V_{out}



Pkg Style 500

Ordering Information

PT78HT2 XX Y

Output Voltage

33 = 3.3 Volts
05 = 5.0 Volts
53 = 5.25 Volts
65 = 6.5 Volts
08 = 8.0 Volts

Package Suffix

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

Specifications

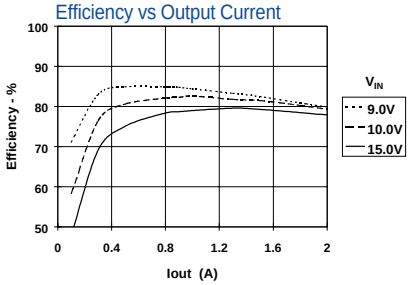
Characteristics (T_a = 25°C unless noted)	Symbols	Conditions		PT78HT200 SERIES Min	Typ	Max	Units
Output Current	I_o	Over V_{in} range		0.1 (2)	—	2.0	A
Short Circuit Current	I_{sc}	V_{in} = V_{in} min		—	6.0	—	Apk
Input Voltage Range	V_{in}	0.1 ≥ I_o ≥ 2.0A	V_o =3.3V V_o =5.0V V_o =6.5V V_o =8.0V	9 9 10.5 12	— — — —	15 28 28 28	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	%Vo
Line Regulation	Reg_{line}	Over V_{in} range		—	±0.4	±0.8	%Vo
Load Regulation	Reg_{load}	0.1 ≤ I_o ≤ 2.0A		—	±0.2	±0.4	%Vo
Vo Ripple/Noise	V_n	V_{in} = V_{in} min, I_o = 2.0A		—	±1	—	%Vo
Transient Response (with 100µF output cap)	t_{tr}	50% load change Vo over/undershoot		—	100 5.0	—	µSec %Vo
Efficiency	η	V_{in}=9V, I_o = 2.0A V_{in} =12V, I_o =2.0A V_{in} =15V, I_o =2.0A	V_o =3.3V V_o =5.0V V_o =8.0V	— — —	80 85 90	— — —	%
Switching Frequency	f_o	Over V_{in} and I_o ranges	V_o ≥5.0V V_o =3.3V	700 950	750 1,000	800 1,050	kHz
Absolute Maximum Operating Temperature Range	T_a	Over V_{in} range		-40	—	+85 (3)	°C
Thermal Resistance	θ_{ja}	Free Air Convection, (40-60LFM)		—	40	—	°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

Notes: (1) The PT78HT200 Series requires a 100µF electrolytic or tantalum output capacitor for proper operation in all applications.
(2) ISR will operate down to no load with reduced specifications.
(3) See Safe Operating Area curves for derating

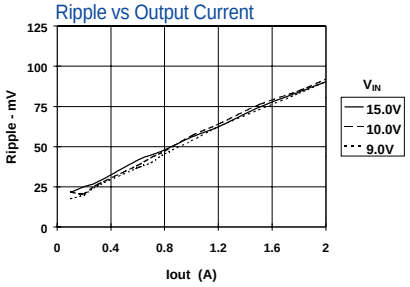
Typical Characteristics

PT78HT233 3.3 VDC (See Note A)

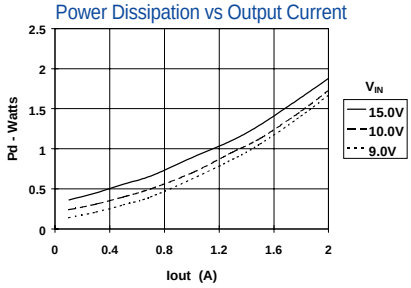
Efficiency vs Output Current



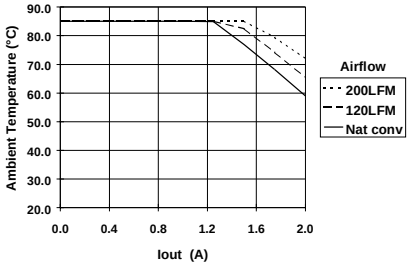
Ripple vs Output Current



Power Dissipation vs Output Current

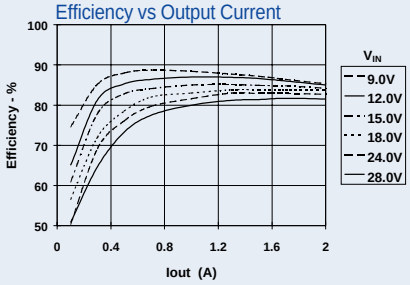


Safe Operating Area @V_{in} =12V (Note B)

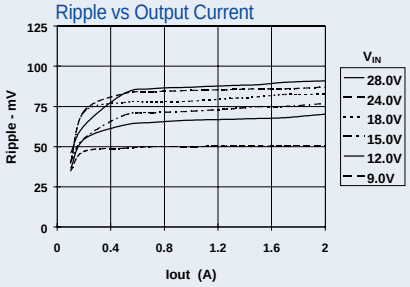


PT78HT205 5.0 VDC (See Note A)

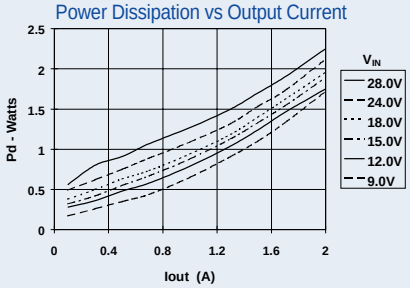
Efficiency vs Output Current



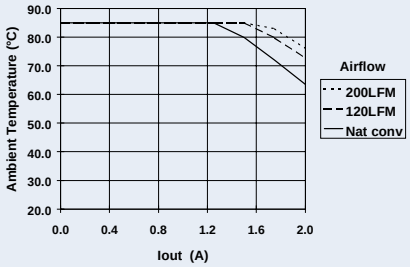
Ripple vs Output Current



Power Dissipation vs Output Current

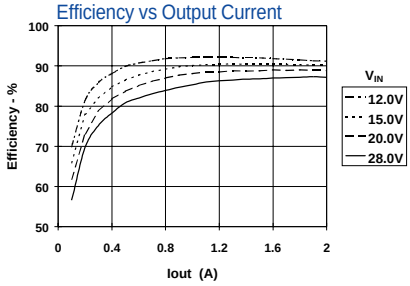


Safe Operating Area @V_{in} =15V (Note B)

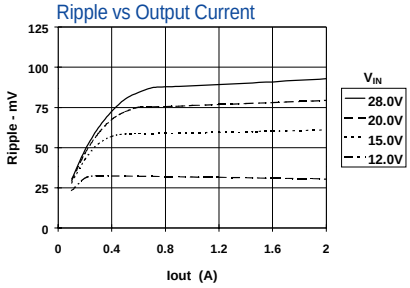


PT78HT208 8.0 VDC (See Note A)

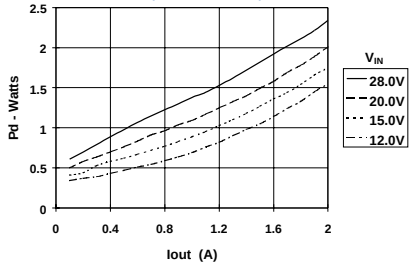
Efficiency vs Output Current



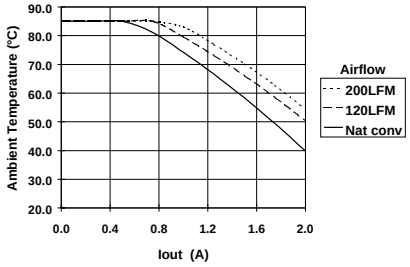
Ripple vs Output Current



Power Dissipation vs Output Current



Safe Operating Area @V_{in} =15V (Note B)



Note A: *All characteristic data has been developed from actual products tested at 25°C. This data is considered typical data for the ISR.*
Note B: *SOA curves represent operating conditions at which internal components are at or below manufacturer's maximum rated operating temperatures.*

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
PT78HT205H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78HT205S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78HT205ST	ACTIVE	SIP MOD ULE	EFC	3	200	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78HT205V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78HT208H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78HT208S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78HT233H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78HT233S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78HT233V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78HT253H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78HT253S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78HT253V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78HT265H	ACTIVE	SIP MOD ULE	EFA	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type
PT78HT265S	ACTIVE	SIP MOD ULE	EFC	3	25	Pb-Free (RoHS)	Call TI	Level-1-215C-UNLIM
PT78HT265V	ACTIVE	SIP MOD ULE	EFD	3	25	Pb-Free (RoHS)	Call TI	N / A for Pkg Type

(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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