

**Features**

- Low power consumption
- Low voltage dropout
- Low temperature coefficient
- Wide operating voltage (12V Max.)
- TO-92 & SOT-89 packages

**Applications**

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

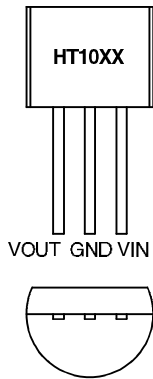
**General Description**

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. The advantage of CMOS technology is low voltage drop-out and low quiescent current.

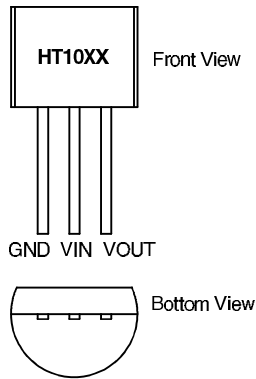
Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

**Pin Assignment**

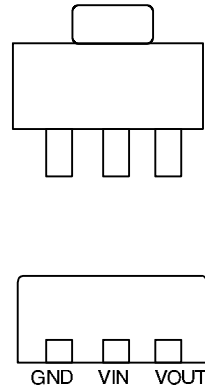
A. TO-92



B. TO-92

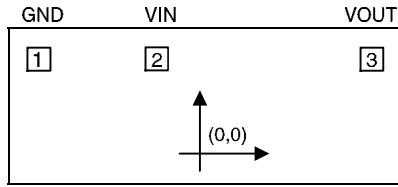


C. SOT-89



**Pad Assignment**

Unit: mil

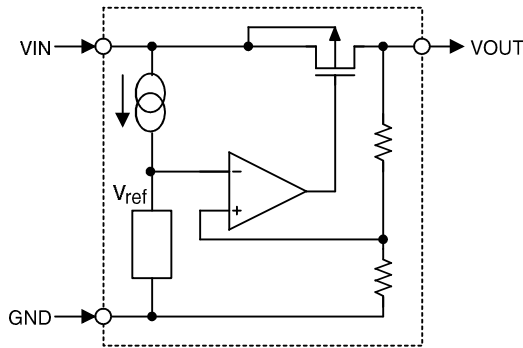


Pad No.	X	Y
1	-28.2	16.6
2	-7.55	16.7
3	-30.1	16.6

Chip size:  $76 \times 50 \text{ (mil)}^2$

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

**Block Diagram**



**Absolute Maximum Ratings**

Supply Voltage ..... -0.3V to 13V  
 Power Dissipation.....250mW

Storage Temperature..... -50°C to 125°C  
 Operating Temperature..... 0°C to 70°C

**Selection Guide**

Item	Pin Assignment	Output Voltage	Tolerance
HT1015 HT1016	B A	1.5V	±2.4%, ±5%
HT1030 HT1031	B A	3.0V	±2.4%, ±5%
HT1033 HT1034	B A	3.3V	±2.4%, ±5%
HT1036 HT1037	B A	3.6V	±2.4%, ±5%
HT1044 HT1045	B A	4.4V	±2.4%, ±5%
HT1050 HT1051	B A	5.0V	±2.4%, ±5%
HT1070 HT1071	B A	7.0V	±2.4%, ±5%

**Electrical Characteristics**

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

(Ta=25°C)

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

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

(Ta=25°C)

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

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

(Ta=25°C)

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Condition				
V <sub>OUT</sub>	Output Voltage Tolerance	5.5V	I <sub>OUT</sub> =10mA	3.135	3.3	3.465	V
I <sub>OUT</sub>	Output Current	5.5V	—	20	30	—	mA
ΔV <sub>OUT</sub>	Load Regulation	5.5V	1mA ≤ I <sub>OUT</sub> ≤ 30mA	—	60	100	mV
V <sub>DIF</sub>	Voltage Dropout	—	I <sub>OUT</sub> =1mA	—	60	—	mV
I <sub>SS</sub>	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 <sub>IN</sub> ≤ 12V I <sub>OUT</sub> =1mA	—	0.2	—	%/V
V <sub>IN</sub>	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.5V	I <sub>OUT</sub> =10mA 0°C < Ta < 70°C	—	±0.5	—	mV/°C

**HT10XX series (HT1036, HT1037, +3.6V output type)**

(Ta=25°C)

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Condition				
V <sub>OUT</sub>	Output Voltage Tolerance	5.6V	I <sub>OUT</sub> =10mA	3.42	3.6	3.78	V
I <sub>OUT</sub>	Output Current	5.6V	—	20	30	—	mA
ΔV <sub>OUT</sub>	Load Regulation	5.6V	1mA≤I <sub>OUT</sub> ≤30mA	—	60	100	mV
V <sub>DIF</sub>	Voltage Dropout	—	I <sub>OUT</sub> =1mA	—	60	—	mV
I <sub>SS</sub>	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 <sub>IN</sub> ≤12V I <sub>OUT</sub> =1mA	—	0.2	—	%/V
V <sub>IN</sub>	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.6V	I <sub>OUT</sub> =10mA 0°C<Ta<70°C	—	±0.6	—	mV/°C

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

(Ta=25°C)

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Condition				
V <sub>OUT</sub>	Output Voltage Tolerance	6.4V	I <sub>OUT</sub> =10mA	4.18	4.4	4.62	V
I <sub>OUT</sub>	Output Current	6.4V	—	20	30	—	mA
ΔV <sub>OUT</sub>	Load Regulation	6.4V	1mA≤I <sub>OUT</sub> ≤30mA	—	60	100	mV
V <sub>DIF</sub>	Voltage Dropout	—	I <sub>OUT</sub> =1mA	—	60	—	mV
I <sub>SS</sub>	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 <sub>IN</sub> ≤12V I <sub>OUT</sub> =1mA	—	0.2	—	%/V
V <sub>IN</sub>	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	6.4V	I <sub>OUT</sub> =10mA 0°C<Ta<70°C	—	±0.7	—	mV/°C

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

(Ta=25°C)

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

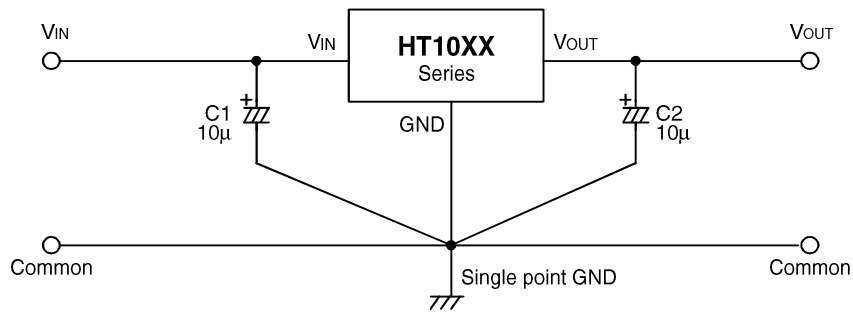
**HT10XX series (HT1070, HT1071, +7.0V output type)**

(Ta=25°C)

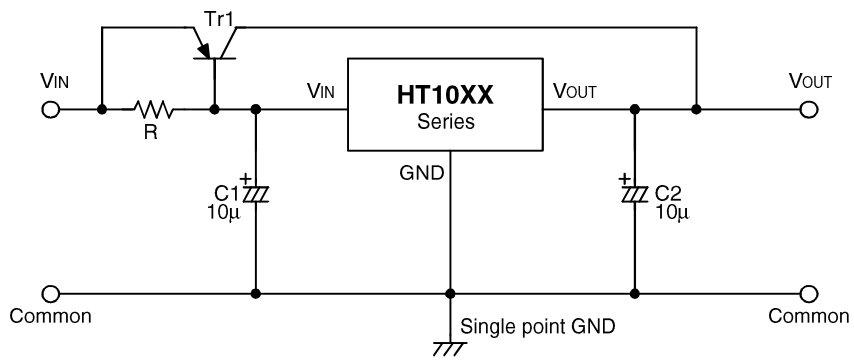
Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Condition				
V <sub>OUT</sub>	Output Voltage Tolerance	9V	I <sub>OUT</sub> =10mA	6.65	7.0	7.35	V
I <sub>OUT</sub>	Output Current	9V	—	20	30	—	mA
ΔV <sub>OUT</sub>	Load Regulation	9V	1mA ≤ I <sub>OUT</sub> ≤ 30mA	—	60	100	mV
V <sub>DIF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

### Application Circuit

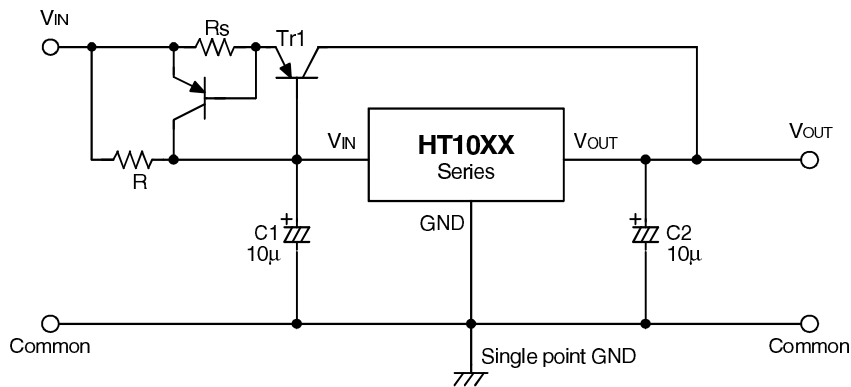
The basic circuits using the HT10XX series



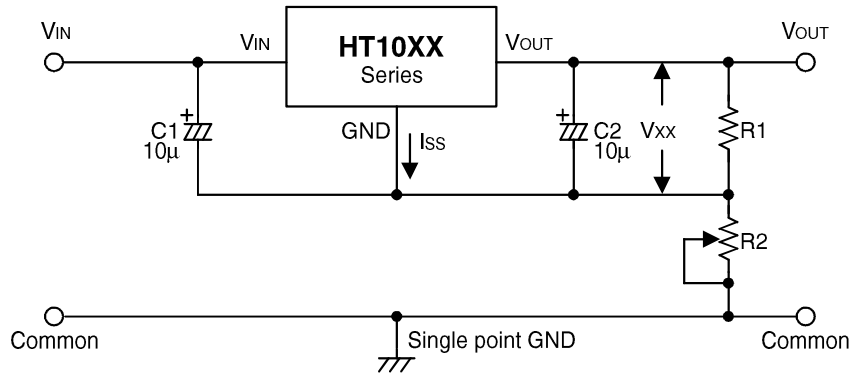
### High output current positive voltage regulator



### Short-Circuit protection for $Tr1$



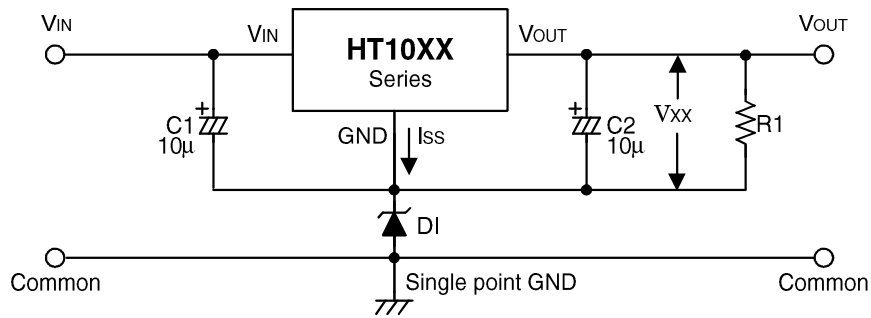
Circuit for increasing output voltage



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

$$\approx V_{XX} \left( 1 + \frac{R_2}{R_1} \right)$$

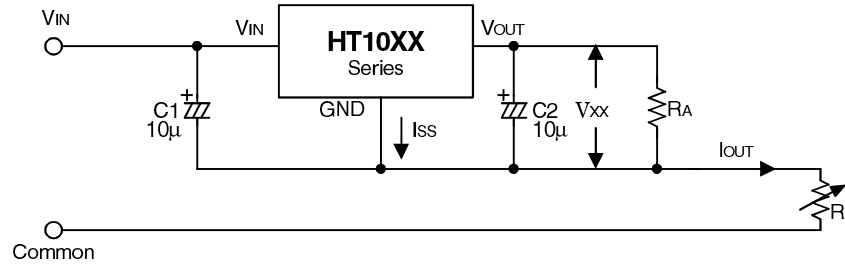
Circuit for increasing output voltage



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

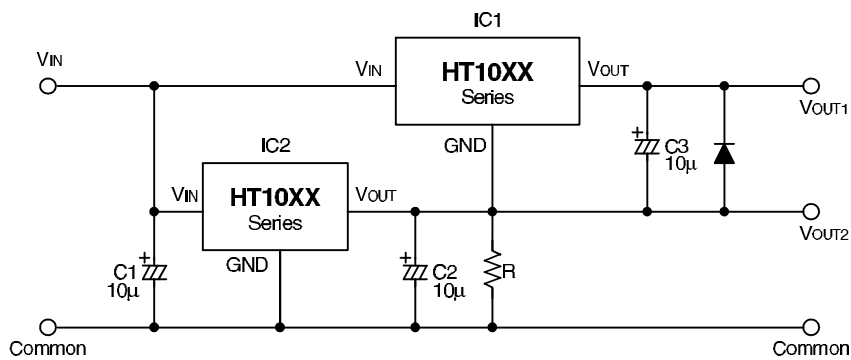


Constant current regulator



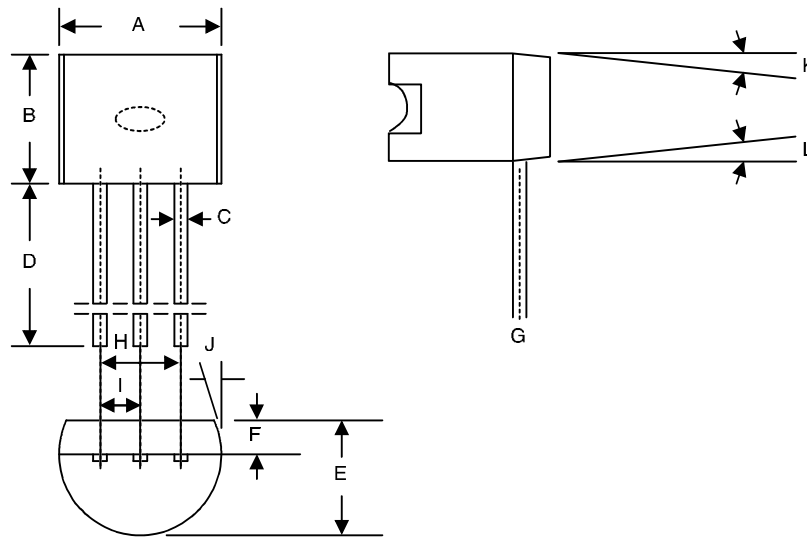
$$I_{OUT} = \frac{V_{XX}}{R_A} + I_{SS}$$

Dual supply



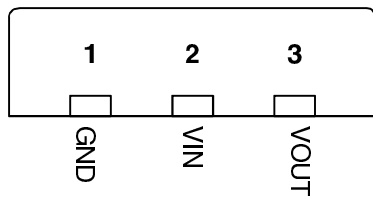
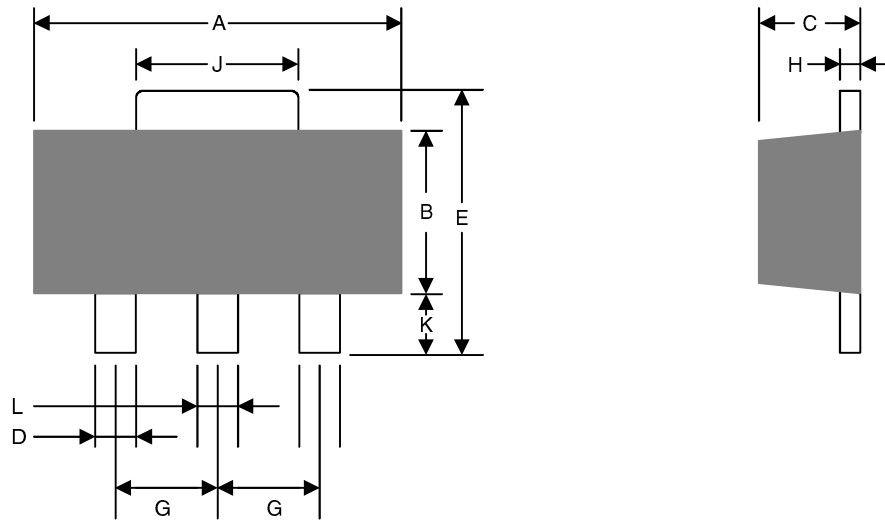
**Package Information**

TO-92



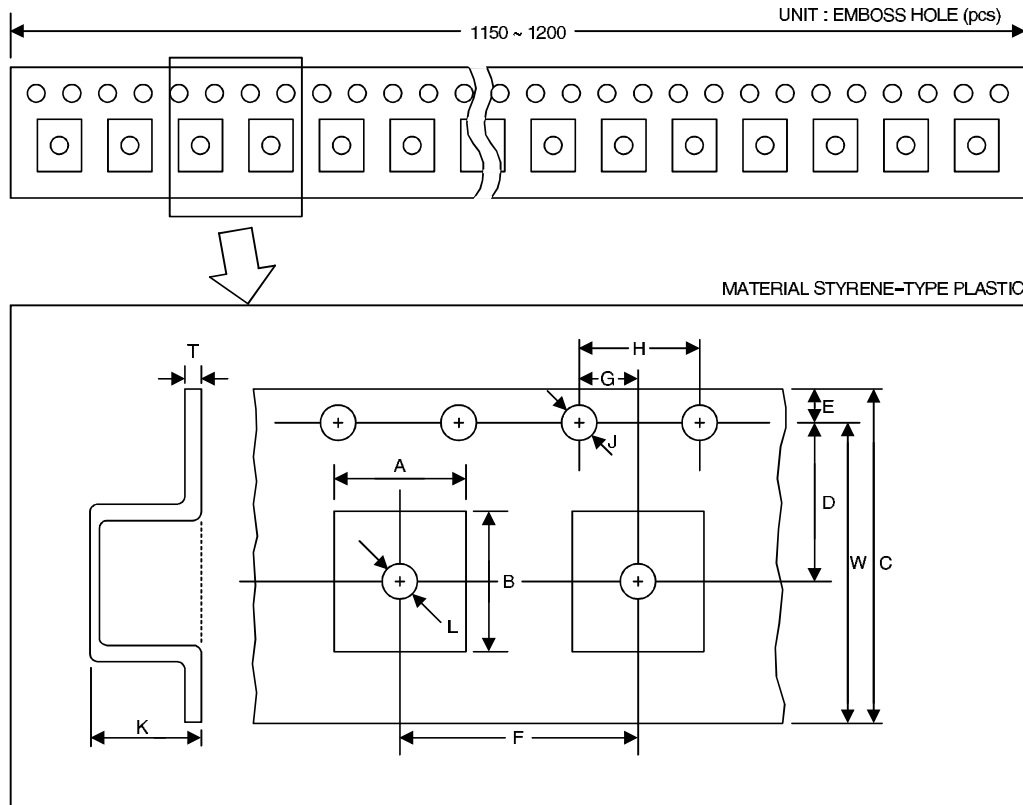
	mm	inches	degree		mm	inches	degree
A	4.57	0.180	—	I	1.27	0.050	—
B	4.57	0.180	—	J	—	—	5
C	0.38	0.015	—	K	—	—	2
D	13.5	0.531	—	L	—	—	2
E	3.66	0.140	—				
F	1.27	0.050					
G	0.39	0.011					
H	2.54	0.100					

SOT-89 outline



	mm	inches		mm	inches
A	4.60	0.18	I		
B	2.60	0.102	J	1.70	0.669
C	1.60	0.063	K	0.80	0.031
D	0.48	0.019	L	0.53	0.021
E	4.20	0.165			
F					
G	1.50	0.059			
H	0.45	0.018			

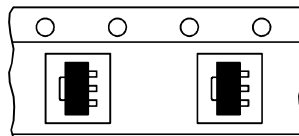
Type form and dimensions



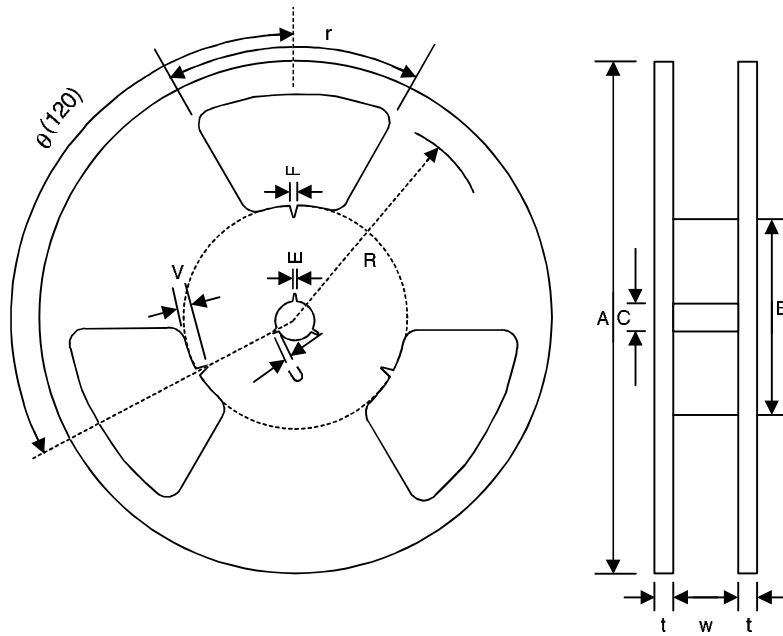
Dimensions

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

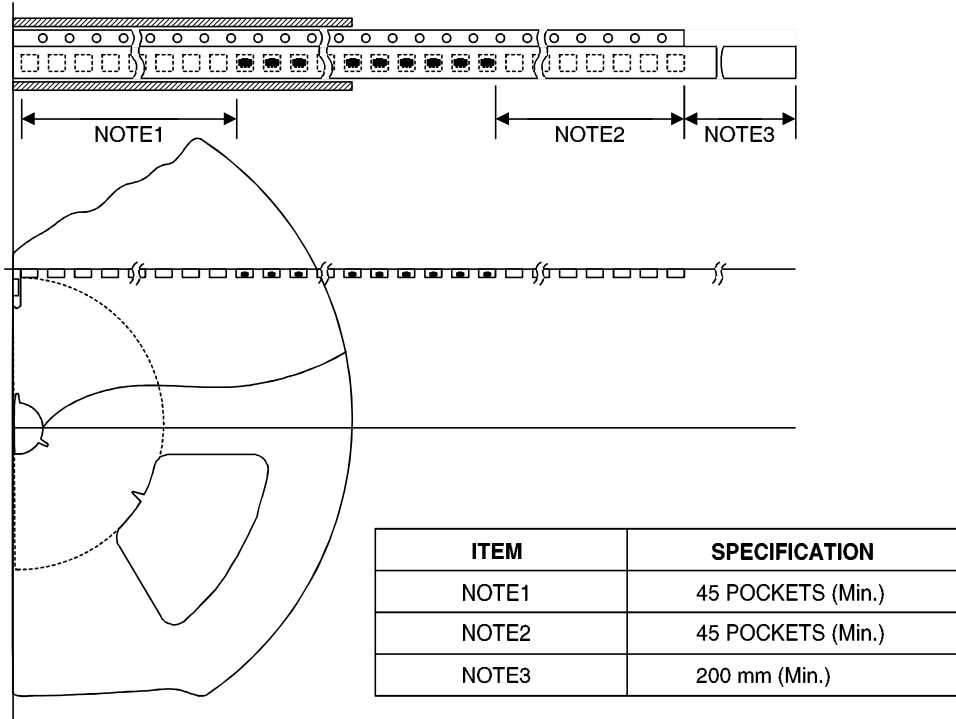


Reel form and dimensions



A	B	C	E	F	U	V	R	r	w	t
$\phi$ 178±2	$\phi$ 80±1	$\phi$ 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

