AM3517/05 Power Reference Design 3.6-V to 6.3-V Input, High-Efficiency, Integrated 5-Output PMIC

This design was created to help those designers desiring an optimized and highly integrated power management solution for the AM3517 and AM3505 processors. Using a power management integrated circuit (PMIC) to power your processor can greatly reduce the number of components and overall size of your design.

1 Introduction

The input voltage range of these designs is 3.6 V to 6.3 V, which allows for operation using a dc, USB, or Li-ion battery input. The TPS650732 has three dc/dc step-down converters, two LDOs, battery charger, touch screen Interface, and a white LED boost converter.

The AM3505 and AM3517 processors can be operated with VDDSHV configured for 3.3-V operation as well as for 1.8-V operation. Depending on the user's design, different requirements (options) are available for power-up sequencing. See the AM3505 and AM3517 data manual for details.

This document proposes one power solution each for 3.3-V operation and for 1.8-V operation based on the TPS650732.

2 TPS650732-Based Design Features

• 3.6-V to 6.3-V Input Voltage Range
• Charger/Power Path Management:
  – 2-A Output Current on the Power Path
  – Linear Charger; 1.5-A Maximum Charge Current
  – 100-mA/500-mA/800-mA/1300-mA Current Limit From USB Input
  – Thermal Regulation, Safety Timers
  – Temperature Sense Input
• Three Step-Down Converters:
  – 2.25-MHz, Fixed-Frequency Operation for Small Component Size
  – Power Save Mode at Light Load Current
  – Typical 19 µA Quiescent per Converter
  – 100% Duty Cycle for Lowest Dropout
• Two LDOs (200-mA Output Current Each)
  – Fixed-Output Voltage
  – Dynamic Voltage Scaling on LDO2
  – 20-µA Quiescent Current
• WLED Boost Converter:
  – Internal Dimming Using I²C
  – Up to 2 x 10 LEDs
  – Up to 25 mA per String With Internal Current Sink
• I²C Interface
• 10-Bit A/D Converter
• Touch Screen Interface
3 Power Requirements

The power requirements for the AM3517/05 devices are listed in Table 1.

For more information and other reference designs, visit www.ti.com/processorpower.

Table 1. AM3517/05 Power Requirements

<table>
<thead>
<tr>
<th>Pin Name</th>
<th>Voltage (V)</th>
<th>Imax (mA)</th>
<th>Tolerance</th>
<th>Sequencing Order</th>
<th>Timing Delay</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core VDD_CORE</td>
<td>1.2</td>
<td>1500</td>
<td>±3%</td>
<td>4</td>
<td></td>
<td>24-mV ripple (pk-pk) at any frequency</td>
</tr>
<tr>
<td>VDDS</td>
<td>1.8</td>
<td>400</td>
<td>±5%</td>
<td>1</td>
<td></td>
<td>50-mV ripple (pk-pk)</td>
</tr>
<tr>
<td>VDSSHV</td>
<td>3.3 / 1.8</td>
<td>600</td>
<td>±5%</td>
<td>2</td>
<td></td>
<td>May be combined with VDDS if 1.8 V is used</td>
</tr>
<tr>
<td>VDD_SRAM_CORE_BG, VDD_SRAM_MPU, VDDOSC</td>
<td>1.8</td>
<td>200</td>
<td>±5%</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDD_DPLL_PER_CORE, VDD_DPLL_MPU_USBHOST</td>
<td>1.8</td>
<td>50</td>
<td>±5%</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDDA1P8V_USBPHY, VDDA_DAC</td>
<td>1.8</td>
<td>115</td>
<td>±5%</td>
<td>6</td>
<td></td>
<td>VDDA_DAC:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>● 0 - 100 kHz &lt; 30 mVp-p</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>● &gt; 100 kHz Decreases 20 dB/dec</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ex: at 1 MHz the max is 3 mVp-p.</td>
</tr>
<tr>
<td>VDDA3P3V_USBPHY</td>
<td>3.3</td>
<td>10</td>
<td>±5%</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) For 1.8-V operation, VDD18, VDD_SRAM_CORE_BG, VDD_SRAM_MPU, VDDOSC, and VDDSHV can be grouped and powered up together.
3.1 3.3-V Operation and Sequencing

www.ti.com  Power Requirements

Figure 1. Powering AM3505/17 Using TPS650732 DCDC2 Used for VDDSHV = 3.3 V
Figure 2. Timing With TPS650732 for AM3505/17 DCDC2 Used for VDDSHV = 3.3 V
3.2 1.8-V Operation and Sequencing

Figure 3. Powering AM3505/17 Using TPS650732 DCDC2 Used for VDDSHV = 1.8 V
Figure 4. Timing With TPS650732 for AM3505/17 DCDC2 Used for VDDSHV = 1.8 V
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