LT1610

1.7MHz, Single Cell Micropower DC/DC Converter

July 1998

FEATURES

- **Uses Tiny Capacitors and Inductor**
- **Internally Compensated**
- **Low Quiescent Current: 30μA**
- Operates with V_{IN} as Low as 1V
- 3V at 30mA from a Single Cell
- 5V at 200mA from 3.3V
- Output Voltage: Up to 28V
- Low Shutdown Current: <1μA
- Automatic Burst Mode™ Switching at Light Load
- Low V_{CESAT} Switch: 300mV at 300mA
- 8-Lead MSOP and SO Packages

APPLICATIONS

- Pagers
- Cordless Phones
- Battery Backup
- LCD Bias
- Portable Electronic Equipment

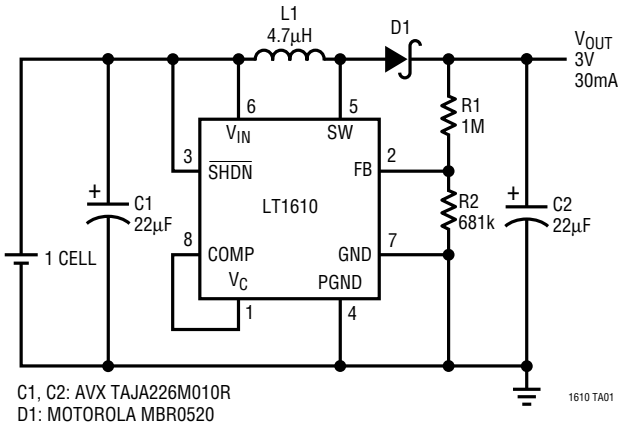
DESCRIPTION

The LT®1610 is a micropower fixed frequency DC/DC converter that operates from an input voltage as low as 1V. Intended for small, low power applications, it switches at 1.7MHz, allowing the use of tiny capacitors and inductors. The device can generate 3V at 30mA from a single cell (1V) supply. An internal compensation network can be connected to the LT1610 V_C pin, eliminating two components. No-load quiescent current of the LT1610 is 30μA and the internal NPN power switch handles a 300mA current with a voltage drop of 300mV.

The LT1610 is available in 8-lead MSOP and SO packages.

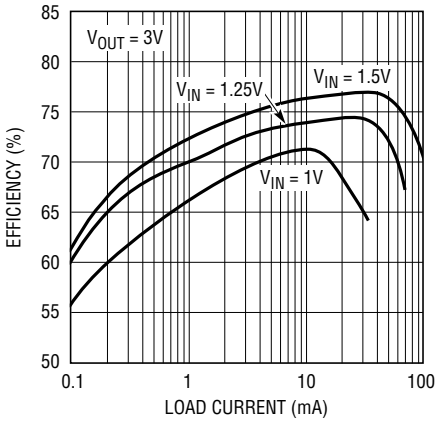
TYPICAL APPLICATION

1-Cell to 3V Step-Up Converter



C1, C2: AVX TAJA226M010R
D1: MOTOROLA MBR0520
L1: MURATA LQH1C4R7

Efficiency

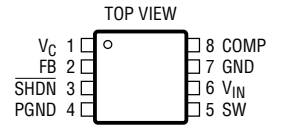


ABSOLUTE MAXIMUM RATINGS

V_{IN} Voltage 8V
SW Voltage ..... –0.4V to 30V
FB Voltage ..... V_{IN} + 0.3V
V_C Voltage 2V
COMP Voltage 2V
Current into FB Pin ..... ±1mA
$\overline{SHDN}$ Voltage 8V
Maximum Junction Temperature ..... 125°C
Operating Temperature Range
  Commercial ..... 0°C to 70°C
  Extended Commercial (Note 1) ..... –40°C to 85°C
Storage Temperature Range ..... –65°C to 150°C
Lead Temperature (Soldering, 10 sec) ..... 300°C

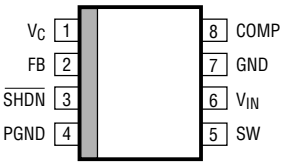
Consult factory for Industrial and Military grade parts.

PACKAGE/ORDER INFORMATION



MS8 PACKAGE
8-LEAD PLASTIC MSOP
T_{JMAX} = 125°C, θ_{JA} = 160°C/W

ORDER PART NUMBER
LT1610CMS8
MS8 PART MARKING
LTDT



S8 PACKAGE
8-LEAD PLASTIC SO
T_{JMAX} = 125°C, θ_{JA} = 120°C/W

ORDER PART NUMBER
LT1610CS8
S8 PART MARKING
1610

ELECTRICAL CHARACTERISTICS

Commercial grade 0°C to 70°C, V_{IN} = 1.5V, $V_{\overline{SHDN}} = V_{IN}$, T_A = 25°C unless otherwise noted. (Note 1)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Minimum Operating Voltage				0.9	1	V
Maximum Operating Voltage					8	V
Feedback Voltage		●	1.20	1.23	1.26	V
Quiescent Current	$V_{\overline{SHDN}}$ = 1.5V, Not Switching			30	60	µA
Quiescent Current in Shutdown	$V_{\overline{SHDN}}$ = 0V, V_{IN} = 2V $V_{\overline{SHDN}}$ = 0V, V_{IN} = 5V			0 0	0.5 1.0	µA µA
FB Pin Bias Current		●		27	60	nA
Reference Line Regulation	1V ≤ V_{IN} ≤ 2V (25°C, 0°C) 1V ≤ V_{IN} ≤ 2V (70°C) 2V ≤ V_{IN} ≤ 8V (25°C, 0°C) 2V ≤ V_{IN} ≤ 8V (70°C)			0.6 0.1 	1 2 0.3 0.4	%/V %/V %/V %/V
Error Amp Transconductance	ΔI = 2µA			40		µmhos
Error Amp Voltage Gain				100		V/V
Switching Frequency		●	1.4	1.7	2	MHz
Maximum Duty Cycle		 ●	77 75	80	95 95	% %
Switch Current Limit	(Note 2)		450	600	900	mA
Switch V_{CESAT}	I_{SW} = 300mA	 ●		300	350 400	mV mV
Switch Leakage Current	V_{SW} = 5V			0.01	1	µA
$\overline{SHDN}$ Input Voltage High			1			V
$\overline{SHDN}$ Input Voltage Low					0.3	V
$\overline{SHDN}$ Pin Bias Current	$V_{\overline{SHDN}}$ = 3V $V_{\overline{SHDN}}$ = 0V			10 0	 0.1	µA µA

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

Note 1: C grade device specifications are guaranteed over the 0°C to 70°C temperature range. In addition, C grade device specifications are assured over the –40°C to 85°C temperature range by design or correlation, but are not production tested.

Note 2: Current limit guaranteed by design and/or correlation to static test. Current limit is affected by duty cycle due to ramp generator. See Block Diagram.

PIN FUNCTIONS

V_C (Pin 1): Error Amplifier Output. Frequency compensation network must be connected to this pin, either internal (COMP pin) or external series RC to ground. 100kΩ/200pF typical value.

FB (Pin 2): 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).

$\overline{\text{SHDN}}$ (Pin 3): Shutdown. Ground this pin to turn off device. Tie to 1V or more to enable.

PGND (Pin 4): Power Ground. Tie directly to local ground plane.

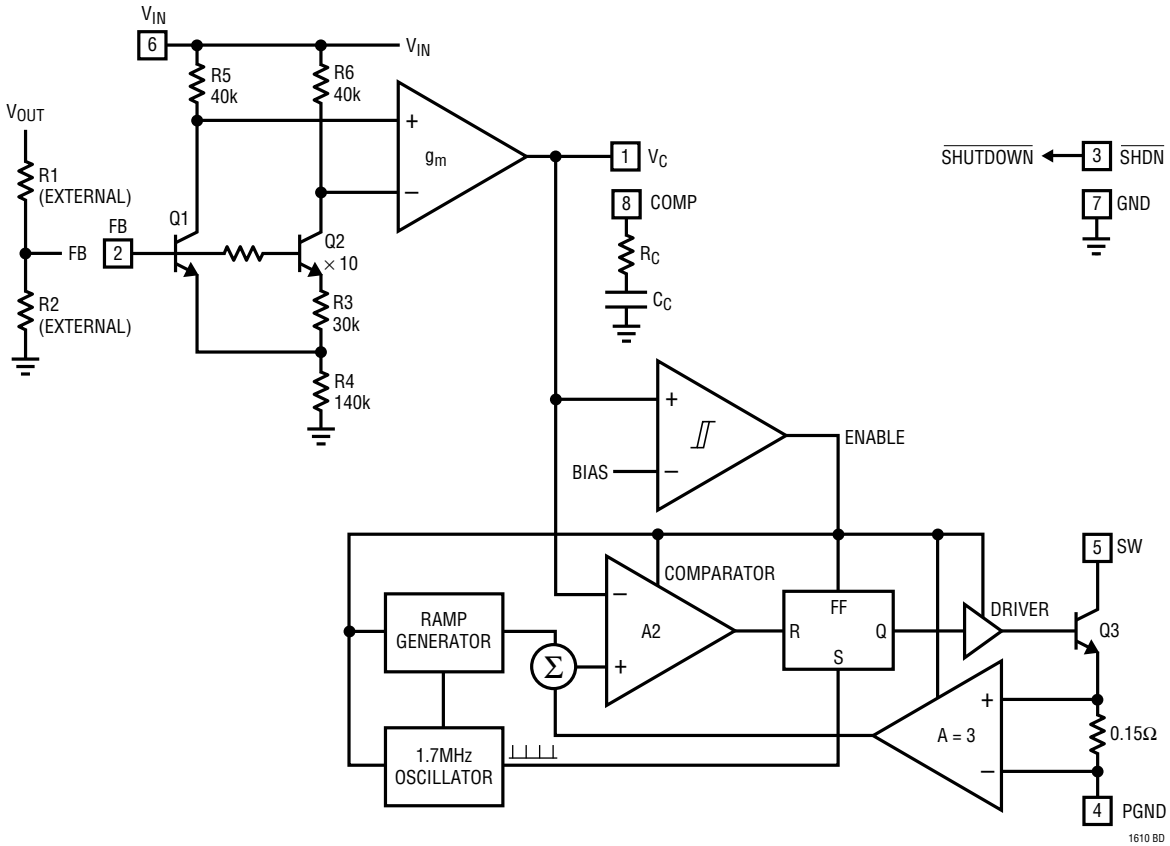
SW (Pin 5): Switch Pin. Connect inductor/diode here. Minimize trace area at this pin to keep EMI down.

V_{IN} (Pin 6): Input Supply Pin. Must be locally bypassed.

GND (Pin 7): Signal Ground. Carries all device ground current except switch current. Tie to local ground plane.

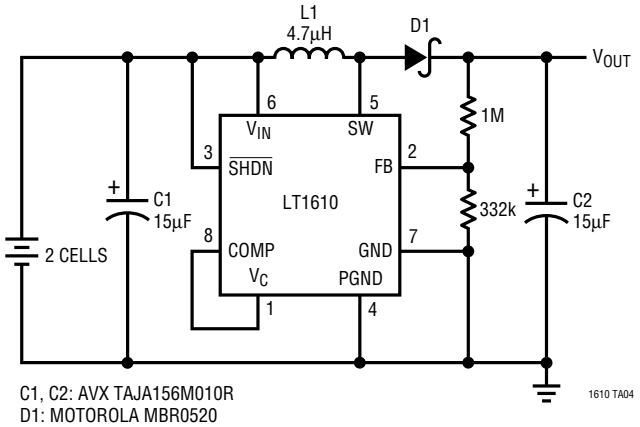
COMP (Pin 8): Internal Compensation Network. Tie to V_C pin, or let float if external compensation is used. Output capacitor must be tantalum if COMP pin is used for compensation.

BLOCK DIAGRAM



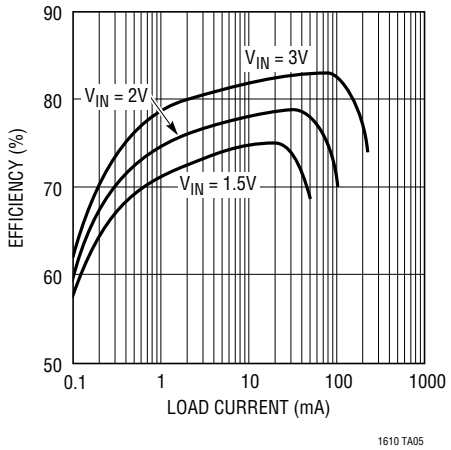
TYPICAL APPLICATIONS

2-Cell to 5V Converter

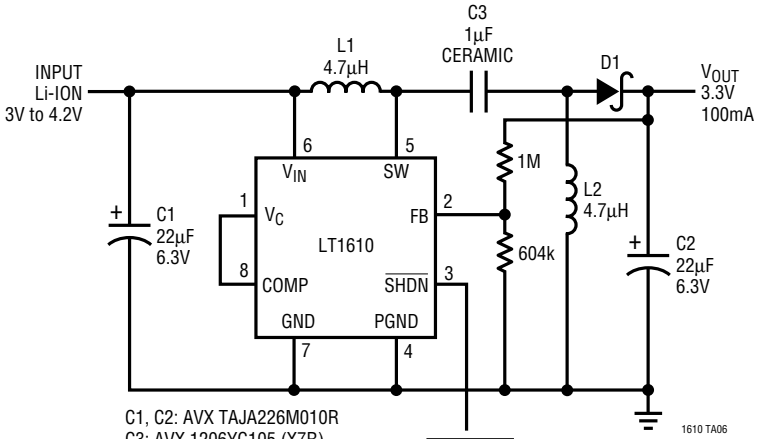


C1, C2: AVX TAJA156M010R
D1: MOTOROLA MBR0520
L1: SUMIDA CD43-4R7
MURATA LQH1C4R7

Efficiency



Li-Ion to 3.3V SEPIC DC/DC Converter



C1, C2: AVX TAJA226M010R
C3: AVX 1206YC105 (X7R)
D1: MOTOROLA MBR0520
L1, L2: MURATA LQH3C4R7M24

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LTC®1163	Triple High Side Driver for 2-Cell Inputs	1.8V Minimum Input, Drives N-Channel MOSFETs
LTC1474	Micropower Step-Down DC/DC Converter	94% Efficiency, 10µA I_Q, 9V to 5V at 250mA
LT1302	High Output Current Micropower DC/DC Converter	5V/600mA from 2V, 2A Internal Switch, 200µA I_Q
LT1304	2-Cell Micropower DC/DC Converter	Low-Battery Detector Active in Shutdown
LT1307	Single Cell Micropower 600kHz PWM DC/DC Converter	3.3V at 75mA from 1 Cell, MSOP Package
LTC1440/1/2	Ultralow Power Single/Dual Comparators with Reference	2.8µA I_Q, Adjustable Hysteresis
LTC1516	2-Cell to 5V Regulated Charge Pump	12µA I_Q, No Inductors, 5V at 50mA from 3V Input
LT1521	Micropower Low Dropout Linear Regulator	500mV Dropout, 300mA Current, 12µA I_Q

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