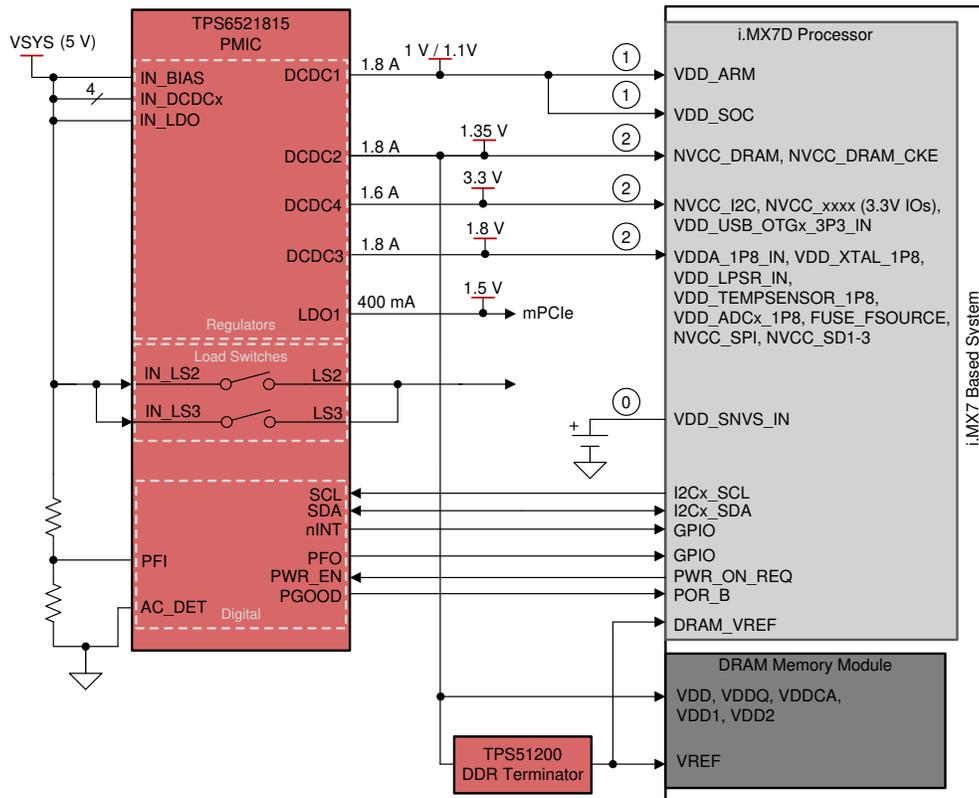


Powering the NXP i.MX 7 processor with the TPS6521815 PMIC



System Power Block Diagram



Can you change PMICs?

Using a multi-rail power management IC (PMIC) for an applications processor is common, but typically the vendor recommends the PMIC that should be used for each processor. Even if the suggested PMIC is not ideal for the needs of the processor, often the complexity makes it difficult to swap out the PMIC for another solution. The purpose of this tech note is to show that the TPS6521815 PMIC can provide power for the i.MX 7Solo and 7Dual processors.

Why the TPS6521815?

The TPS6521815 device has an input range from 2.7 to 5.5 V, making it appropriate for system-on-module applications powered from a 3.3-V or 5-V DC supply or a Li-Ion battery. The device has four step-down converters that provide the 1-V/1.1-V power rail required for the ARM® and SoC cores, the 1.2-V (or 1.5-V, 1.35-V) rail required for DDR3L (or DDR3, LPDDR3) memory, a 1.8-V rail required for the analog domain plus additional I/Os, and a 3.3-V rail required for VDD_SNVs and I/Os. A low-dropout (LDO) regulator provides 1.5-V for a peripheral IC (mPCle in

this design). Two load switches provide power for USB devices and other peripheral ICs. The TPS6521815 automatically sequences these rails in the correct power-up sequence for the i.MX 7Solo and 7Dual processors.

How do you make the switch?

The TPS6521815 output voltages and sequencing order are determined by an EEPROM-backed register map, which can be programmed using the [BOOSTXL-TPS65218](#) socketed booster pack. Samples of the TPS6521815RSLR can be programmed during the prototype phase of product development and soldered down on the [TPS65218EVM-100](#) or the prototype PCB of the final product to evaluate the performance of the PMIC. To order pre-programmed samples of the TPS6521815RSLR for the NXP i.MX 7Solo, 7Dual processor that match this tech note, [contact the programming services](#) organization at ARROW.

Table 1. i.MX 7Solo and 7Dual Power Requirements

TPS6521815				i.MX 7Solo, 7Dual		
POWER-UP SEQUENCE	POWER SUPPLY (OUTPUT)	OUTPUT CURRENT [mA]	OUTPUT VOLTAGE [V]	POWER SUPPLY (INPUT)	VOLTAGE RATING [V]	MAX CURRENT [mA]
1	DCDC1	1800	1.0 / 1.1	VDD_ARM, VDD_SOC	0.95 (min), 1.25 (max)	1500
2	DCDC2	1800	1.35 ⁽¹⁾	NVCC_DRAM, NVCC_DRAM_CKE	1.283 (min), 1.45 (max)	1000
2	DCDC3	1800	1.8	VDDA_1P8_IN, VDD_XTAL_1P8, VDD_LPSR_IN, VDD_TEMPESENSOR_1P8, VDDA_ADCx_1P8, FUSE_FSOURCE, NVCC_SPI, NVCC_SD1-3	1.8 V ± 5%	≈625 + peripheral ICs
2	DCDC4	1600	3.3	NVCC_I2C, NVCC_UART, NVCC_GPIO1-2, NVCC_SD1, NVCC_ENET1, NVCC_SAI, NVCC_LCD, NVCC_EPDC1-2, VDD_USB_OTGx_3P3_IN	3.3 V ± 9.09%	≈150 + peripheral ICs
2	LDO1	400	1.5	Peripheral IC (mPCIe)	–	250
0	–	–	–	VDD_SNVS_IN ⁽²⁾	2.4 (min), 3.6 (max)	1
N/A	LS2/LS3	1820	5	5-V peripheral ICs	–	>1000

⁽¹⁾ i.MX 7Solo/Dual also support DDR3 (1.5 V) and LPDDR3 (1.2 V) which would require re-programming DCDC2 to output a different voltage.

⁽²⁾ VDD_SNVS_IN supplied directly by coin cell battery in design, but this rail can also be powered DCDC4 in always-on applications without RTC. When VDD_SNVS is powered by DCDC4, this rail must turn on first in the power sequence.

Table 2. Adjacent Tech Notes

Processor	Title
i.MX 6Solo and 6DualLite	Powering the NXP i.MX 6Solo, 6DualLite with the TPS6521815 PMIC
i.MX 8M Mini	Powering the NXP i.MX 8M Mini with the TPS6521825 and LP873347 PMICs

References

Texas Instruments, [TPS6521815 User-Programmable Power Management IC \(PMIC\) With 6 DC/DC Converters, 1 LDO, and 3 Load Switches Data Sheet](#), Nov. 2019

Texas Instruments, [Integrated Power Supply Reference Design for NXP i.MX 7D Processor Design Guide](#), Dec. 2019

NXP Semiconductors, [i.MX 7Solo Family of Applications Processors Data Sheet \(IMX7SCEC\)](#), Rev. 6, 03/2019

NXP Semiconductors, [i.MX 7Dual Family of Applications Processors Data Sheet \(IMX7DCEC\)](#), Rev. 6, 03/2019

NXP Semiconductors, [i.MX 7DS Power Consumption Measurement Application Note \(AN5383\)](#), Rev. 0, 11/2016

0.1 Trademarks

ARM is a registered trademark of Arm Limited.

All other trademarks are the property of their respective owners.

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (March 2019) to A Revision	Page
• Updated part number from TPS65218D0 to TPS6521815	1
• Updated Block Diagram based on completed design	1
• Updated i.MX 7Solo and 7Dual Power Requirements Table based on completed design	2

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2022, Texas Instruments Incorporated