

# How to Use PMBus Power Solutions for NXP QorIQ Processors



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NXP QorIQ processors are high-performance 64-bit Arm® multicore processors for cloud networking and storage applications. Two of the high-end QorIQ variants are the LS2085A and LS2088A.

There are several power-supply rails required on an LS2085A/2088A board: the most important are the core rail and the SerDes logic and receiver rail. Using the PMBus interface eases the programming and monitoring of these high-current rails.

TI offers the [PMBus Voltage Regulator Reference Design for NXP QorIQ LS2085A/88A Processors](#), which fully meets LS2085A/88A tolerance specifications while requiring only 50% of the output capacitance necessary on NXP evaluation boards. The reference design consists of the [TPS53681](#) dual-output PMBus controller and TI's [CSD95490Q5MC](#) smart power stages, as shown in [Figure 1](#).

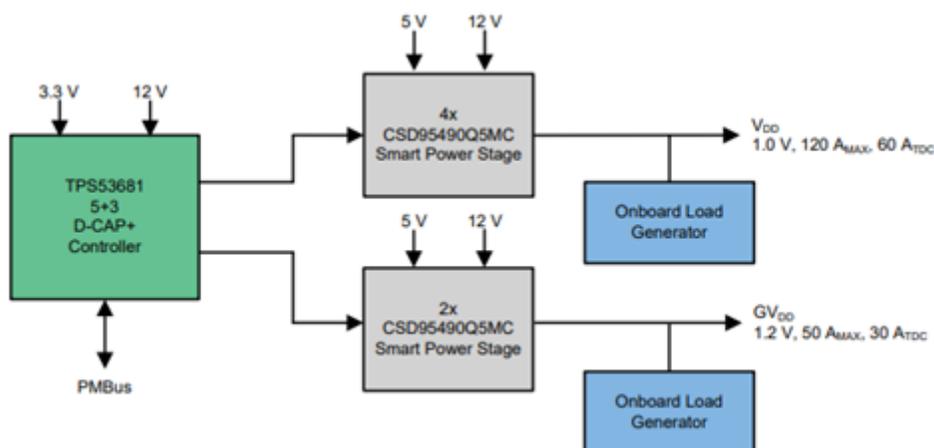
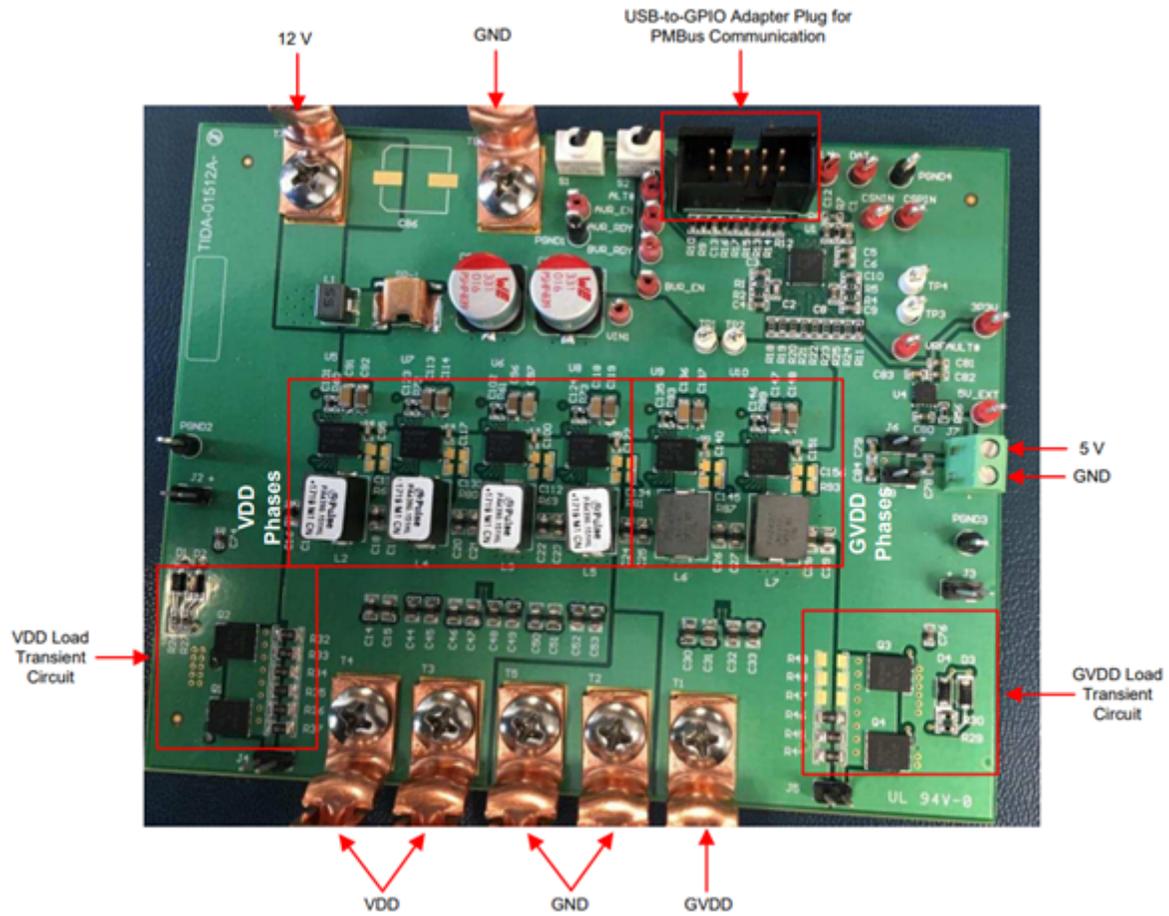


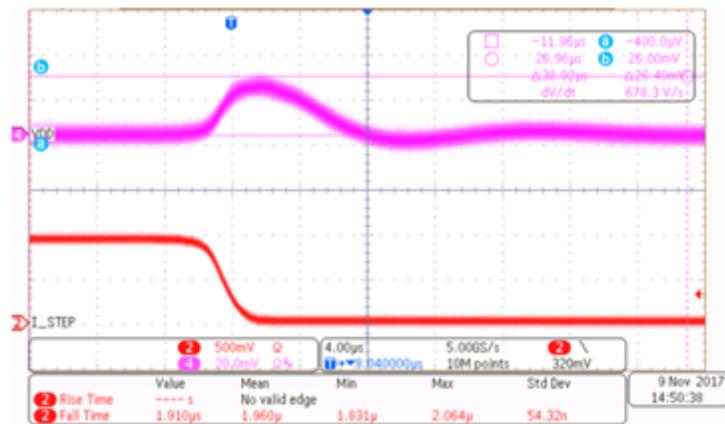
Figure 1. NXP LS2085A/88A QorIQ Power Design

TI fully tested this reference design, and the board includes onboard load-transient generator circuits to test load transients and thus measure the AC output-voltage tolerance. The reference design board has all of the connections for complete power-supply testing, as well as programming of the TPS53681 and monitoring of the two voltage rails through the PMBus interface using TI's [Fusion Digital Power™ Designer](#) ([Figure 2](#)).

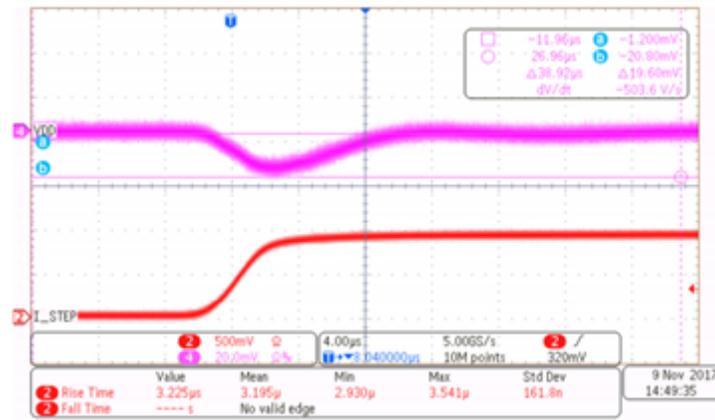


**Figure 2. NXP LS2085A88A QorIQ Power Design Evaluation Board**

Among the many tests are the important load-step and load-release transient tests, as shown in [Figure 3](#) and [Figure 4](#). In both cases, the reference design meets the NXP tolerance specifications.

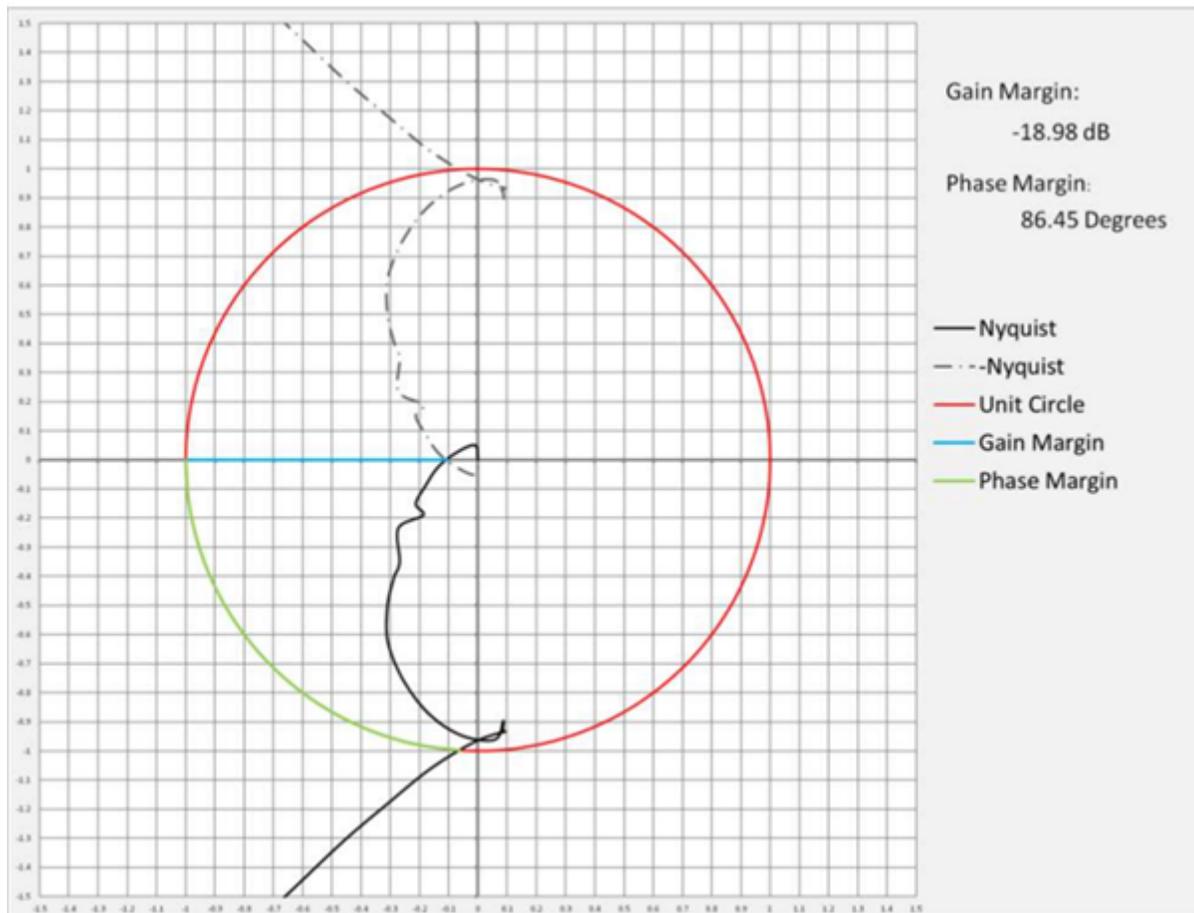


**Figure 3. NXP LS2085A88A QorIQ Load-step Test**



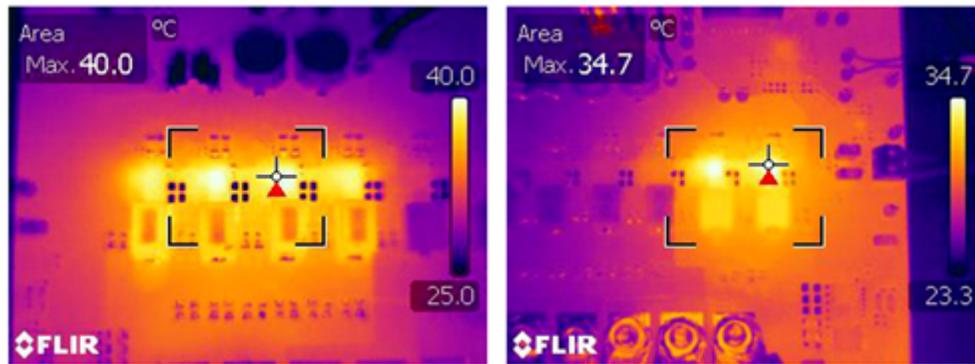
**Figure 4. NXP LS2085A88A QorIQ Load-release Test**

The design even includes a Nyquist plot on top of the Bode plot to prove design stability, as shown in [Figure 5](#). The Nyquist plot is stable if no encirclements (circle wrapping around) of the point  $(-1, 0)$  occur as the test frequency is swept during testing.



**Figure 5. NXP LS2085A88A QorIQ GDD Rail Nyquist Plot**

Finally, the design also offers thermal performance data of both VDD and GVDD power supplies, as shown in [Figure 6](#).



**Figure 6. VDD Rail Power-stage Temperatures, 60A Load (Left); GVDD Power-stage Temperatures, 30A Load (Right)**

NXP processors are now part of TI's [power for processors portal](#), which will be updated with TI power solutions and designs for additional NXP networking processors. So if you are designing with NXP QorIQ processors and don't know where to start, download the reference design now.

#### **Additional Resources**

- Read the blog post, [Power Tips: How to use Nyquist plots to assess system stability](#).
- Download the [LS2085A/88A QorIQ TI Design Guide](#).

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