



36V, 3A, 160KHz Buck DC/DC Converter With Constant Current Loop

Description

The ME3148 is a 160KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 3A load with high efficiency, low ripple and excellent line and load regulation. Requiring a minimum number of external components, the regulator is simple to use and include internal frequency compensation and a fixed-frequency oscillator.

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 100%. An enable function, an over current protection function is built inside. An internal compensation block is built in to minimize external component count.

Applications

- Car Charger
- Battery Charger
- Portable instrument power supply
- Buck constant current driver
- Monitor LED Backlighting
- General purpose LED lighting

Features

- Input Voltage Range 8V~36V
- Maximum output current 3A
- Fixed 160KHz Switching Frequency
- Output Adjustable from 1.25V to 33V
- Minimum Drop Out 0.3V
- Internal Optimize Power MOSFET
- Excellent line and load regulation
- With output constant current loop
- Built in OTP,OCP and OVP
- Recommend output power less than 13W

Package

- 8-pin ESOP8

Typical Application (Constant Voltage Charge)

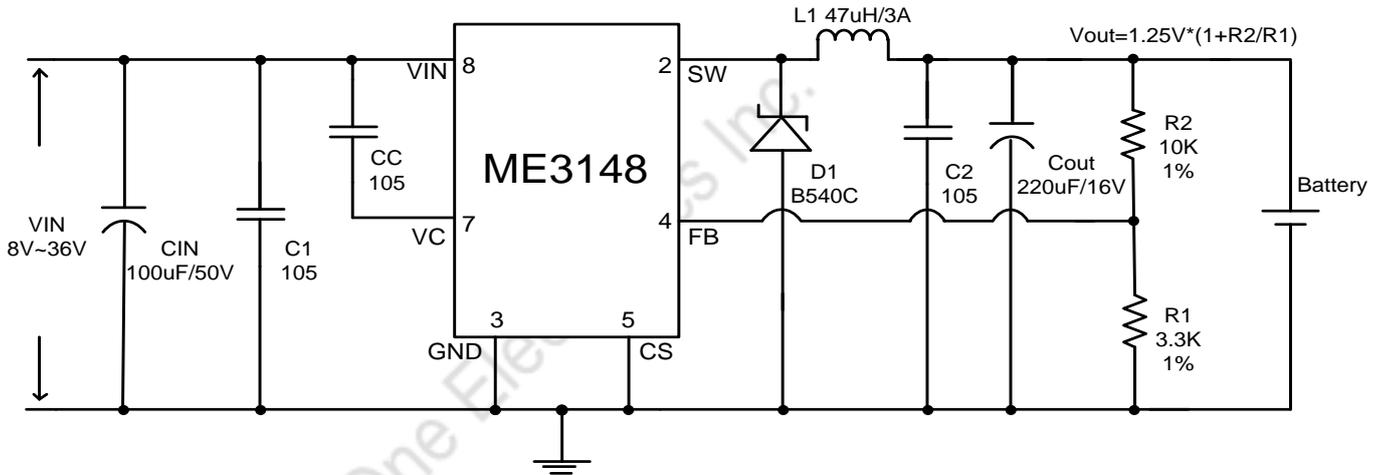


Figure 1. Constant Voltage Charge

Typical Application (Constant Voltage Constant Current Charge)

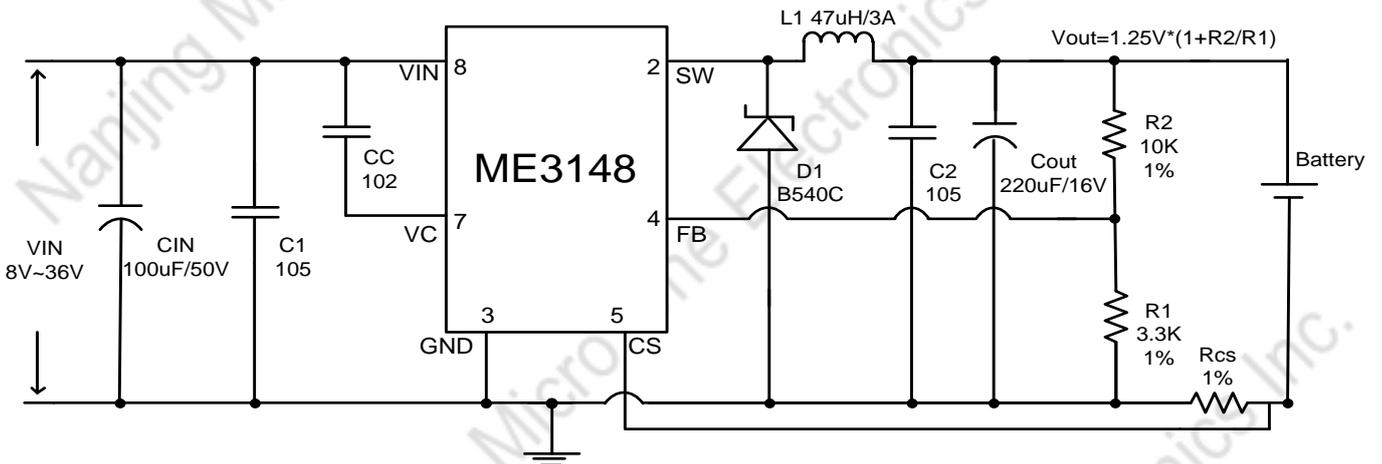


Figure 2. Constant Voltage Constant Current Charge

Typical Application (Constant Current LED Driver)

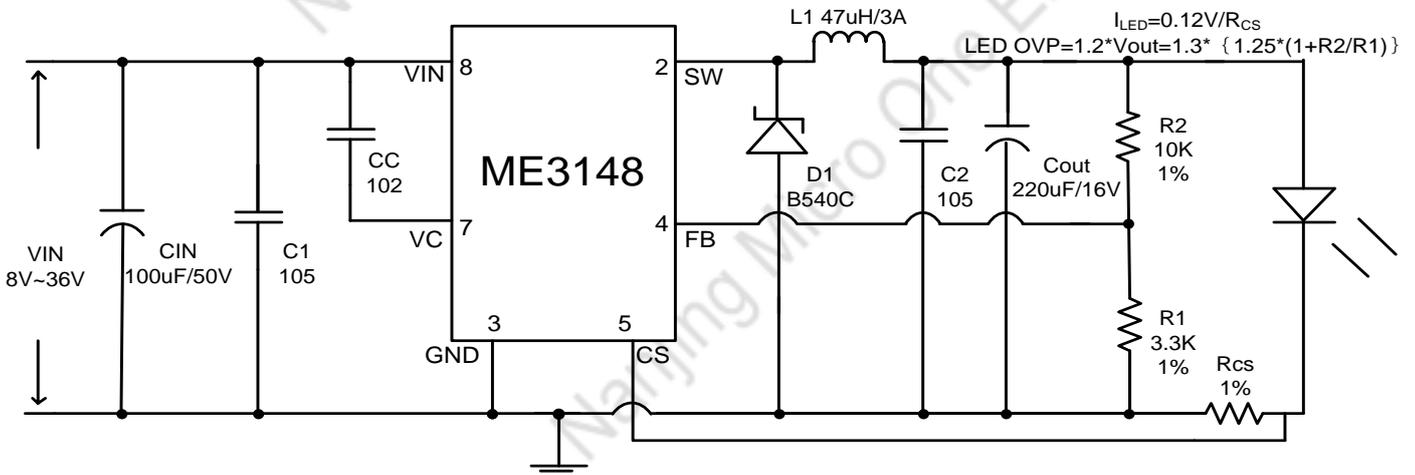
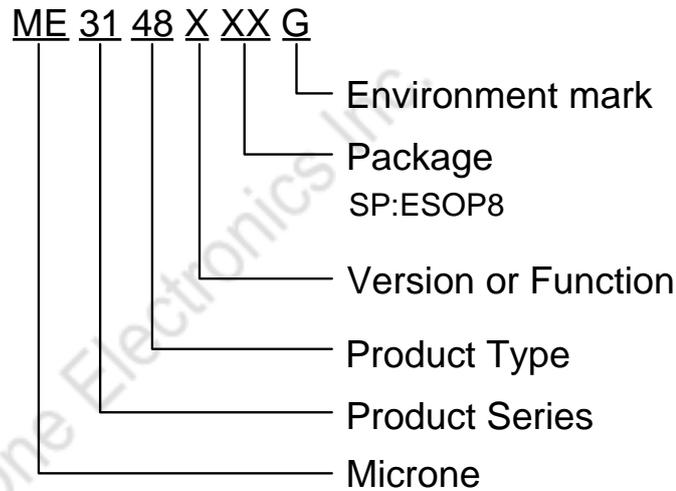


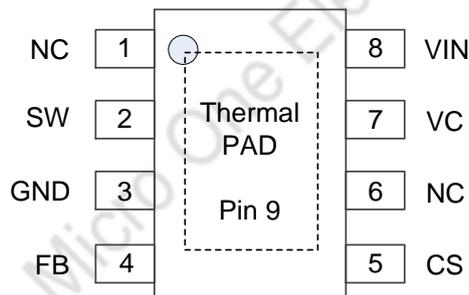
Figure 3. Constant Current LED Driver

Selection Guide



Product Series	Package
ME3148ASPG	ESOP8

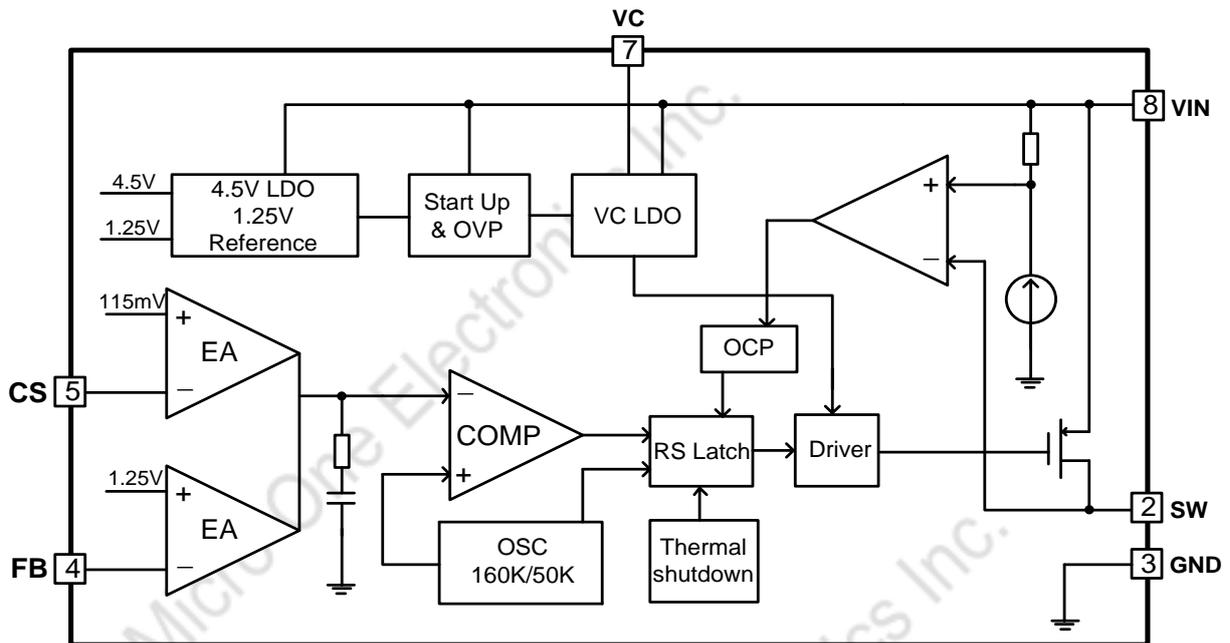
Pin Configuration & Pin Assignment



Pin Assignment

Pin Number	Pin Name	Description
1, 6	NC	Not connected.
2, Thermal pad	SW	Power Switch Output Pin (SW). The large current at the SW terminal is recommended to be drawn from the Thermal pad, and the 2 pin should not be subjected to a large current.
3	GND	Ground Pin.
4	FB	Feedback Pin (FB). Through an external resistor divider network, Feedback senses the output voltage and regulates it.
5	CS	Output Current Sense Pin
7	VC	Internal Voltage Regulator Bypass Capacity. The VC pin should connect a 1uF capacity to VIN.
8	VIN	Supply Voltage Input Pin. 8~36V wide voltage range

Block Diagram



Absolute Maximum Ratings

Parameter	Rating	Unit
Input Voltage	-0.3~45	V
FB Pin Voltage	-0.3~45	V
SW Pin Voltage	-0.3~VIN	V
Thermal resistance (Junction to air)	63	°C/W
Power Dissipation	Thermal Dissipation limited	W
Maximum Junction Temperature	-40~150	°C
Operating Ambient Temperature	-40~85	°C
Storage Temperature	-55~150	°C
Lead Temperature	260 (Soldering, 10 sec)	°C
ESD (HBM)	>2000	V

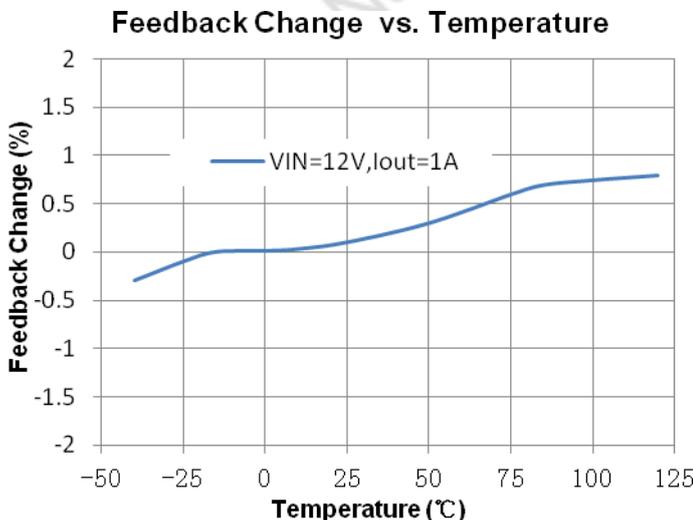
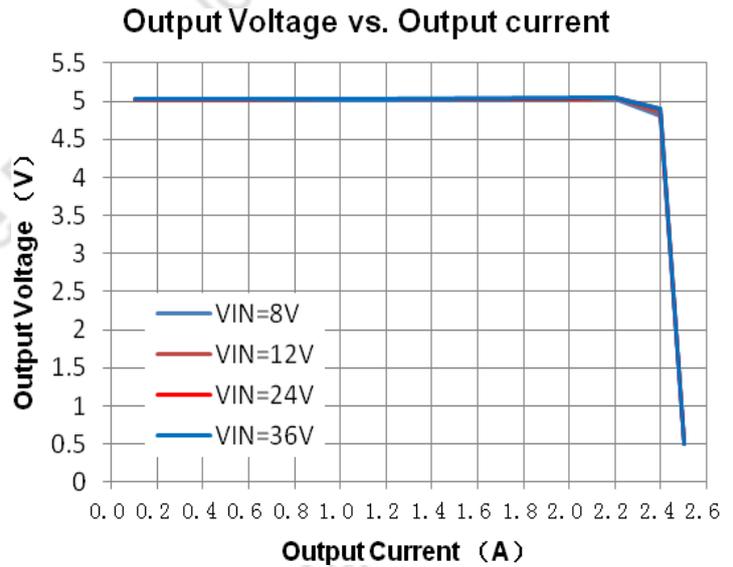
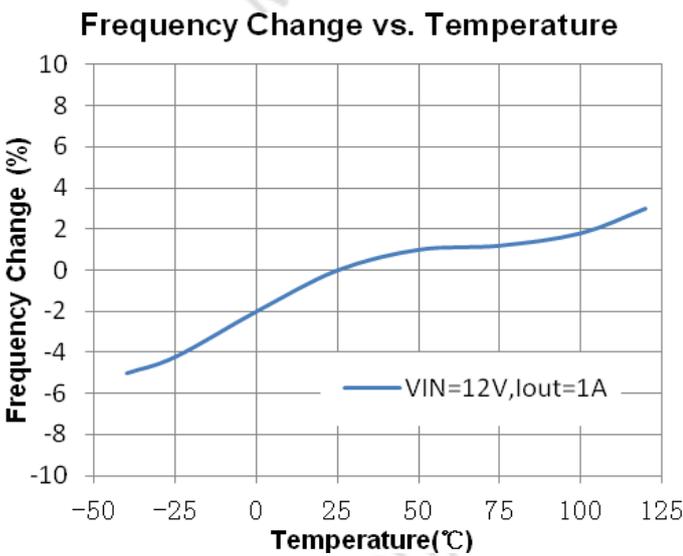
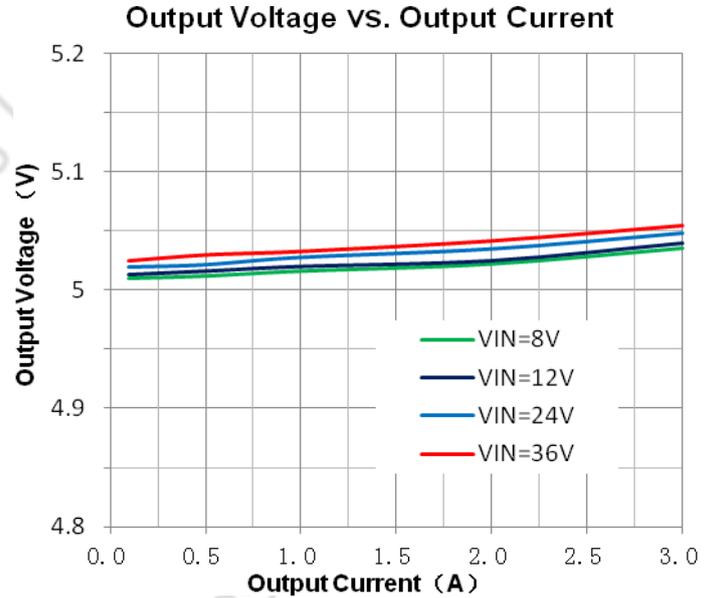
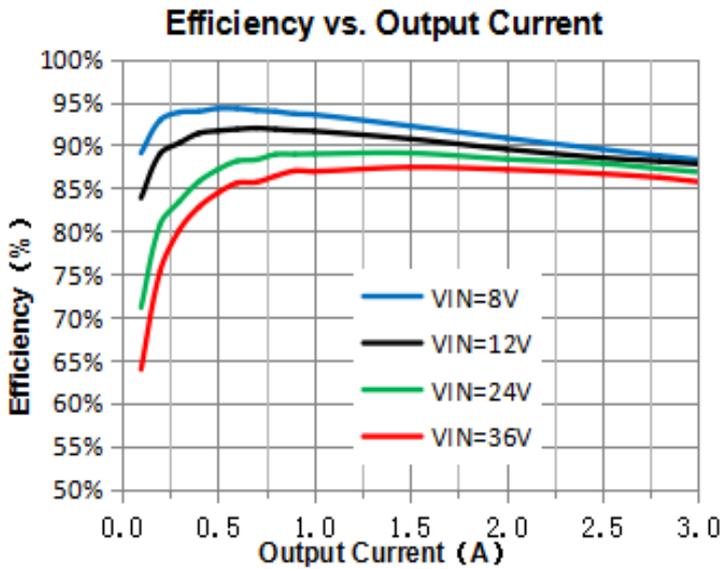
Note: Use this IC within the stated maximum ratings. Operation beyond these limits may cause degrading or permanent damage to the device.

Electrical Characteristics

$V_{in} = 12V$, $GND=0V$, V_{in} & GND parallel connect a $100\mu F/50V$ capacitor; $I_{out}=500mA$, $T_a = 25^{\circ}C$; the others floating unless otherwise specified.

Symbol	Parameters	Test Condition	Min.	Typ.	Max.	Unit
V_{IN}	VIN operation voltage		8	-	36	V
I_q	Quiescent Supply Current	$V_{FB} = 2V$	-	2	5	mA
F_{sw}	Oscillator Frequency		140	160	180	KHz
UVLO	VIN UVLO		-	5	-	V
OVP	VIN OVP		37	42	45	V
V_{FB}	Feedback Voltage	$V_{in} = 8\sim 36V, V_{out}=5V$ $I_{load}=0.2\sim 2A$	1.232	1.250	1.268	V
η	Efficiency	$V_{in} = 12V, V_{out}=5V$ $I_{out}=2.4A$	-	89	-	%
I_{CL}	Switch Current Limit		-	3.5	-	A
R_{dson}	Output Power PMOS	$V_{FB}=0V$ $V_{in} = 12V, I_{SW}=3A$	-	73	-	m Ω
V_{CS}	Constant current sense Voltage		109.5	115	120.5	mV

Typical Performance Characteristics (Vout=5V, Iout=0.1~2.5A, unless otherwise noted)



Note: Internal temperature compensation circuitry is provided to compensation the PCB and external line loss in system application. When the junction temperature or the output power rise, the feedback voltage will be compensated. This function is provided to compensation the PCB and external line loss in system application.

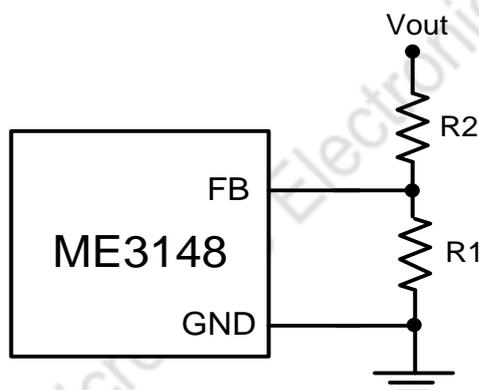
Application Information

ME3148 has the circuit to protect the chip in the normal working state. The temperature protection module will monitor the junction temperature in real time. When the temperature arrived the limit value, the chip will be shut down to prevent damage. When the temperature is recovered to the retardation threshold, the chip will restart and resume work. The UVLO function can effectively prevent the opening of the chip under the normal operating voltage condition. The current limiting protection can limit the maximum current of the chip power tube and prevent the current too large to damage the chip.

Output Voltage Programming

The output voltage is set by a resistive voltage divider from the output voltage to FB. The output voltage is:

$$V_{out} = 1.25 \times \frac{R1 + R2}{R1}$$



Maximum Output Power

The maximum output power is directly related to the heat dissipation. In the general environment, the maximum output power is 13W for 5V output, and the output power can be further improved by optimizing the cooling environment of the system. Fast charging 9V, 12V output higher efficiency heating, output power can be higher.

Loop Stability

When the system has higher requirements for the stability of the constant voltage loop, it is recommended to connect a 0.1uF feed-forward capacitor between FB and Vout, so that the stability of the constant voltage loop can be obviously improved. When applying constant current loop, please adjust the CC capacitance between the 7 and 8 pins in the 1~4nF range to ensure the constant current loop stability.

System Design

When the constant voltage loop is applied, the CS pin can be short circuited with GND, and the CS resistance is eliminated. Over current protection and over temperature protection can ensure that the chip will not damage under abnormal conditions such as overcurrent and short circuit. The 105 capacitance of the input and output terminal is

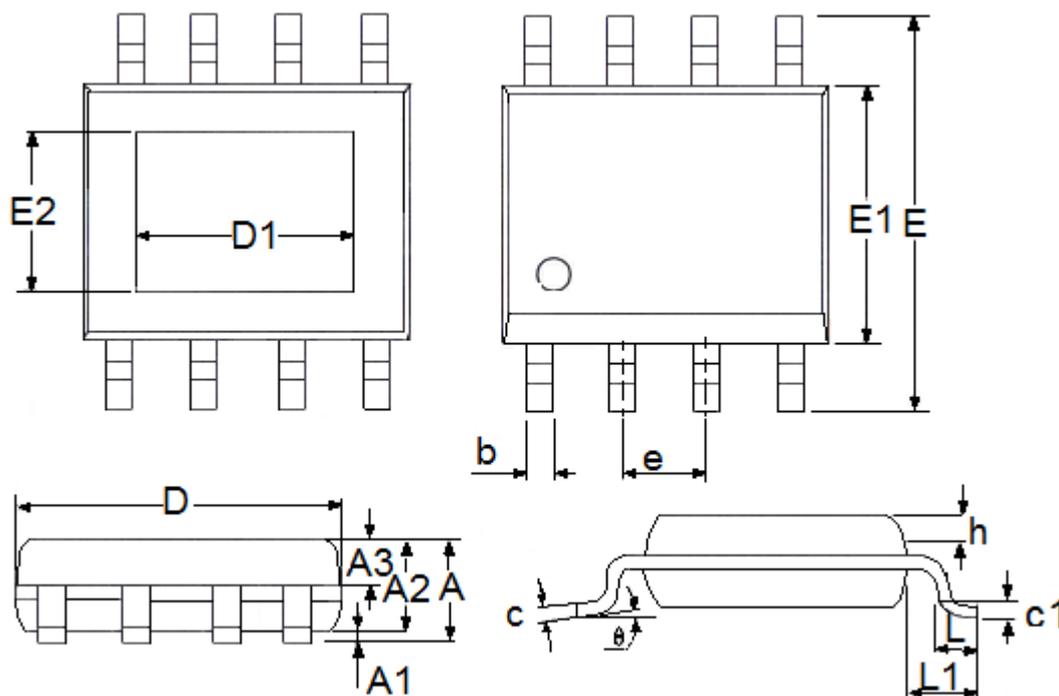
used to filter the high frequency peak interference on the circuit, which should not be omitted. In large current, if the selection of inductance is too small, the ripple increases and the efficiency is reduced. The 3A current is recommended to select the inductance of 47uH and line diameter 0.5mm.

PCB Layout

The power traces, consisting of the GND trace, the SW trace and the VIN trace should be kept short, direct and wide. SW should be wide and short trace to reduce EMI. Place CIN near VCC pin as closely as possible to maintain input voltage steady and filter out the pulsing input current. The FB resistor must be connected to FB pin directly as closely as possible. FB is a sensitive node. Please keep it away from SW. ME3148, inductor and Schottky diode as the main heating device, pay attention to the uniform distribution of PCB heat to avoid local temperature rise.

Packaging Information

- Packaging Type: ESOP8



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.3	1.75	0.0512	0.0689
A1	0	0.2	0.0000	0.0079
A2	1.25	1.65	0.0492	0.0650
A3	0.5	0.7	0.0197	0.0276
b	0.33	0.51	0.0130	0.0201
c	0.17	0.25	0.0067	0.0098
D	4.7	5.1	0.1850	0.2008
E	5.8	6.2	0.2283	0.2441
E1	3.8	4	0.1496	0.1575
e	1.27(TYP)		0.05(TYP)	
h	0.25	0.5	0.0098	0.0197
L	0.4	1.27	0.0157	0.0500
L1	1.04(TYP)		0.0409(TYP)	
theta	0	8°	0.0000	8°
c1	0.25(TYP)		0.0098(TYP)	
D1	3.1(TYP)		0.122(TYP)	
E2	2.21(TYP)		0.087(TYP)	

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