

### Features

- Low power consumption
- Wide operating voltage (12V max.)
- Low voltage drop
- TO92, SOT89 and SOT23-5 package
- Low temperature coefficient

### Applications

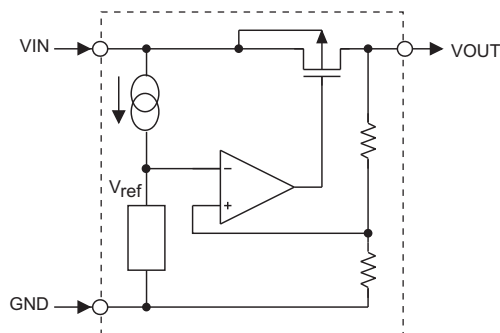
- Battery-powered equipment
- Audio/Video equipment
- Communication equipment

### General Description

The HT1015-1 is a three-terminal low power voltage regulator implemented in CMOS technology. It is available with a fixed output voltage at 1.5V. CMOS technology ensures low voltage drop and low quiescent current.

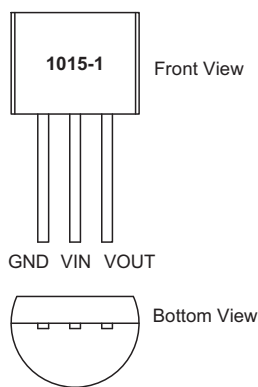
Although designed primarily as a fixed voltage regulator, this device can be used with external components to obtain variable voltages and currents.

### Block Diagram

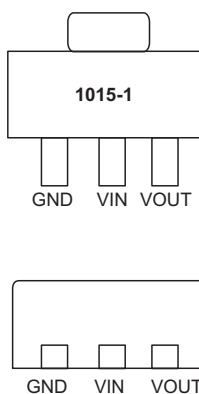


### Pin Assignment

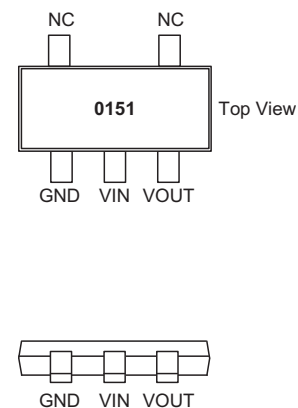
**TO92**



**SOT89**



**SOT23-5**



Note: For lead free devices, TO92 package will add a "#" mark at the end of the date code, whereas SOT89 and SOT23-5 packages will add a "#" mark at the end of the marking.

**Absolute Maximum Ratings**

Supply Voltage ..... $V_{SS}-0.3V$  to  $V_{SS}+13V$       Storage Temperature ..... $-50^{\circ}C$  to  $125^{\circ}C$   
 Operating Temperature ..... $-40^{\circ}C$  to  $85^{\circ}C$

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	$^{\circ}C/W$
		SOT89	200	$^{\circ}C/W$
		TO92	200	$^{\circ}C/W$
$P_D$	Power Dissipation	SOT23-5	0.20	W
		SOT89	0.50	W
		TO92	0.50	W

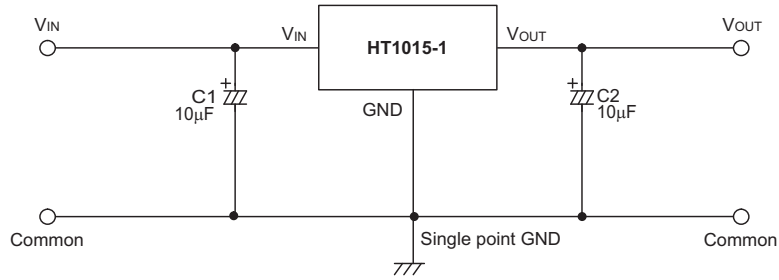
Note:  $P_D$  is measured at  $T_a = 25^{\circ}C$

**Electrical Characteristics**
 $T_a = 25^{\circ}C$ 

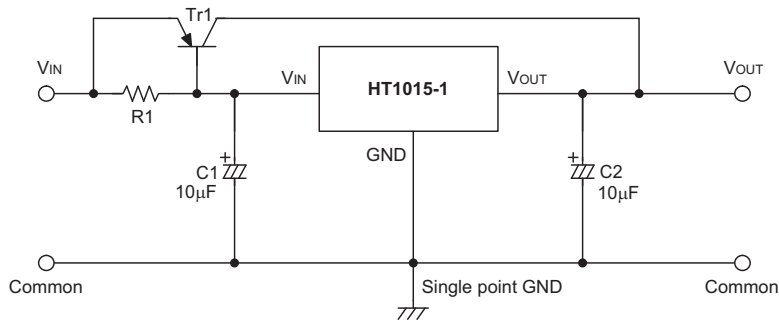
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		$V_{IN}$	Conditions				
$V_{OUT}$	Output Voltage Tolerance	3.5V	$I_{OUT} = 0.5mA$	1.455	1.5	1.545	V
$I_{OUT}$	Output Current	3.5V	—	7.0	18	—	mA
$\Delta V_{OUT}$	Load Regulation	3.5V	$1mA \leq I_{OUT} \leq 7mA$	—	15	—	mV
$V_{DIF}$	Voltage Drop	—	$I_{OUT} = 0.5mA$	—	250	—	mV
$I_{SS}$	Current Consumption	3.5V	No load	—	2.2	5.0	$\mu A$
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	$2.5V \leq V_{IN} \leq 12V$ $I_{OUT} = 0.5mA$	—	0.1	—	%/V
$V_{IN}$	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	3.5V	$I_{OUT} = 0.5mA$ $-40^{\circ}C \sim 85^{\circ}C$	—	-0.75	—	mV/ $^{\circ}C$

**Application Circuits**

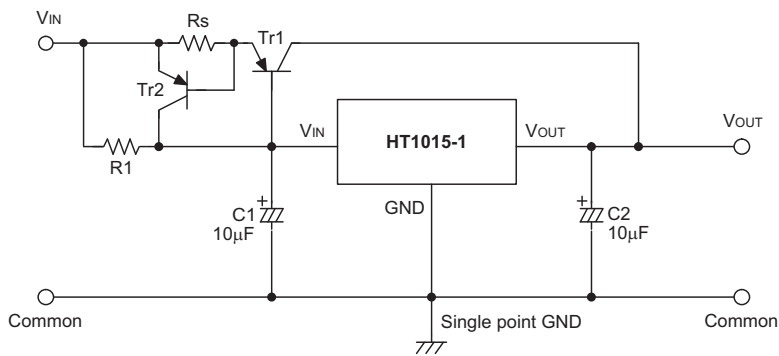
**Basic Circuit**



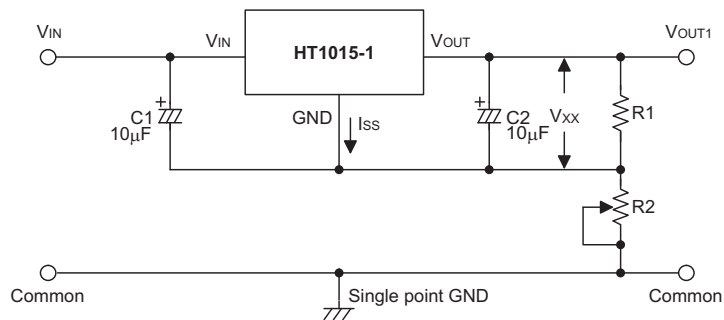
**High Output Current Positive Voltage Regulator**



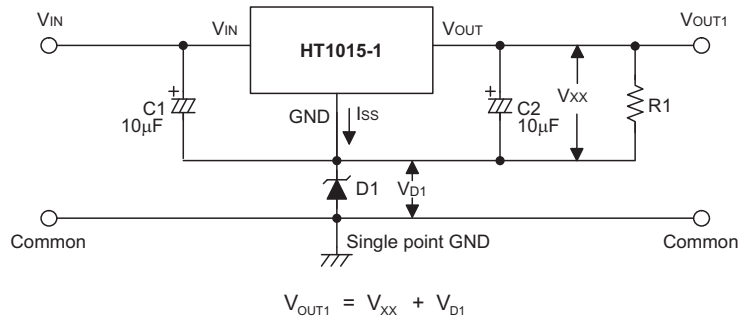
**Short-Circuit Protection Using External Transistors**



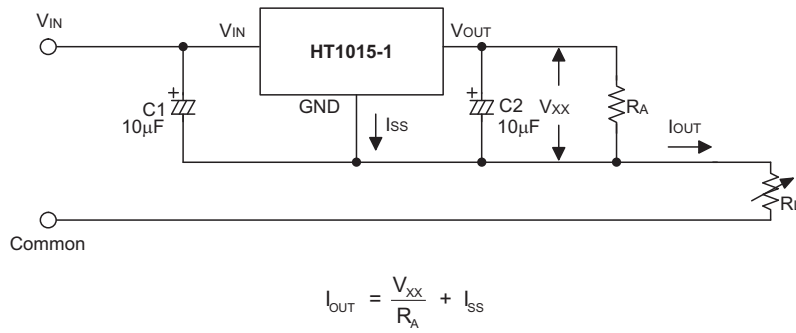
**Increased Output Voltage Circuits**



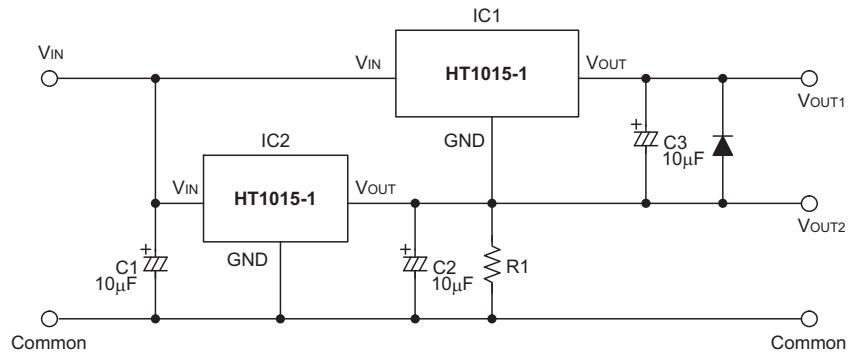
$$V_{OUT1} = V_{xx} \left( 1 + \frac{R2}{R1} \right) + I_{SS} R2$$



**Constant Current Regulator**

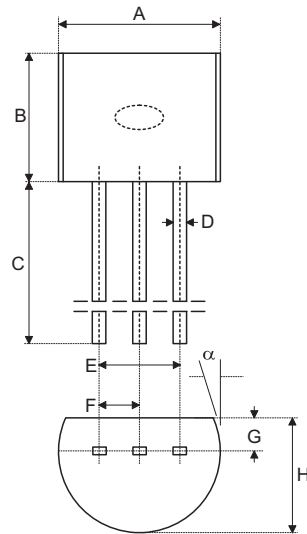


**Dual Supply**



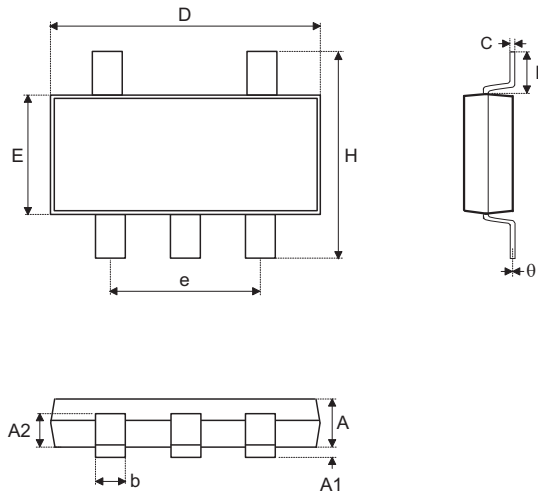
**Package Information**

**3-pin TO92 Outline Dimensions**



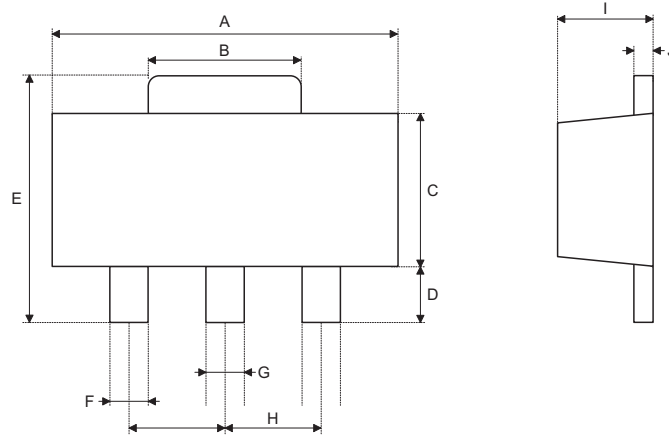
Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	170	—	200
B	170	—	200
C	500	—	—
D	11	—	20
E	90	—	110
F	45	—	55
G	45	—	65
H	130	—	160
I	8	—	18
$\alpha$	4°	—	6°

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



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	—	3.00
L	0.37	—	—
θ	1°	—	9°

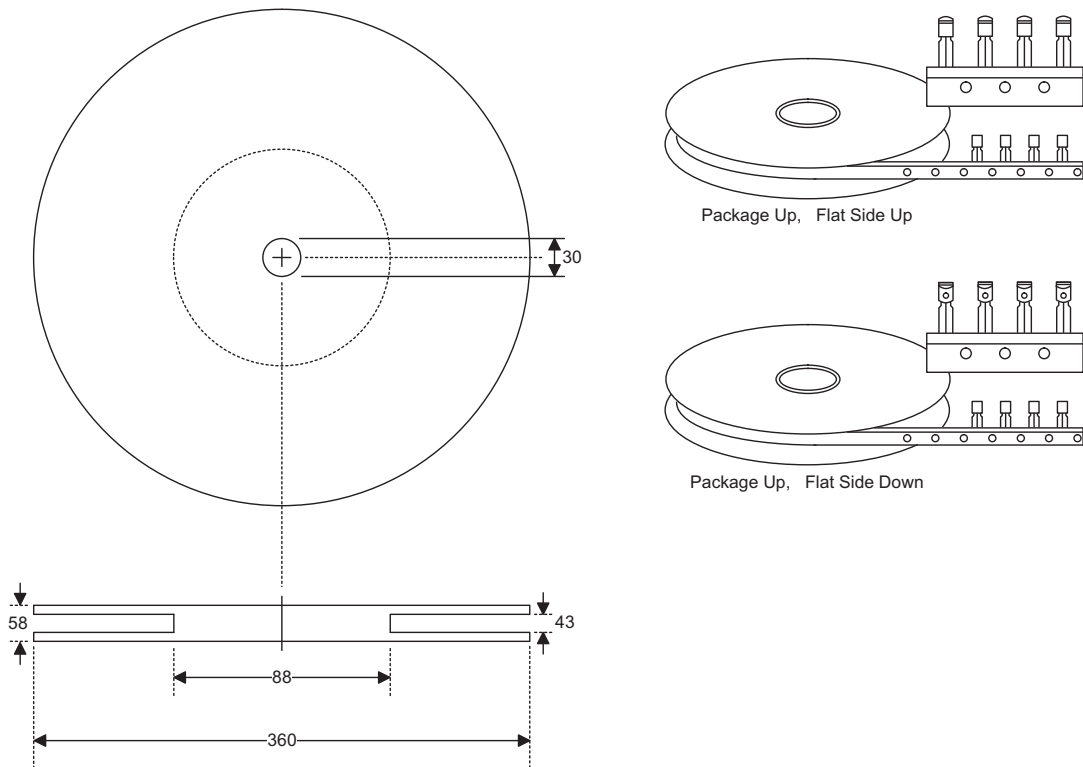
**3-pin SOT89 Outline Dimensions**



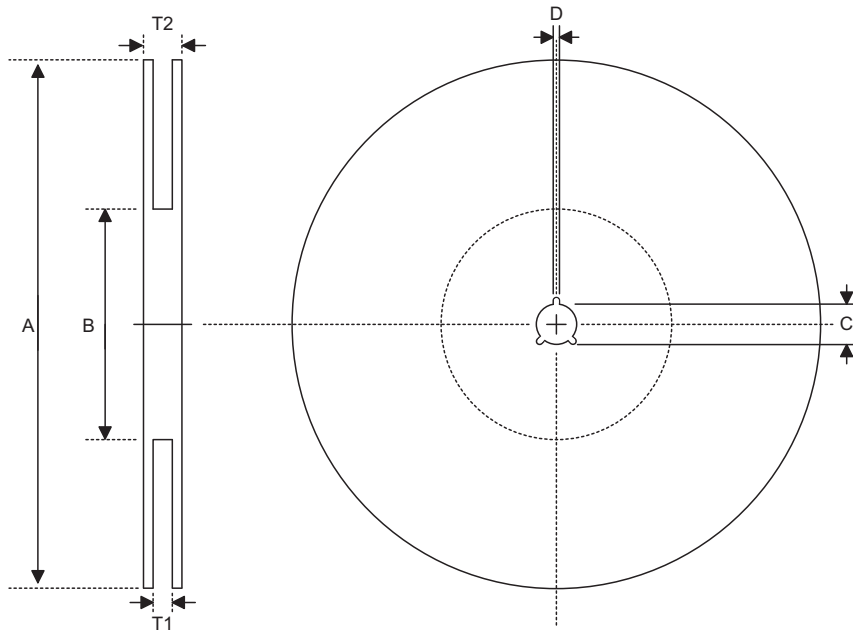
Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	173	—	181
B	59	—	72
C	90	—	102
D	35	—	47
E	155	—	167
F	14	—	19
G	17	—	22
H	—	59	—
I	55	—	63
J	14	—	17

**Product Tape and Reel Specifications**

**TO92 Reel Dimensions (Unit: mm)**



**Reel Dimensions**

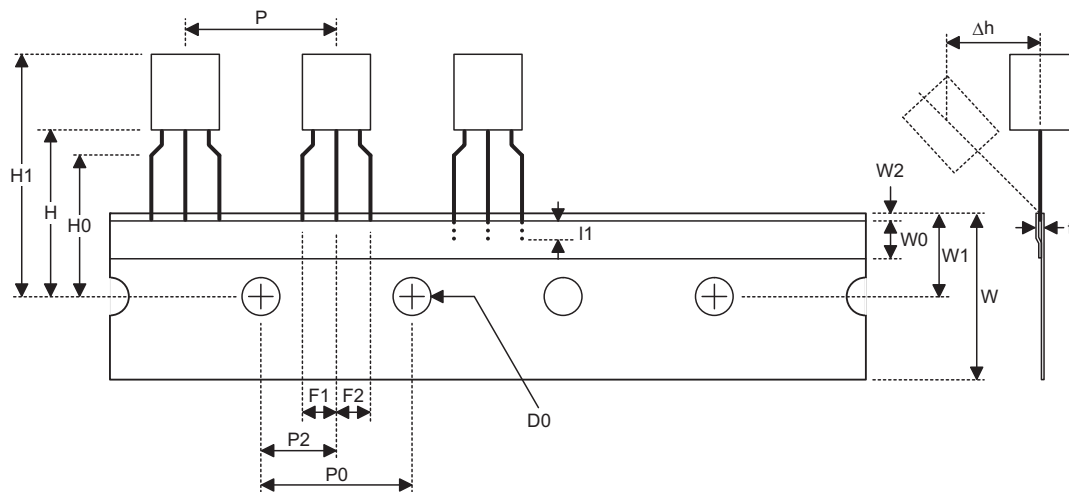


**SOT23-5**

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>

**SOT89**

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>

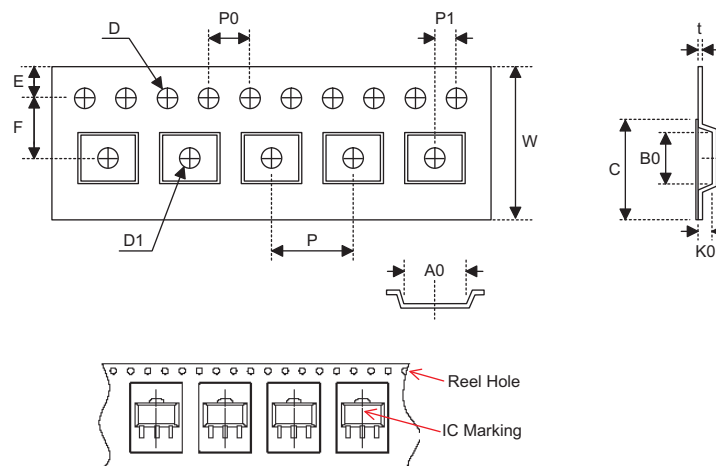
**Carrier Tape Dimensions**

**TO92**

Symbol	Description	Dimensions in mm
l1	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

P<sub>0</sub> Accumulated pitch tolerance: ±1mm/20pitches.

( ) Bracketed figures are for consultation only

**Carrier Tape Dimensions**

**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

**SOT89**

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

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