Product/Process Change Notice - PCN 23_0190 Rev. -

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This notice is to inform you of a change that will be made to certain ADI products (see Appendix A) that you may have purchased in the last 2 years. **Any inquiries or requests with this PCN (additional data or samples) must be sent to ADI within 30 days of publication date.** ADI contact information is listed below.

PCN Title:	LTM4649 Data Sheet Revision
Publication Date:	18-Sep-2023
Effectivity Date:	18-Sep-2023 *(the earliest date that a customer could expect to receive changed material)*
Revision Description:	Initial Release

Description Of Change:

FSYNC changed from 250kHz-800kHz to 250kHz-750kHz.

Reason For Change:

The data sheet is being updated to accurately reflect device capabilities.

Impact of the change (positive or negative) on fit, form, function & reliability:

This change has no impact to form, fit, function, quality, or reliability. This is a data sheet change only with no change to product.

Summary of Supporting Information:

Changes are reflected in Product Data Sheet revision D

Supporting Documents

Attachment 1: Type: Datasheet Specification Comparison

ADI_PCN_23_0190_Rev_-_LTM4649 Data Sheet Specification Comparison.pdf...

Note: If applicable, the device material declaration will be updated due to material change.

ADI Contact Information:

For questions on this PCN, please send an email to the regional contacts below or contact your local ADI sales representatives.

Americas:	Europe:	Japan:	Rest of Asia:
PCN_Americas@analog.com	PCN_Europe@analog.com	PCN_Japan@analog.com	PCN_ROA@analog.com

Appendix A - Affected ADI Models:

Added Parts On This Revision - Product Family / Model Number (4)

LTM4649 / LTM4649EY#3MDPBF	LTM4649 / LTM4649EY#PBF	LTM4649 / LTM4649IY	LTM4649 / LTM4649IY#PBF

Appendix B - Revision History:			
Rev	**Publish Date**	**Effectivity Date**	**Rev Description**
Rev. -	18-Sep-2023	18-Sep-2023	Initial Release

ANALOG DEVICES

AHEAD OF WHAT'S POSSIBLE™

LTM4649 Data Sheet Revision

Data Sheet Specification Comparison LTM4649

LTM4649

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the specified internal operating temperature range, otherwise specifications are at T_A = 25°C (Note 2). V_{IN} = 12V per typical application.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
SR	Slew Rate	(Note 5)			2		V/µs
GBP	Gain Bandwidth Product	(Note 5)			3		MHz
CMRR	Common Mode Rejection	(Note 3)			60		dB
$I_{DIFFOUT}$	DIFFOUT Current	Sourcing		2			mA
R_{IN}	Input Resistance	DIFFP, DIFFN to GND			80		kΩ
V_{PGOOD}	PGOOD Trip Level	V_{FB} With Respect to Set Output V_{FB} Ramping Negative V_{FB} Ramping Positive			 –10 10		 % %
V_{PGL}	PGOOD Voltage Low	I_{PGOOD} = 2mA			0.1	0.3	V
$INTV_{CC}$ Linear Regulator							
V_{INTVCC}	Internal V_{CC} Voltage			4.8	5	5.2	V
V_{INTVCC} Load Reg	$INTV_{CC}$ Load Regulation	I_{CC} = 0mA to 50mA			0.9		%
Oscillator and Phase-Locked Loop							
f_{SYNC}	Frequency Sync Capture Range			250		750	kHz
f_S	Nominal Switching Frequency			400	450	500	kHz
R_{MODE}	MODE Input Resistance				250		kΩ
V_{IH_CLKIN}	Clock Input Level High			2.0			V
V_{IL_CLKIN}	Clock Input Level Low					0.8	V

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime. Notes are automatically numbered when you apply the note style.

Note 2: The LTM4649 is tested under pulsed load conditions such that $T_J \approx T_A$. The LTM4649E is guaranteed to meet performance specifications over the 0°C to 125°C internal operating temperature range. Specifications over the –40°C to 125°C internal operating temperature range are assured by design, characterization and correlation with statistical process controls. The LTM4649I is guaranteed to meet specifications over the –40°C to 125°C internal operating temperature range. Note that the maximum ambient temperature consistent with these specifications is determined by specific operating conditions in conjunction with board layout, the rated package thermal resistance and other environmental factors.

Note 3: 100% tested at wafer level.

Note 4: See output current derating curves for different V_{IN}, V_{OUT} and T_A.

Note 5: Guaranteed by design.

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OPERATION

Power Module Description

The LTM4649 is a high performance single output standalone nonisolated switching mode DC/DC power supply. It can provide up to 10A output current with few external input and output capacitors. This module provides precisely regulated output voltage programmable via an external resistor from 0.6VDC to 3.3VDC over a 4.5V to 16V input range. The typical application schematic is shown in Figure 17.

The LTM4649 has an integrated constant-frequency current mode regulator, power MOSFETs, inductor, and other supporting discrete components. The typical switching frequency is 450kHz. For switching noise-sensitive applications, it can be externally synchronized from 400kHz to ~~800~~kHz. See the Applications Information section.

750

With current mode control and internal feedback loop compensation, the LTM4649 module has sufficient stability margins and good transient performance with a wide range of output capacitors, especially with all ceramic output capacitors.

Current mode control provides cycle-by-cycle fast current limit in an overcurrent condition. An internal overvoltage monitor protects the output voltage in the event of an overvoltage >10%. The top MOSFET is turned off and the bottom MOSFET is turned on until the output is cleared.

Pulling the RUN pin below 1.1V forces the regulator into a shutdown state. The TRACK/SS pin is used for programming the output voltage ramp and voltage tracking during start-up. See the Application Information section.

The LTM4649 is internally compensated to be stable over all operating conditions. Table 3 provides a guideline for input and output capacitances for several operating conditions. LTpowerCAD™ is available for transient and stability analysis. The V_{FB} pin is used to program the output voltage with a single external resistor to ground.

A remote sense amplifier is provided in the LTM4649 for accurately sensing output voltages ≤3.3V at the load point.

Multiphase operation can be easily employed with the synchronization inputs using an external clock source. See application examples.

High efficiency at light loads can be accomplished with selectable Burst Mode operation using the MODE pin. These light load features will accommodate battery operation. Efficiency graphs are provided for light load operation in the Typical Performance Characteristics section.

A TEMP pin is provided to allow the internal device temperature to be monitored using an onboard diode connected PNP transistor. This diode connected PNP transistor is grounded in the module and can be used as a general temperature monitor using a device that is designed to monitor the single-ended connection.

The switching node pin is available for functional operation monitoring. A resistor-capacitor snubber circuit can be carefully placed from the switching node pin to ground to dampen any high frequency ringing on the transition edges. See the Applications Information section for details.

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APPLICATIONS INFORMATION

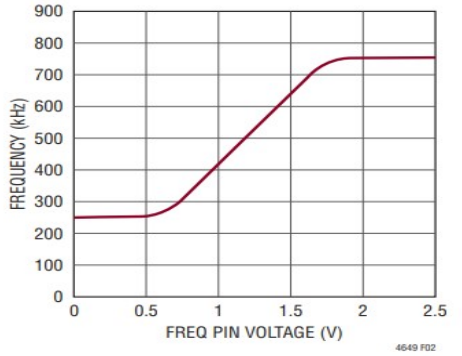

Figure 2. Operating Frequency vs FREQ Pin Voltage

PLL and Frequency Synchronization

The LTM4649 device operates over a range of frequencies to improve power conversion efficiency. The nominal switching frequency is 450kHz. It can also be synchronized from 400kHz to 750kHz with an input clock that has a high level above 2V and a low level below 0.8V at the CLKIN pin. Once the LTM4649 is synchronizing to an external clock frequency, it will always be running in Forced Continuous operation. Although synchronization to 250kHz is possible, 400kHz is the lowest recommended operating frequency to limit inductor ripple current.

Multiphase Operation

For outputs that demand more than 10A of load current, multiple LTM4649 devices can be paralleled to provide more output current and reduced input and output voltage ripple.

The CLKOUT signal together with CLKIN pin can be used to cascade additional power stages to achieve a multiphase power supply solution. Tying the PHMODE pin to $INTV_{CC}$, GND, or leaving it floating generates a phase difference (between CLKIN and CLKOUT) of 180°, 120°, or 90° respectively as shown in Table 2. A total of 4 phases can be cascaded to run simultaneously with respect to each other by programming the PHMODE pin of each LTM4649 channel to different levels. Figure 3 shows a 3-phase design and 4-phase design example for clock phasing with the PHMODE table.

Table 2. PHMODE and CLKOUT Signal Relationship

PHMODE	GND	FLOAT	$INTV_{CC}$
CLKOUT	120°	90°	180°

The LTM4649 device is an inherently current mode controlled device, so parallel modules will have good current sharing. This will balance the thermals in the design. Tie the COMP, V_{FB}, TRACK/SS and RUN pins of each LTM4649 together to share the current evenly. Figures 19 and 20 each show a schematic of a parallel design.

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