

**Low Dropout CMOS Voltage Regulators**

# LM1114

**Features**

- Maximum output current 250mA
- Highly accurate : output voltage $\pm 2\%$
- Low power consumption : typ. 1  $\mu$  A
- Small input/output differential:
  - 0.45V typ at 160mA( 2.5V, 3.0V, 3.3V, 3.6V)
  - 0.4V typ at 200mA( $V_{out}=5V$ )
- Pb-free lead plating and halogen-free package

**Applications**

- Battery powered equipment
- Palmtops
- Portable cameras and video recorders
- Reference voltage sources

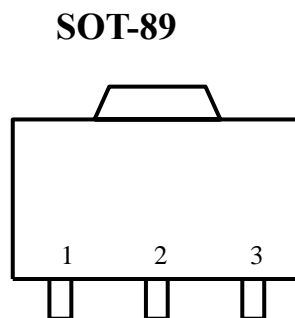
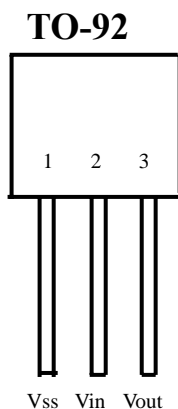
**Product Description**

The LM1114 series is a group of positive voltage output, three-pin regulators, that provide a high current even when the input/output voltage differential is small. Low power consumption and high accuracy is achieved through CMOS and programmable fuse technologies.

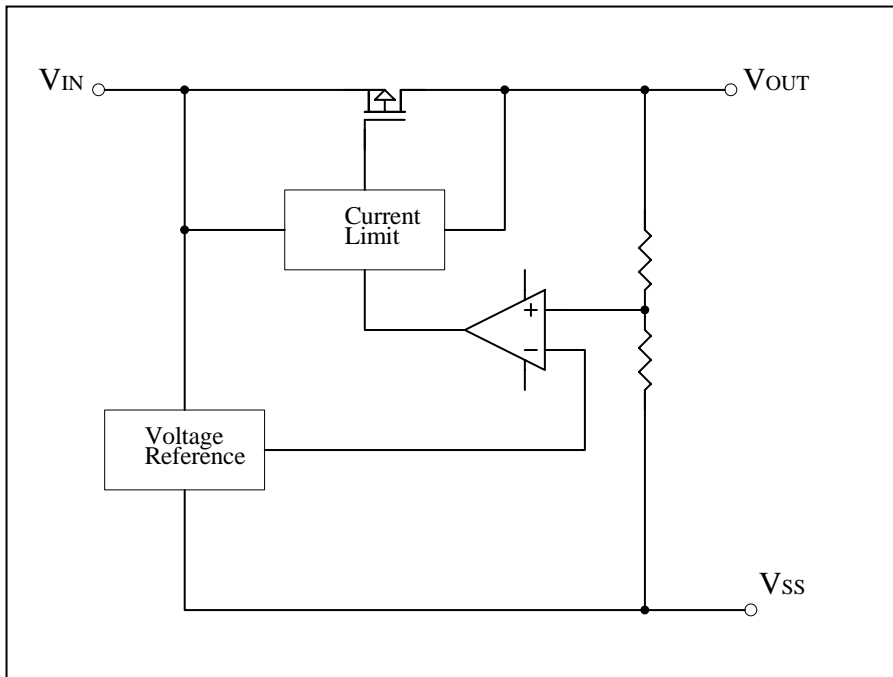
The LM1114 consists of a high-precision voltage reference, an error correction circuit, and a current limited output driver. Transient response to load variations is improved in comparison to the existing ones.

**Absolute Maximum Ratings**

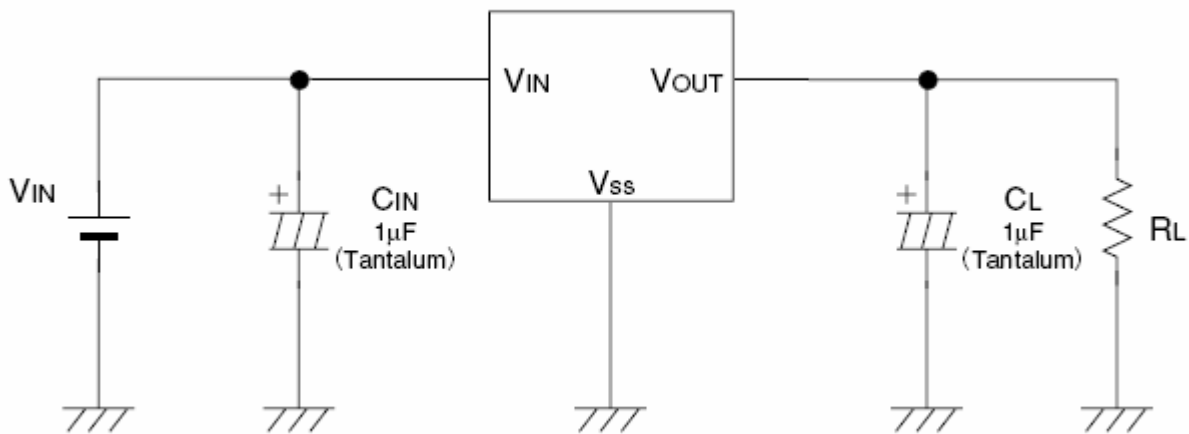
| Parameter                          | Symbol    | Ratings                      | Units        |
|------------------------------------|-----------|------------------------------|--------------|
| Input Voltage                      | $V_{in}$  | 12                           | V            |
| Output Current                     | $I_{out}$ | 500                          | mA           |
| Output Voltage                     | $V_{out}$ | $V_{ss}-0.3 \sim V_{in}+0.3$ | V            |
| Continuous Total Power Dissipation | $P_D$     | TO-92                        | 500          |
|                                    |           | SOT-89                       | 500          |
| Operating Ambient Temperature      | $T_{opr}$ | -40 $\sim$ +85               | $^{\circ}$ C |
| Storage Temperature                | $T_{stg}$ | -40 $\sim$ +125              | $^{\circ}$ C |

**Pin Configuration**


**Block Diagram**



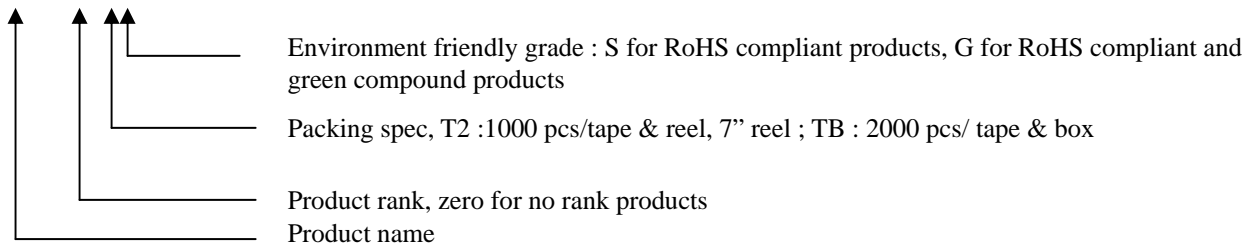
**Typical Application Circuit**





**Ordering Information**

| Device               | Output Voltage | Package   | Shipping         |
|----------------------|----------------|---|------------------|
| LM1114-1.8 A3-0-TB-G | 1.8V           | TO-92<br>(Pb-free lead plating and halogen-free package)  | Tape & Box / 2K  |
| LM1114-1.8 M3-0-T2-G | 1.8V           | SOT-89<br>(Pb-free lead plating and halogen-free package) | Tape & Reel / 1K |
| LM1114-2.5 A3-0-TB-G | 2.5V           | TO-92<br>(Pb-free lead plating and halogen-free package)  | Tape & Box / 2K  |
| LM1114-2.5 M3-0-T2-G | 2.5V           | SOT-89<br>(Pb-free lead plating and halogen-free package) | Tape & Reel / 1K |
| LM1114-3.0 A3-0-TB-G | 3.0V           | TO-92<br>(Pb-free lead plating and halogen-free package)  | Tape & Box / 2K  |
| LM1114-3.0 M3-0-T2-G | 3.0V           | SOT-89<br>(Pb-free lead plating and halogen-free package) | Tape & Reel / 1K |
| LM1114-3.3 A3-0-TB-G | 3.3V           | TO-92<br>(Pb-free lead plating and halogen-free package)  | Tape & Box / 2K  |
| LM1114-3.3 M3-0-T2-G | 3.3V           | SOT-89<br>(Pb-free lead plating and halogen-free package) | Tape & Reel / 1K |
| LM1114-3.6A3-0-TB-G  | 3.6V           | TO-92<br>(Pb-free lead plating and halogen-free package)  | Tape & Box / 2K  |
| LM1114-3.6M3-0-T2-G  | 3.6V           | SOT-89<br>(Pb-free lead plating and halogen-free package) | Tape & Reel / 1K |
| LM1114-5.0 A3-0-TB-G | 5.0V           | TO-92<br>(Pb-free lead plating and halogen-free package)  | Tape & Box / 2K  |
| LM1114-5.0 M3-0-T2-G | 5.0V           | SOT-89<br>(Pb-free lead plating and halogen-free package) | Tape & Reel / 1K |





**Electrical Characteristics @ $V_{IN}=5V, T_a=25^{\circ}C, C_{IN}=1\mu F(\text{tantalum}),$   
 $C_{OUT}=1\mu F(\text{tantalum}),$  unless otherwise noted**

**LM1114-1.8**

| Parameter                                      | Conditions                      | Min   | Typ   | Max   | Units   | Circuit |
|--|---------------------------------|-------|-------|-------|---------|---------|
| Output Voltage                                 | $I_o=40mA, V_{in}=2.8V$         | 1.764 | 1.800 | 1.836 | V       | 1       |
| Line Regulation $\Delta V_{out}/\Delta V_{in}$ | $I_o=40mA, 4V < V_{in} < 10V$   | -     | 0.2   | 0.3   | %/V     | 1       |
| Load Regulation                                | $V_{in}=2.8V, 1mA < I_o < 40mA$ | -     | 10    | 30    | mV      | 1       |
| Current Consumption                            | $V_{in}=2.8V$                   | -     | 1     | 4.5   | $\mu A$ | 2       |
| Dropout Voltage                                | $I_o=40mA$                      | -     | 0.2   | 0.36  | V       | 1       |
|  | $I_o=80mA$                      | -     | 0.45  | 0.7   | V       | 1       |

**LM1114-2.5**

| Parameter                                      | Conditions                    | Min   | Typ   | Max   | Units   | Circuit |
|--|-------------------------------|-------|-------|-------|---------|---------|
| Output Voltage                                 | $I_o=40mA, V_{in}=4V$         | 2.450 | 2.500 | 2.550 | V       | 1       |
| Line Regulation $\Delta V_{out}/\Delta V_{in}$ | $I_o=40mA, 4V < V_{in} < 10V$ | -     | 0.2   | 0.3   | %/V     | 1       |
| Load Regulation                                | $V_{in}=4V, 1mA < I_o < 80mA$ | -     | 15    | 40    | mV      | 1       |
| Current Consumption                            | $V_{in}=4V$                   | -     | 1     | 4.5   | $\mu A$ | 2       |
| Dropout Voltage                                | $I_o=80mA$                    | -     | 0.2   | 0.36  | V       | 1       |
|  | $I_o=160mA$                   | -     | 0.45  | 0.7   | V       | 1       |

**LM1114-3.0**

| Parameter                                      | Conditions                      | Min   | Typ   | Max   | Units   | Circuit |
|--|---------------------------------|-------|-------|-------|---------|---------|
| Output Voltage                                 | $I_o=40mA, V_{in}=4.0V$         | 2.940 | 3.000 | 3.060 | V       | 1       |
| Line Regulation $\Delta V_{out}/\Delta V_{in}$ | $I_o=40mA, 4.0V < V_{in} < 10V$ | -     | 0.2   | 0.3   | %/V     | 1       |
| Load Regulation                                | $V_{in}=6V, 1mA < I_o < 80mA$   | -     | 15    | 40    | mV      | 1       |
| Current Consumption                            | $V_{in}=4.0V$                   | -     | 1     | 4.5   | $\mu A$ | 2       |
| Dropout Voltage                                | $I_o=80mA$                      | -     | 0.24  | 0.36  | V       | 1       |
|  | $I_o=160mA$                     | -     | 0.5   | 0.7   | V       | 1       |

**LM1114-3.3**

| Parameter                                      | Conditions                      | Min   | Typ   | Max   | Units   | Circuit |
|--|---------------------------------|-------|-------|-------|---------|---------|
| Output Voltage                                 | $I_o=40mA, V_{in}=4.3V$         | 3.234 | 3.300 | 3.366 | V       | 1       |
| Line Regulation $\Delta V_{out}/\Delta V_{in}$ | $I_o=40mA, 4.3V < V_{in} < 10V$ | -     | 0.2   | 0.3   | %/V     | 1       |
| Load Regulation                                | $V_{in}=6V, 1mA < I_o < 80mA$   | -     | 15    | 40    | mV      | 1       |
| Current Consumption                            | $V_{in}=4.3V$                   | -     | 1     | 4.5   | $\mu A$ | 2       |
| Dropout Voltage                                | $I_o=80mA$                      | -     | 0.22  | 0.36  | V       | 1       |
|  | $I_o=160mA$                     | -     | 0.45  | 0.7   | V       | 1       |

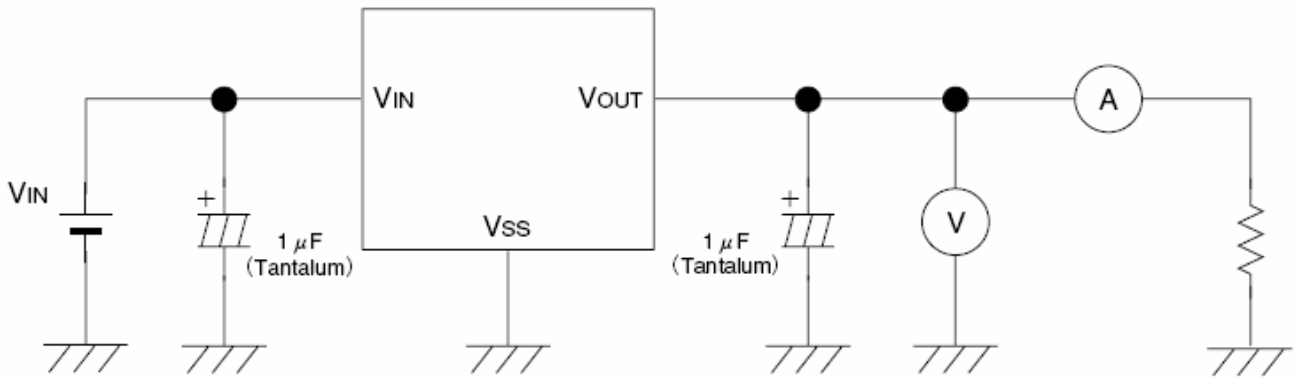
**LM1114-3.6**

| Parameter                                      | Conditions                      | Min   | Typ   | Max   | Units   | Circuit |
|--|---------------------------------|-------|-------|-------|---------|---------|
| Output Voltage                                 | $I_o=40mA, V_{in}=4.6V$         | 3.522 | 3.600 | 3.672 | V       | 1       |
| Line Regulation $\Delta V_{out}/\Delta V_{in}$ | $I_o=40mA, 4.6V < V_{in} < 10V$ | -     | 0.2   | 0.3   | %/V     | 1       |
| Load Regulation                                | $V_{in}=6V, 1mA < I_o < 80mA$   | -     | 15    | 40    | mV      | 1       |
| Current Consumption                            | $V_{in}=4.6V$                   | -     | 1     | 4.5   | $\mu A$ | 2       |
| Dropout Voltage                                | $I_o=80mA$                      | -     | 0.22  | 0.36  | V       | 1       |
|  | $I_o=160mA$                     | -     | 0.45  | 0.7   | V       | 1       |

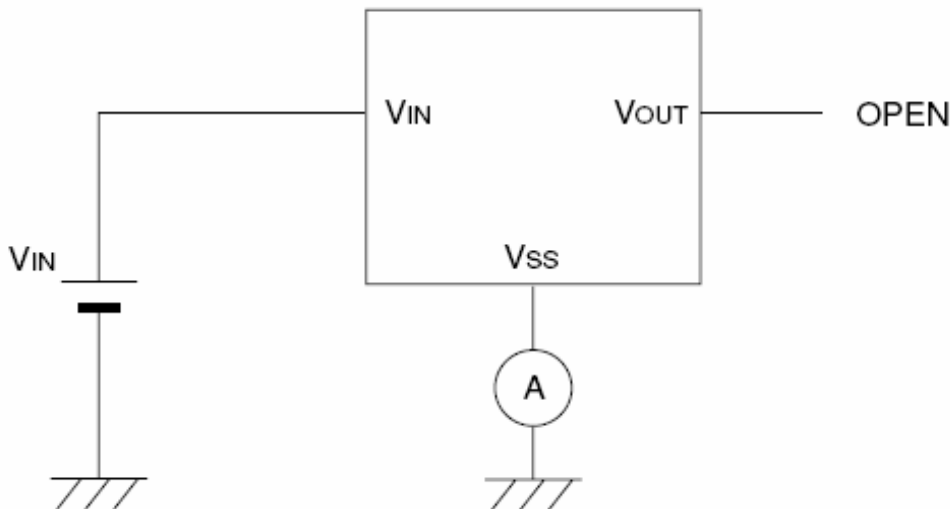
**LM1114-5.0**

| Parameter   | Conditions                      | Min   | Typ   | Max   | Units   | Circuit |
|---|---------------------------------|-------|-------|-------|---------|---------|
| Output Voltage  | $I_o=40mA, V_{in}=6.0V$         | 4.900 | 5.000 | 5.100 | V       | 1       |
| Line Regulation $\Delta V_{out}/\Delta V_{in}V_{out}$ | $I_o=40mA, 6.0V < V_{in} < 10V$ | -     | 0.2   | 0.3   | %/V     | 1       |
| Load Regulation                                       | $V_{in}=6V, 1mA < I_o < 100mA$  | -     | 30    | 70    | mV      | 1       |
| Current Consumption                                   | $V_{in}=6.0V$                   | -     | 1     | 4.5   | $\mu A$ | 2       |
| Dropout Voltage                                       | $I_o=100mA$                     | -     | 0.21  | 0.3   | V       | 1       |
|   | $I_o=200mA$                     | -     | 0.4   | 0.6   | V       | 1       |

**Test Circuits**  
**Circuit 1**



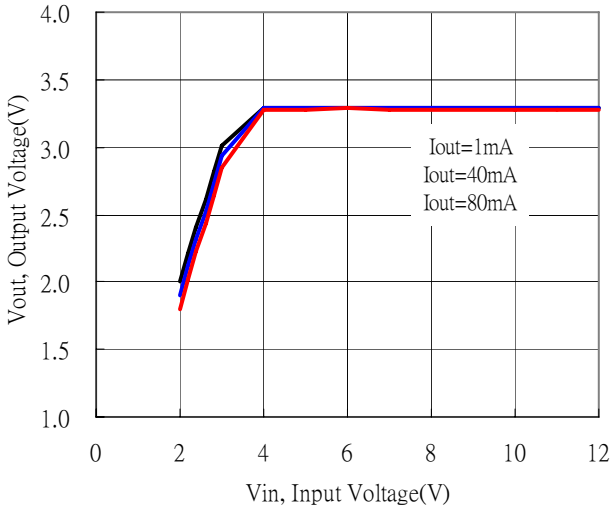
**Circuit 2**



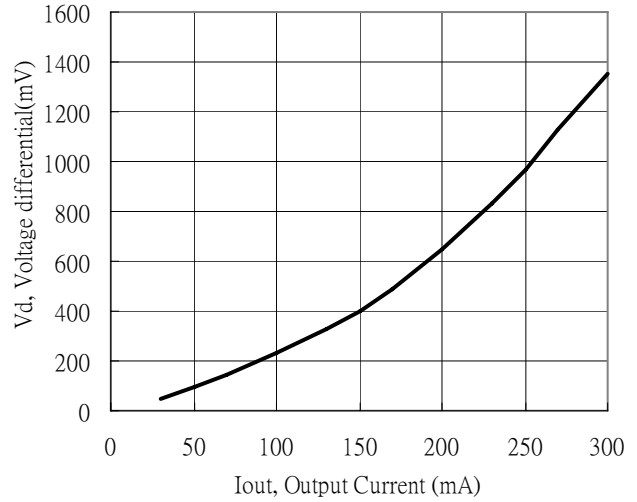
**Characteristic Curves @C<sub>IN</sub>=1μF(tantalum), C<sub>OUT</sub>=1μF(tantalum)**

**LM1114-3.3**

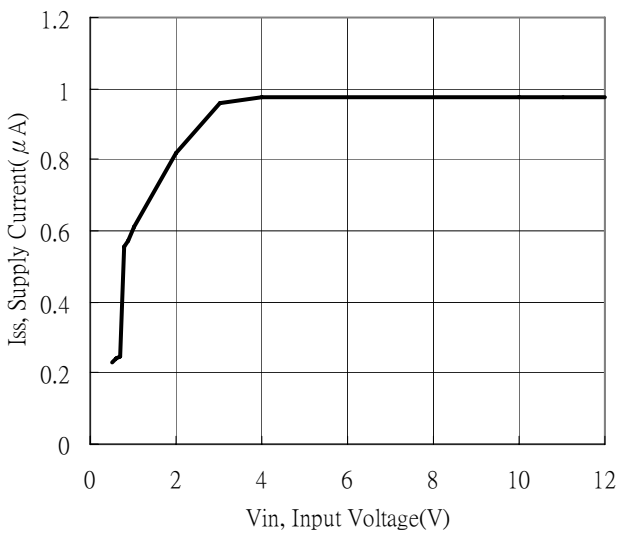
Output Voltage vs Input Voltage



Input-Output Voltage Differential

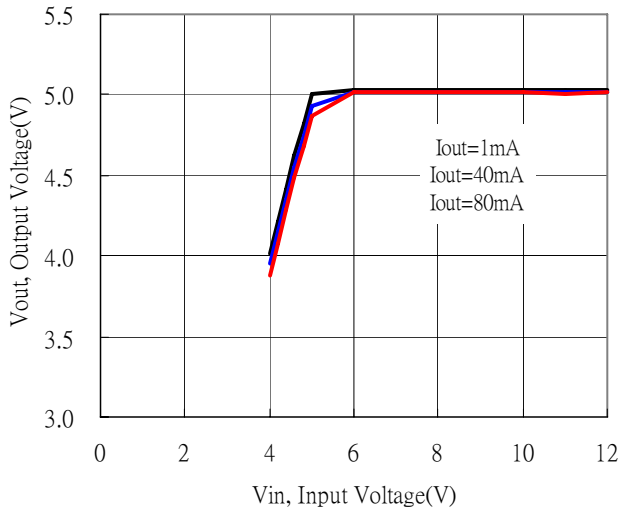


Supply Current vs Input Voltage

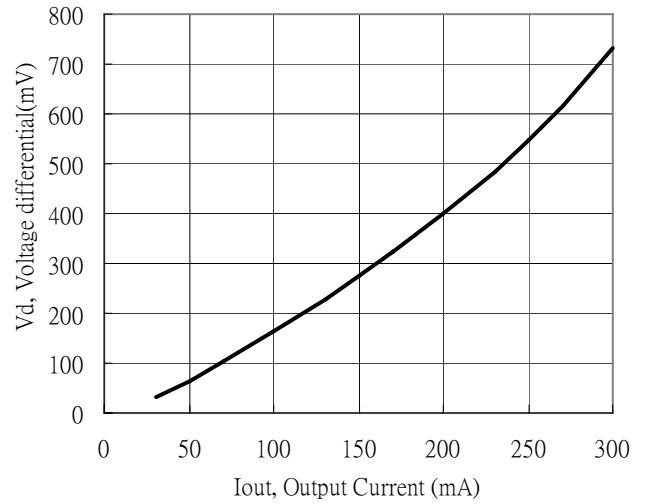


**LM1114-5.0**

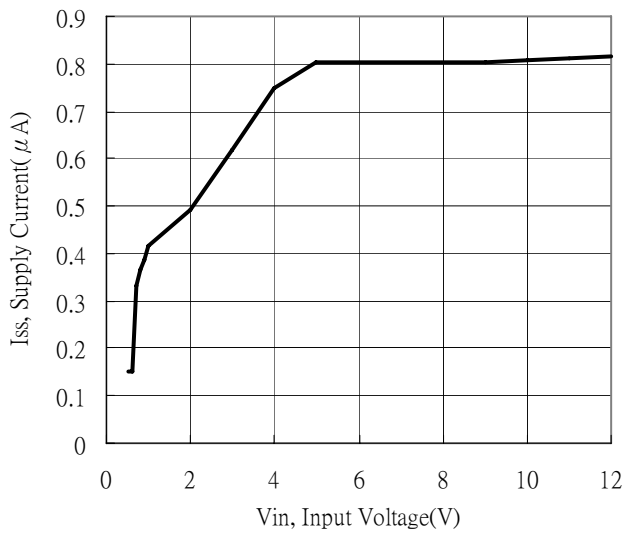
Output Voltage vs Input Voltage



Input-Output Voltage Differential



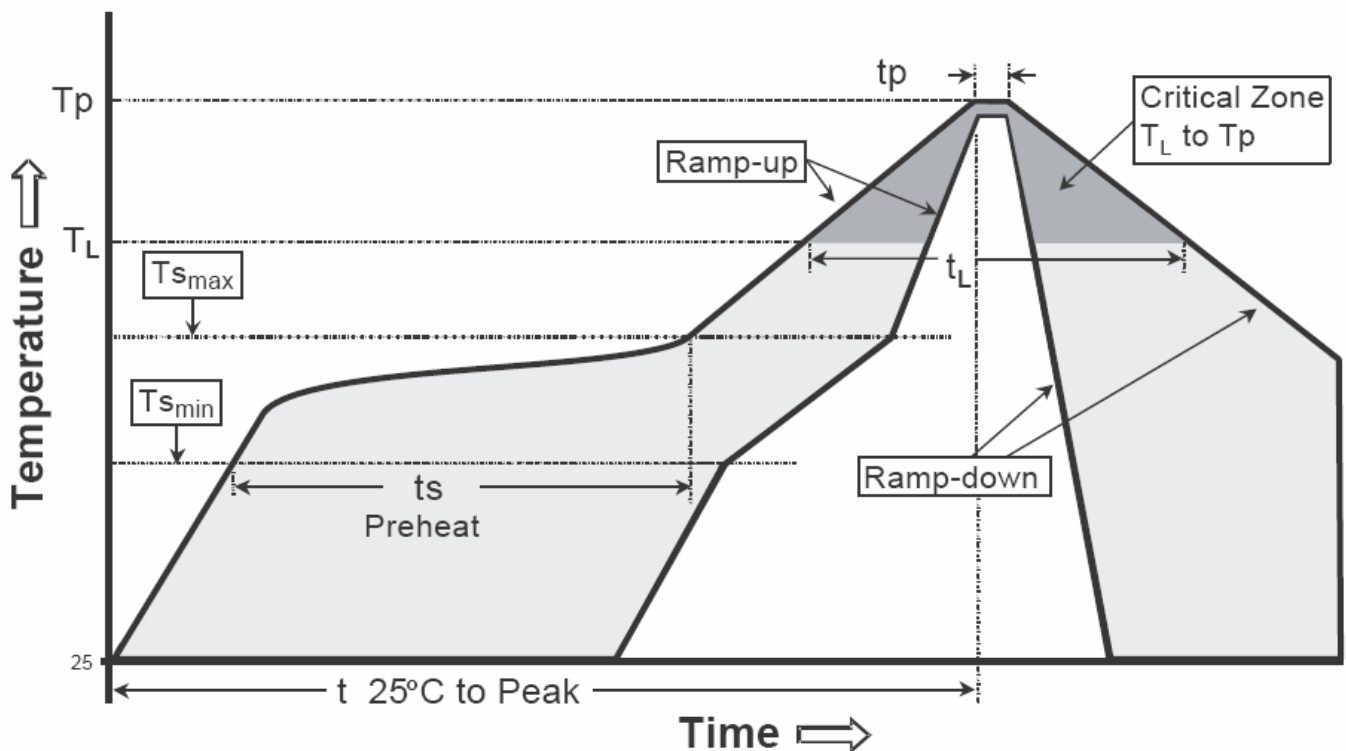
Supply Current vs Input Voltage



**Recommended wave soldering condition**

|                 |                  |                 |
|-----------------|------------------|-----------------|
| Product         | Peak Temperature | Soldering Time  |
| Pb-free devices | 260 +0/-5 °C     | 5 +1/-1 seconds |

**Recommended temperature profile for IR reflow**

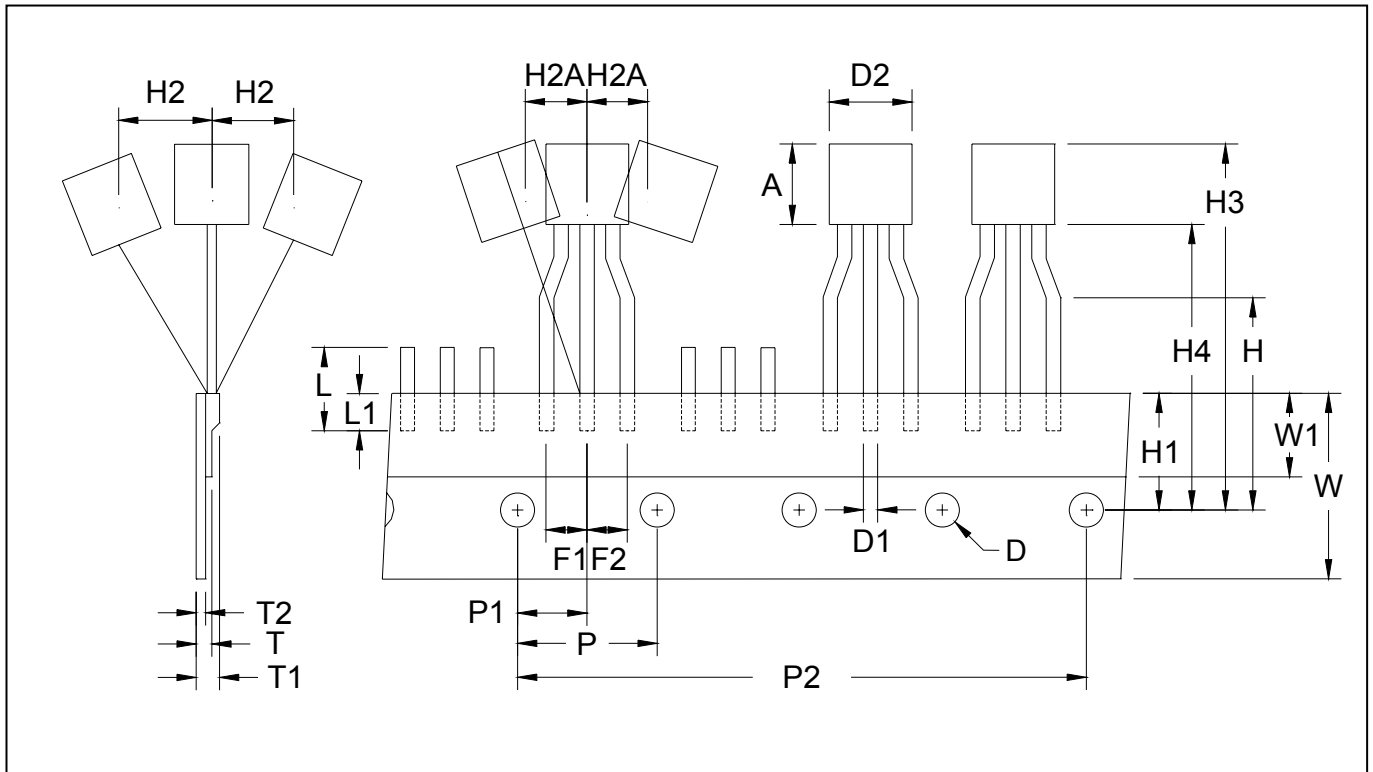


| Profile feature   | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|-------------------------|------------------|
| Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> ) | 3°C/second max.         | 3°C/second max.  |
| Preheat   |                         |                  |
| -Temperature Min(T <sub>s min</sub> )                       | 100°C                   | 150°C            |
| -Temperature Max(T <sub>s max</sub> )                       | 150°C                   | 200°C            |
| -Time(t <sub>s min</sub> to t <sub>s max</sub> )            | 60-120 seconds          | 60-180 seconds   |
| Time maintained above:                                      |                         |                  |
| -Temperature (T <sub>L</sub> )                              | 183°C                   | 217°C            |
| - Time (t <sub>L</sub> )                                    | 60-150 seconds          | 60-150 seconds   |
| Peak Temperature(T <sub>P</sub> )                           | 240 +0/-5 °C            | 260 +0/-5 °C     |
| Time within 5°C of actual peak temperature(tp)              | 10-30 seconds           | 20-40 seconds    |
| Ramp down rate  | 6°C/second max.         | 6°C/second max.  |
| Time 25 °C to peak temperature                              | 6 minutes max.          | 8 minutes max.   |

Note : All temperatures refer to topside of the package, measured on the package body surface.

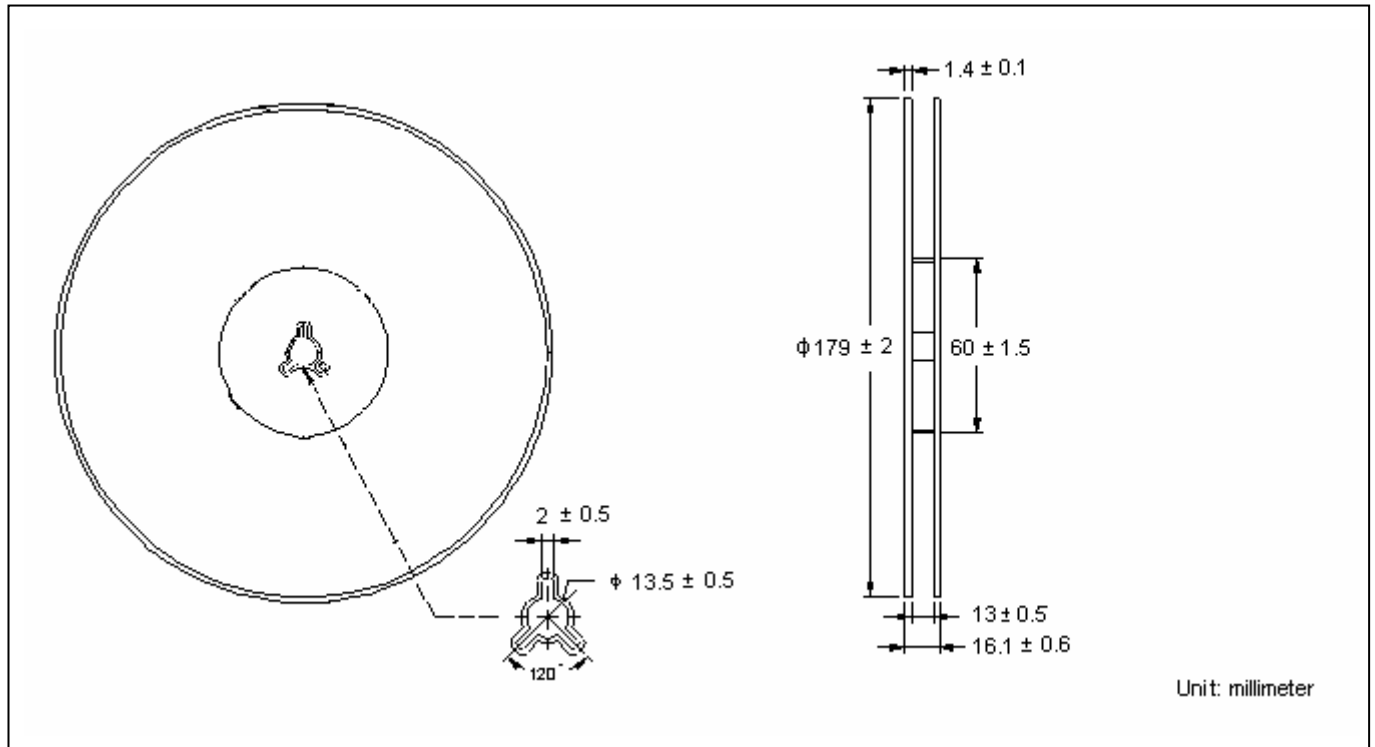


**TO-92 Taping Outline**

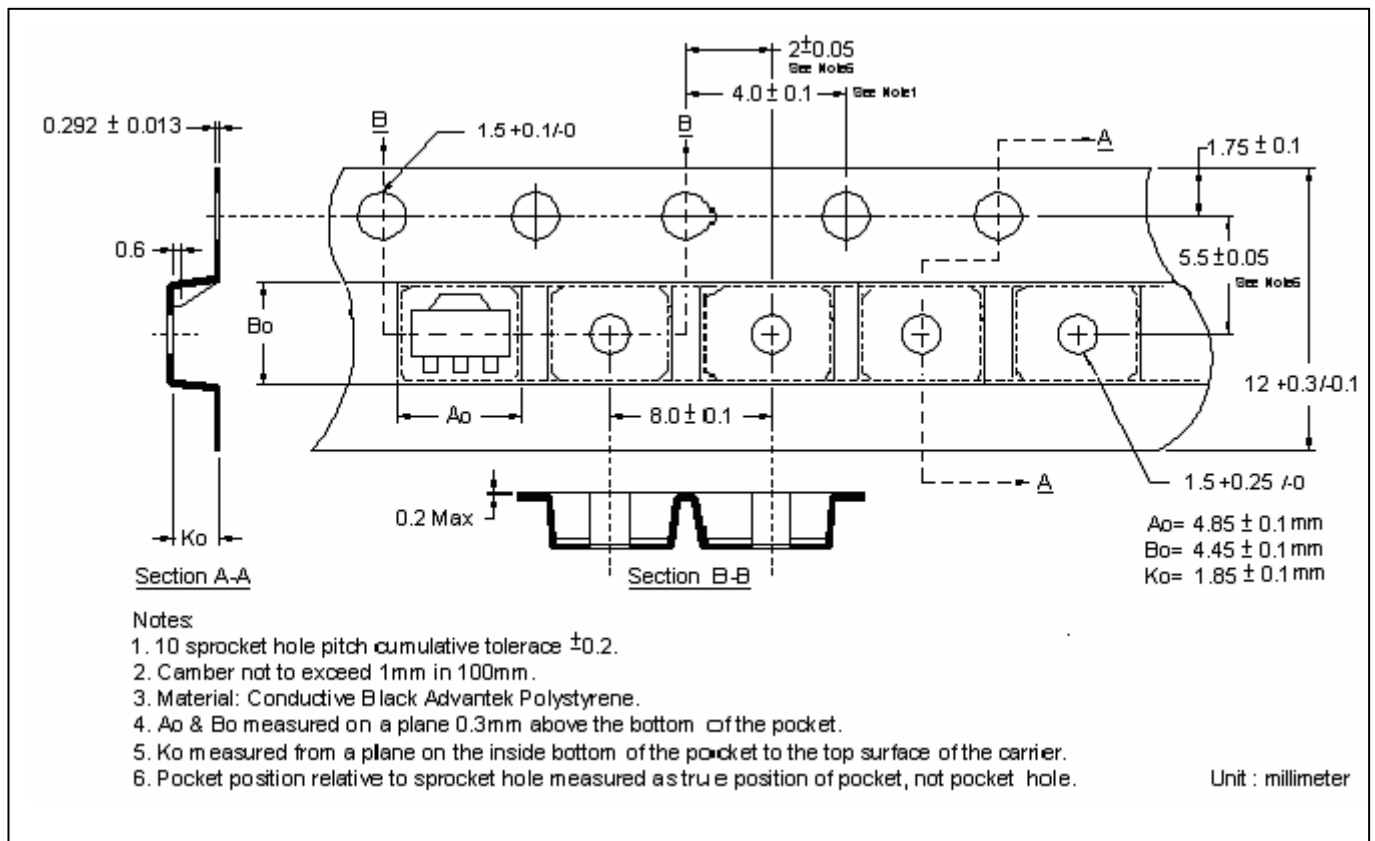


| DIM   | Item                                | Millimeters |       |
|-------|-------------------------------------|-------------|-------|
|       |                                     | Min.        | Max.  |
| A     | Component body height               | 4.33        | 4.83  |
| D     | Tape Feed Diameter                  | 3.80        | 4.20  |
| D1    | Lead Diameter                       | 0.36        | 0.53  |
| D2    | Component Body Diameter             | 4.33        | 4.83  |
| F1,F2 | Component Lead Pitch                | 2.40        | 2.90  |
| F1,F2 | F1-F2                               | -           | ±0.3  |
| H     | Height Of Seating Plane             | 15.50       | 16.50 |
| H1    | Feed Hole Location                  | 8.50        | 9.50  |
| H2    | Front To Rear Deflection            | -           | 1     |
| H2A   | Deflection Left Or Right            | -           | 1     |
| H3    | Component Height                    | -           | 27    |
| H4    | Feed Hole To Bottom Of Component    | -           | 21    |
| L     | Lead Length After Component Removal | -           | 11    |
| L1    | Lead Wire Enclosure                 | 2.50        | -     |
| P     | Feed Hole Pitch                     | 12.50       | 12.90 |
| P1    | Center Of Seating Plane Location    | 5.95        | 6.75  |
| P2    | 4 Feed Hole Pitch                   | 50.30       | 51.30 |
| T     | Over All Tape Thickness             | -           | 0.55  |
| T1    | Total Taped Package Thickness       | -           | 1.42  |
| T2    | Carrier Tape Thickness              | 0.36        | 0.68  |
| W     | Tape Width                          | 17.50       | 19.00 |
| W1    | Adhesive Tape Width                 | 5.00        | 7.00  |
| -     | 20 pcs Pitch                        | 253         | 255   |

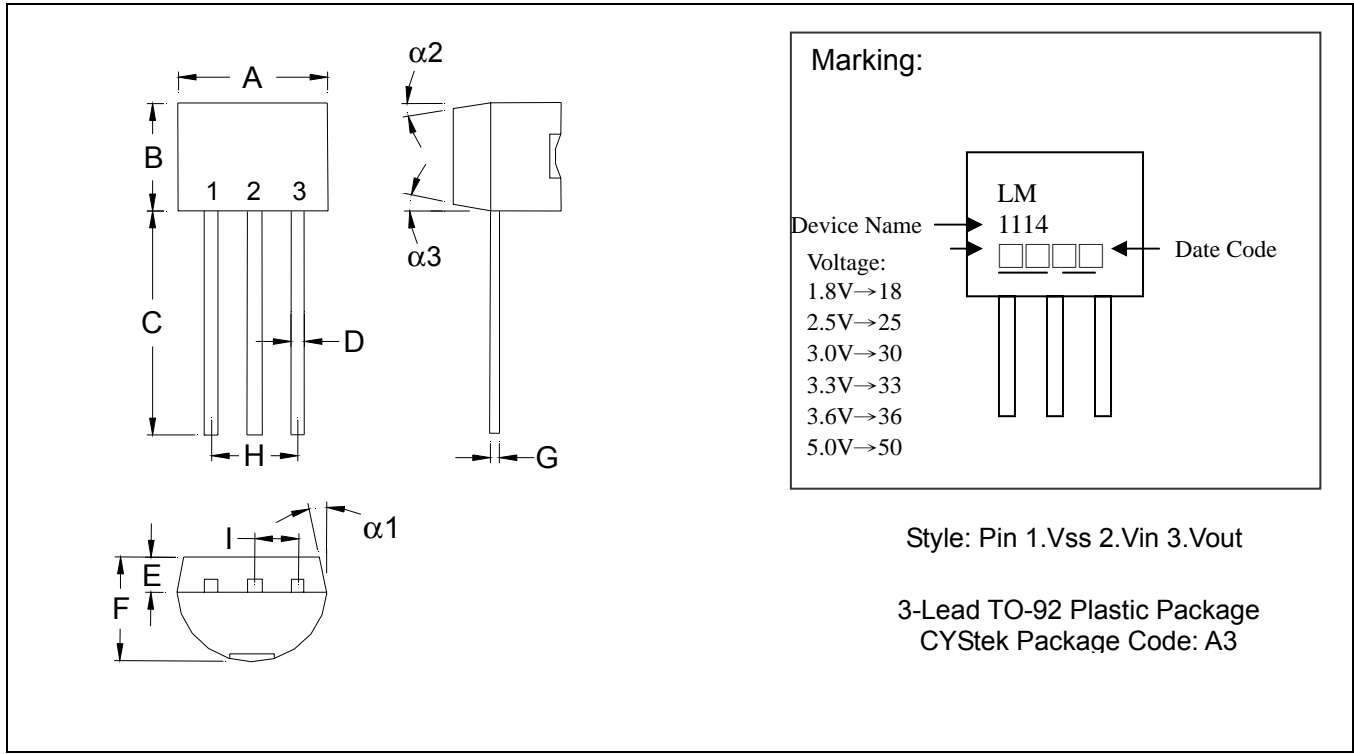
**Reel Dimension for SOT-89**



**Carrier Tape Dimension**



**TO-92 Dimension**



\*: Typical

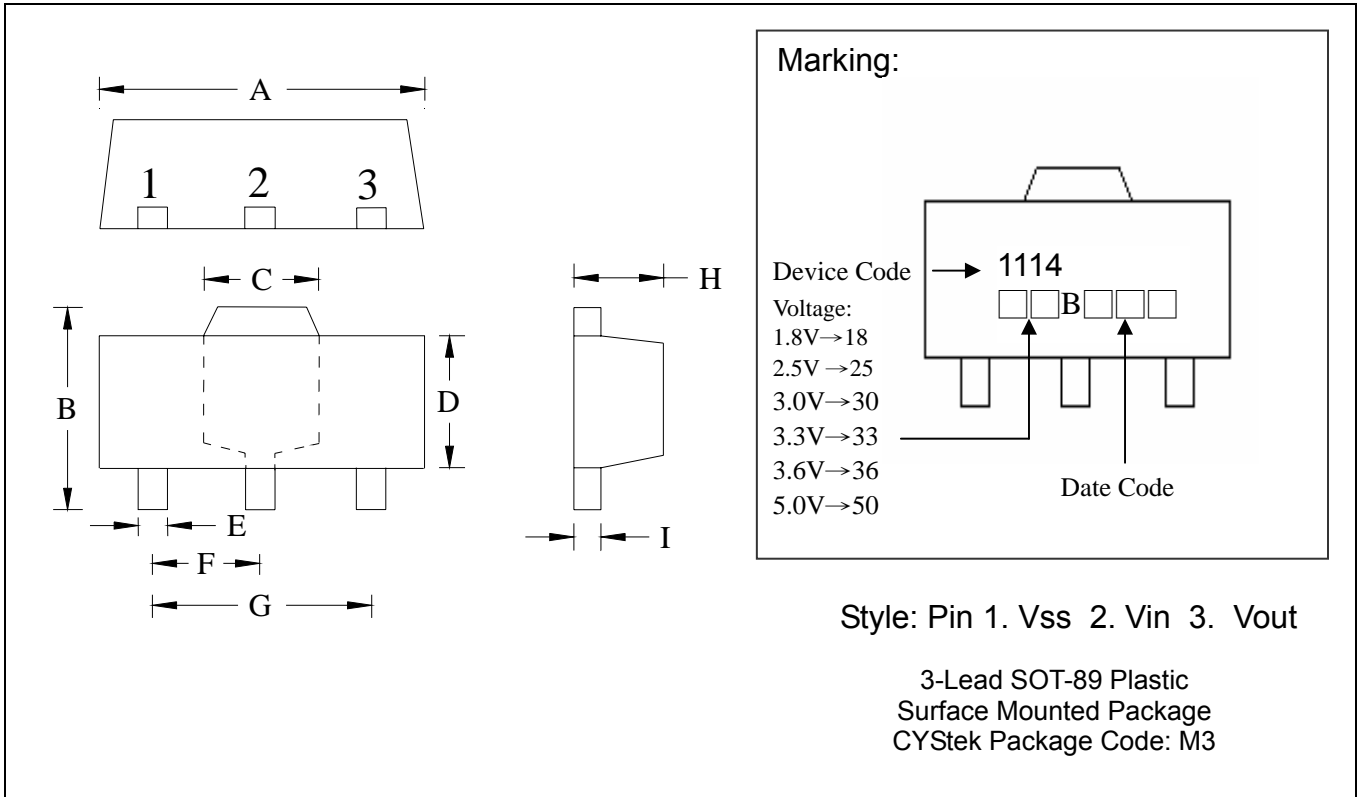
| DIM | Inches |         | Millimeters |       | DIM        | Inches |         | Millimeters |       |
|-----|--------|---------|-------------|-------|------------|--------|---------|-------------|-------|
|     | Min.   | Max.    | Min.        | Max.  |            | Min.   | Max.    | Min.        | Max.  |
| A   | 0.1704 | 0.1902  | 4.33        | 4.83  | G          | 0.0142 | 0.0220  | 0.36        | 0.56  |
| B   | 0.1704 | 0.1902  | 4.33        | 4.83  | H          | -      | *0.1000 | -           | *2.54 |
| C   | 0.5000 | -       | 12.70       | -     | I          | -      | *0.0500 | -           | *1.27 |
| D   | 0.0142 | 0.0220  | 0.36        | 0.56  | $\alpha 1$ | -      | *5°     | -           | *5°   |
| E   | -      | *0.0500 | -           | *1.27 | $\alpha 2$ | -      | *2°     | -           | *2°   |
| F   | 0.1323 | 0.1480  | 3.36        | 3.76  | $\alpha 3$ | -      | *2°     | -           | *2°   |

Notes: 1.Dimension and tolerance based on our Spec. dated Apr. 18,2002.  
 2.Controlling dimension: millimeters.  
 3.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.  
 4.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material:**

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

**SOT-89 Dimension**



**Marking:**

Device Code → 1114  
 Voltage:  
 1.8V → 18  
 2.5V → 25  
 3.0V → 30  
 3.3V → 33  
 3.6V → 36  
 5.0V → 50

Date Code

**Style: Pin 1. Vss 2. Vin 3. Vout**

3-Lead SOT-89 Plastic  
 Surface Mounted Package  
 CYStek Package Code: M3

| DIM | Inches |        | Millimeters |      | DIM | Inches |        | Millimeters |      |
|-----|--------|--------|-------------|------|-----|--------|--------|-------------|------|
|     | Min.   | Max.   | Min.        | Max. |     | Min.   | Max.   | Min.        | Max. |
| A   | 0.1732 | 0.1811 | 4.40        | 4.60 | F   | 0.0591 | TYP    | 1.50        | TYP  |
| B   | 0.1551 | 0.1673 | 3.94        | 4.25 | G   | 0.1181 | TYP    | 3.00        | TYP  |
| C   | 0.0610 | REF    | 1.55        | REF  | H   | 0.0551 | 0.0630 | 1.40        | 1.60 |
| D   | 0.0906 | 0.1024 | 2.30        | 2.60 | I   | 0.0138 | 0.0173 | 0.35        | 0.44 |
| E   | 0.0126 | 0.0205 | 0.32        | 0.52 |     |        |        |             |      |

**Notes:** 1. Controlling dimension: millimeters.  
 2. Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.  
 3. If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material:**

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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