

CC6201E

Full-Polarity, Micro-Power Hall Effective Switch

FEATURES

- ◆ Wide operating voltage range: 2.0 ~ 5.5V
- ◆ Micro-power
- ◆ Fast response speed, working frequency is 40Hz
- ◆ Full polarity output, response to both South and North magnetic field
- ◆ Superior temperature stability
- ◆ Extremely low switch-point drift
- ◆ ESD (HBM) 4kV, ESD (CDM) 1kV, LU 200mA
- ◆ Small package size: SOT23-3 and DFN4L

APPLICATION

- ◆ Instrument, Meter
- ◆ Laptop
- ◆ Rope Counter

GENERAL DESCRIPTION

CC6201E is a micro-power, ultra sensitive, full polarity, and with latch output hall switch sensing device, which can directly replace the traditional magnetic reed switch. It is especially suitable for portable electronic products using battery power supply, such as mobile phones, cordless phones, notebook computer and PDA.

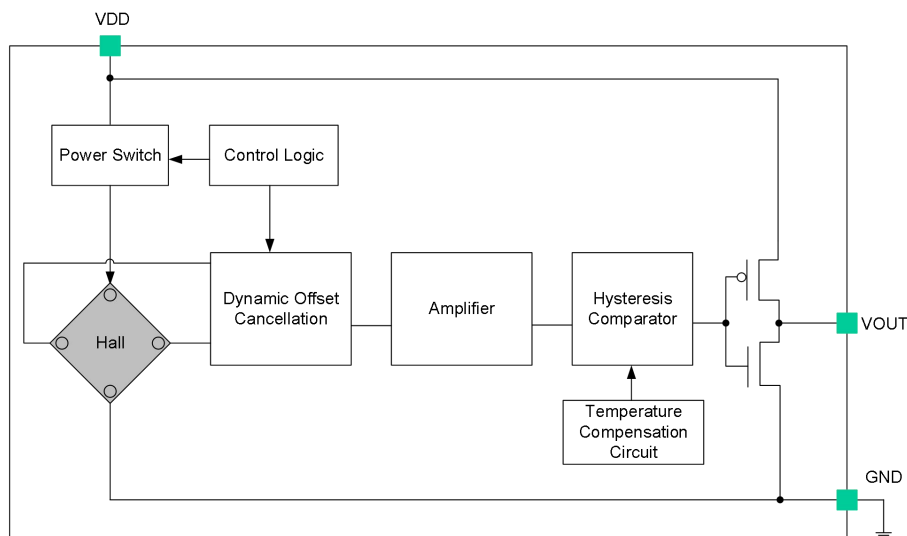
The CC6201E is fully polarised for magnetic field discrimination, i.e. it can be activated as soon as the magnetic north pole or south pole is close by, and the output is switched off when the magnetic field is withdrawn. Unlike other Hall sensors, the CC6201E does not require a specific south or north pole to operate, reducing the need to identify magnetic poles during assembly.

CC6201E includes hall sensor, voltage stabilizing module, a small-signal amplifier, dynamic offset cancellation, latch module and CMOS output stage. Because CC6201E uses advanced BiCMOS technology, the overall circuit structure is optimized, so that the product can obtain very low input error feedback.

The product adopts dynamic offset cancellation technology, which eliminates misalignment voltages caused by package stresses, thermal stresses, and temperature gradients to improve device uniformity. At the same time, the product adopts its miniaturized packaging process, which makes the product have higher performance and market advantages.

CC6201E is available in SOT23-3, TO-92S and DFN4L packages. The operating temperature is -40 ~ 125°C(SOT23-3) and -40 ~ 105°C(TO-92S and DFN4L). Comply with RoHS requirements

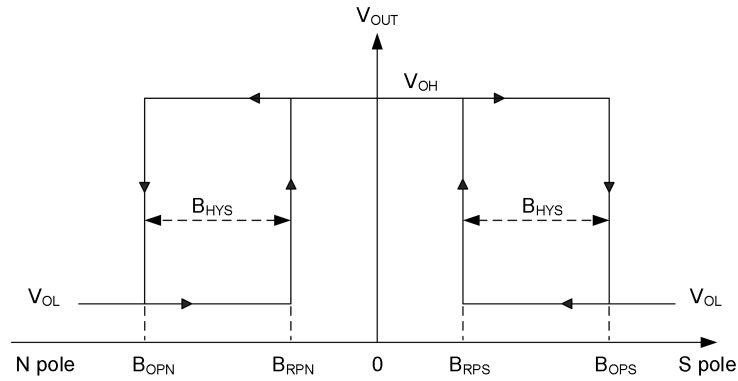
FUNCTION BLOCK DIAGRAM



ORDERING INFORMATION

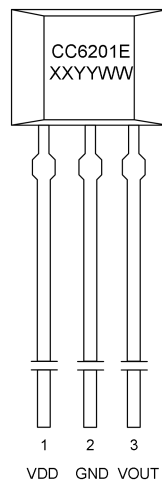
Part No.	Package	Packing Form
CC6201ETO	TO-92S	bulk, 1000 pcs/bulk
CC6201EST	SOT23-3	tape reel, 3000 pcs/reel
CC6201EDN	DFN4L	tape reel, 5000 pcs/reel

OUTPUT VOLTAGE VS. MAGNETIC POLE

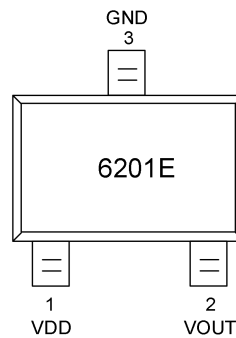


Note: The magnetic field is applied to the screen printing surface of the chip

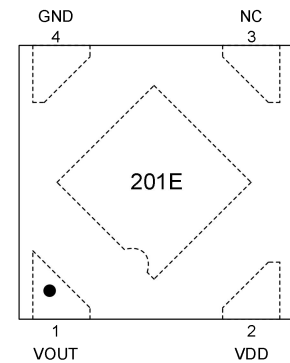
PIN CONFIGURATIONS



TO-92S package



SOT23-3 package



DFN4L package

PIN Name	PIN NO.			Function
	TO-92S	SOT23-3	DFN4L	
VDD	1	1	2	Supply Power
GND	2	3	4	Ground
VOUT	3	2	1	Output
NC	-	-	3	NC

ABSOLUTE MAXIMUM RATINGS

Parameter	symbol		value	unit
Supply Voltage	V _{DD}		-0.3~5.5	V
Magnetic Flux Density	B		unlimited	Gs
Ambient Temperature	T _A	SOT23-3	-40 ~ 125	°C
		TO-92S、DFN4L	-40 ~ 105	°C
Storage Temperature	T _s		-50 ~ 160	°C
Electrostatic Discharge (ESD)	HBM		4	kV
	CDM		1	kV
Latch Up	LU		200	mA

Note: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum rated conditions for extended periods may degrade device reliability.

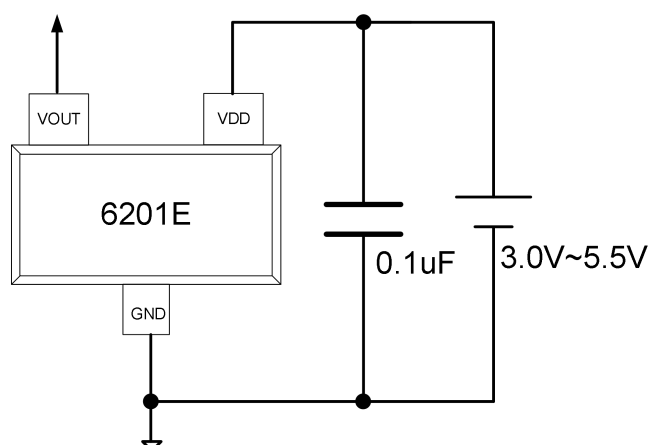
ELECTRICAL PARAMETERS ($V_{DD} = 3.5V$ @ $T_A = 25^\circ C$, unless specified otherwise)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Power	V_{DD}	-	2.0	-	5.5	V
Output High Voltage	V_{OH}	$I_{OUT(SOURCE)} = 0.5mA$	$V_{DD}-0.2$	-	-	
Output Low Voltage	V_{OL}	$I_{OUT(SINK)} = 0.5mA$	-	-	0.2	
Average Quiescent Current	$I_{DD(AVG)}$	VOUT pin is floating	-	4	-	uA
Enable Current	$I_{DD(EN)}$		-	1.0	-	mA
Disable Current	$I_{DD(DIS)}$		-	4	-	uA
Output Source Current	$I_{OUT(SOURCE)}$		-	-	0.5	mA
Output Sink Current	$I_{OUT(SINK)}$		-	-	0.5	mA
Awake Time	T_{AWAKE}		-	15	-	us
Period	T_{PERIOD}		-	25	-	ms
Duty Cycle	D.C.		-	0.06	-	%

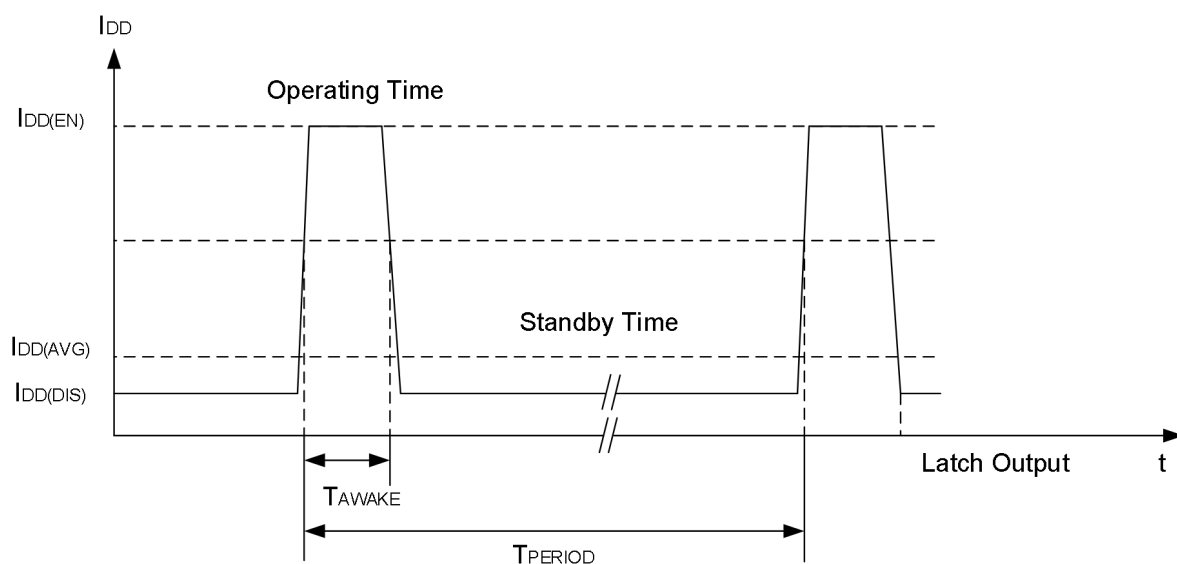
MAGNETIC SPECIFICATIONS (the magnetic field is positive when the south pole is applied to the chip screen printing surface)

Parameter	Symbol	Condition	Min	Typ.	Max	Unit
South Operating Point	B_{OPS}	$V_{DD}=3.5V$ @ $T_a=25^\circ C$	26	40	54	Gs
South Release Point	B_{RPS}	$V_{DD}=3.5V$ @ $T_a=25^\circ C$	20	30	40	Gs
North Operating Point	B_{OPN}	$V_{DD}=3.5V$ @ $T_a=25^\circ C$	-54	-40	-26	Gs
North Release Point	B_{RPN}	$V_{DD}=3.5V$ @ $T_a=25^\circ C$	-40	-30	-20	Gs
Hysteresis	B_{HYS}	$V_{DD}=3.5V$ @ $T_a=25^\circ C$	5	10	15	Gs

TYPICAL APPLICATION CIRCUIT

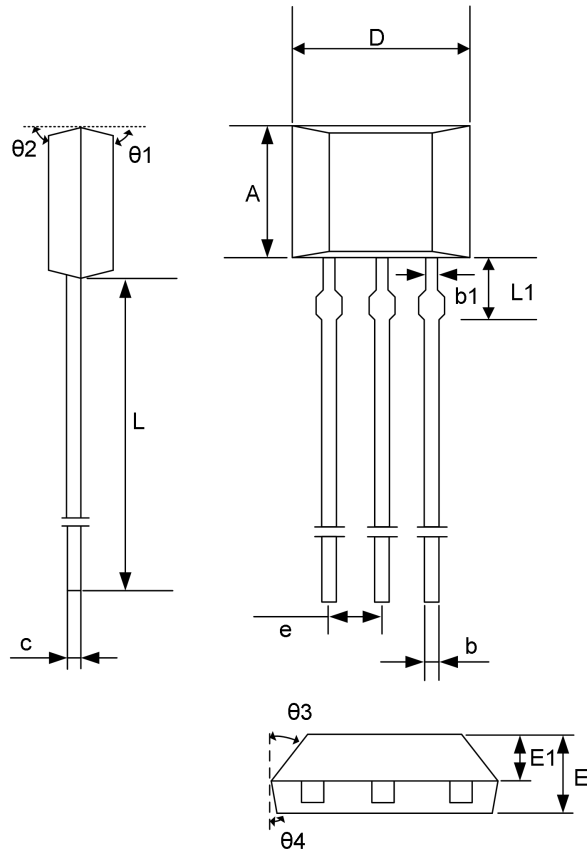


WORKING SEQUENCE DIAGRAM



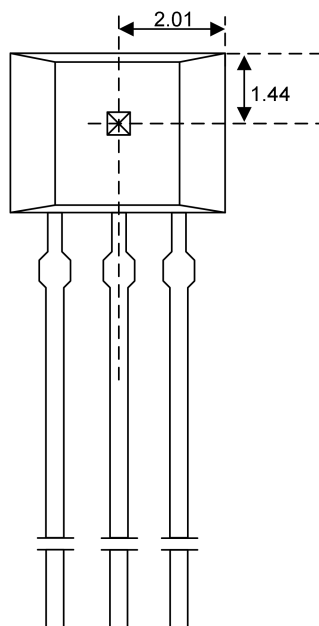
PACKAGE INFORMATION

(1)TO-92S Package



Symbol	Millimeter		
	Min.	Typ.	Max.
A	2.90	3.00	3.10
b	0.35	0.39	0.56
b1	-	0.44	-
c	0.36	0.38	0.51
D	3.9	4.0	4.1
e	1.27BSC		
E	1.42	1.52	1.62
E1	-	0.75	-
L	13.5	14.5	15.5
L1	-	1.6	-
$\theta1$	-	6°	-
$\theta2$	-	3°	-
$\theta3$	-	45°	-
$\theta4$	-	3°	-

Hall Location



Notes:

All dimensions are in millimeters

Marking:

1st Line: CC6201E - Name of the device

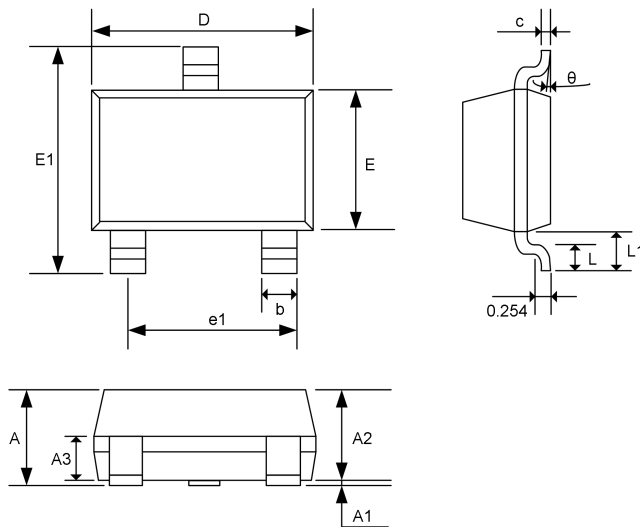
2nd Line: XXYYWW

XX – code

YY – last 2 digits of year

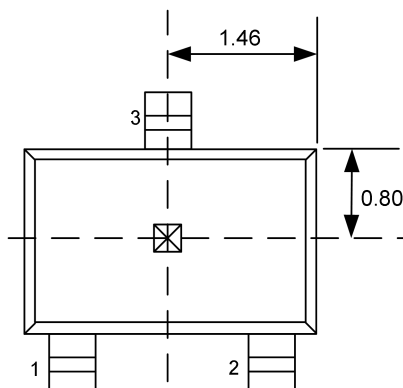
WW – week

(2)SOT23-3 Package



Symbol	Millimeter		
	Min.	Typ.	Max.
A	-	-	1.35
A1	0.04	0.08	0.12
A2	1.00	1.10	1.20
A3	0.55	0.65	0.75
b	0.37	0.40	0.43
c	0.11	0.16	0.21
D	2.77	2.90	3.07
E	1.40	1.60	1.80
E1	2.70	2.85	3.00
e1	1.80	1.90	2.00
L	0.35	0.45	0.55
L1	0.55	0.65	0.75
θ	0°	-	8°

Hall Location



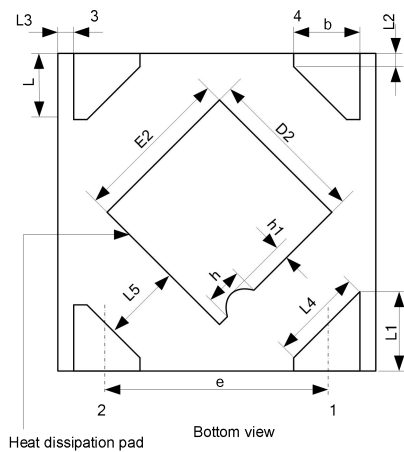
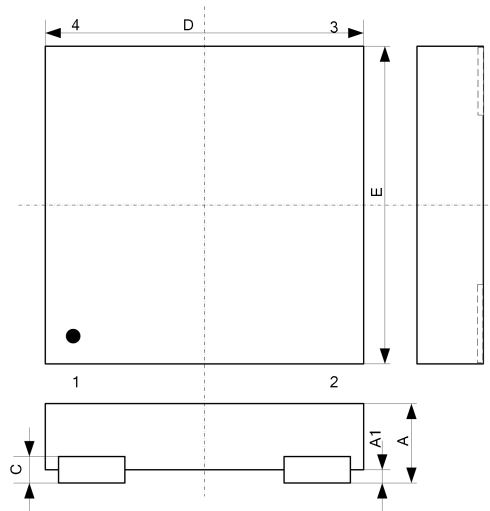
Notes:

All dimensions are in millimeters

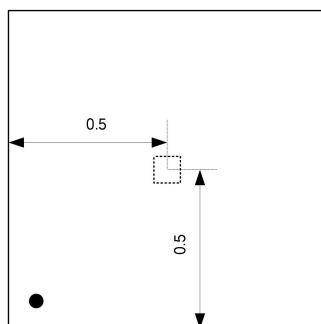
Marking:

1st Line: 6201E

(3)DFN4L Package



Hall Location



Symbol	Millimeters		
	Min.	Typ.	Max.
A	0.35	-	0.40
A1	0.00	0.02	0.05
b	0.20	0.25	0.30
c	0.07	0.12	0.17
D	0.95	1.00	1.05
D2	0.38	0.48	0.58
e	0.65BSC		
E	0.95	1.00	1.05
E2	0.38	0.48	0.58
L	0.20	0.25	0.30
L1	0.27	0.32	0.37
L2	0.077REF		
L3	0.05REF		
L4	0.34REF		
L5	0.20REF		
h	0.09REF		
h1	0.03REF		

Notes:

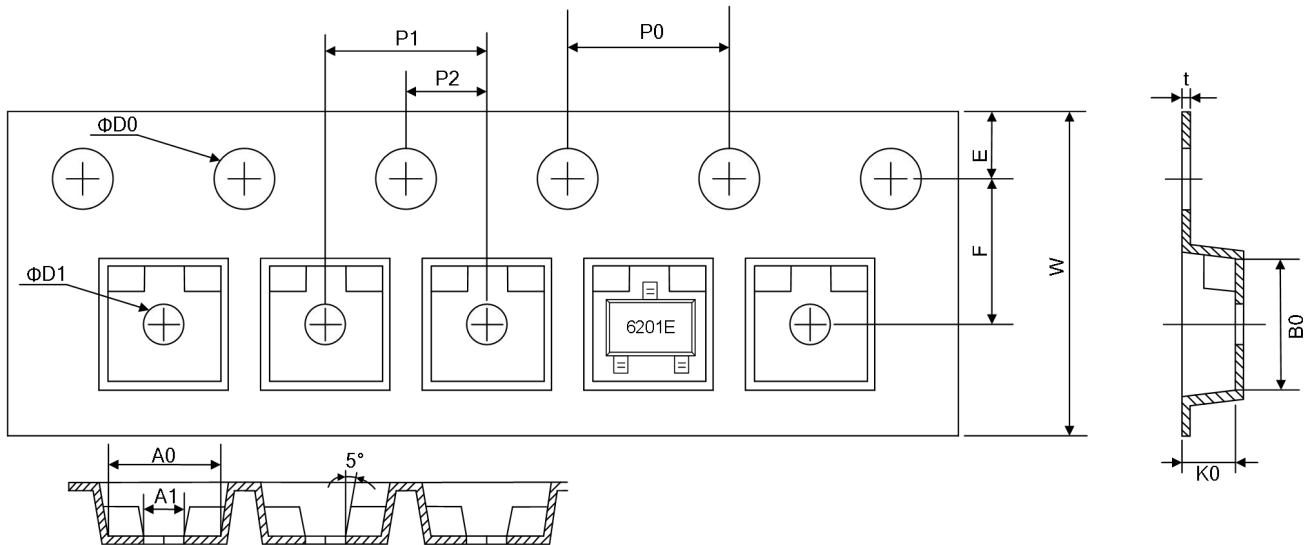
All dimensions are in millimeters

Marking:

1st Line: 201E

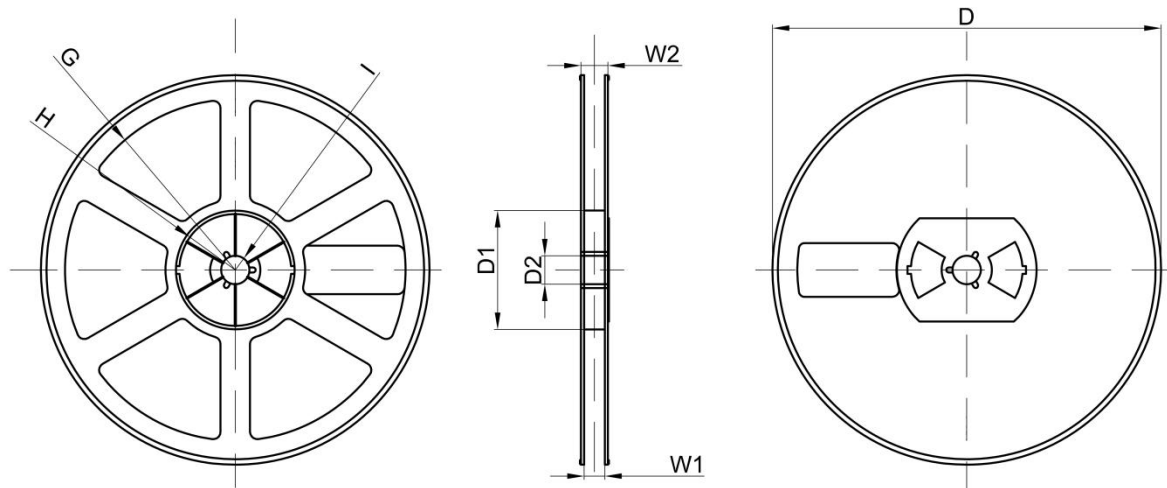
TAPE AND REEL INFORMATION

(1) SOT23-3 Tape



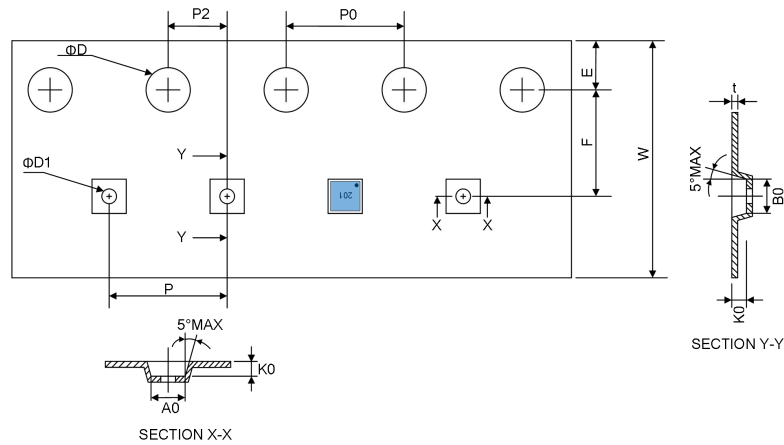
Symbol	Millimeter		
	Min.	Typ.	Max.
W	7.90	8.00	8.10
E	1.65	1.75	1.85
F	3.40	3.50	3.60
D0	1.40	1.50	1.60
D1	0.90	1.00	1.10
P0	3.90	4.00	4.10
P1	3.90	4.00	4.10
P2	1.95	2.00	2.05
t	0.20	0.25	0.30
A0	3.15	3.20	3.25
A1	0.85	0.95	1.05
B0	3.20	3.25	3.30
K0	1.27	1.32	1.37
10*P0	39.80	40.00	40.20

Note: Each plate has 50 ± 2 grids in front of the tape and 105 ± 2 in the tail



Symbol	Millimeter		
	Min.	Typ.	Max.
D	-	Φ178	-
D1	-	54.40	-
D2	-	13.00	-
G	-	R78.00	-
H	-	R25.60	-
I	-	R6.50	-
W1	-	9.50	-
W2	-	12.30	-

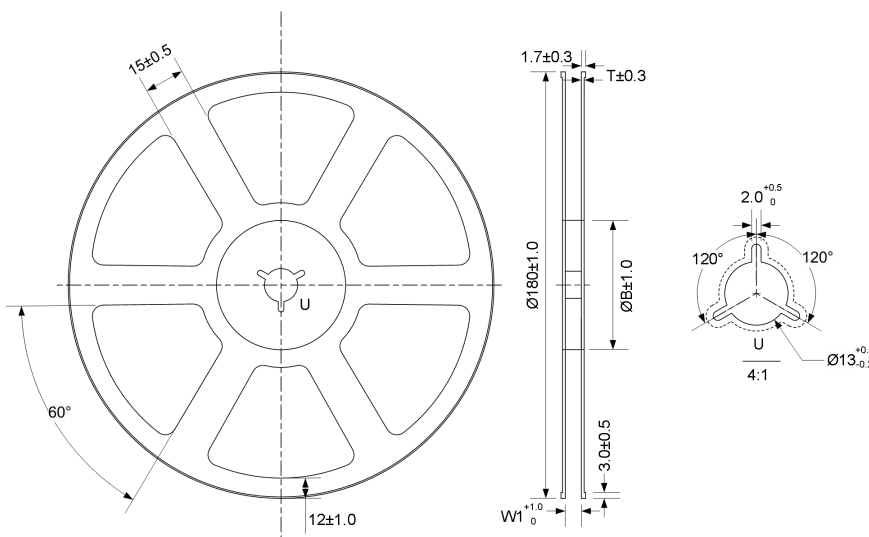
(2) DFN4L Tape



Symbol	Millimeter		
	Min.	Typ.	Max.
E	1.65	1.75	1.85
F	3.45	3.50	3.55
P2	1.95	2.00	2.05
D	1.40	1.50	1.60
D1	0.45	0.50	0.55
P0	3.90	4.00	4.10
W	7.90	8.00	8.30
P	3.90	4.00	4.10
A0	1.11	1.16	1.21
B0	1.11	1.16	1.21
K0	0.48	0.53	0.58
t	0.23	0.25	0.27
10*P0	39.80	40.00	40.20

Note: Each plate has 30 ± 2 grids in front of the tape and 140 ± 2 in the tail.

DNF4L Reel

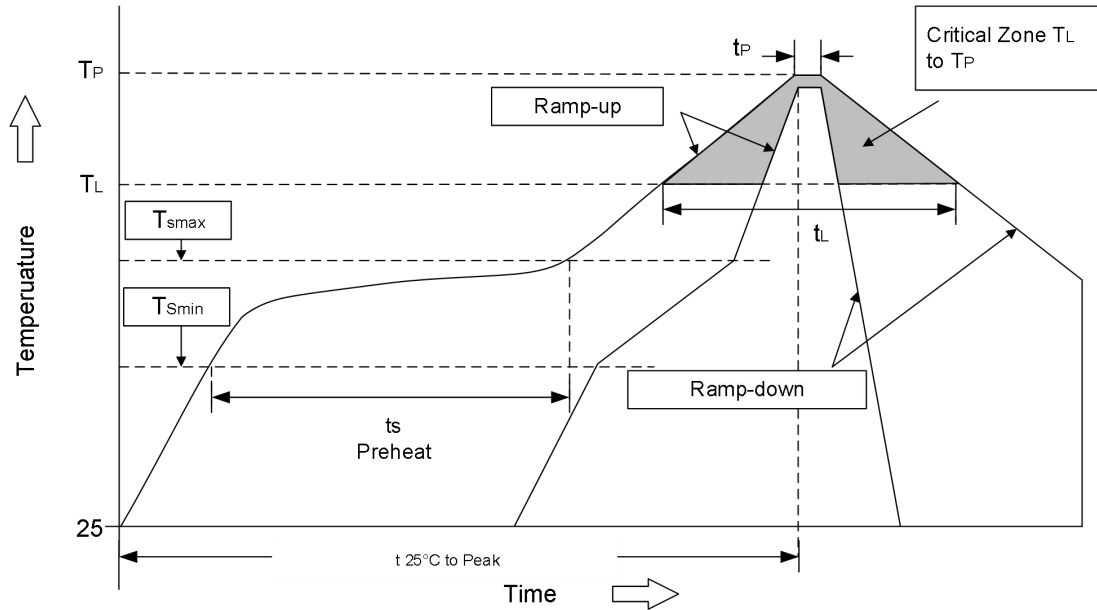


Reel Basic Size(mm)			
Applicable Carrier Tape Width	B	W1	T
8	54.5	8.6	15

RECOMMENDED WELDING CONDITIONS

SOT23-3 Welding Conditions

1、Thermal reflow profile



2、Thermal reflow setting

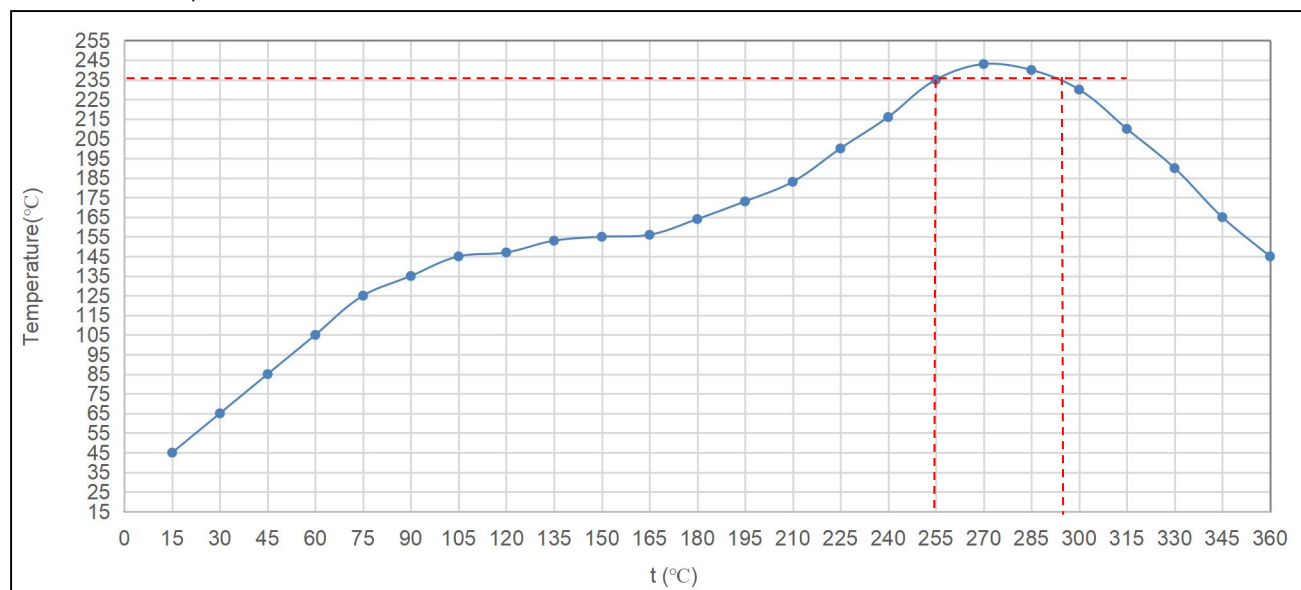
Distribution Map Features	Package thickness <2.5mm & Package volume<350mm ³
Average tilt rise rate (T_L to T_P)	Maximum 3°C/s
Preheat -Minimum Temperature (T_{smin}) -Maximum Temperature (T_{smax}) -Time (min-max) (t_s)	100°C 150°C 60-120s
$T_{smax}-T_L$ tilt rise rate	
Keep the above time -Temperature (T_L) -Time (t_L)	183°C 60-150s
Peak Temperature(T_P)	260 +0/-5°C
Time within 5°C of actual peak temperature (t_P)	20-40s
Tilt descent rate	Maximum 6°C/s
Time from 25°C to peak temperature	Maximum 6 min

3、Manual welding conditions

Manual welding conditions	260°C/10s
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DFN4L Welding conditions

1、Thermal reflow profile

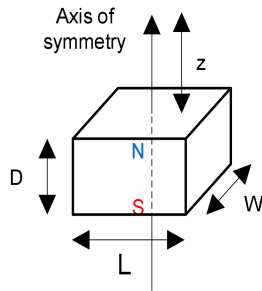


2、Thermal reflow setting

Peak Temperature	245~252°C
Minimum Welding Temperature	240°C
Maximum warming rate	3°C/s
Maximum cooling rate	-4°C/s
Time of Temperature rising (150°C)	135s
Time of Temperature rising (150~200°C)	75s
Time of Temperature rising (25~200°C)	210s
Time of Temperature rising (200~217°C)	15s
Time of Temperature rising (>217°C)	70s
Total time (217~255°C)	35~40s
Total time (>255°C)	0

FLUX DENSITY OF PERMANENT MAGNET AT SOME POINT IN THE AXIAL DIRECTION VS. PERMANENT MAGNET SHAPE

Cuboid permanent magnet



$$B = \frac{B_r}{\pi} \times \left[\arctan \left(\frac{LW}{2z\sqrt{4z^2 + L^2 + W^2}} \right) - \arctan \left(\frac{LW}{2(D+z)\sqrt{4(D+z)^2 + L^2 + W^2}} \right) \right]$$

B_r : residual flux density, depending on the model number of the permanent magnet.

The unit is T.

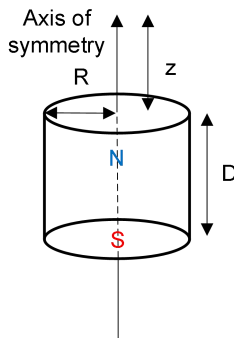
z : The distance from the symmetry axis of the permanent magnet to the surface of the permanent magnet ($z > 0$). The unit is m.

L : the length of the cuboid. The unit is m.

W : the width of the cuboid. The unit is m.

D : thickness / height of the cuboid. The unit is m.

Cylindrical permanent magnet



$$B = \frac{B_r}{2} \times \left(\frac{D+z}{\sqrt{R^2 + (D+z)^2}} - \frac{z}{\sqrt{R^2 + z^2}} \right)$$

B_r : residual flux density, depending on the model number of the permanent magnet.

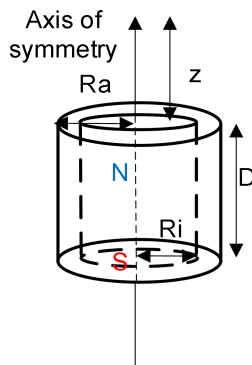
The unit is T.

z : The distance from the symmetry axis of the permanent magnet to the surface of the permanent magnet ($z > 0$). The unit is m.

D : thickness / height of the cylinder. The unit is m.

R : the radius of the cylinder. The unit is m.

Cycloid permanent magnet



$$B = \frac{B_r}{2} \times \left[\frac{D+z}{\sqrt{R_a^2 + (D+z)^2}} - \frac{z}{\sqrt{R_a^2 + z^2}} - \left(\frac{D+z}{\sqrt{R_i^2 + (D+z)^2}} - \frac{z}{\sqrt{R_i^2 + z^2}} \right) \right]$$

B_r : residual flux density, depending on the model number of the permanent magnet.

The unit is T.

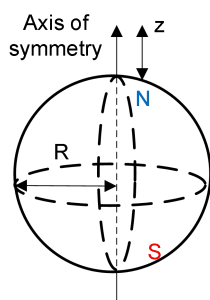
z : The distance from the symmetry axis of the permanent magnet to the surface of the permanent magnet ($z > 0$). The unit is m.

D : thickness / height of the annulus. The unit is m.

R_a : Outer ring radius. The unit is m.

R_i : Internal circle radius. The unit is m.

Spherical permanent magnet



$$B = \frac{2B_r}{3} \frac{R^3}{(R+z)^3}$$

B_r : residual flux density, depending on the model number of the permanent magnet.

The unit is T.

z : The distance from the symmetry axis of the permanent magnet to the surface of the permanent magnet ($z > 0$). The unit is m.

R : the radius of the sphere. The unit is m.

REVISION HISTORY

Revision Date	Description of Revision	Revision
2023-08	CC6201E preview specification released.	rev0.1
2023.09.15	I _{DD(EN)} 、Magnetic Parameter update; Additional ESD information.	rev0.8
2023.11.03	Magnetic Parameter update, official specification released.	rev1.0
2024.02.21	The maximum value of the magnetic parameter B _{RPN} was changed from "-26" to "-20".	rev1.1
2024.02.22	Operating temperature range changed from "-40 ~ 85°C" to "-40 ~ 105°C".	rev1.2
2024.05.20	Modified the operating temperature range of the SOT23-3 package to "-40 ~ 125°C".	rev1.3
2024.08.08	The operating voltage range has been updated from "2.5~5.5V" to "2.0~5.5V".	rev1.4

CrossChip

CrossChip Microsystems Inc. was founded in 2013, is a national high-tech enterprise, engaged in integrated circuit design and sales. The company has strong technical strength, has more than 60 kinds of patents, mainly used in Hall sensor signal processing, with the following product lines:

- ✓ High precision linear Hall sensor
- ✓ All kinds of Hall switches
- ✓ Single phase motor drive
- ✓ Single chip current sensor
- ✓ AMR Magnetoresistance sensor
- ✓ Isolation drive class chip

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