TPS6507x Device Comparison

Christian Hoefling *PMP-DC/DC Power Mgmt Units*

ABSTRACT

This application report presents an overview of the differences among the TPS65070, TPS65072, TPS65073, TPS650731, and TPS650732 power management integrated circuits (IC). It can assist design engineers in selecting the most suitable IC for their applications.

Contents

List of Tables

1 TPS6507x Family Members

Table 1. TPS6507x Family Members

Device	TPS65070	TPS65072	TPS65073	TPS650731	TPS650732
Output Voltage DCDC1	3.3 V	3.3 V	1.8 V	1.8 V	1.8 V
Max Output Current DCDC1	600 mA	600 mA	600 mA	600 mA	600 mA
Output Voltage DCDC2	1.8 V / 3.3 V	1.8 V / 2.5 V Adjustable via I2C (see Table 3)	1.2 V / 1.8 V Adjustable via I2C (see Table 3)	1.2 V / 1.8 V Adjustable via I2C (see Table 3)	1.2 V / 1.8 V Adjustable via I2C (see Table 3)
Max Output Current DCDC2	1500 mA	600 mA	600 mA	600 mA	600 mA
Output Voltage DCDC3	1 V / 1.2 V Adjustable via I2C (see Table 3)	1.2 V / 1.4 V Adjustable via I2C (see Table 3)	1.2 V / 1.35 V Adjustable via I2C (see Table 3)	1.2 V / 1.35 V Adjustable via I2C (see Table 3)	1 V / 1.35 V Adjustable via I2C (see Table 3)
Max Output Current DCDC3	1500 mA	600 mA	1500 mA	1500 mA	1500 mA
Default Output Voltage LDO1	1.8 V Adjustable via I2C (see Table 2)	1.2 V Adjustable via I2C (see Table 2)	1.8 V Adjustable via I2C (see Table 2)	1.2 V Adjustable via I2C (see Table 2)	1.2 V Adjustable via I2C (see Table 2)
Max Output Current LDO1	200 mA	200 mA	200 mA	200 mA	200 mA
Default Output Voltage LDO2	1.2 V Adjustable via I2C (see Table 3)	1.2 V Adjustable via I2C (see Table 3)	1.8 V Adjustable via I2C (see Table 3)	1.8 V Adjustable via I2C (see Table 3)	1.8 V Adjustable via I2C (see Table 3)
Max Output Current LDO2	200 mA	200 mA	200 mA	200 mA	200 mA
PGOOD, $\overline{\text{RESET}}$ delay	400 ms	20 ms	400 ms	400 ms	400 ms
Touch Screen Interface	Yes	No	Yes	Yes	Yes

2 TPS6507x Feature Explanation

2.1 DCDC1 Output Voltage

The TPS6507x family supports a different default output voltages on DCDC1. The TPS65070 and TPS65072 have a default output voltage of 3.3 V. The TPS65073, TPS650731, and TPS650732 have a default output voltage of 1.8 V. After start-up, the output voltage of DCDC1 can be adjusted via I2C Interface. The output voltage for DCDC1 can be adjusted in the register 0x10h. See Table 1 for voltage settings.

2.2 DCDC2 Output Voltage

The TPS6507x family supports different default output voltages on DCDC2. Two different output voltages can be selected with the DEFDCDC2 pin. A low level on DEFDCDC2 selects the lower output voltage; a high level on DEFDCDC2 selects the higher default output voltage. The TPS65070 and TPS650732 provide default output voltages of 1.8 V / 3.3 V. TPS65073 and TPS650731 have default output voltages of 1.2 V / 1.8 V. The TPS65072 has a default output voltages of 1.8 V / 2.5 V. See Table 1 for available output voltages.

After start-up, the output voltage of DCDC2 can be adjusted via I2C interface. The lower default output voltage for DCDC2 is set in the user register 0x11h. The higher default output voltage for DCDC2 is set in the user register 0x12h.

2.3 DCDC3 Output Voltage

The TPS6507x family supports different default output voltages on DCDC3. Two different output voltages can be selected with the DEFDCDC3 pin. A low level on DEFDCDC3 selects the lower output voltage; a high level on DEFDCDC3 selects the higher default output voltage. The TPS65073, TPS650731, and TPS650732 provide default output voltages of 1.2 V / 1.35 V. TPS65072 has default output voltages of 1.2 V / 1.4 V. The TPS65070 has a default output voltages of 1 V / 1.2 V.

After start-up, the output voltage of DCDC3 can be adjusted via I2C interface. The lower default output voltage for DCDC3 is set in the user register 0x13h. The higher default output voltage for DCDC3 is set in the user register 0x14h.

2.4 DCDC1 Output Current

All devices of the TPS6507x family supply a load current of up to 600 mA on DCDC1.

2.5 DCDC2 Output Current

The TPS65070 provides a load current of up to 1500 mA on DCDC2, whereas all other devices provide load currents of up to 600 mA on DCDC2.

2.6 DCDC3 Output Current

The TPS65072 provides a load current of up to 600 mA on DCDC3, whereas all other devices provide load currents of up to 1500 mA on DCDC3.

2.7 LDO1 Output Voltage

The TPS65072 has a default output voltage of 1.2 V on LDO1. All other parts of the TPS6507x family have a default output voltage of 1.8 V on LDO1.

After start-up, the output voltage of LDO1 can be changed via I2C interface. The output voltage of LDO1 is set in the user register 0x16h. See Table 2 for available output voltages.

Table 2. Available Output Voltages

LDO1[3]	LDO1[2]	LDO1[1]	LDO1[0]	LDO1 OUTPUT VOLTAGE
0	0	0	0	1.0 V
0	0	0	1	1.1 V
0	0	1	0	1.2 V
0	0	1	1	1.25 V
0	1	0	0	1.3 V
0	1	0	1	1.35 V
0	1	1	0	1.4 V
0	1	1	1	1.5 V
1	0	0	0	1.6 V
1	0	0	1	1.8 V
1	0	1	0	2.5 V
1	0	1	1	2.75 V
1	1	0	0	2.8 V
1	1	0	1	3.0 V
1	1	1	0	3.1 V
1	1	1	1	3.3 V

2.8 LDO2 Output Voltage

The TPS65070 and TPS65072 have a default output voltage of 1.2 V on LDO2. All other parts of the TPS6507x family have a default output voltage of 1.8 V on LDO2.

After start-up, the output voltage of LDO2 can be changed via I2C interface. The output voltage of LDO2 is set in the user register 0x17h. See Table 3 for available output voltages.

Table 3. DCDC1, DCDC2, DCDC3, and LDO2 Output Voltages

OUTPUT VOLTAGE [V]	B5	B4	B3	B2	B1	B0
0.725	0	0	0	0	0	0
0.750	0	0	0	0	0	1
0.775	0	0	0	0	1	0
0.800	0	0	0	0	1	1
0.825	0	0	0	1	0	0
0.850	0	0	0	1	0	1
0.875	0	0	0	1	1	0
0.900	0	0	0	1	1	1
0.925	0	0	1	0	0	0
0.950	0	0	1	0	0	1
0.975	0	0	1	0	1	0
1.000	0	0	1	0	1	1
1.025	0	0	1	1	0	0
1.050	0	0	1	1	0	1
1.075	0	0	1	1	1	0
1.100	0	0	1	1	1	1
1.125	0	1	0	0	0	0
1.150	0	1	0	0	0	1
1.175	0	1	0	0	1	0
1.200	0	1	0	0	1	1
1.225	0	1	0	1	0	0
1.250	0	1	0	1	0	1
1.275	0	1	0	1	1	0
1.300	0	1	0	1	1	1
1.325	0	1	1	0	0	0
1.350	0	1	1	0	0	1
1.375	0	1	1	0	1	0
1.400	0	1	1	0	1	1
1.425	0	1	1	1	0	0
1.450	0	1	1	1	0	1
1.475	0	1	1	1	1	0
1.500	0	1	1	1	1	1
1.550	1	0	0	0	0	0
1.600	1	0	0	0	0	1
1.650	1	0	0	0	1	0
1.700	1	0	0	0	1	1
1.750	1	0	0	1	0	0
1.800	1	0	0	1	0	1
1.850	1	0	0	1	1	0
1.900	1	0	0	1	1	1
1.950	1	0	1	0	0	0

Table 3. DCDC1, DCDC2, DCDC3, and LDO2 Output Voltages (continued)

OUTPUT VOLTAGE [V]	B5	B4	B3	B2	B1	B0
2.000	1	0	1	0	0	1
2.050	1	0	1	0	1	0
2.100	1	0	1	0	1	1
2.150	1	0	1	1	0	0
2.200	1	0	1	1	0	1
2.250	1	0	1	1	1	0
2.300	1	0	1	1	1	1
2.350	1	1	0	0	0	0
2.400	1	1	0	0	0	1
2.450	1	1	0	0	1	0
2.500	1	1	0	0	1	1
2.550	1	1	0	1	0	0
2.600	1	1	0	1	0	1
2.650	1	1	0	1	1	0
2.700	1	1	0	1	1	1
2.750	1	1	1	0	0	0
2.800	1	1	1	0	0	1
2.850	1	1	1	0	1	0
2.900	1	1	1	0	1	1
3.000	1	1	1	1	0	0
3.100	1	1	1	1	0	1
3.200	1	1	1	1	1	0
3.300	1	1	1	1	1	1

2.9 LDO1 Output Current

The LDOs of all devices of the TPS6507x family supply a load current of up to 200 mA.

2.10 LDO2 Output Current

The LDOs of all devices of the TPS6507x family supply a load current of up to 200 mA.

2.11 EN_WLED

The EN_WLED pin is only available in the TPS65072. Pulling this pin high enables the white LED driver and the current sinks. The LED driver and current sinks can be enabled with the EN_WLED pin or the ENABLE SINK bit in the user register 0x18h. For all other devices of the TPS6507x family, the WLED driver can only be enabled by setting the ENABLE SINK bit in the user register 0x18h via I2C interface.

2.12 EN_EXTLDO

The EN_EXTLDO pin is only available in the TPS65072. This is a push-pull output to enable/disable an external LDO. This output is active high. This pin is set and reset during start-up / shutdown according to the automatic sequence.

The external LDO is used for the sequencing option DCDC_SQ[0,2]=111, LDO_SQ[0,2]=010, used for the Atlas4 processor and with sequencing option DCDC_SQ[0,2]=100, LDO_SQ[0,2]=111 used for the SiRFprima processor.

2.13 RESET Comparator

Most devices of the TPS6507x family integrate circuitry that can generate a RESET pulse for a processor. Input voltage of the comparator is sensed at an input called THRESHOLD. When the input voltage exceeds the threshold, the $\overline{\text{RESET}}$ output goes high after a delay time. The delay time is set in the user register 0x0Bh. The TPS65072 does not contain this feature.

2.14 Power-Up/Down Sequence

All parts of the TPS6507x family provide an automatic power-up sequence for the DC/DC converters and LDOs that meet the power requirements for different application processors. EN pins of converters that are part of the automatic sequence must be connected to GND. See Table 4 for details on the power-up sequence and supported processors. The power-down sequence is the reverse of the power-up sequence.

Table 4. TPS6507x Automatic Power-Up Sequence

Device	Supported Processor	Sequencing Code for the DC/DC Converters	Sequencing Code for the LDOs
TPS65070	OMAP-L138 (Freon)	011	001
		1) DCDC3 2) DCDC2 after DCDC3 PGOOD 3) DCDC1 not part of automatic sequence (controlled by EN_DCDC1 pin)	1) LDO1 and LDO2 after DCDC3 PGOOD
TPS65073	OMAP3503, OMAP3515 OMAP3525, OMAP3530	101	001
		No automatic sequence all converters controlled by their enable pins.	1) LDO1 and LDO2 after DCDC3 PGOOD
TPS650731	OMAP35xx	110	011
		1) DCDC1 2) DCDC2 when DCDC1 PGOOD 3) DCDC3 when DCDC2 PGOOD	1) LDO1 enabled 300 µs after DCDC1 PGOOD LDO2 disabled, LDO2 can be enabled by I2C
TPS650732	OMAP3505, OMAP3517	110	001
		1) DCDC1 2) DCDC2 when DCDC1 PGOOD 3) DCDC3 when DCDC2 PGOOD	1) LDO1 and LDO2 after DCDC3 PGOOD

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
DLP® Products	www.dlp.com	Communications and Telecom	www.ti.com/communications
DSP	dsp.ti.com	Computers and Peripherals	www.ti.com/computers
Clocks and Timers	www.ti.com/clocks	Consumer Electronics	www.ti.com/consumer-apps
Interface	interface.ti.com	Energy	www.ti.com/energy
Logic	logic.ti.com	Industrial	www.ti.com/industrial
Power Mgmt	power.ti.com	Medical	www.ti.com/medical
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Space, Avionics & Defense	www.ti.com/space-avionics-defense
RF/IF and ZigBee® Solutions	www.ti.com/lprf	Video and Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless-apps

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