



HT10XX Voltage Regulator

Features

- Low power consumption
- Low voltage drop
- Low temperature coefficient

- Wide operating voltage (12V Max.)
- TO-92 and SOT-89 packages

Applications

- Battery-powered equipment
- Communication equipment

- Audio/Video equipment

General Description

The HT10XX series is a set of three-terminal low power voltage regulators implemented in CMOS technology. They are available with several fixed output voltages ranging from 1.5V~7.0V. CMOS technology ensures low voltage drop and low quiescent current.

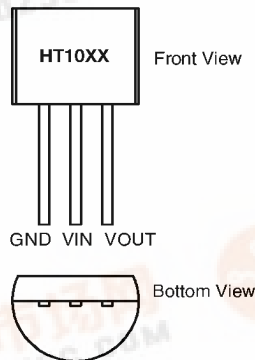
Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

Pin Assignment

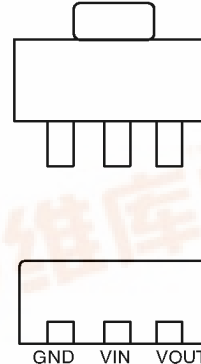
A. TO-92



B. TO-92

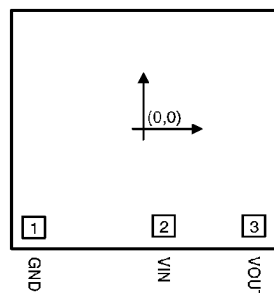


C. SOT-89



Pad Coordinates

Unit: μm

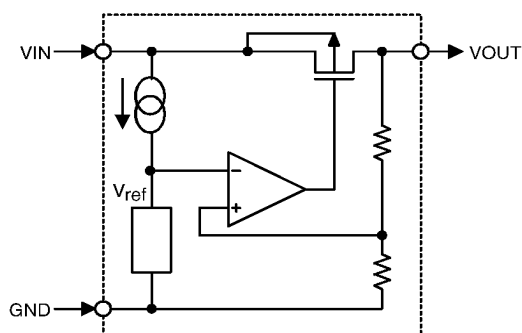


Pad No.	X	Y
1	-480.00	-451.50
2	87.50	-444.50
3	482.00	-444.50

Chip size: $1374 \times 1294 (\mu\text{m})^2$

*The IC substrate should be connected to VDD in the PCB layout artwork.

Block Diagram



Absolute Maximum Ratings*

Supply Voltage	-0.3V to 13V	Storage Temperature	-50°C to 125°C
Power Consumption	250mW	Operating Temperature	0°C to 70°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.

Selection Guide

Part No.	Pin Assignment	Output Voltage	Tolerance
HT1015 HT1016	B, C A	1.5V	±2.4%, ±5%
HT1030 HT1031	B, C A	3.0V	±2.4%, ±5%
HT1033 HT1034	B, C A	3.3V	±2.4%, ±5%
HT1036 HT1037	B, C A	3.6V	±2.4%, ±5%
HT1038 HT1039	B, C A	3.8V	±2.4%, ±5%
HT1044 HT1045	B, C A	4.4V	±2.4%, ±5%
HT1050 HT1051	B, C A	5.0V	±2.4%, ±5%
HT1070 HT1071	B, C A	7.0V	±2.4%, ±5%

Note: For semi-custom parts, selectable regulated voltage range is from 2.4V to 9V in 0.1V increment, if custom's first order is 100k pieces.

Electrical Characteristics

HT10XX series (HT1015, HT1016, +1.5V output type)

(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	3.5V	I _{OUT} =0.5mA	1.425	1.5	1.575	V
I _{OUT}	Output Current	3.5V	—	7.0	—	—	mA
ΔV _{OUT}	Load Regulation	3.5V	1mA≤I _{OUT} ≤7mA	—	80	—	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =0.5mA	—	300	—	mV
I _{SS}	Current Consumption	3.5V	No load	—	2.2	5.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	Line Regulation	—	2.5V≤V _{IN} ≤12V I _{OUT} =0.5mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	3.5V	I _{OUT} =0.5mA 0°C<T _a <70°C	—	±0.25	—	mV/°C

HT10XX series (HT1030, HT1031, +3.0V output type)

(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	5V	I _{OUT} =10mA	2.85	3.0	3.15	V
I _{OUT}	Output Current	5V	—	20	30	—	mA
ΔV _{OUT}	Load Regulation	5V	1mA≤I _{OUT} ≤20mA	—	60	100	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	60	—	mV
I _{SS}	Current Consumption	5V	No load	—	2.5	6.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	4V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5V	I _{OUT} =10mA 0°C<Ta<70°C	—	±0.45	—	mV/°C

HT10XX series (HT1033, HT1034, +3.3V output type)

(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	5.5V	I _{OUT} =10mA	3.135	3.3	3.465	V
I _{OUT}	Output Current	5.5V	—	20	30	—	mA
ΔV _{OUT}	Load Regulation	5.5V	1mA≤I _{OUT} ≤30mA	—	60	100	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	60	—	mV
I _{SS}	Current Consumption	5.5V	No load	—	2.5	6.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	4.5V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.5V	I _{OUT} =10mA 0°C<Ta<70°C	—	±0.5	—	mV/°C

HT10XX series (HT1036, HT1037, +3.6V output type)
(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	5.6V	I _{OUT} =10mA	3.42	3.6	3.78	V
I _{OUT}	Output Current	5.6V	—	20	30	—	mA
ΔV _{OUT}	Load Regulation	5.6V	1mA≤I _{OUT} ≤30mA	—	60	100	mV
V _{IDF}	Voltage Drop	—	I _{OUT} =1mA	—	60	—	mV
I _{SS}	Current Consumption	5.6V	No load	—	3.0	7.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	4.6V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.6V	I _{OUT} =10mA 0°C<Ta<70°C	—	±0.6	—	mV/°C

HT10XX series (HT1038, HT1039, +3.8V output type)
(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	5.8V	I _{OUT} =10mA	3.61	3.8	3.99	V
I _{OUT}	Output Current	5.8V	—	20	30	—	mA
ΔV _{OUT}	Load Regulation	5.8V	1mA≤I _{OUT} ≤30mA	—	60	150	mV
V _{IDF}	Voltage Drop	—	I _{OUT} =1mA	—	60	—	mV
I _{SS}	Current Consumption	5.8V	No load	—	3.0	8.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	4.8V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.8V	I _{OUT} =10mA 0°C<Ta<70°C	—	±0.7	—	mV/°C

HT10XX series (HT1044, HT1045, +4.4V output type)

(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	6.4V	I _{OUT} =10mA	4.18	4.4	4.62	V
I _{OUT}	Output Current	6.4V	—	20	30	—	mA
ΔV _{OUT}	Load Regulation	6.4V	1mA≤I _{OUT} ≤30mA	—	60	100	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	60	—	mV
I _{SS}	Current Consumption	6.4V	No load	—	3.0	7.5	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	5.4V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	6.4V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.7	—	mV/°C

HT10XX series (HT1050, HT1051, +5.0V output type)

(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	7V	I _{OUT} =10mA	4.75	5.0	5.25	V
I _{OUT}	Output Current	7V	—	20	30	—	mA
ΔV _{OUT}	Load Regulation	7V	1mA≤I _{OUT} ≤30mA	—	60	100	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	60	—	mV
I _{SS}	Current Consumption	7V	No load	—	3.5	9.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	6V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	7V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.75	—	mV/°C

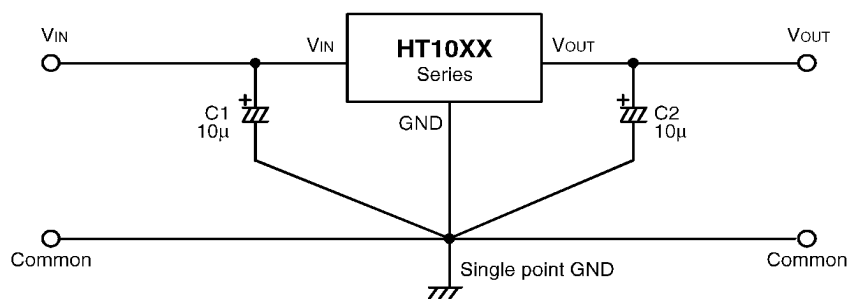
HT10XX series (HT1070, HT1071, +7.0V output type)

(Ta=25°C)

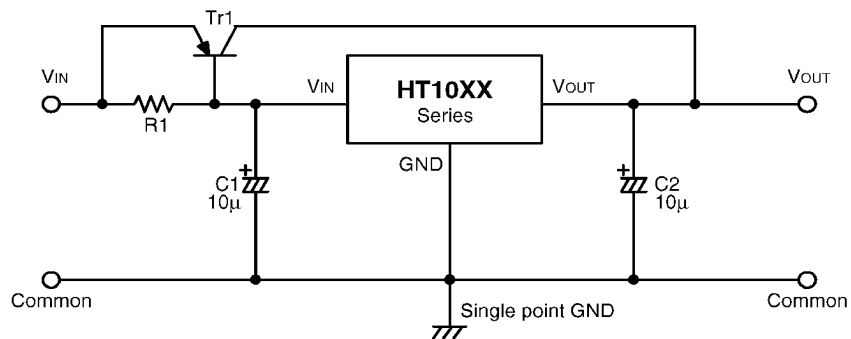
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	9V	I _{OUT} =10mA	6.65	7.0	7.35	V
I _{OUT}	Output Current	9V	—	20	30	—	mA
ΔV _{OUT}	Load Regulation	9V	1mA ≤ I _{OUT} ≤ 30mA	—	60	100	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	60	—	mV
I _{SS}	Current Consumption	9V	No load	—	5.0	12.5	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	8V ≤ V _{IN} ≤ 12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	9V	I _{OUT} =10mA 0°C < Ta < 70°C	—	±1.05	—	mV/°C

Application Circuit

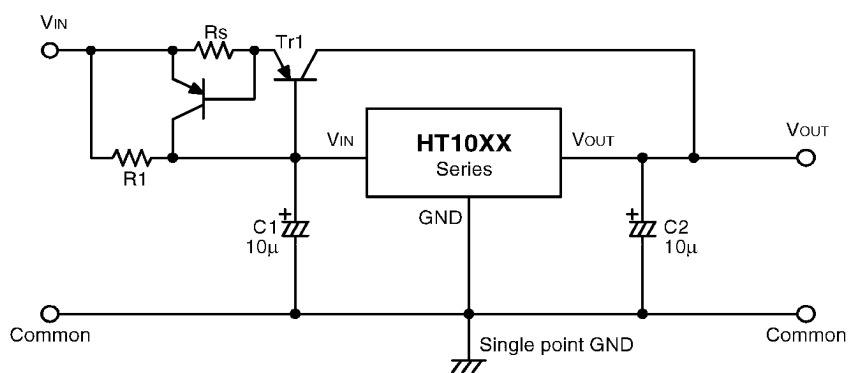
The basic circuits of the HT10XX series



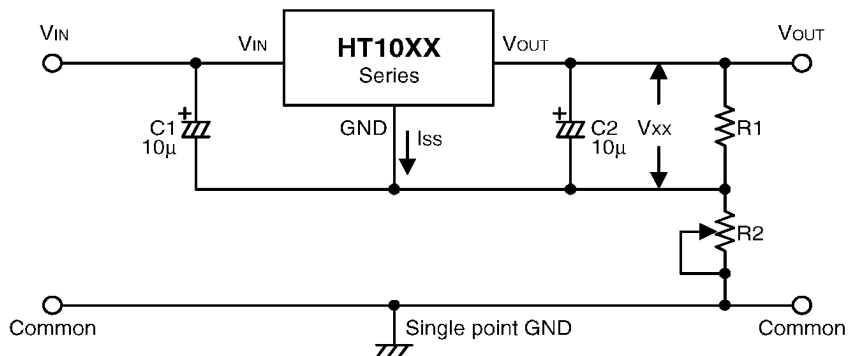
High output current positive voltage regulator



Short-Circuit protection for $Tr1$



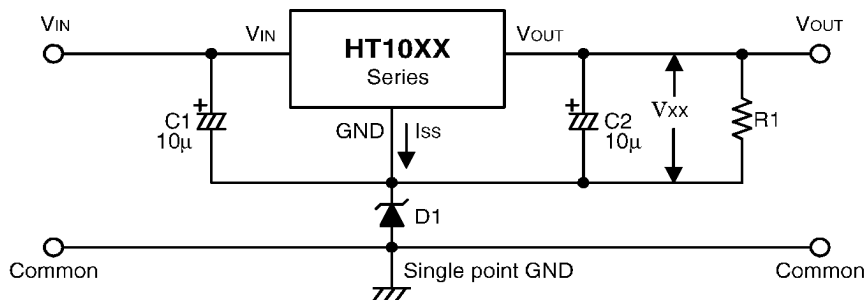
Circuit for increasing output voltage



$$V_{OUT} = V_{XX} \left(1 + \frac{R2}{R1} \right) + I_{SS} R2$$

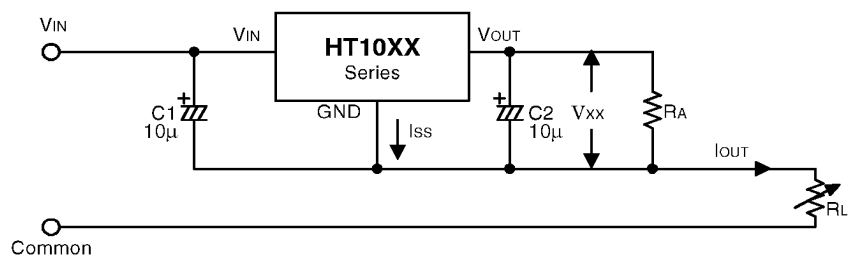
$$\approx V_{XX} \left(1 + \frac{R2}{R1} \right)$$

Circuit for increasing output voltage



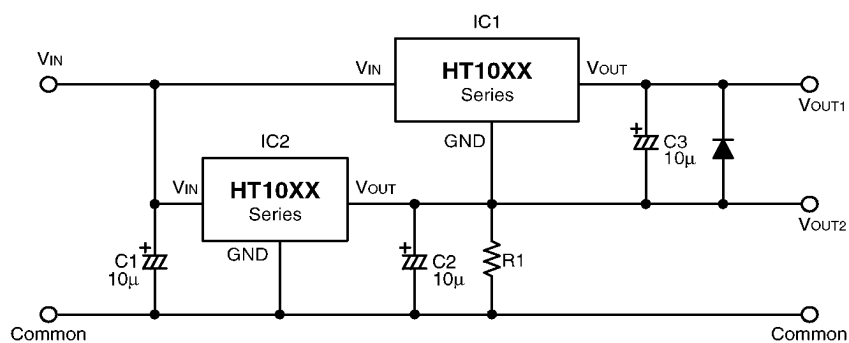
$$V_{OUT} = V_{XX} + V_{D1}$$

Constant current regulator



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

Dual supply

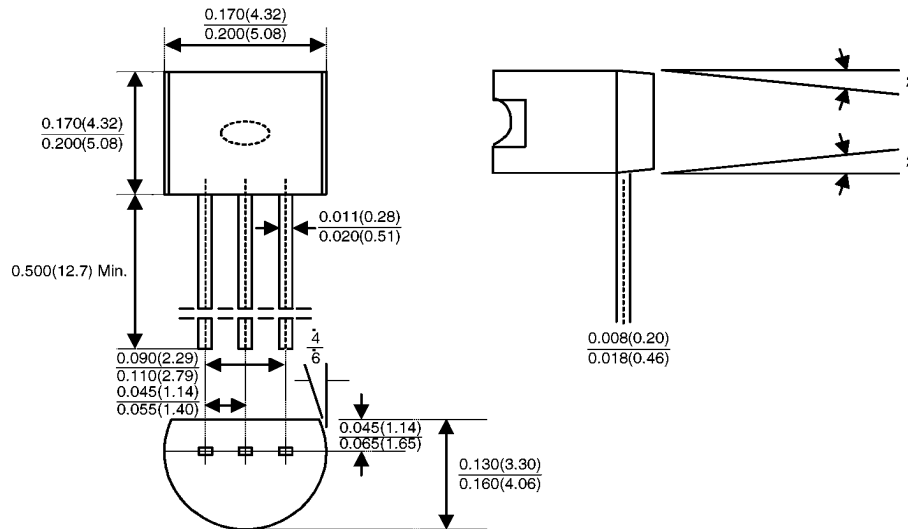


Package Outlines

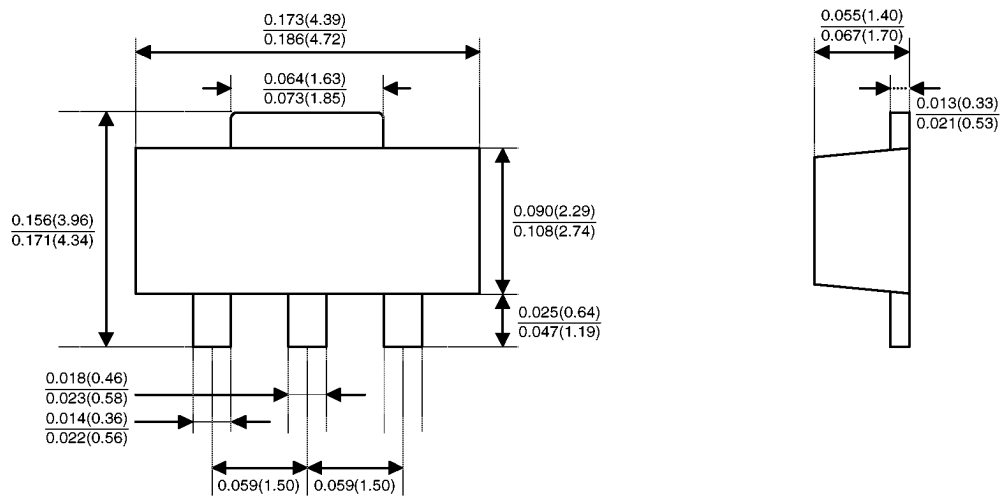
Dimension

All linear dimensions are in inches and parenthetically in millimeters ($\frac{\text{Min.}}{\text{Max.}}$)

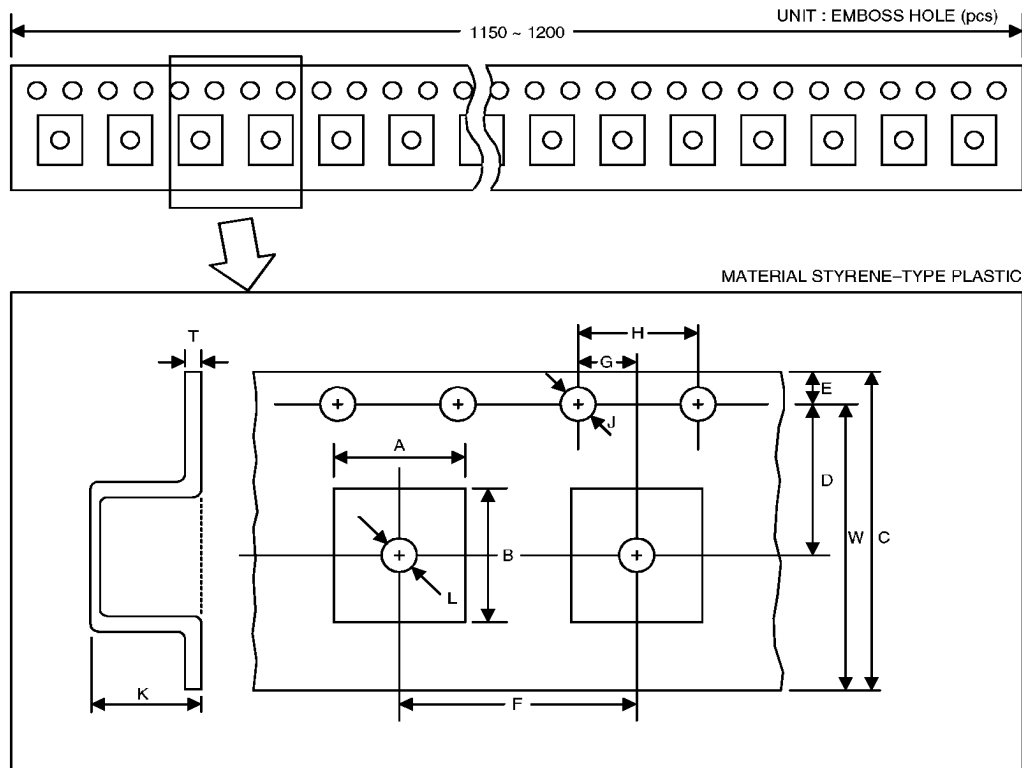
3-pin TO-92 package



SOT-89 package



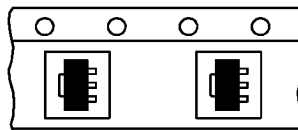
Tape form and dimensions



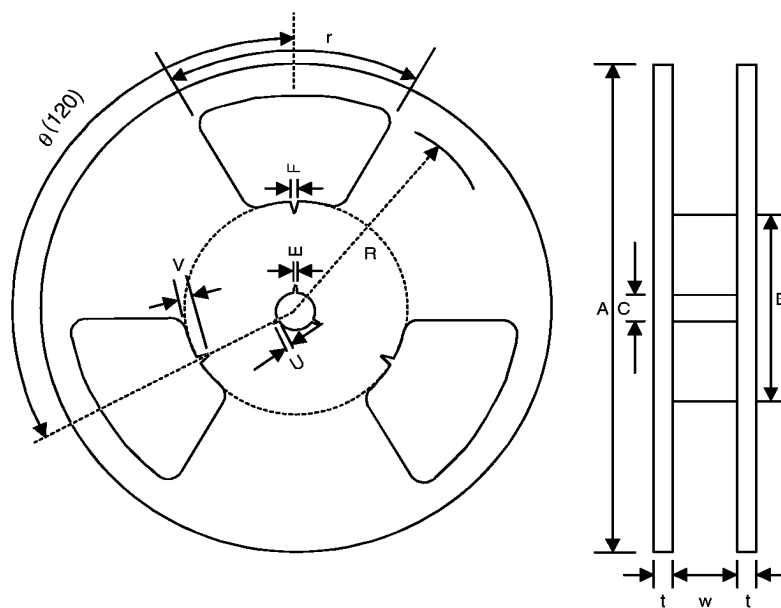
Dimensions

SYMBOL	A	B	C	D	E	F	G	H	J	K	W	T	L
VALUE	5.0	4.6	12	5.65	1.5	8.0	2.0	4.0	φ1.5	1.7	10.5	0.3	φ1.6
TOLERANCE	±0.1	±0.1	±0.2	±0.05	±0.1	±0.1	±0.05	±0.1	±0.1	±0.1	±0.1	±0.05	±0.1

* Total 10 Pitch tolerance ± 2mm

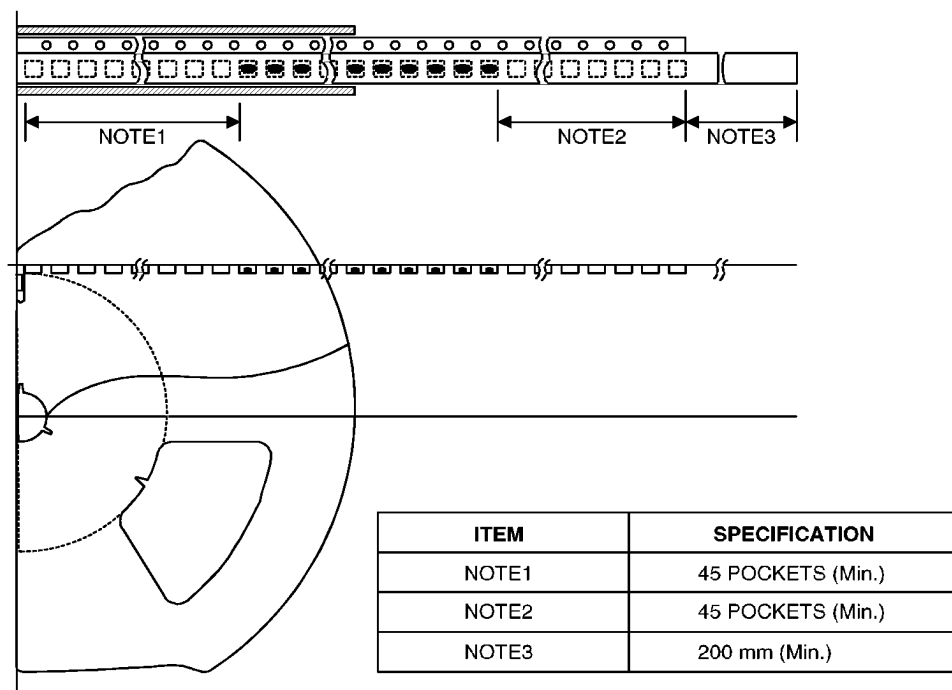


Reel form and dimensions



A	B	C	E	F	U	V	R	r	w	t
ϕ 178 ± 2	ϕ 80 ± 1	ϕ 13 ± 0.5	20 ± 0.5	1.5 ± 0.5	4 ± 0.5	6 ± 1	70 ± 1	40°	14 ± 1.5	2 ± 0.1

Leader and trailer portion



Taped parts quantity

1000 Pcs/1 reel (-0/+10Pcs)

Mechanical data

ITEM	DATA	REMARK
Cover tape	30 ~ 60g	Carrier tape and cover tape open angle 0 ~ 5°
Adhesion		F=120±5mm/minute

