

HIGH-VOLTAGE ANALOG-SIGNAL IC

UC54XX

5mA~450mA Constant Current Regulator

RoHS compliant Green Product

PP Specifications
Datasheet Revision: 0.9

IC Version: c_A
January 27, 2014

ULTRACHIP

The Coolest Current Regulator, Ever!!

UC54XX

5mA~450mA 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 450mA.

Packages of SOT23-3, SOT89-3, SOT223, and TO252 are available.

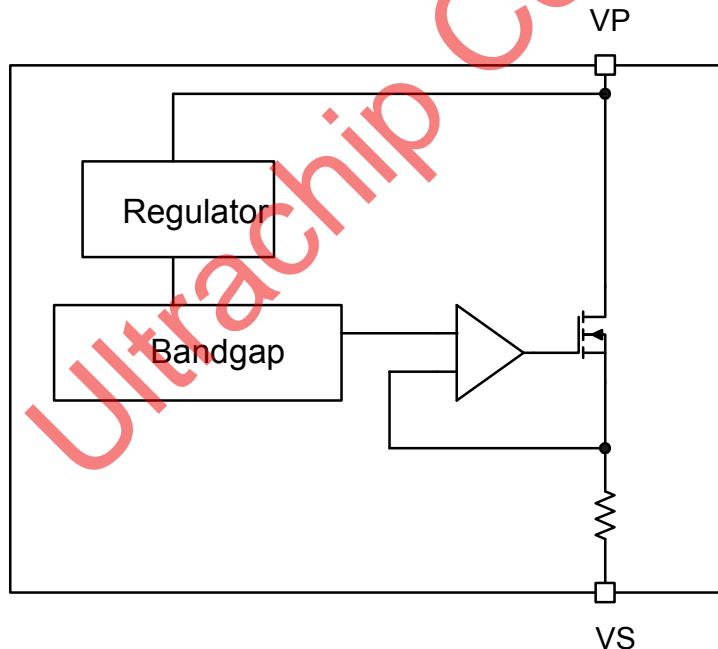
MAIN APPLICATIONS

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

FEATURE HIGHLIGHTS

- Wide output voltage range: 2V~40V
- Negative temperature coefficient
- Accurate sink current: $\pm 3\%$
- $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$ operation temperature range
- Pb-free and green packages: SOT23-3, SOT89-3, SOT223, TO252
- Output current: 5mA~450mA

BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Current (mA)	Package	Eco	Description
UC5400-5cA-NST2303R7	5	SOT23-3	RoHS compliant	Pb-free
UC5401-0cA-NST2303R7	10			
UC5402-0cA-NST2303R7	20			
UC5403-0cA-NST2303R7	30			
UC5406-0cA-NST8903R7	60	SOT89-3		
UC5408-0cA-NST8903R7	80			
UC5410-0cA-NST8903R7	100			
UC5412-0cA-NST2203R7	120	SOT223		
UC5415-0cA-NST2203R7	150			
UC5418-0cA-NST2203R7	180			
UC5430-0cA-UTOP203R7	300	TO252		
UC5435-0cA-UTOP203R7	350			
UC5440-0cA-UTOP203R7	400			
UC5445-0cA-UTOP203R7	450			

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

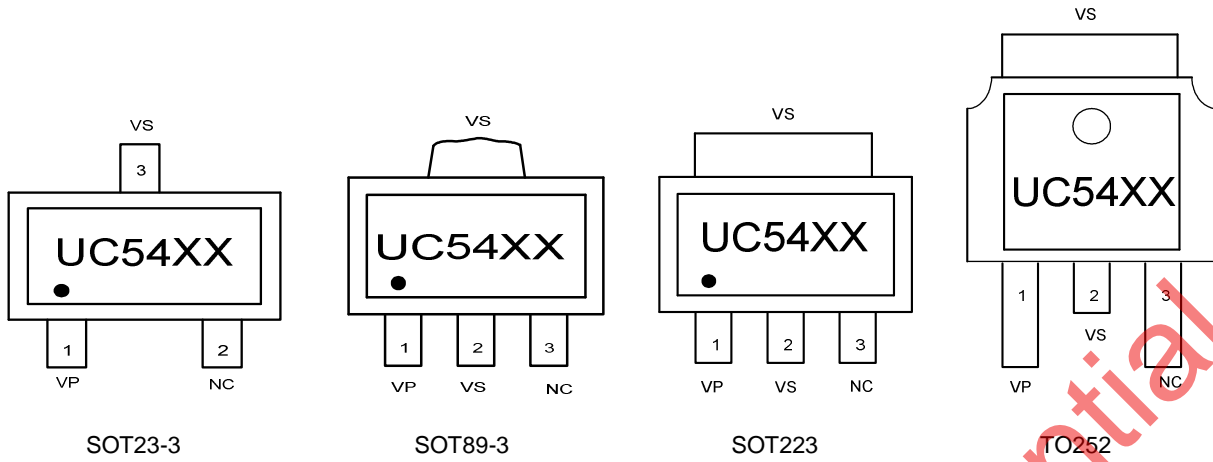
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PIN DESCRIPTION



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

SOT223

No	Pin	Type	Description
1	V _P	I	Current Input
2	V _S	O	Current Out
3	NC	--	No connection

TO252

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}	Saturation 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	
UC5445	450	mA			
T _{OPR}	Operation Temperature	-40 ~ +85	°C		
T _J	Junction Temperature	135	°C		
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	215	°C/W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	50	°C/W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	0.55	W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	150	°C/W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	40	°C/W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	1	W	Note1	
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	140	°C/W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	30	°C/W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	1.5	W	Note2	
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	110	°C/W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	15	°C/W		
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				
R _{TH(j-a)}	Thermal Resistance (junction to ambient)	3	W	Note3	
R _{TH(j-c)}	Thermal Resistance (junction to case)				
P _D	Power Dissipation at T _A =25°C				

Note:

- The conditions for the power dissipation (SOT89-3) are as below:
 Double-sided, FR4 PCB size: 50mmx50mmx1.6mm, Copper ratio: top side approx. 10%, back side approx. 100%,
 No through-holes, T_a=25°C.
- When surface mounted to an FR4 board using a minimum recommended pad size (Cu. area = 0.341 in²)
- Double-sided, FR4 PCB size: 50mmx50mmx1.6mm, Copper ratio: top side approx. 20%, back side approx. 100%,

DC CHARACTERISTICS

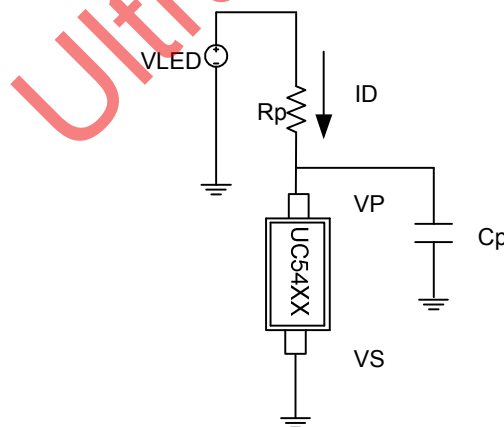
VP=3.0V, Cp = 0.1uF, Ta =25°C; unless otherwise specified.

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~UC5445	4		40	
IVP	Saturation current	VP=1.5V~8V	UC5400-5		5	mA
			UC5401		10	
			UC5402		20	
			UC5403		30	
		VP=2V~8V	UC5406		60	
			UC5408		80	
			UC5410		100	
		VP=2.5V~7V	UC5412		120	
			UC5415		150	
			UC5418		180	
		VP=3V~6V	UC5430 (Note 2)		300	
			UC5435 (Note 2)		350	
UC5440 (Note 2)			400			
UC5445 (Note 2)			450			
IAC	Current Accuracy	(Note 1)	-3		+3	%
Tc	Temperature Coefficient	Ta=-40°C~125°C		-500		ppm/°C

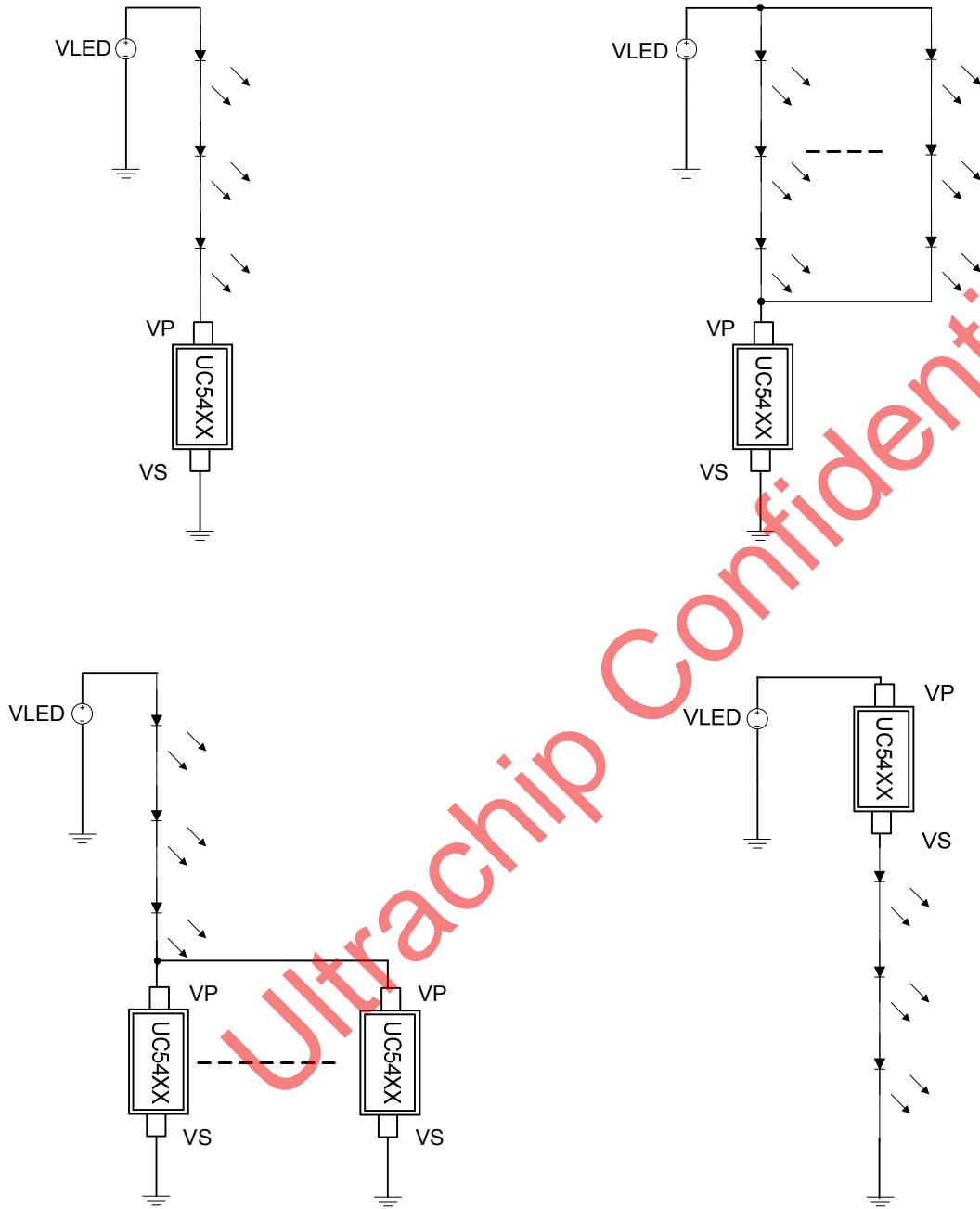
Note:

- (1) The condition can be achieved with the test circuit only. The Current Accuracy may be affected by negative temperature coefficient and inappropriate package.
- (2) For UC5430/UC5435/UC5440/UC5445 high current applications, it is necessary to add a heat sink to lower the case temperature to below 70°C to guarantee the current accuracy of ±3%.

TEST CIRCUIT

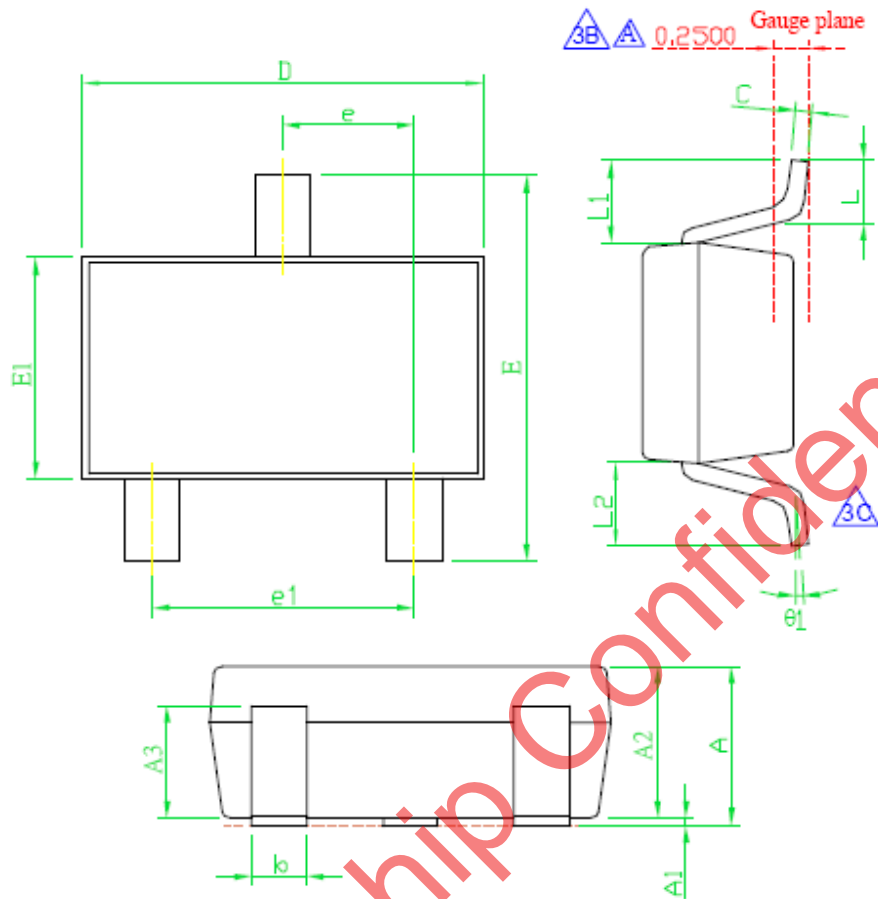


APPLICATION SCHEMATIC



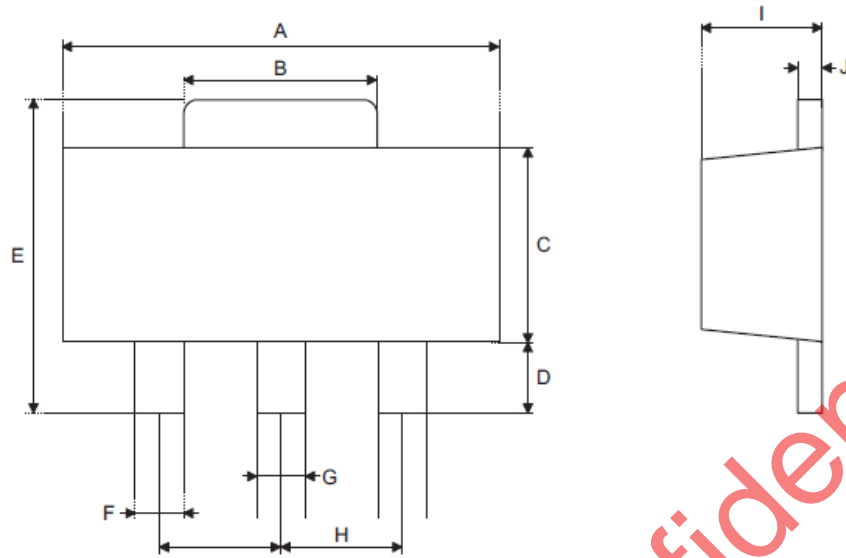
PACKAGE INFORMATION

SOT23-3 Package Outline Drawing



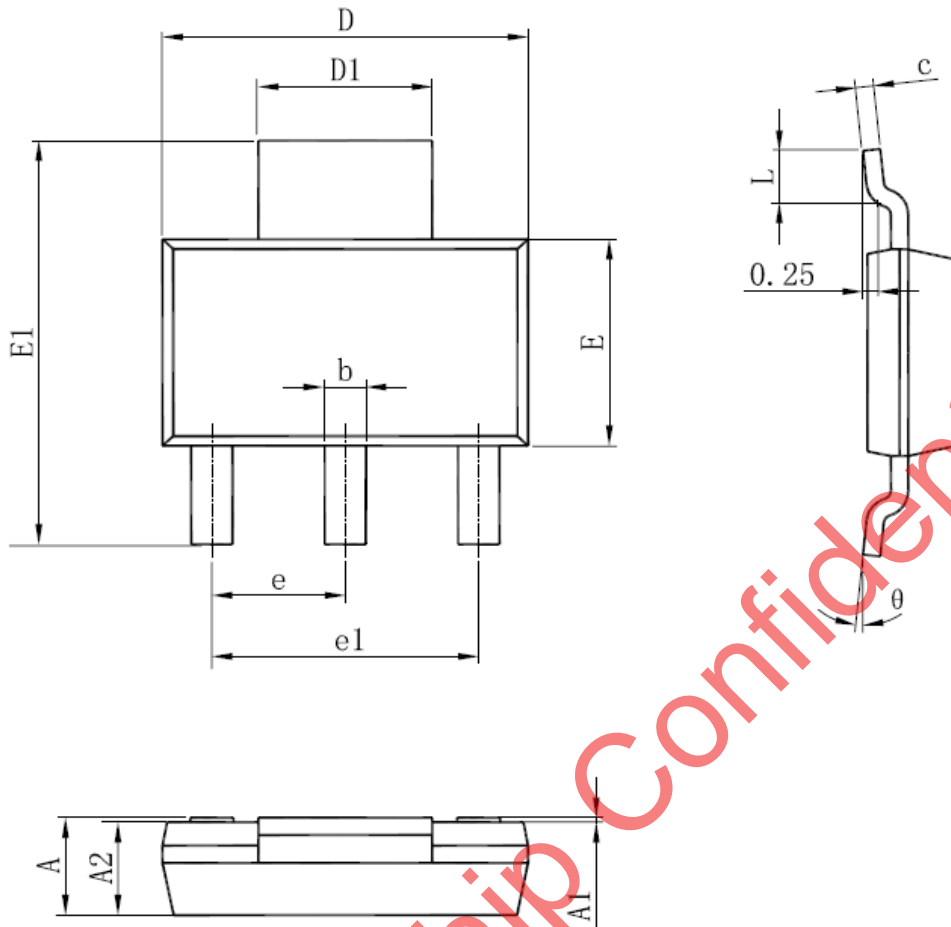
Symbol	Dimensions in mm		
	Min.	Nom	Max.
A	1.00	1.10	1.40
A1	0.00	0.05	0.10
A2	1.00	1.10	1.30
A3	0.70	0.80	0.90
B	0.35	0.40	0.50
C	0.12	0.125	0.225
D	2.70	2.90	3.10
E	2.60	2.80	3.00
E1	1.40	1.60	1.80
e	--	0.95 (Typ.)	--
e1	--	1.90 (Typ.)	--
θ1	1°	5°	9°
L	0.37	--	--
L1	--	0.6REF	--
L1-L2	--	--	0.12
--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

SOT89-3 Package Outline Drawing



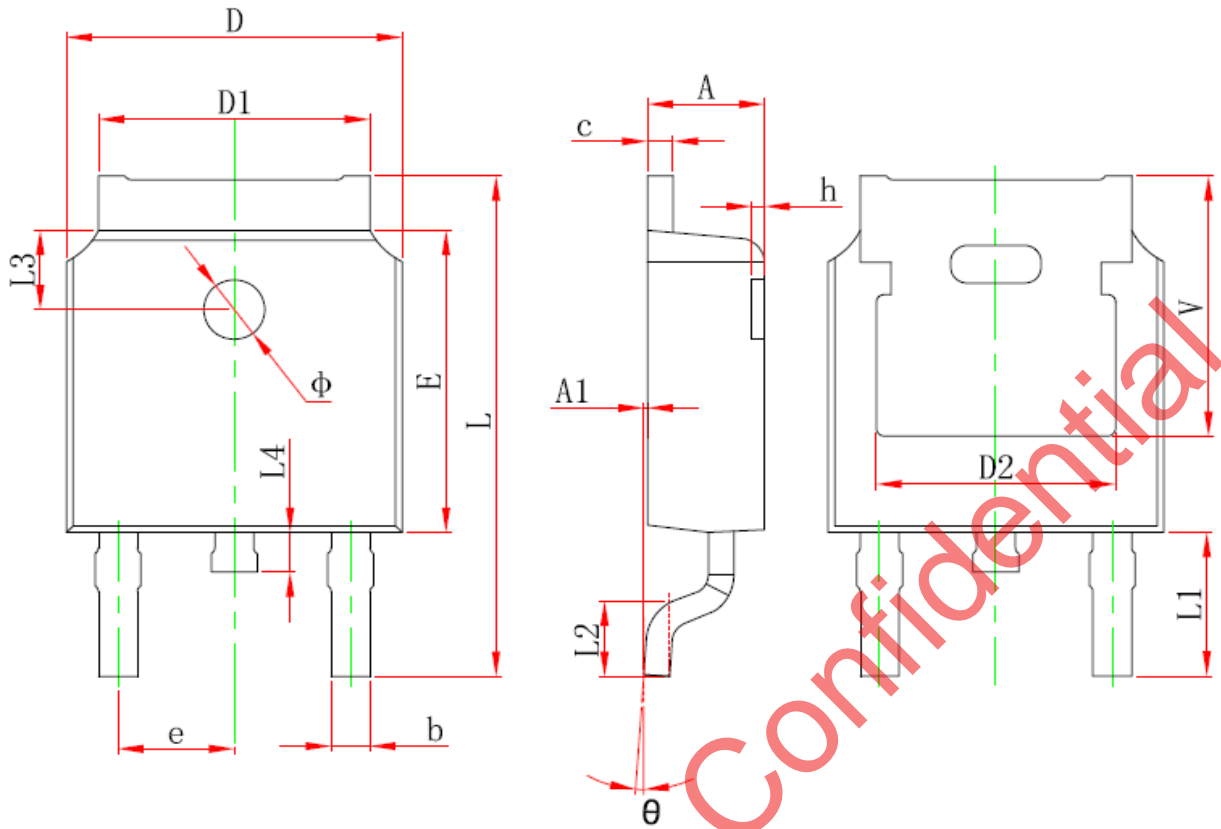
Symbol	Dimensions in mm			Dimensions in inch		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	4.39	--	4.60	0.173	--	0.181
B	1.50	--	1.83	0.059	--	0.072
C	2.29	--	2.59	0.090	--	0.102
D	0.89	--	1.19	0.035	--	0.047
E	3.94	--	4.24	0.155	--	0.167
F	0.36	--	0.48	0.014	--	0.019
G	0.43	--	0.56	0.017	--	0.022
H	--	1.50	--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

SOT223 Package Outline Drawing



Symbol	Dimensions in mm		Dimensions in 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°	10°	0°	10°

TO252 Package Outline Drawing



Symbol	Dimensions in mm		Dimensions in 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°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	