

Features

- Low power consumption
- Low voltage drop
- Low temperature coefficient
- High input voltage (up to 24V)
- TO-92 and SOT-89 packages

Applications

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

General Description

The HT71XX series is a set of three-terminal low power high voltage regulators implemented in CMOS technology. They allow input voltages as high as 24V. They are available with several fixed output voltages ranging from 1.5V to 15V. CMOS technology ensures low voltage drop and low quiescent current.

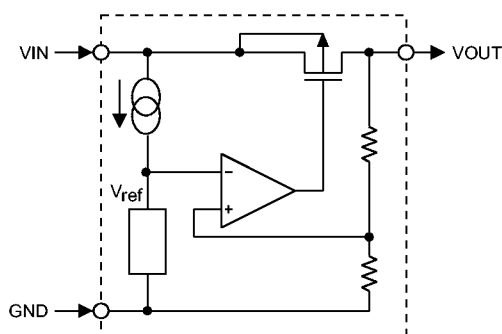
Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

Selection Table

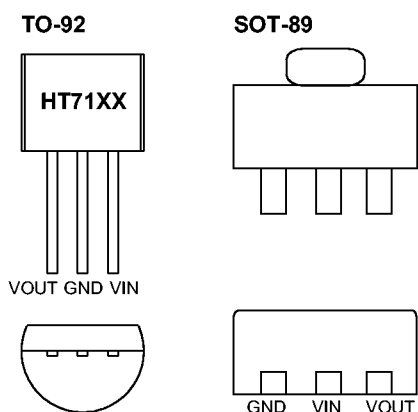
Part No.	Output Voltage	Tolerance
HT7130	3.0V	±5%
HT7133	3.3V	±5%
HT7136	3.6V	±5%
HT7145	4.5V	±5%
HT7150	5.0V	±5%
HT7170	7.0V	±5%
HT7190	9.0V	±5%
HT71C0	12V	±5%

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.

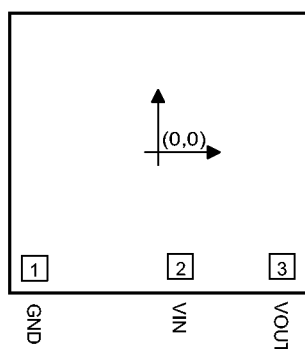
Block Diagram



Pin Assignment



Pad Assignment



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.

Absolute Maximum Ratings

Supply Voltage	-0.3V to 28V	Storage Temperature	-50°C to 125°C
Power Consumption	200mW	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.

Electrical Characteristics

HT71XX series (HT7130, +3.0V output type)
T_a=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage	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	—	100	—	mV
I _{SS}	Current Consumption	5V	No load	—	4	6.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	4V≤V _{IN} ≤24V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	24	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.45	—	mV/°C

HT71XX series (HT7133, +3.3V output type)
T_a=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage	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	—	100	—	mV
I _{SS}	Current Consumption	5.5V	No load	—	4	6	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	—	4.5V≤V _{IN} ≤24V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	24	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.5V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.5	—	mV/°C

HT71XX series (HT7136, +3.6V output type)
Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage	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 _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	60	—	mV
I _{SS}	Current Consumption	5.6V	No load	—	3.0	7.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	Line Regulation	—	4.6V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	24	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.6V	I _{OUT} =10mA 0°C<Ta<70°C	—	±0.6	—	mV/°C

HT71XX series (HT7145, +4.5V output type)
Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage	6.4V	I _{OUT} =10mA	4.27	4.4	4.72	V
I _{OUT}	Output Current	6.4V	—	20	30	—	mA
ΔV _{OUT}	Load Regulation	6.4V	1mA≤I _{OUT} ≤30mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	6.4V	No load	—	4	7.5	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	Line Regulation	—	5.4V≤V _{IN} ≤24V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	24	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	6.4V	I _{OUT} =10mA 0°C<Ta<70°C	—	±0.7	—	mV/°C

HT71XX series (HT7150, +5.0V output type)
Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage	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	—	100	—	mV
I _{SS}	Current Consumption	7V	No load	—	5	9	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	Line Regulation	—	6V≤V _{IN} ≤24V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	24	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	7V	I _{OUT} =10mA 0°C<Ta<70°C	—	±0.75	—	mV/°C

HT71XX series (HT7170, +7.0V output type)
Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage	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	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	9V	No load	—	7	12.5	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	Line Regulation	—	8V≤V _{IN} ≤24V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	24	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	9V	I _{OUT} =10mA 0°C<Ta<70°C	—	±1.05	—	mV/°C

HT71XX series (HT7190, +9V output type)
T_a=25°C

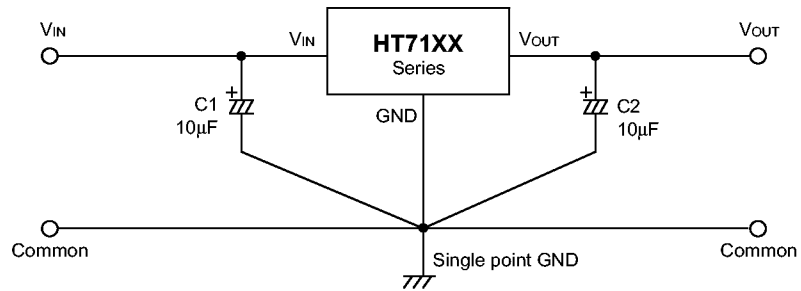
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage	12V	I _{OUT} =10mA	8.55	9	9.45	V
I _{OUT}	Output Current	12V	—	30	40	—	mA
ΔV _{OUT}	Load Regulation	12V	1mA≤I _{OUT} ≤30mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	12V	No load	—	9	14	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	Line Regulation	—	10V≤V _{IN} ≤24V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	24	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	12V	I _{OUT} =10mA 0°C<T _a <70°C	—	±1.35	—	mV/°C

HT71XX series (HT71C0, +12V output type)
T_a=25°C

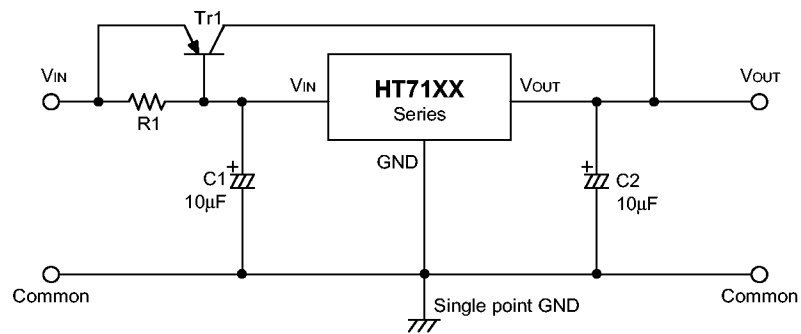
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage	15V	I _{OUT} =10mA	11.4	12	12.6	V
I _{OUT}	Output Current	15V	—	30	40	—	mA
ΔV _{OUT}	Load Regulation	15V	1mA≤I _{OUT} ≤30mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	15V	No load	—	11	15	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$	Line Regulation	—	13V≤V _{IN} ≤24V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	24	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	15V	I _{OUT} =10mA 0°C<T _a <70°C	—	±1.8	—	mV/°C

Application Circuits

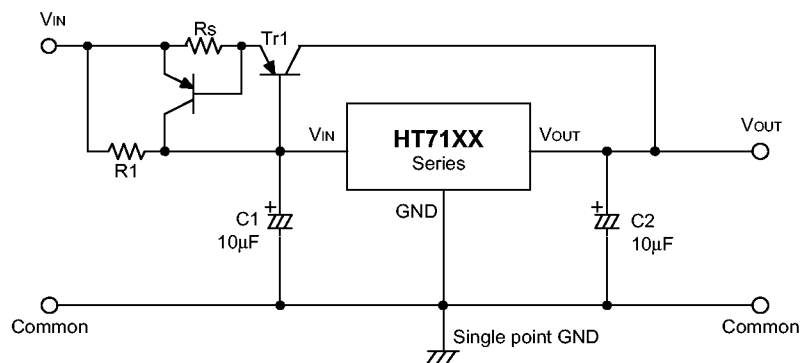
The basic circuits of the HT71XX series



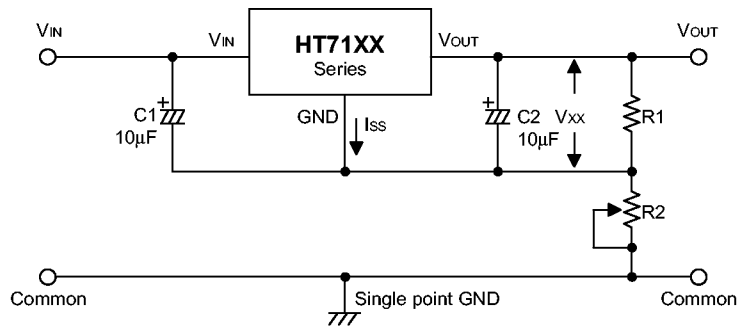
High output current positive voltage regulator



Tr1 short-circuit protection

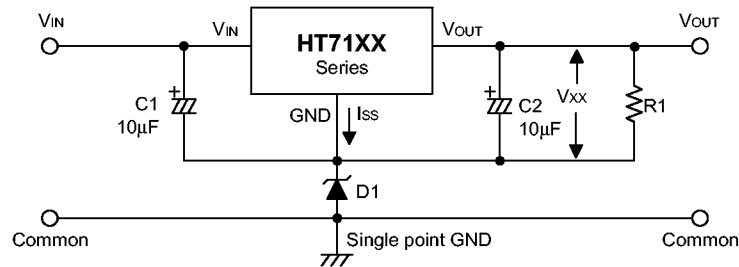


Circuit for increasing output voltage



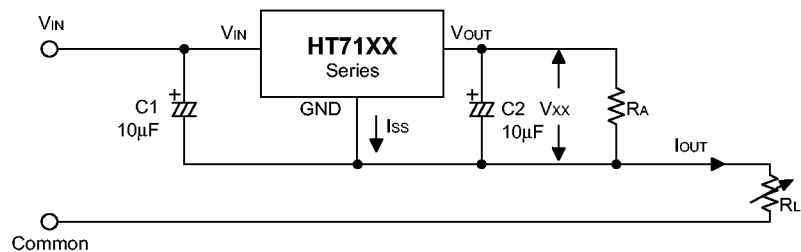
$$V_{OUT} = V_{XX} \left(1 + \frac{R2}{R1}\right) + I_{SS} R2$$

Circuit for increasing output voltage



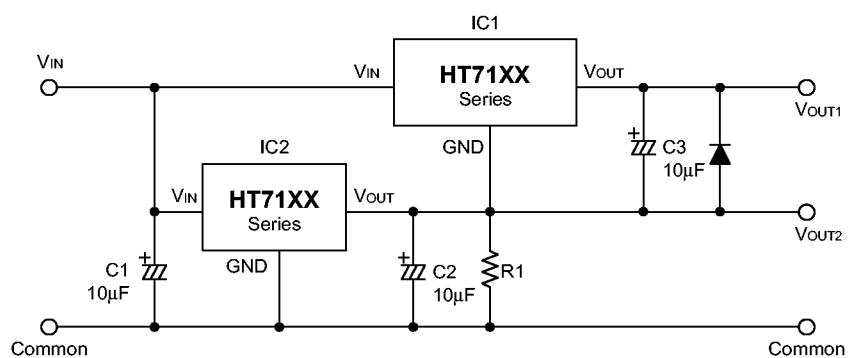
$$V_{OUT} = V_{XX} + V_{D1}$$

Constant current regulator



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

Dual supply

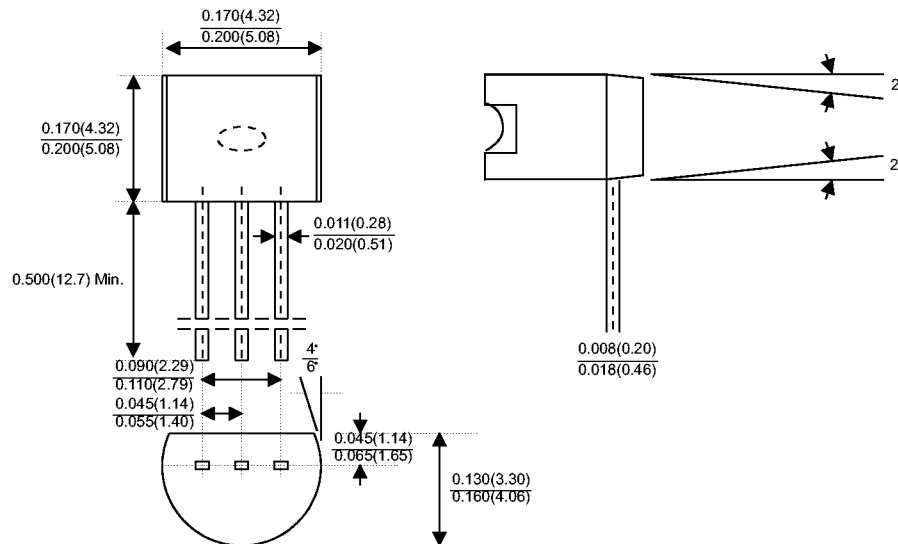


Package Outlines

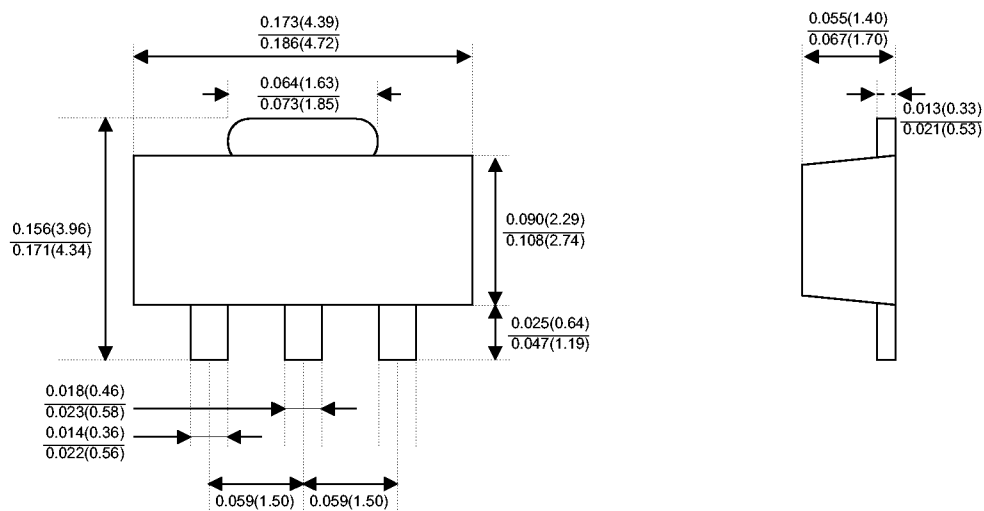
Dimension

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

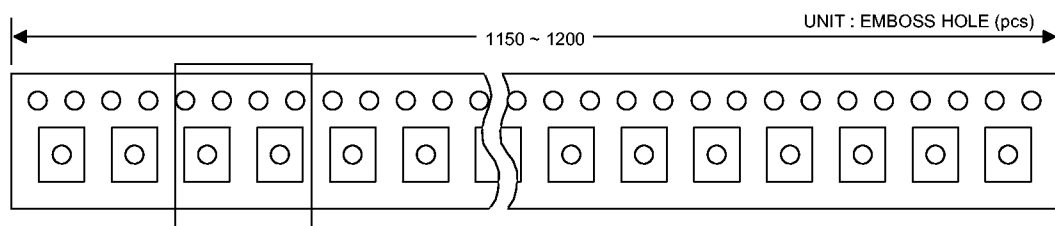
3-pin TO-92 package



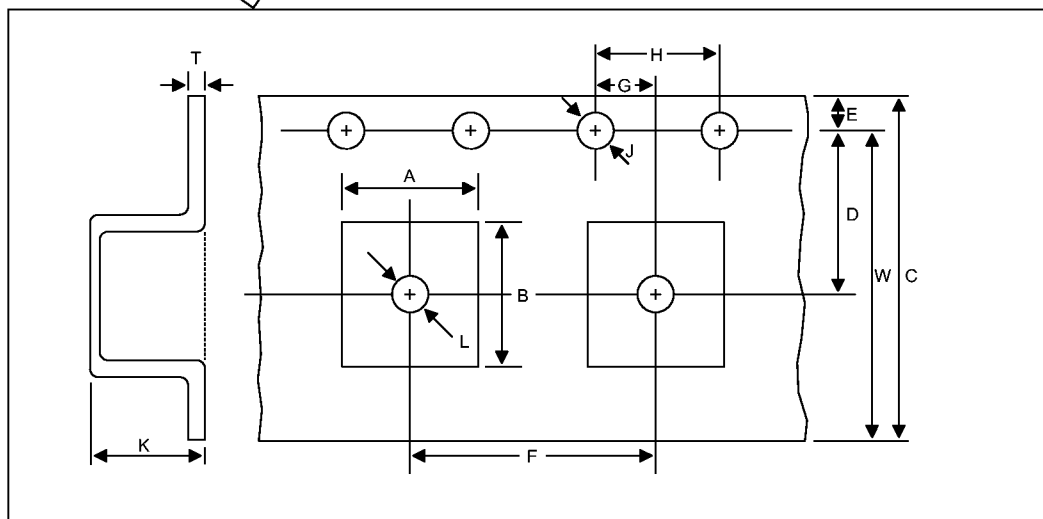
SOT-89 package



Tape form and dimensions



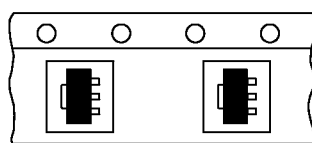
MATERIAL : STYRENE TYPE PLASTIC

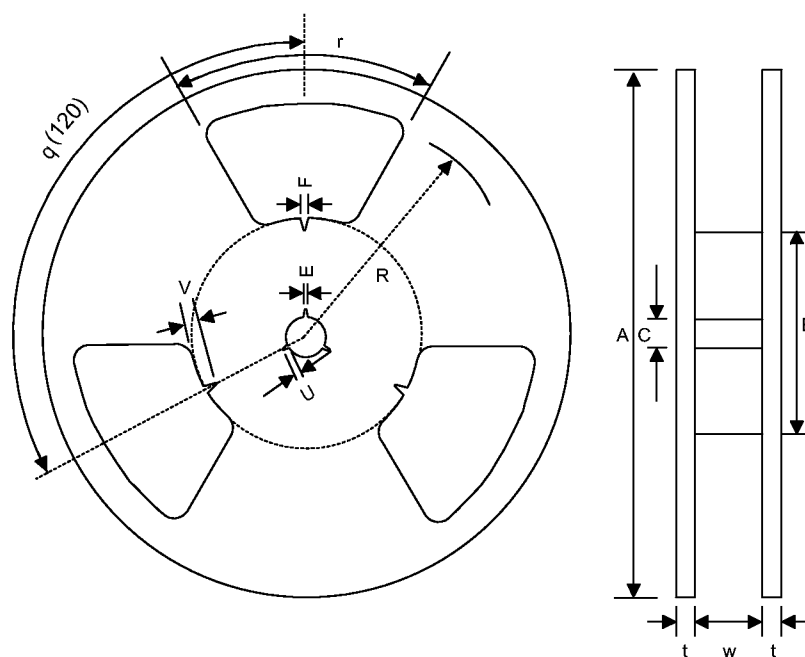


Dimensions

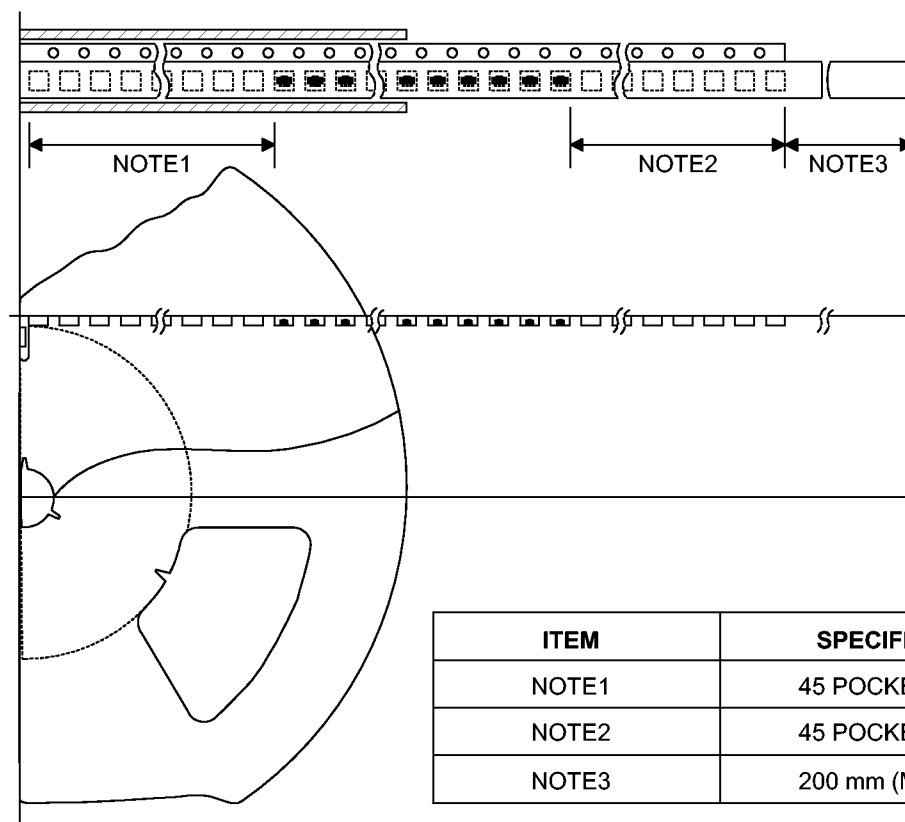
SYMBOL	A	B	C	D	E	F	G	H	J	K	W	T	L
VALUE	5.0	4.6	12	5.65	1.5	8.0	2.0	4.0	φ1.5	1.7	10.5	0.3	φ1.6
TOLERANCE	±0.1	±0.1	±0.2	±0.05	±0.1	±0.1	±0.05	±0.1	±0.1	±0.1	±0.1	±0.05	±0.1

* Total 10 Pitch tolerance ± 2mm



Reel form and dimensions


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

Leader and trailer portions

Taped part 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=12±05mm/minute

