1A Low Dropout Positive Voltage Regulator

FEATURES

- Adjustable or Fixed Output
- Output Current of 1A
- Low Dropout, 1.2 V typ. at 1A Output Current
- 0.04% Line Regulation
- 0.2 % Load Regulation
- 100% Thermal Limit Burn-In
- Fast Transient Response
- Current-Limit : 1A Typ. at T_J = 25°C
- On-Chip Thermal Limiting: 150°C Typ.
- Standard 3-pin SOT-223 TO-252 Power Packages.

APPLICATIONS

- High Efficiency Linear Regulators
- Post Regulators for Switching Supplies
- Adjustable Power Supply

ORDERING INFORMATION

PART	PACKAGE	RoHS	Ship, Quantity
ZTP1117SA	SOT-223	Yes	Tape and Reel, 3000
ZTP1117Sxx	SOT-223	Yes	Tape and Reel, 3000
ZTP1117UA	TO-252	Yes	Tape and Reel, 3000
ZTP1117Uxx	TO-252	Yes	Tape and Reel, 3000

The last letter(s) of PART No. denote the Output Voltage:
A = adjustable; xx = 12: 1.2V; xx = 15: 1.5V;xx = 18: 1.8V; xx = 25: 2.5V; xx = 33: 3.3V; xx = 50: 5.0V.

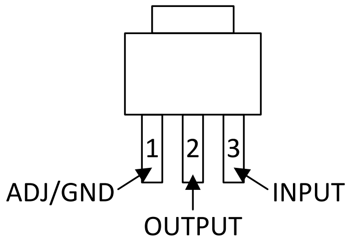
DESCRIPTION

The ZTP1117 series of positive adjustable and fixed regulators are designed to provide 1A with high efficiency. All internal circuitry is designed to operate down to 1.4V input to output differential.

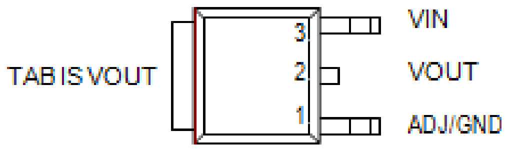
On-chip trimming adjusts the reference voltage to 1%. Current limit the typical value of 1.5A allows to minimize the stress on both the regulator and the power source circuitry under overload conditions.

Pins Configuration

SOT-223

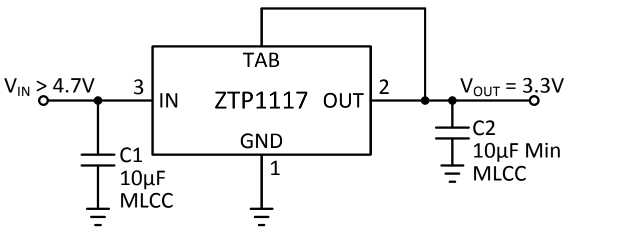


TO-252



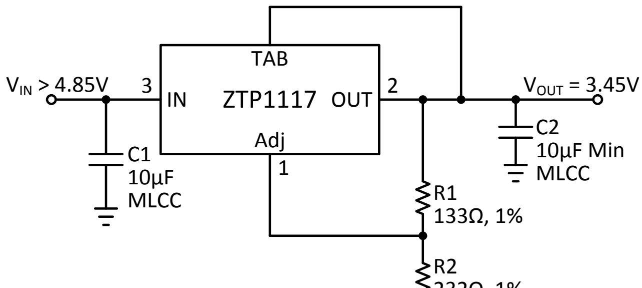
Typical Application Circuits

Fixed Voltage Regulator



Notes:
1) C1 needed if device is far from filter capacitors.
2) C2 minimum value required for stability.

Adjustable Voltage Regulator



$V_{OUT} = V_{REF} \times (1 + R2/R1) + I_{ADJ} \times R2$

4F-3, No.5, Technology Rd., Science-Based Industrial Park, Hsinchu 30078, Taiwan
Tel: (886) 3577 7509; Fax: (886) 3577 7390
Email: sales@zilltek.com

Absolute Maximum Ratings

Power Dissipation P_D .... Internally Limited
Input Voltage V_{IN} .... +20V
Operating Junction Temperature T_J ...... −40°C to +125°C
Storage Temperature T_{STG} .... −65°C to +150°C
Lead Temperature (Soldering 10sec) .... +300°C
Minimum ESD Rating (HBM) V_{ESD} 3kV

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Package Thermal Characteristics

Thermal Resistance, SOT-223, θ_{JA} .... 63°C/W
Thermal Resistance, TO-252, θ_{JA} .... 50°C/W
Thermal Resistance, SOT-223, θ_{JC} .... 27°C/W
Thermal Resistance, TO-252, θ_{JC} .... 10°C/W

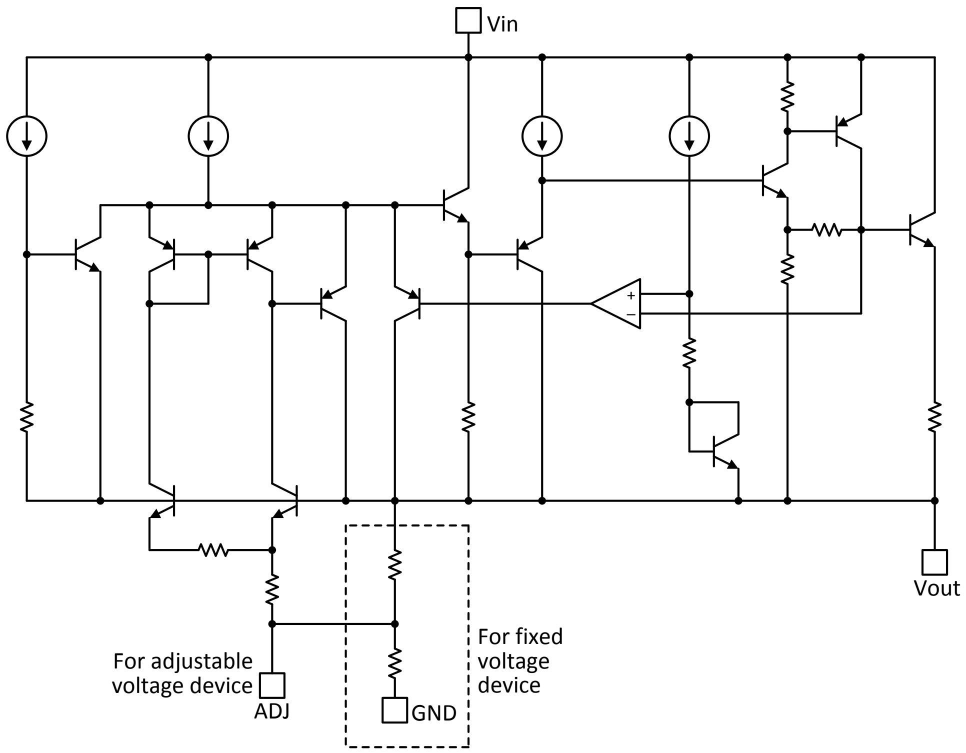
Electro-Static Discharge Sensitivity

This integrated circuit can be damaged by ESD. It is recommended that all integrated circuits be handled with proper precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure.

Pins Description

Pin	Description
1	ADJ/GND
2	OUTPUT
3	INPUT

Functional Block Diagram



4F-3, No.5, Technology Rd., Science-Based Industrial Park, Hsinchu 30078, Taiwan
Tel: (886) 3577 7509; Fax: (886) 3577 7390
Email: sales@zilltek.com

Electrical Specifications

(I_{LOAD} = 0mA, T_J = +25°C, unless otherwise noted.)

PARAMETER	Device	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Operating Voltage	V_{IN}		F			16	V
Output Voltage	Adj	Maximum P_D < 2.25W		1.25		14.6	V
Reference Voltage (Note 1)	Adj	V_{IN} = +5V, I_{LOAD} = 10mA		1.232	1.250	1.268	V
		1.5V ≤ V_{IN} – V_{OUT} ≤ 10V, I_{LOAD} = 10mA to 1A	F	1.225	1.250	1.275	
Output Voltage (Note 1)	All fixed version	V_{IN} = V_{OUT} + 1.5V, Variation from nominal V_{OUT}		–1.5		+1.5	%
		1.5V ≤ V_{IN} – V_{OUT} ≤ 10V, I_{LOAD} = 0mA to 1A, Variation from nominal V_{OUT}	F	–2		+2	
	V_{OUT} = +1.2V			–3		+2	
Output Voltage Accuracy (at Wafer Testing)	All	V_{IN} = V_{OUT} + 1.5V, I_{LOAD} = 10mA		–0.6%	0	+0.6%	%
Line Regulation	All	I_{LOAD} = 10mA, 1.5V ≤ V_{IN} – V_{OUT} ≤ 10V	F		0.04	0.238	%
Load Regulation (Note 1)	All	V_{IN} = V_{OUT} + 1.5V, I_{LOAD} = 10mA to 1A	F		0.4	0.8	
Minimum Load Current	Adj	V_{IN} = +5V, V_{ADJ} = 0V	F		2	7	mA
Ground Pin Current	All fixed version	V_{IN} = V_{OUT} + 1.5V, I_{LOAD} = 10mA to 1A	F		3.5	6	mA
Adjust Pin Current	Adj	1.5V ≤ V_{IN} – V_{OUT} ≤ 10V, I_{LOAD} = 10mA	F		35	60	μA
Current Limit	All	V_{IN} – V_{OUT} = 1.5V	F	1	1.5	2	A
Ripple Rejection (Note 2)	All	V_{IN} – V_{OUT} = 2.5V, I_{LOAD} = 1A		60			dB
Dropout Voltage (Note 1, 3)	All	I_{LOAD} = 500mA	F		1.15	1.25	V
		I_{LOAD} = 1A	F		1.20	1.40	V
Temperature Coefficient	All	V_{IN} – V_{OUT} = 1.5V, I_{LOAD} = 10mA	F			0.015	%/°C
Current-Limit	All	T_J = 25°C			1		A
On-Chip Thermal Limiting	All				150		°C

The "F" denotes the specifications which apply over the full temperature range: −40°C ≤ T_J ≤ +125°C.

Note 1: Low duty pulse testing with Kelvin connections required.

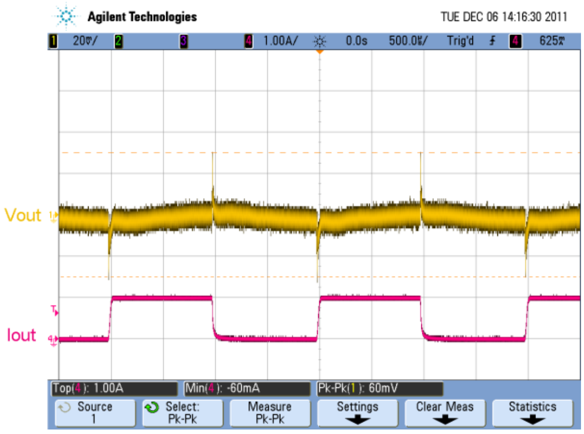
Note 2: 120Hz input ripple (C_{ADJ} for ADJ = 25μF).

Note 3: ΔV_{OUT}, ΔV_{REF} = 1%.

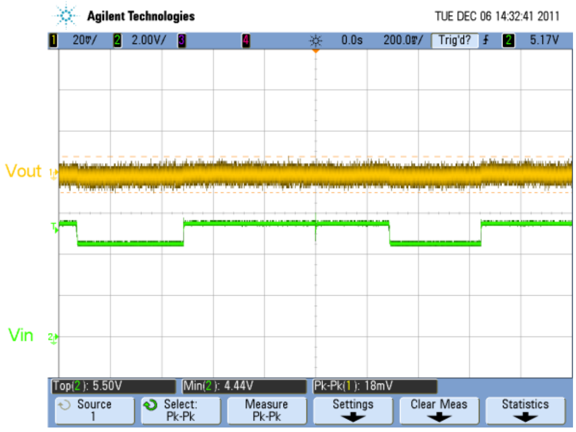
4F-3, No.5, Technology Rd., Science-Based Industrial Park, Hsinchu 30078, Taiwan
Tel: (886) 3577 7509; Fax: (886) 3577 7390
Email: sales@zilltek.com

Typical Characteristics

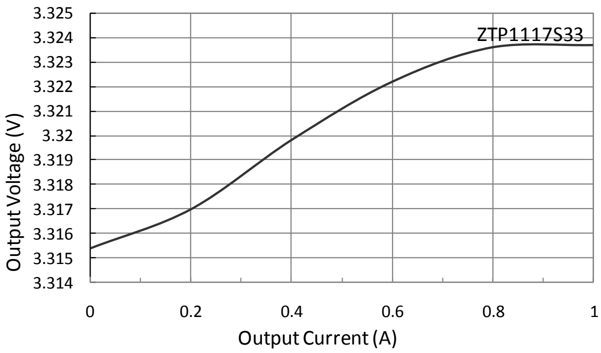
Load Transient Response



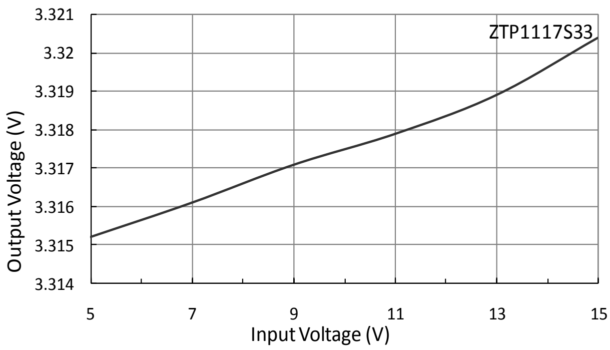
Line Transient Response



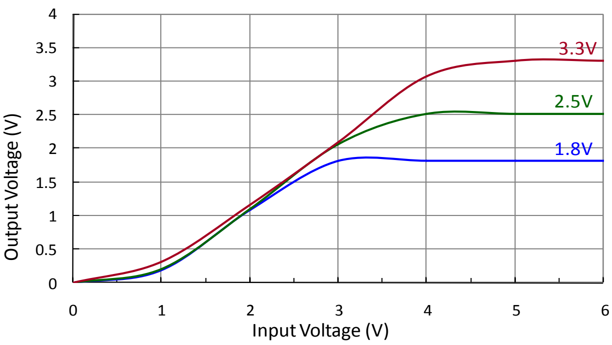
Load Regulation (Input Voltage = 5V)



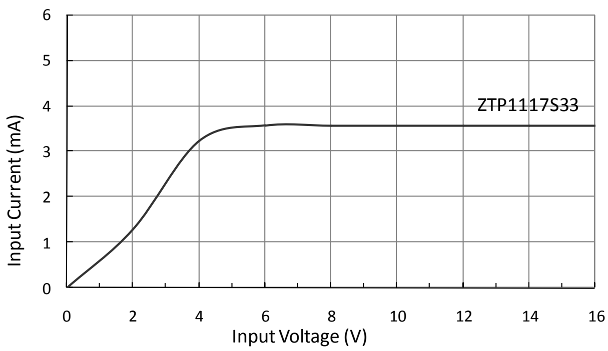
Line Regulation (Output Current = 100mA)



Output Voltage vs. Input Voltage

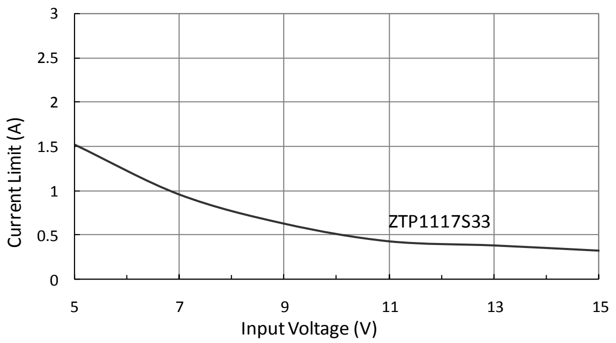


Input Current vs. Input Voltage

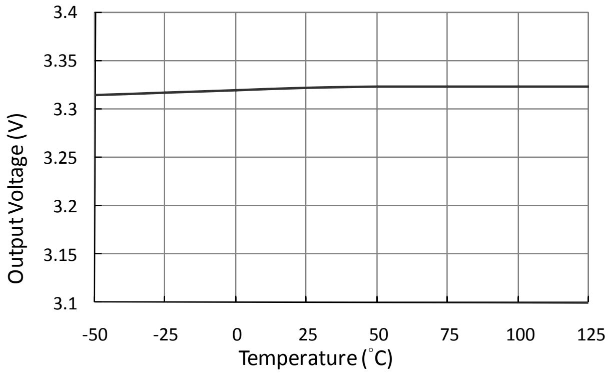


4F-3, No.5, Technology Rd., Science-Based Industrial Park, Hsinchu 30078, Taiwan
Tel: (886) 3577 7509; Fax: (886) 3577 7390
Email: sales@zilltek.com

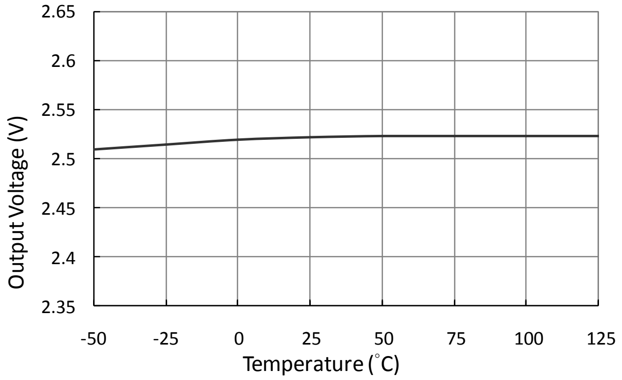
Current Limit vs. Input Voltage



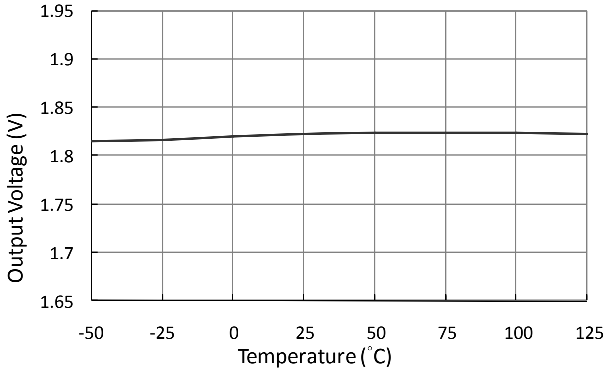
Output Voltage vs. Temperature (3.3V)



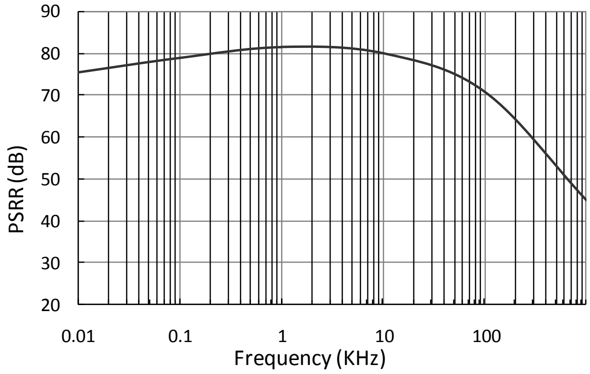
Output Voltage vs. Temperature (2.5V)



Output Voltage vs. Temperature (1.8V)



PSRR vs. Frequency



4F-3, No.5, Technology Rd., Science-Based
Industrial Park, Hsinchu 30078, Taiwan
Tel: (886) 3577 7509; Fax: (886) 3577 7390
Email: sales@zilltek.com

APPLICATION INFORMATION

Output Voltage

The ZTP1117 develops a 1.25V reference voltage between the output and the adjust terminal. By placing a resistor between these two terminals, a constant current is caused to flow through R1 and down through R2 to set the overall output voltage. Normally, this current is chosen to be the specified minimum load current of 10mA. For fixed voltage devices R1 and R2 are included in the device.

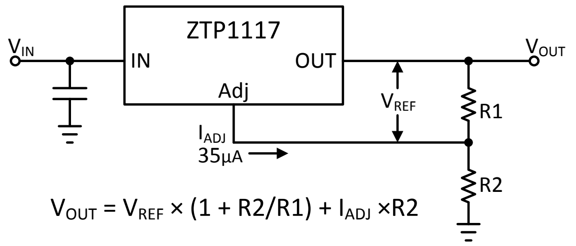


Figure 1: Basic adjustable regulator.

Load Regulation

When the adjustable regulator is used, load regulation will be limited by the resistance of the wire connecting the regulator to the load. The data sheet specification for load regulation is measured at the output pin of the device.

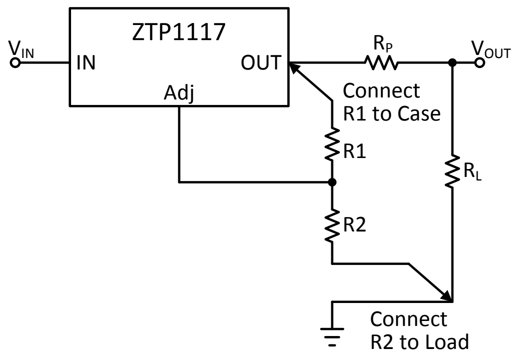


Figure 2: Connections for best load regulation.

Best load regulation is obtained when the top of the resistor divider (R1) is tied directly to the output pin of the device not to the load. For fixed voltage, devices the top of R1 is internally connected to the output, and the ground pin can be connected to low side of the load. If R1 is connected to the load, R_P is multiplied by the divider ratio, the effective resistance between the regulator and the load would be:

$$R_P \times (1 + R2/R1),\ R_P = \text{Parasitic Line Resistance}$$

Input Capacitor

An input capacitor of 10μF or greater is recommended. Tantalum or aluminum electrolytic capacitors can be used for bypassing. Larger Values will improve ripple rejection by bypassing the input to the regulator.

Output Capacitor

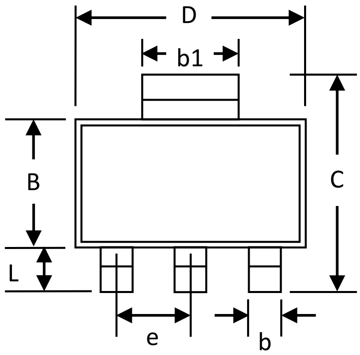
The ZTP1117 requires an output capacitor to maintain stability and improve transient response. Proper capacitor selection is important to ensure proper operation. The ZTP1117 output capacitor selection is dependent upon the ESR (equivalent series resistance) of the output capacitor to maintain stability. When the output capacitor is 10μF or greater, the output capacitor should have an ESR less than 1Ω. This will improve transient response as well as promote stability. A low-ESR solid tantalum capacitor works extremely well and provides good transient response and stability over temperature.
Aluminum electrolytic can also be used, as long as the ESR of the capacitor is <1Ω. The value of the output capacitor can be increased without limit. Higher capacitance values help to improve transient response and ripple rejection and reduce output noise.

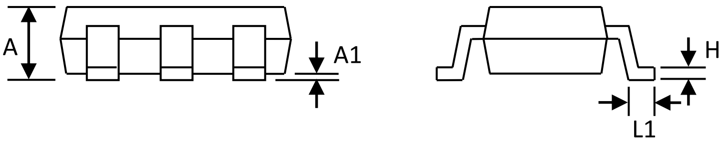
Ripple Rejection

The curves for Ripple Rejection were generated using an adjustable device with the adjust pin bypassed. With a 25μF bypassing capacitor, 75dB ripple rejection is obtainable at any output level. The impedance of the adjust pin capacitor, at the ripple frequency, should be < R1. R1 is normally in the range of 100W to 200W. The size of the required adjust pin capacitor is the function of the input ripple frequency. At 120Hz, with R1=100Ω, the adjust pin capacitor should be 13μF. For fixed voltage devices and adjustable devices without an adjust pin capacitor, the output ripple will increase as the ratio of the output voltage to the reference voltage (V_{OUT} /V_{REF}).

4F-3, No.5, Technology Rd., Science-Based Industrial Park, Hsinchu 30078, Taiwan
Tel: (886) 3577 7509; Fax: (886) 3577 7390
Email: sales@zilltek.com

PACKAGE DIMENSIONS SOT-223

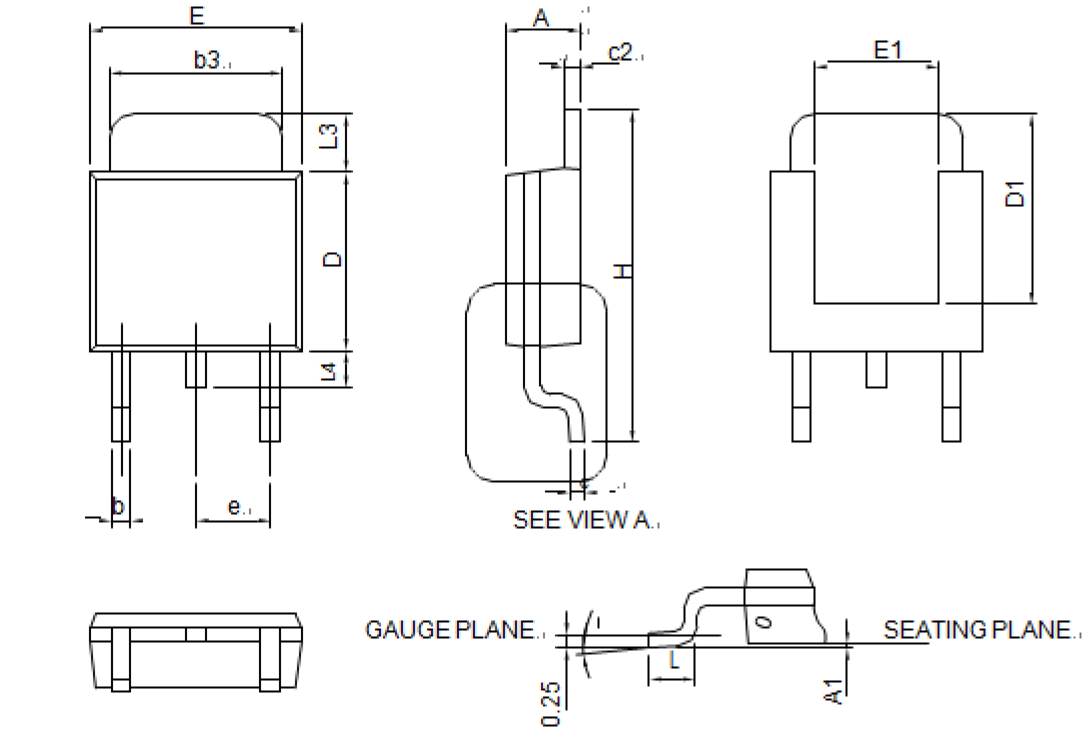




Symbol	Dimensions in mm	
	Min	Max
A	1.400	1.800
A1	0.000	0.120
B	3.300	3.700
b	0.600	0.840
b1	2.900	3.150
C	6.700	7.300
D	6.200	6.700
e	2.300 BSC	
H	0.230	0.350
L	1.500	2.000
L1	0.750	1.150

4F-3, No.5, Technology Rd., Science-Based
Industrial Park, Hsinchu 30078, Taiwan
Tel: (886) 3577 7509; Fax: (886) 3577 7390
Email: sales@zilltek.com

PACKAGE DIMENSIONS TO-252-3



SYMBOL	TO-252			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1		0.13		0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.235
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.235
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	0.90	1.78	0.035	0.070
L3	0.89	2.03	0.035	0.080
L4		1.02		0.040
θ	0°	8°	0°	8°

Note : Follow JEDEC TO-252 .

4F-3, No.5, Technology Rd., Science-Based
Industrial Park, Hsinchu 30078, Taiwan
Tel: (886) 3577 7509; Fax: (886) 3577 7390
Email: sales@zilltek.com