HT10XX
Voltage Regulator

Features

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

Applications

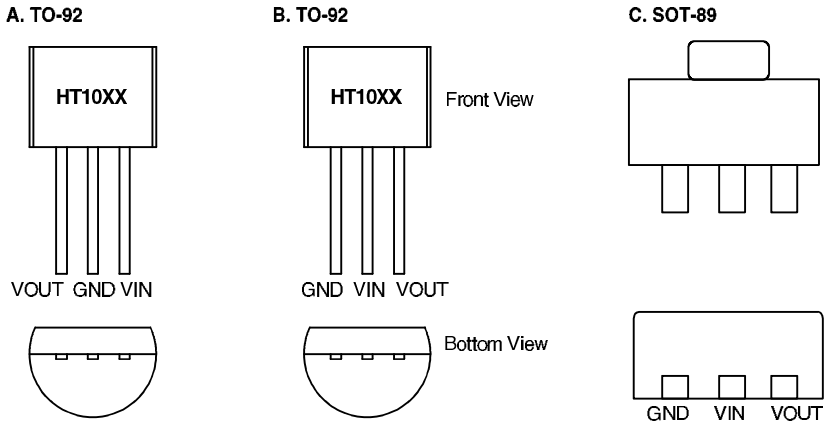
- Battery-powered equipment
- Communication equipment
- Audio/Video equipment

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 dropout and low quiescent current.

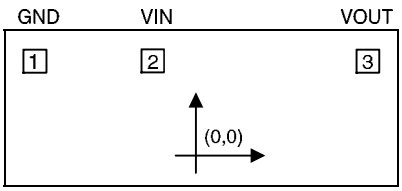
Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

Pin Assignment



Pad Assignment

Unit:mil

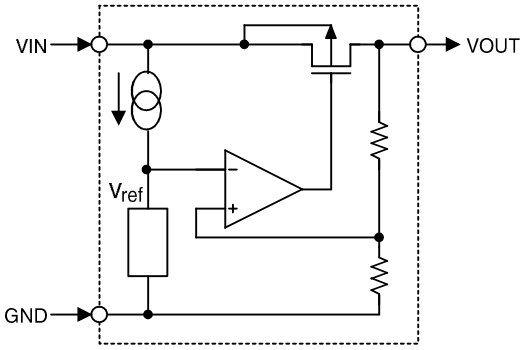


Pad No.	X	Y
1	–28.2	16.6
2	–7.55	16.7
3	–30.1	16.6

Chip size: 76×50 $(mil)^2$

*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_{IN}	Condition				
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 Dropout	—	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<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_{IN}	Condition				
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 Dropout	—	I_{OUT}=1mA	—	60	—	mV
I_{SS}	Current Consumption	5V	No load	—	2.5	6.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	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 Condition		Min.	Typ.	Max.	Unit
		V_{IN}	Condition				
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 Dropout	—	I_{OUT}=1mA	—	60	—	mV
I_{SS}	Current Consumption	5.5V	No load	—	2.5	6.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	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 Condition		Min.	Typ.	Max.	Unit
		V_{IN}	Condition				
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 Dropout	—	I_{OUT}=1mA	—	60	—	mV
I_{SS}	Current Consumption	5.6V	No load	—	3.0	7.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	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 (HT1044, HT1045, +4.4V output type) (Ta=25°C)

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V_{IN}	Condition				
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 Dropout	—	I_{OUT}=1mA	—	60	—	mV
I_{SS}	Current Consumption	6.4V	No load	—	3.0	7.5	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	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<Ta<70°C	—	±0.7	—	mV/°C

HT10XX series (HT1050, HT1051, +5.0V output type) (Ta=25°C)

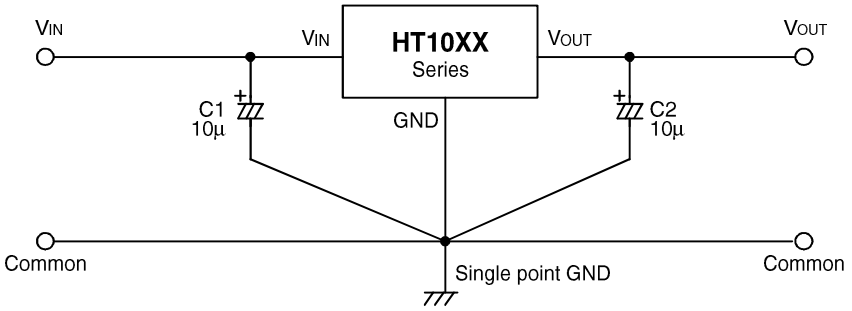
Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V_{IN}	Condition				
V_{OUT}	Output Voltage Tolerance	7V	I_{OUT}=10mA	4.75	5.0	5.25	V
I_{OUT}	Output Current	7V	—	20	30	—	mA
ΔV_{OUT}	Load Regulation	7V	1mA≤I_{OUT}≤30mA	—	60	100	mV
V_{DIF}	Voltage Dropout	—	I_{OUT}=1mA	—	60	—	mV
I_{SS}	Current Consumption	7V	No load	—	3.5	9.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	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<Ta<70°C	—	±0.75	—	mV/°C

HT10XX series (HT1070, HT1071, +7.0V output type) (Ta=25°C)

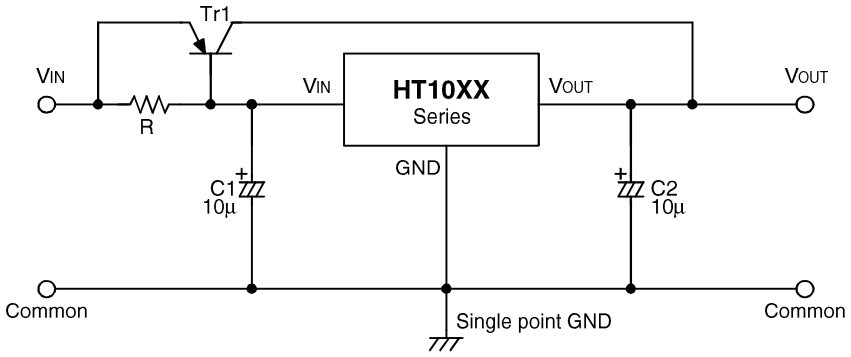
Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V_{IN}	Condition				
V_{OUT}	Output Voltage Tolerance	9V	I_{OUT}=10mA	6.65	7.0	7.35	V
I_{OUT}	Output Current	9V	—	20	30	—	mA
ΔV_{OUT}	Load Regulation	9V	1mA≤I_{OUT}≤30mA	—	60	100	mV
V_{DIF}	Voltage Dropout	—	I_{OUT}=1mA	—	60	—	mV
I_{SS}	Current Consumption	9V	No load	—	5.0	12.5	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	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

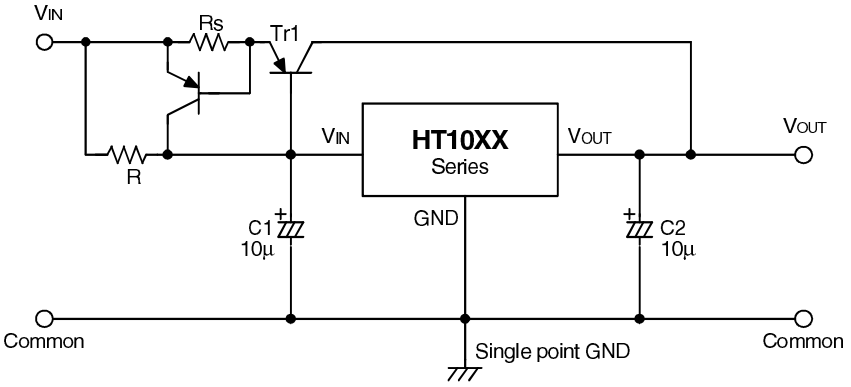
The basic circuits using the HT10XX series



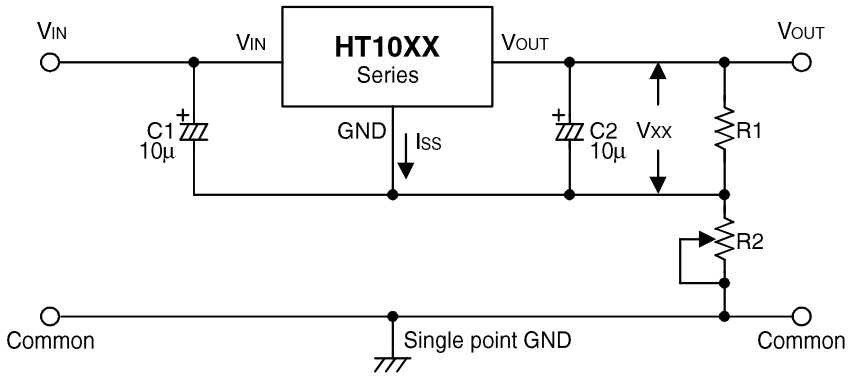
High output current positive voltage regulator



Short-Circuit protection for Tr1



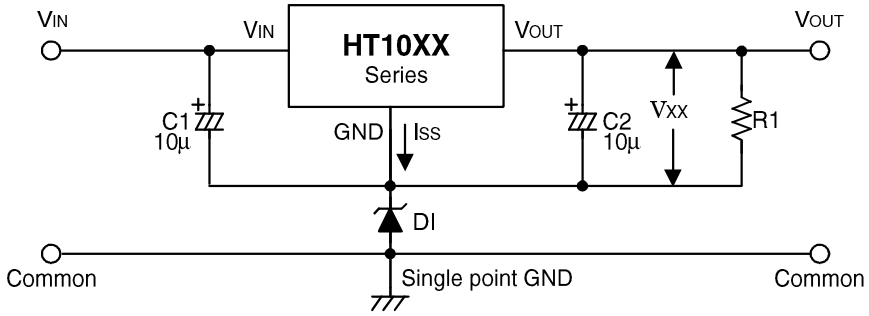
Circuit for increasing output voltage



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

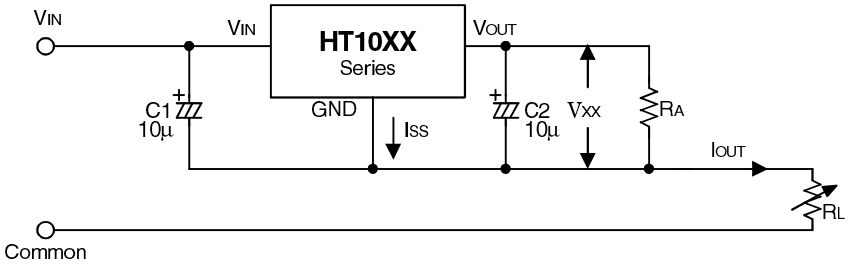
$$\approx V_{XX} \left(1 + \frac{R2}{R1}\right)$$

Circuit for increasing output voltage



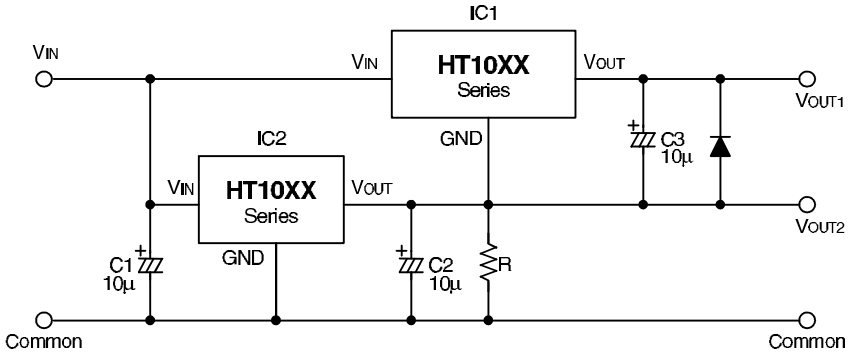
$$V_{OUT} = V_{XX} + V_{DI}$$

Constant current regulator



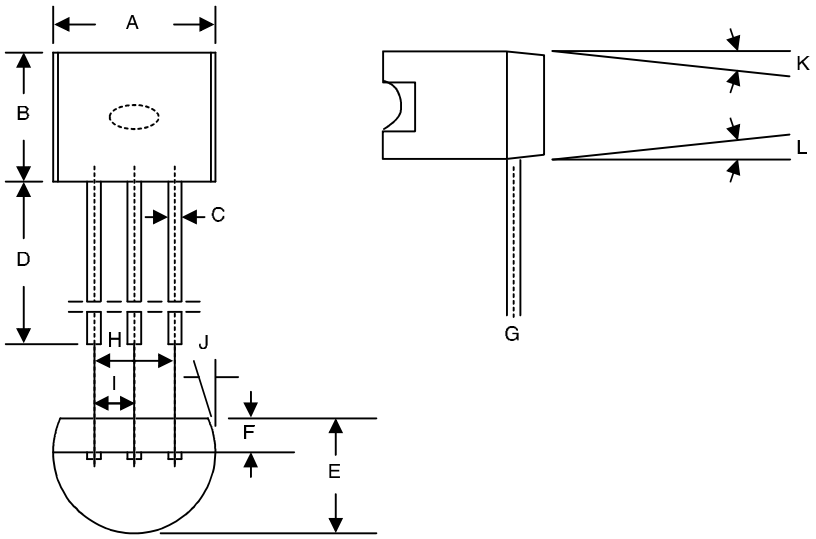
$$I_{OUT} = \frac{V_{XX}}{R_A} + I_{SS}$$

Dual supply



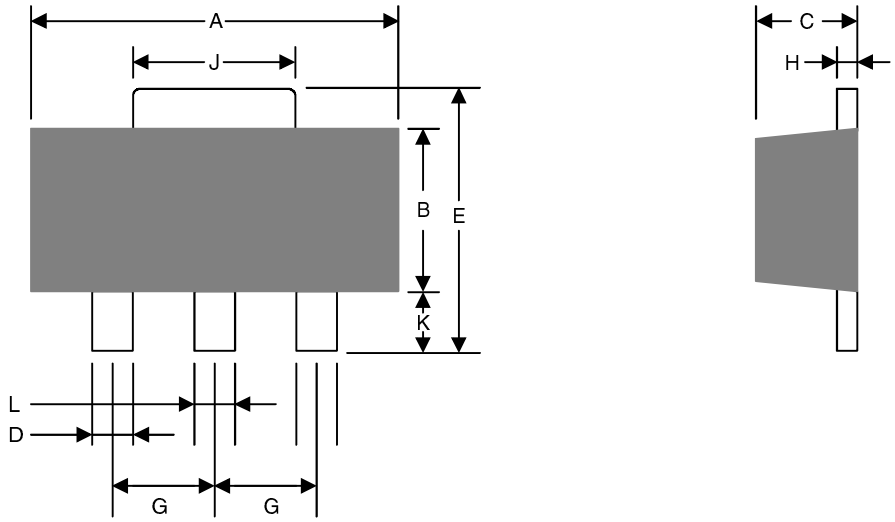
Package Information

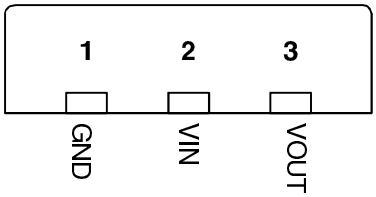
TO-92



	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					

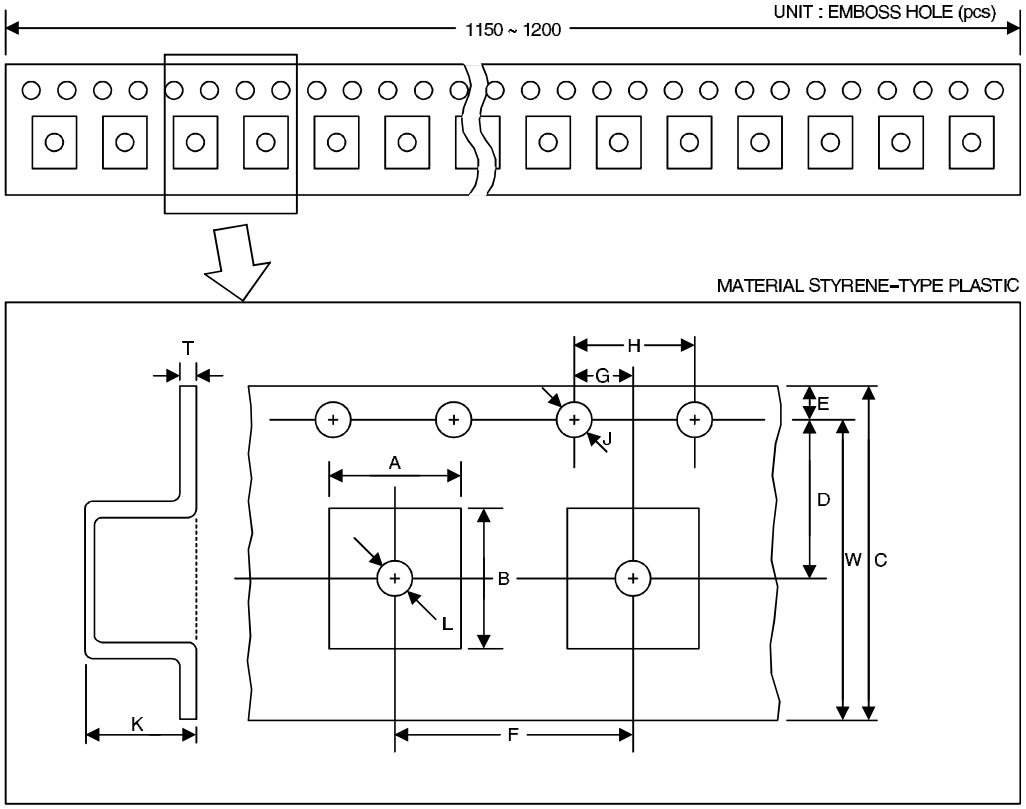
SOT–89 outline





	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			

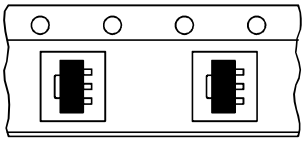
Type form and dimensions



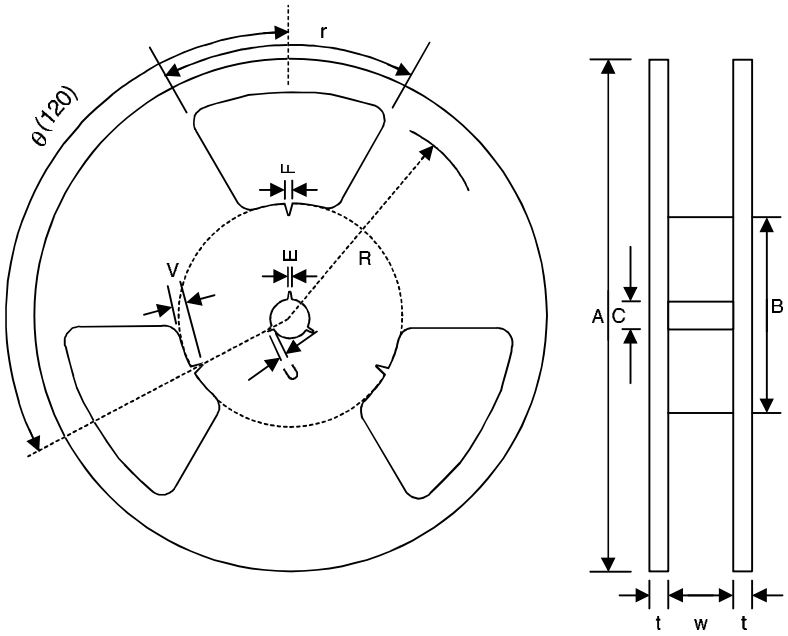
Dimensions

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

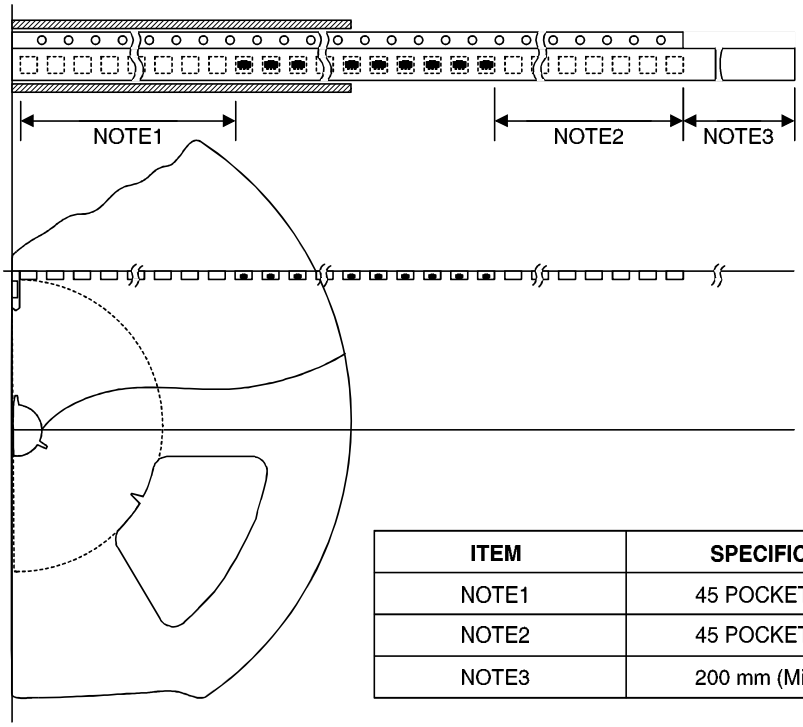


Reel form and dimensions



A	B	C	E	F	U	V	R	r	w	t
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



ITEM	SPECIFICATION
NOTE1	45 POCKETS (Min.)
NOTE2	45 POCKETS (Min.)
NOTE3	200 mm (Min.)

Taped parts quantity

1000 Pcs/1 reel (–0/+10PCS)
Mechanical data

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