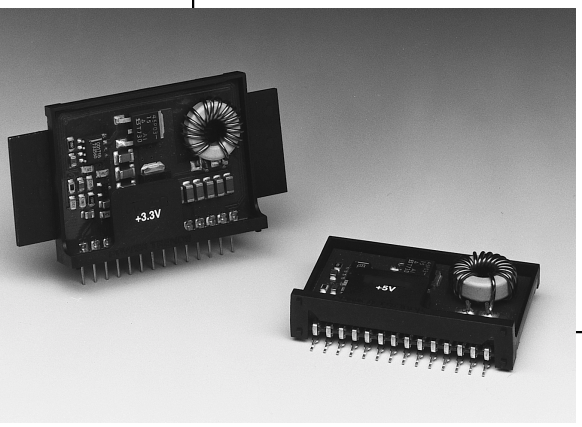
PT6610 Series

SLTS124
(Revised 1/21/2000)

9 AMP 5V STEP-DOWN INTEGRATED SWITCHING REGULATOR



- Single Device 9A Output
- Input Voltage Range: 4.5V to 6.0V
- Adjustable Output Voltage
- 90% Efficiency
- Remote Sense Capability
- Standby Function
- Over-Temperature Protection

The PT6610 series is a high performance +5V family of 14-Pin SIP (Single In-line Package) Integrated Switching Regulators (ISRs), designed for stand alone operation in applications requiring as much as 9A of output current.

Only two external capacitors are required for proper operation. Please note that this product does not include short circuit protection.

Pin-Out Information

Pin	Function
1	Remote Sense
2	Do not connect
3	STBY*-Standby
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

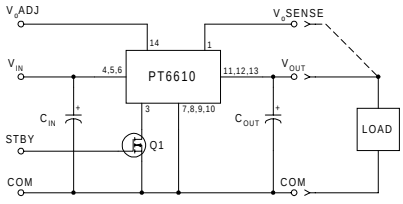
Ordering Information

PT6611☐ = +3.3 Volts
PT6613☐ = +2.5 Volts

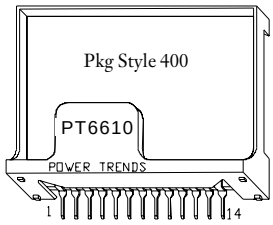
PT Series Suffix (PT1234X)

Case/Pin Configuration	*Heat Spreader*	*Heat Spreader with Side Tabs*
Vertical Through-Hole	P	R
Horizontal Through-Hole	D	G
Horizontal Surface Mount	E	B

Standard Application



C_1 = Required 330µF electrolytic (1)
C_2 = Required 330µF electrolytic (1)
Q_1 = NFET-or Open Collector Gate



Note: Back surface of product is conducting metal.

Specifications

Characteristics (T_a = 25°C unless noted)	Symbols	Conditions		PT6610 SERIES Min	Typ	Max	Units
Output Current	I_o	T_a = 60°C, 200 LFM, pkg P T_a = 25°C, natural convection		0.1 (2) 0.1 (2)	— —	9.0 7.0	A A
Input Voltage Range	V_{in}	0.1A ≤ I_o ≤ 9.0A	V_o= +2.5/3.3V	4.5	—	6.0	
Output Voltage Tolerance	ΔV_o	V_{in} = +5V, I_o = 9.0A T_a = 0°C to 65°C		V_o-0.1	—	V_o+0.1	V
Output Voltage Adjust Range	V_{oadj}	Pin 14 to V_o or ground V_{in}min=+4.5V or V_o+1.2V (whichever is greater)	V_o= +3.3V V_o= +2.5V	2.25 1.80	— —	4.20 3.50	V
Line Regulation	Reg_{line}	4.5V ≤ V_{in} ≤ 6.0V, I_o = 9.0A 4.5V ≤ V_{in} ≤ 6.0V, I_o = 9.0A	V_o= +3.3V V_o= +2.5V	— —	±7 ±7	±17 ±13	mV
Load Regulation	Reg_{load}	V_{in} = +5V, 0.1 ≤ I_o ≤ 9.0A	V_o= +3.3V V_o= +2.5V	— —	±17 ±13	±33 ±25	mV
V_o Ripple/Noise	V_n	V_{in} = 5V, I_o = 9.0A		—	50	—	mVpp
Transient Response with C_2 = 330µF	t_{tr} V_{os}	I_o step between 4.0A and 9.0A V_o over/undershoot		— —	100 150	— —	µSec mV
Efficiency	η	V_{in} = +5V, I_o = 3.0A	V_o = +3.3V V_o = +2.5V	— —	90 88	— —	%
		V_{in} = +5V, I_o = 9.0A	V_o = +3.3V V_o = +2.5V	— —	86 83	— —	%
Switching Frequency	f_o	4.5V ≤ V_{in} ≤ 6.0V 0.1A ≤ I_o ≤ 9.0A		475	600	725	kHz
Absolute Maximum Operating Temperature Range	T_a	Free Air Convection (40-60 LFM) Over V_{in} and I_o ranges with heat tab		–40 (3)	—	+85 (4)	°C
Thermal Resistance	θ_{ja}	Free Air Convection (40-60 LFM)		—	25	—	°C/W
Storage Temperature	T_s	—		-40	—	+125	°C

Continued

Specifications *(Continued)*

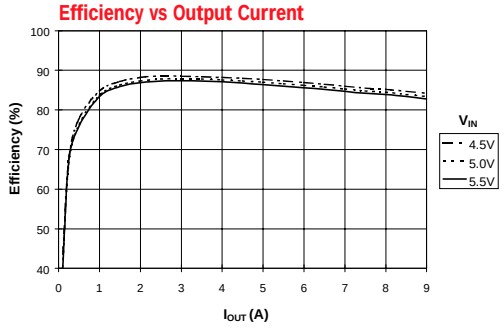
Characteristics (T_a = 25°C unless noted)	Symbols	Conditions	PT6610 SERIES Min	Typ	Max	Units
Mechanical Shock	—	Per Mil-STD-883D, Method 2002.3	—	500	—	G's
Mechanical Vibration	—	Per Mil-STD-883D, Method 2007.2, 20-2000 Hz, soldered in a PC board	—	7.5	—	G's
Weight	—	—	—	14	—	grams

Notes: *(1) The PT6610 Series requires two 330µF electrolytic capacitors (input and output) for proper operation in all applications. The input capacitance must be rated for a minimum of 1.1Arms of ripple current. See the application note, PT6500/6600 Series Capacitor Recommendations.*
(2) ISR will operate down to no load with reduced specifications.
(3) For operation below 0°C, use tantalum capacitors for C_{IN} and C_{OUT}.
(4) See Safe Operating Curves, or contact the factory for the appropriate derating.

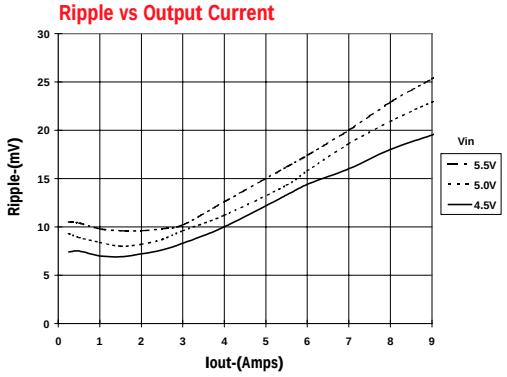
CHARACTERISTIC DATA

PT6613, 2.5 VDC (See Note A)

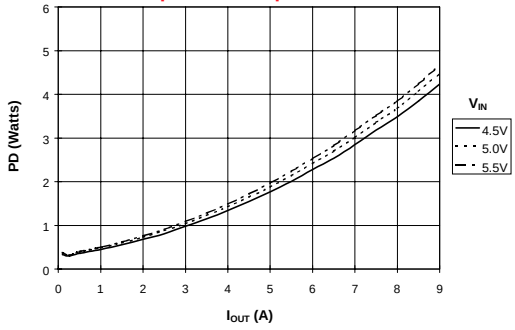
Efficiency vs Output Current



Ripple vs Output Current

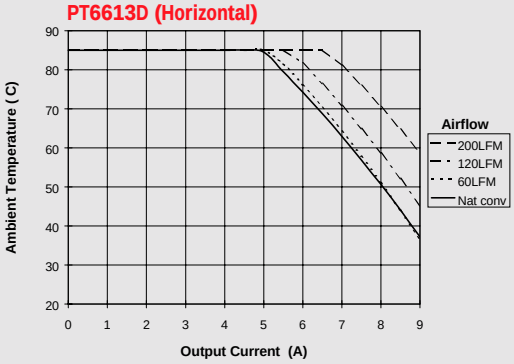


Power Dissipation vs Output Current



Safe Operating Area Curves (V_{in}=+5.0V) (See Note B)

PT6613D (Horizontal)



Note A: *All data listed 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.*

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Clocks and Timers	www.ti.com/clocks	Digital Control	www.ti.com/digitalcontrol
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Telephony	www.ti.com/telephony
RF/IF and ZigBee® Solutions	www.ti.com/lprf	Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265