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5mA~450mA Constant Current Regulator

INTRODUCTION

The HM72XX-series products are linear constant current regulators. With simple features, the HM72XX are economical devices designed to provide a cost-effective solution for current regulation of LED applications. The HM72XX 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, HM72XX can protect LEDs from thermal runaway at extreme current. HM72XX also provides a wide constant current range from 5mA to 450mA.

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

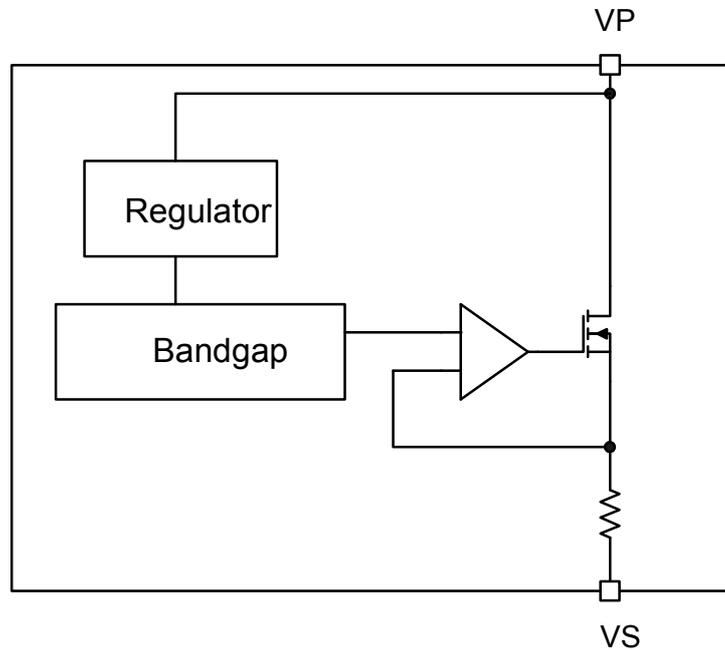
MAIN APPLICATIONS

- 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
HM7200-5	5	SOT23-3	RoHS compliant	Pb-free
HM7201	10			
HM7202	20			
HM7203	30			
HM7206	60	SOT89-3		
HM7208	80			
HM7210	100			
HM7212	120	SOT223		
HM7215	150			
HM7218	180			
HM7230	300	TO252		
HM7235	350			
HM7240	400			
HM7245	450			

Please contact H&M SEMI 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, H&M SEMI 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. H&M SEMI assumes no liability for device functionality or performance of the die or systems after handling, packing or assembly of the die.

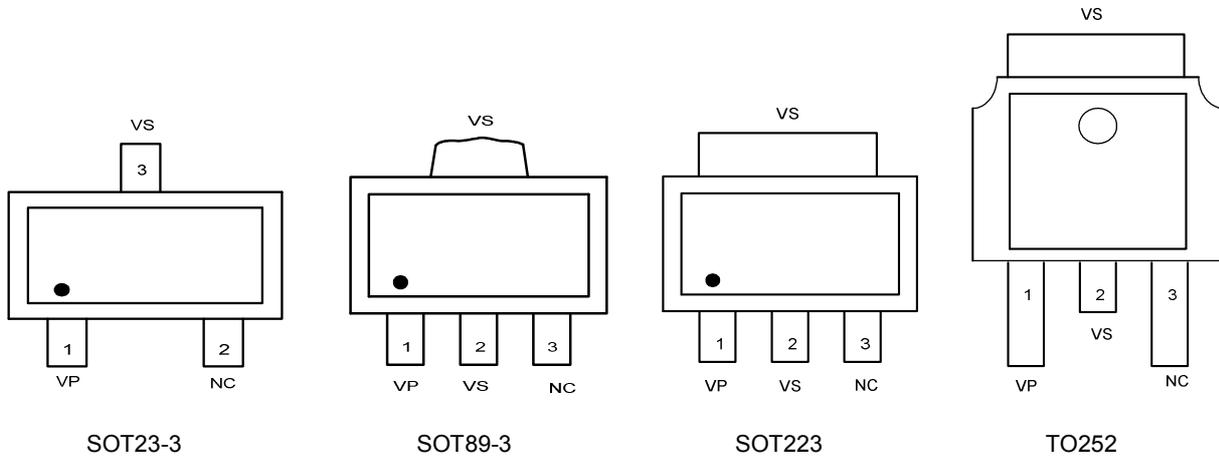
LIFE SUPPORT APPLICATIONS

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.

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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	HM7200-5	5.5	mA	
		HM7201	11	mA	
		HM7202	22	mA	
		HM7203	33	mA	
		HM7206	66	mA	
		HM7208	88	mA	
		HM7210	110	mA	
		HM7212	132	mA	
		HM7215	165	mA	
		HM7218	198	mA	
		HM7230	330	mA	
		HM7235	385	mA	
		HM7240	440	mA	
HM7245	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

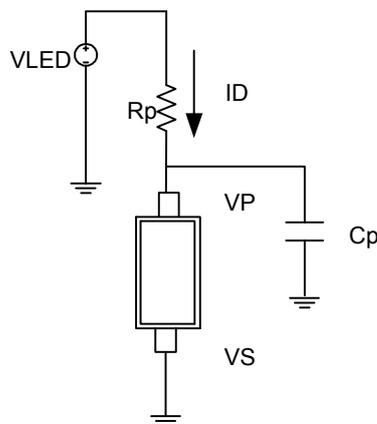
VP=3.0V, Cp = 0.1uF, Ta =25°C; unless otherwise specified.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
VP	Supply voltage	HM7200-5~HM7203	1.5		40	V
		HM7206~HM7210	2		40	
		HM7212~HM7218	2.5		40	
		HM7230~HM7245	3		40	
IVP	Saturation current	VP=1.5V~8V	HM7200-5			mA
			HM7201			
			HM7202			
			HM7203			
		VP=2V~8V	HM7206			
			HM7208		80	
			HM7210		100	
		VP=2.5V~7V	HM7212		120	
			HM7215		150	
			HM7218		180	
			VP=3V~6V	HM7230 (Note 2)		
		HM7235 (Note 2)			350	
HM7240 (Note 2)		400				
HM7245 (Note 2)		450				
IAC	Current Accuracy	(Note 1)	-3		+3	%
Tc	Temperature Coefficient	Ta=-40°C~125°C		-500		ppm/°C

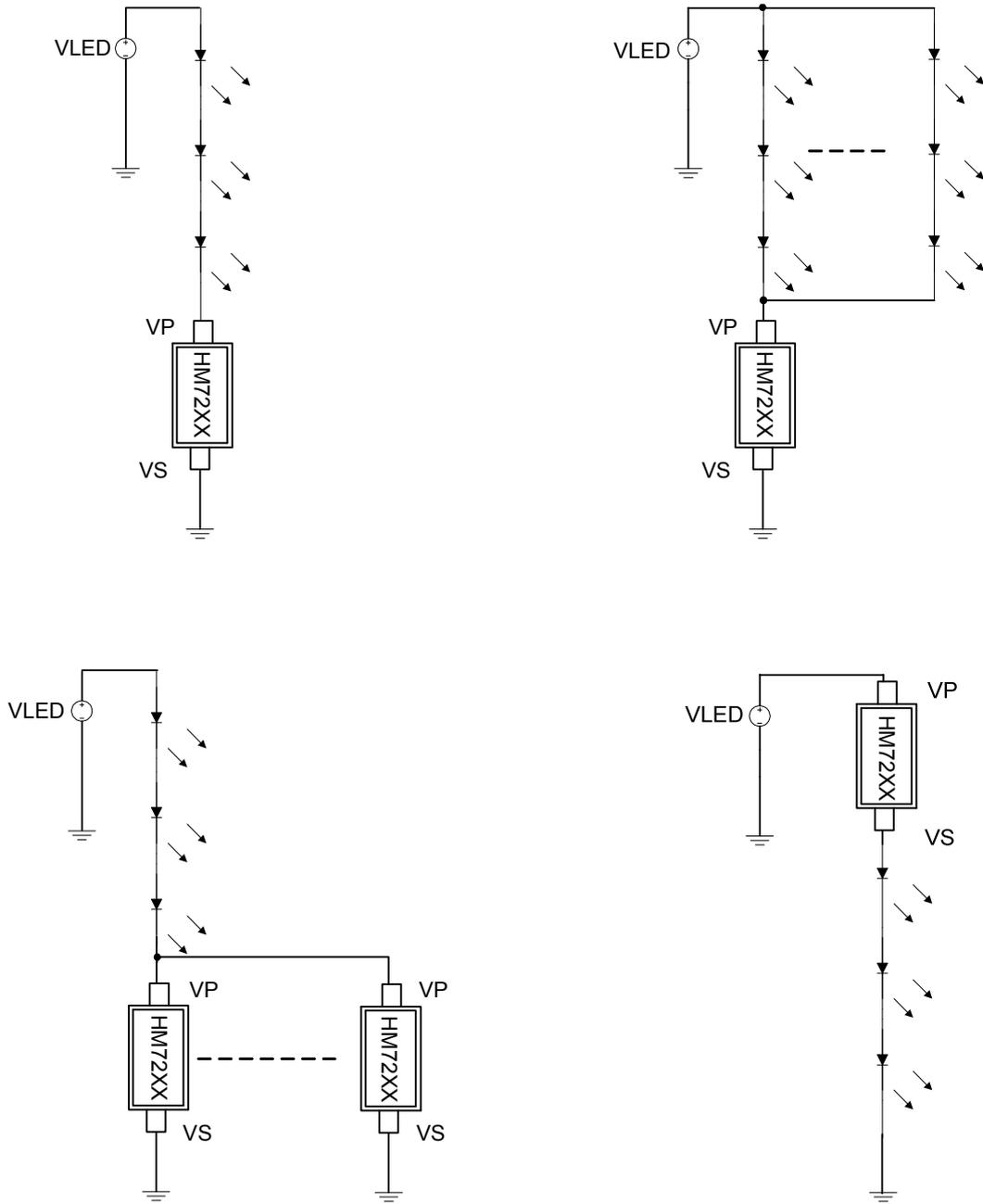
Note:

- (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 HM7230/HM7235/HM7240/HM7245 high current applications, it is necessary to add a heat sink to lower the case temperature to below 50°C to guarantee the current accuracy of ±3%.

TEST CIRCUIT

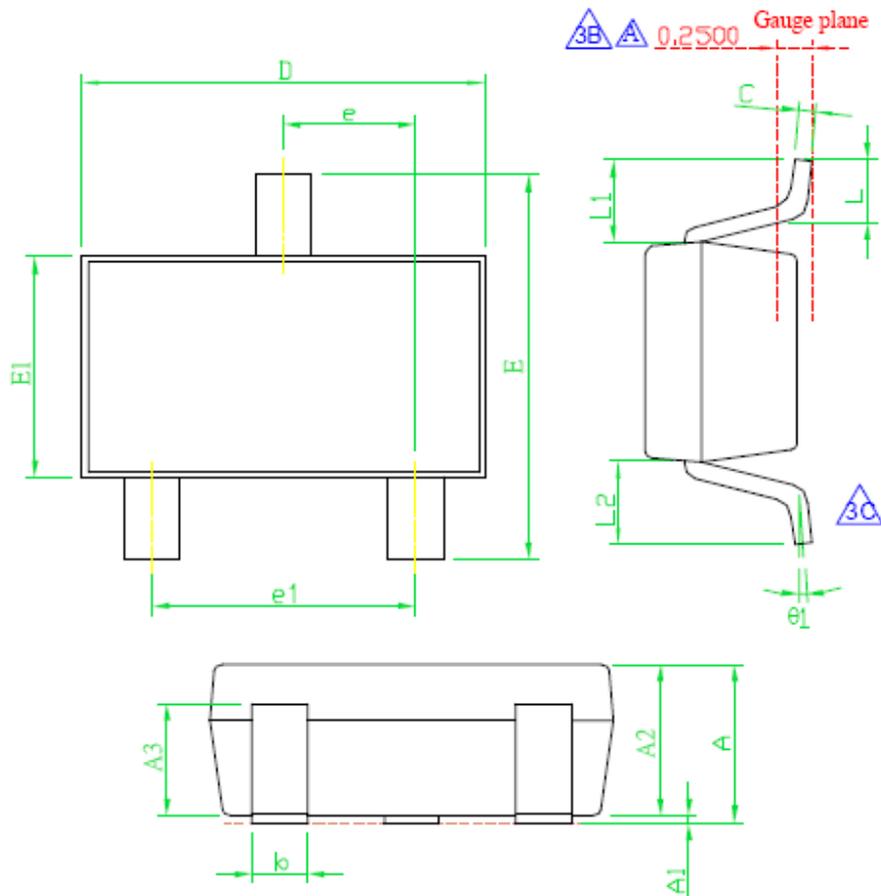


APPLICATION SCHEMATIC



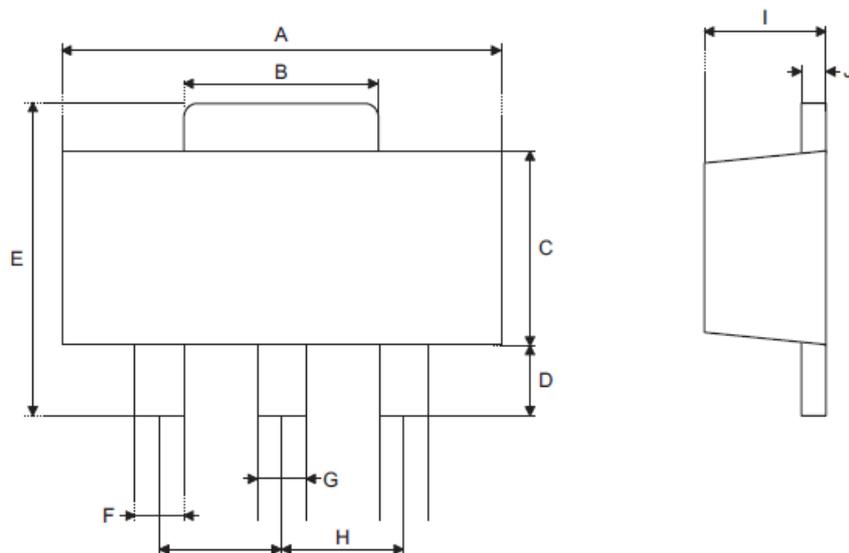
PACKAGE INFORMATION

SOT23-3 Package Outline Drawing



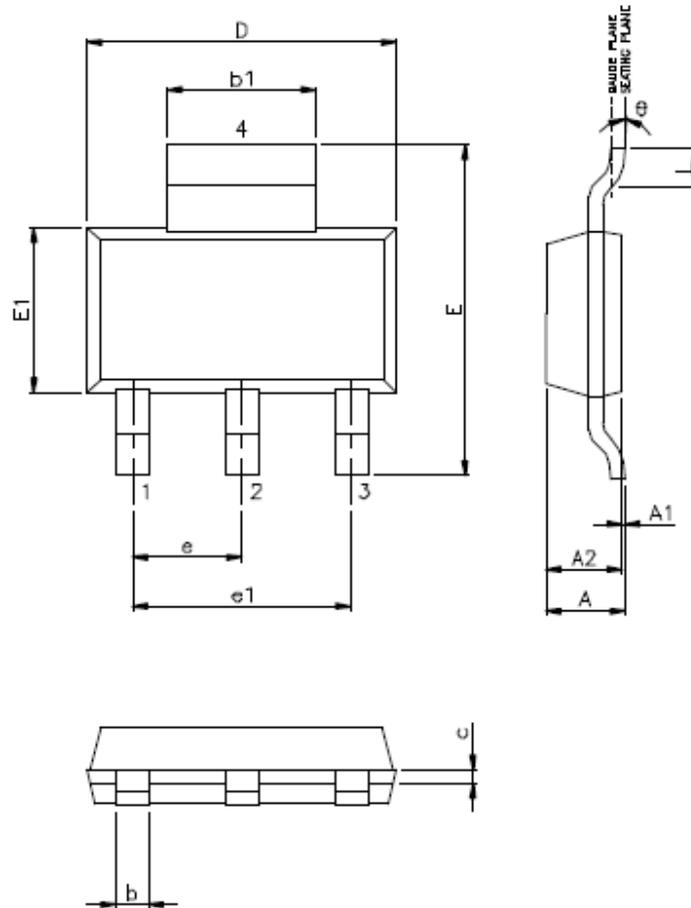
Symbol	Dimensions in mm		
	Min.	Nom	Max.
A	1.00	1.10	1.40
A1	0.00	0.05	0.10
A2	1.00	1.10	1.30
A3	0.70	0.80	0.90
B	0.35	0.40	0.50
C	0.12	0.125	0.225
D	2.70	2.90	3.10
E	2.60	2.80	3.00
E1	1.40	1.60	1.80
e	—	0.95 (Typ.)	—
e1	—	1.90 (Typ.)	—
θ1	1°	5°	9°
L	0.37	—	—
L1	—	0.6REF	—
L1-L2	—	—	0.12
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SOT89-3 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

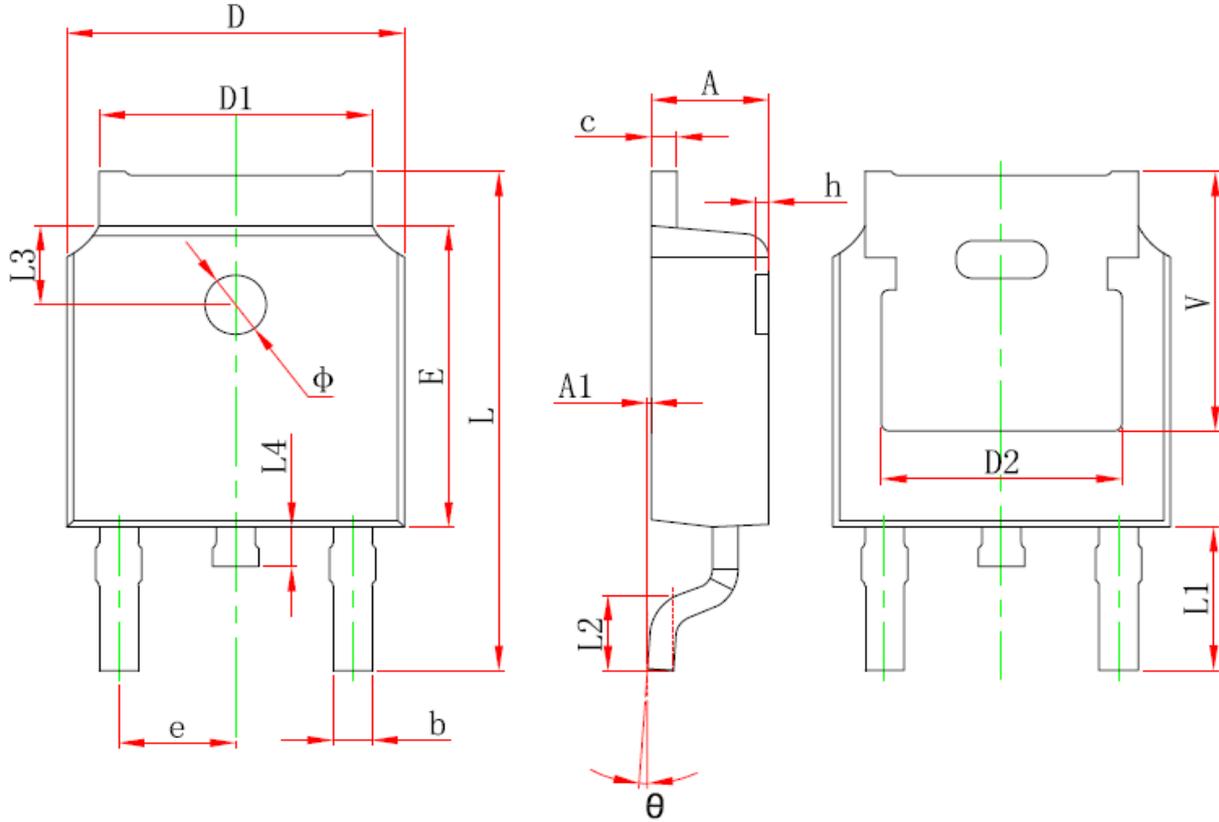


VARIATION(ALL DIMENSIONS SHOWN IN MM)

SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.80
A1	0.02		0.10
A2	1.50	1.60	1.70
b	0.66	0.70	0.84
\triangle b1	2.90	3.00	3.10
c	0.23	0.30	0.35
D	6.30	6.50	6.80
E	6.70	7.00	7.30
E1	3.30	3.50	3.70
e	2.30 BASIC		
e1	4.60 BASIC		
L	0.75	-	-
θ	0°	-	10°

NOTE : 1.JEDEC OUTLINE : TO-261 AA

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.	