

### Features

- Low power consumption
- Low voltage drop
- Low temperature coefficient
- High input voltage (up to 24V)
- High output current : 100mA
- Output voltage accuracy: tolerance  $\pm 1\%$
- TO92, SOT89 and SOT23-5 packages

### Applications

- Battery-powered equipment
- Communication equipment
- Audio/Video equipment

### General Description

The HT75XX-2 series is a set of three-terminal low power high voltage implemented in CMOS technology. They can deliver 100mA output current and allow an input voltage as high as 24V. They are available with several fixed output voltages ranging from 2.1V to 12.0V.

CMOS technology ensures low voltage drop and low quiescent current.

Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

### Selection Table

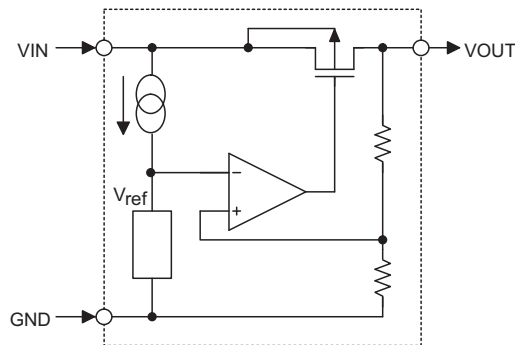
Part No.	Output Voltage	Package	Marking
HT7521-2	2.1V	TO92 SOT89 SOT23-5	75XX-2# (for TO92) 75XX-2# (for SOT89) 5XX2+ (for SOT23-5-A)
HT7523-2	2.3V		
HT7525-2	2.5V		
HT7527-2	2.7V		
HT7530-2	3.0V		
HT7533-2	3.3V		
HT7536-2	3.6V		
HT7540-2	4.0V		
HT7544-2	4.4V		
HT7550-2	5.0V		
HT7560-2	6.0V		
HT7570-2	7.0V		
HT7580-2	8.0V		
HT7590-2	9.0V		
HT75A0-2	10.0V		
HT75C0-2	12.0V	SOT23-5	541B+ (for SOT23-5-B)
HT7541-2	4.15V		

Note: "XX" stands for output voltages.

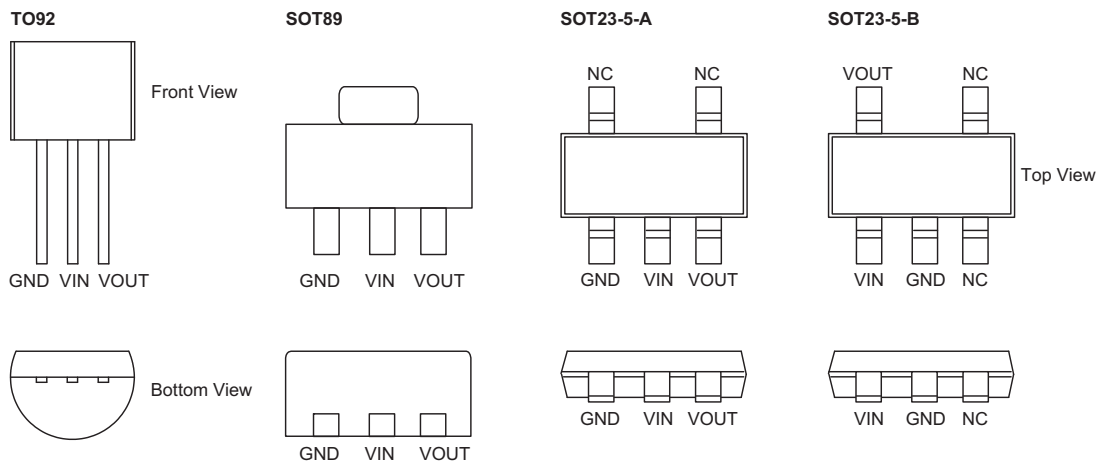
"#" stands for Lead-free devices.

"+" stands for green compound devices, which are Lead-free and Halogen-free.

**Block Diagram**



**Pin Assignment**



**Absolute Maximum Ratings**

Supply Voltage .....-0.3V to 26V      Storage Temperature .....-50°C to 125°C  
 Operating Temperature .....-40°C to 85°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.

**Thermal Information**

Symbol	Parameter	Package	Max.	Unit
$\theta_{JA}$	Thermal Resistance (Junction to Ambient) (Assume no ambient airflow, no heat sink)	SOT23-5	500	°C/W
		SOT89	200	°C/W
		TO92	200	°C/W
$P_D$	Power Dissipation	SOT23-5	0.20	W
		SOT89	0.50	W
		TO92	0.50	W

Note:  $P_D$  is measured at  $T_a = 25^\circ\text{C}$

**Pin Descriptions**

Pin No.	Pin Name	Pin Description
1	GND	Ground pin
2	VIN	Input pin
3	VOUT	Output pin

**Electrical Characteristics**

$V_{IN} = V_{OUT} + 2V, C_{IN} = C_O = 10\mu F$

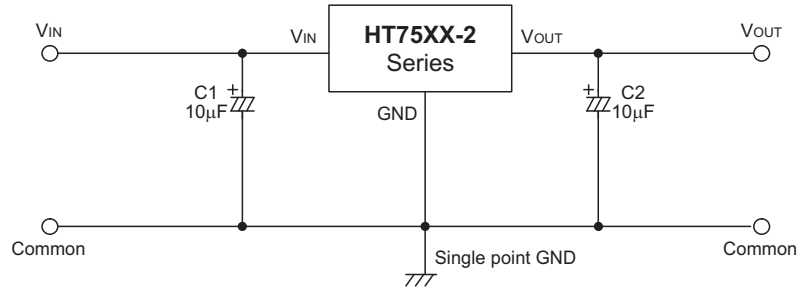
$T_a = 25^\circ C$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		Conditions					
$V_{IN}$	Input Voltage	—		—	—	24	V
$V_{OUT}$	Output Voltage Tolerance	$I_{OUT} = 10mA$		-1%		+1%	V
$I_{OUT}$	Output Current	$2.1V \leq V_{OUT} \leq 4.4V$		70	100	—	mA
		$V_{OUT} = 5.0V$		100	150	—	mA
		$6.0V \leq V_{OUT} \leq 12.0V$		150	—	—	mA
$\Delta V_{OUT}$	Load Regulation	$2.1V \leq V_{OUT} \leq 3.6V$ $1mA \leq I_{OUT} \leq 50mA$		—	10	45	mV
		$4.0V \leq V_{OUT} \leq 4.4V$ $1mA \leq I_{OUT} \leq 50mA$		—	13	65	mV
		$5.0V \leq V_{OUT} \leq 12.0V$ $1mA \leq I_{OUT} \leq 70mA$		—	17	80	mV
$V_{DIF}$	Voltage Drop (Note)	$I_{OUT} = 10mA,$ $\Delta V_{OUT} = 2\%$	$2.1V \leq V_{OUT} \leq 2.4V$	—	0.46	0.95	V
			$2.5V \leq V_{OUT} \leq 2.7V$		0.32	0.68	V
			$3.0V \leq V_{OUT} \leq 3.3V$		0.23	0.41	V
			$V_{OUT} = 3.6V$		0.19	0.35	V
			$4.0V \leq V_{OUT} \leq 4.4V$		0.16	0.30	V
			$V_{OUT} = 5.0V$		0.12	0.25	V
			$6.0V \leq V_{OUT} \leq 12.0V$		0.11	0.23	V
$I_{SS}$	Quiescent Current	No load		—	2.5	5.0	$\mu A$
$\Delta V_{LINE}$	Line Regulation	$V_{IN} = V_{OUT} + 1V \leq V_{IN} \leq 24V, I_{OUT} = 1mA$		—	0.1	0.2	%/V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	$I_{OUT} = 10mA$ $-40^\circ C < T_a < 85^\circ C$	$2.1V \leq V_{OUT} \leq 12.0V$	—	100	—	ppm/ $^\circ C$

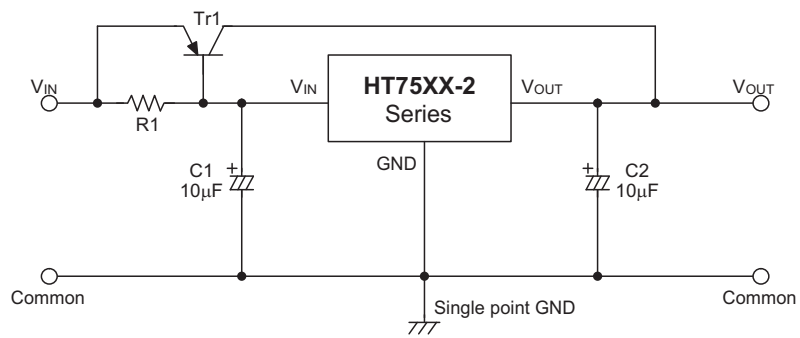
Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at  $V_{IN} = V_{OUT} + 2V$  with a fixed load.

**Application Circuits**

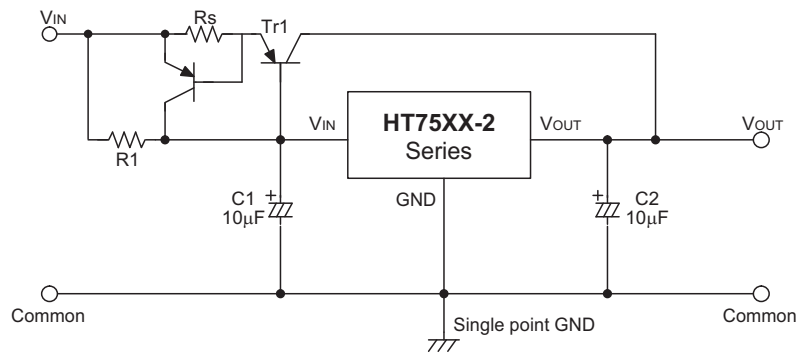
**Basic Circuit**



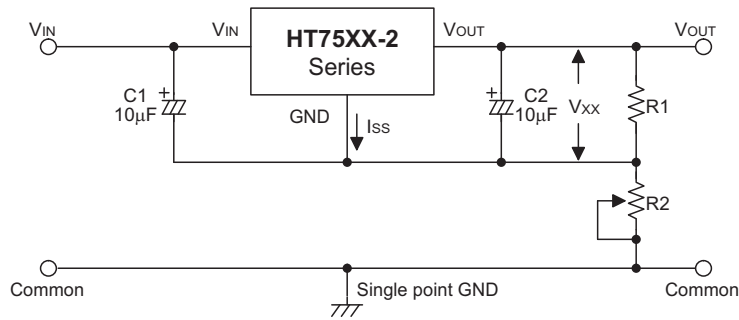
**High Output Current Positive Voltage Regulator**



**Short-Circuit Protection for Tr1**

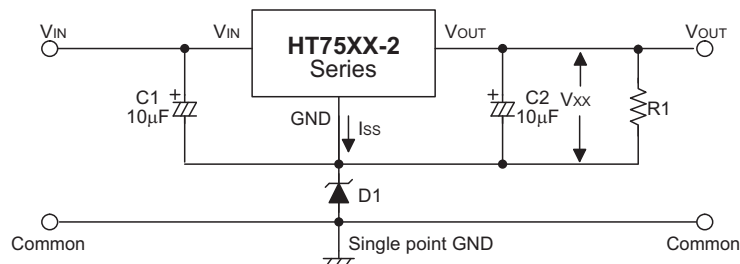


**Circuit for Increasing Output Voltage**



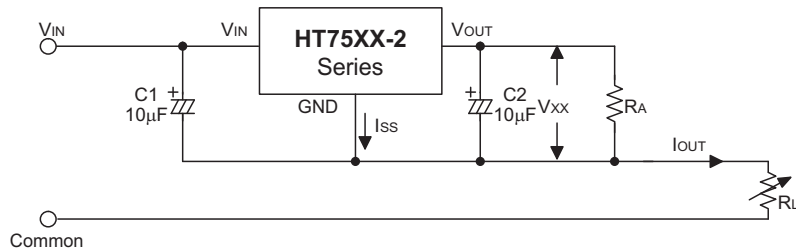
$$V_{OUT} = V_{xx} \left( 1 + \frac{R_2}{R_1} \right) + I_{SS} R_2$$

**Circuit for Increasing Output Voltage**



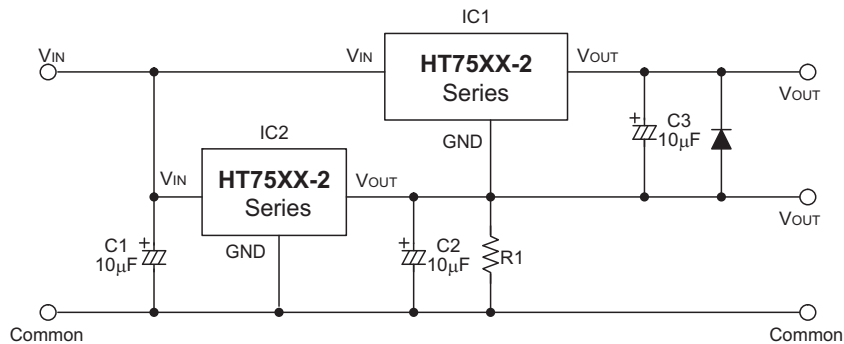
$$V_{OUT} = V_{xx} + V_{D1}$$

**Constant Current Regulator**



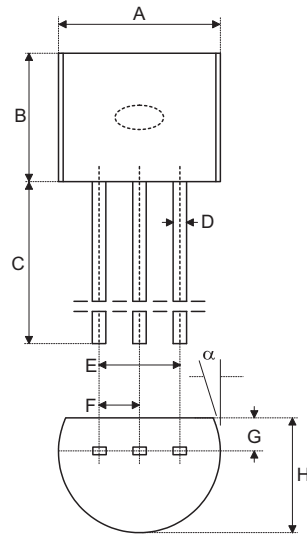
$$I_{OUT} = \frac{V_{xx}}{R_A} + I_{SS}$$

**Dual Supply**



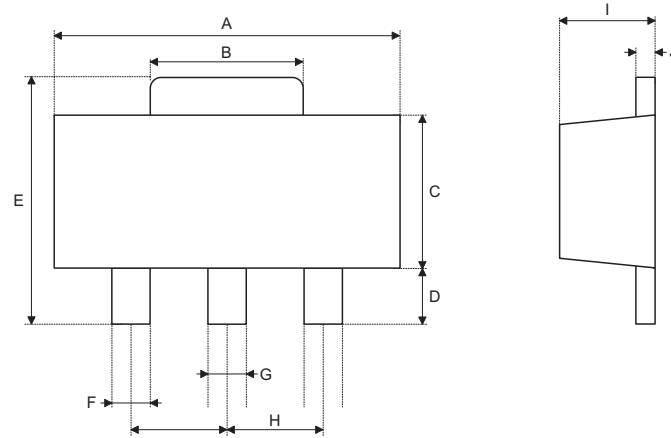
Package Information

3-pin TO92 Outline Dimensions



Symbol	Dimensions in inch		
	Min.	Nom.	Max.
A	0.170	—	0.200
B	0.170	—	0.200
C	0.500	—	—
D	0.011	—	0.020
E	0.090	—	0.110
F	0.045	—	0.055
G	0.045	—	0.065
H	0.130	—	0.160
$\alpha$	0°	—	10°

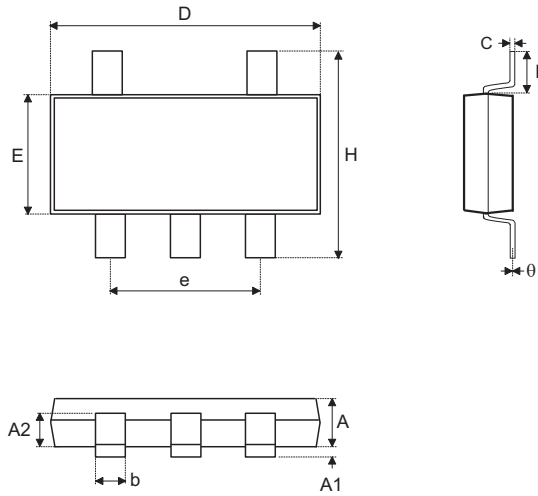
Symbol	Dimensions in mm		
	Min.	Nom.	Max.
A	4.32	—	5.08
B	4.32	—	5.08
C	12.70	—	—
D	0.28	—	0.51
E	2.29	—	2.79
F	1.14	—	1.40
G	1.14	—	1.65
H	3.30	—	4.06
$\alpha$	0°	—	10°

**3-pin SOT89 Outline Dimensions**


Symbol	Dimensions in inch		
	Min.	Nom.	Max.
A	0.173	—	0.181
B	0.059	—	0.072
C	0.090	—	0.102
D	0.035	—	0.047
E	0.155	—	0.167
F	0.014	—	0.019
G	0.017	—	0.022
H	—	0.059	—
I	55	—	63
J	14	—	17

Symbol	Dimensions in mm		
	Min.	Nom.	Max.
A	4.39	—	4.60
B	1.50	—	1.83
C	2.29	—	2.59
D	0.89	—	1.19
E	3.94	—	4.24
F	0.36	—	0.48
G	0.43	—	0.56
H	—	1.50	—
I	1.40	—	1.60
J	0.36	—	0.43

**5-pin SOT23-5 Outline Dimensions**

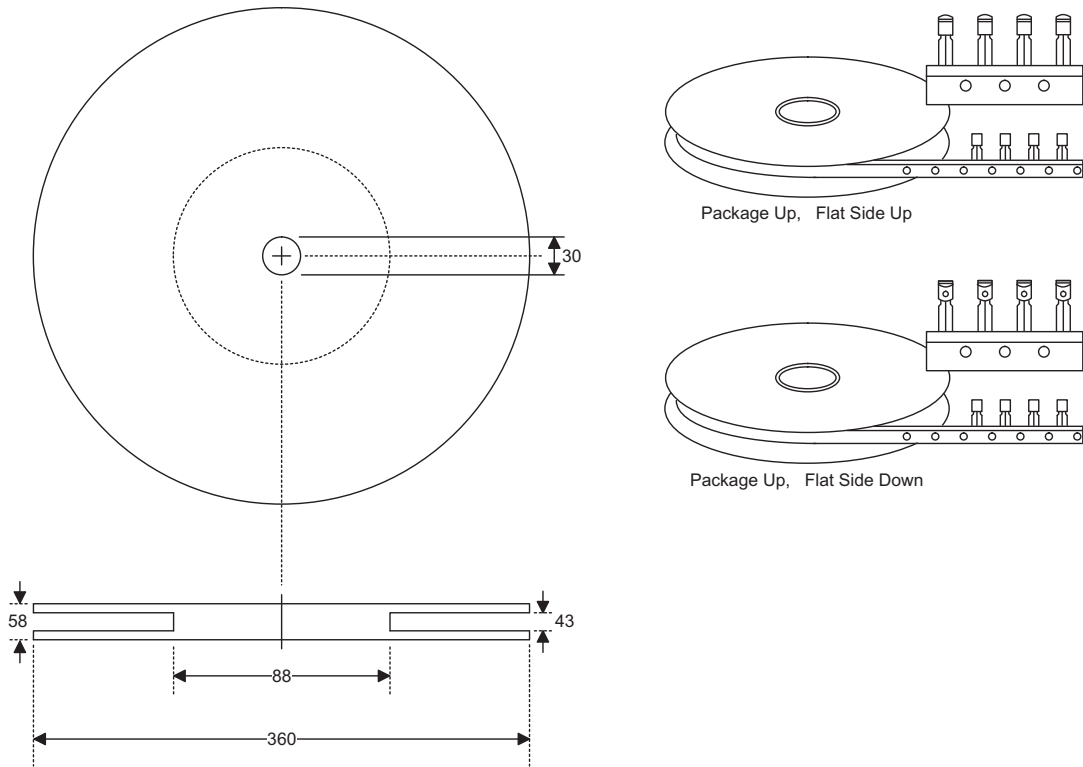


Symbol	Dimensions in inch		
	Min.	Nom.	Max.
A	0.039	—	0.051
A1	—	—	0.004
A2	0.028	—	0.035
b	0.014	—	0.020
C	0.004	—	0.010
D	0.106	—	0.122
E	0.055	—	0.071
e	—	0.075	—
H	0.102	—	0.118
L	0.015	—	—
$\theta$	0°	—	9°

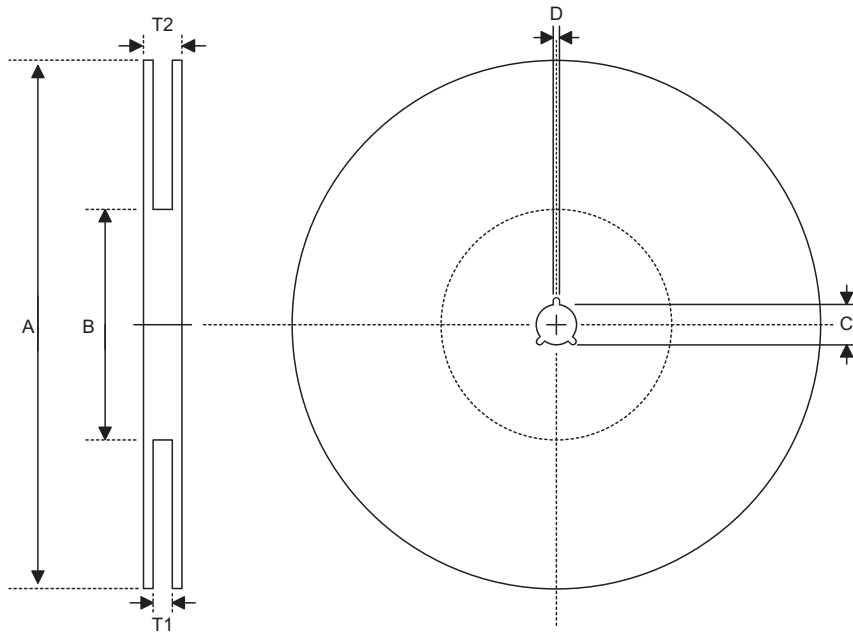
Symbol	Dimensions in mm		
	Min.	Nom.	Max.
A	1.00	—	1.30
A1	—	—	0.10
A2	0.70	—	0.90
b	0.35	—	0.50
C	0.10	—	0.25
D	2.70	—	3.10
E	1.40	—	1.80
e	—	1.90	—
H	2.60	—	3.0
L	0.37	—	—
$\theta$	0°	—	9°

**Product Tape and Reel Specifications**

TO92 Reel Dimensions (Unit: mm)



Reel Dimensions

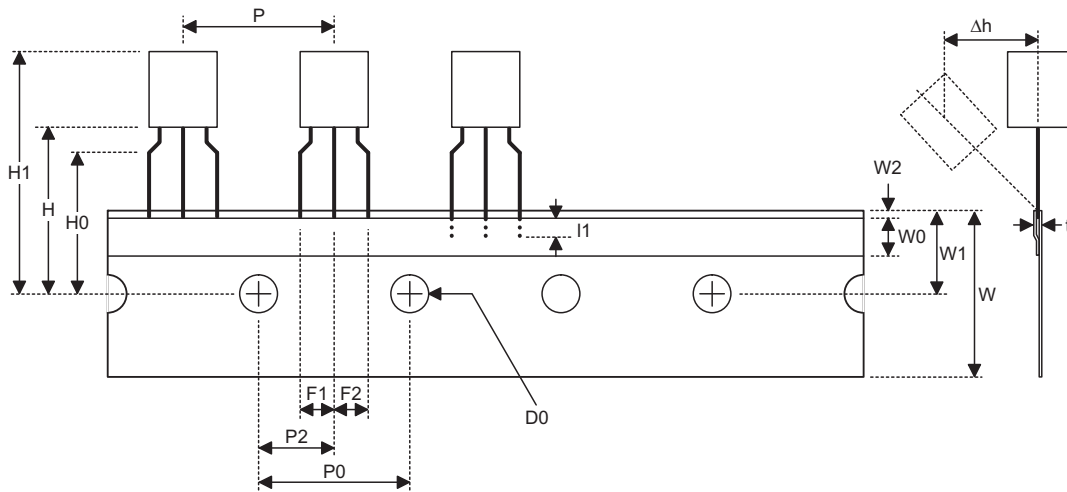


SOT89-3

Symbol	Description	Dimensions in mm
A	Reel Outer Diameter	180.0±1.0
B	Reel Inner Diameter	62.0±1.5
C	Spindle Hole Diameter	12.75 <sup>+0.15/-0.00</sup>
D	Key Slit Width	1.90±0.15
T1	Space Between Flange	12.4 <sup>+0.2/-0.0</sup>
T2	Reel Thickness	17.0 <sup>+0.0/-0.4</sup>

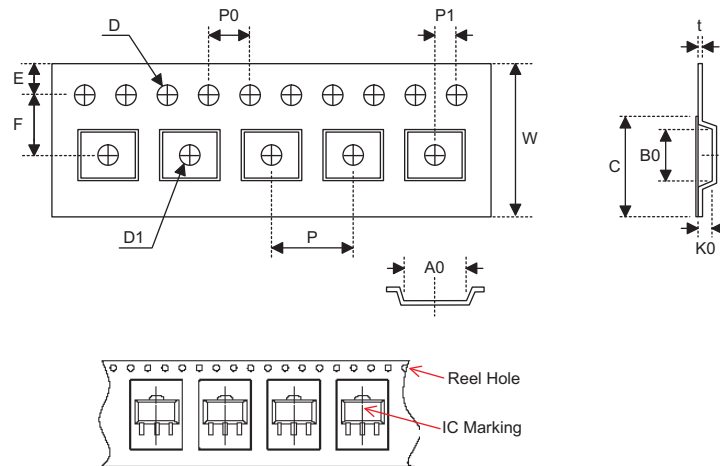
SOT23-5

Symbol	Description	Dimensions in mm
A	Reel Outer Diameter	178.0±1.0
B	Reel Inner Diameter	62.0±1.0
C	Spindle Hole Diameter	13.0±0.2
D	Key Slit Width	2.50±0.25
T1	Space Between Flange	8.4 <sup>+1.5/-0.0</sup>
T2	Reel Thickness	11.4 <sup>+1.5/-0.0</sup>

**Carrier Tape Dimensions**

**TO92**

Symbol	Description	Dimensions in mm
I1	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±0.40
F <sub>1</sub>	Lead Spread	2.5 <sup>+0.4/-0.1</sup>
F <sub>2</sub>	Lead Spread	2.5 <sup>+0.4/-0.1</sup>
Δh	Component Alignment	0.0±0.1
W	Carrier Tape Width	18.0 <sup>+1.0/-0.5</sup>
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

**Carrier Tape Dimensions**

**SOT89-3**

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	12.0 <sup>+0.3/-0.1</sup>
P	Cavity Pitch	8.0±0.1
E	Perforation Position	1.75±0.10
F	Cavity to Perforation (Width Direction)	5.50±0.05
D	Perforation Diameter	1.5 <sup>+0.1/-0.0</sup>
D1	Cavity Hole Diameter	1.5 <sup>+0.1/-0.0</sup>
P0	Perforation Pitch	4.0±0.1
P1	Cavity to Perforation (Length Direction)	2.0±0.1
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	0.300±0.013
C	Cover Tape Width	9.3±0.1

**SOT23-5**

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	8.0±0.3
P	Cavity Pitch	4.0±0.1
E	Perforation Position	1.75±0.10
F	Cavity to Perforation (Width Direction)	3.50±0.05
D	Perforation Diameter	1.5 <sup>+0.1/-0.0</sup>
D1	Cavity Hole Diameter	1.5 <sup>+0.1/-0.0</sup>
P0	Perforation Pitch	4.0±0.1
P1	Cavity to Perforation (Length Direction)	2.00±0.05
A0	Cavity Length	3.15±0.10
B0	Cavity Width	3.2±0.1
K0	Cavity Depth	1.4±0.1
t	Carrier Tape Thickness	0.20±0.03
C	Cover Tape Width	5.3±0.1

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