

4V to 30V Input, 3A Output, Synchronous Step Down Voltage Converter

1 Features

- ◆ Wide input voltage Range: 4V~30V
- ◆ Adjustable Output Voltage from 0.925V to V_{IN}
- ◆ Low RDS(ON) Switches 130 m Ω / 100 m Ω
- ◆ 650KHz Typical Switching Frequency
- ◆ Duty Cycle up to 92%
- ◆ Short Circuit Protection
- ◆ Over Current Protection
- ◆ Internal Soft Startup
- ◆ Thermal Shutdown Protection

2 Applications

- ◆ LCD Monitor and LCD TV
- ◆ Battery-powered Equipment
- ◆ Entertainment Devices
- ◆ Digital Home Appliances: Digital TVs
- ◆ ADSL Modem Portable Instruments

3 Description

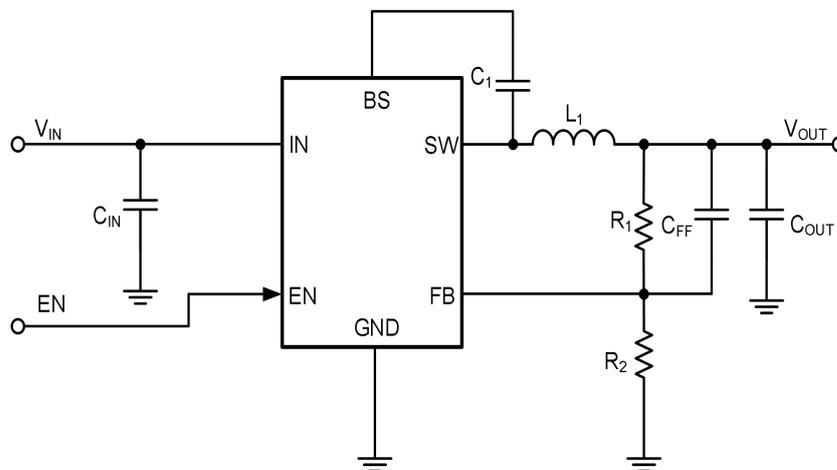
The MX8134 is a monolithic IC designed for a step-down DC/DC converter with low EMI signature, and own the ability of driving a 3A load without additional transistor. It saves board space. The MX8134 also can run at 92% duty cycle for low dropout operation, and Internal soft-start results in small inrush current extending battery life in portable systems. As a protection function, it has cycle by cycle peak current limit function, short protection function, thermal shutdown function. The device is available in a 8-pin small profile ESOP8 package.

Device Information

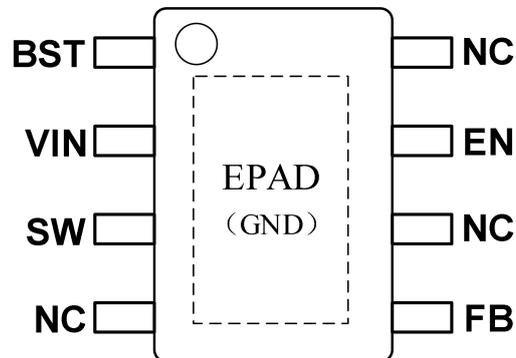
ORDERABLE DEVICE	PACKAGE TYPE	PACKAGE SIZE(mm)	DEVICE MARKING ⁽¹⁾
MX8134	ESOP8	4.9 x 3.9 x 1.5	GExyz

(1) "GE" is Device code, "x" is year code, "y" is Month code, "z" is lot number code.

Simplified Schematic



4 Pin Configuration and Functions



ESOP8 Pin Configuration

PIN NO.	NAME	DESCRIPTION
1	BST	Bootstrap. A capacitor connected between SW and BS pins is required to form a floating supply across the high-side switch driver.
2	VIN	Power supply voltage input.
3	SW	Switch pin connected to the internal FET switches and inductor terminal. Connect the inductor of the output filter to this pin.
5	FB	Feedback pin for the internal control loop. Connect this pin to an external feedback divider.
4,6,8	NC	Non function Pin.
7	EN	Device enable logic input. Logic high enables the device, logic low disables the device and turns it into shutdown. Do not leave floating.
9	EPAD (GND)	Ground pin.

5 Specifications

5.1 Absolute Maximum Ratings

Over operating temperature range(25°C) (unless otherwise noted)⁽¹⁾

ITEM		MIN	MAX	UNIT
Voltage ⁽²⁾	V _{IN} , EN	-0.3	36	V
	BST		V _{SW} +5	V
	SW	-0.3	V _{IN} +0.5	V
	FB	-0.3	6.5	V
Operating junction temperature, T _J		-40	150	°C
Storage temperature, T _{stg}		-65	150	°C
Junction-to-ambient thermal resistance, R _{θJA}			50	°C/W
Junction-to-case thermal resistance, R _{θJC}			10	°C/W

Note1: Exceeding these ratings may damage the device.

Note2: The device is not guaranteed to function outside of its operating conditions.

(1) Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only and the device is not switching. Functional operation of the device at these or any other conditions beyond those indicated under recommended perating conditions is not implied. Exposure to absolute- maximum- rated conditions for extended periods may affect device reliability.

(2) All voltage values are with respect to network ground terminal .

5.2 Recommended Operating Conditions

ITEM	MIN	MAX	UNIT
Operating junction temperature ⁽¹⁾	-40	125	°C/W
Operating temperature range	-40	85	°C/W
Input voltage V _{IN}	4.5	30	V
Output current	0	3.0	A

(1) All limits specified at room temperature (TA = 25°C) unless otherwise specified. All room temperature limits are 100% production tested. All limits at temperature extremes are ensured through correlation using standard Statistical Quality Control (SQC) methods. All limits are used to calculate Average Outgoing Quality Level (AOQL).

5.3 Electrical Characteristics

$V_{IN}=12V$, $T_A=25^{\circ}C$, unless otherwise specified.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IN}	Input voltage range		4.0		30	V
I_Q	Non switching quiescent current	$V_{FB}=1.1V$		400	590	μA
I_{OFF}	Shut down current	EN = GND			3	μA
V_{FB}	Regulated Feedback Voltage		907	925	944	mV
ENABLE (EN PIN)						
$V_{(EN_RISING)}$	Enable threshold	Rising	1.2			V
$V_{(EN_FALLING)}$		Falling			0.4	V
$V_{(EN_HYS)}$	Threshold Hysteresis			200		mV
POWER STAGE						
$R_{(HSD)}$	High-side FET on resistance			130		m Ω
$R_{(LSD)}$	Low-side FET on resistance			100		m Ω
CURRENT LIMIT						
$I_{(LIM)}$	Upper Switch Current Limit	FB=90%	4			A
OSCILLATOR						
F_{sw}	Centre switching frequency			650		KHz
OVER TEMPERATURE PROTECTION						
Thermal Shutdown	Rising temperature			160		$^{\circ}C$
	Hysteresis			20		$^{\circ}C$
Soft start			0.5	1	1.5	ms

6 Detailed Description

6.1 Overview

The MX8134 DC/DC converter is designed to provide up to a 3A output from an input voltage source of 4V to 30V. The MX8134 is a high output current monolithic switch-mode step-down DC-DC converter. The device operates at a fixed 650KHz switching frequency, and uses a slope compensated current mode architecture. The external shutdown function can be controlled by logic level and then come into standby mode. The internal compensation makes feedback control having good line and load regulation without external design. Regarding protected function, thermal shutdown is to prevent over temperature operating from damage, and current limit is against over current operating of the output switch. If current limit function occurs and V_{FB} is down below 0.925V, the switching frequency will be reduced.

6.2 Functional Block Diagram

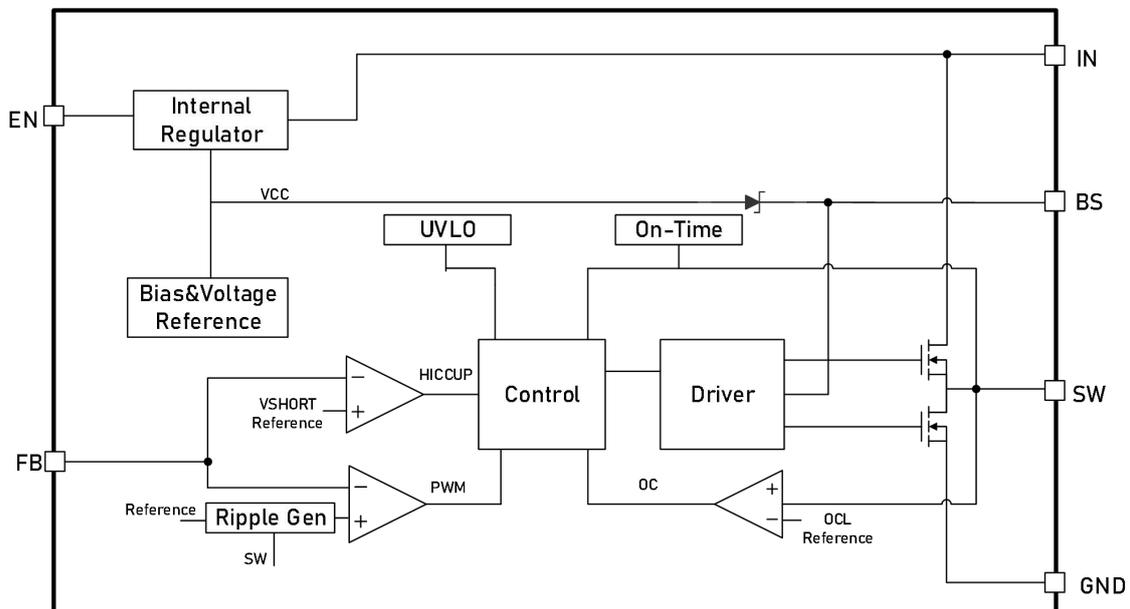
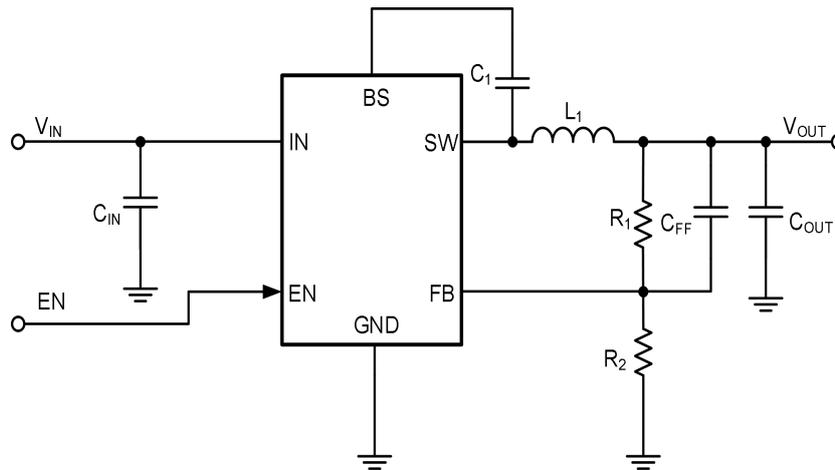


Figure 1. MX8134 Functional Block Diagram

7 Application information

The MX8134 is a 4V to 30V wide input voltage range, high performance with 3A output current, 650KHz monolithic step-down converter. The MX8134 requires few external power components (C_{IN} , C_{OUT} and L1). The output voltage can be programmed with external feedback to any voltage, ranging from 0.925V to the input voltage.

$$V_{OUT} = 0.925 \times \frac{R1 + R2}{R2}$$


Table 7-1. Recommended Component Values

V _{OUT} (V)	L ₁ (μH)	C ₁ (μF)	C _{IN} (μF)	C _{OUT} (μF)	C _{FF} Opt.(pF)	R ₁ (kΩ)	R ₂ (kΩ)
3.3	3.3-4.7	0.1	20-47	20-68	10-100	26.1	10
5	3.3-4.7	0.1	20-47	20-68	10-100	50	11.3

C_{FF}: Optional

8 Power Supply Recommendations

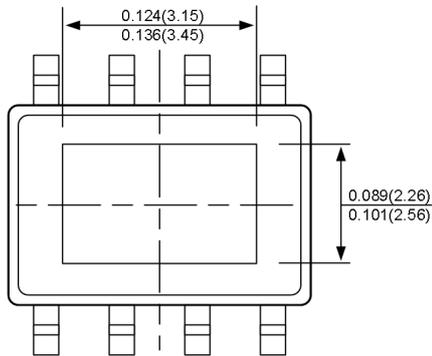
The devices are designed to operate from an input voltage supply range between 4V and 30V. This input supply must be well regulated. If the input supply is located more than a few inches from the device or converter, additional bulk capacitance may be required in addition to the ceramic bypass capacitors. An electrolytic capacitor with a value of 47 μF is a typical choice.

9 Layout Guidelines

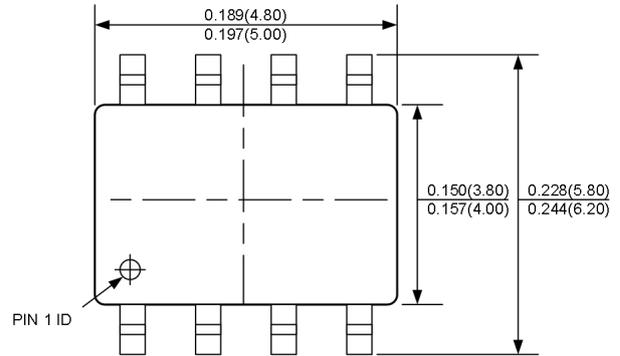
- V_{IN} and GND traces should be as wide as possible to reduce trace impedance. The wide areas are also of advantage from the viewpoint of heat dissipation.
- The input capacitor and output capacitor should be placed as close to the device as possible to minimize trace impedance.
- Provide sufficient vias for the input capacitor and output capacitor.
- Keep the SW trace as physically short and wide as practical to minimize radiated emissions.
- Do not allow switching current to flow under the device.
- A separate V_{OUT} path should be connected to the upper feedback resistor.
- Make a Kelvin connection to the GND pin for the feedback path.
- Voltage feedback loop should be placed away from the high-voltage switching trace, and preferably has ground shield.
- The trace of the V_{FB} node should be as small as possible to avoid noise coupling.
- The GND trace between the output capacitor and the GND pin should be as wide as possible to minimize its trace impedance.

10 Package Outline

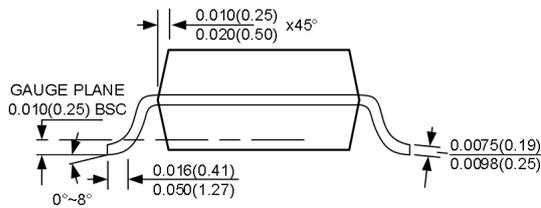
ESOP8 (EXPOSED PAD)



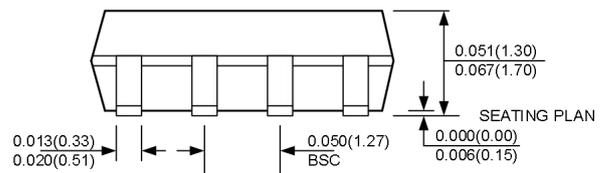
BOTTOM VIEW



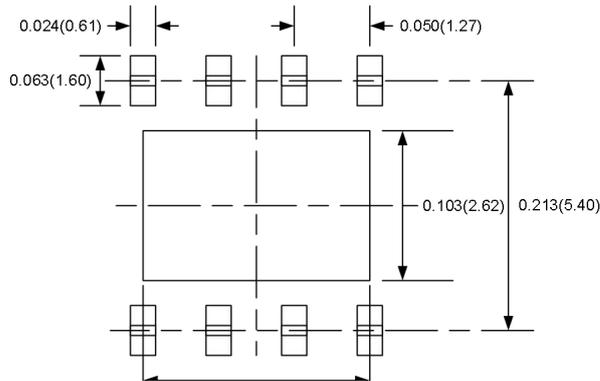
TOP VIEW



SIDE VIEW



FRONT VIEW



- NOTE:
- CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
 - PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
 - PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
 - LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
 - DRAWING CONFORMS TO JEDEC MS-012, VARIATION BA.
 - DRAWING IS NOT TO SCALE.