



1.4MHz, Single Cell DC/DC Converter in 5-Lead SOT-23

December 1998

FEATURES

- Uses Tiny Capacitors and Inductor
- Internally Compensated
- Fixed Frequency 1.4MHz Operation
- Operates with V_{IN} as Low as 1V
- 3V at 30mA from a Single Cell
- 5V at 200mA from 3.3V Input
- 15V at 60mA from Four Alkaline Cells
- High Output Voltage: Up to 34V
- Low Shutdown Current: $<1\mu A$
- Low V_{CESAT} Switch: 300mV at 300mA
- 5-Lead SOT-23 Package

APPLICATIONS

- Digital Cameras
- Pagers
- Cordless Phones
- Battery Backup
- LCD Bias
- Medical Diagnostic Equipment
- Local 5V or 12V Supply
- External Modems
- PC Cards

DESCRIPTION

The LT[®]1613 is the industry's first 5-lead SOT-23 current mode DC/DC converter. Intended for small, low power applications, it operates from an input voltage as low as 1V and switches at 1.4MHz, allowing the use of tiny, low cost capacitors and inductors 2mm or less in height. Its small size and high switching frequency enables the complete DC/DC converter function to take up less than 0.2 square inches of PC board area. Multiple output power supplies can now use a separate regulator for each output voltage, replacing cumbersome quasi-regulated approaches using a single regulator and a custom transformer.

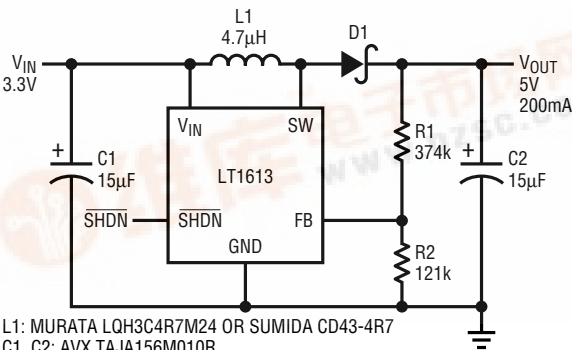
A constant frequency, internally compensated current mode PWM architecture results in low, predictable output noise that is easy to filter. The high voltage switch on the LT1613 is rated at 36V, making the device ideal for boost converters up to 34V as well as for Single-Ended Primary Inductance Converter (SEPIC) and flyback designs. The device can generate 5V at up to 200mA from a 3.3V supply or 5V at 200mA from four alkaline cells in a SEPIC design.

The LT1613 is available in the 5-lead SOT-23 package.

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TYPICAL APPLICATION

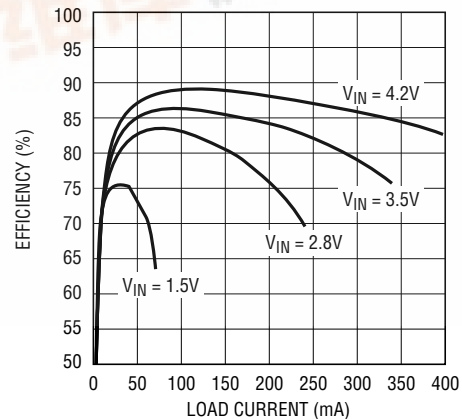
3.3V to 5V 200mA DC/DC Converter



L1: MURATA LQH3C4R7M24 OR SUMIDA CD43-4R7
C1, C2: AVX TAJA156M010R
D1: MBR0520

1613 TA01

Efficiency Curve



1613 TA01a



LT1613

ABSOLUTE MAXIMUM RATINGS

(Note 1)

V_{IN} Voltage	10V
SW Voltage	-0.4V to 36V
FB Voltage	$V_{IN} + 0.3V$
Current into FB Pin	$\pm 1mA$
SHDN Voltage	10V
Maximum Junction Temperature	125°C
Operating Temperature Range	
Commercial	0°C to 70°C
Extended Commercial (Note 2)	-40°C to 85°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

PACKAGE/ORDER INFORMATION

	ORDER PART NUMBER
	LT1613CS5
	S5 PART MARKING
	LTED

Consult factory for Industrial and Military grade parts.

ELECTRICAL CHARACTERISTICS

Commercial grade 0°C to 70°C, $V_{IN} = 1.5V$, $V_{SHDN} = V_{IN}$, $T_A = 25^\circ C$, unless otherwise noted. (Note 2)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Minimum Operating Voltage				0.9	1.1	V
Maximum Operating Voltage					10	V
Feedback Voltage		●	1.205	1.23	1.255	V
FB Pin Bias Current		●		27	80	nA
Quiescent Current	$V_{SHDN} = 1.5V$, Not Switching			3	4.5	mA
Quiescent Current in Shutdown	$V_{SHDN} = 0V$, $V_{IN} = 2V$			0	0.5	μA
	$V_{SHDN} = 0V$, $V_{IN} = 5V$			0	1.0	μA
Reference Line Regulation	$1.5V \leq V_{IN} \leq 10V$			0.02	0.2	%/V
Switching Frequency		●	1.0	1.4	1.8	MHz
Maximum Duty Cycle		●	82	86		%
Switch Current Limit	(Note 3)		550	800		mA
Switch V_{CESAT}	$I_{SW} = 300mA$			300	350	mV
Switch Leakage Current	$V_{SW} = 5V$			0.01	1	μA
SHDN Input Voltage High			1			V
SHDN Input Voltage Low					0.3	V
SHDN Pin Bias Current	$V_{SHDN} = 3V$			25	50	μA
	$V_{SHDN} = 0V$			0	0.1	μA

The ● denotes specifications which apply over the full specified temperature range.

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: The LT1613C is guaranteed to meet specified performance from 0°C to 70°C and is designed, characterized and expected to meet these extended temperature limits, but is not tested at -40°C and 85°C. Guaranteed I grade parts are available, consult factory.

Note 3: Current limit guaranteed by design and/or correlation to static test.

PIN FUNCTIONS

SW (Pin 1): Switch Pin. Connect inductor/diode here. Minimize trace area at this pin to keep EMI down.

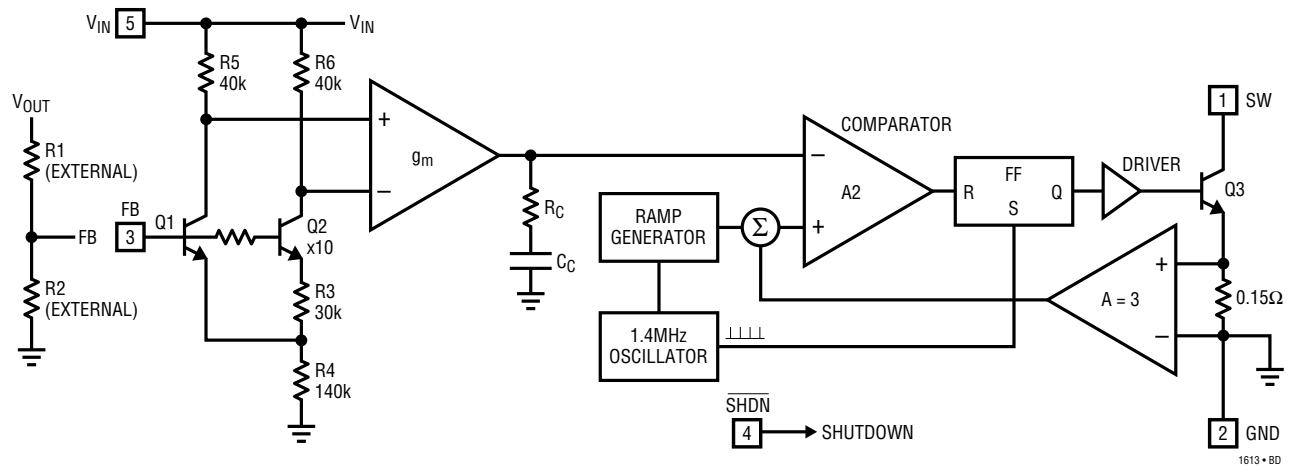
GND (Pin 2): Ground. Tie directly to local ground plane.

FB (Pin 3): Feedback Pin. Reference voltage is 1.23V. Connect resistive divider tap here. Minimize trace area at FB. Set V_{OUT} according to $V_{OUT} = 1.23V(1 + R1/R2)$.

SHDN (Pin 4): Shutdown Pin. Tie to 1V or more to enable device. Ground to shut down.

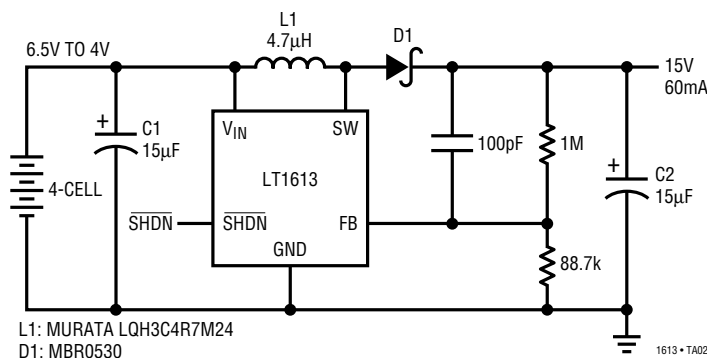
V_{IN} (Pin 5): Input Supply Pin. Must be locally bypassed.

BLOCK DIAGRAM



TYPICAL APPLICATIONS

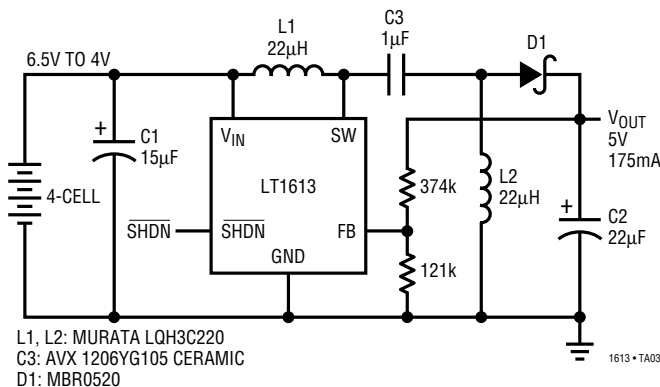
4-Cell to 15V 60mA DC/DC Converter



LT1613

TYPICAL APPLICATIONS

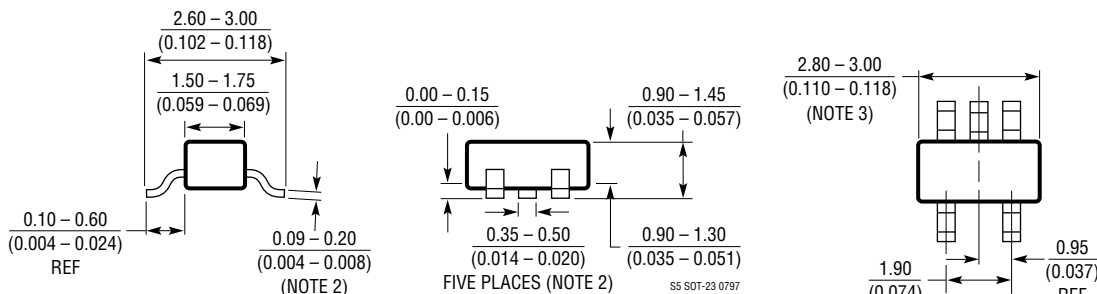
4-Cell to 5V SEPIC DC/DC Converter



PACKAGE DESCRIPTION

Dimensions in inches (millimeters) unless otherwise noted.

S5 Package 5-Lead Plastic SOT-23 (LTC DWG # 05-08-1633)



- NOTE:
1. DIMENSIONS ARE IN MILLIMETERS
 2. DIMENSIONS ARE INCLUSIVE OF PLATING
 3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH AND METAL BURR
 4. MOLD FLASH SHALL NOT EXCEED 0.254mm
 5. PACKAGE EIAJ REFERENCE IS SC-74A (EIAJ)

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1307	Single Cell Micropower DC/DC	3.3V/75mA From 1V; 600kHz Fixed Frequency
LT1317	2-Cell Micropower DC/DC	3.3V/200mA From Two Cells; 600kHz Fixed Frequency
LT1316	Burst Mode™ Operation DC/DC with Programmable Current Limit	1.5V Minimum V_{IN} ; Precise Control of Peak Switch Current
LT1474	Low Quiescent Current, High Efficiency Step-Down Converter	94% Efficiency, 10µA I_Q , 9V to 5V at 250µA
LT1521	300mA Low Dropout Regulator with Micropower Quiescent Current and Shutdown	500mV Dropout, 300mA Output Current, 12µA I_Q
LTC1517-5	Micropower, Regulated Charge Pump	3-Cells to 5V at 20mA, SOT-23 Package, 6µA I_Q
LT1610	1.7MHz Single Cell Micropower DC/DC Converter	30µA I_Q , MSOP Package, Internal Compensation
LT1611	Inverting 1.4MHz Switching Regulator	5V to -5V at 150mA, Low Output Noise

Burst Mode is a trademark of Linear Technology Corporation.