

### Features

- 2V to 24V Input Voltage
- Up to 24V Output Voltage
- Integrated 80mΩ Power MOSFET
- 1.4MHz Fixed Switching Frequency
- Internal 3.5A Switch Current Limit
- Internal Compensation
- Thermal Shutdown
- Output Adjustable from 0.6V
- Available in a 6-pin SOT-23 package

### Applications

- Digital Set-top Box (STB)
- Tablet Personal Computer (Pad)
- LCD Bias Supply
- Battery-Powered Equipment
- Portable Media Player (PMP)
- General Purposes

### General Description

The HE9810 is a constant frequency, current mode step-up converter intended for small, low power applications. The HE9810 switches at 1.4MHz and allows the use of tiny, low cost capacitors and inductors 2mm or less in height. Internal soft-start results in small

inrush current and extends battery life.

The HE9810 includes under-voltage lockout, current limiting, and thermal overload protection to prevent damage in the event of an output overload. The HE9810 is available in a small 6-pin SOT-23 package.

### Typical Application

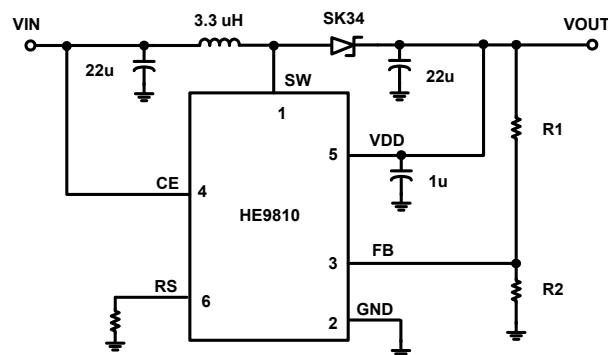


Figure. Basic Application Circuit

$$V_{OUT} = V_{FB} \times \left(1 + \frac{R1}{R2}\right)$$

注：芯片 5 脚 VDD 端可以接 VOUT 也可以接 VIN，当 VIN<5V 时，建议接 VOUT 来增强驱动能力。

### Functional Block Diagram

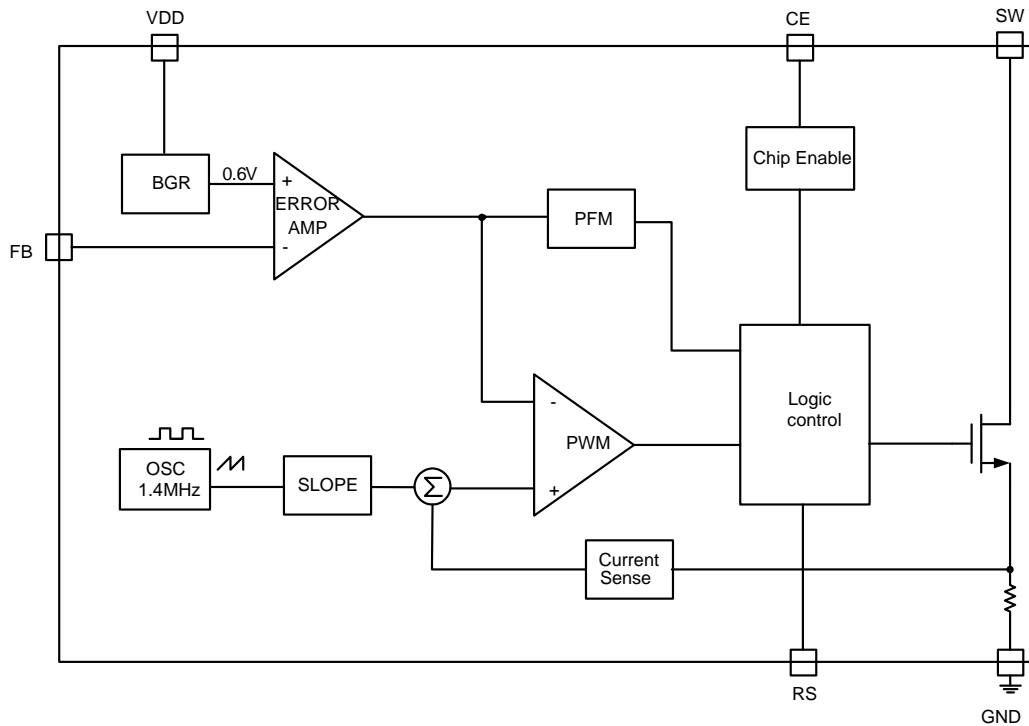
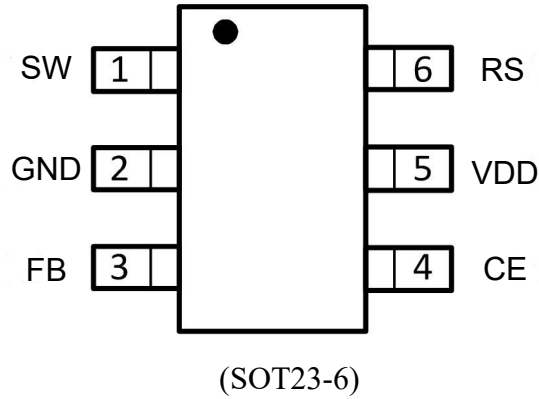


Figure 1. HE9810 Block Diagram

### Pin Description

PIN	NAME	FUNCTION
1	SW	Power Switch Output. SW is the drain of the internal MOSFET switch. Connect the power inductor and output rectifier to SW. SW can swing between GND and 24V.
2	GND	Ground Pin
3	FB	Feedback Input. The FB voltage is 0.6V. Connect a resistor divider to FB.
4	CE	Regulator On/Off Control Input. A high input at CE turns on the converter, and a low input turns it off. When not used, connect EN to the input supply for automatic startup.
5	VDD	Input Supply Pin. Must be locally bypassed.
6	RS	Limiting Resistor

### Package/order Information



### Absolute Maximum Ratings (Note 1)

PARAMETER	ABSOLUTE MAXIMUM RATINGS	UNIT
$V_{IN}, V_{EN}$	-0.3 to 24	V
$V_{SW}$	-0.3 to 24	V
All Other Pins	-0.3 to 6	V
Continuous Power Dissipation( $T_A=+25^{\circ}\text{C}$ )	0.6	W
Junction Temperature	150	$^{\circ}\text{C}$
Operating Temperature Range	-40 to 85	
Lead Temperature	260	$^{\circ}\text{C}$
Storage Temperature	-65 to 150	$^{\circ}\text{C}$
Thermal Resistance $\theta_{JA}$	250	$^{\circ}\text{C}/\text{W}$
Thermal Resistance $\theta_{JC}$	130	$^{\circ}\text{C}/\text{W}$

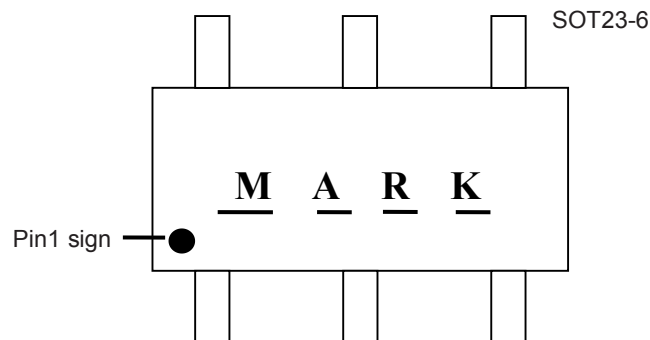
### Recommended Operating Conditions

PARAMETER	RECOMMENDED	UNIT
Supply Voltage $V_{IN}$	2 to 24	V
Output Voltage $V_{OUT}$	$V_{IN}$ to 24	V
Operating Junction Temp.( $T_J$ )	-40 to 125	$^{\circ}\text{C}$

### Electrical Characteristics (Note 3)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current(Shutdown)	$I_{IN}$	$V_{EN}=0V$		0.1	1	$\mu A$
Quiescent Current (PFM)		$V_{FB}=0.7V$ ,No switch		50	100	$\mu A$
Quiescent Current (PWM)		$V_{FB}=0.5V$ ,switch		0.2	0.4	mA
SW Leakage		$V_{SW} = 20V$			1	$\mu A$
SW On Resistance				80	150	m $\Omega$
Operating Input Voltage			2		24	V
Current Limit	$I_{LIMIT}$	$V_{IN}= 5V$ ,Duty cycle=50%		3.5		A
Oscillator Frequency	$f_{SW}$	$V_{FB}=0.75V$		1.4		MHz
Maximum Duty Cycle	$D_{MAX}$	$V_{FB}=0.7V$		90		%
Feedback Voltage	$V_{FB}$		588	600	612	mV
FB Input Bias Current		$V_{FB}=0.6V$	-50	-10		nA
EN Threshold	$V_{EN}$			1		V
Thermal Shutdown				160		$^{\circ}C$

### Marking Information

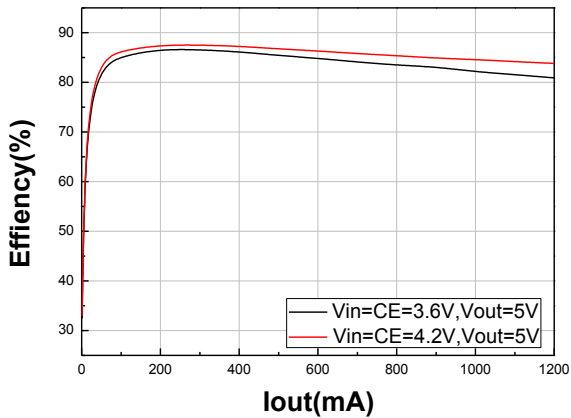


The major marks: **LOT NO.**

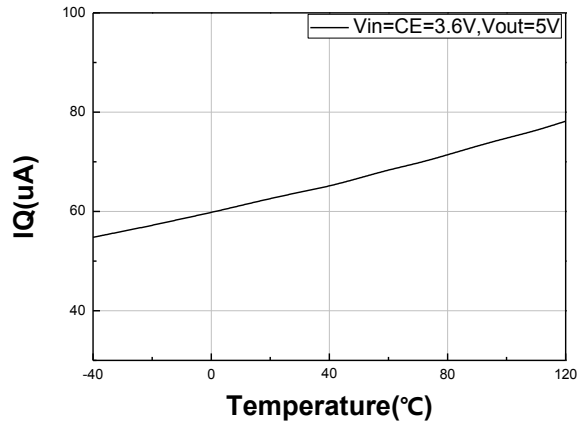
**Remark** If there are other requirements, please contact our sales office.

### Typical Performance Characteristics

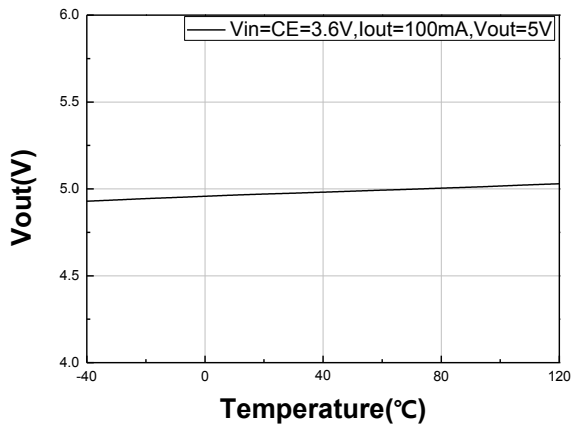
#### 1、Efficiency



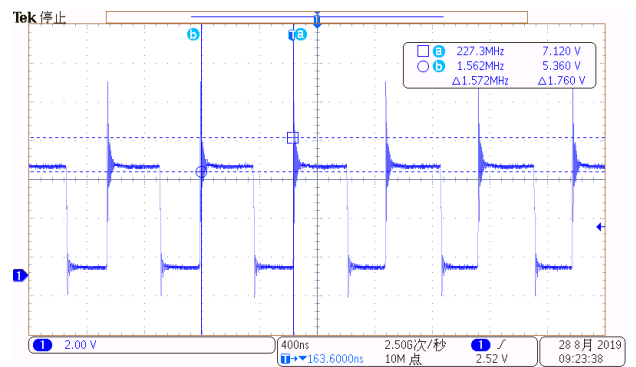
#### 2、IQ VS Temperature



#### 3、Vout Temperature

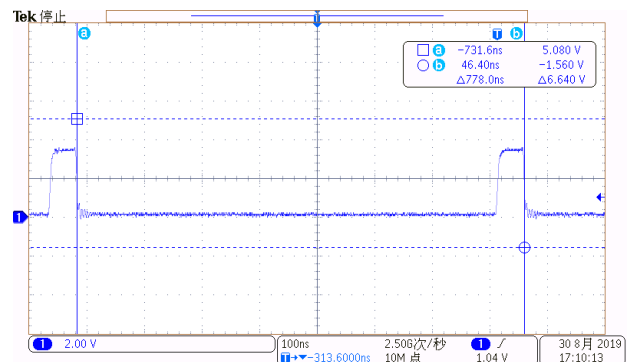


#### 4、Oscillation frequency



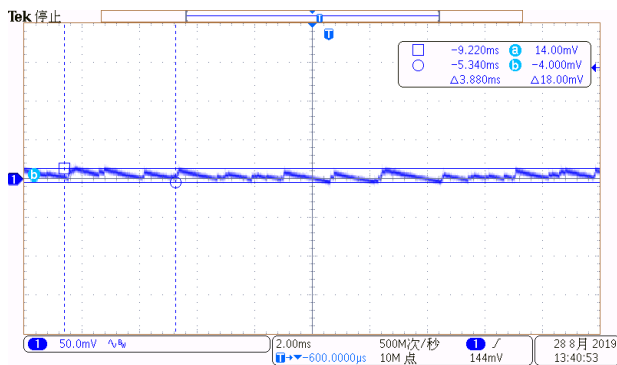
#### 5、Maximum duty cycle of oscillation waveform

VIN=CE=3.6V IOUT=1.2A VOUT=5V

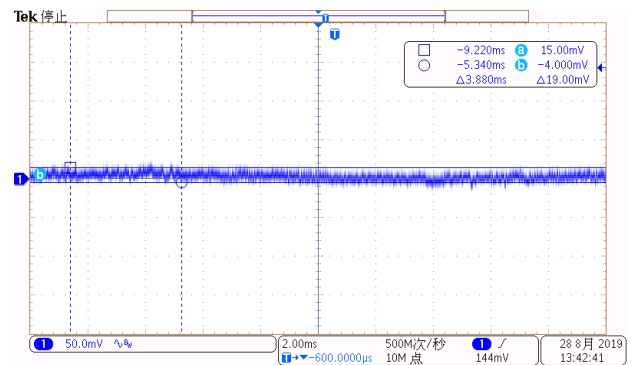


### 6、Output Voltage Ripple

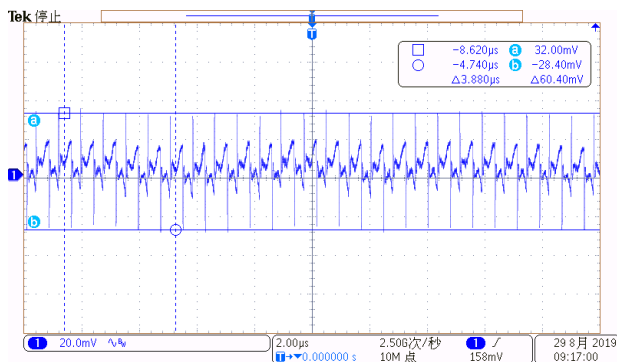
(1) VIN=CE=3.6V , IOU=0mA



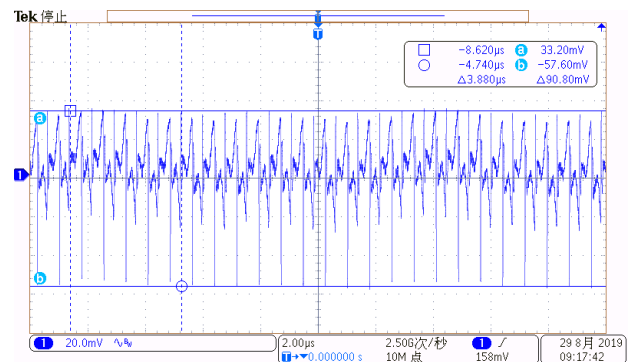
(2) VIN=CE=3.6V , IOU=10mA



(3) VIN=CE=3.6V , IOU=600mA

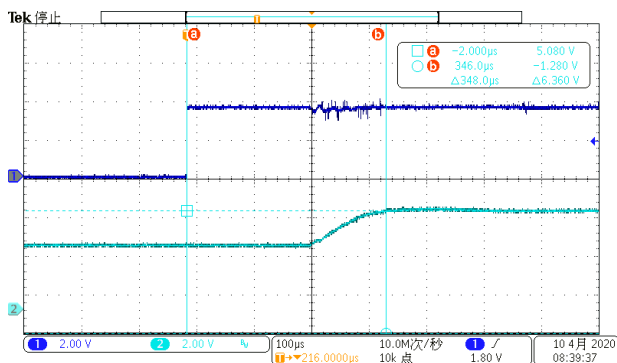


(4) VIN=CE=3.6V , IOU=1200mA



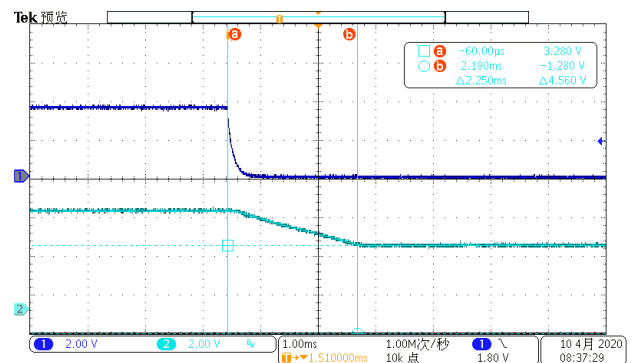
### 7、CE on waveform

VIN=3.6V, CE=3.6V IOU=10mA



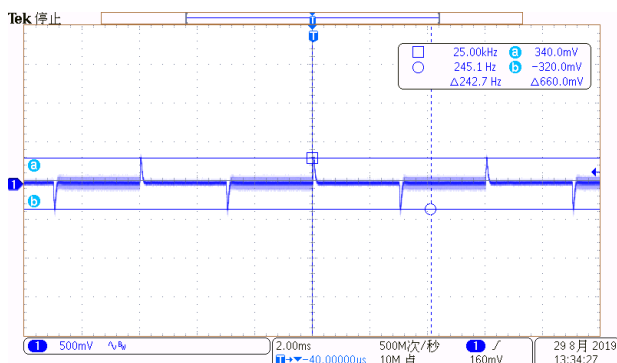
### 8、CE off waveform

VIN=3.6V, CE=3.6V IOU=10mA

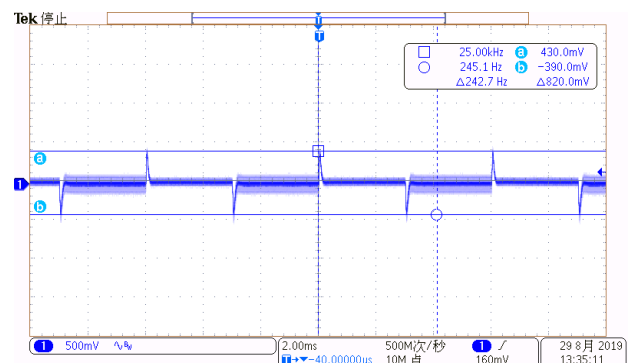


### 9、Load transient response

(1) VIN=CE=3.6V, IOU=300-900-300mA



(2) VIN=CE=3.6V, IOU=600-1200-600mA



### Application information

- **Output Voltage Set**

Through the external resistance voltage division of FB, the output voltage value can be calculated according to the following formula;

$$V_{OUT} = V_{FB} \times \left( 1 + \frac{R1}{R2} \right), \text{ for example: } R2 = 100K, R1 = 1.4M, V_{FB} = 0.6V, \text{ then } V_{out} = 9V$$

- **RS set**

Connecting a resistor between RS to GND, this sets the max input current value ILMT, the ILMT can be calculated according to the following formula:

RS=25(K)/ILMT(A). for example: RS=25K, ILMT=1A.

Input average current  $I_{IN}$  can be calculated by  $I_{IN} = ILMT - \frac{V_{IN}}{2 \times L \times FS} \times \frac{V_{OUT} - V_{IN}}{V_{OUT}}$ .

For example: VIN=5V, VOUT=9V, RS=25K, L=3.3uH, FS=1.4MHz, then ILMT=1A,  $I_{IN}$ =0.76A.

RS pin should connect to GND if not used, suspending is not allowed.

RS pin contains internal regulator to stabilize RS voltage.

- **Inductance selection**

It is recommended to choose 3.3uH to 22uH for the range of inductance value. The selection of inductance mainly considers the smaller DCR resistance to ensure the higher efficiency.

- **Input and output capacitance**

It is recommended to use more than 22uF for input capacitance and output capacitance. In order to get smaller output ripple, it is recommended to use ceramic capacitance for output. The 5-pin terminal needs 1uF capacitor for voltage stabilization. It is recommended to use ceramic capacitor.

- **Diode**

Use fast response Schottky diode for continuous current diode. The lower the forward voltage drop, the higher the load efficiency. For different output voltage, the reverse withstand voltage of the continuous current diode should be high enough (> Vout + 5V) to prevent reverse leakage or breakdown.

- **PCB layout**

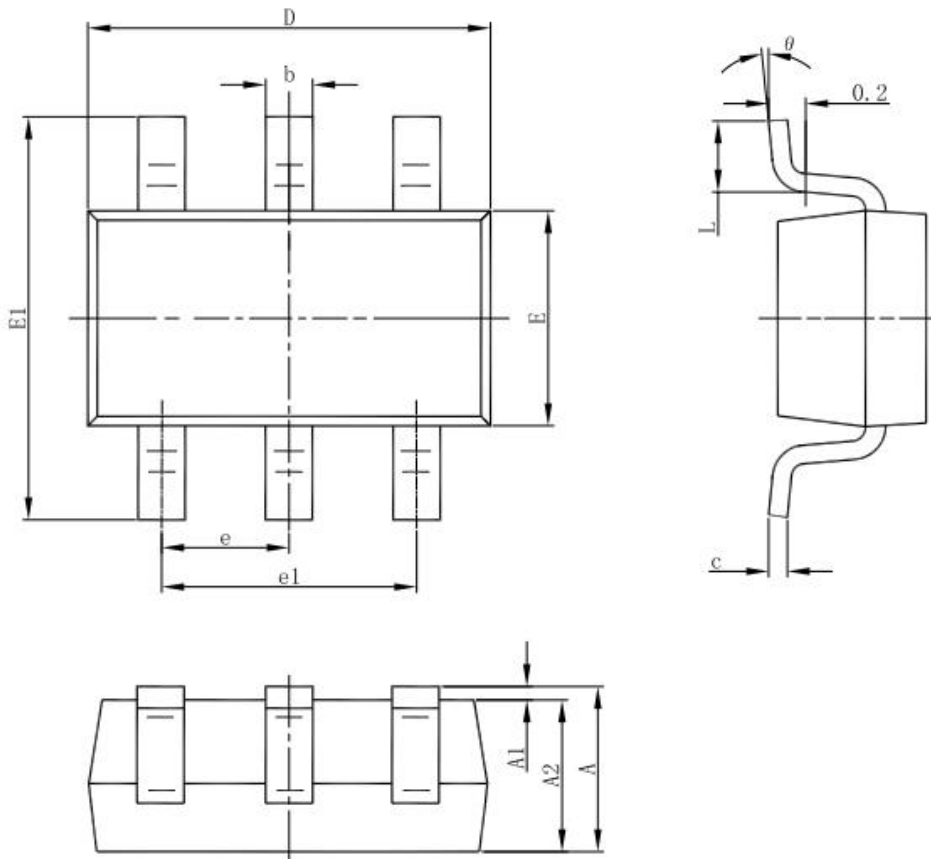
In order to get better use effect, the main precautions for PCB layout are as follows:

Input capacitance and output capacitance shall be close to chip pin as much as possible;

The power path from VIN to inductance L to Vout shall be as short and thick as possible;

The SW pin has high-frequency switch signal. Pay attention to the isolation from other components on the board.

**Package Description**  
**6-pin SOT23-6 Outline Dimensions**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°