



## 1A Step-Up Current Mode PWM Converter ME2159

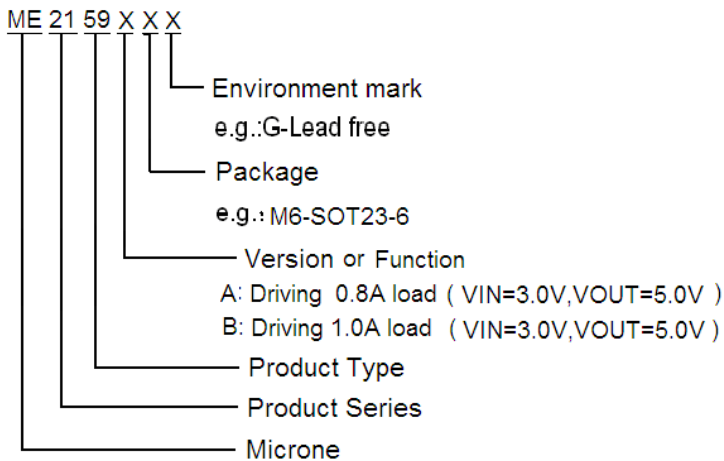
### General Description

The ME2159 is a current mode boost DC-DC converter. Its PWM circuitry with built-in 0.18Ω power MOSFET make this regulator highly power efficient. The internal compensation network also minimizes as much as 6 external component counts. The non-inverting input of error amplifier connects to a 0.6V precision reference voltage and internal soft-start function can reduce the inrush current.

### Features

- Precision Feedback Reference Voltage: 0.6V
- Reference Voltage accuracy:  $\pm 2\%$
- Adjustable Output up to 12V
- Internal Fixed PWM frequency: 650KHz
- Internal 0.18Ω ,2A, 16V Power MOSFET
- Shutdown Current: 0.1μA
- Over Temperature Protection: 165°C
- Package: SOT23-6

### Selection Guide

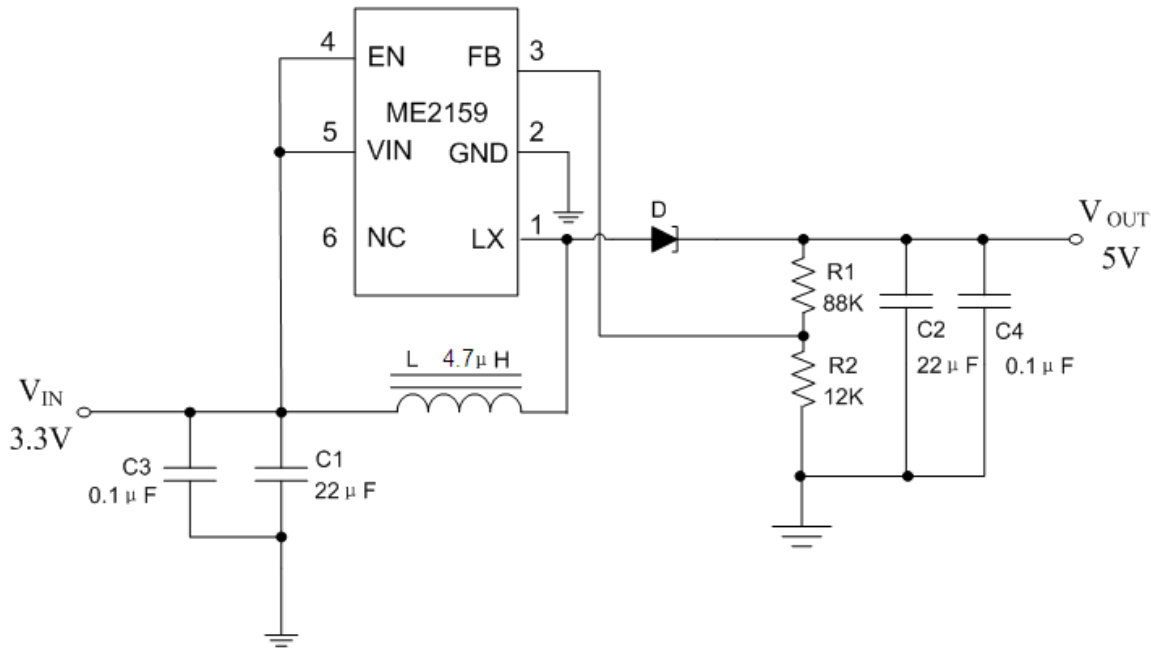


### Applications

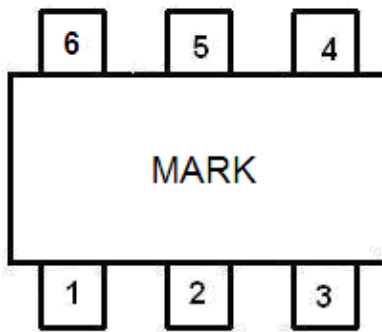
- Chargers
- LCD Displays
- Digital Cameras
- Handheld Devices
- Portable Products



### Typical Application



### Pin Configuration



SOT23-6

### Pin information

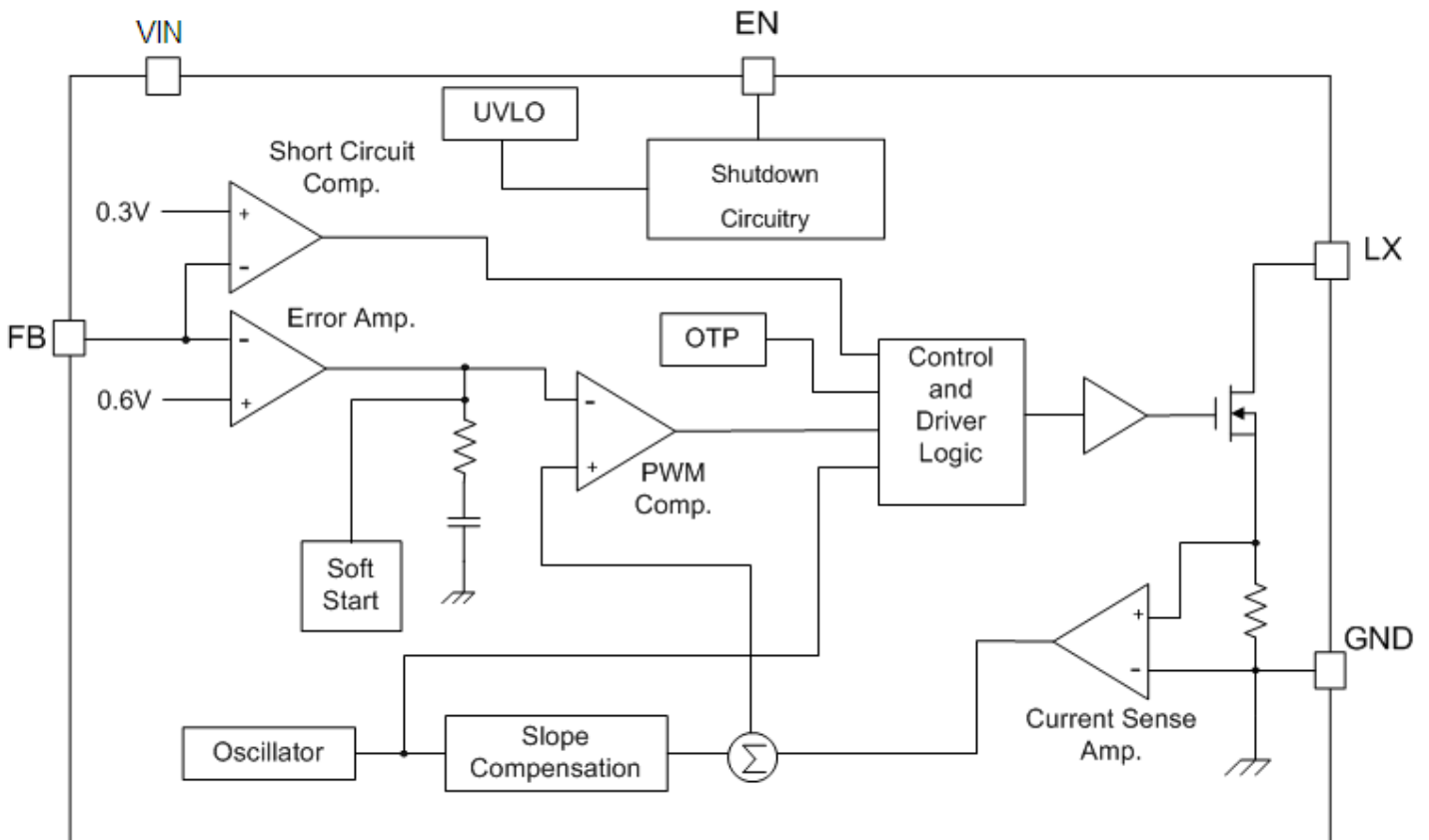
Pin Number	Name	Function
1	LX	Power Switch Output
2	GND	Ground
3	FB	Feedback
4	EN	Chip Enable(Active High)
5	VIN	Power Supply
6	NC	NC



### Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit	
Power supply voltage, $V_{IN}$	$V_{IN}$	-0.3~6.0	V	
voltage at EN、FB Pin	$V_{EN}, V_{FB}$	-0.3~ $V_{IN}$	V	
voltage at SW Pin	$V_{LX}$	-0.3~12	V	
LX Pin Current	$I_{LX}$	ME2159AM6G	1850 ( $V_{IN}=3.0V, V_{OUT}=5.0V$ )	mA
		ME2159BM6G	2200 ( $V_{IN}=3.0V, V_{OUT}=5.0V$ )	mA
Internal Power Dissipation, (SOT23-6)	$P_D$	300	mW	
Operating Ambient Temperature	$T_{opr}$	-40~85	°C	
Storage Temperature	$T_{stg}$	-40~+150	°C	
Soldering temperature and time	$T_{solder}$	260°C, 10S	°C	

### Block Diagram





## Electrical Characteristics

( $V_{IN} = V_{EN}=3.3V$ ,  $V_{OUT}=5V$ ,  $C1= C2= 22\mu F$ ,  $L=4.7\mu H$ ,  $T_A =25^\circ C$ , unless otherwise noted.)

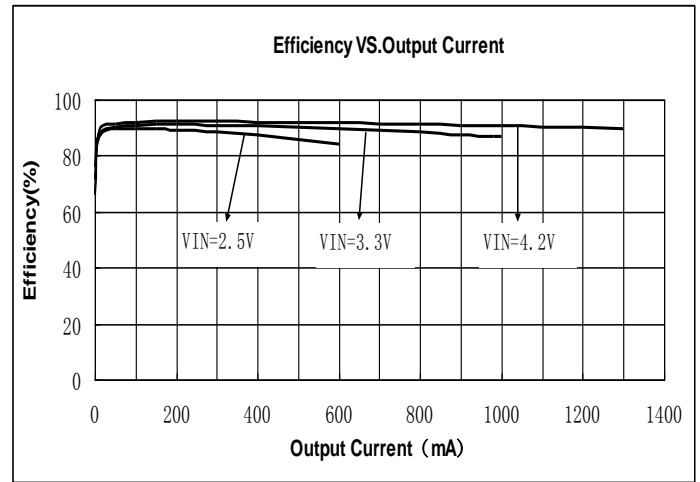
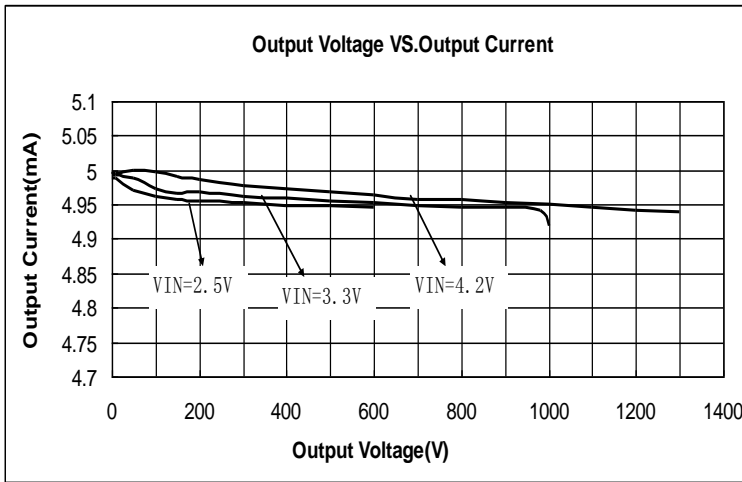
Parameter	Symbol	Test condition	Min	Typ.	Max	Unit
<b>System Supply Input</b>						
Input voltage range	$V_{IN}$		2.5	-	5.5	V
Under Voltage Lockout	$V_{UVLO}$			2.15		V
UVLO Hysteresis				0.08		V
Average Supply Current	$I_{SS1}$	$V_{FB}=0.55V$ , Switching		0.8	1.5	mA
Quiescent Current	$I_{SS2}$	$V_{FB}=0.66V$ , No Switching		280		$\mu A$
Shutdown Supply Current	$I_{SS3}$	$V_{EN}=GND$		0.1	5	$\mu A$
<b>Oscillator</b>						
Operation Frequency	$F_{OSC}$	$V_{FB}=1.0V$	0.5	0.65	0.8	MHz
Maximum Duty Cycle	$D_{MAX}$			90		%
Minimum Duty Cycle	$D_{MIN}$			22		%
<b>Reference Voltage</b>						
Reference Voltage	$V_{FB}$		0.588	0.6	0.612	V
Line Regulation		$V_{IN}=2.6V$ to 4.3V		0.03		%/V
<b>Enable Control</b>						
Enable Voltage	$V_{EN}$		1.5			V
Shutdown Voltage	$V_{EN}$		-		0.6	V
<b>MOSFET</b>						
On Resistance of Driver	$R_{DS(ON)}$	$I_{LX}=2A$		0.18		$\Omega$
<b>Protection</b>						
OCP Current	ME2159A	$I_{OCP}$		1.85		A
	ME2159B	$I_{OCP}$		2.2		A
Over Temperature Protection	OTP		-	165	-	$^\circ C$
OTP Hysteresis	OTH		-	25	-	$^\circ C$



### Typical Performance Characteristics (ME2159AM6G)

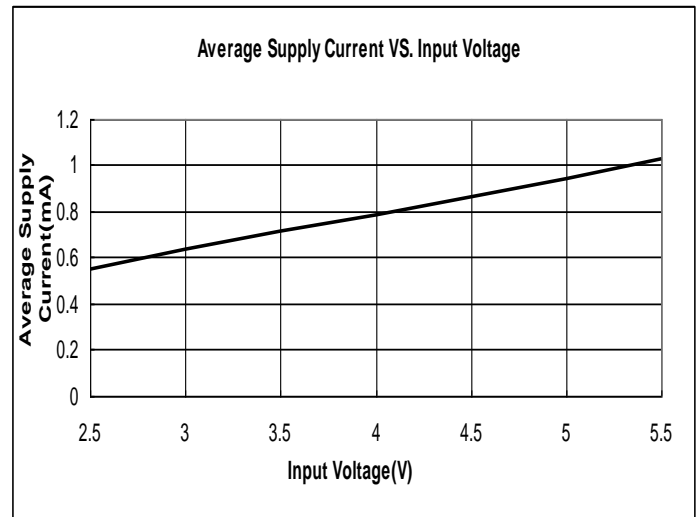
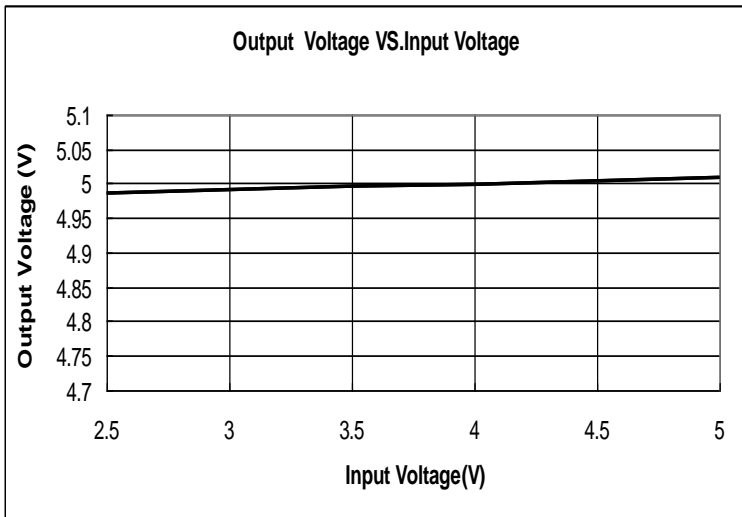
#### 1、Output Voltage VS. Output Current (Vout =5.0V)

#### 2、Efficiency VS. Output Current (Vout=5.0V)



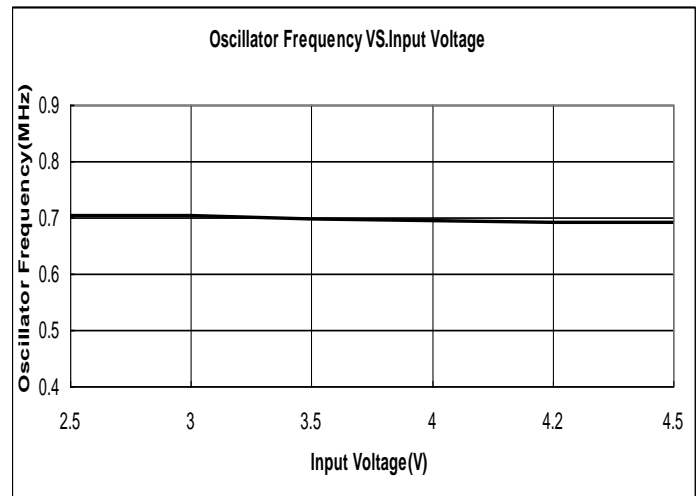
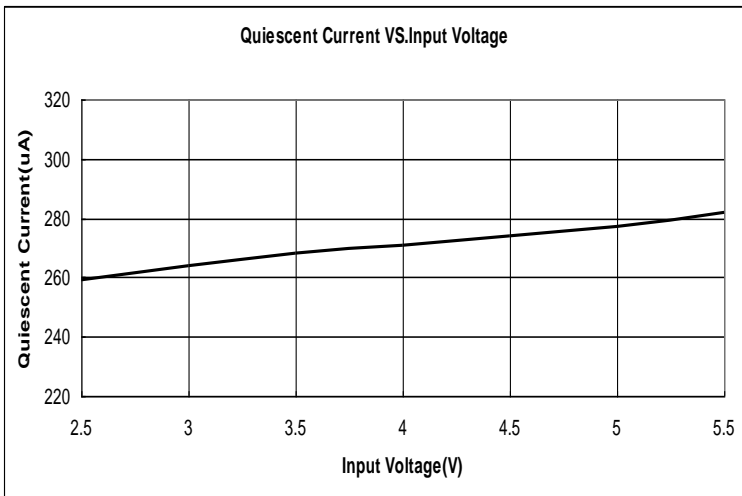
#### 3、V<sub>OUT</sub> VS. Input Voltage (I<sub>OUT</sub>=10mA)

#### 4、I<sub>SS1</sub> VS. Input Voltage



#### 5、ISS2 VS. Input Voltage

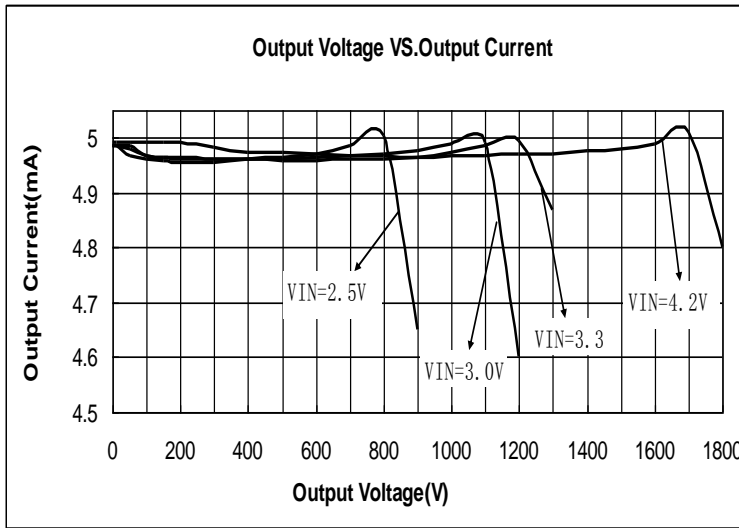
#### 6、Oscillator Frequency VS. Input Voltage



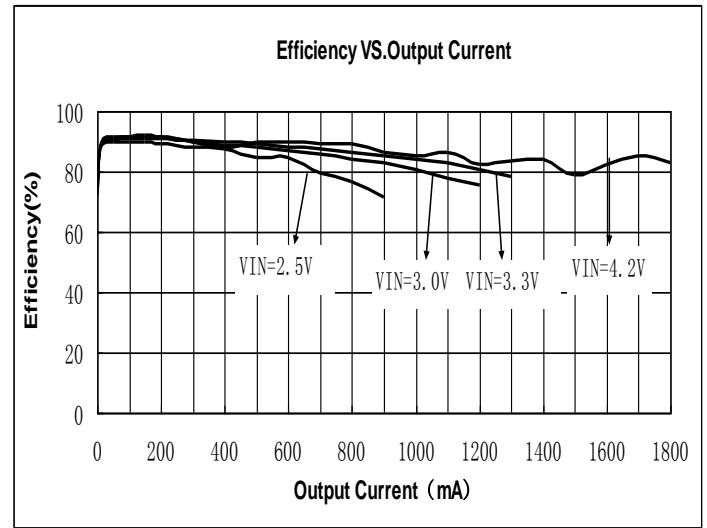


### Typical Performance Characteristics (ME2159BM6G)

#### 7、Output Voltage VS. Output Current (Vout =5.0V)



#### 8、Efficiency VS. Output Current (Vout=5.0V)



## Function Description

### Operation

The ME2159 is a current mode boost converter. The constant switching frequency is 1MHz and operates with pulse width modulation (PWM). Build-in 16V / 2A MOSFET provides a high output voltage. The control loop architecture is peak current mode control; therefore slope compensation circuit is added to the current signal to allow stable operation for duty cycles larger than 50%.

### Soft Start Function

Soft start circuitry is integrated into ME2159 to avoid inrush current during power on. After the IC is enabled, the output of error amplifier is clamped by the internal soft-start function, which causes PWM pulse width increasing slowly and thus reducing input surge current.

### Over Temperature Protection (OTP)

The ME2159 will turn off the power MOSFET automatically when the internal junction temperature is over 150° C. The power MOSFET wake up when the junction temperature drops 30° C under the OTP threshold temperature.

### Output Disconnect

When power on and the EN pin will be pulled high. The ME2159 start up and operates. The external PMOS is turned on and current through it for output loading. While output loading is increase, output voltage is drop. When the FB pin voltage is under 0.3V, the EN pin sinks 20μA current, the external PMOS will be turn off. The output short condition will be disconnected.

---

## Application Information

### Inductor Selection

Inductance value is decided based on different condition. 3.3uH to 4.7μH inductor value is recommended for general application circuit. There are three important inductor specifications, DC resistance, saturation current and core loss. Low DC resistance has better power efficiency. Also, it avoids inductor saturation which will cause circuit system unstable and lower core loss at 1MHz.

### Capacitor Selection

The output capacitor is required to maintain the DC voltage. Low ESR capacitors are preferred to reduce the output voltage ripple. Ceramic capacitor of X5R and X7R are recommended, which have low equivalent series resistance (ESR) and wider operation temperature range.

### Diode Selection

Schottky diodes with fast recovery times and low forward voltages are recommended. Ensure the diode average and peak current rating exceed the average output current and peak inductor current. In addition, the diode's reverse breakdown voltage must exceed the output voltage.

### Output Voltage Programming

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

$$V_{OUT} = 0.6 \times \left( 1 + \frac{R_1}{R_2} \right)$$

### PCB Layout Check List

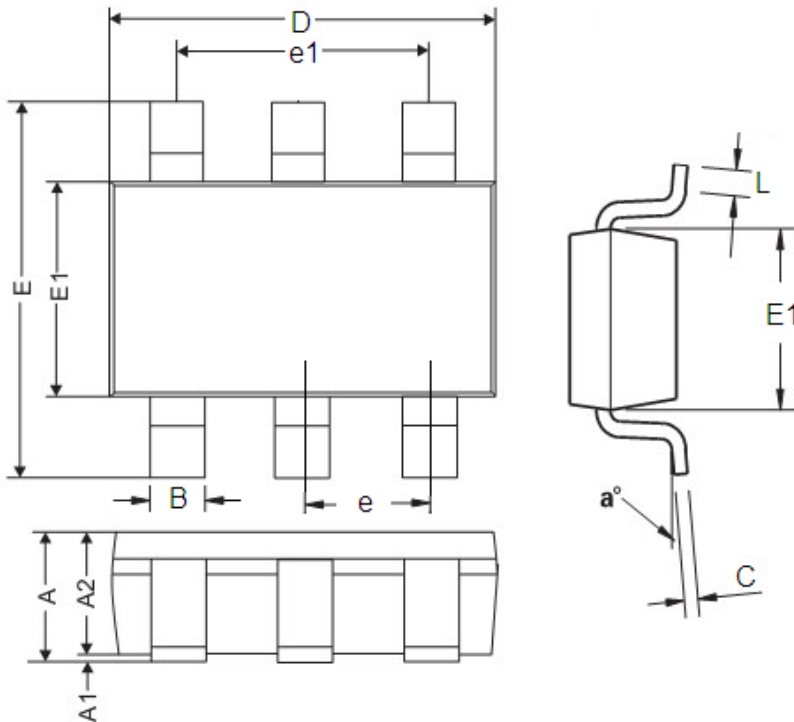
When laying out the printed circuit board, the following checklist should be used to ensure proper operation of the ME2159.

1. The power traces, consisting of the GND trace, the SW trace and the  $V_{IN}$  trace should be kept short, direct and wide.
2. LX、L and D switching node, wide and short trace to reduce EMI.
3. Place CIN near VCC pin as closely as possible to maintain input voltage steady and filter out the pulsing input current.
4. The resistive divider R1 and R2 must be connected to FB pin directly as closely as possible. the internal power MOSFETs.
5. FB is a sensitive node. Please keep it away from switching node, LX.
6. The GND of the IC, CIN and COUT should be connected close together directly to a ground plane.



### Package Information

Package type:SOT23-6 Unit:mm(inch)



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.9	1.45	0.0354	0.0570
A1	0	0.15	0	0.0059
A2	0.9	1.3	0.0354	0.0511
B	0.2	0.5	0.0078	0.0196
C	0.09	0.26	0.0035	0.0102
D	2.7	3.10	0.1062	0.1220
E	2.2	3.2	0.0866	0.1181
E1	1.30	1.80	0.0511	0.0708
e	0.95REF		0.0374REF	
e1	1.90REF		0.0748REF	
L	0.10	0.60	0.0039	0.0236
a <sup>0</sup>	0 <sup>0</sup>	30 <sup>0</sup>	0 <sup>0</sup>	30 <sup>0</sup>



- The information described herein is subject to change without notice.
- Nanjing Micro One Electronics Inc is not responsible for any problems caused by circuits or diagrams described herein whose related industrial properties, patents, or other rights belong to third parties. The application circuit examples explain typical applications of the products, and do not guarantee the success of any specific mass-production design.
- Use of the information described herein for other purposes and/or reproduction or copying without the express permission of Nanjing Micro One Electronics Inc is strictly prohibited.
- The products described herein cannot be used as part of any device or equipment affecting the human body, such as exercise equipment, medical equipment, security systems, gas equipment, or any apparatus installed in airplanes and other vehicles, without prior written permission of Nanjing Micro One Electronics Inc.
- Although Nanjing Micro One Electronics Inc exerts the greatest possible effort to ensure high quality and reliability, the failure or malfunction of semiconductor products may occur. The user of these products should therefore give thorough consideration to safety design, including redundancy, fire-prevention measures, and malfunction prevention, to prevent any accidents, fires, or community damage that may ensue.