1.5 Amp, 12V Step-Up/Step-Down Integrated Switching Regulator

EXCALIBUR

(Revised 2/7/2001)

Features

- Single-Device: +12V Output, 7-16V Input
- 84% Efficiency
- 14-Pin Excalibur™ Package
- Output Current Limit
- Adjustable Output Voltage
- Adjustable Undervoltage Lockout
- Solderable Copper Case

Description

The PT5071 is a 1.5-ampere rated step-up/step-down Integrated Switching Regulator (ISR) that provides a tightly regulated 12V output voltage from a 7V to 16V variable input source. This high-performance ISR has applications in systems where the input voltage straddles the desired 12V output. The regulator has an adjustable output voltage and input start-up threshold, and a standby function for power conservation.

Standard Application

C_1, C_2 = Required 100µF electrolytic (See footnotes)
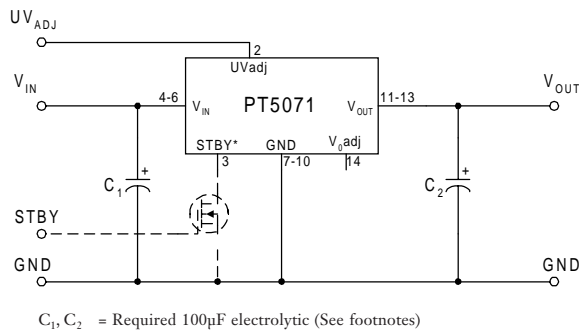
Pin-Out Information

Pin	Function
1	N/C
2	UVLO Adj
3	STBY*
4	V_{in}
5	V_{in}
6	V_{in}
7	GND
8	GND
9	GND
10	GND
11	V_{out}
12	V_{out}
13	V_{out}
14	V_{out} Adjust

Ordering Information

PT5071☐ = +12 Volts

PT Series Suffix (PT1234X)

Case/Pin Configuration

Vertical Through-Hole	**N**
Horizontal Through-Hole	**A**
Horizontal Surface Mount	**C**

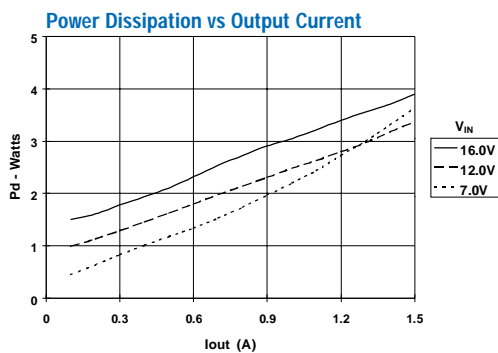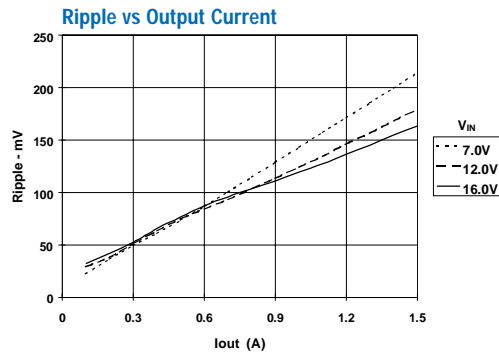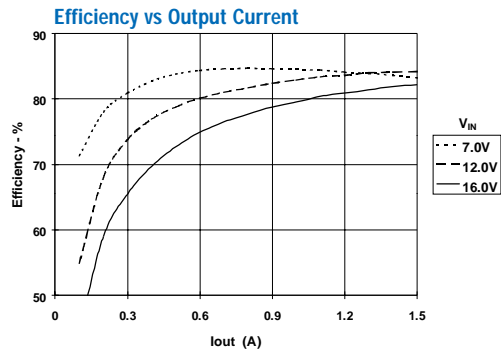*(For dimensions and PC board layout, see Package Styles 1360 and 1370.)*

For Inhibit pin:
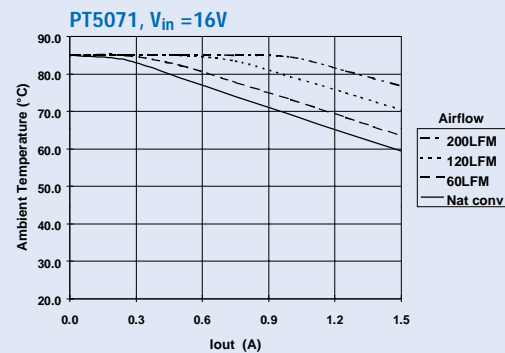Open = output enabled
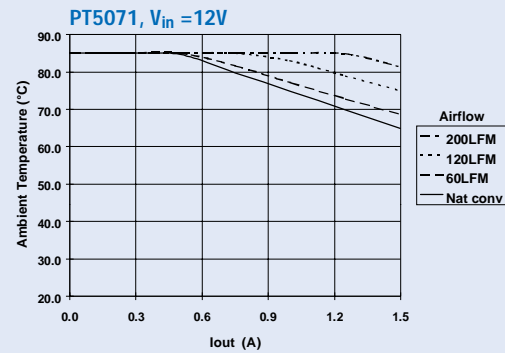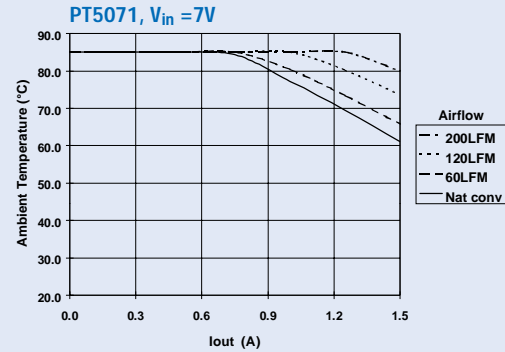Ground = output disabled

Specifications

Characteristics (Ta = 25°C unless noted)	Symbols	Conditions	PT5071 Min	PT5071 Typ	PT5071 Max	Units
Output Current	I_o	Over V_{in} Range	0.1 (1)	—	1.5	A
Current Limit	I_{lim}	V_{in} = 12V	—	4.0		A
Input Voltage Range	V_{in}	$0.1A \le I_o \le I_o max$	7.0	—	16.0	V
Output Voltage Tolerance	ΔV_o	V_{in}=12V, I_o =$I_o$max −40°C ≤ T_a ≤ +85°C		±1.0		%
Output Voltage Adjust Range	$V_o$adj		10	—	15	V
Line Regulation	Reg_{line}	Over V_{in} Range, I_o =$I_o$max	—	±0.5		%
Load Regulation	Reg_{load}	V_{in} =12V, $0.1 \le I_o \le I_o$max	—	±0.5		%
Vo Ripple/Noise	V_n	V_{in} =12V, I_o =$I_o$max	—	±2.0	±3.0	%
Transient Response with C_2 = 100µF	t_{tr} V_{os}	Load step from 50% to 100% $I_o$max, V_{in}=12V V_o over/undershoot	— —	200 1.0	— —	µSec %V_o
Efficiency	η	V_{in} =12V, V_o=12V, I_o =1.5A	—	83	—	%
Switching Frequency	f_o	Over V_{in} Range $0.1A \le I_o \le I_o$max	—	550	—	kHz
Absolute Maximum Operating Temperature Range	T_a	Over V_{in} range	−40 (2)	—	+85 (3)	°C
Storage Temperature	T_s	—	−40	—	+125	°C
Mechanical Shock		Per Mil-STD-883D, Method 2002.3 , 1 msec, Half Sine, mounted to a fixture	—	TBD	—	G's
Mechanical Vibration		Per Mil-STD-883D, Method 2007.2, 20-2000 Hz, Soldered in a PC board	—	TBD	—	G's
Weight	—	—	—	25	—	grams

Notes: *1. The regulator will operate down to no load with reduced specifications.*
2. For operating temperatures below 0°C, it is recommended that tantalum capacitors be used at both the input and output.
3. See SOA curves, or contact the factory for derating guidelines.

Input/Output Capacitors: *The PT5071 regulator requires a 100µF electrolytic capacitor at the input and output for proper operation in all applications. The ESR (equivalent series resistance) of both capacitors must be less than 250mΩ @100kHz. In addition, C_1 and C_2 must be rated to a minimum of 300mArms ripple current.*

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PT5071 Performance, V_o =12V (See Note A)

Efficiency vs Output Current

V_{IN}
7.0V
12.0V
16.0V

Ripple vs Output Current

V_{IN}
7.0V
12.0V
16.0V

Power Dissipation vs Output Current

V_{IN}
16.0V
12.0V
7.0V

Safe Operating Area Curves (See Note B)

PT5071, V_{in} =7V

Airflow
200LFM
120LFM
60LFM
Nat conv

PT5071, V_{in} =12V

Airflow
200LFM
120LFM
60LFM
Nat conv

PT5071, V_{in} =16V

Airflow
200LFM
120LFM
60LFM
Nat conv

Note A: *All Characteristic data in the above graphs 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)	Samples (Requires Login)
PT5071A	LIFEBUY	SIP MODULE	EMF	14	10	Pb-Free (RoHS)	Call TI	N / A for Pkg Type	
PT5071N	OBSOLETE	SIP MODULE	EME	14		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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