

2.5MHz, 1.5A Input Current, DC-DC Boost Converter in CSP 1.2x1.2

DESCRIPTION

ETA1133 is highly efficient 2.5 MHz, 1.5A input current, step-up DC-to-DC converter. ETA1133 converts input voltages from 2.5 V to 5.25 V to a fixed output voltage of 5.4V.

Unlike most step-up converter, it incorporates circuits that disconnect the input from output, during shutdown, short-circuit, output current overloading, or other events when output is higher than the input. This eliminates the need for an external MOSFET and its control circuitry to disconnect the input from output, and provides robust output overload protection. These devices are optimized for battery-powered applications. High efficiency of up to 95% enables an extended battery life in all portable designs. Step-up operation at a switching frequency 2.5 MHz allows using 1uH inductor and 10uF output capacitor.

ETA1133 is with a space saving CSP1.2x1.2-9L package.

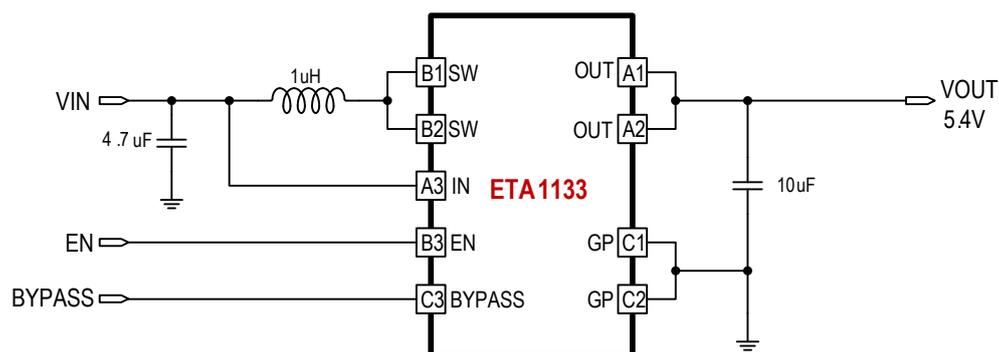
FEATURES

- ◆ Up to 95% DC-DC Efficiency
- ◆ Up to 1.5A Max input current
- ◆ Output Disconnect
- ◆ Short-circuit Protection
- ◆ Output to Input Reversed Current Protection
- ◆ 45µA No load IQ and light load PFM Mode; BYPASS MODE
- ◆ Current Mode control
- ◆ Shutdown at first power up and OTP
- ◆ Fixed 5.4V output
- ◆ CSP1.2x1.2-9 package

APPLICATIONS

- ◆ NFC for POS terminal
- ◆ NFC for Smart Phone
- ◆ Application with 5.4V Output for General Purpose

TYPICAL APPLICATION

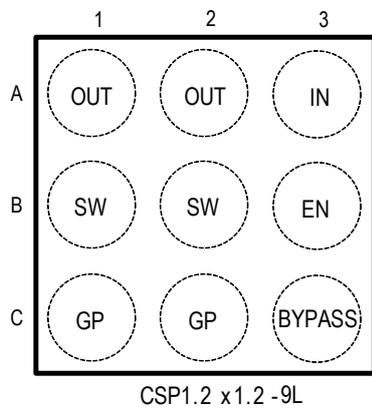


ORDERING

INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA1133CSJ	CSP 1.2x1.2-9	1133 YWWL	3000

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

SW Voltage	-0.3V to 6.5V
All Other Pin Voltage	-0.3V to 6V
SW to ground current.....	Internally limited
Operating Temperature Range	-40°C to 85°C
Storage Temperature Range	-55°C to 150°C
Thermal Resistance θ_{JA}	
CSP1.2x1.2-9.....	90 °C /W
Lead Temperature (Soldering, 10sec)	260°C
ESD HBM (Human Body Mode)	2KV
ESD MM (Machine Mode)	200V

ELECTRICAL CHARACTERISTICS

($V_{IN} = 5V$, unless otherwise specified. Typical values are at $T_A = 25^\circ C$.)

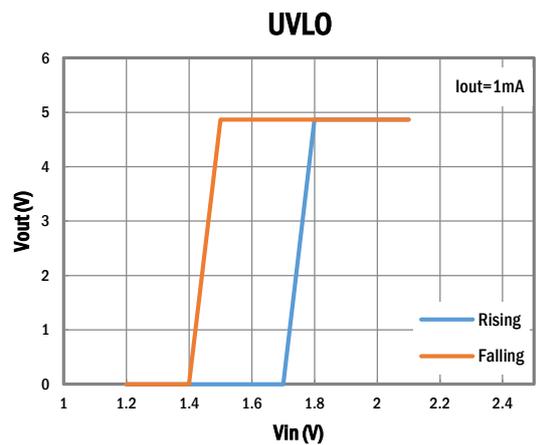
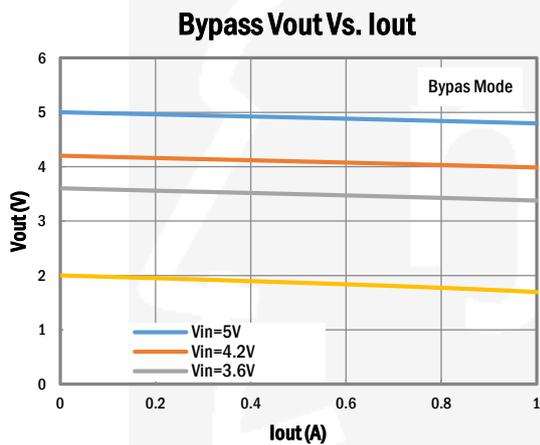
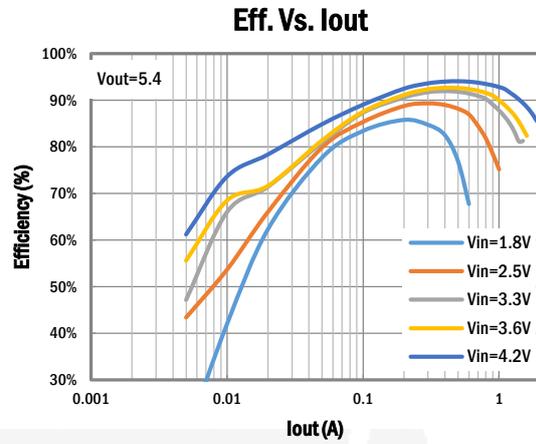
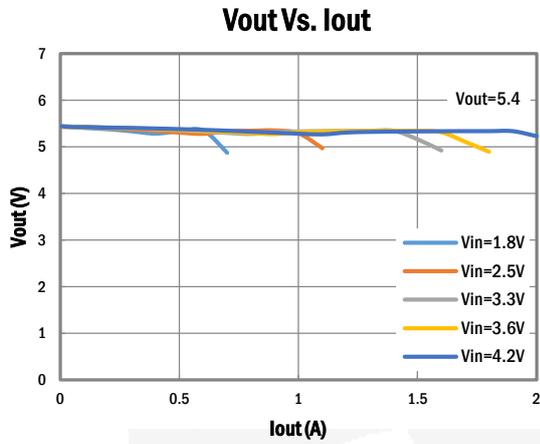
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT Range		2.5	3.6	5.25	V
INPUT UVLO	Rising, Hys=300mV		1.8		V
INPUT Operating Current	EN=Low, BYPASS=High		44		uA
	EN=High, No Switching		45		µA
Shutdown Current	EN=GND, BYPASS=GND		1.2	5	µA
Output Voltage			5.4		V
Switching Frequency			2.5		MHz
NMOS Switch On Resistance	ISW=100mA		130		mΩ
PMOS Switch On Resistance	ISW=100mA		115		mΩ
SW Leakage Current	VOUT=6V, VSW=0 or 6V, EN=GND			10	µA
NMOS Switch Current Limit			3		A
Start-up Current Limit			1.5		A
Bypass mode Max Current			0.8		A
Bypass mode short current			450		mA
Short Circuit Hiccup time	ON		3.5		ms
	OFF		75		ms
EN Input Current			0	1	µA
EN Input Low Voltage				0.4	V
EN Input High Voltage		1.1			V
Thermal Shutdown	Rising, Hysteresis=25°C		160		°C

PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
A1, A2	OUT	Boost converter output.
A3	IN	Power supply input.
B1, B2	SW	This is the switch pin of the converter and is connected to the drain of the internal Power MOSFETs.
B3	EN	This is the enable pin of the device. Connecting this pin to ground forces the device into shutdown mode. Pulling this pin high enables the device. This pin must not be left floating and must be terminated.
C1, C2	GP	GROUND
C3	BYPASS	<p>This is the mode selection pin of the device and is only of relevance when the device is disabled (EN = Low). This pin must not be left floating and must be terminated.</p> <p>BYPASS= Low: The device is in true shutdown mode.</p> <p>BYPASS= High: Bypass mode. The output is biased at the input voltage level with a maximum load current capability of ca. 0.8A. In bypass mode, the device only consumes a standby current of 44μA (typ.).</p>

TYPICAL CHARACTERISTICS

(Typical values are at $T_A = 25^\circ\text{C}$ unless otherwise specified.)



APPLICATION INFORMATION

Loop Operation

The ETA1133 is a wide input range, high-efficiency, DC/DC step up switching regulator, integrated with a 130m Ω Low Side Main MOSFET and 115m Ω synchronous MOSFET. It uses a PWM current-mode control scheme. An error amplifier integrates error between the FB signal and the internal reference voltage. The output of the integrator is then compared to the sum of a current-sense signal and the slope compensation ramp. This operation generates a PWM signal that modulates the duty cycle of the power MOSFETs to achieve regulation for output voltage.

The peak current of the NMOS switch is also sensed to limit the maximum current flowing through the switch and the inductor. The typical peak current limit is set to 3A. An internal temperature sensor prevents the device from getting overheated in case of excessive power dissipation.

Light Load Operation

Traditionally, a fixed constant frequency PWM DC/DC regulator always switches even when the output load is small. When energy is shuffling back and forth through the power MOSFETs, power is lost due to the finite RDSONs of the MOSFETs and parasitic capacitances. At light load, this loss is prominent and efficiency is therefore very low. ETA1133 employs a proprietary control scheme that improves efficiency in this situation by enabling the device into a power saving mode during light load, thereby extending the range of high efficiency operation.

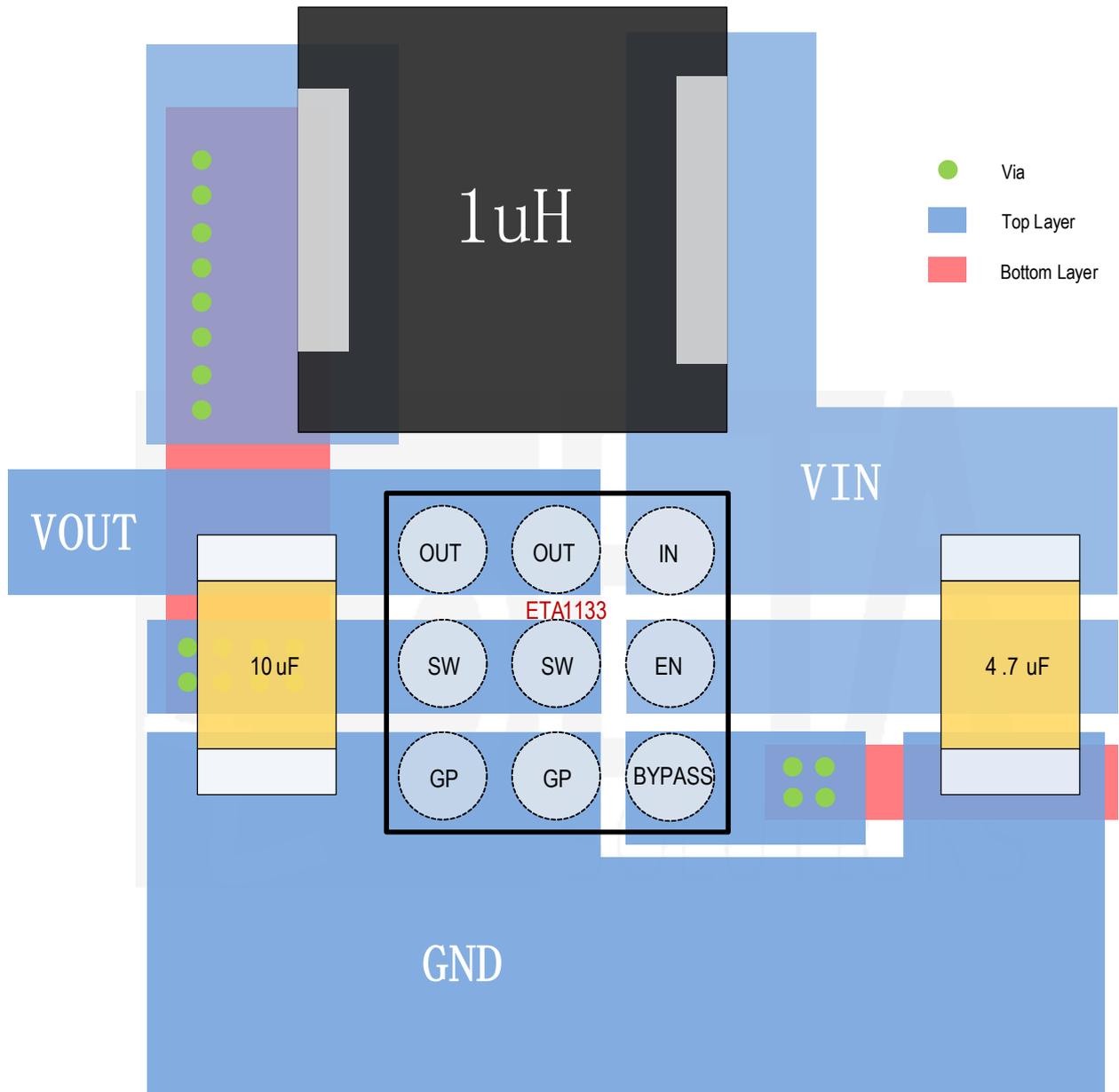
Short-Circuit Protection

Unlike most step-up converters, the ETA1133 allows for short circuits on the output. In the event of a short circuit, the device first turns off the NMOS when the sensed current reaches the current limit. After VOUT drops below VIN the device then enters a linear charge period with the current limited same as with the start-up period. In addition, the thermal shutdown circuits disable switching if the die temperature rises above 160°C.

BYPASS MODE

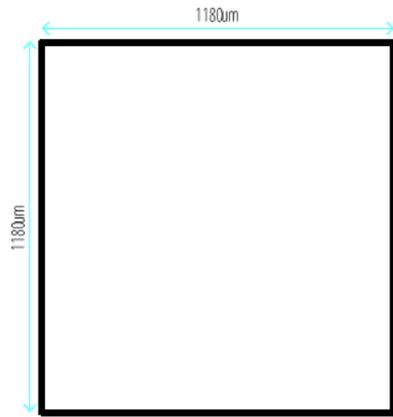
The ETA1133 is able to maintain its output biased at the input voltage level. In so called bypass mode (EN = 0, BYPASS = 1), the synchronous rectifier is current limited to ca. 0.8A allowing an external load (e.g. audio amplifier) to be powered with a restricted supply. The output voltage is slightly reduced due to voltage drop across the rectifier MOSFET and the inductor DC resistance. The device consumes a standby current of 44 μ A (typ).

PCB GUIDELINES

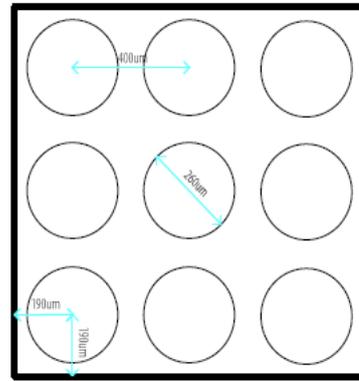


PACKAGE OUTLINE

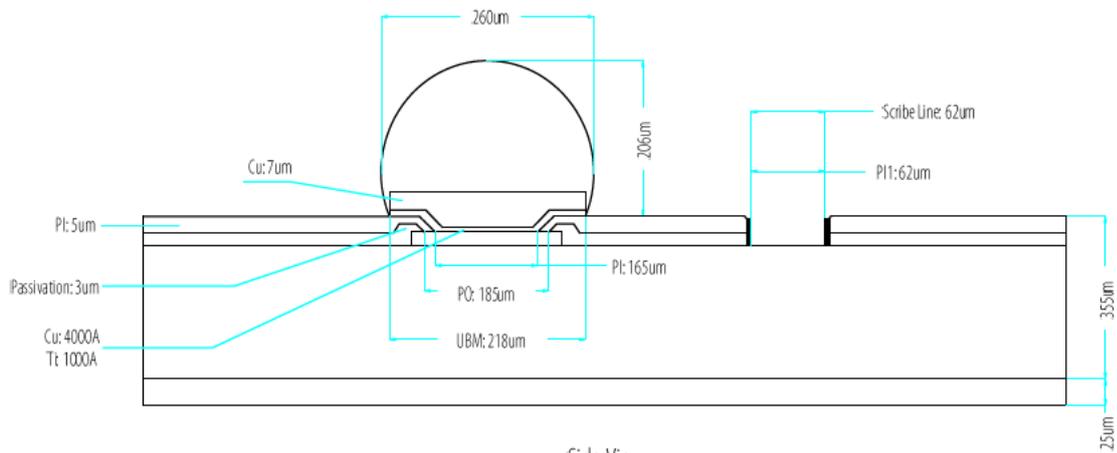
Package: CSP 1.2x1.2-9



Top View



Bottom View



Side View