FAN53525
3.0A, 2.4MHz, Digitally Programmable TinyBuck® Regulator

Features
- Fixed-Frequency Operation: 2.4 MHz
- Best-in-Class Load Transient
- Continuous Output Current Capability: 3.0 A
- 2.5 V to 5.5 V Input Voltage Range
- Digitally Programmable Output Voltage:
  - 0.600 V to 1.39375 V in 6.25 mV Steps
- Programmable Slew Rate for Voltage Transitions
- I²C-Compatible Interface Up to 3.4 Mbps
- PFM Mode for High Efficiency in Light Load
- Quiescent Current in PFM Mode: 50 µA (Typical)
- Input Under-Voltage Lockout (UVLO)
- Thermal Shutdown and Overload Protection
- 15-Bump Wafer-Level Chip Scale Package (WLCSP)

Applications
- Application, Graphic, and DSP Processors
  - ARM™, Tegra™, OMAP™, NovaThor™, ARMADA™, Krait™, etc.
- Hard Disk Drives, LPDDR3
- Tablets, Netbooks, Ultra-Mobile PCs
- Smart Phones
- Gaming Devices

Description
The FAN53525 is a step-down switching voltage regulator that delivers a digitally programmable output from an input voltage supply of 2.5 V to 5.5 V. The output voltage is programmed through an I²C interface capable of operating up to 3.4 MHz.

Using a proprietary architecture with synchronous rectification, the FAN53525 is capable of delivering 3.0 A continuous at over 80% efficiency, maintaining that efficiency at load currents as low as 10 mA. The regulator operates at a nominal fixed frequency of 2.4 MHz, which reduces the value of the external components to 330 nH for the output inductor and as low as 20 µF for the output capacitor. Additional output capacitance can be added to improve regulation during load transients without affecting stability, allowing inductance up to 1.2 µH to be used.

At moderate and light loads, Pulse Frequency Modulation (PFM) is used to operate in Power-Save Mode with a typical quiescent current of 50 µA at room temperature. Even with such a low quiescent current, the part exhibits excellent transient response during large load swings. At higher loads, the system automatically switches to fixed-frequency control, operating at 2.4 MHz. In Shutdown Mode, the supply current drops below 1 µA, reducing power consumption. PFM Mode can be disabled if fixed frequency is desired. The FAN53525 is available in a 15-bump, 1.310 mm x 2.015 mm, 0.4 mm ball pitch WLCSP.

Figure 1. Typical Application

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Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Power-Up Defaults</th>
<th>DVS Range / Step Size</th>
<th>Max. RMS Current</th>
<th>Temperature Range</th>
<th>Package</th>
<th>Packing Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAN53525UC96X</td>
<td>VSEL0: 1.20</td>
<td>VSEL1: 1.225</td>
<td>0.600 V to 1.39375 V / 6.25 mV</td>
<td>3.0 A</td>
<td>-40 to 85°C</td>
<td>WLCSP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tape &amp; Reel</td>
</tr>
<tr>
<td>FAN53525UC48X</td>
<td>0.9</td>
<td>1.225</td>
<td>0.600 V to 1.39375 V / 6.25 mV</td>
<td>3.0 A</td>
<td>-40 to 85°C</td>
<td>WLCSP</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Tape &amp; Reel</td>
</tr>
</tbody>
</table>

Recommended External Components

Table 1. Recommended External Components for 3.0 A Maximum Load Current

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Vendor</th>
<th>Parameter</th>
<th>Typ.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>470 or 330 nH, 2016 Case Size</td>
<td></td>
<td>See Table 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COUT</td>
<td>22 μF, 6.3 V, X5R, 0603</td>
<td>C1608X5R0J226M (TDK)</td>
<td>C</td>
<td>22</td>
<td>μF</td>
</tr>
<tr>
<td>CIN</td>
<td>1 Piece; 4.7 μF, 10 V, X5R, 0603</td>
<td>C1608X5R1A475K(TDK)</td>
<td>C</td>
<td>4.7</td>
<td>μF</td>
</tr>
</tbody>
</table>

Table 2. Recommended Inductors

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Part#</th>
<th>L (nH)</th>
<th>DCR (mΩ Typ.)</th>
<th>I_{MAXDC}^{(1)}</th>
<th>L</th>
<th>W</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toko</td>
<td>DFR201612 C-R33N</td>
<td>330</td>
<td>23</td>
<td>4.2</td>
<td>2.0</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Toko</td>
<td>DFE201612 C-R47N</td>
<td>470</td>
<td>40</td>
<td>3.2</td>
<td>2.0</td>
<td>1.6</td>
<td>1.2</td>
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<tr>
<td>Cyntek</td>
<td>PIFE20161B-R47MS-39</td>
<td>470</td>
<td>30</td>
<td>3.1</td>
<td>2.0</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>SEMCO</td>
<td>CIGT201610UMR47MNE</td>
<td>470</td>
<td>30</td>
<td>4.0</td>
<td>2.0</td>
<td>1.6</td>
<td>0.9</td>
</tr>
<tr>
<td>SEMCO</td>
<td>CIGT201210UMR47MNE</td>
<td>470</td>
<td>33</td>
<td>3.0</td>
<td>2.0</td>
<td>1.2</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Note:
1. \( I_{MAXDC} \) is the lesser current to produce 40°C temperature rise or 30% inductance roll-off.
Physical Dimensions

![Diagram of the physical dimensions of the FAN53525 regulator](image)

**NOTES**

A. NO JEDEC REGISTRATION APPLIES.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCE PER ASME Y14.5 - 2009.
D. DATUM C IS DEFINED BY THE SPHERICAL CROWNS OF THE BALLS.
E. PACKAGE NOMINAL HEIGHT IS 586 ± 39 MICRONS (547-625 MICRONS).
F. FOR DIMENSIONS D,E,X, AND Y SEE PRODUCT DATASHEET.
G. DRAWING FILENAME: MKT-UC015AB Rev1

**Figure 39.** 15-Ball, Wafer-Level Chip-Scale Package (WLCSP), 3x5 Array, 0.4 mm Pitch, 250 µm Ball

**Product-Specific Dimensions**

<p>| | | | |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>E</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>2.015 ±0.03 mm</td>
<td>1.310 ±0.03 mm</td>
<td>0.255 mm</td>
<td>0.2075 mm</td>
</tr>
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</table>

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- RapidConfigure™
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- SuperFET™
- SuperSOT-3
- SuperSOT-6
- SuperSOT-8
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- SyncFET™
- Sync-Lock™
- TekPower™
- TinyBuck™
- TinyCalc™
- TinyLogic®
- TINYOPTO™
- TinyPower™
- TinyPWR™
- TinyWire™
- TransSIC™
- TriFault Detect™
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<th>Definition</th>
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