LM2734
Thin SOT23 1A Load Step-Down DC-DC Regulator

General Description

The LM2734 regulator is a monolithic, high frequency, PWM step-down DC/DC converter in a 6-pin Thin SOT23 package. It provides all the active functions to provide local DC/DC conversion with fast transient response and accurate regulation in the smallest possible PCB area.

With a minimum of external components and online design support through WEBENCH™, the LM2734 is easy to use. The ability to drive 1A loads with an internal 300mΩ NMOS switch using state-of-the-art 0.5µm BiCMOS technology results in the best power density available. The world class control circuitry allows for on-times as low as 13ns, thus supporting exceptionally high frequency conversion over the entire 3V to 20V input operating range down to the minimum output voltage of 0.8V. Switching frequency is internally set to 550kHz (LM2734Y) or 1.6MHz (LM2734X), allowing the use of extremely small surface mount inductors and chip capacitors. Even though the operating frequencies are very high, efficiencies up to 90% are easy to achieve. External shutdown is included, featuring an ultra-low stand-by current of 30nA. The LM2734 utilizes current-mode control and internal compensation to provide high-performance regulation over a wide range of operating conditions. Additional features include internal soft-start circuitry to reduce inrush current, pulse-by-pulse current limit, thermal shutdown, and output over-voltage protection.

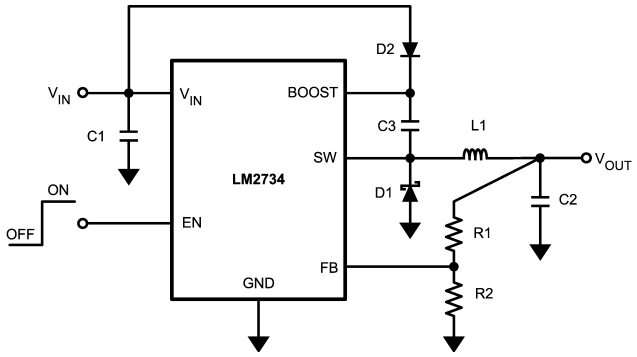
Features

- Thin SOT23-6 package
- 3.0V to 20V input voltage range
- 0.8V to 18V output voltage range
- 1A output current
- 550kHz (LM2734Y) and 1.6MHz (LM2734X) switching frequencies
- 300mΩ NMOS switch
- 30nA shutdown current
- 0.8V, 2% internal voltage reference
- Internal soft-start
- Current-Mode, PWM operation
- WEBENCH online design tool

Applications

- Local Point of Load Regulation
- Core Power in HDDs
- Set-Top Boxes
- Battery Powered Devices
- USB Powered Devices
- DSL Modems
- Notebook Computers

Typical Application Circuit



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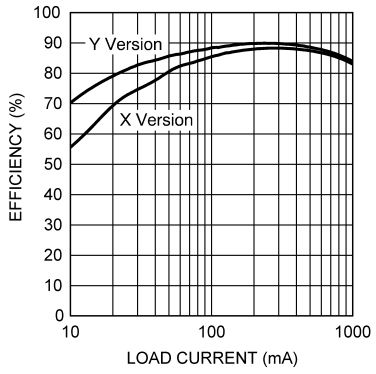
Efficiency vs Load Current
V_{IN} = 5V, V_{OUT} = 3.3V



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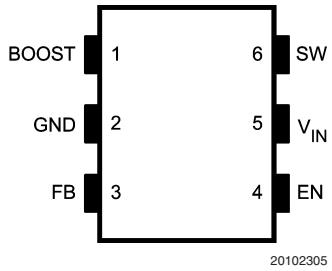
Connection Diagram



6-Lead TSOT
NS Package Number MK06A

Ordering Information

Order Number	Package Type	NSC Package Drawing	Package Marking	Supplied As
LM2734XMK	TSOT-6	MK06A	SFDB	1000 Units on Tape and Reel
LM2734YMK			SFEB	1000 Units on Tape and Reel
LM2734XMKX			SFDB	3000 Units on Tape and Reel
LM2734YMKX			SFEB	3000 Units on Tape and Reel

* Contact the local sales office for the lead-free package.

Pin Description

Pin	Name	Function
1	BOOST	Boost voltage that drives the internal NMOS control switch. A bootstrap capacitor is connected between the BOOST and SW pins.
2	GND	Signal and Power ground pin. Place the bottom resistor of the feedback network as close as possible to this pin for accurate regulation.
3	FB	Feedback pin. Connect FB to the external resistor divider to set output voltage.
4	EN	Enable control input. Logic high enables operation. Do not allow this pin to float or be greater than V_{IN} + 0.3V.
5	V_{IN}	Input supply voltage. Connect a bypass capacitor to this pin.
6	SW	Output switch. Connects to the inductor, catch diode, and bootstrap capacitor.

Absolute Maximum Ratings (Note 1)

V_{IN}	-0.5V to 24V
SW Voltage	-0.5V to 24V
Boost Voltage	-0.5V to 30V
Boost to SW Voltage	-0.5V to 6.0V
FB Voltage	-0.5V to 3.0V
EN Voltage	-0.5V to (V_{IN} + 0.3V)
Junction Temperature	150˚C
ESD Susceptibility (Note 2)	2kV
Storage Temp. Range	-65˚C to 150˚C

Soldering Information

Infrared/Convection Reflow (15sec)	220˚C
Wave Soldering Lead Temp. (10sec)	260˚C

Operating Ratings (Note 1)

V_{IN}	3V to 20V
SW Voltage	-0.5V to 20V
Boost Voltage	-0.5V to 25V
Boost to SW Voltage	1.6V to 5.5V
Junction Temperature Range	–40˚C to +125˚C
Thermal Resistance θ_{JA} (Note 3)	118˚C/W

Electrical Characteristics

Specifications with standard typeface are for T_J = 25˚C, and those in **boldface type** apply over the full **Operating Temperature Range** (T_J = -40˚C to 125˚C). V_{IN} = 5V, V_{BOOST} - V_{SW} = 5V unless otherwise specified. Datasheet min/max specification limits are guaranteed by design, test, or statistical analysis.

Symbol	Parameter	Conditions	Min (Note 4)	Typ (Note 5)	Max (Note 4)	Units
V_{FB}	Feedback Voltage		**0.784**	0.800	**0.816**	V
$\Delta V_{FB}/\Delta V_{IN}$	Feedback Voltage Line Regulation	V_{IN} = 3V to 20V		0.01		% / V
I_{FB}	Feedback Input Bias Current	Sink/Source		10	**250**	nA
UVLO	Undervoltage Lockout	V_{IN} Rising		2.74	**2.90**	V
	Undervoltage Lockout	V_{IN} Falling	**2.0**	2.3		
	UVLO Hysteresis		**0.30**	0.44	**0.62**	
F_{SW}	Switching Frequency	LM2734X	**1.2**	1.6	**1.9**	MHz
		LM2734Y	**0.40**	0.55	**0.66**	
D_{MAX}	Maximum Duty Cycle	LM2734X	**85**	92		%
		LM2734Y	**90**	96		
D_{MIN}	Minimum Duty Cycle	LM2734X		2		%
		LM2734Y		1		
$R_{DS(ON)}$	Switch ON Resistance	V_{BOOST} - V_{SW} = 3V		300	**600**	mΩ
I_{CL}	Switch Current Limit	V_{BOOST} - V_{SW} = 3V	**1.2**	1.7	**2.5**	A
I_Q	Quiescent Current	Switching		1.5	**2.5**	mA
	Quiescent Current (shutdown)	V_{EN} = 0V		30		nA
I_{BOOST}	Boost Pin Current	LM2734X (50% Duty Cycle)		2.5	**3.5**	mA
		LM2734Y (50% Duty Cycle)		1.0	**1.8**	
V_{EN_TH}	Shutdown Threshold Voltage	V_{EN} Falling			**0.4**	V
	Enable Threshold Voltage	V_{EN} Rising	**1.8**			
I_{EN}	Enable Pin Current	Sink/Source		10		nA
I_{SW}	Switch Leakage			40		nA

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see Electrical Characteristics.

Note 2: Human body model, 1.5kΩ in series with 100pF.

Note 3: Thermal shutdown will occur if the junction temperature exceeds 165˚C. The maximum power dissipation is a function of $T_{J(MAX)}$, θ_{JA} and T_A . The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} – T_A)/\theta_{JA}$. All numbers apply for packages soldered directly onto a 3” x 3” PC board with 2oz. copper on 4 layers in still air. For a 2 layer board using 1 oz. copper in still air, θ_{JA} = 204˚C/W.

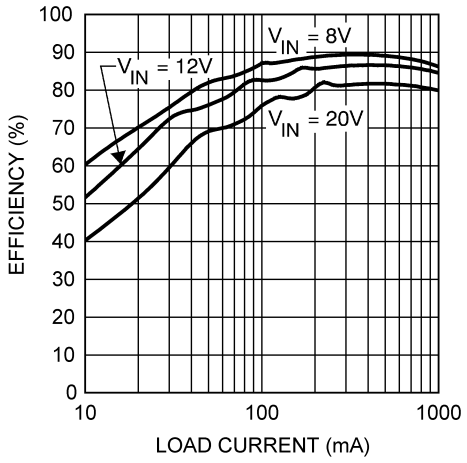
Note 4: Guaranteed to National’s Average Outgoing Quality Level (AOQL).

Note 5: Typicals represent the most likely parametric norm.

Typical Performance Characteristics

All curves taken at V_{IN} = 5V, V_{BOOST} - V_{SW} = 5V, L1 = 4.7 µH ("X"), L1 = 10 µH ("Y"), and T_A = 25˚C, unless specified otherwise.

Efficiency vs Load Current - "X" V_{OUT} = 5V



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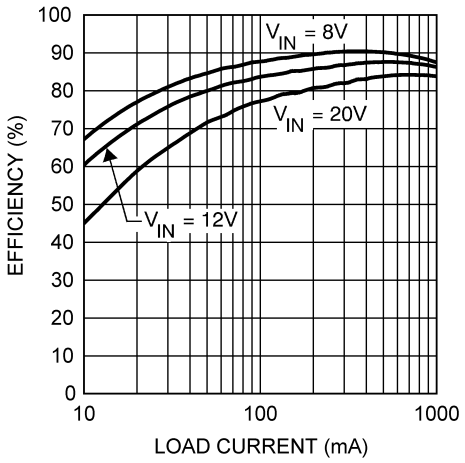
Efficiency vs Load Current - "Y" V_{OUT} = 5V



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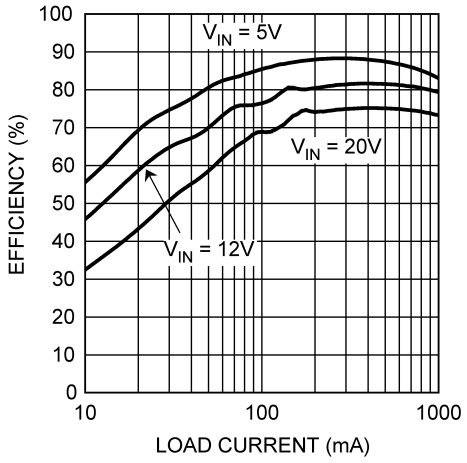
Efficiency vs Load Current - "X" V_{OUT} = 3.3V



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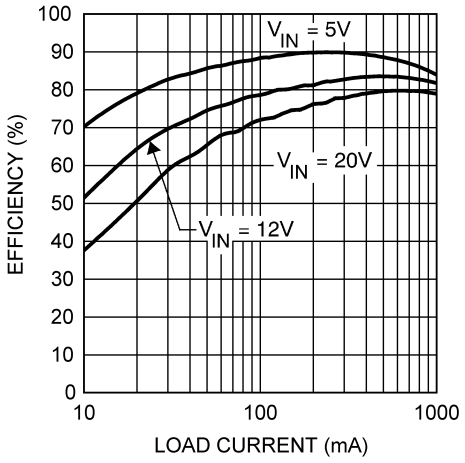
Efficiency vs Load Current - "Y" V_{OUT} = 3.3V



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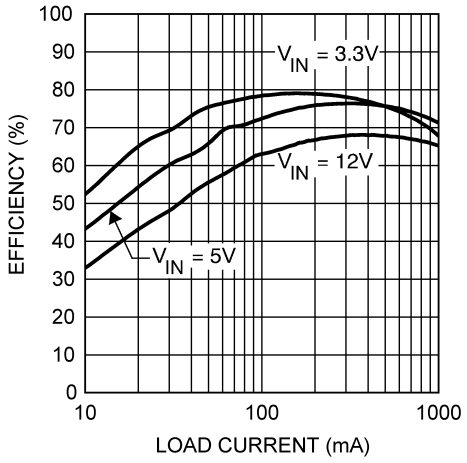
Efficiency vs Load Current - "X" V_{OUT} = 1.5V



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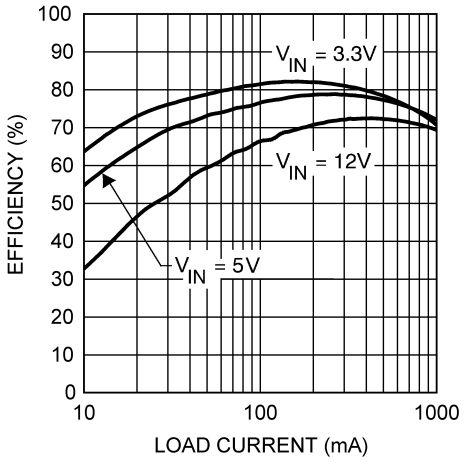
Efficiency vs Load Current - "Y" V_{OUT} = 1.5V



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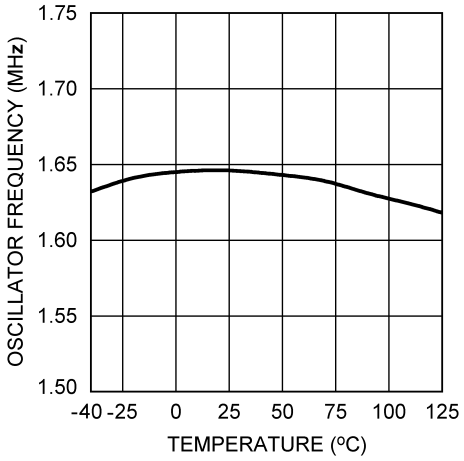
Typical Performance Characteristics

All curves taken at V_{IN} = 5V, V_{BOOST} - V_{SW} = 5V, L1 = 4.7 µH ("X"), L1 = 10 µH ("Y"), and T_A = 25˚C, unless specified otherwise. (Continued)

Oscillator Frequency vs Temperature - "X"



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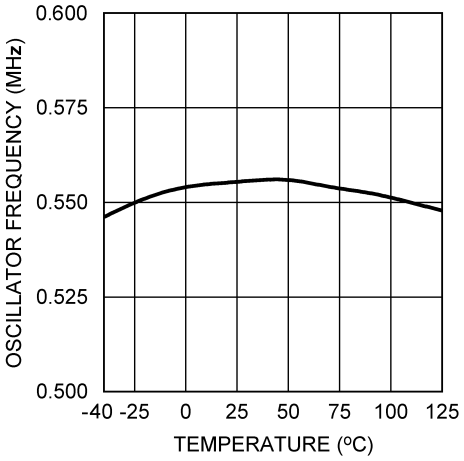
Oscillator Frequency vs Temperature - "Y"



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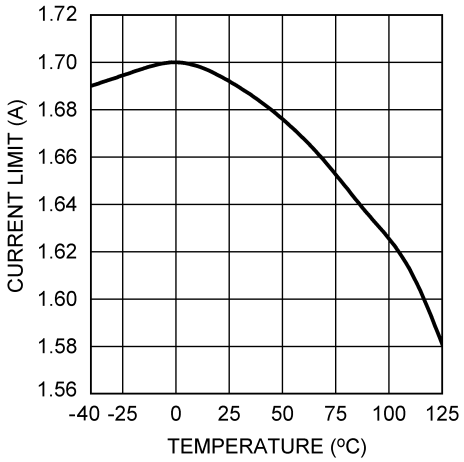
Current Limit vs Temperature
V_{IN} = 5V



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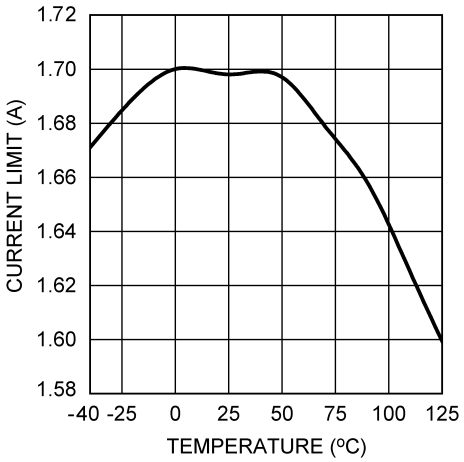
Current Limit vs Temperature
V_{IN} = 20V



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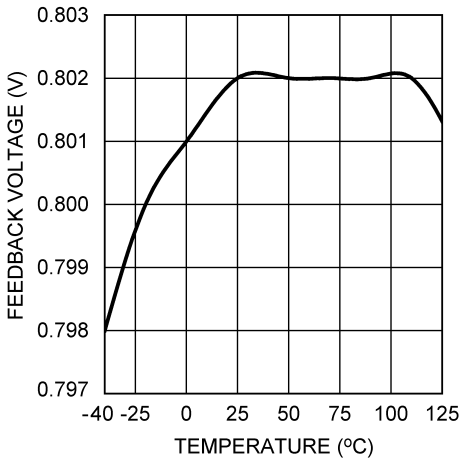
V_{FB} vs Temperature



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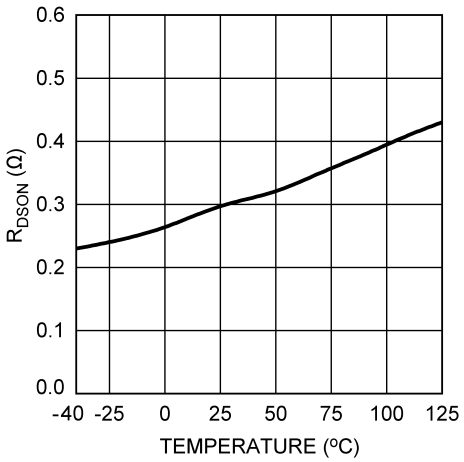
R_{DSON} vs Temperature



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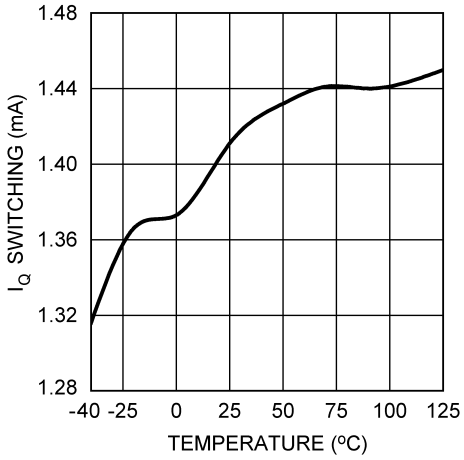
Typical Performance Characteristics

All curves taken at V_{IN} = 5V, V_{BOOST} - V_{SW} = 5V, L1 = 4.7 µH ("X"), L1 = 10 µH ("Y"), and T_A = 25˚C, unless specified otherwise. (Continued)

I_Q Switching vs Temperature



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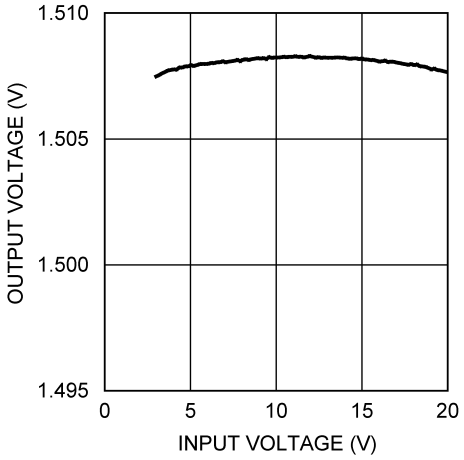
Line Regulation - "X"
V_{OUT} = 1.5V, I_{OUT} = 500mA



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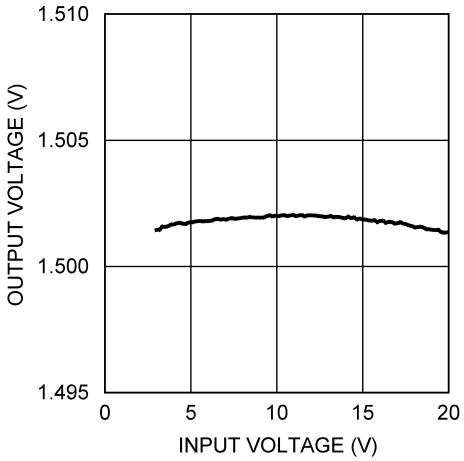
Line Regulation - "Y"
V_{OUT} = 1.5V, I_{OUT} = 500mA



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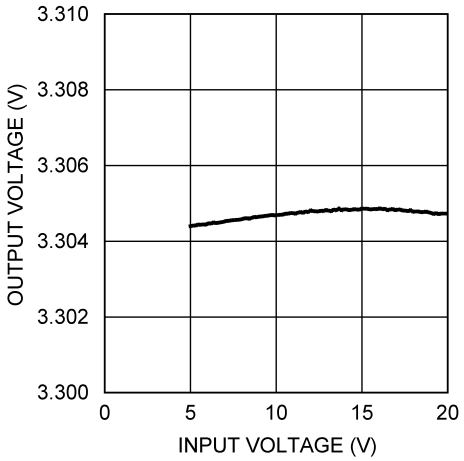
Line Regulation - "X"
V_{OUT} = 3.3V, I_{OUT} = 500mA



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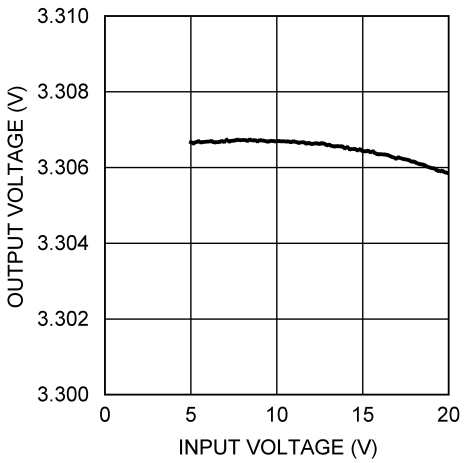
Line Regulation - "Y"
V_{OUT} = 3.3V, I_{OUT} = 500mA



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