7.5A, 150kHz Switching Regulators

FEATURES

- Wide Input Voltage Range: 3.5V to 30V
- Low Quiescent Current: 7mA
- Internal 7.5A Switch
- Very Few External Parts Required
- Self-Protected Against Overloads
- Available in Standard and Surface Mount 5-Pin Packages
- Can Be Externally Synchronized (See LT1072 Data Sheet)

APPLICATIONS

- High Efficiency Boost Converter
- PC Power Supply with Multiple Outputs
- Battery Upconverter
- Negative-to-Positive Converter

USER NOTE:

This data sheet is only intended to provide specifications, graphs, and a general functional description of the LT1268B/LT1268. Application circuits are included to show the capability of the LT1268B/LT1268. A complete design manual (AN19) should be obtained to assist in developing new designs. This manual contains a comprehensive discussion of both the LT1070 and the external components used with it, as well as complete formulas for calculating the values of these components. The manual can also be used for the LT1268B/LT1268 factoring in the higher switch current rating and higher operating frequency.

DESCRIPTION

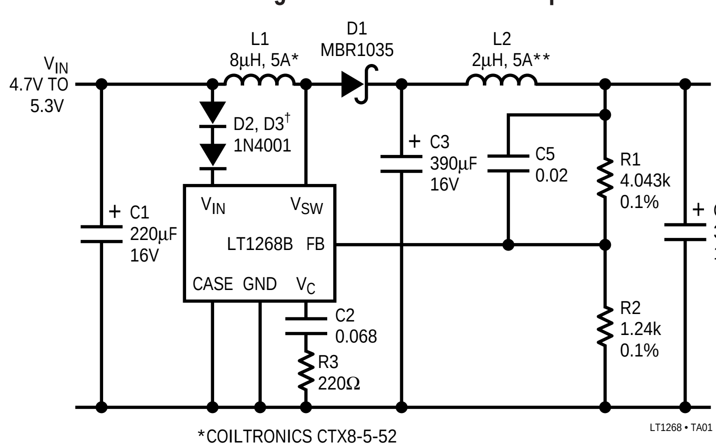
The LT1268B and LT1268 are monolithic high power switching regulators. Identical to the popular LT1070, except for switching frequency (150kHz) and higher switch current, they can be operated in all standard switching configurations including buck, boost, flyback, and inverting. A high current, high efficiency switch is included on the die along with all oscillator, control, and protection circuitry. Integration of all functions allows the LT1268 to be built in standard 5-pin power packages. This makes it extremely easy to use and provides "bust proof" operations similar to that obtained with 3-pin linear regulators.

The LT1268 operate with supply voltages from 3.5V to 30V and draw only 7mA quiescent current. By utilizing current mode switching techniques, it provides excellent AC and DC load and line regulation.

The LT1268 use an adaptive anti-sat switch drive to allow very wide ranging load currents with no loss in efficiency. An externally activated shutdown mode reduces total supply current to 100μA typical for standby operation.

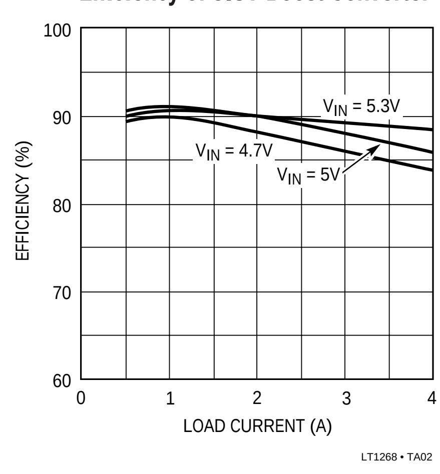
TYPICAL APPLICATION

Boost Regulator with 5.3V ±1% Output



*COILTRONICS CTX8-5-52
**COILTRONICS CTX2-5-52
†OPTIONAL. D2 AND D3 ARE USED TO INCREASE UNDERVOLTAGE LOCKOUT FROM 2.7V TO ≈4V.

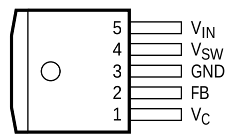
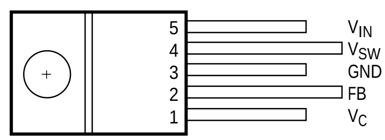
Efficiency of 5.3V Boost Converter



ABSOLUTE MAXIMUM RATINGS

Supply Voltage 30V
Switch Output Voltage 60V
Feedback Pin Voltage (Transient, 1ms) .... ±15V
Operating Junction Temperature Range
  Operating .... 0°C to 125°C
  Short-Circuit .... 0°C to 140°C
Storage Temperature Range .... –65°C to 150°C
Lead Temperature (Soldering, 10 sec) .... 300°C

PACKAGE/ORDER INFORMATION

	ORDER PART NUMBER
FRONT VIEW  Q PACKAGE 5-LEAD DD T_{JMAX} = 125°C, θ_{JC} = 2°C/W, θ_{JA} = See Notes 5 and 6	LT1268CQ LT1268BCQ
FRONT VIEW  T PACKAGE 5-LEAD TO-220 T_{JMAX} = 125°C, θ_{JC} = 2°C/W, θ_{JA} = 50°C/W	LT1268CT LT1268BCT

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ELECTRICAL CHARACTERISTICS

V_{IN} = 15V, V_C = 0.5V, V_{FB} = V_{REF}, switch pin open, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{REF}	Reference Voltage Measured at Feedback Pin (Note 4)	LT1268B	 ●	1.235 1.224	1.244 1.244	1.253 1.264	V V
	Reference Voltage	LT1268	 ●	1.224 1.214	1.244 1.244	1.264 1.274	V V
I_B	Feedback Input Current	V_{FB} = V_{REF}	 ●		350	750 1100	nA nA
g_m	Error Amplifier Transconductance	ΔI_C = ±25µA	 ●	3000 2400	4400	6000 7000	µmho µmho
	Error Amplifier Source or Sink Current	V_C = 1.5V	 ●	150 120	200	350 400	µA µA
	Error Amplifier Clamp Voltage	Hi Clamp, V_{FB} = 1V Lo Clamp, V_{FB} = 1.5V		1.80 0.25	 0.38	2.30 0.52	V V
	Reference Voltage Line Regulation	3V ≤ V_{IN} ≤ V_{MAX}, V_C = 0.8V	●			0.03	%/V
A_V	Error Amplifier Voltage Gain	0.9V ≤ V_C ≤ 1.4V		500	800		V/V
	Minimum Input Voltage		●		2.8	3.0	V
I_Q	Supply Current	3V ≤ V_{IN} ≤ V_{MAX}, V_C = 0.6V			7	10	mA
	Control Pin Threshold	Duty Cycle = 0	 ●	0.7 0.5	0.9	1.08 1.25	V V
BV	Output Switch Breakdown Voltage	3V ≤ V_{IN} ≤ V_{MAX}, I_{SW} = 1.5mA	●	60	75		V
V_{SAT}	Output Switch-ON Resistance (Note 1, 3)	T_J ≤ 100°C T_J ≤ 125°C			0.12	0.18 0.22	Ω Ω
	Control Voltage to Switch Current Transconductance				12		A/V
I_{LIM}	Switch Current Limit (Note 3, 6)	Duty Cycle = 50%, T_J ≤ 100°C Duty Cycle = 65%, T_J ≤ 100°C	● ●	7.50 6.50		15 14	A A

ELECTRICAL CHARACTERISTICS

V_{IN} = 15V, V_C = 0.5V, V_{FB} = V_{REF}, switch pin open, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
$\frac{\Delta I_{IN}}{\Delta I_{SW}}$	Supply Current Increase During Switch-ON Time				25	45	mA/A
f	Switching Frequency			120	150	180	kHz
			●	120		180	kHz
DC_{MAX}	Maximum Switch Duty Cycle			65	85	92	%
	Shutdown Mode Supply Current	$3V \le V_{IN} \le V_{MAX}$, V_C = 0.05V			100	500	μA
	Shutdown Mode Threshold Voltage	$3V \le V_{IN} \le V_{MAX}$		100	150	250	mV
			●	50		300	mV

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

Note 1: Measured with V_C in hi clamp, V_{FB} = 0.8V.

Note 2: For duty cycles (DC) between 50% and 65%, minimum guaranteed switch current is given by I_{LIM} = 6.25 (1.7 – DC).

Note 3: Minimum current limit is reduced by 0.5A at 125°C. 100°C test limits are guaranteed by correlation to 125°C tests.

Note 4: LT1268B reference voltage is specified at ±9mV to guarantee ±1% output voltage accuracy when 0.1% external resistors are used to set output voltage. To maintain output accuracy under load, load current should be taken from the case and the ground pin should be connected separately to output ground. See AN19 for details.

Note 5: The Q package is intended for surface mount without a separate heat sink. See graph for thermal resistance as a function of the mounting area. This curve assumes no other heat dissipators adjacent to package.

Note 6: Maximum switch current may be limited by package power dissipation, especially for the surface mount (Q) package. This package has a thermal resistance of 20°C/W to 50°C/W (see graph). The following formula will allow an estimate of maximum continuous switch current as a function of power loss and duty cycle. See AN19 for more details.

$$I_{MAX} = \sqrt{\frac{P}{R_{SW} \times DC}}$$

P = Power dissipation due to switch current

R_{SW} = Switch-ON resistance ≈ 0.15Ω

DC = Switch duty cycle

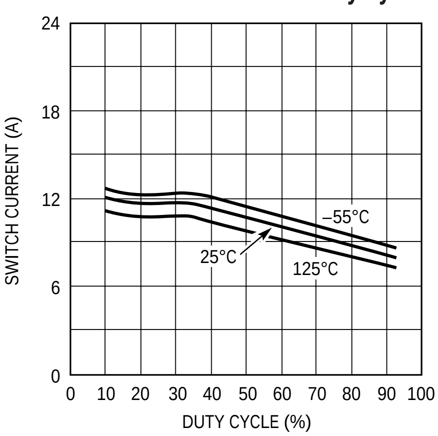
In a typical application where thermal resistance is 30°C/W, maximum power might be limited to 2W and power allocated to switch loss is 1.5W. For a duty cycle of 40%, this yields

$$I_{MAX} = \sqrt{\frac{1.5}{0.15 \times 0.4}} = 5A$$

Obviously, a combination of high thermal resistance and high duty cycle may restrict switch current to a value well below the 7.5A electrical limit.

TYPICAL PERFORMANCE CHARACTERISTICS

Switch Current Limit vs Duty Cycle



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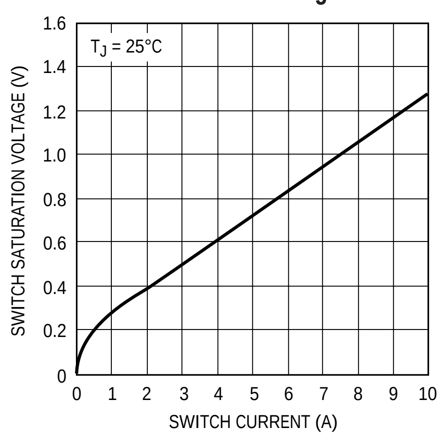
Switch Saturation Voltage



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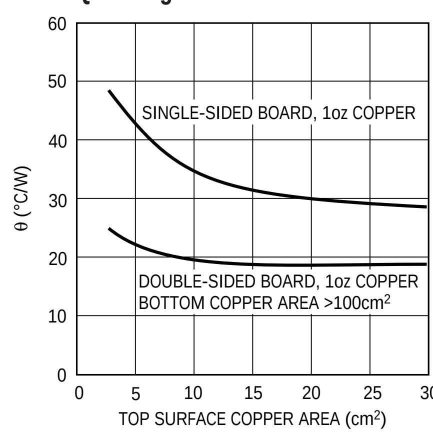
Q Package Thermal Resistance



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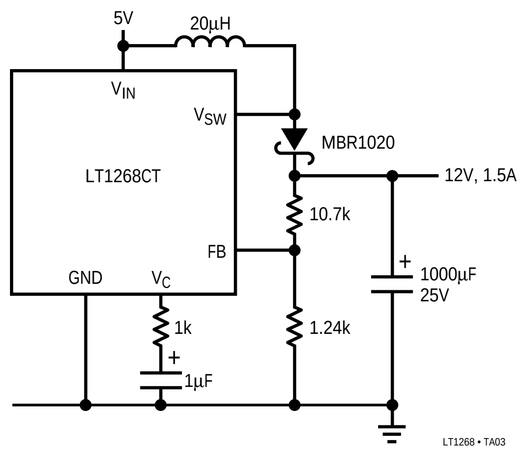
TYPICAL APPLICATION

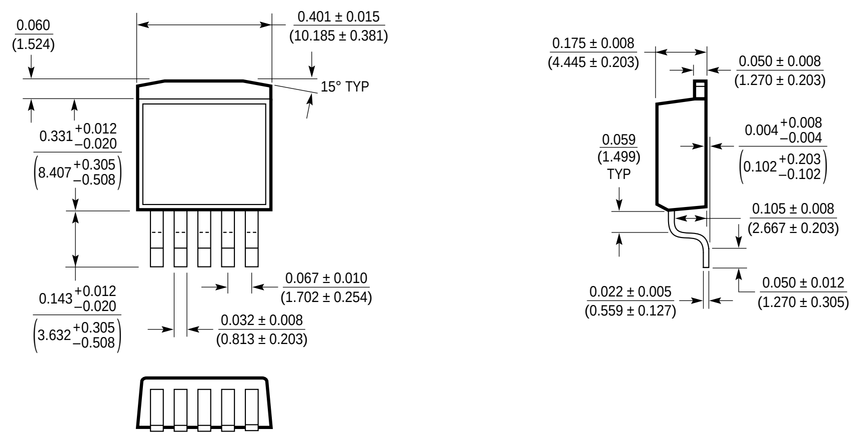
Boost Converter (5V TO 12V)



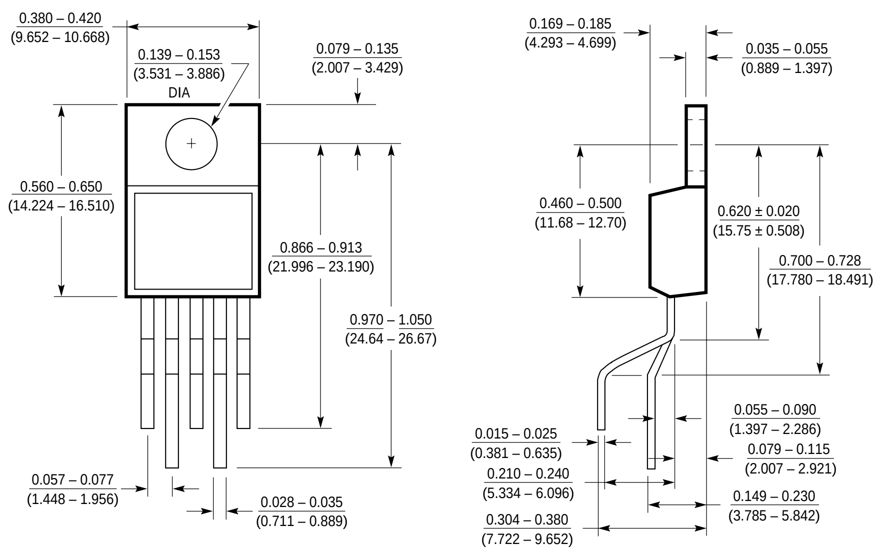
PACKAGE DESCRIPTION

Dimensions in inches (millimeters) unless otherwise noted.

Q Package
5-Lead DD



T Package
5-Lead TO-220



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