HIGH-VOLTAGE ANALOG-SIGNAL IC

UC54XX

5mA~500mA Constant Current Regulator

RoHS compliant | Green Product

Preliminary Specifications
Datasheet Revision: 0.1

IC Version: c_A
April 24, 2013

ULTRACHIP

The Coolest Current Regulator, Ever!!

UC54XX

5mA~500mA Constant Current Regulator

INTRODUCTION

The UC54xx-series products are linear constant current regulators. With simple features, the UC54xx are economical devices designed to provide a cost-effective solution for current regulation of LED applications. The UC54XX lets LEDs work under stable current and avoid brightness unstable caused by current change, while their low voltage reduces power consumption.

With function of negative temperature coefficient, UC54XX can protect LEDs from thermal runaway at extreme current. UC54XX also provides a wide constant current range from 5mA to 500mA.

Packages of SOT23-3, SOT89-3, SOT-223, and TO252-2 are available.

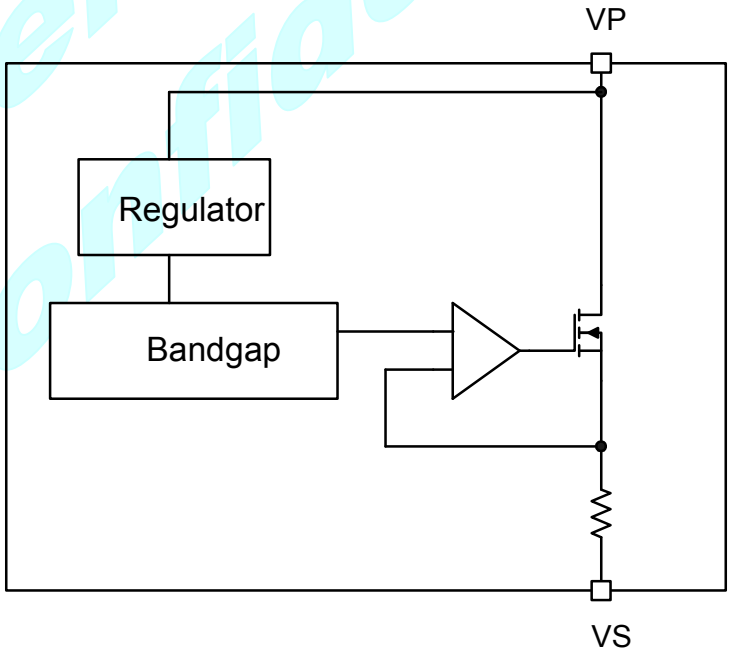
MAIN APPLICATIONS

- LED Light Bars
- LED Bulbs
- LED Fluorescent Lights
- LED Backlight

FEATURE HIGHLIGHTS

- Wide output voltage range: 2V~40V
- Negative temperature coefficient
- Accurate sink current: ±3%
- –40 °C ~+85 °C operation temperature range
- Pb-free and green packages:
  SOT23-3, SOT89-3, SOT223, TO252
- Output current: 5mA~500mA

BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Current (mA)	Package	Eco	Description
UC5400-5cAHST2303R7	5	SOT23-3	RoHS compliant	Pb-free
UC5401cAHST2303R7	10			
UC5402cAHST2303R7	20			
UC5403cAHST2303R7	30			
UC5406cAHST8903R7	60	SOT89-3		
UC5408cAHST8903R7	80			
UC5410cAHST8903R7	100			
UC5412cAHSTM303R7	120	SOT223		
UC5415cAHSTM303R7	150			
UC5418cAHSTM303R7	180			
UC5430cAHTOP202R7	300	TO252		
UC5435cAHTOP202R7	350			
UC5440cAHTOP202R7	400			
UC5450cAHTOP202R7	500			

Please contact UltraChip for other current selections.

General Notes

APPLICATION INFORMATION
For improved readability, the specification contains many application data points. When application information is given, it is advisory and does not form part of the specification for the device.

BARE DIE DISCLAIMER
All die are tested and are guaranteed to comply with all data sheet limits up to the point of wafer sawing. There is no post waffle saw/pack testing performed on individual die. Although the latest modern processes are utilized for wafer sawing and die pick-&-place into waffle pack carriers, UltraChip has no control of third party procedures in the handling, packing or assembly of the die. Accordingly, it is the responsibility of the customer to test and qualify their application in which the die is to be used. UltraChip assumes no liability for device functionality or performance of the die or systems after handling, packing or assembly of the die.

LIFE SUPPORT APPLICATIONS
These devices are not designed for use in life support appliances, or systems where malfunction of these products can reasonably be expected to result in personal injuries. Customer using or selling these products for use in such applications do so at their own risk.

CONTENT DISCLAIMER

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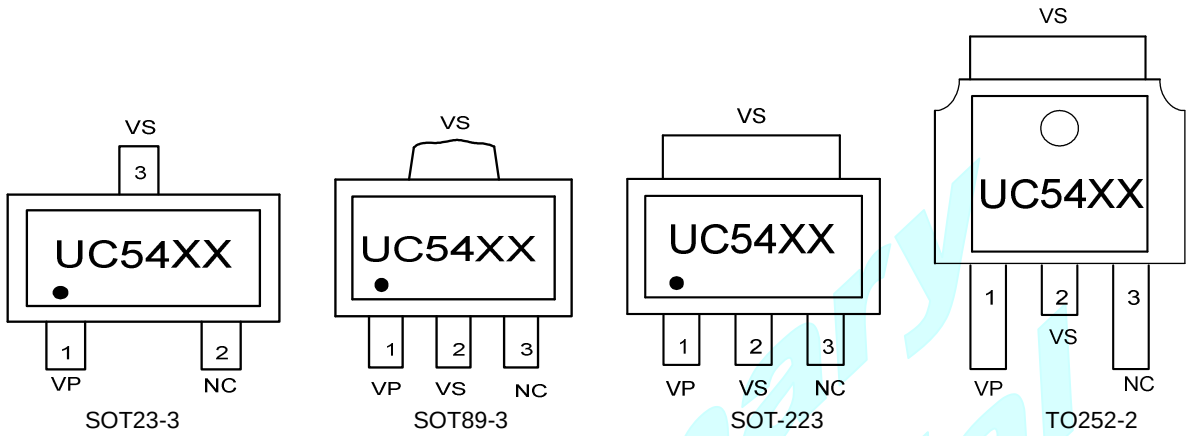
PIN DESCRIPTION



SOT23-3

No	Pin	Type	Description
1	V_P	I	Current Input
2	NC	--	No connection
3	V_S	O	Current Out

SOT89-3

No	Pin	Type	Description
1	V_P	I	Current Input
2	V_S	O	Current Out
3	NC	--	No connection

SOT233

No	Pin	Type	Description
1	V_P	I	Current Input
2	V_S	O	Current Out
3	NC	--	No connection

TO252-2

No	Pin	Type	Description
1	V_P	I	Current Input
2	V_S	O	Current Out
3	NC	--	No connection

MAXIMUM RATING

Symbol	Parameter		Max.	Unit	Note
V_P	Supply voltage		44	V	
I_{VP}	Satuation current	UC5400-5	5.5	mA	
		UC5401	11	mA	
		UC5402	22	mA	
		UC5403	33	mA	
		UC5406	66	mA	
		UC5408	88	mA	
		UC5410	110	mA	
		UC5412	132	mA	
		UC5415	165	mA	
		UC5418	198	mA	
		UC5430	330	mA	
		UC5435	385	mA	
		UC5440	440	mA	
		UC5450	550	mA	
T_{OPR}	Operation Temperature		–40 ~ +85	^oC	
T_J	Junction Temperature		135	^oC	
R_{TH} (j-a)	Thermal Resistance (junction to ambient)	SOT23-3	215	$^oC/W$	
R_{TH} (j-c)	Thermal Resistance (junction to case)		50	$^oC/W$	
P_D	Power Dissipation at T_A=25^oC		0.55	W	
R_{TH} (j-a)	Thermal Resistance (junction to ambient)	SOT89-3	150	$^oC/W$	
R_{TH} (j-c)	Thermal Resistance (junction to case)		40	$^oC/W$	
P_D	Power Dissipation at T_A=25^oC		1	W	Note1
R_{TH} (j-a)	Thermal Resistance (junction to ambient)	SOT223	140	$^oC/W$	
R_{TH} (j-c)	Thermal Resistance (junction to case)		30	$^oC/W$	
P_D	Power Dissipation at T_A=25^oC		1.5	W	Note2
R_{TH} (j-a)	Thermal Resistance (junction to ambient)	TO252	110	$^oC/W$	
R_{TH} (j-c)	Thermal Resistance (junction to case)		15	$^oC/W$	
P_D	Power Dissipation at T_A=25^oC		3	W	Note3

Note:

1. The conditions for the power dissipation (SOT89-5) are as below:
   Double-sided, FR4 PCB size: 50mmx50mmx1.6nn, Copper ratio: top side approx. 10%, back side approx. 100%,
   No through-holes, Ta=25^oC.
2. When surface mounted to an FR4 board using a minimum recommended pad size (Cu. area = 0.341 in^2)
3. Double-sided, FR4 PCB size: 50mmx50mmx1.6nn, Copper ratio: top side approx. 20%, back side approx. 100%,

DC CHARACTERISTICS

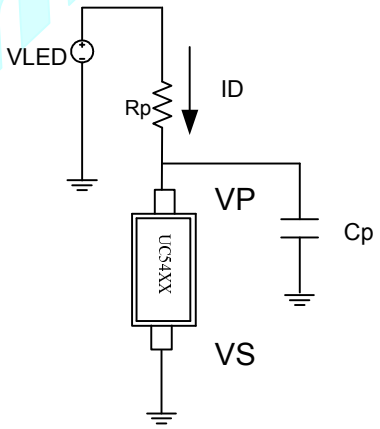
VP=3.0V, Cp = 0.1uF, Ta =25°C, unless otherwise specified.

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
VP	Supply voltage	UC5400-5~UC5403		2		40	V
		UC5406~UC5410		2.5		40	
		UC5412~UC5418		3		40	
		UC5430~UC5450		4		40	
IVP	Saturation current	VP=2V~8V	UC5400-5		5		mA
			UC5401		10		
			UC5402		20		
			UC5403		30		
		VP=2.5V~8V	UC5406		60		
			UC5408		80		
			UC5410		100		
		VP=3V~7V	UC5412		120		
			UC5415		150		
			UC5418		180		
		VP=4V~6V	UC5430		300		
			UC5435		350		
			UC5440		400		
			UC5450		500		
IAC	Current Accuracy	(See Note)		-3		+3	%
Tc	Temperature Coefficient	Ta=-40℃~125℃			-500		ppm/°C

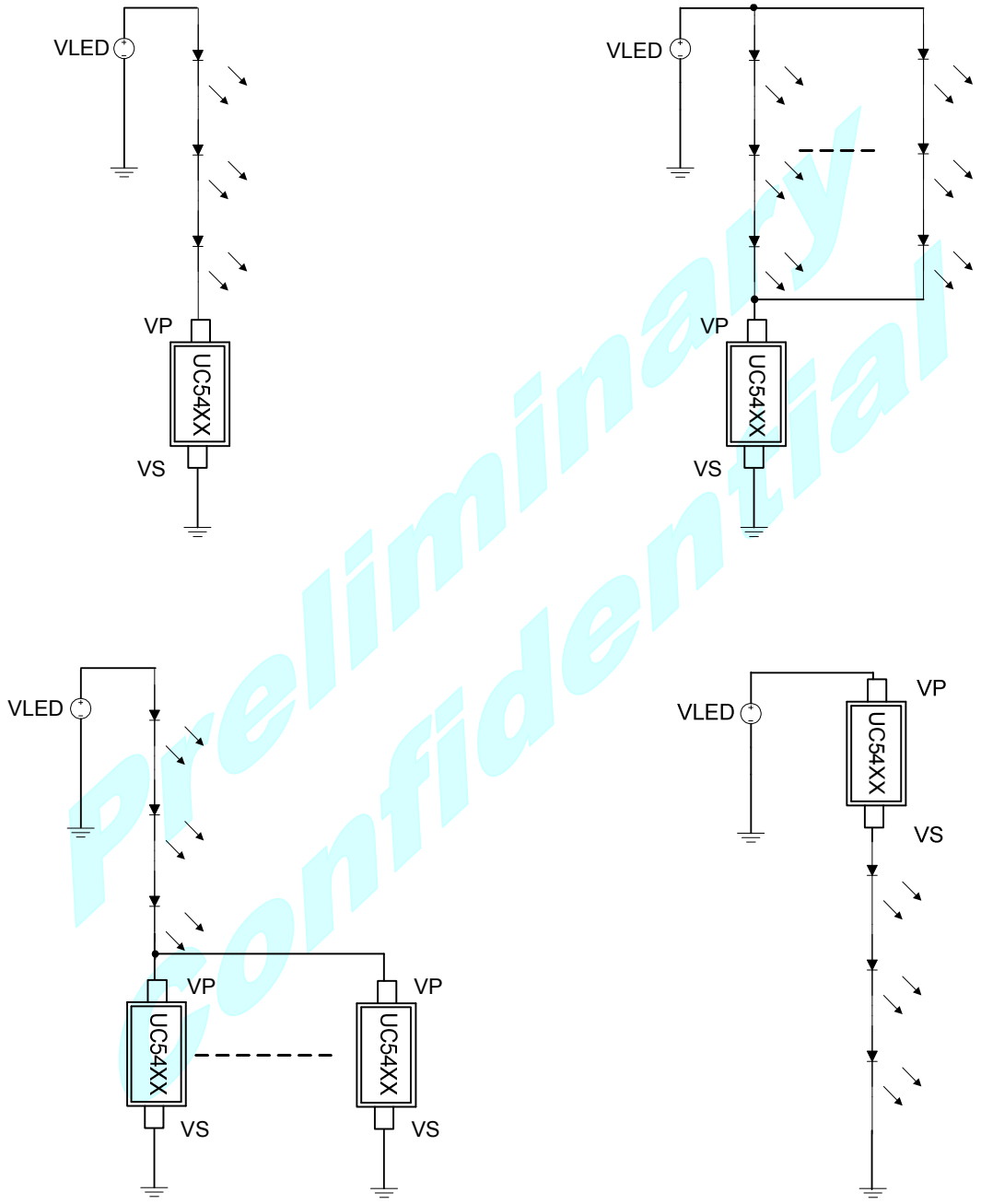
Note:

The condition can be achieved with the test circuit only. The current accuracy is affected by negative temperature coefficient and appropriate package.

TEST CIRCUIT

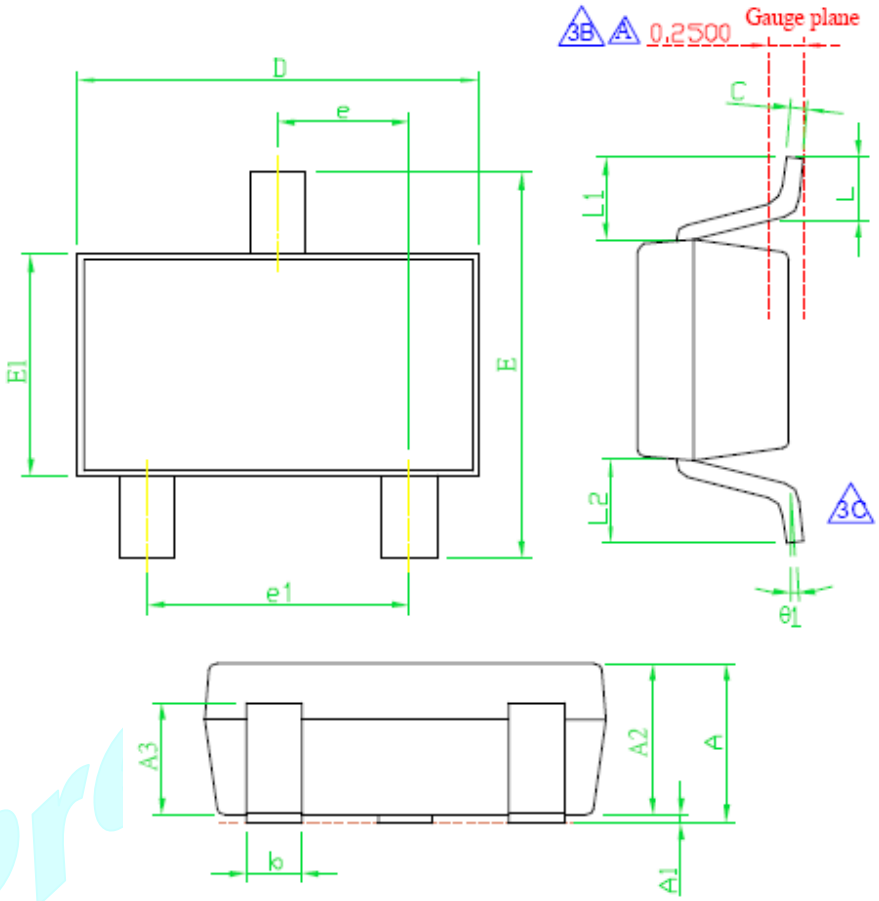


APPLICATION SCHEMATIC



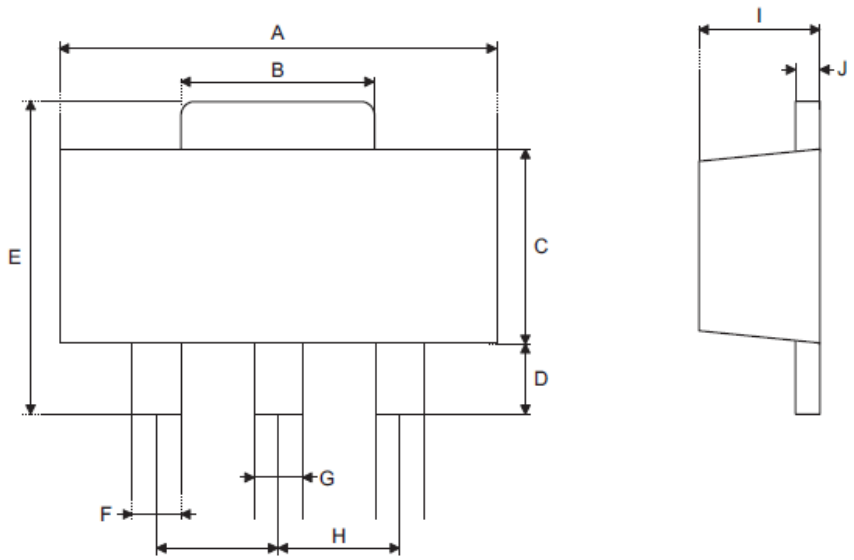
PACKAGE INFORMATION

SOT23-3 Package Outline Drawing



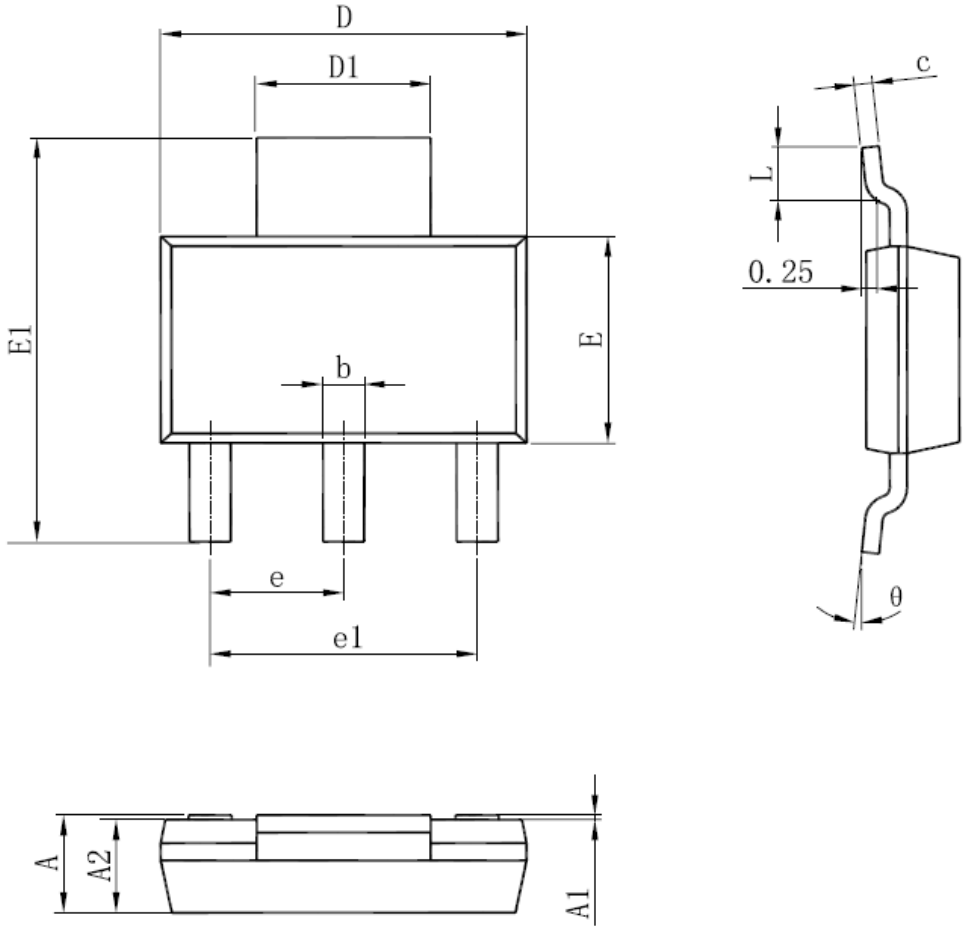
Dimension	Unit: mm			Dimension	Unit: mm		
	Min.	Nom	Max.		Min.	Nom	Max.
A	1.00	1.10	1.40	E1	1.40	1.60	1.80
A1	0.00	0.05	0.10	e	–-	0.95 (Typ.)	–-
A2	1.00	1.10	1.30	e1	–-	1.90 (Typ.)	–-
A3	0.70	0.80	0.90	θ1	1°	5°	9°
B	0.35	0.40	0.50	L	0.37	–-	–-
C	0.12	0.125	0.225	L1	–-	0.6REF	–-
D	2.70	2.90	3.10	L1-L2	–-	–-	0.12
E	2.60	2.80	3.00	–-	–-	–-	–-

SOT89-3 Package Outline Drawing



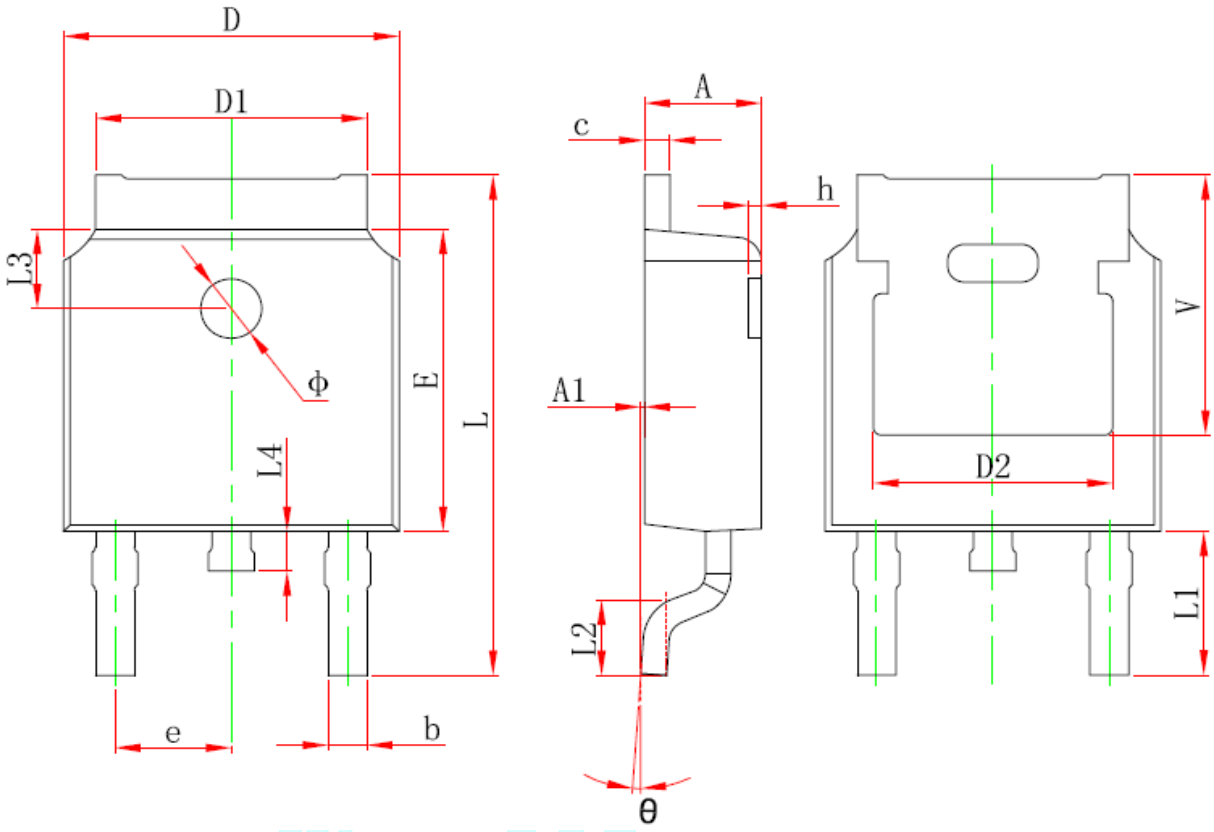
Dimension	Unit: mm			Unit: Inch		
	Min.	Nom	Max.	Min.	Nom	Max.
A	4.39	--	4.60	0.173	--	0.181
B	1.50	--	1.83	0.059	--	0.072
C	2.29	--	2.59	0.090	--	0.102
D	0.89	--	1.19	0.035	--	0.047
E	3.94	--	4.24	0.155	--	0.167
F	0.36	--	0.48	0.014	--	0.019
G	0.43	--	0.56	0.017	--	0.022
H	--	1.50	--	--	0.059	--
I	1.40	--	1.60	55	--	63
J	0.36	--	0.43	14	--	17

SOT-223 Package Outline Drawing



Dimension	Unit: mm		Unit: Inch	
	Min.	Max.	Min.	Max.
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.200	6.400	0.244	0.252
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300(BSC)		0.091(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0^o	10^o	0^o	10^o

TO-252-2L Package Outline Drawing



Dimension	Unit: mm		Unit: Inch	
	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^o	8^o	0^o	8^o
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	