Features

- Good Transient Response
- Output voltage accuracy: tolerance ±2%
- SOT223, and TO252 package
- PSRR:65dB@1KHz
- High input voltage (up to 18V)
- Low Power Consumption: 2μA (Typ)
- Maximum Output Current: 1000mA
- Voltage drop:1000mV@1000mA(3.3V)

Applications

- Portable, Battery Powered Equipmpm
- Microcontroller Applications
- Smoke detector and sensor
- Audio/Video equipment
- Weighting Scales
- Home Automation

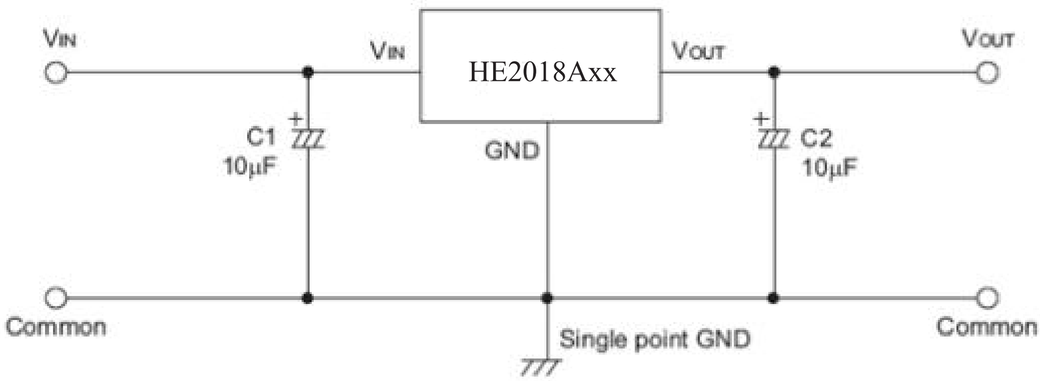
General Description

The HE2018 series is a high voltage, ultralow-power, low dropout voltage regulator. The device can deliver 1000mA output current with a dropout voltage of 1000mV and allows an input voltage as high as 18V. The typical quiescent current is only 2μA. The device is available in fixed output voltages of 3.3 and 5.0V.The device features integrated short-circuit and thermal shutdown protection.Although designed primarily as fixed voltage regulators, the device can be used with external components to obtain variable voltages.

Selection Table

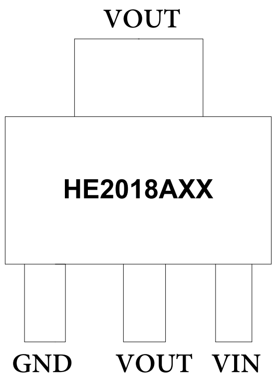
Part No.	Output Voltage	Package	Marking
HE2018A33FR	3.3V	SOT223	
HE2018A50FR	5.0V	SOT223	
HE2018A33GR	3.3V	TO252	
HE2018A50GR	5.0V	TO252	

Application Circuits

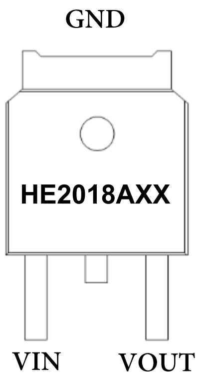


Pin Assignment

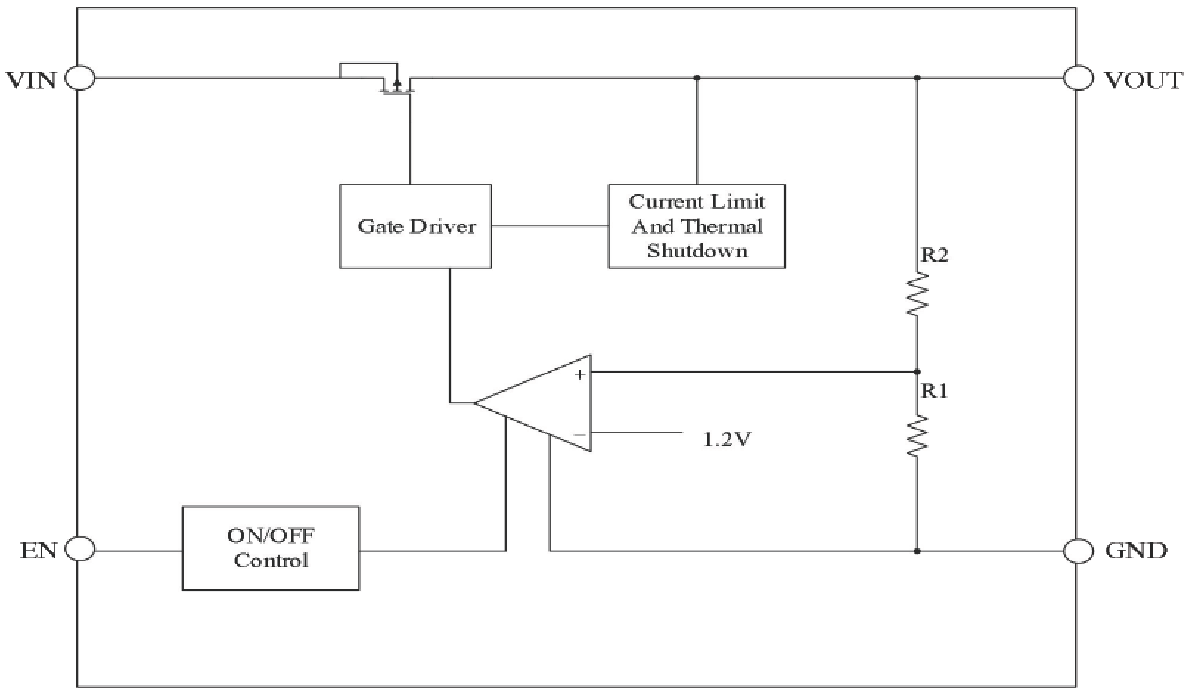
SOT223 (Top View)



TO252 (Top View)



Functional Block Diagrara



Absolute Maximum Ratings (1) (2)

Parameter		Symbol	Maximum Rating	Unit
Input Voltage		V_{IN}	V_{SS} -0.3~V_{SS}+18.0	V
		V_{OUT}	V_{SS} -0.3~V_{SS}+6.0	V
Output Current		I_{OUT}	1000	mA
Power Dissipation	SOT223	Pd	1200	mW
	TO252		1800	
Thermal Resistance	SOT223	$R_{\theta JA}$ (3)	66	℃/W
	TO252		55	℃/W
Operating Temperature		Topr	-40~85	℃
Storage Temperature		Tstg	-40~125	℃
Soldering Temperature & Time		Tsolder	260℃, 10s	

Note (1): Exceeding these ratings may damage the device.

Note (2): The device is not guaranteed to function outside of its operating conditions

Note (3): The package thermal impedance is calculated in accordance to JESD 51-7.

ESD Ratings

Item	Description	Value	Unit
$V_{(ESD-HBM)}$	Human Body Model (HBM) ANSI/ESDA/JEDEC JS-001-2014 Classification, Class: 2	±4000	V
$V_{(ESD-CDM)}$	Charged Device Mode (CDM) ANSI/ESDA/JEDEC JS-002-2014 Classification, Class: C0b	±200	V
$I_{LATCH-UP}$	JEDEC STANDARD NO.78E APRIL 2016 Temperature Classification, Class: I	±150	mA

ESD testing is performed according to the respective JESD22 JEDEC standard.The human body model is a 100 pF capacitor discharged through a 1.5kΩ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.

Recommended Operating Conditions

Parameter	MIN.	MAX.	Units
Supply voltage at V_{IN}	---	15	V
Operating junction temperature range, Tj	-40	125	°C
Operating free air temperature range, TA	-40	85	°C

Note : All limits specified at room temperature (TA = 25°C) unless otherwise specified. All room temperature limits are 100% production tested. All limits at temperature extremes are ensured through correlation using standard Statistical Quality Control (SQC) methods. All limits are used to calculate Average Outgoing Quality Level (AOQL).

Electrical characteristics

（At T_A=25°C, C_{IN}=1uF, V_{IN}=V_{OUTNOM}+1.0V, C_{OUT}=10µF, unless otherwise noted）

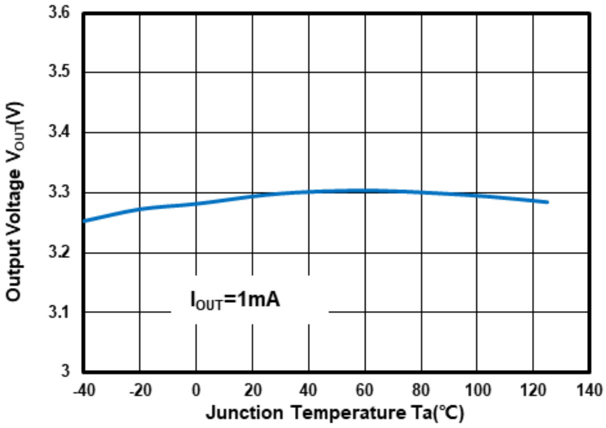
PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage*1	$V_{OUT(S)}$	V_{IN}= $V_{OUT(S)}$+2V，I_{OUT}=1mA	$V_{OUT(S)}$×0.98	$V_{OUT(S)}$	$V_{OUT(S)}$×1.02	V
Dropout Voltage*2	V_{DROP}	$V_{OUT(S)}$=3.3V, I_{OUT}=1mA		3	8	mV
		$V_{OUT(S)}$=3.3V, I_{OUT}=1A		1000	1300	mV
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT(S)}}$	$V_{OUT(S)}$+2V≤V_{IN}≤18V I_{OUT} =1mA		0.01	0.02	%/V
Load Regulation	ΔV_{OUT2}	V_{IN}=$V_{OUT(S)}$+2V 1mA≤I_{OUT}≤1A, $V_{OUT(S)}$≤5.0V		80		mV
		V_{IN}=$V_{OUT(S)}$+2V 1mA≤I_{OUT}≤1A, $V_{OUT(S)}$>5.0V		90		mV
Temperature Stability	$\frac{\Delta V_{OUT}}{\Delta T_a \bullet V_{OUT(S)}}$	V_{IN} = $V_{OUT(S)}$+2V，I_{OUT}=1mA -40℃≤T_a≤125℃		±50		ppm/℃
GND Current	I_{GND}	no load, $V_{OUT(S)}$≤5.0V	1.0	2.0	3.0	µA
		I_{OUT}=100mA		420		µA
Shutdown Current	I_{SHUT}	V_{IN}=18V, V_{EN}=0		0.1	1	µA
Input Voltage	V_{IN}	---	2.2		18	V
Maximum Output Current	I_{OUTMAX}		1			A
Current Limit*3	I_{LIM}	V_{IN}= $V_{OUT(S)}$+2V, V_{OUT} = 0.95 ×$V_{OUT(S)}$		1.5		A
Power Supply Rejection Ratio*4	PSRR	f=10Hz, I_{OUT}=10mA		75		dB
		f=100Hz, I_{OUT}=10mA		80		dB
		f=1kHz, I_{OUT}=10mA		65		dB
Short Circuit Current*5	I_{SHORT}	V_{IN}=$V_{OUT(S)}$+2.0V V_{OUT}=0V		30		mA
EN 'H' Level Voltage	V_{ENH}		1.5		18	V
EN 'L' Level Voltage	V_{ENL}		0		0.5	V
EN 'H' Level Current	I_{ENH}	V_{IN}=18V, V_{EN}=V_{IN}	-0.1		0.1	uA
EN 'L' Level Voltage	I_{ENL}	V_{IN}=18V, V_{EN}=0	-0.1		0.1	uA
Over Temperature Protection	OTP	I_{OUT}=1mA		150		℃

Notes:

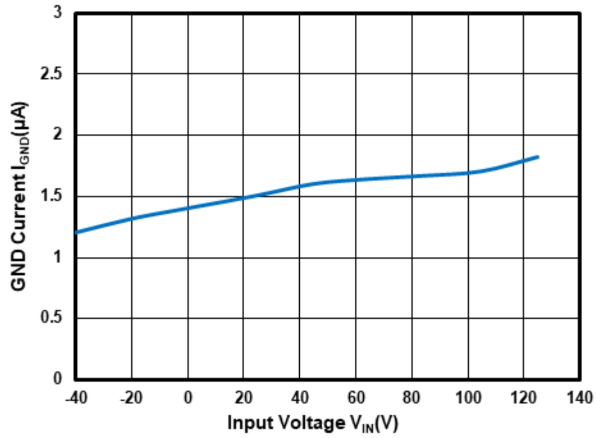
1. $V_{OUT(S)}$: Output voltage when V_{IN}=V_{OUT}+2V, I_{OUT}=1 mA.
2. V_{DROP}=V_{IN1} -（$V_{OUT(S)}$× 0.98）where V_{IN1} is the input voltage when V_{OUT} = $V_{OUT(S)}$× 0.98.
3. I_{LIM}: Output current when V_{IN}=$V_{OUT(S)}$+2V and V_{OUT} = 0.95*$V_{OUT(S)}$.
4. PSRR was measured for $V_{OUT(S)}$ = 3.3V and V_{IN}= 5.3V.
5. VOUT pin should be shorted to GND pin, and the impedance between them is less than 0.1 ohm

■ Typical Performance Characteristics:

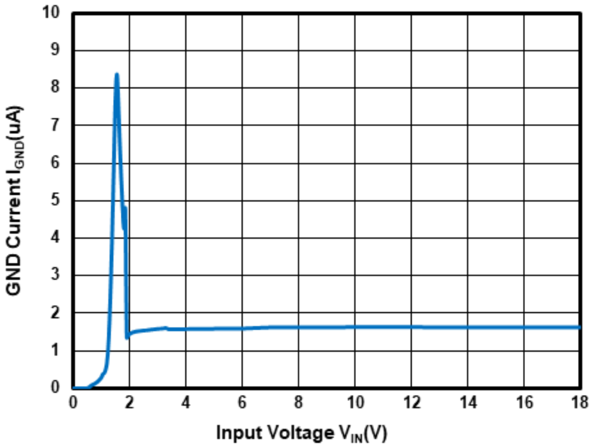
Test Conditions: V_{IN}=V_{OUT}+2.0V, C_{IN}=2.2μF, C_{OUT}=2.2μF, unless otherwise indicated.



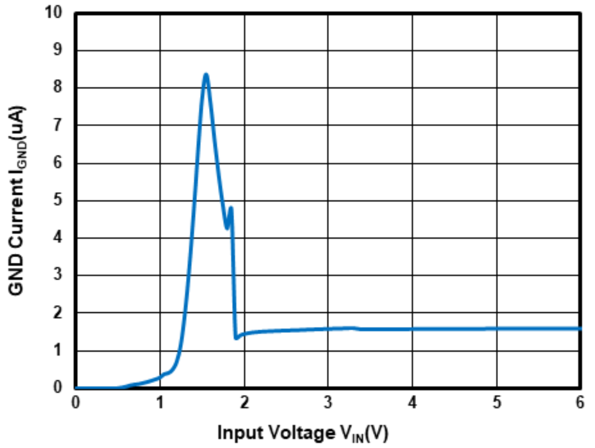
Output Voltage vs Temperature at V_{OUT}=3.3V



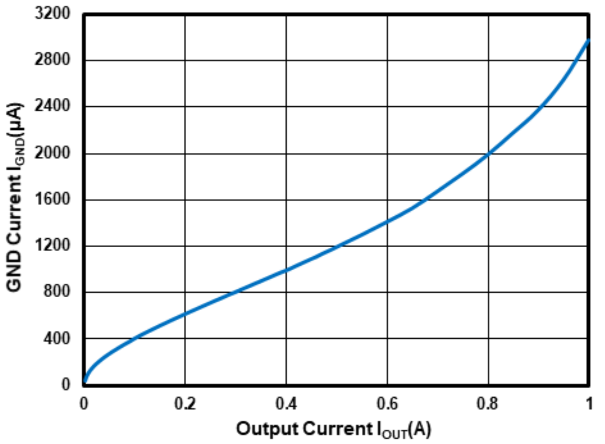
GND Current vs Temperature at V_{OUT}=3.3V



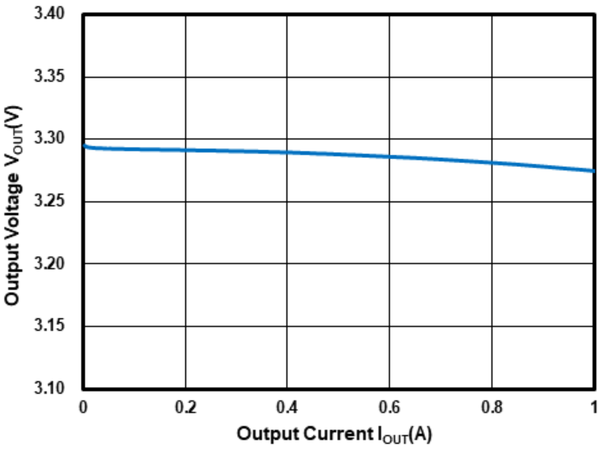
GND Current vs Input Voltage at V_{OUT}=3.3V



GND Current vs Input Voltage at V_{OUT}=3.3V



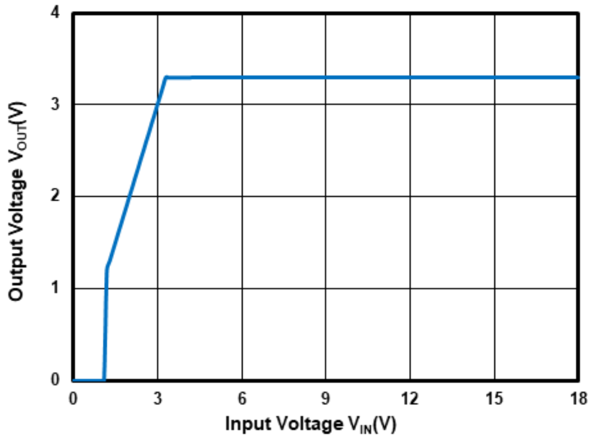
GND Current vs Output Current at V_{OUT}=3.3V



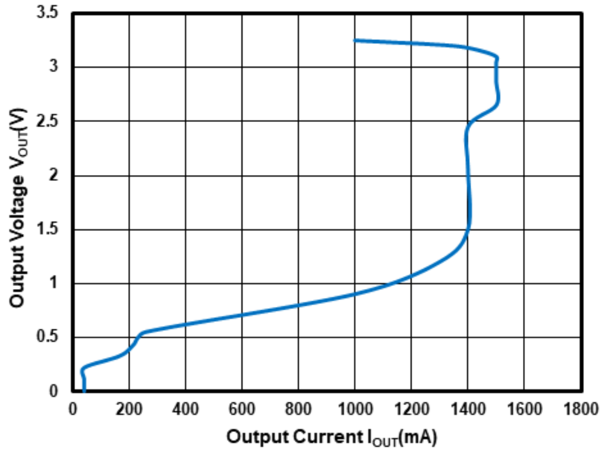
Output Voltage vs Output Current at V_{OUT}=3.3V

■ Typical Performance Characteristics (Continued):

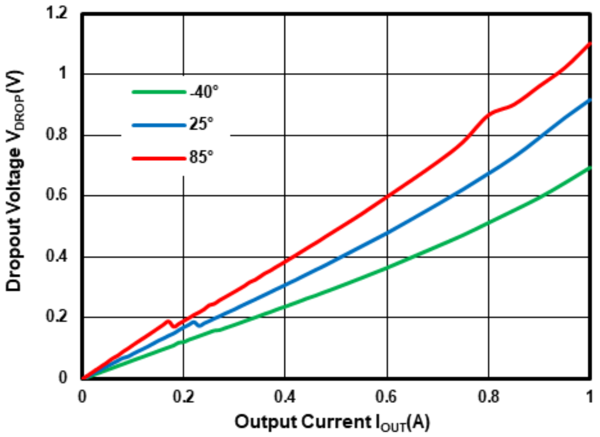
Test Conditions: $V_{IN}=V_{OUT}+2.0V$, $C_{IN}=2.2\mu F$, $C_{OUT}=2.2\mu F$, unless otherwise indicated.



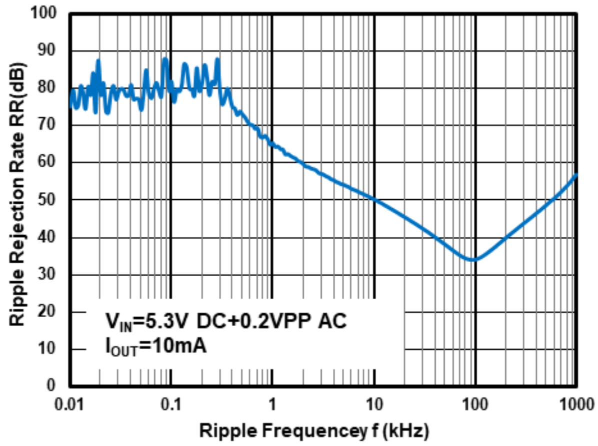
Output Voltage vs Input Voltage at V_{OUT}=3.3V



Output Current Fold-back at V_{OUT}=3.3V



Dropout Voltage vs Temperature at V_{OUT}=3.3V



Power Supply Rejection Ratio at V_{OUT}=3.3V

Application Guideline

Input Capacitor

A 10μF ceramic capacitor is recommended to connect between V_{DD} and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is 10μF, ceramic capacitor is recommended, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to VOUT and GND pins.

Dropout Voltage

The dropout voltage refers to the voltage difference between the VIN and VOUT pins while operating at specific output current. The dropout voltage VDROP also can be expressed as the voltage drop on the pass-FET at specific output current (IRATED) while the pass-FET is fully operating at ohmic region and the pass-FET can be characterized asan resistance RDS(ON). Thus the dropout voltage can bedefined as (VDROP = VIN − VOUT = RDS(ON) x IRATED). Fornormal operation, the suggested LDO operating range is (VIN > VOUT + VDROP) for good transient response and PSRR ability. Vice versa, while operating at the ohmic region will degrade the performance severely.

Thermal Application

For continuous operation, do not exceed the absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction and ambient temperature. The maximum power dissipation can be calculated as below: TA=25°C, PCB,

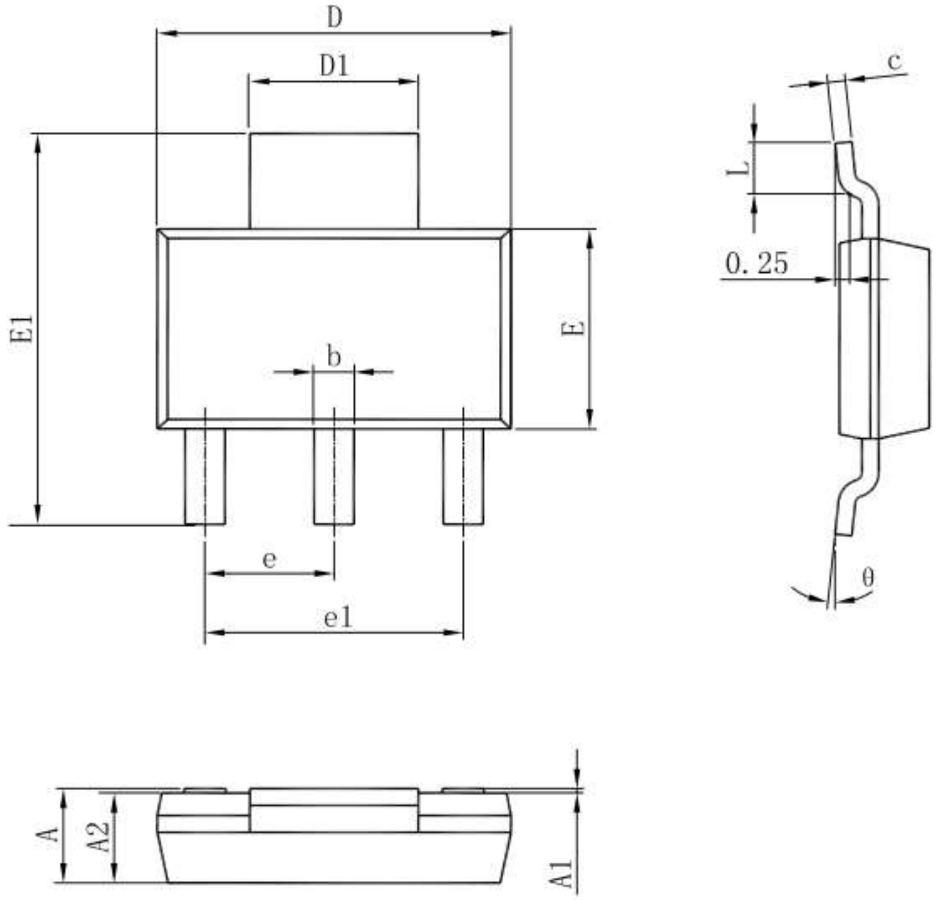
The max PD= (125°C − 25°C) / (Thermal Resistance °C/W)

Power dissipation (PD) is equal to the product of the output current and the voltage drop across the output pass element, as shown in the equation below:

PD = (VIN – VOUT) × IOUT

■ PACKAGING INFORMATION(Continued)

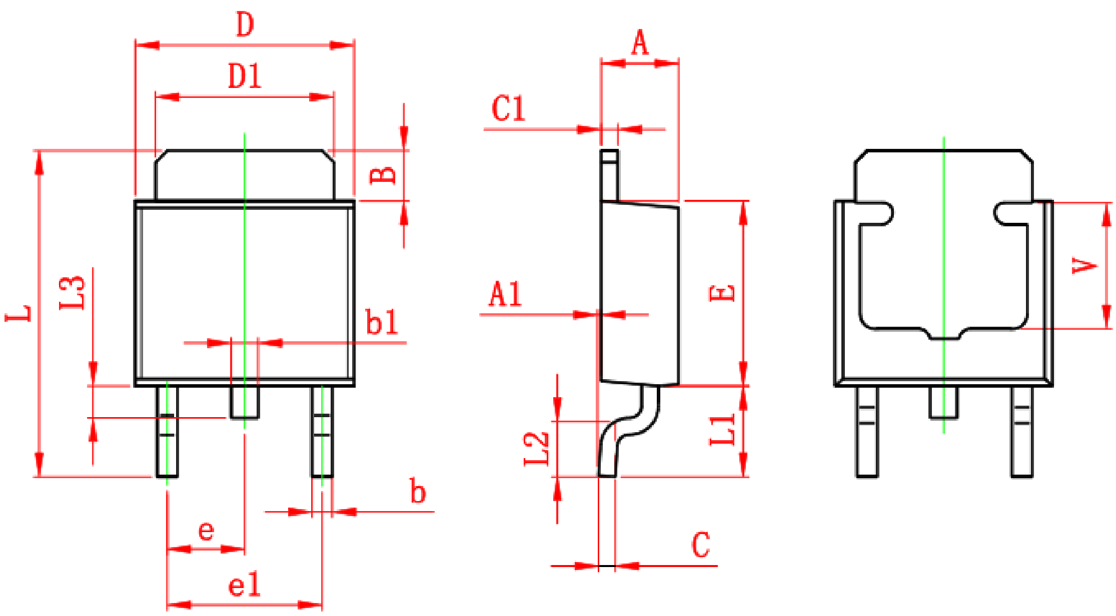
SOT-223 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	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°

■ PACKAGING INFORMATION

TO-252-2L 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	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.600	0.900	0.024	0.035
V	3.800 REF.		0.150 REF.	