

Using The PT6520 Series To Replace PT6500 Series Parts In Existing Designs

Overview

The PT6520 series of integrated switching regulators share many similarities with the PT6500 series. This allows a PT6520 series product to be used as a replacement for a PT6500 part in most applications. The PT6520 and PT6500 series share the same single in-line package (SIP) outline, the same pin-out, and have a similar rating and electrical performance. PT6520 series also has improved efficiency, lower power dissipation, and lower inrush current. Table 1 provides a convenient cross reference between the PT6500 series part numbers and the equivalent PT6520 series part. However, there are some functional and performance differences that should be reviewed prior to a PT6520 part being specified as a replacement in any existing design.

Table 1 PT6500 / PT6520 Series Equivalent Parts

PT6500 Series	Output VDC	PT6520 Series
PT6501	3.3 V	PT6521
PT6502	1.5 V	PT6522
PT6503	2.5 V	PT6523
PT6504	3.6 V	PT6521 *
PT6505	1.2 V	PT6527
PT6506	1.8 V	PT6526

* Requires a 17.4-kW trim resistor. Consult the PT6520 series data sheet for further information.

The following details some of the differences between the PT6520 and PT6500 series. These should be used to assess a circuit's compatibility with a PT6520 alternative part. Compatibility should then be further verified with appropriate board-level testing.

Mechanical/Package Outline

The PT6520 and PT6500 series of parts share the same package outline drawing, pin functions and footprint. One minor difference with the PT6520 series is a metal heat spreader that is affixed to the underside of the module's printed circuit board (PCB). The heat spreader is electrically conductive and makes contact with the host PCB when horizontal versions of the package are used. Any PCB traces or 'vias' routed underneath the package could be shorted by the heat spreader. The heat spreader is electrically isolated from the module's internal nodes, so contact with copper areas referenced to ground should be safe.

The use of insulating tape, such as 0.0028-in thick polyimide film, may be an option to protect signal traces.

Electrical Characteristics

Although functionally similar, there are a few differences in the electrical characteristics between the PT6520 and PT6500 series that must be evaluated to ensure compliance with the system operating requirements.

Input Voltage Range: The maximum input voltage of the PT6520 series is slightly lower than that of the PT6500. The respective input voltage ranges are:

PT6500	*3.1 V to 6 V
PT6520	*3.1 V to 5.5 V

* The minimum input voltage is output voltage dependent.

Output voltage adjustment. The output voltage adjustment pin of the PT6520 will require a different value of resistor to adjust the output to a specific voltage. The adjustment range of the PT6520 series is also limited compared to the equivalent PT6500 part. This is not an issue if the application circuit does not use the adjust feature.

On/Off Standby: The Standby input of the PT6520 series is compatible with both the logic polarity and thresholds of PT6500 series. One exception is the internal pull-up voltage, which is appreciably higher on the PT6520 parts. The open-circuit voltage for the PT6520 series is about 12.8 V versus about 1 V for the PT6500 series. This should not be a problem if the Standby input is controlled with an open-drain transistor with a sufficient max-V_{ds} rating. However the voltage may exceed the absolute maximum rating for the output of a logic gate.

Switching Frequency: The switch-conversion frequency of the PT6520 series is more tightly controlled, but generally lower than the PT6500. For example:

PT6500	600 kHz ±125 kHz.
PT6520	350 kHz ± 50 kHz.

This may affect applications that process video and radio frequency signals. Any input/output EMC filtering may also be impacted.

Over-Current & Over-Temperature Protection: To protect against short circuits and load impedance faults, the PT6500 employs a constant output current limit combined with over-temperature shutdown. The PT6500 will feed a limited steady-state current into a fault. When limiting output current, the PT6500 exhibits higher power dissipation, which increases the module's operating temperature. When its internal temperature rises above the over-temperature threshold, the module will shut itself down for a few seconds. The module will continue to periodically shut down until the fault is removed.

In contrast the PT6520 series does not incorporate over-temperature protection, and its over-current protection mechanism is very different. If the output current increases above a certain value, the output voltage is momentarily turned off. Once off the module immediately attempts to recover by executing a soft-start power up. The module continues a rapid succession of shutdowns and restarts until the load fault is removed. During this period both the average output current and power dissipation are significantly lower than under normal operation.

Power-Up Characteristic: Following the application of a valid input source, the PT6520 series modules exhibit a longer time delay and slower output rise than the equivalent PT6500 series part. The PT6520 series has a soft-start power-up feature, which significantly lowers its in-rush current.

Figure 1 and Figure 2 show the power-up characteristics of the PT6501 and PT6521 respectively. Both modules have a 3.3-V regulated output. Note that the PT6501 achieves full output voltage within 5ms, whereas the PT6521 takes in excess of 30 ms to reach full regulation voltage.

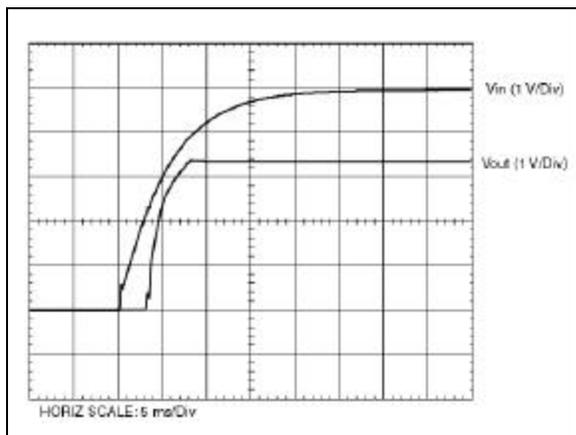


Figure 1 PT6501 Power-Up Characteristic

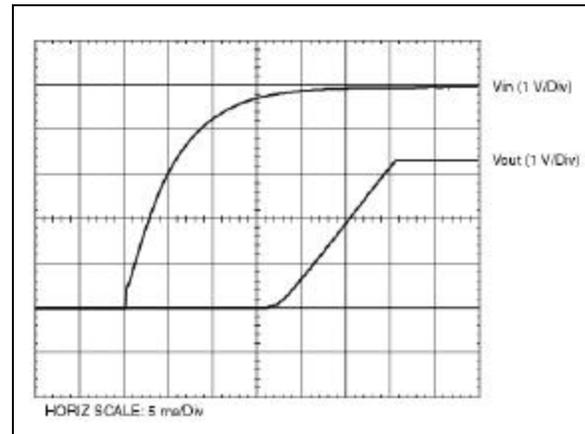


Figure 2 PT6521 Power-Up Characteristic

Conclusion

From both a packaging and electrical performance standpoint the PT6520 series is a viable replacement for a PT6500 part in most applications. In many aspects the PT6520 series exhibits improved performance over the PT6500. The performance and functional differences described should help customers both realize and work through any compatibility issues. This should ensure the viability of using a PT6520 series equivalent part as a replacement in a specific application. For additional information and questions call Texas Instrument's product information center and request application assistance for Plug-in Power products.

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 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.

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.

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
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
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
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

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