

SM2082B

Features

- Patented constant current control technology
- Output current adjustable with range 5mA~60mA
- Inter-chip output current deviation $\leq \pm 4\%$
- Over temperature protection
- Sharing PCB board with LED lamps
- Excellence EMI performance
- Simple circuit and low cost
- Package: ESOP8、TO252-2

Applications

- ◆ T5/T8 LED tubes;
- ◆ LED street lighting;
- ◆ LED bulb lamp, LED ceiling lamp;

General Description

SM2082B is a single channel LED constant current driver which integrates patented constant current setting and control technology. The output current designed by external REXT is 5mA~60mA and it is invariant to OUT output voltage change, which has better constant current performance. It is a low cost circuit with simple circuit and less external components.

Pin Figure

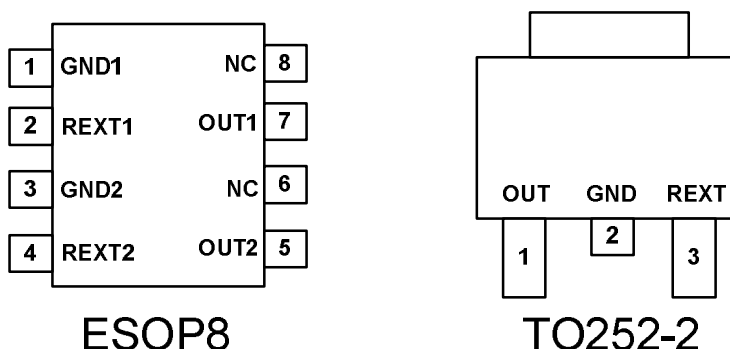


Diagram 1. SM2082B Each Package Pin Diagram

Pin	Pin Function
OUT	Power input and constant current output
GND	GND
REXT	Output current setting port

Typical Schematic Circuit Diagram

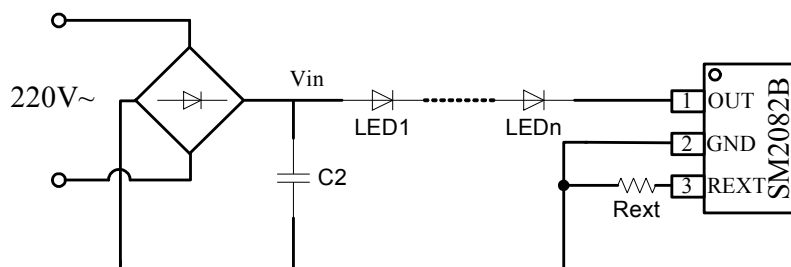


Diagram 2. SM2082B Typical Application Circuit

In diagram 2, the power can be AC or DC.

Limiting Values

The ambient temperature is 25°C if there is no special instruction.

Characteristic Parameters	Symbol	Range
Output voltage	VOUT	-0.5V ~ +250V
Output current	IOUT	1mA ~ 60mA
Operating current	TOPT	-40°C ~ +120°C
Storage temperature	TSTG	-50°C ~ +150°C
ESD withstand voltage	VESD	2KV

Thermal Resistance Parameters

Symbol	Explanation	ESOP8	TO252-2	Unit
R _{THJA}	Thermal resistance (1)*	89.2	74.9	°C/W

Note(1)*: The chip should be mounted on PCB board with 200mm² copper (35um thick) to dissipate heat.

Electrical Operating Parameters

The ambient temperature is 25°C if there is no special instruction.

Parameters	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	VOUT_MIN	IOUT = 30mA	-	-	6.5	V
Output withstand voltage	VOUT_BV	IOUT = 0	250	-	-	V
Output current	IOUT	-----	5	-	60	mA
Static current	IDD	VOUT = 10V, REXT no connection	-	0.16	0.25	mA
REXT output voltage	VREXT	VOUT = 10V	-	0.6	-	V
I _{OUT} deviation	d _{IOUT}	IOUT = 20mA	-	±4	-	%
Over-temperature Protection point(2)*	TSC	-	-	110	-	°C

Note(2)*:When the junction temperature is over 110 °C, the output current of SM2082B will be reduced.

Output Current Characteristics

SM2082B output current formula :
$$I_{OUT} = \frac{V_{REXT}}{r_{ext}} = \frac{0.6V}{r_{ext}(\Omega)} (A)$$

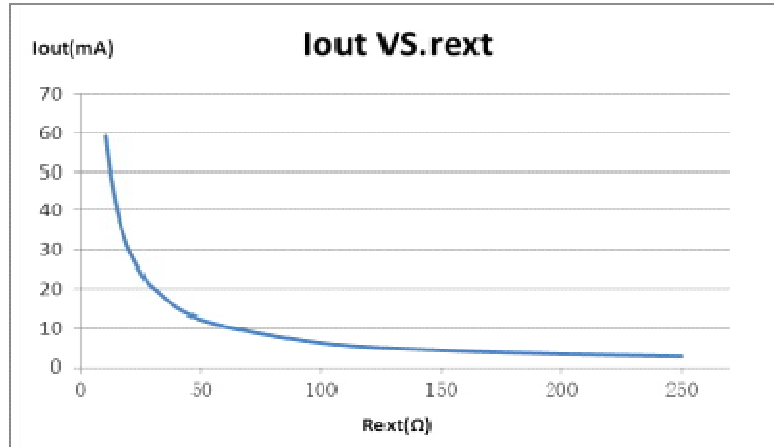


Diagram 3. SM2082B The Relationship between Output Current and REXT

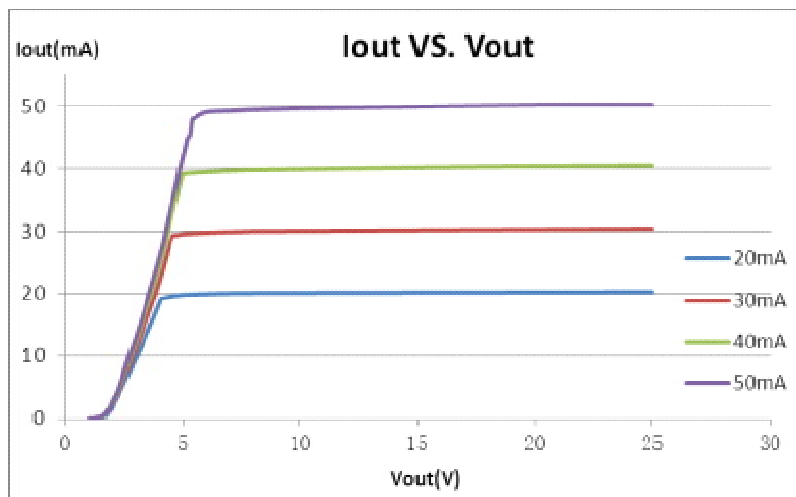


Diagram 4. SM2082B Constant Current Graph

Diagram 4 SM2082B constant current graph represents the lowest output voltage (V_{OUT_MIN} : $I_{OUT} = 20mA$, $V_{OUT_MIN} = 4.1V$, $I_{OUT} = 30mA$, $V_{OUT_MIN} = 4.6V$; $I_{OUT} = 40mA$, $V_{OUT_MIN} = 5.0V$; $I_{OUT} = 50mA$, $V_{OUT_MIN} = 5.5V$) in normal temperature.

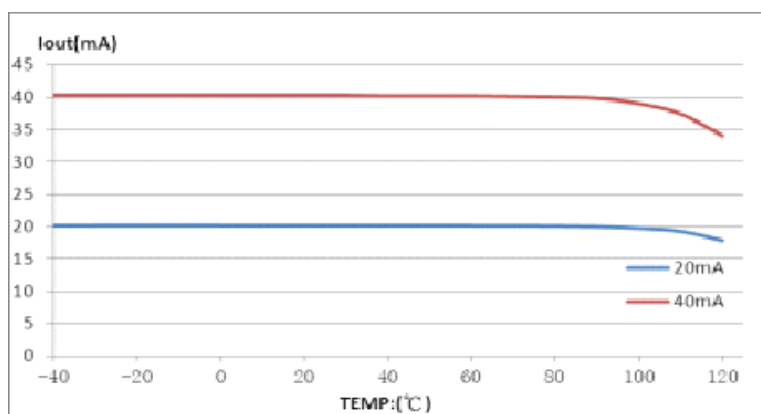


Diagram 5. SM2082B Output Current Temperature Characteristics (I_{OUT} = 20mA 和 40mA)

Temperature Compensation

High temperature inside the LED lamps will cause serious LED light decay, which deduces LED service life. Temperature compensation of SM2082 helps to decrease output current automatically when the inside temperature is more than 110 °C. Therefore, temperature inside lamps can be reduced.

System Design

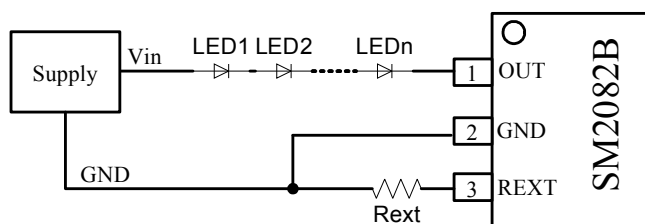


Diagram 6. 82B Application Circuit

◆ Efficiency Design

Diagram 6 below shows the application circuit efficiency formula:

$$\eta = \frac{P_{LED}}{P_{IN}} = \frac{n * V_{LED} * I_{LED}}{V_{IN} * I_{LED}} = \frac{n * V_{LED}}{V_{IN}}$$

V_{in} is system input power voltage. V_{LED} is single LED drop voltage. I_{LED} is LED current. It is can be seen that larger quantities of series LED in system brings higher efficiency.

In system design, SM2082B output operating voltage is based on application environment so that it optimizes N value.

◆ LED Series Number Design

Designing LED series number in the system should consider two aspects below:

In diagram 6, output voltage is V_{OUT} = V_{in} - n*V_{LED}.

- (1) To ensure the normal operation, output voltage should be $V_{OUT} > V_{OUT_MIN}$;
- (2) Lower output voltage brings higher system efficiency.

Basing on the two points above, SM2082 output voltage range is $V_{OUT_MIN} \sim V_{OUT_MAX}$ and LED series

number formula is:
$$\frac{V_{in} - V_{OUT_MAX}}{V_{LED}} < n < \frac{V_{in} - V_{OUT_MIN}}{V_{LED}}$$

Typical Application Circuit

◆ AC Power Input

Diagram 7 shows AC power application circuit for SM2082B. The LED lights inside LED tubes can be designed into series connection, parallel connection or the combination of the two. C1 is high voltage ceramic capacitors to reduce Vin voltage and C2 electrolytic capacitors to reduce Vin voltage ripple. Rext is designed to set LED current.

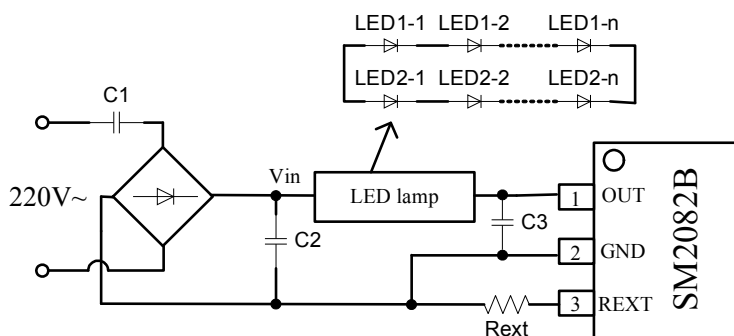


Diagram 7. SM2082B Typical Application Circuit – AC Power Input

The ceramic capacitor C1 is based on AC power and the number of LED series in tubes (0uF ~ 4.7uF). There is no need to use C1 capacitor when the quantity of LED cascade is enough.

The larger capacitance C2 produces smaller voltage ripple to Vin, and keeps small ripple to SM2082 output voltage. C2 capacitance depends on total operating current from LED tubes: the more current generates the more C2 capacitance (usually 4.7uF/400V~22uF/400V). The formula is shown below :

$$C_2 \text{ capacitance of filter capacitor} : C_2 = \frac{I_{LED} * t}{\Delta V}$$

In the formula, I_{LED} is the constant current in the circuit, and time "t" (50Hz) = $(1/4) * (1/f_{AC}) = 5ms$. ΔV is output voltage ripple.

2) IC Parallel Application

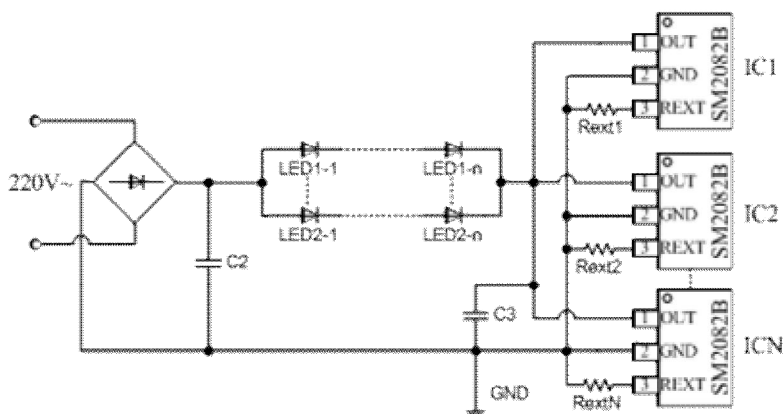


Diagram 8. SM2082B Parallel Application Circuit

The quantity of chip is based on the amount of parallel connection groups and lights operating current of LED tubes. In the diagram below, resistance of REXT1~REXT2 can be the same or different.

In IC parallel application, when Rext value is different, the constant current turn-on voltage in the system is the maximum voltage of parallel SM2082.

3) LED Lamps Circuit Access

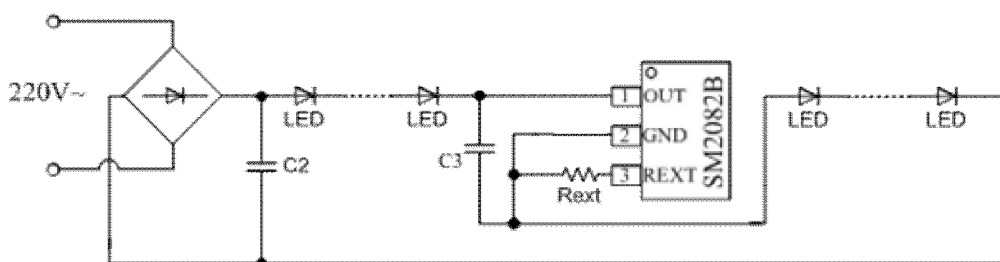
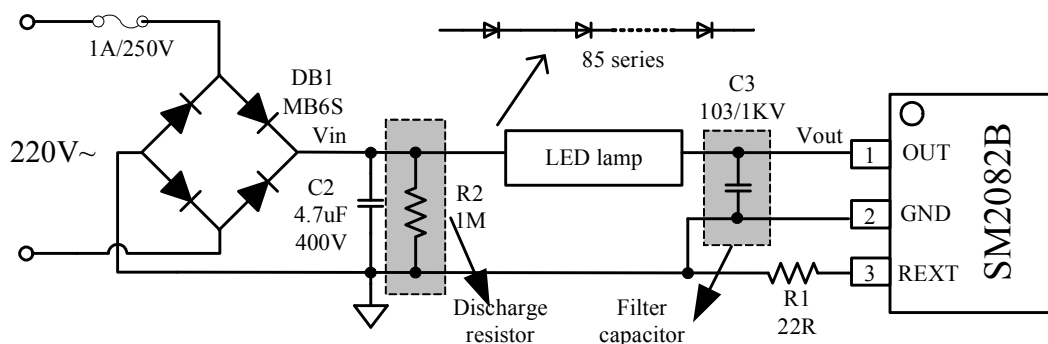


Diagram 9 SM2082B Series Access to LED light tube

SM2082B can be connected to GND, middle of LED light or LED light front-end according to the various application conditions.

Typical Application Circuit EMI Test:



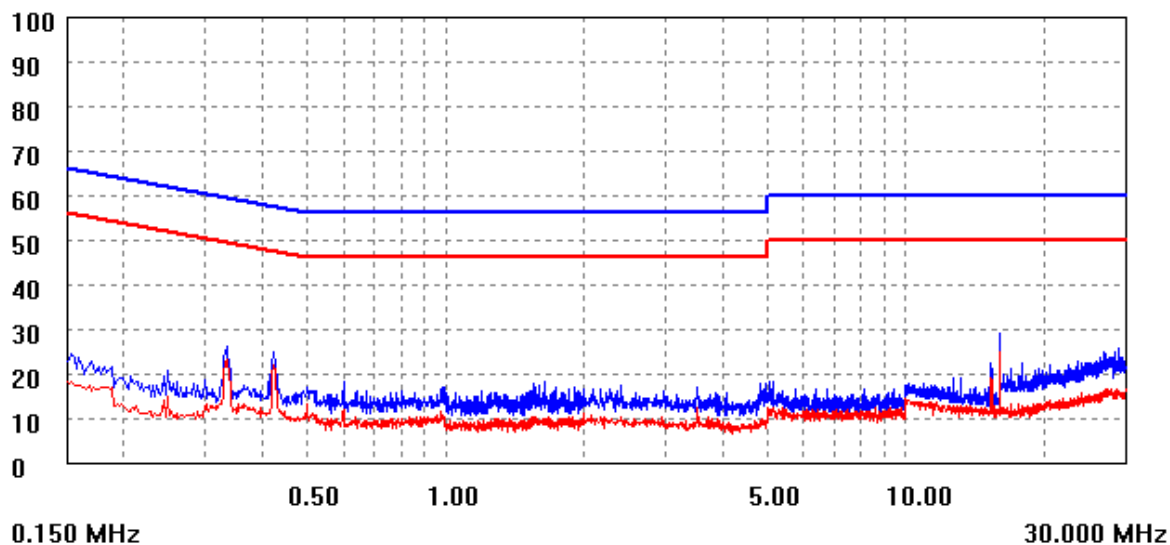
EMI Test: Line N shows the test result

EMI TEST REPORT

Organization: sm	Operator: zhuxingan	EUT: parameter
Place:	Time: 2012/10/23/17:2	Test equipment: KH3935
Detector: PK+AV	Test-time(ms): 20	SN: 1135217
Limit: EN55022B	Transductor(PK/AV): PK-1 / AV-1	
Remark:		

Start(MHz)	End(MHz)	Step(MHz)
0.150	2.000	0.002
2.000	10.000	0.010
10.000	30.000	0.025

dBuV scan result



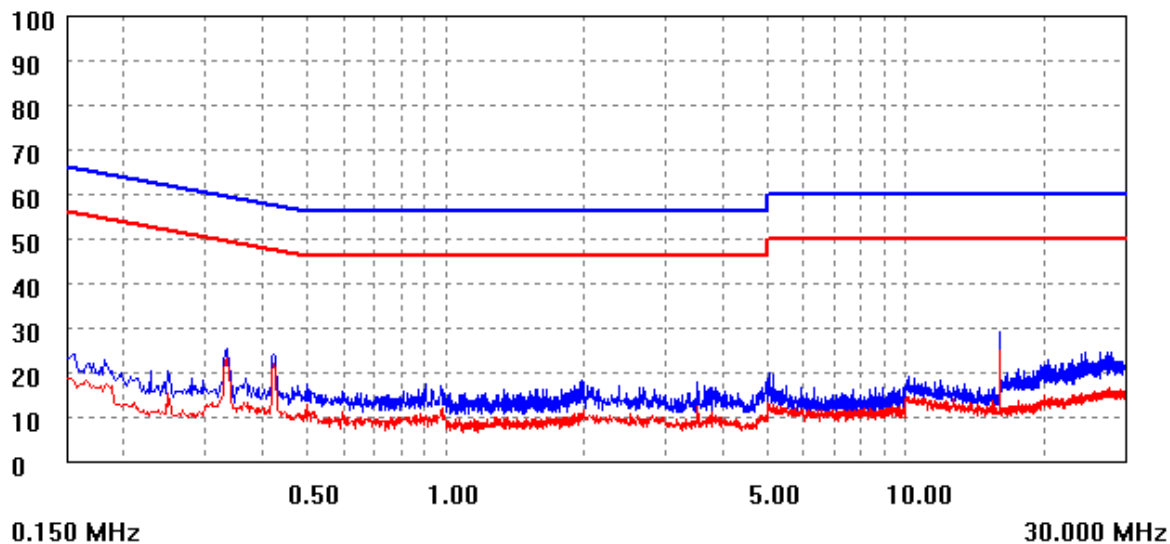
EMI Test: Line L shows the test result

EMI TEST REPORT

Organization: sm	Operator: zhuxingan	EUT:
Place:	Time: 2012/10/23/16:57	Test equipment: KH3935
Detector: PK+AV	Test-time(ms): 20	SN: 1135217
Limit: EN55022B	Transductor(PK/AV): PK-1 / AV-1	
Remark:		

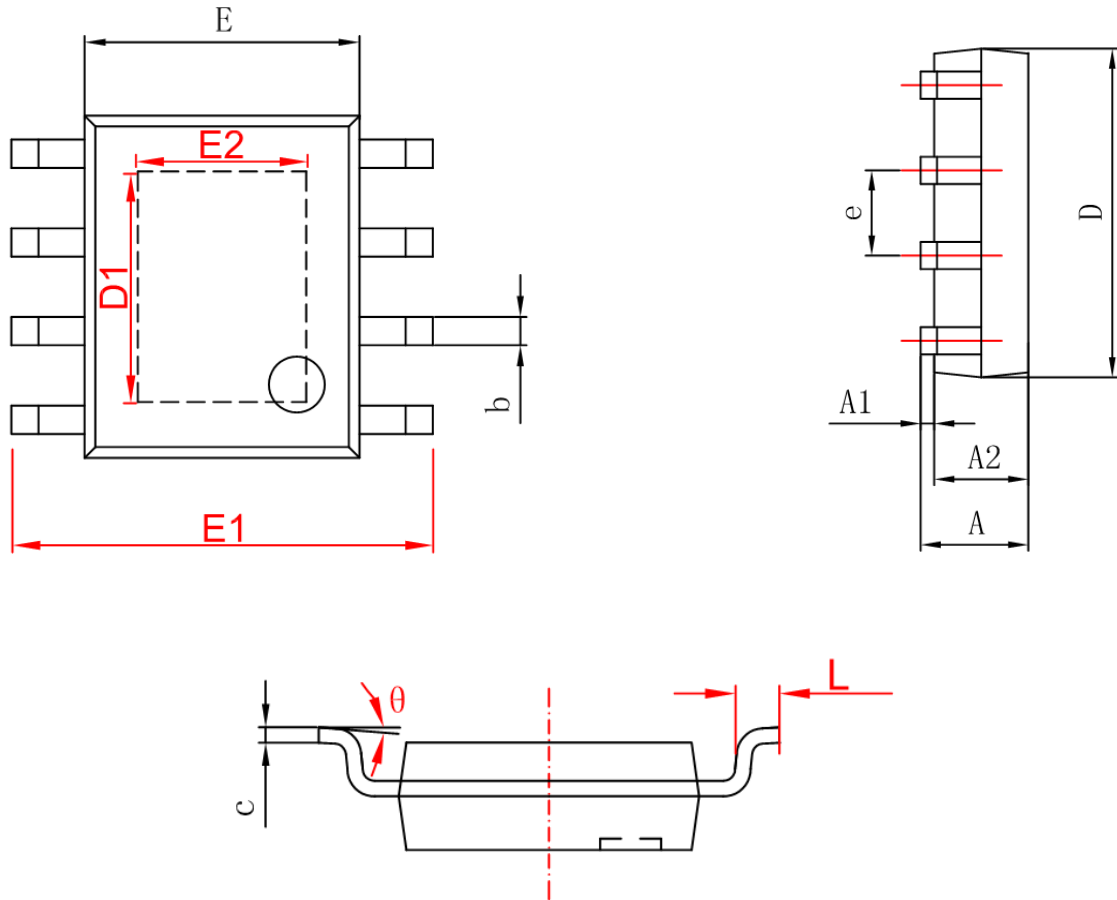
Start(MHz)	End(MHz)	Step(MHz)
0.150	2.000	0.002
2.000	10.000	0.010
10.000	30.000	0.025

dBuV



Package

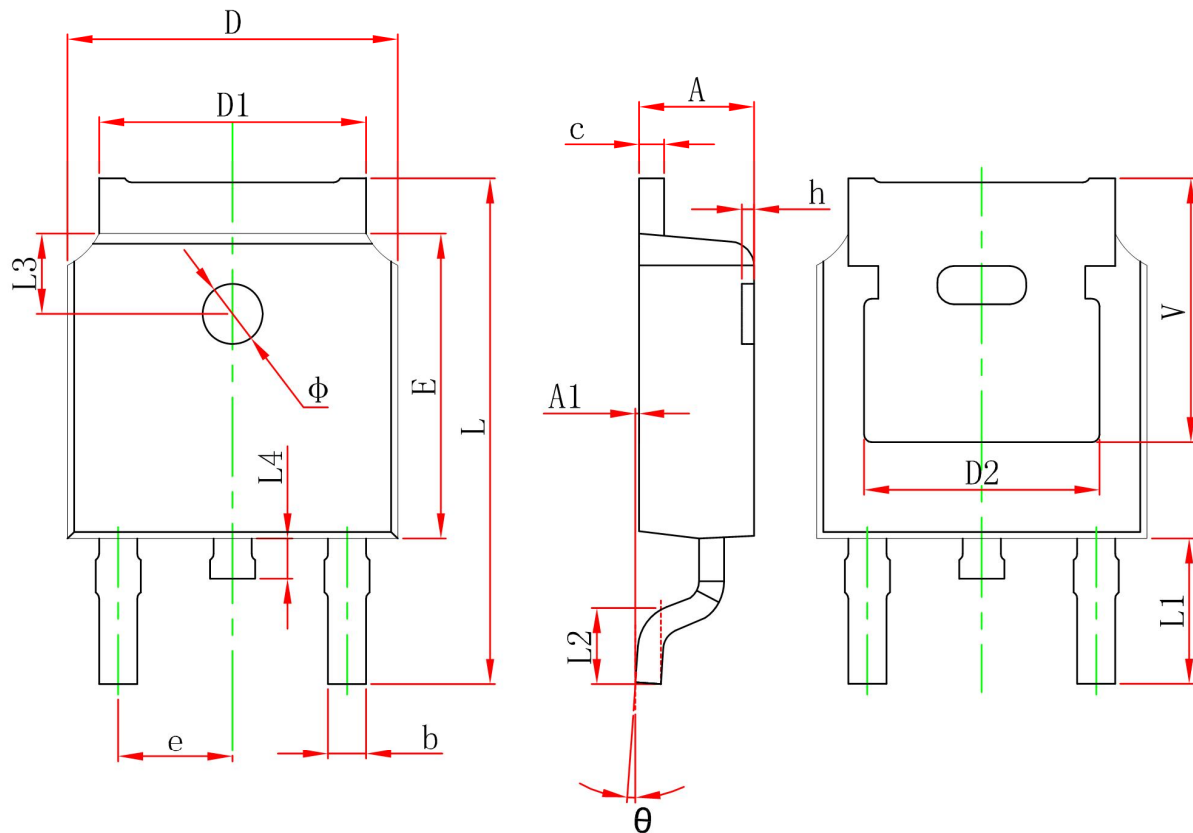
ESOP8



	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TO252-2:

TO-252-2L(PIN 4ROW) PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	