

### Features

- Ultra low quiescent current: 4 $\mu$ A (typ.)
- High input voltage (up to 12V)
- Output voltage:  
1.8V, 2.5V, 2.7V, 3.0V, 3.3V, 3.5V, 5.0V
- Output voltage accuracy: tolerance  $\pm 3\%$
- Maximum output current: 250mA
- Low dropout voltage
- Low temperature coefficient
- TO-92, SOT-89 package

### Applications

- Battery-powered equipment
- Voltage regulator for microprocessor
- Voltage regulator for LAN cards
- Wireless Communication equipment
- Audio/Video equipment

### General Description

The HT73XX series is a set of three-terminal, low power, high voltage regulators implemented in CMOS technology. The series features extremely low quiescent current which is typically 4 $\mu$ A. They allow input voltages as high as 12V. The device provides large current with a significantly small dropout voltage.

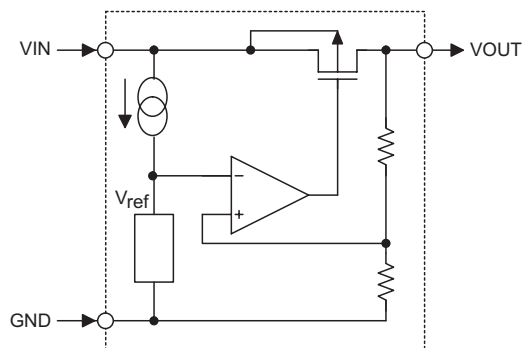
The HT73XX consists of a high-precision voltage reference, an error correction circuit, and a current limited output driver. They are available with several fixed output voltages ranging from 1.8V to 5.0V. CMOS technology ensures low dropout voltage and low current consumption. Although designed primarily as fixed voltage regulators, these devices can be used with external components to generate variable voltages and currents.

### Selection Table

| Part No. | Output Voltage | Tolerance | Package                        | Marking                                                             |
|----------|----------------|-----------|--------------------------------|---------------------------------------------------------------------|
| HT7318   | 1.8V           | $\pm 3\%$ | TO-92-A<br>TO-92-B<br>SOT-89-A | 73XX-A (for TO-92-A)<br>73XX-B (for TO-92-B)<br>73XX-A (for SOT-89) |
| HT7325   | 2.5V           | $\pm 3\%$ |                                |                                                                     |
| HT7327   | 2.7V           | $\pm 3\%$ |                                |                                                                     |
| HT7330   | 3.0V           | $\pm 3\%$ |                                |                                                                     |
| HT7333   | 3.3V           | $\pm 3\%$ |                                |                                                                     |
| HT7335   | 3.5V           | $\pm 3\%$ |                                |                                                                     |
| HT7350   | 5.0V           | $\pm 3\%$ |                                |                                                                     |

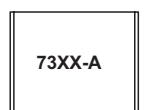
Note: "XX" stands for output voltages

## Block Diagram

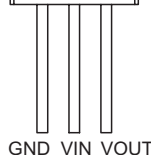


## Pin Assignment

**TO-92-A**

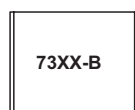


Front View

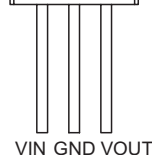


Bottom View

**TO-92-B**

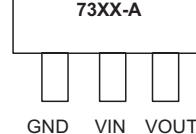
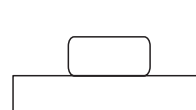


Front View



Bottom View

**SOT-89-A**



## Absolute Maximum Ratings

Supply Voltage .....  $V_{SS} - 0.3V$  to  $V_{SS} + 14V$

Power Consumption (\*1) ..... 500mW

Power Consumption (\*2) ..... 500mW

Storage Temperature .....  $-50^{\circ}C$  to  $125^{\circ}C$

Operating Temperature .....  $-40^{\circ}C$  to  $85^{\circ}C$

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

\*1: applied to TO-92

\*2: applied to SOT-89

## Electrical Characteristics

### HT7318, +1.8V Output Type

Ta=25°C

| Symbol                                                | Parameter               | Test Conditions |                                                     | Min.  | Typ. | Max.  | Unit   |
|-------------------------------------------------------|-------------------------|-----------------|-----------------------------------------------------|-------|------|-------|--------|
|                                                       |                         | V <sub>IN</sub> | Conditions                                          |       |      |       |        |
| V <sub>OUT</sub>                                      | Output Voltage          | 2.8V            | I <sub>OUT</sub> =40mA                              | 1.746 | 1.8  | 1.854 | V      |
| I <sub>OUT(MAX)</sub>                                 | Maximum Output Current  | 2.8V            | V <sub>OUT</sub> ≥1.62V                             | 150   | —    | —     | mA     |
| ΔV <sub>OUT</sub> *                                   | Load Regulator          | 2.8V            | 1mA≤I <sub>OUT</sub> ≤80mA                          | —     | 45   | 90    | mV     |
| V <sub>DROP</sub> **                                  | Dropout Voltage         | —               | I <sub>OUT</sub> =40mA                              | —     | 300  | —     | mV     |
| I <sub>SS</sub>                                       | Quiescent Current       | 2.8V            | No load                                             | —     | 4    | 8     | μA     |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulator          | —               | I <sub>OUT</sub> =40mA<br>2.8V≤V <sub>IN</sub> ≤12V | —     | 0.2  | 0.3   | %/V    |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —                                                   | —     | —    | 12    | V      |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 2.8V            | I <sub>OUT</sub> =40mA<br>-40°C<Ta<85°C             | —     | ±0.7 | —     | ppm/°C |

### HT7325, +2.5V Output Type

Ta=25°C

| Symbol                                                | Parameter               | Test Conditions |                                                     | Min.  | Typ. | Max.  | Unit   |
|-------------------------------------------------------|-------------------------|-----------------|-----------------------------------------------------|-------|------|-------|--------|
|                                                       |                         | V <sub>IN</sub> | Conditions                                          |       |      |       |        |
| V <sub>OUT</sub>                                      | Output Voltage          | 3.5V            | I <sub>OUT</sub> =40mA                              | 2.425 | 2.5  | 2.575 | V      |
| I <sub>OUT(MAX)</sub>                                 | Maximum Output Current  | 3.5V            | V <sub>OUT</sub> ≥2.25V                             | 180   | —    | —     | mA     |
| ΔV <sub>OUT</sub> *                                   | Load Regulator          | 3.5V            | 1mA≤I <sub>OUT</sub> ≤80mA                          | —     | 45   | 90    | mV     |
| V <sub>DROP</sub> **                                  | Dropout Voltage         | —               | I <sub>OUT</sub> =40mA                              | —     | 230  | —     | mV     |
| I <sub>SS</sub>                                       | Quiescent Current       | 3.5V            | No load                                             | —     | 4    | 8     | μA     |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulator          | —               | I <sub>OUT</sub> =40mA<br>3.5V≤V <sub>IN</sub> ≤12V | —     | 0.2  | 0.3   | %/V    |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —                                                   | —     | —    | 12    | V      |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 3.5V            | I <sub>OUT</sub> =40mA<br>-40°C<Ta<85°C             | —     | ±0.7 | —     | ppm/°C |

### HT7327, +2.7V Output Type

Ta=25°C

| Symbol                                                | Parameter               | Test Conditions |                                                     | Min.  | Typ. | Max.  | Unit   |
|-------------------------------------------------------|-------------------------|-----------------|-----------------------------------------------------|-------|------|-------|--------|
|                                                       |                         | V <sub>IN</sub> | Conditions                                          |       |      |       |        |
| V <sub>OUT</sub>                                      | Output Voltage          | 3.7V            | I <sub>OUT</sub> =40mA                              | 2.619 | 2.7  | 2.781 | V      |
| I <sub>OUT(MAX)</sub>                                 | Maximum Output Current  | 3.7V            | V <sub>OUT</sub> ≥2.43V                             | 200   | —    | —     | mA     |
| ΔV <sub>OUT</sub> *                                   | Load Regulator          | 3.7V            | 1mA≤I <sub>OUT</sub> ≤100mA                         | —     | 45   | 90    | mV     |
| V <sub>DROP</sub> **                                  | Dropout Voltage         | —               | I <sub>OUT</sub> =40mA                              | —     | 190  | —     | mV     |
| I <sub>SS</sub>                                       | Quiescent Current       | 3.7V            | No load                                             | —     | 4    | 8     | μA     |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulator          | —               | I <sub>OUT</sub> =40mA<br>3.7V≤V <sub>IN</sub> ≤12V | —     | 0.2  | 0.3   | %/V    |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —                                                   | —     | —    | 12    | V      |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 3.7V            | I <sub>OUT</sub> =40mA<br>-40°C<Ta<85°C             | —     | ±0.7 | —     | ppm/°C |

**HT7330, +3.0V Output Type**

Ta=25°C

| Symbol                                                | Parameter               | Test Conditions |                                                   | Min. | Typ. | Max. | Unit   |
|-------------------------------------------------------|-------------------------|-----------------|---------------------------------------------------|------|------|------|--------|
|                                                       |                         | V <sub>IN</sub> | Conditions                                        |      |      |      |        |
| V <sub>OUT</sub>                                      | Output Voltage          | 4V              | I <sub>OUT</sub> =40mA                            | 2.91 | 3    | 3.09 | V      |
| I <sub>OUT(MAX)</sub>                                 | Maximum Output Current  | 4V              | V <sub>OUT</sub> ≥2.7V                            | 250  | —    | —    | mA     |
| ΔV <sub>OUT</sub> *                                   | Load Regulator          | 4V              | 1mA≤I <sub>OUT</sub> ≤100mA                       | —    | 45   | 90   | mV     |
| V <sub>DROP</sub> **                                  | Dropout Voltage         | —               | I <sub>OUT</sub> =40mA                            | —    | 160  | —    | mV     |
| I <sub>SS</sub>                                       | Quiescent Current       | 4V              | No load                                           | —    | 4    | 8    | μA     |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulator          | —               | I <sub>OUT</sub> =40mA<br>4V≤V <sub>IN</sub> ≤12V | —    | 0.2  | 0.3  | %/V    |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —                                                 | —    | —    | 12   | V      |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 4V              | I <sub>OUT</sub> =40mA<br>-40°C<Ta<85°C           | —    | ±0.7 | —    | ppm/°C |

**HT7333, +3.3V Output Type**

Ta=25°C

| Symbol                                                | Parameter               | Test Conditions |                                                     | Min.  | Typ. | Max.  | Unit   |
|-------------------------------------------------------|-------------------------|-----------------|-----------------------------------------------------|-------|------|-------|--------|
|                                                       |                         | V <sub>IN</sub> | Conditions                                          |       |      |       |        |
| V <sub>OUT</sub>                                      | Output Voltage          | 4.3V            | I <sub>OUT</sub> =40mA                              | 3.201 | 3.3  | 3.399 | V      |
| I <sub>OUT(MAX)</sub>                                 | Maximum Output Current  | 4.3V            | V <sub>OUT</sub> ≥2.97V                             | 250   | —    | —     | mA     |
| ΔV <sub>OUT</sub> *                                   | Load Regulator          | 4.3V            | 1mA≤I <sub>OUT</sub> ≤100mA                         | —     | 45   | 90    | mV     |
| V <sub>DROP</sub> **                                  | Dropout Voltage         | —               | I <sub>OUT</sub> =40mA                              | —     | 150  | —     | mV     |
| I <sub>SS</sub>                                       | Quiescent Current       | 4.3V            | No load                                             | —     | 4    | 8     | μA     |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulator          | —               | I <sub>OUT</sub> =40mA<br>4.3V≤V <sub>IN</sub> ≤12V | —     | 0.2  | 0.3   | %/V    |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —                                                   | —     | —    | 12    | V      |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 4.3V            | I <sub>OUT</sub> =40mA<br>-40°C<Ta<85°C             | —     | ±0.7 | —     | ppm/°C |

**HT7335, +3.5V Output Type**

Ta=25°C

| Symbol                                                | Parameter               | Test Conditions |                                                     | Min.  | Typ. | Max.  | Unit   |
|-------------------------------------------------------|-------------------------|-----------------|-----------------------------------------------------|-------|------|-------|--------|
|                                                       |                         | V <sub>IN</sub> | Conditions                                          |       |      |       |        |
| V <sub>OUT</sub>                                      | Output Voltage          | 4.5V            | I <sub>OUT</sub> =40mA                              | 3.395 | 3.5  | 3.605 | V      |
| I <sub>OUT(MAX)</sub>                                 | Maximum Output Current  | 4.5V            | V <sub>OUT</sub> ≥3.15V                             | 250   | —    | —     | mA     |
| ΔV <sub>OUT</sub> *                                   | Load Regulator          | 4.5V            | 1mA≤I <sub>OUT</sub> ≤100mA                         | —     | 45   | 90    | mV     |
| V <sub>DROP</sub> **                                  | Dropout Voltage         | —               | I <sub>OUT</sub> =40mA                              | —     | 140  | —     | mV     |
| I <sub>SS</sub>                                       | Quiescent Current       | 4.5V            | No load                                             | —     | 4    | 8     | μA     |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulator          | —               | I <sub>OUT</sub> =40mA<br>4.5V≤V <sub>IN</sub> ≤12V | —     | 0.2  | 0.3   | %/V    |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —                                                   | —     | —    | 12    | V      |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 4.5V            | I <sub>OUT</sub> =80mA<br>-40°C<Ta<85°C             | —     | ±0.7 | —     | ppm/°C |

**HT7350, +5.0V Output Type**

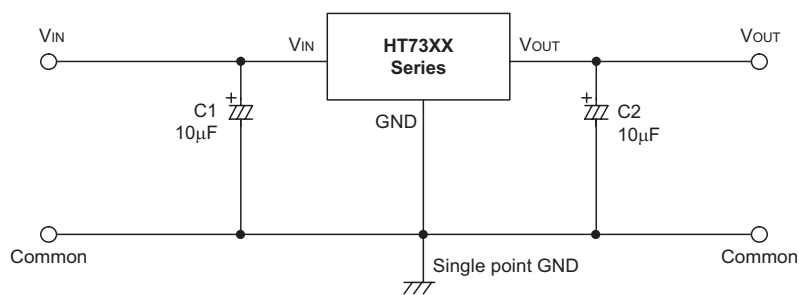
Ta=25°C

| Symbol                                                | Parameter               | Test Conditions |                                                      | Min. | Typ. | Max. | Unit   |
|-------------------------------------------------------|-------------------------|-----------------|------------------------------------------------------|------|------|------|--------|
|                                                       |                         | V <sub>IN</sub> | Conditions                                           |      |      |      |        |
| V <sub>OUT</sub>                                      | Output Voltage          | 6V              | I <sub>OUT</sub> =40mA                               | 4.85 | 5    | 5.15 | V      |
| I <sub>OUT(MAX)</sub>                                 | Maximum Output Current  | 6V              | V <sub>OUT</sub> ≥4.5V                               | 250  | —    | —    | mA     |
| ΔV <sub>OUT</sub> *                                   | Load Regulator          | 6V              | 1mA≤I <sub>OUT</sub> ≤100mA                          | —    | 45   | 90   | mV     |
| V <sub>DROP</sub> **                                  | Dropout Voltage         | —               | I <sub>OUT</sub> =40mA                               | —    | 100  | —    | mV     |
| I <sub>SS</sub>                                       | Quiescent Current       | 6V              | No load                                              | —    | 4    | 8    | μA     |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulator          | —               | I <sub>OUT</sub> =40mA<br>6V≤V <sub>IN</sub> ≤12V    | —    | 0.2  | 0.3  | %/V    |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —                                                    | —    | —    | 12   | V      |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 6V              | I <sub>OUT</sub> =80mA<br>-40°C<T <sub>a</sub> <85°C | —    | ±0.7 | —    | ppm/°C |

Note: \*\*\* Regulation is measured at constant junction temperature, using pulsed ON time.

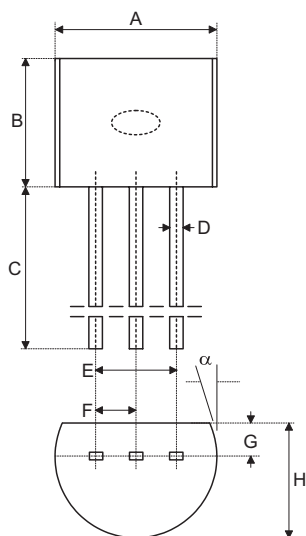
\*\*\*\* Dropout is measured at constant junction temperature, using pulsed ON time, and the criterion is V<sub>OUT</sub> inside target value ±2%.

**Application Circuits**

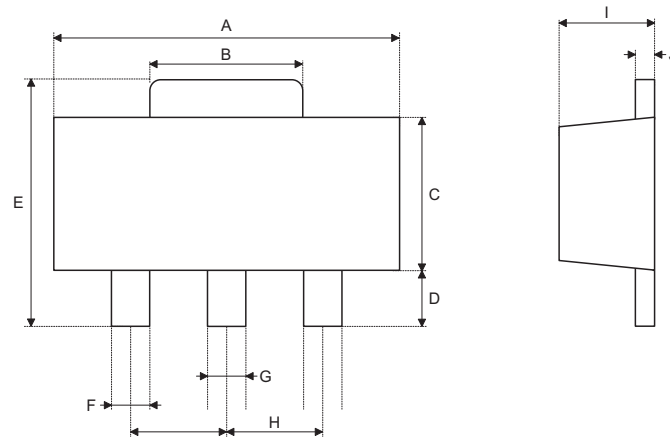


# Package Information

## 3-pin TO-92 Outline Dimensions



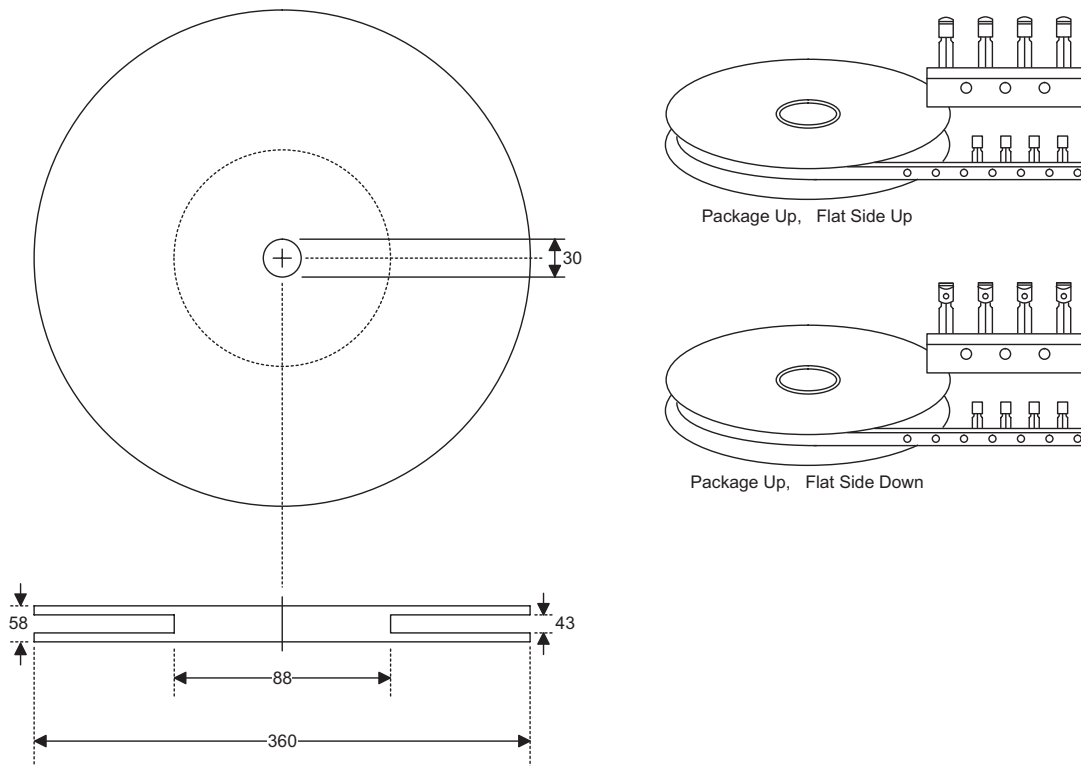
| Symbol   | Dimensions in mil |      |      |
|----------|-------------------|------|------|
|          | Min.              | Nom. | Max. |
| A        | 170               | —    | 200  |
| B        | 170               | —    | 200  |
| C        | 500               | —    | —    |
| D        | 11                | —    | 20   |
| E        | 90                | —    | 110  |
| F        | 45                | —    | 55   |
| G        | 45                | —    | 65   |
| H        | 130               | —    | 160  |
| I        | 8                 | —    | 18   |
| $\alpha$ | 4°                | —    | 6°   |

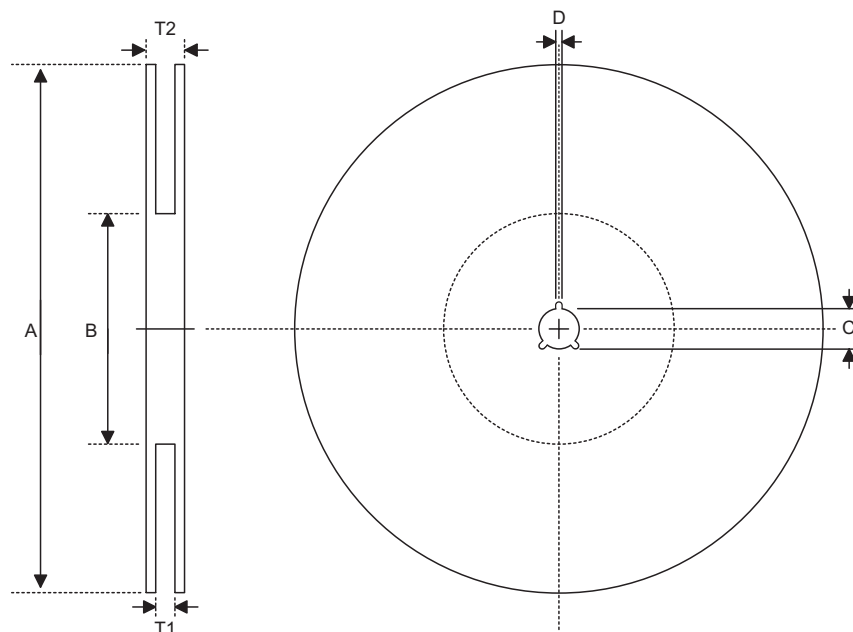
**3-pin SOT-89 Outline Dimensions**


| Symbol | Dimensions in mil |      |      |
|--------|-------------------|------|------|
|        | Min.              | Nom. | Max. |
| A      | 173               | —    | 181  |
| B      | 64                | —    | 72   |
| C      | 90                | —    | 102  |
| D      | 35                | —    | 47   |
| E      | 155               | —    | 167  |
| F      | 14                | —    | 19   |
| G      | 17                | —    | 22   |
| H      | —                 | 59   | —    |
| I      | 55                | —    | 63   |
| J      | 14                | —    | 17   |

## Product Tape and Reel Specifications

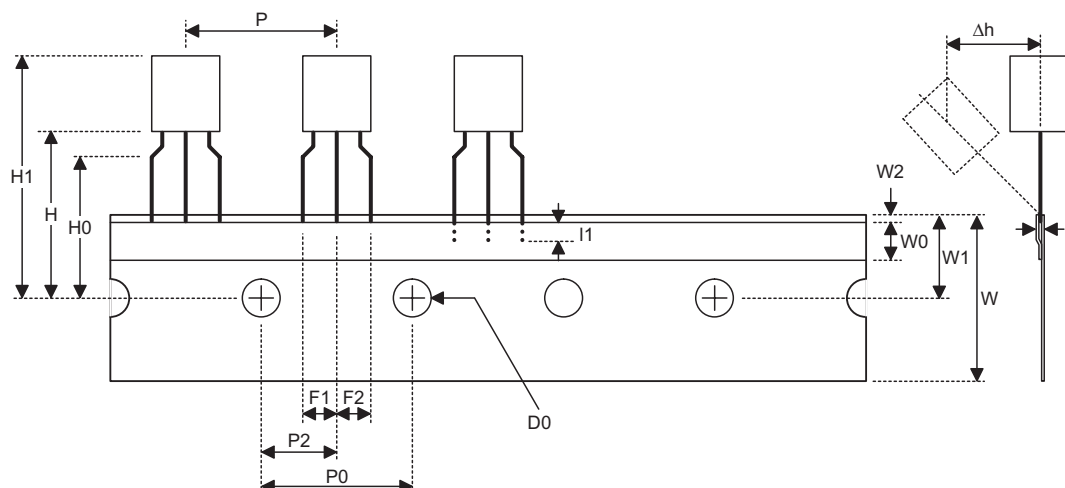
TO-92 Reel Dimensions (Unit: mm)



**SOT-89 Reel Dimensions**

**SOT-89**

| Symbol | Description           | Dimensions in mm |
|--------|-----------------------|------------------|
| A      | Reel Outer Diameter   | 180±1.0          |
| B      | Reel Inner Diameter   | 62±1.5           |
| C      | Spindle Hole Diameter | 12.75+0.15       |
| D      | Key Slit Width        | 1.9±0.15         |
| T1     | Space Between Flange  | 12.4+0.2         |
| T2     | Reel Thickness        | 17-0.4           |

**TO-92 Carrier Tape Dimensions**



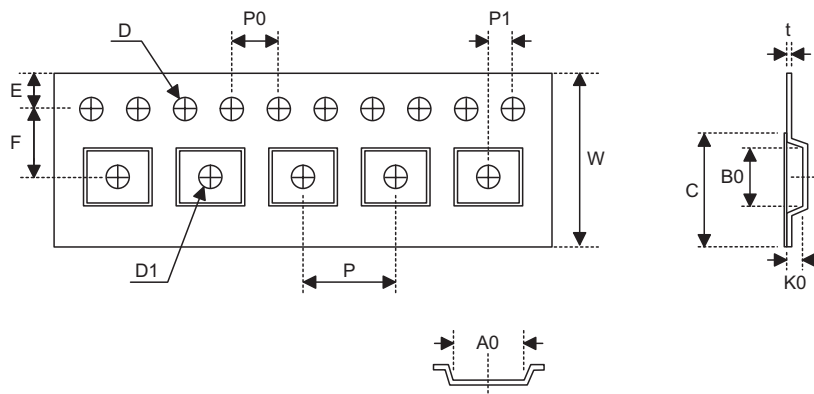
**TO-92**

| Symbol         | Description                                 | Dimensions in mm |
|----------------|---------------------------------------------|------------------|
| l1             | Taped Lead Length                           | (2.5)            |
| P              | Component Pitch                             | 12.7±1.0         |
| P <sub>0</sub> | Perforation Pitch                           | 12.7±0.3         |
| P <sub>2</sub> | Component to Perforation (Length Direction) | 6.35±0.4         |
| F <sub>1</sub> | Lead Spread                                 | 2.5+0.4<br>-0.1  |
| F <sub>2</sub> | Lead Spread                                 | 2.5+0.4<br>-0.1  |
| Δh             | Component Alignment                         | 0±0.1            |
| W              | Carrier Tape Width                          | 18.0+1.0<br>-0.5 |
| W <sub>0</sub> | Hold-down Tape Width                        | 6.0±0.5          |
| W <sub>1</sub> | Perforation Position                        | 9.0±0.5          |
| W <sub>2</sub> | Hold-down Tape Position                     | (0.5)            |
| H <sub>0</sub> | Lead Clinch Height                          | 16.0±0.5         |
| H <sub>1</sub> | Component Height                            | Less than 24.7   |
| D <sub>0</sub> | Perforation Diameter                        | 4.0±0.2          |
| t              | Taped Lead Thickness                        | 0.7±0.2          |
| H              | Component Base Height                       | 19.0±0.5         |

Note: Thickness less than 0.38±0.05mm~0.5mm

P0 Accumulated pitch tolerance: ±1mm/20pitches.

( ) Bracketed figures are for consultation only

**SOT-89 Carrier Tape Dimensions**

**SOT-89**

| Symbol | Description                              | Dimensions in mm |
|--------|------------------------------------------|------------------|
| W      | Carrier Tape Width                       | 12.0+0.3<br>-0.1 |
| P      | Cavity Pitch                             | 8.0±0.1          |
| E      | Perforation Position                     | 1.75±0.1         |
| F      | Cavity to Perforation (Width Direction)  | 5.5±0.05         |
| D      | Perforation Diameter                     | 1.5+0.1          |
| D1     | Cavity Hole Diameter                     | 1.5+0.1          |
| P0     | Perforation Pitch                        | 4.0±0.1          |
| P1     | Cavity to Perforation (Length Direction) | 2.0±0.10         |
| A0     | Cavity Length                            | 4.8±0.1          |
| B0     | Cavity Width                             | 4.5±0.1          |
| K0     | Cavity Depth                             | 1.8±0.1          |
| t      | Carrier Tape Thickness                   | 0.30±0.013       |
| C      | Cover Tape Width                         | 9.3              |

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