



# LIMITED DATASHEET

Email [mobilepower@fairchildsemi.com](mailto:mobilepower@fairchildsemi.com)  
to request the full datasheet.



## 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
- I<sup>2</sup>C-Compatible Interface Up to 3.4 Mbps
- PFM Mode for High Efficiency in Light Load
- Quiescent Current in PFM Mode: 50  $\mu$ A (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

All trademarks are the property of their respective owners.

### 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 I<sup>2</sup>C 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  $\mu$ F 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  $\mu$ H 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  $\mu$ A 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  $\mu$ A, 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.

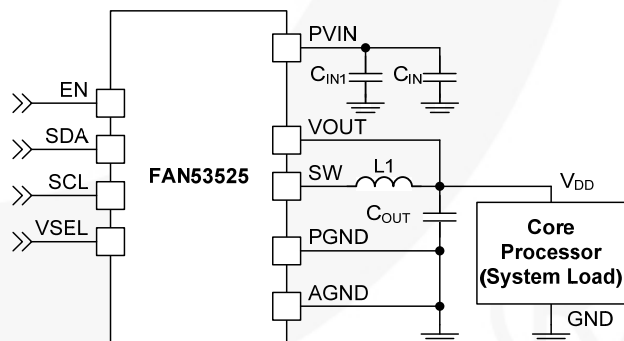


Figure 1. Typical Application

## Ordering Information

Part Number	Power-Up Defaults		DVS Range / Step Size	Max. RMS Current	Temperature Range	Package	Packing Method
	VSEL0	VSEL1					
FAN53525UC96X	1.20	1.225	0.600 V to 1.39375 V / 6.25 mV	3.0 A	-40 to 85°C	WLCSP	Tape & Reel
FAN53525UC48X	0.9	1.225	0.600 V to 1.39375 V / 6.25 mV	3.0 A	-40 to 85°C	WLCSP	Tape & Reel

## Recommended External Components

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

Component	Description	Vendor	Parameter	Typ.	Unit
L1	470 or 330 nH, 2016 Case Size	See Table 2			
C <sub>OUT</sub>	22 μF, 6.3 V, X5R, 0603	C1608X5R0J226M (TDK)	C	22	μF
C <sub>IN</sub>	1 Piece; 4.7 μF, 10 V, X5R, 0603	C1608X5R1A475K(TDK)	C	4.7	

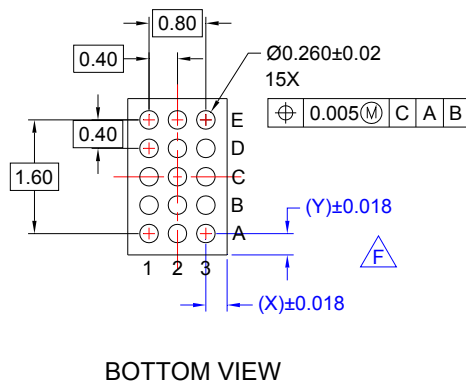
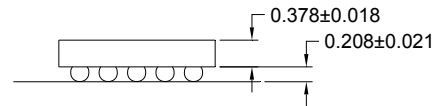
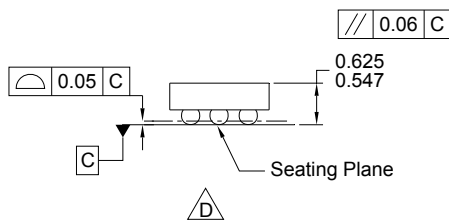
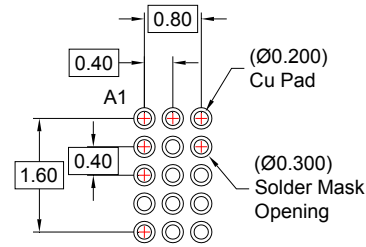
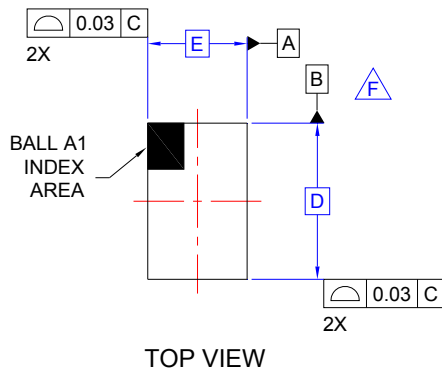
**Table 2. Recommended Inductors**

Manufacturer	Part#	L (nH)	DCR (mΩ Typ.)	I <sub>MAXDC</sub> <sup>(1)</sup>	Component Dimensions		
					L	W	H
Toko	DFR201612 C-R33N	330	23	4.2	2.0	1.6	1.2
Toko	DFE201612 C-R47N	470	40	3.2	2.0	1.6	1.2
Cyntek	PIFE20161B-R47MS-39	470	30	3.1	2.0	1.6	1.2
SEMCO	CIGT201610UMR47MNE	470	30	4.0	2.0	1.6	0.9
SEMCO	CIGT201210UMR47MNE	470	33	3.0	2.0	1.2	0.9

**Note:**

1. I<sub>MAXDC</sub> is the lesser current to produce 40°C temperature rise or 30% inductance roll-off.

## Physical Dimensions



### 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  $586 \pm 39$  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

D	E	X	Y
2.015 ±0.03 mm	1.310 ±0.03 mm	0.255 mm	0.2075 mm

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:  
<http://www.fairchildsemi.com/dwg/UC/UC015AB.pdf>



**TRADEMARKS**

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- |                          |  |                                       |                  |
|--------------------------|--|---------------------------------------|------------------|
| AccuPower™               | F-PFS™   |                                       |                  |
| AX-CAP®*                 | FRFET®   | PowerTrench®                          | TinyBoost®       |
| BitSiC™                  | Global Power Resource™                         | PowerXS™                              | TinyBuck®        |
| Build it Now™            | GreenBridge™                                   | Programmable Active Droop™            | TinyCalc™        |
| CorePLUS™                | Green FPS™                                     | QFET®                                 | TinyLogic®       |
| CorePOWER™               | Green FPS™ e-Series™                           | QS™                                   | TINYOPTO™        |
| CROSSVOLT™               | Gmax™  | Quiet Series™                         | TinyPower™       |
| CTL™                     | GTO™   | RapidConfigure™                       | TinyPVM™         |
| Current Transfer Logic™  | IntelliMAX™                                    |                                       | TinyWire™        |
| DEUXPEED®                | ISOPLANAR™                                     | Saving our world, 1mW/W/kW at a time™ | TranSiC™         |
| Dual Cool™               | Making Small Speakers Sound Louder and Better™ | SignalWise™                           | TriFault Detect™ |
| EcoSPARK®                | MegaBuck™                                      | SmartMax™                             | TRUECURRENT®*    |
| EfficientMax™            | MICROCOUPLER™                                  | SMART START™                          | μSerDes™         |
| ESBC™                    | MicroFET™                                      | Solutions for Your Success™           |                  |
|                          | MicroPak™                                      | SPM®                                  | UHC®             |
| Fairchild®               | MicroPak2™                                     | STEALTH™                              | Ultra FRFET™     |
| Fairchild Semiconductor® | MillerDrive™                                   | SuperFET®                             | UniFET™          |
| FACT Quiet Series™       | MotionMax™                                     | SuperSOT™-3                           | VCX™             |
| FACT®                    | mWSaver®                                       | SuperSOT™-6                           | VisualMax™       |
| FAST®                    | OptoHiT™                                       | SuperSOT™-8                           | VoltagePlus™     |
| FastvCore™               | OPTOLOGIC®                                     | SupreMOS®                             | XS™              |
| FETBench™                | OPTOPLANAR®                                    | SyncFET™                              | 仙童™              |
| FPS™                     |  | Sync-Lock™                            |                  |

\* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**ANTI-COUNTERFEITING POLICY**

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I68