

500mA, Low Quiescent, Low Dropout LDO Linear Regulators

ME6210 Series

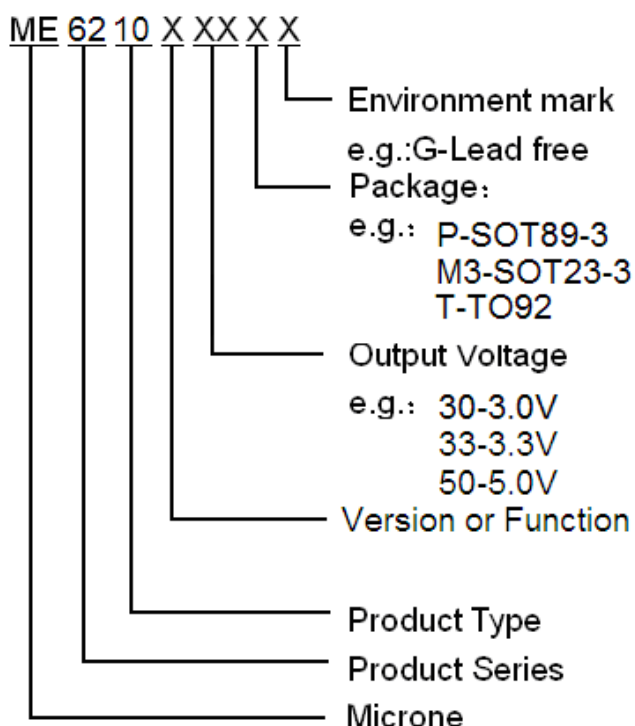
General Description

ME6210 series are low quiescent, low-dropout linear voltage regulators. ME6210 series are based on the CMOS process and allow high voltage input. The allow operation voltage as high as 18V. ME6210 series have short circuit protection function.

Features

- High output accuracy: $\pm 2\%$
- Input voltage: 2V to 18V
- Output voltage: 1.5V ~ 5.0V
- Ultra-low quiescent current (Typ. = 1.5 μ A)
- Output Current: $I_{out} = 500\text{mA}$
(When $V_{in} = 4\text{V}$ and $V_{out} = 3\text{V}$)
- Low dropout voltage: 11mV @ $I_{out} = 10\text{mA}$ (Typ. $V_{out} = 3.0\text{V}$)
- Input good stability: Typ. 0.03% / V
- Short-circuit Current: Typ. 50mA
- Ceramic capacitor can be used
- Package: SOT89-3, SOT23-3, TO-92.

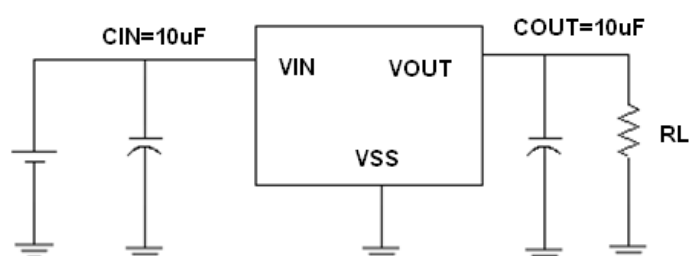
Selection Guide



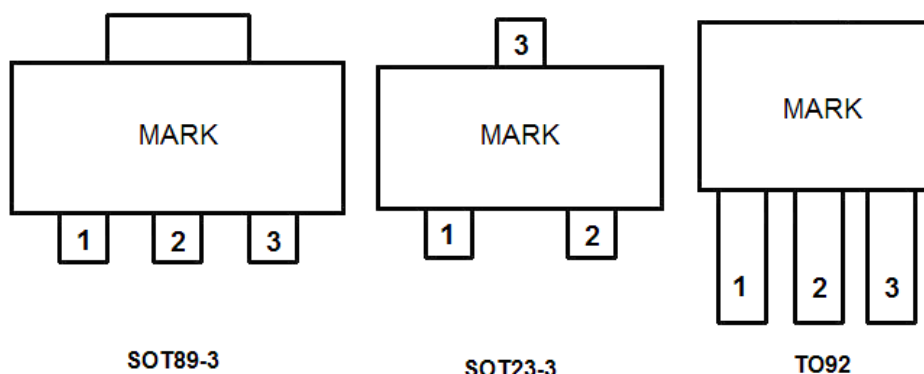
Typical Application

- Power source for home electric/electronic appliances
- Power source for battery-powered devices
- Power source for personal communication devices

Typical Application Circuit



Pin Configuration



Pin Assignment

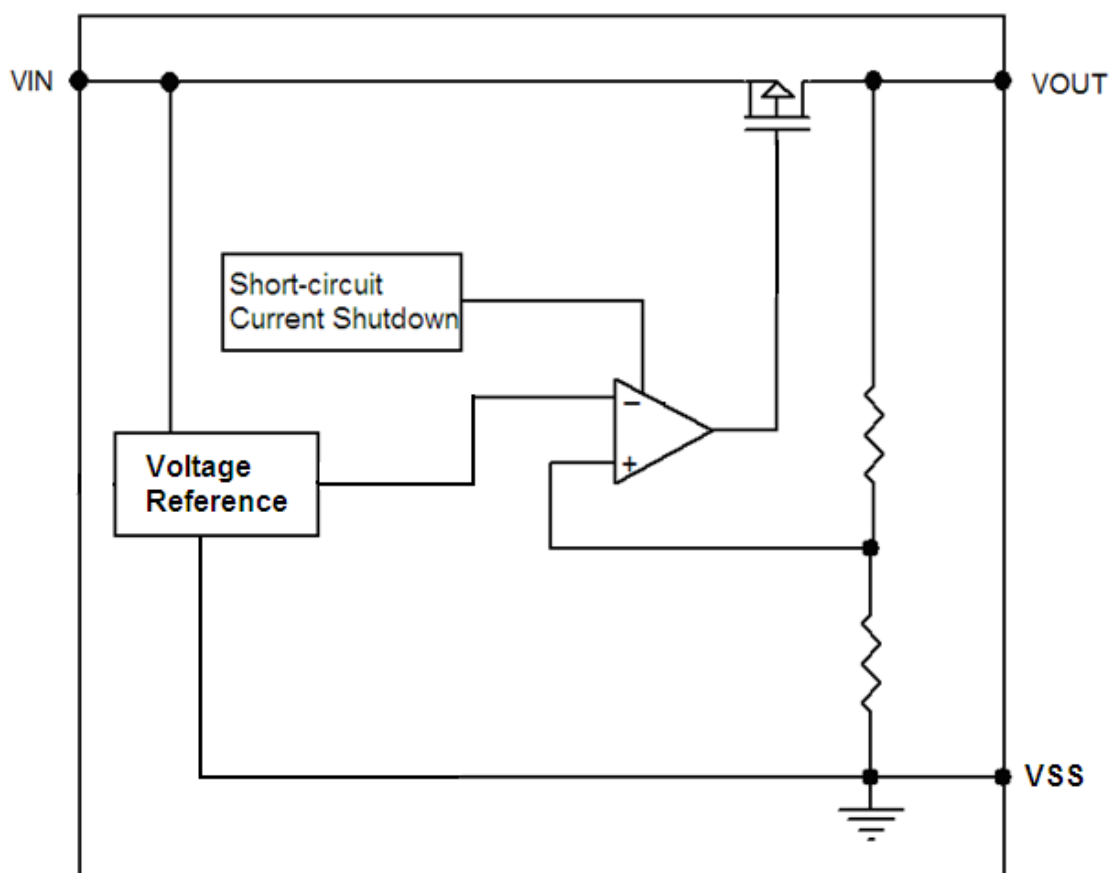
ME6210AXX

| Pin Number | | Pin Name | Functions |
|----------------|---------|-----------|-------------|
| SOT89-3 / TO92 | SOT23-3 | | |
| 1 | 1 | V_{SS} | Ground |
| 2 | 3 | V_{IN} | Power Input |
| 3 | 2 | V_{OUT} | Output |

Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Units |
|-----------------------------|-----------|--------------------------------|-------------|
| Input Voltage | V_{IN} | 18 | V |
| Output Current | I_{OUT} | 700 | mA |
| Output Voltage | V_{OUT} | $V_{SS}-0.3 \sim V_{IN} + 0.3$ | V |
| Power Dissipation | SOT89-3 | P_D | 500 |
| | TO92 | | 500 |
| | SOT23-3 | | 300 |
| Operating Temperature Range | T_{OPR} | $-25 \sim +85$ | $^{\circ}C$ |
| Storage Temperature Range | T_{STG} | $-40 \sim +125$ | $^{\circ}C$ |
| Lead Temperature | | $260^{\circ}C, 10sec$ | |

Block Diagram



Electrical Characteristics

ME6210A30

($V_{IN} = V_{OUT} + 1.0V$, $C_{IN} = C_{OUT} = 10\mu F$, $T_a = 25^\circ C$, unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|-----------------------------|--------------------------|--|--------|--------------------------|--------|-------|
| Output Voltage | $V_{OUT(E)}$ (Note 2) | $I_{OUT} = 40mA$, $V_{IN} = V_{out} + 1V$ | X 0.98 | $V_{OUT(T)}$ (Note 1) | X 1.02 | V |
| Input Voltage | V_{IN} | | | | 18 | V |
| Maximum Output Current | I_{OUT_max} | $V_{IN} = V_{out} + 1V$ | 500 | 500 | | mA |
| Load Regulation | ΔV_{OUT} | $V_{IN} = V_{out} + 1V$, $1mA \leq I_{OUT} \leq 200mA$ | | 12 | 30 | mV |
| Dropout Voltage (Note 3) | V_{DIF1} | $I_{OUT} = 10mA$ | | 11 | 14 | mV |
| | V_{DIF2} | $I_{OUT} = 100mA$ | | 110 | 140 | mV |
| | V_{DIF3} | $I_{OUT} = 200mA$ | | 220 | 280 | mV |

| | | | | | | |
|-------------------------|---|---|--|----------|-----------|------------------|
| Supply Current | I_{SS} | $V_{IN}=V_{out}+1V$ | | 1.5 | 2.5 | μA |
| Line Regulations | $\frac{\Delta V_{OUT}}{\Delta V_{IN}} \times V_{OUT}$ | $I_{OUT}=10mA$ $V_{out}+1V \leq V_{IN} \leq 18V$ | | 0.03 | 0.1 | %/V |
| Temperature coefficient | $\frac{\Delta V_{OUT}}{\Delta Ta} \times V_{OUT}$ | $V_{IN}=V_{out}+1V, I_{OUT}=10mA$ $-40^{\circ}C \leq Ta \leq 125^{\circ}C$ | | ± 60 | ± 100 | Ppm/ $^{\circ}C$ |
| Short-circuit Current | I_{short} | $V_{IN}=V_{out}+1V$ | | 50 | 70 | mA |

ME6210A33

($V_{IN}=V_{OUT}+1.0V$, $C_{IN}=C_{OUT}=10\mu F$, $Ta=25^{\circ}C$, unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|-----------------------------|---|---|--------|--------------------------|-----------|------------------|
| Output Voltage | $V_{OUT}(E)$ (Note 2) | $I_{OUT}=40mA$, $V_{IN}=V_{out}+1V$ | X 0.98 | $V_{OUT}(T)$ (Note 1) | X 1.02 | V |
| Input Voltage | V_{IN} | | | | 18 | V |
| Maximum Output Current | I_{OUT_max} | $V_{IN}=V_{out}+1V$ | 500 | 500 | | mA |
| Load Regulation | ΔV_{OUT} | $V_{IN}=V_{out}+1V$, $1mA \leq I_{OUT} \leq 200mA$ | | 12 | 30 | mV |
| Dropout Voltage (Note 3) | V_{DIF1} | $I_{OUT}=10mA$ | | 10 | 13 | mV |
| | V_{DIF2} | $I_{OUT}=100mA$ | | 100 | 130 | mV |
| | V_{DIF3} | $I_{OUT}=200mA$ | | 200 | 260 | mV |
| Supply Current | I_{SS} | $V_{IN}=V_{out}+1V$ | | 1.6 | 2.5 | μA |
| Line Regulations | $\frac{\Delta V_{OUT}}{\Delta V_{IN}} \times V_{OUT}$ | $I_{OUT}=10mA$ $V_{out}+1V \leq V_{IN} \leq 18V$ | | 0.03 | 0.1 | %/V |
| Temperature coefficient | $\frac{\Delta V_{OUT}}{\Delta Ta} \times V_{OUT}$ | $V_{IN}=V_{out}+1V, I_{OUT}=10mA$ $-40^{\circ}C \leq Ta \leq 125^{\circ}C$ | | ± 60 | ± 100 | Ppm/ $^{\circ}C$ |
| Short-circuit Current | I_{short} | $V_{IN}=V_{out}+1V$ | | 50 | 70 | mA |

ME6210A50

($V_{IN}=V_{OUT}+1.0V$, $C_{IN}=C_{OUT}=10\mu F$, $Ta=25^{\circ}C$, unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|------------------------|--------------------------|--|--------|--------------------------|--------|-------|
| Output Voltage | $V_{OUT}(E)$ (Note 2) | $I_{OUT}=40mA$, $V_{IN}=V_{out}+1V$ | X 0.98 | $V_{OUT}(T)$ (Note 1) | X 1.02 | V |
| Input Voltage | V_{IN} | | | | 18 | V |
| Maximum Output Current | I_{OUT_max} | $V_{IN}=V_{out}+1V$ | 500 | 500 | | mA |
| Load Regulation | ΔV_{OUT} | $V_{IN}=V_{out}+1V$, $1mA \leq I_{OUT} \leq 200mA$ | | 10 | 30 | mV |

| | | | | | | |
|-----------------------------|---|--|--|----------|-----------|-----------------|
| Dropout Voltage (Note 3) | V_{DIF1} | $I_{OUT} = 10mA$ | | 8 | 11 | mV |
| | V_{DIF2} | $I_{OUT} = 100mA$ | | 80 | 110 | mV |
| | V_{DIF3} | $I_{OUT} = 200mA$ | | 160 | 220 | mV |
| Supply Current | I_{SS} | $V_{IN} = V_{out} + 1V$ | | 1.7 | 2.5 | μA |
| Line Regulations | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | $I_{OUT} = 10mA$ $V_{out} + 1V \leq V_{IN} \leq 18V$ | | 0.03 | 0.1 | %/V |
| Temperature coefficient | $\frac{\Delta V_{OUT}}{\Delta T_a \times V_{OUT}}$ | $V_{IN} = V_{out} + 1V, I_{OUT} = 10mA$ $-40^\circ C \leq T_a \leq 125^\circ C$ | | ± 60 | ± 100 | Ppm/ $^\circ C$ |
| Short-circuit Current | I_{short} | $V_{IN} = V_{out} + 1V$ | | 50 | 70 | mA |

Note :

- $V_{OUT}(T)$: Specified Output Voltage
- $V_{OUT}(E)$: Effective Output Voltage (ie. The output voltage when " $V_{OUT}(T) + 1.0V$ " is provided at the Vin pin while maintaining a certain Iout value.)
- V_{DIF} : $V_{IN1} - V_{OUT}(E)'$
 V_{IN1} : The input voltage when $V_{OUT}(E)'$ appears as input voltage is gradually decreased.
 $V_{OUT}(E)'$ = A voltage equal to 98% of the output voltage whenever an amply stabilized Iout and $\{V_{OUT}(T) + 1.0V\}$ is input.

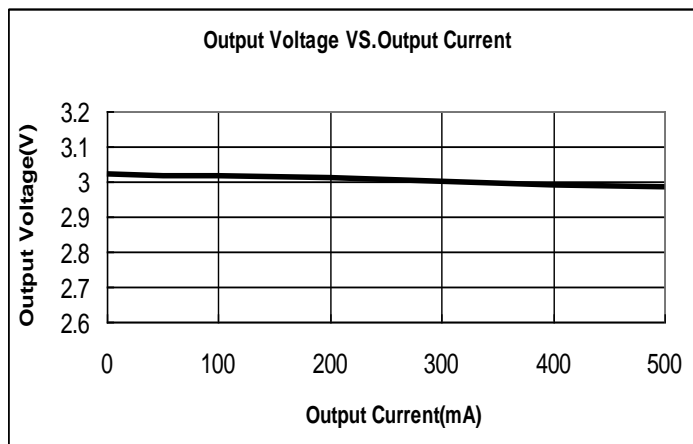
Precautions

- During the test, if AC/DC power supply and the ceramic chip capacitors collocation is used, there may be serious voltage spike phenomenon instantaneously. When the power supply access to 15V, the voltage is rushed to about 30V instantaneously. Because of exceeding the limit voltage of chip, the chip is damaged. If you string a small resistance of 1 ohm in the input end during the test, the peak phenomenon can be avoided.
- In the test, there is serious burr phenomenon only when the AC/DC power is used with ceramic chip capacitors. But electrolytic capacitors and tantalum capacitance won't appear above phenomenon. Please be sure to pay attention to this point when you use AC/DC power.
- In normal use, when any type of capacitor is used with battery or the supply of fire power, the above phenomenon doesn't occur.

Type Characteristics

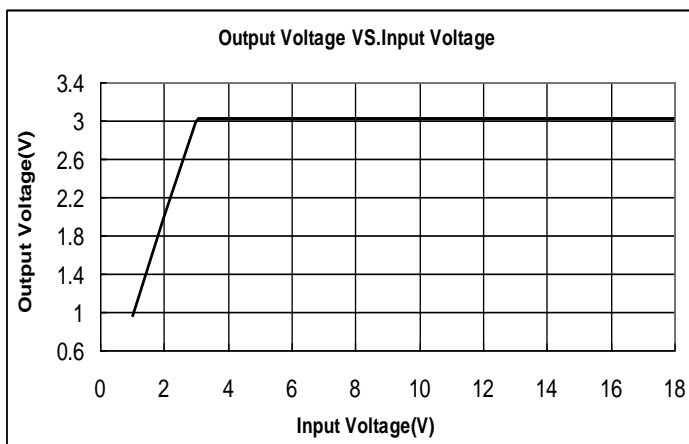
(1) Output Voltage VS. Output Current

($T_a = 25\text{ }^\circ\text{C}$, $V_{IN}=4\text{V}$) ME6210A30



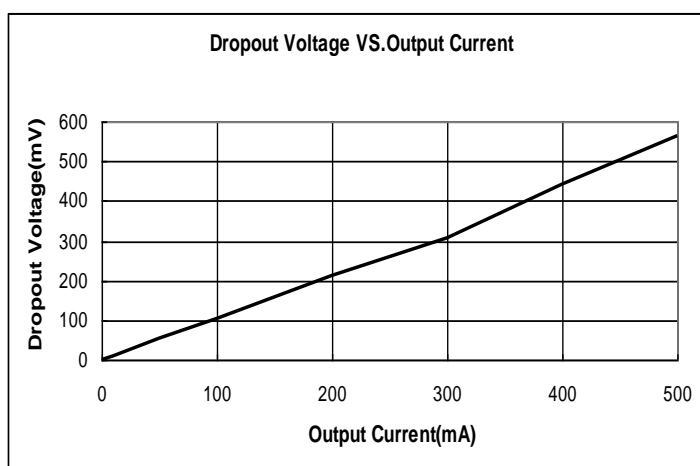
(2) Output Voltage VS. Input Voltage

($T_a = 25\text{ }^\circ\text{C}$, $I_{out}=10\text{mA}$) ME6210A30



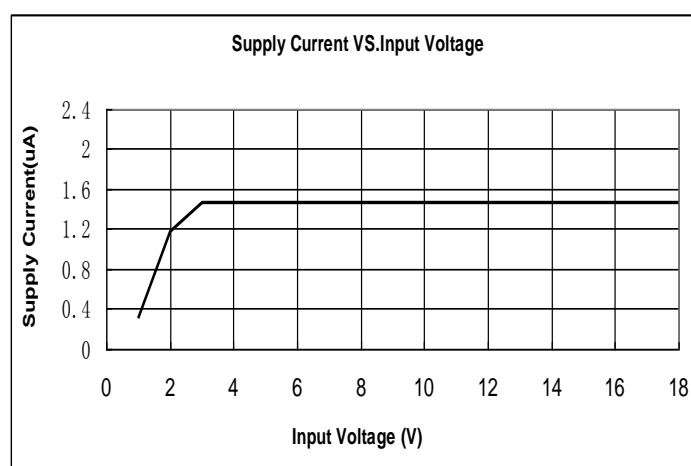
(3) Dropout Voltage VS. Output Current

($T_a = 25\text{ }^\circ\text{C}$) ME6210A30

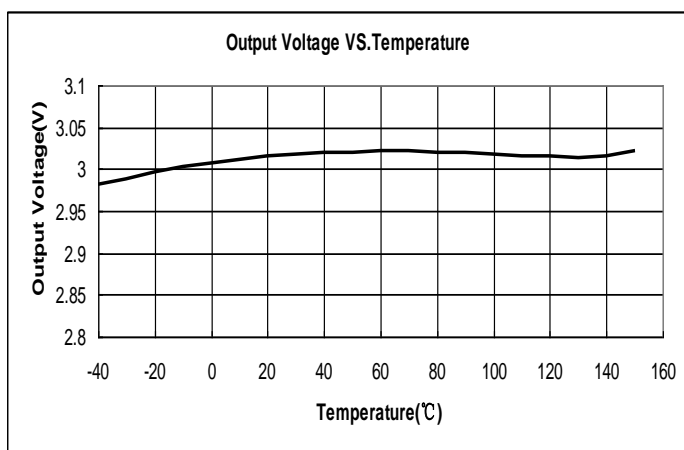


(4) Supply Current VS. Input Voltage

($T_a = 25\text{ }^\circ\text{C}$) ME6210A30

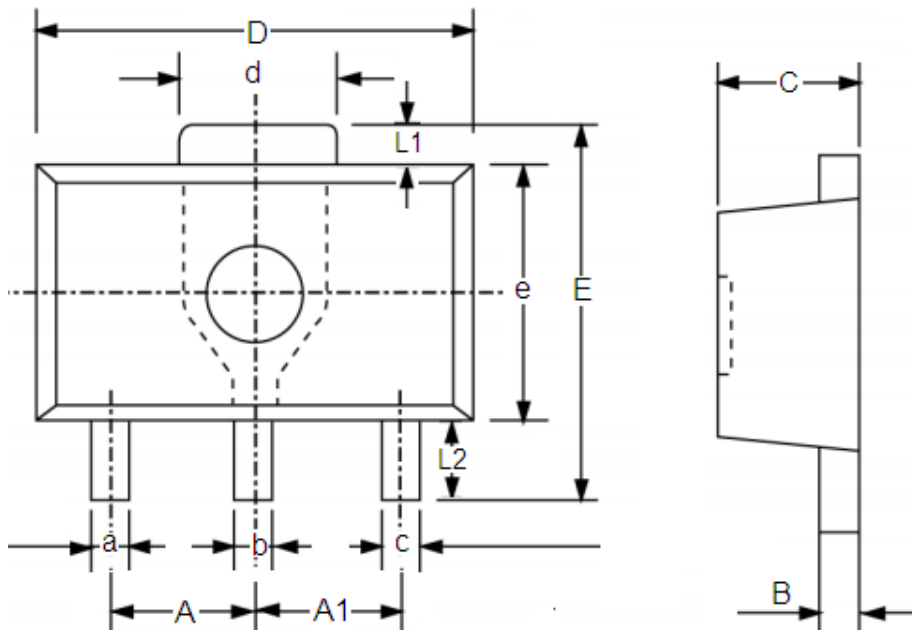


(5) Output Voltage VS. Temperature ($V_{IN}=4\text{V}$, $I_{out}=10\text{mA}$) ME6210A30



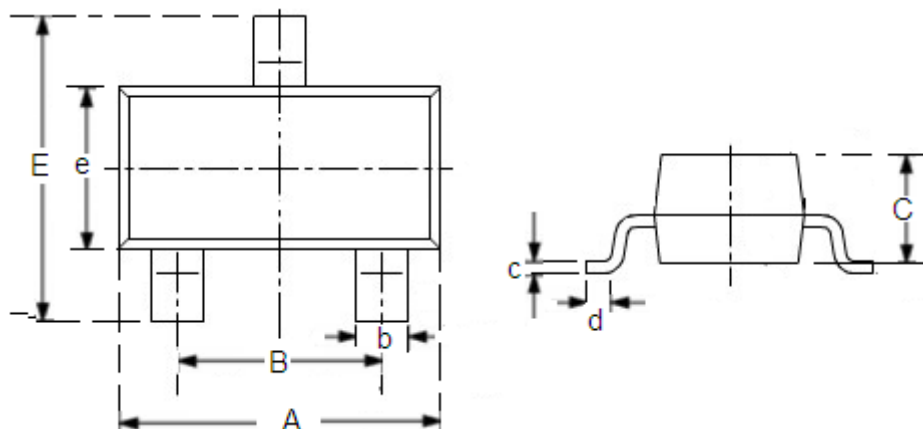
Packaging Information

● SOT89-3



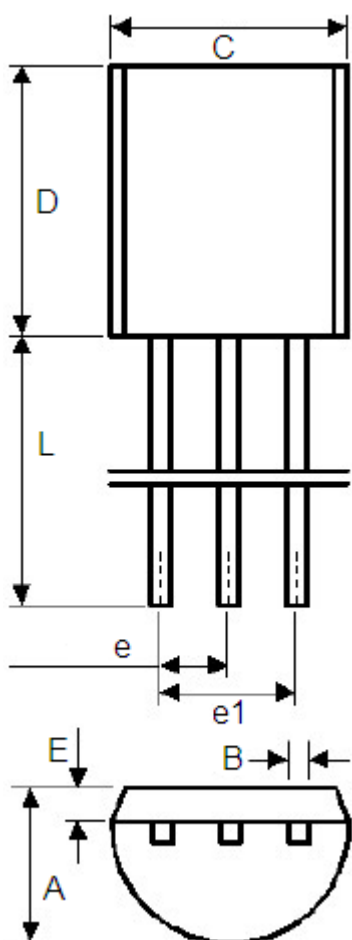
| DIM | Millimeters | | Inches | |
|-----|-------------|------|--------|--------|
| | Min | Max | Min | Max |
| A | 1.4 | 1.6 | 0.0551 | 0.0630 |
| A1 | 1.4 | 1.6 | 0.0551 | 0.0630 |
| a | 0.36 | 0.48 | 0.0142 | 0.0189 |
| b | 0.41 | 0.53 | 0.0161 | 0.0209 |
| c | 0.36 | 0.48 | 0.0142 | 0.0189 |
| d | 1.4 | 1.75 | 0.0551 | 0.0689 |
| B | 0.38 | 0.43 | 0.015 | 0.0169 |
| C | 1.4 | 1.6 | 0.0551 | 0.0630 |
| D | 4.4 | 4.6 | 0.1732 | 0.181 |
| E | - | 4.25 | - | 0.1673 |
| e | 2.4 | 2.6 | 0.0945 | 0.1023 |
| L1 | 0.4 | - | 0.0157 | - |
| L2 | 0.8 | - | 0.0315 | - |

● SOT23-3



| DIM | Millimeters | | Inches | |
|-----|-------------|------|--------|--------|
| | Min | Max | Min | Max |
| A | 2.7 | 3.1 | 0.1063 | 0.122 |
| B | 1.7 | 2.1 | 0.0669 | 0.0827 |
| b | 0.35 | 0.5 | 0.0138 | 0.0197 |
| C | 1.0 | 1.2 | 0.0394 | 0.0472 |
| c | 0.1 | 0.25 | 0.0039 | 0.0098 |
| d | 0.2 | - | 0.0079 | - |
| E | 2.6 | 3.0 | 0.1023 | 0.1181 |
| e | 1.5 | 1.8 | 0.059 | 0.0708 |

● TO-92



| | Min | Max | Min | Max |
|----|------|------|---------|--------|
| A | 3.4 | 3.8 | 0.13386 | 0.1496 |
| B | 0.3 | 0.5 | 0.0118 | 0.0197 |
| C | 4.4 | 4.8 | 0.1732 | 0.189 |
| D | 4.4 | 4.8 | 0.1732 | 0.189 |
| E | 0.9 | 1.5 | 0.0354 | 0.059 |
| e | 1.17 | 1.37 | 0.046 | 0.0539 |
| e1 | 2.39 | 2.69 | 0.094 | 0.1059 |
| L | 12 | 16 | 0.4724 | 0.6299 |

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