

# RS78XX

## 1.0A Low Dropout Positive Voltage Regulator

### General Description

The RS78XX series can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each employs internal current limiting, thermal shut-down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

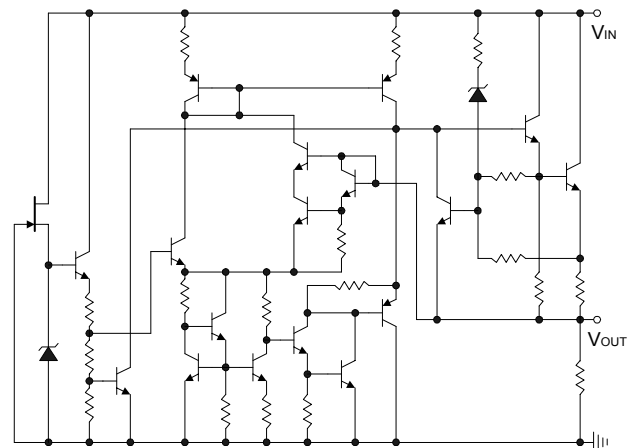
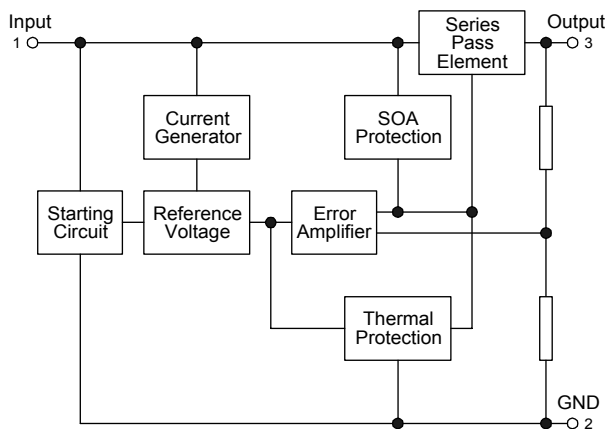
### Features

- Output Current In Excess of 1A
- Output Voltages of 5V, 6V, 8V, 9V, 12V
- Internal Short-Circuit Current Limiting & Thermal Overload Protection
- Guaranteed In Extended Temperature Range

### Applications

- SCSI-2 Active Termination
- High Efficiency Linear Regulators
- 5V to 3.3V Voltage Converter
- Battery Charger
- Battery Management Circuits For Notebook And Palmtop PCs
- Core Voltage Supply: FPGA, PLD, DSP, CPU

### Schematic Diagram & Equivalent Circuit

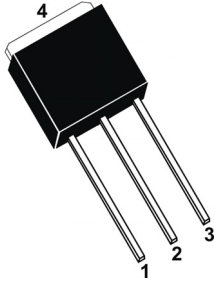


This integrated circuit can be damaged by ESD. Orister Corporation recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

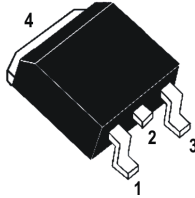
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## Pin Assignments

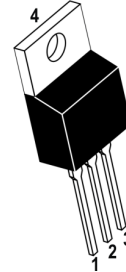
**TO-251**



**TO-252**



**TO-220-3**



PACKAGE	PIN	SYMBOL	DESCRIPTION
TO-251	1	VIN	Regulator Input Pin
	2, 4	GND	Ground Pin
	3	VOUT	Regulator Output Pin

PACKAGE	PIN	SYMBOL	DESCRIPTION
TO-252	1	VIN	Regulator Input Pin
	2, 4	GND	Ground Pin
	3	VOUT	Regulator Output Pin

PACKAGE	PIN	SYMBOL	DESCRIPTION
TO-220-3	1	VIN	Regulator Input Pin
	2, 4	GND	Ground Pin
	3	VOUT	Regulator Output Pin

## Ordering Information

Part Number	V <sub>OUT</sub>	Package
RS7805AJ	5V±0.15V	TO-252
RS7805AE	5V±0.15V	TO-220AB
RS7805AI	5V±0.15V	TO-251
RS7806AJ	6V±0.18V	TO-252
RS7806AE	6V±0.18V	TO-220AB
RS7806AI	6V±0.18V	TO-251
RS7808AJ	8V±0.24V	TO-252
RS7808AE	8V±0.24V	TO-220AB
RS7808AI	8V±0.24V	TO-251
RS7809AJ	9V±0.27V	TO-252
RS7809AE	9V±0.27V	TO-220AB
RS7809AI	9V±0.27V	TO-251
RS7812AJ	12V±0.36V	TO-252
RS7812AE	12V±0.36V	TO-220AB
RS7812AI	12V±0.36V	TO-251

## Absolute Maximum Ratings

Parameter	Symbol	Maximum	Unit
Input Voltage	$V_{IN}$	40	V
Power Dissipation	$P_D$	Internally limited <sup>(Note)</sup>	W
Operating Temperature	$T_{OPR}$	0 to 125	°C
Storage Temperature	$T_{STG}$	-55 to 150	°C
Junction Temperature	$T_J$	150	°C

### Note:

(1) $T_A=25^{\circ}\text{C}$ , TO-252 / TO-251: 1W, TO-220AB: 2.7W

(2) $T_C=25^{\circ}\text{C}$ , All package: 10W

## Thermal Data

Characteristic	Symbol	TO-252 / TO-251	TO-220AB	Unit
Thermal Resistance Junction-Case	$R_{th(j-c)}$	12.5	12.5	°C/W
Thermal Resistance Junction-Ambient	$R_{th(j-a)}$	125	47	°C/W

## RS7805A Series Electrical Characteristics

$V_{IN}=10\text{V}$ ,  $I_{OUT}=500\text{mA}$ ,  $C_{IN}=0.33\mu\text{F}$ ,  $C_{OUT}=0.1\mu\text{F}$ ,  $0^{\circ}\text{C}\leq T_J\leq 125^{\circ}\text{C}$  (unless otherwise specified)

Symbol	Parameter	Conditions	RS7805AJ/E/I			Units
			Min	Typ	Max	
$V_O$	Output Voltage	$T_J=25^{\circ}\text{C}$ , $I_{OUT}=500\text{mA}$	4.85	5	5.15	V
		$5\text{mA}\leq I_{OUT}\leq 1\text{A}$	4.85	5	5.15	
		$7\text{V}\leq V_{IN}\leq 25\text{V}$ , $P_{OUT}\leq 15\text{W}$				
$\Delta V_O$	Line Regulation	$T_J=25^{\circ}\text{C}$ , $7\text{V}\leq V_{IN}\leq 25\text{V}$	-	3	50	mV
		$T_J=25^{\circ}\text{C}$ , $8\text{V}\leq V_{IN}\leq 12\text{V}$	-	1	25	
$\Delta V_O$	Load Regulation	$T_J=25^{\circ}\text{C}$ , $5\text{mA}\leq I_{OUT}\leq 1\text{A}$	-	15	100	mV
		$T_J=25^{\circ}\text{C}$ , $250\text{mA}\leq I_{OUT}\leq 750\text{mA}$	-	5	50	
$I_B$	Quiescent Current	$I_{OUT}=5\text{mA}$ , $T_J=25^{\circ}\text{C}$	-	3.9	8	mA
$\Delta I_B$	Quiescent Current Change	$I_{OUT}=500\text{mA}$ , $7\text{V}\leq V_{IN}\leq 25\text{V}$ , $T_J=25^{\circ}\text{C}$	-	-	1.3	mA
		$5\text{mA}\leq I_{OUT}\leq 1\text{A}$ , $V_{IN}=10\text{V}$ , $T_J=25^{\circ}\text{C}$	-	-	0.5	
eN	Output Noise Voltage	$B=10\text{Hz}\sim 100\text{KHz}$ , $I_{OUT}=50\text{mA}$ , $T_J=25^{\circ}\text{C}$	-	50	-	$\mu\text{V}/V_O$
RR	Ripple Rejection	$10\text{V}\leq V_{IN}\leq 18\text{V}$ , $f=120\text{Hz}$ , $I_{OUT}=50\text{mA}$ , $T_J=25^{\circ}\text{C}$	57	73	-	dB
$V_D$	Dropout Voltage	$T_J=25^{\circ}\text{C}$ , $I_{OUT}=1\text{A}$	-	2	2.5	V
$R_O$	Output Resistance	$f=1\text{KHz}$	-	17	-	$\text{m}\Omega$
$I_{SC}$	Short Circuit Current	$T_J=25^{\circ}\text{C}$	-	2.3	2.8	A
$\Delta V_O/\Delta T$	Output Voltage Drift	$0^{\circ}\text{C}\leq T_J\leq 125^{\circ}\text{C}$	-	-	0.6	$\text{mV}/^{\circ}\text{C}$

## RS7806A Series Electrical Characteristics

$V_{IN}=11V$ ,  $I_{OUT}=500mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_J \leq 125^{\circ}C$  (unless otherwise specified)

Symbol	Parameter	Conditions	RS7806AJ/E/I			Units
			Min	Typ	Max	
$V_O$	Output Voltage	$T_J=25^{\circ}C$ , $I_{OUT}=500mA$	5.82	6	6.18	V
		$5mA \leq I_{OUT} \leq 1A$	5.82	6	6.18	
		$8V \leq V_{IN} \leq 25V$ , $P_{OUT} \leq 15W$				
$\Delta V_O$	Line Regulation	$T_J=25^{\circ}C$ , $8V \leq V_{IN} \leq 25V$	-	3	60	mV
		$T_J=25^{\circ}C$ , $9V \leq V_{IN} \leq 13V$	-	1	25	
$\Delta V_O$	Load Regulation	$T_J=25^{\circ}C$ , $5mA \leq I_{OUT} \leq 1A$	-	15	100	mV
		$T_J=25^{\circ}C$ , $250mA \leq I_{OUT} \leq 750mA$	-	5	50	
$I_B$	Quiescent Current	$I_{OUT}=5mA$ , $T_J=25^{\circ}C$	-	3.9	8	mA
$\Delta I_B$	Quiescent Current Change	$I_{OUT}=500mA$ , $9V \leq V_{IN} \leq 25V$ , $T_J=25^{\circ}C$	-	-	1.3	mA
		$5mA \leq I_{OUT} \leq 1A$ , $V_{IN}=11V$ , $T_J=25^{\circ}C$	-	-	0.5	
eN	Output Noise Voltage	$B=10Hz \sim 100KHz$ , $I_{OUT}=50mA$ , $T_J=25^{\circ}C$	-	-	55	$\mu V/V_O$
RR	Ripple Rejection	$11V \leq V_{IN} \leq 19V$ , $f=120Hz$ , $I_{OUT}=50mA$ , $T_J=25^{\circ}C$	56	72	-	dB
$V_D$	Dropout Voltage	$T_J=25^{\circ}C$ , $I_{OUT}=1A$	-	2	2.5	V
$R_O$	Output Resistance	$f=1KHz$	-	17	-	$m\Omega$
$I_{SC}$	Short Circuit Current	$V_{IN}=45V$ , $T_J=25^{\circ}C$	-	2.3	2.8	A
$\Delta V_O/\Delta T$	Output Voltage Drift	$0^{\circ}C \leq T_J \leq 125^{\circ}C$	-	-	0.7	$mV/^{\circ}C$

## RS7808A Series Electrical Characteristics

$V_{IN}=14V$ ,  $I_{OUT}=500mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_J \leq 125^{\circ}C$  (unless otherwise specified)

Symbol	Parameter	Conditions	RS7808AJ/E/I			Units
			Min	Typ	Max	
$V_O$	Output Voltage	$T_J=25^{\circ}C$ , $I_{OUT}=500mA$	7.76	8	8.24	V
		$5mA \leq I_{OUT} \leq 1A$	7.76	8	8.24	
		$10V \leq V_{IN} \leq 25V$ , $P_{OUT} \leq 15W$				
$\Delta V_O$	Line Regulation	$T_J=25^{\circ}C$ , $10.5V \leq V_{IN} \leq 25V$	-	3	80	mV
		$T_J=25^{\circ}C$ , $11V \leq V_{IN} \leq 17V$	-	1	40	
$\Delta V_O$	Load Regulation	$T_J=25^{\circ}C$ , $5mA \leq I_{OUT} \leq 1A$	-	15	100	mV
		$T_J=25^{\circ}C$ , $250mA \leq I_{OUT} \leq 750mA$	-	5	50	
$I_B$	Quiescent Current	$I_{OUT}=5mA$ , $T_J=25^{\circ}C$	-	3.9	8	mA
$\Delta I_B$	Quiescent Current Change	$I_{OUT}=500mA$ , $10.5V \leq V_{IN} \leq 25V$ , $T_J=25^{\circ}C$	-	-	1.3	mA
		$5mA \leq I_{OUT} \leq 1A$ , $V_{IN}=14V$ , $T_J=25^{\circ}C$	-	-	0.5	
eN	Output Noise Voltage	$B=10Hz \sim 100KHz$ , $I_{OUT}=50mA$ , $T_J=25^{\circ}C$	-	-	70	$\mu V/V_O$
RR	Ripple Rejection	$14V \leq V_{IN} \leq 21.5V$ , $f=120Hz$ , $I_{OUT}=50mA$ , $T_J=25^{\circ}C$	53	69	-	dB
$V_D$	Dropout Voltage	$T_J=25^{\circ}C$ , $I_{OUT}=1A$	-	2	2.5	V
$R_O$	Output Resistance	$f=1KHz$	-	17	-	$m\Omega$
$I_{SC}$	Short Circuit Current	$T_J=25^{\circ}C$	-	2.3	2.8	A
$\Delta V_O/\Delta T$	Output Voltage Drift	$0^{\circ}C \leq T_J \leq 125^{\circ}C$	-	-	1	$mV/^{\circ}C$

## RS7809A Series Electrical Characteristics

$V_{IN}=15V$ ,  $I_{OUT}=500mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_J \leq 125^{\circ}C$  (unless otherwise specified)

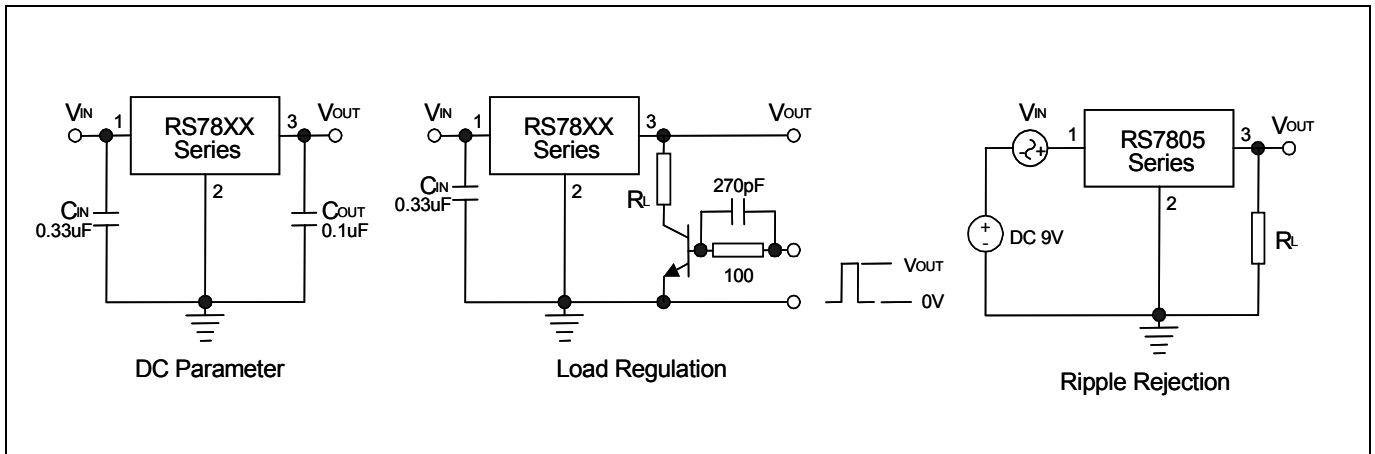
Symbol	Parameter	Conditions	RS7809AJ/E/I			Units
			Min	Typ	Max	
$V_O$	Output Voltage	$T_J=25^{\circ}C$ , $I_{OUT}=500mA$	8.73	9	9.27	V
		$5mA \leq I_{OUT} \leq 1A$	8.73	9	9.27	
		$11V \leq V_{IN} \leq 25V$ , $P_{OUT} \leq 15W$				
$\Delta V_O$	Line Regulation	$T_J=25^{\circ}C$ , $11.5V \leq V_{IN} \leq 25V$	-	3	90	mV
		$T_J=25^{\circ}C$ , $13V \leq V_{IN} \leq 19V$	-	1	45	
$\Delta V_O$	Load Regulation	$T_J=25^{\circ}C$ , $5mA \leq I_{OUT} \leq 1A$	-	15	100	mV
		$T_J=25^{\circ}C$ , $250mA \leq I_{OUT} \leq 750mA$	-	5	50	
$I_B$	Quiescent Current	$I_{OUT}=5mA$ , $T_J=25^{\circ}C$	-	3.9	8	mA
$\Delta I_B$	Quiescent Current Change	$I_{OUT}=500mA$ , $11.5V \leq V_{IN} \leq 26V$ , $T_J=25^{\circ}C$	-	-	1.3	mA
		$5mA \leq I_{OUT} \leq 1A$ , $V_{IN}=15V$ , $T_J=25^{\circ}C$	-	-	0.5	
eN	Output Noise Voltage	$B=10Hz \sim 100KHz$ , $I_{OUT}=50mA$ , $T_J=25^{\circ}C$	-	-	75	$\mu V/V_O$
RR	Ripple Rejection	$15V \leq V_{IN} \leq 22.5V$ , $f=120Hz$ , $I_{OUT}=50mA$ , $T_J=25^{\circ}C$	51	67	-	dB
$V_D$	Dropout Voltage	$T_J=25^{\circ}C$ , $I_{OUT}=1A$	-	2	2.5	V
$R_O$	Output Resistance	$f=1KHz$	-	17	-	$m\Omega$
$I_{SC}$	Short Circuit Current	$T_J=25^{\circ}C$	-	2.3	2.8	A
$\Delta V_O/\Delta T$	Output Voltage Drift	$0^{\circ}C \leq T_J \leq 125^{\circ}C$	-	-	1.1	$mV/^{\circ}C$

## RS7812A Series Electrical Characteristics

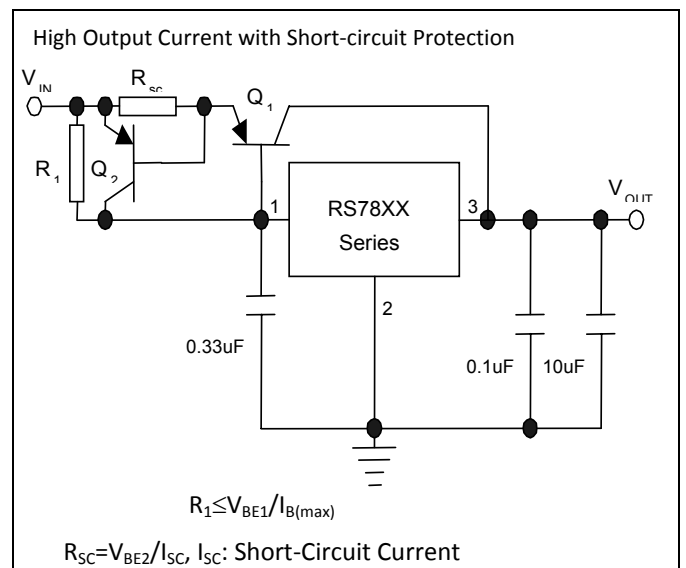
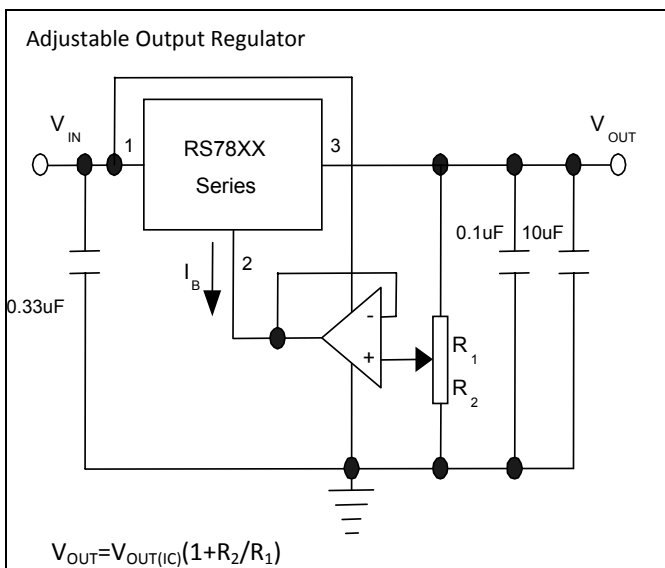
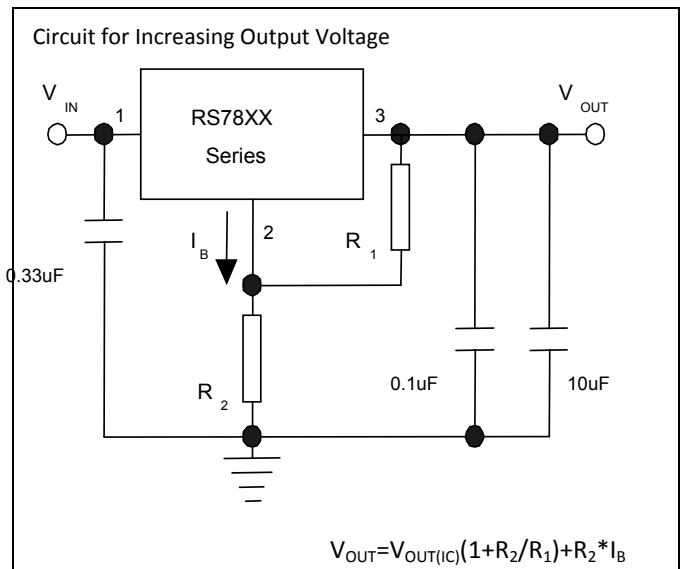
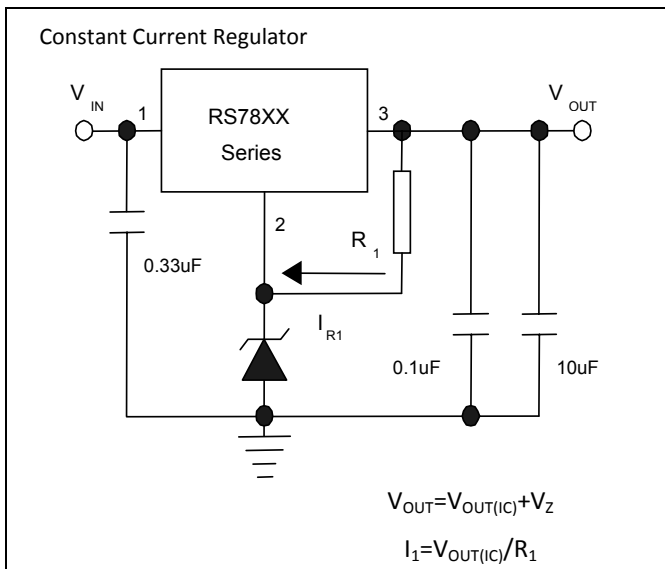
$V_{IN}=19V$ ,  $I_{OUT}=500mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_J \leq 125^{\circ}C$  (unless otherwise specified)

Symbol	Parameter	Conditions	RS7812AJ/E/I			Units
			Min	Typ	Max	
$V_O$	Output Voltage	$T_J=25^{\circ}C$ , $I_{OUT}=500mA$	11.64	12	12.36	V
		$5mA \leq I_{OUT} \leq 1A$	11.64	12	12.36	
		$14V \leq V_{IN} \leq 30V$ , $P_{OUT} \leq 15W$				
$\Delta V_O$	Line Regulation	$T_J=25^{\circ}C$ , $14.5V \leq V_{IN} \leq 30V$	-	10	120	mV
		$T_J=25^{\circ}C$ , $16V \leq V_{IN} \leq 22V$	-	3	60	
$\Delta V_O$	Load Regulation	$T_J=25^{\circ}C$ , $5mA \leq I_{OUT} \leq 1A$	-	12	100	mV
		$T_J=25^{\circ}C$ , $250mA \leq I_{OUT} \leq 750mA$	-	4	60	
$I_B$	Quiescent Current	$I_{OUT}=5mA$ , $T_J=25^{\circ}C$	-	3.9	8	mA
$\Delta I_B$	Quiescent Current Change	$I_{OUT}=500mA$ , $14.5V \leq V_{IN} \leq 30V$ , $T_J=25^{\circ}C$	-	-	1.3	mA
		$5mA \leq I_{OUT} \leq 1A$ , $V_{IN}=19V$ , $T_J=25^{\circ}C$	-	-	0.5	
eN	Output Noise Voltage	$B=10Hz \sim 100KHz$ , $I_{OUT}=50mA$ , $T_J=25^{\circ}C$	-	-	90	$\mu V/V_O$
RR	Ripple Rejection	$19V \leq V_{IN} \leq 25V$ , $f=120Hz$ , $I_{OUT}=50mA$ , $T_J=25^{\circ}C$	50	66	-	dB
$V_D$	Dropout Voltage	$T_J=25^{\circ}C$ , $I_{OUT}=1A$	-	2	2.5	V
$R_O$	Output Resistance	$f=1KHz$	-	18	-	$m\Omega$
$I_{SC}$	Short Circuit Current	$T_J=25^{\circ}C$	-	2.3	2.8	A
$\Delta V_O/\Delta T$	Output Voltage Drift	$0^{\circ}C \leq T_J \leq 125^{\circ}C$	-	-	1.6	$mV/^{\circ}C$

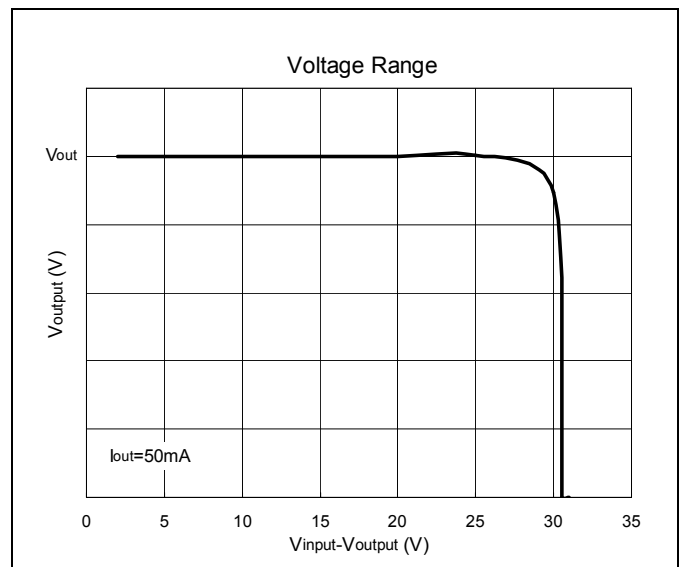
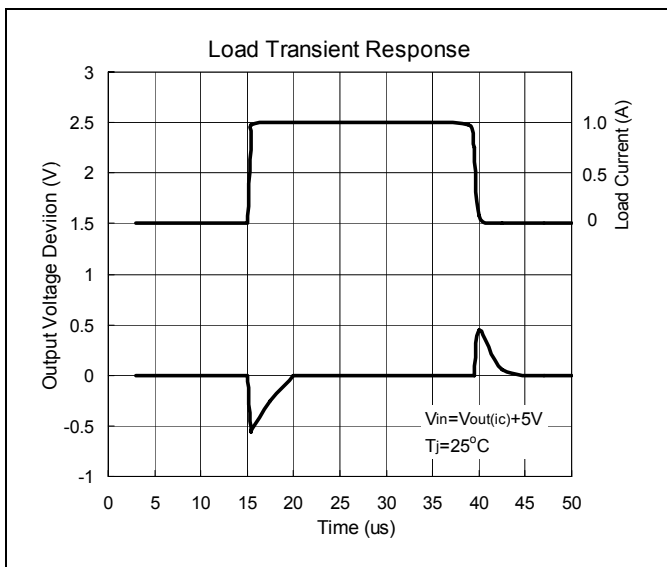
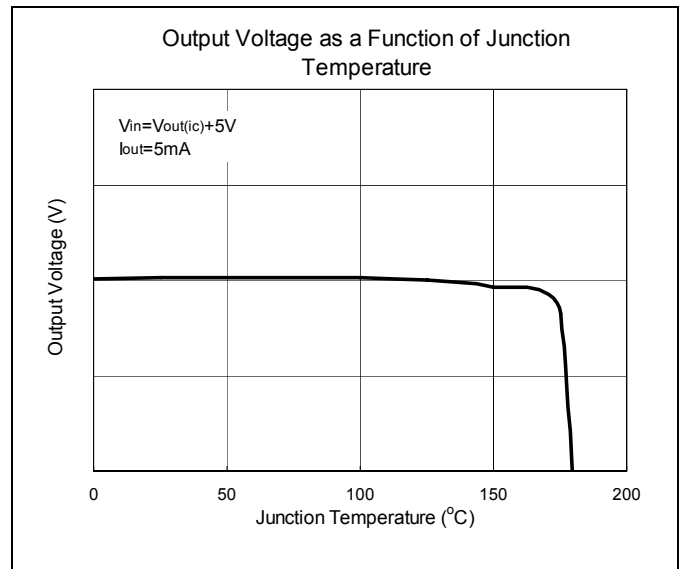
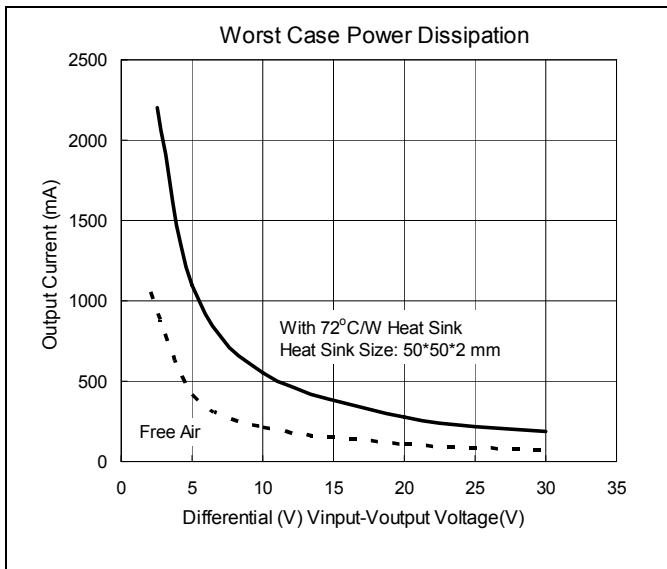
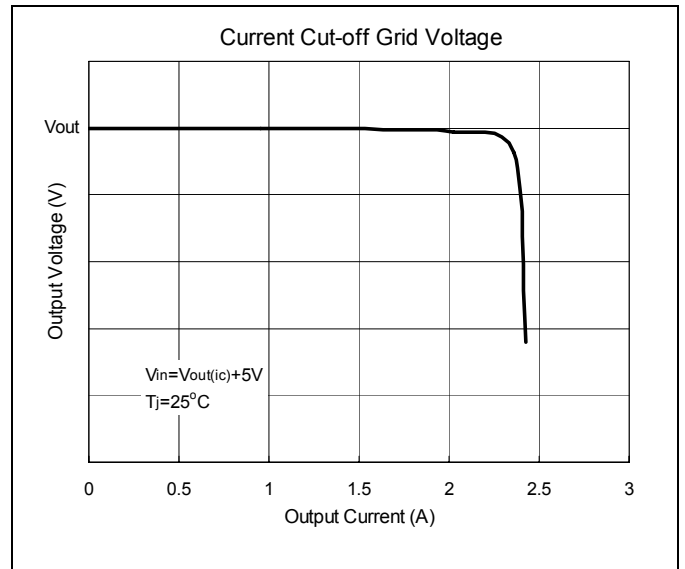
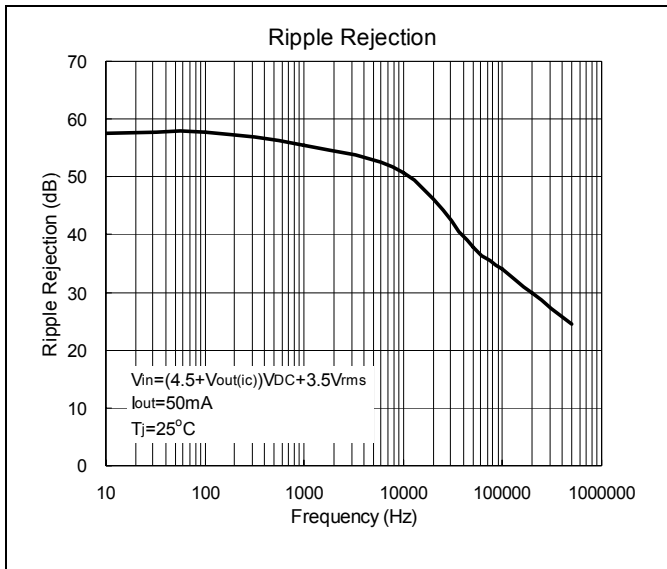
## Test Circuits



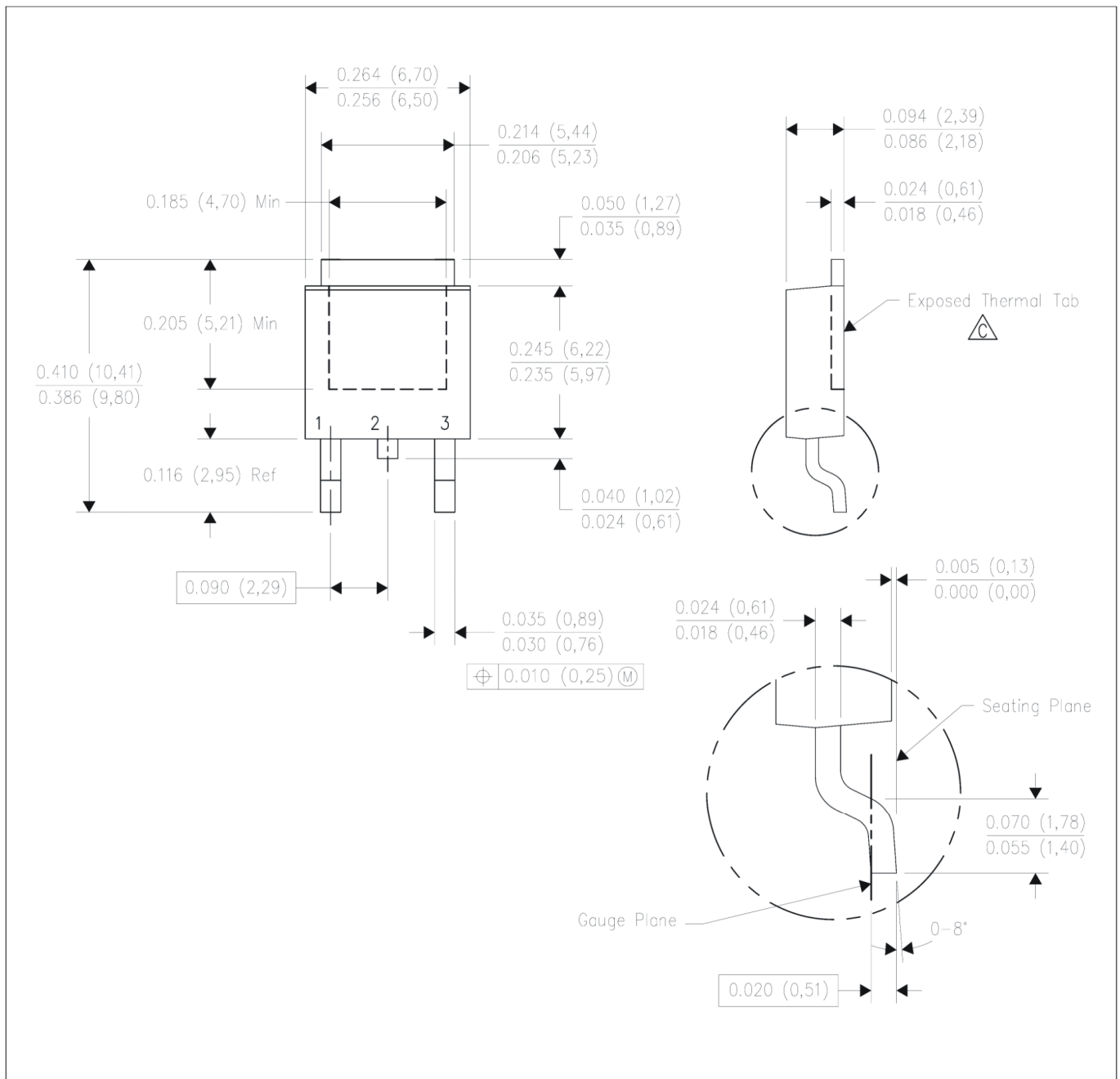
## Application Circuits



## Characteristics Curve



## TO-252 Dimension

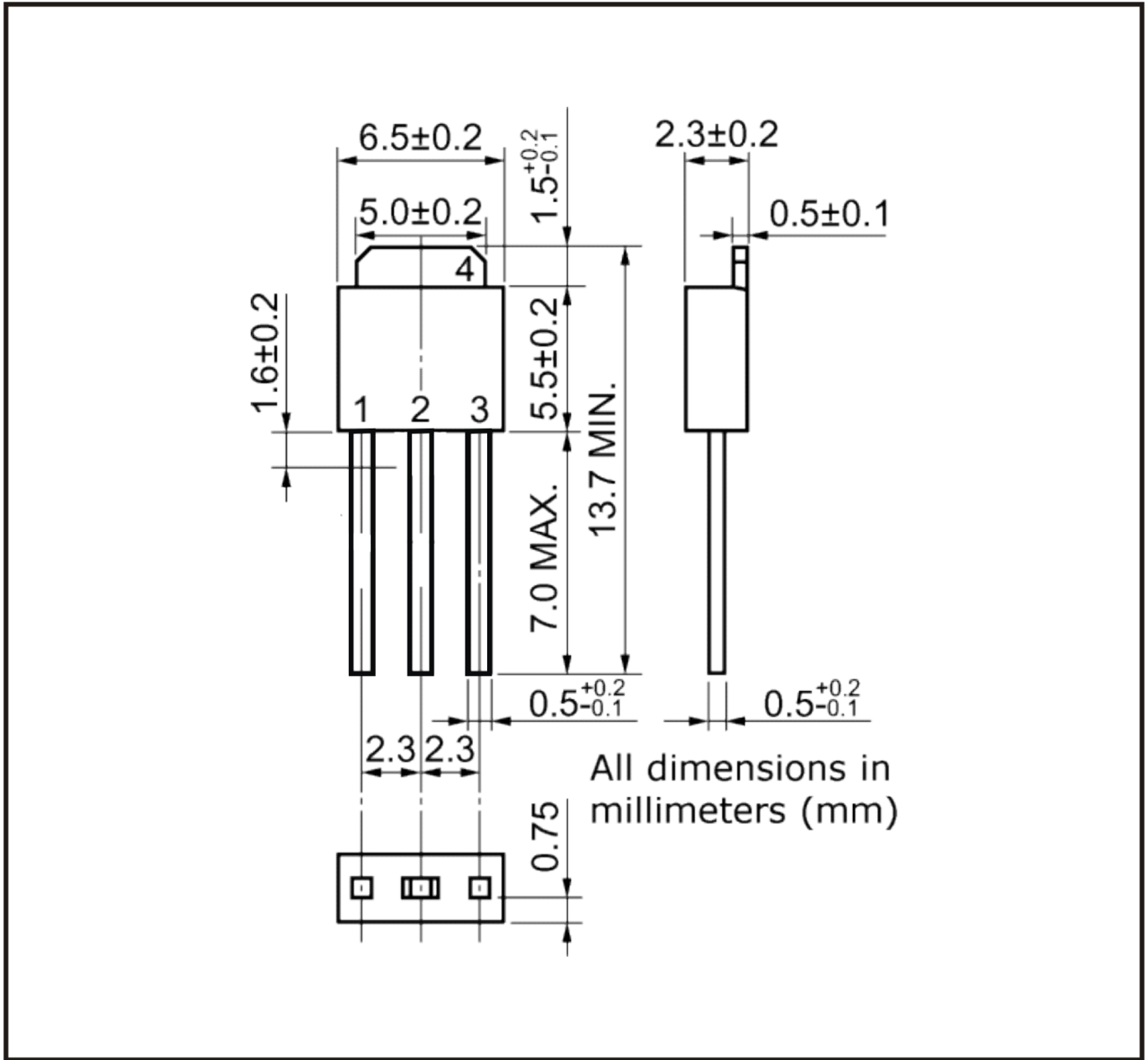


### NOTES:

- All linear dimensions are in inches (millimeters).
- This drawing is subject to change without notice.
- The center lead is in electrical contact with the tab.
- Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
- Thermal pad contour optional within these dimensions.
- Falls within JEDEC TO-252 variation AA.



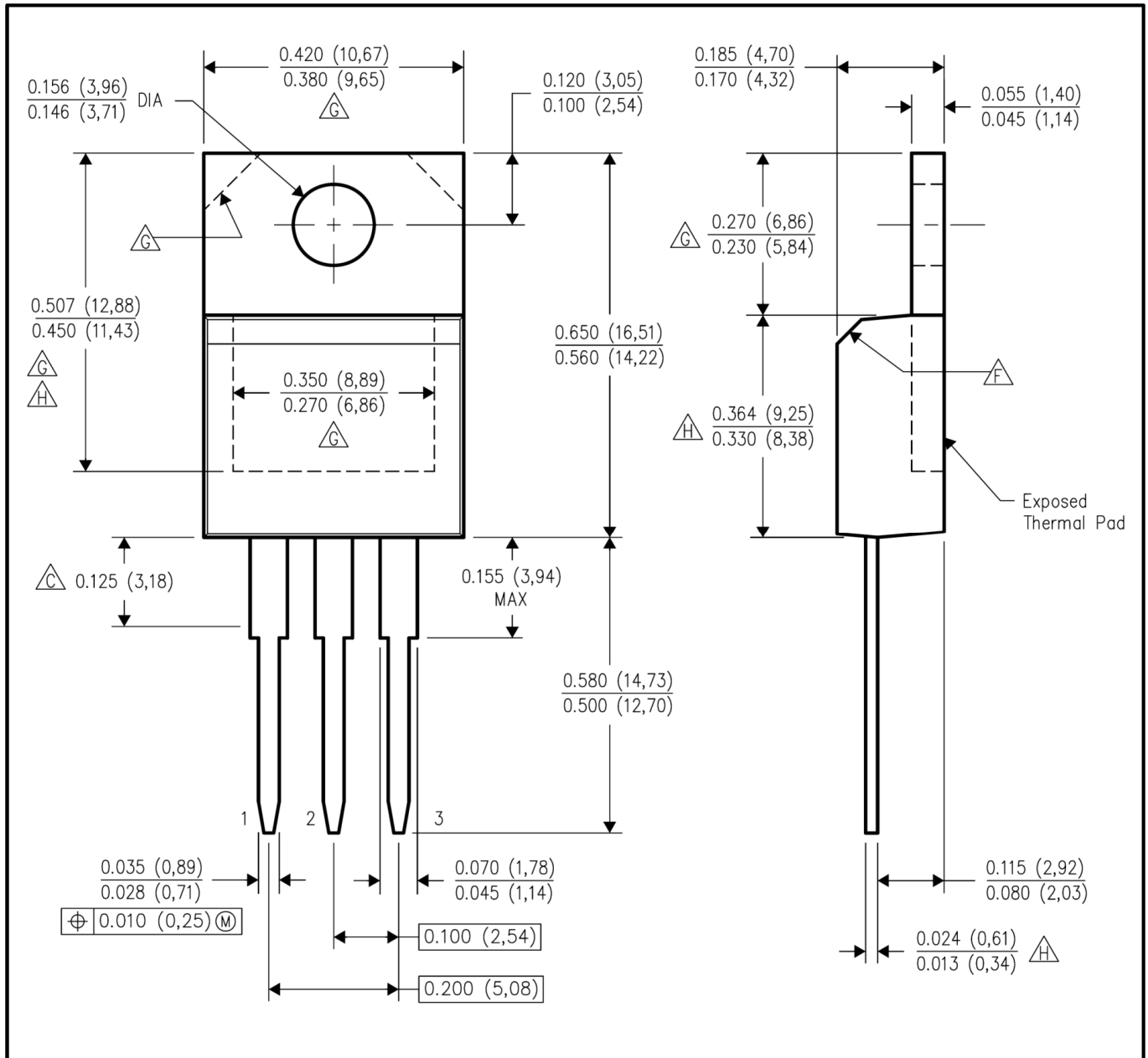
## TO-251 Dimension



### NOTES:

- G. All linear dimensions are in inches (millimeters).
- H. This drawing is subject to change without notice.
- I. The center lead is in electrical contact with the tab.
- J. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
- K. Thermal pad contour optional within these dimensions.
- L. Falls within JEDEC TO-251 variation AA.

## TO-220-3 Dimension



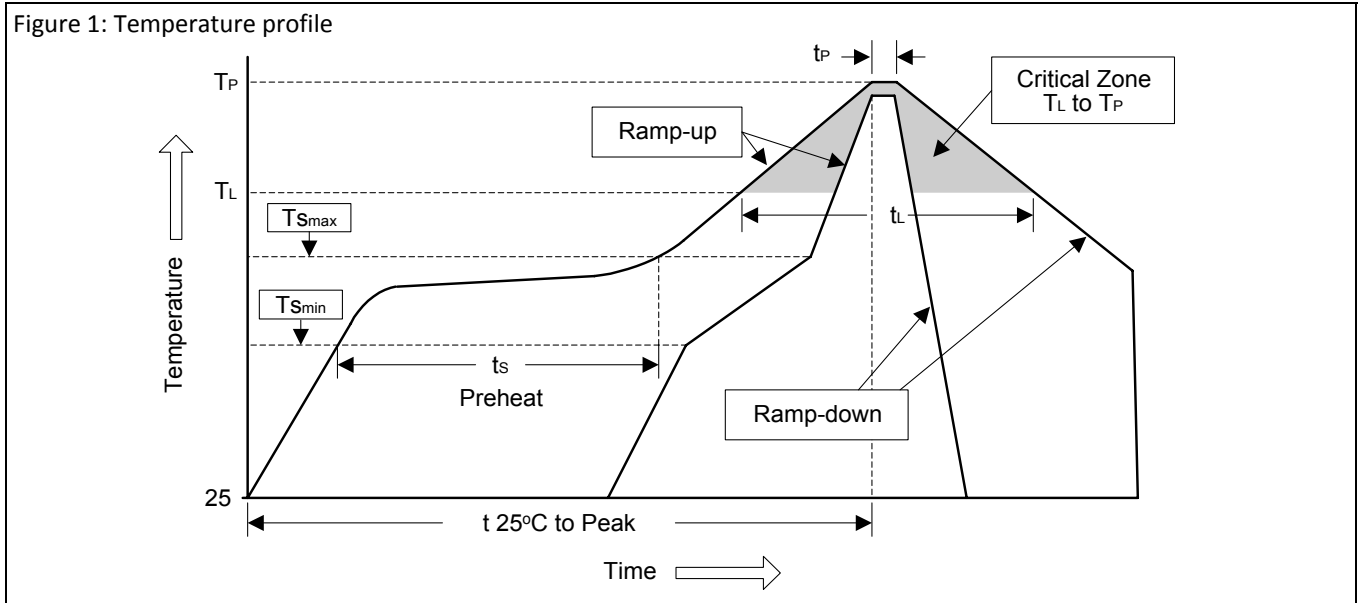
### NOTES:

- All linear dimensions are in inches (millimeters).
- This drawing is subject to change without notice.
- Lead dimensions are not controlled within this area.
- All lead dimensions apply before solder dip.
- The center lead is in electrical contact with the tab.
- The chamfer is optional.
- Thermal pad contour optional within these dimensions.
- Falls within JEDEC TO-220 variation AB. Except minimum lead thickness, minimum exposed pad length, and maximum body length.

## Soldering Methods for Orister's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min ( $T_{Smin}$ )	100°C	150°C
- Temperature Max ( $T_{Smax}$ )	150°C	200°C
- Time (min to max) ( $t_s$ )	60~120 sec	60~180 sec
$T_{Smax}$ to $T_L$		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature ( $T_L$ )	183°C	217°C
- Time ( $t_L$ )	60~150 sec	60~150 sec
Peak Temperature ( $T_P$ )	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature ( $t_p$ )	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

### 3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec

## ***Important Notice:***

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