MT3451 Series

BiCMOS, Latch , Hall-Effect Magnetic Position Sensors

MagnTek

Features and Benefits

- **BiCMOS Technology**
- **Magnetic Type: Latch**
- **Wide Operating Voltage Range:**
  Supply Voltage 2.8~24V
- **Specified Operating Temperature Range:**
  From -40℃~150℃
- **High Magnetic Sensitivity**
  B_{OP}=20Gauss, B_{RP}=-20Gauss (typical)
- **RoHS Compliant**
  2011/65/EU

Applications

- Water Flow Sensor
- BLDC for Power Tools
- BLDC for Washing Machine
- BLDC for Air Conditioner

Family Members

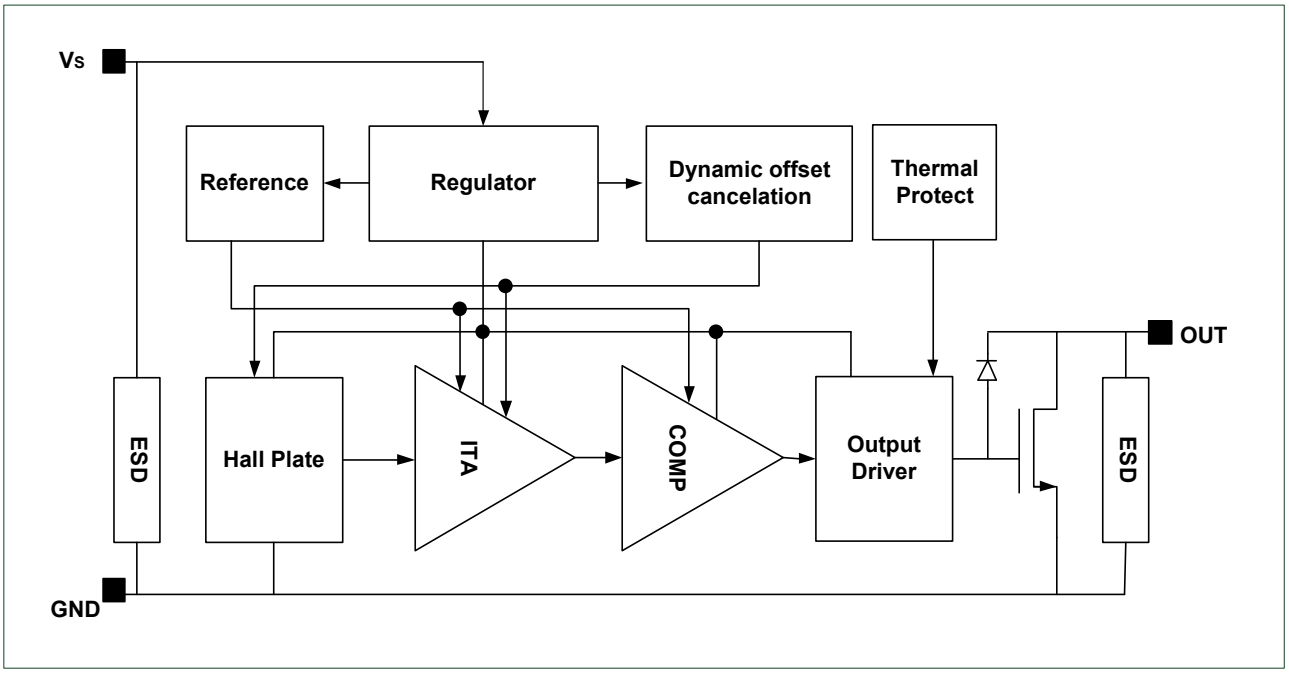
Part number	Description
MT3451A	Flat TO-92 package, bulk packaging (1000pcs/bag)
MT3451A-T	Flat TO-92 package, radial lead, bulk packaging (1000pcs/bag)
MT3451AT	SOT-23 package, tape and reel packaging (3000pcs/bag)
MT3451BT	SOT-89B package, tape and reel packaging (1000pcs/bag)
MT3451ET	SOT-23(thin outline)package, tape and reel packaging (3000pcs/bag)
MT3451DT	DFNWB2*2-3L-B package, tape and reel packaging (3000pcs/bag)

General Description

The MT3451 family, produced with BiCMOS technology. The Hall IC internally includes an on-chip Hall voltage generator, a voltage regulator for operation with supply voltage of 2.8 to 24V, temperature compensation circuitry, small-signal amplifier, Hall sensor with dynamic offset cancellation system, Schmitt trigger and an open-drain output.

They are designed to respond to alternating North and South poles. While the magnetic flux (B) is larger than operate point (B_{OP}), the output will be turned no (Low), the output is held until the magnetic flux density (B) is lower than release point (B_{RP}), then turn off (High).

MT3451 family provides a variety of packages to customers: SOT-23 /SOT-89B/DFN for surface mount and flat TO-92 for through-hole mount. All packages are RoHS compliant.



Functional Block Diagram

Function Description

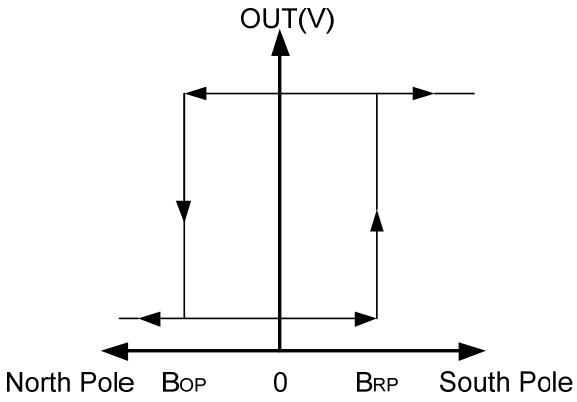
Definition of Magnetic Parameters

B_{OP}: Operating Point, Magnetic flux density applied on the branded side of the package which turns the output driver ON (V_{OUT}=Low)

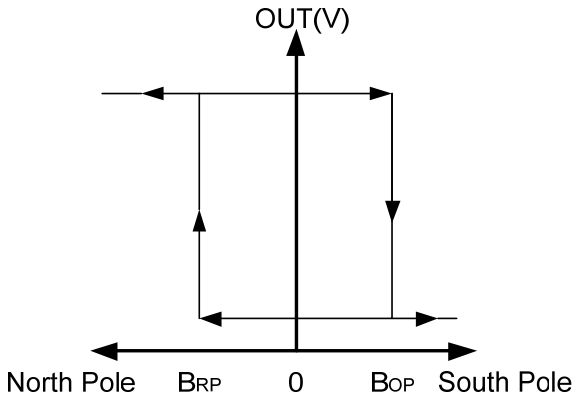
B_{RP}: Release Point, Magnetic flux density applied on the branded side of the package which turns the output driver OFF (V_{OUT}=High)

B_{HYST}: Hysteresis Window, $|B_{OP}-B_{RP}|$

Definition of Switching Function

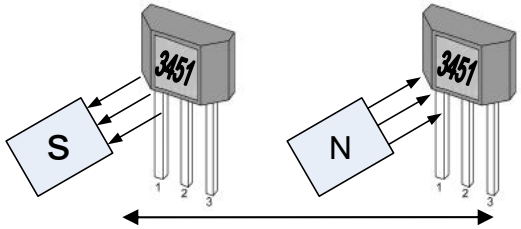


Switching Behavior of AT



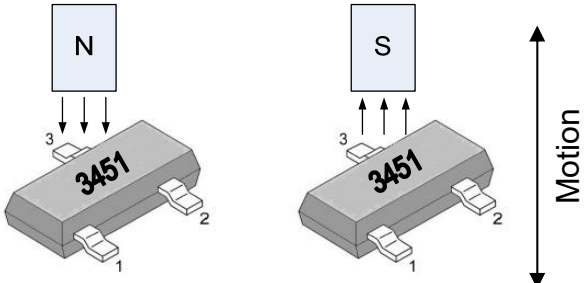
Switching Behavior of A, BT, ET and DT

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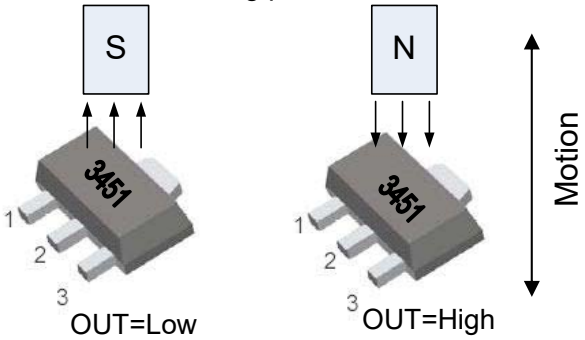
OUT=Low OUT=High

Switching point of A



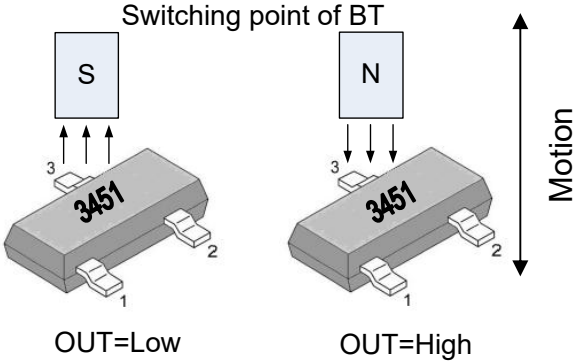
OUT=Low OUT=High

Switching point of AT



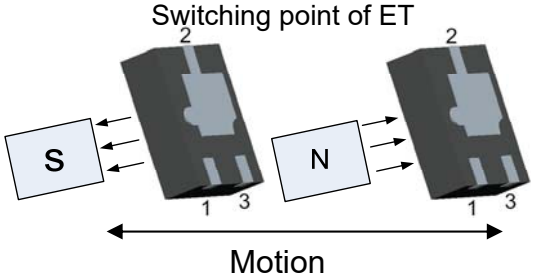
OUT=Low OUT=High

Switching point of BT



OUT=Low OUT=High

Switching point of ET



OUT=Low OUT=High

Switching point of DT

Note: Direction of magnetic flux

Pin Description

MT3451A (MT3451A-T)

Name	Number	Description
V_S	1	Power
GND	2	Ground
OUT	3	Open-drain Output

MT3451AT

Name	Number	Description
V_S	1	Power
GND	3	Ground
OUT	2	Open-drain Output

MT3451BT

Name	Number	Description
V_S	1	Power
GND	2	Ground
OUT	3	Open-drain Output

MT3451ET

Name	Number	Description
V_S	1	Power
GND	3	Ground
OUT	2	Open-drain Output

MT3451DT

Name	Number	Description
V_S	1	Power
GND	2	Ground
OUT	3	Open-drain Output

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Electrical and Magnetic Characteristics

Absolute Maximum Ratings

Absolute maximum ratings are limiting values to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability is not necessarily implied. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability.

Absolute maximum ratings: all voltages listed are referenced to GND.

Symbol	Parameters	Min	Max	Units
V_S	Supply Voltage	-	30	V
V_{RCC}	Reverse Battery Voltage	-0.7	-	V
V_{OUT}	Output Voltage	-	30	V
I_{OUT}	Continuous output current	-	30	mA
T_A	Operating ambient Temperature	-40	150	℃
T_S	Storage temperature	-50	150	℃
T_J	Junction Temperature	-	165	℃
B	Magnetic Flux	No Limit		Gauss

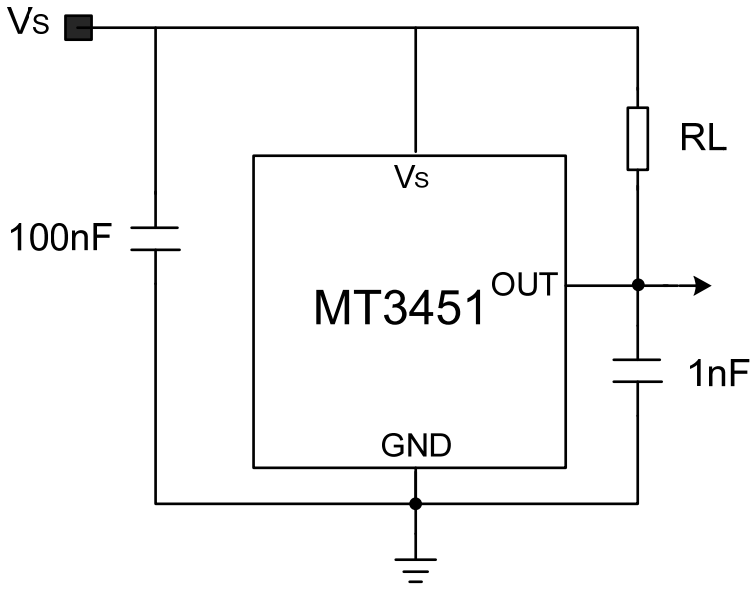
MT3451 Series Specifications

At T_A =-40 to 150℃, V_S = 2.8V to 24V (unless otherwise specified)

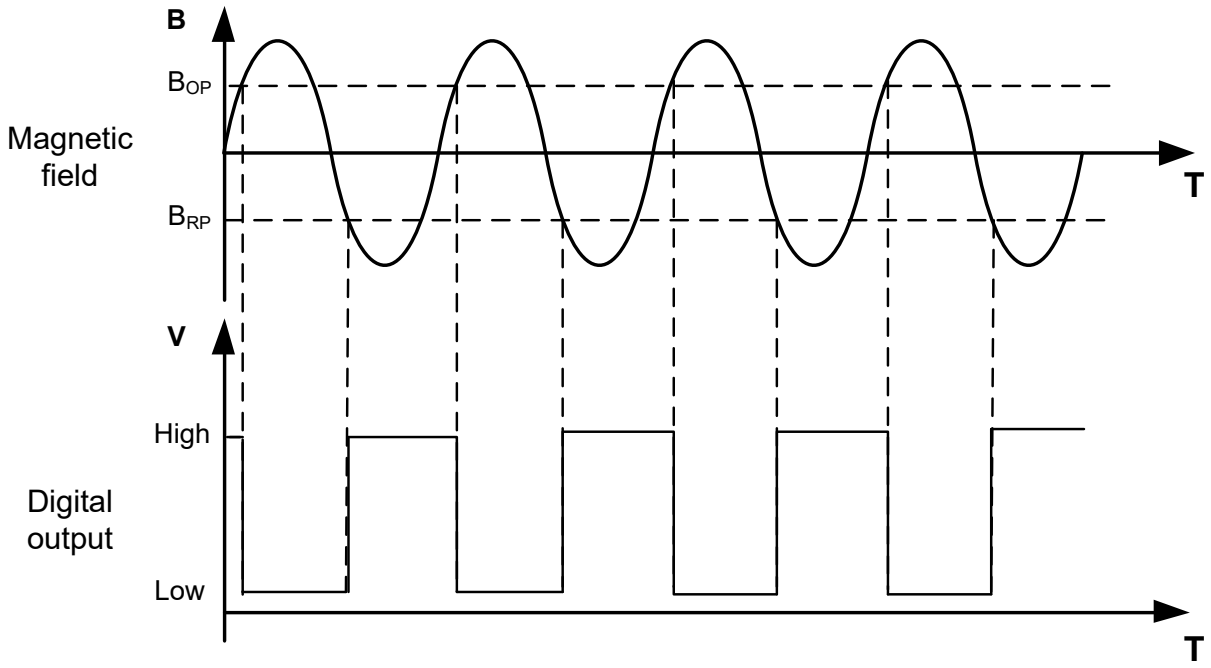
Symbol	Parameter	Test Condition	Min	Typ	Max	Units
V_S	Supply Voltage	Operating	2.8	-	24	V
I_S	Supply Current	B< B_{RP}	0.5	-	3	mA
V_{DSON}	Output Saturation Voltage	I_{OUT}=10mA, B> B_{OP}	-	-	0.4	V
I_{OFF}	Output Leakage Current	B< B_{RP}, V_{OUT}=24V	-	-	10	μA
T_R	Output Rise Time	RL=1KOhm,CL=20pF	-	-	1.0	μs
T_F	Output Fall Time	RL=1KOhm,CL=20pF	-	-	1.0	μs
T_{PO}	Power-On Time	V_S>2.8V,B<B_{RP}(min)-100G, B>B_{OP}(max)+10G	-	-	25	μs
F_{SW}	Maximum Switching Frequency		20	-	-	KHz
R_{TH}	SOT-23 Package Thermal Resistance		-	301	-	℃/W
	TO-92 Package Thermal Resistance		-	230	-	℃/W
	SOT-89B Package Thermal Resistance		-	230	-	℃/W
B_{OP}	Magnetic Operating Point	T_A =25℃	5	20	40	Gauss
B_{RP}	Magnetic Release Point	T_A =25℃	-40	-20	-5	Gauss
B_{HYST}	Hysteresis Window	T_A =25℃, | B_{OP}-B_{RP} |	10	40	80	Gauss

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Typical Application Circuit Note: RL recommend 1KOhm to 10KOhm



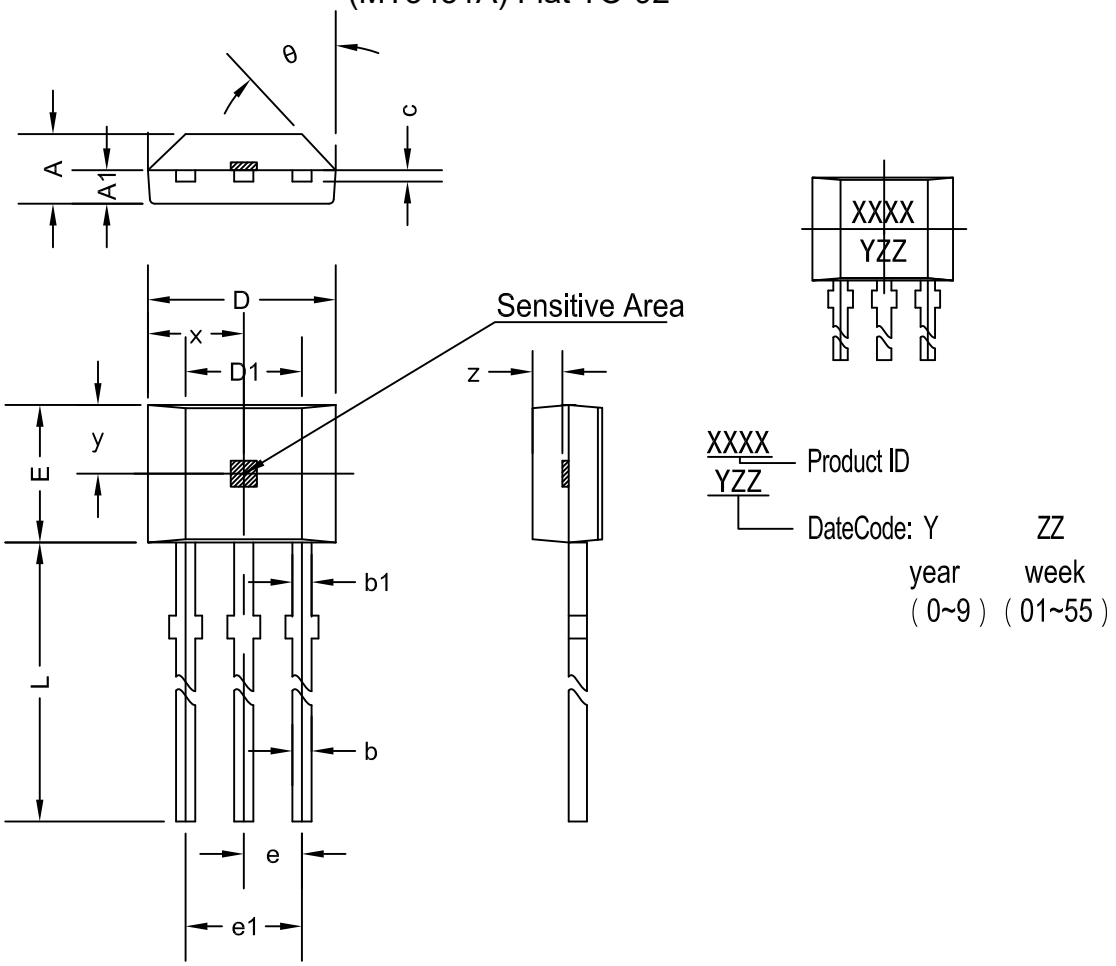
Typical Output Waveform



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PACKAGE DESIGNATOR

(MT3451A) Flat TO-92

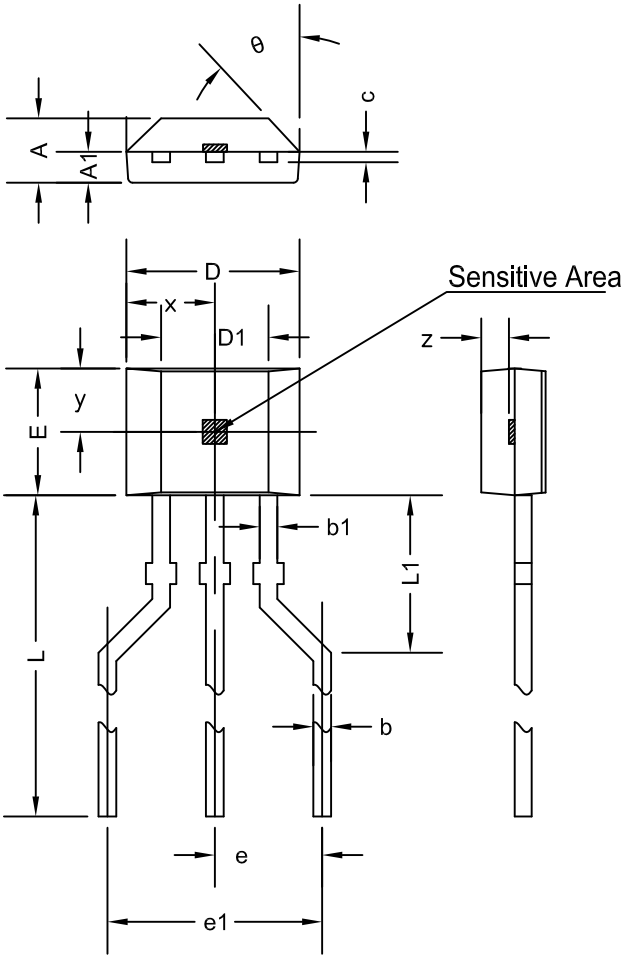


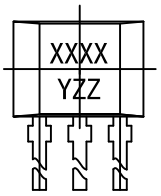
Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.670	0.056	0.066
A1	0.660	0.860	0.026	0.034
b	0.350	0.560	0.014	0.022
b1	0.400	0.550	0.016	0.022
C	0.360	0.510	0.014	0.020
D	3.900	4.200	0.154	0.165
D1	2.970	3.270	0.117	0.129
E	2.900	3.280	0.114	0.129
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	13.500	15.500	0.531	0.610
x	2.025TYP		0.080TYP	
y	1.545TYP		0.061TYP	
z	0.500TYP		0.020TYP	
θ	45˚TYP		45˚TYP	

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PACKAGE DESIGNATOR

(MT3451A-T) Flat TO-92 Radial Lead





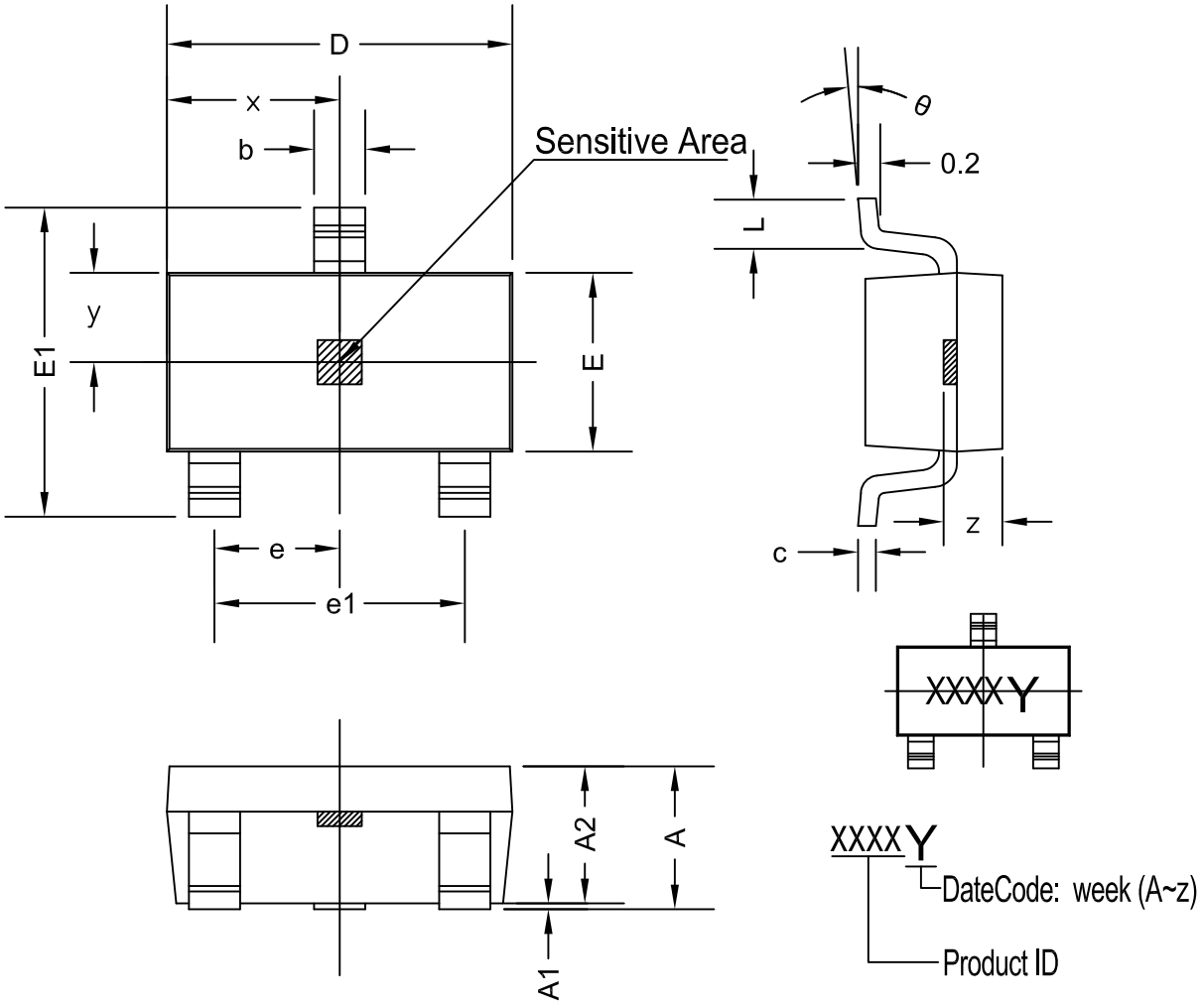
XXXX — Product ID

YZZ — DateCode: Y (year, 0~9) ZZ (week, 01~55)

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.670	0.056	0.066
A1	0.660	0.860	0.026	0.034
b	0.350	0.560	0.014	0.022
b1	0.400	0.550	0.016	0.022
c	0.360	0.510	0.014	0.020
D	3.900	4.200	0.154	0.165
D1	2.970	3.270	0.117	0.129
E	2.900	3.280	0.114	0.129
e	2.540TYP		0.100TYP	
e1	5.080TYP		0.200TYP	
L	14.300REF		0.563REF	
L1	2.150REF		0.085REF	
x	2.025TYP		0.080TYP	
y	1.545TYP		0.061TYP	
z	0.500TYP		0.020TYP	
θ	45°TYP		45°TYP	

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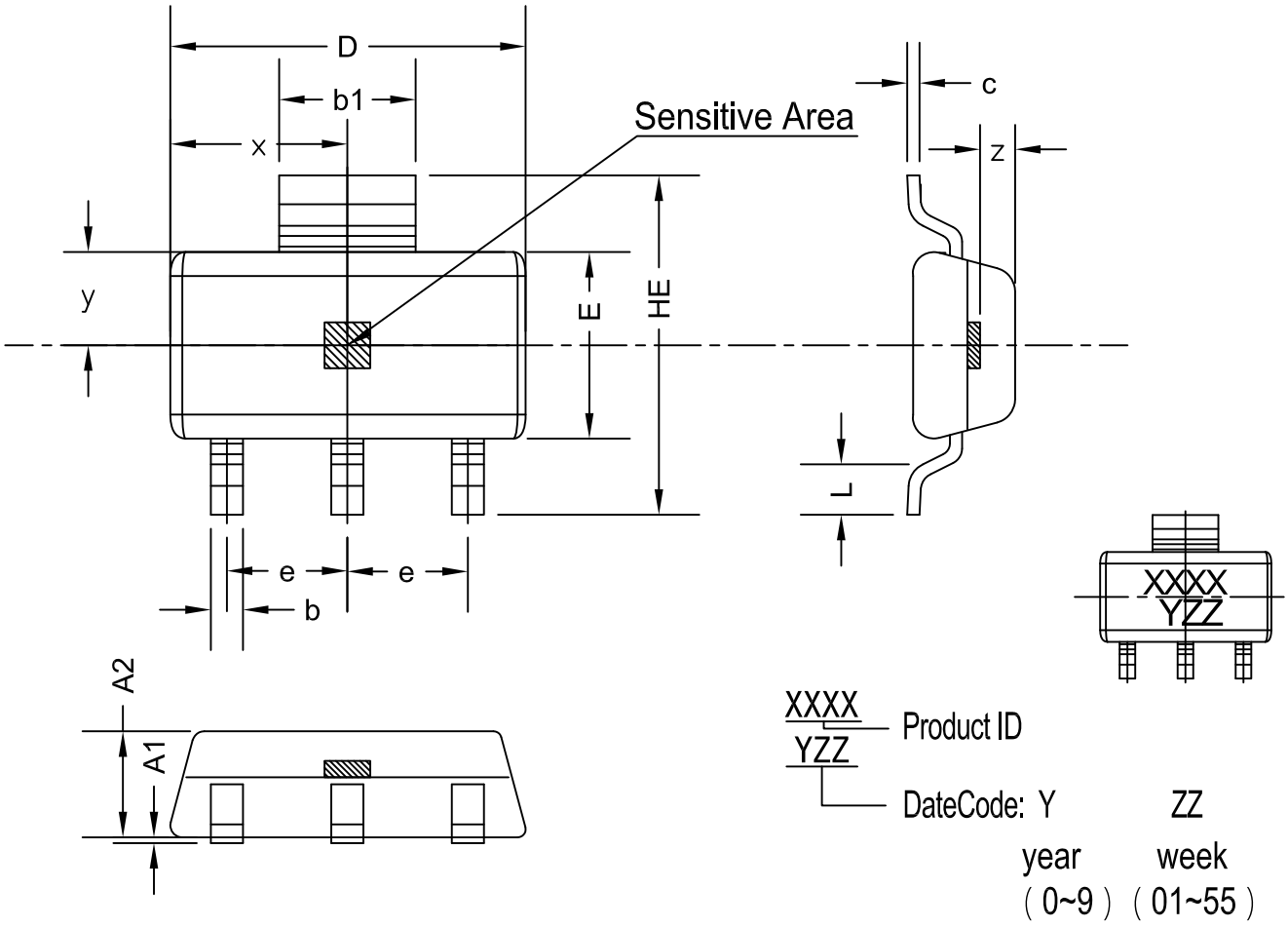
PACKAGE DESIGNATOR
(MT3451AT) SOT-23



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0. 100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
x	1.460TYP		0.057TYP	
y	0.800TYP		0.032TYP	
z	0.600TYP		0.024TYP	
θ	0˚	8˚	0˚	8˚

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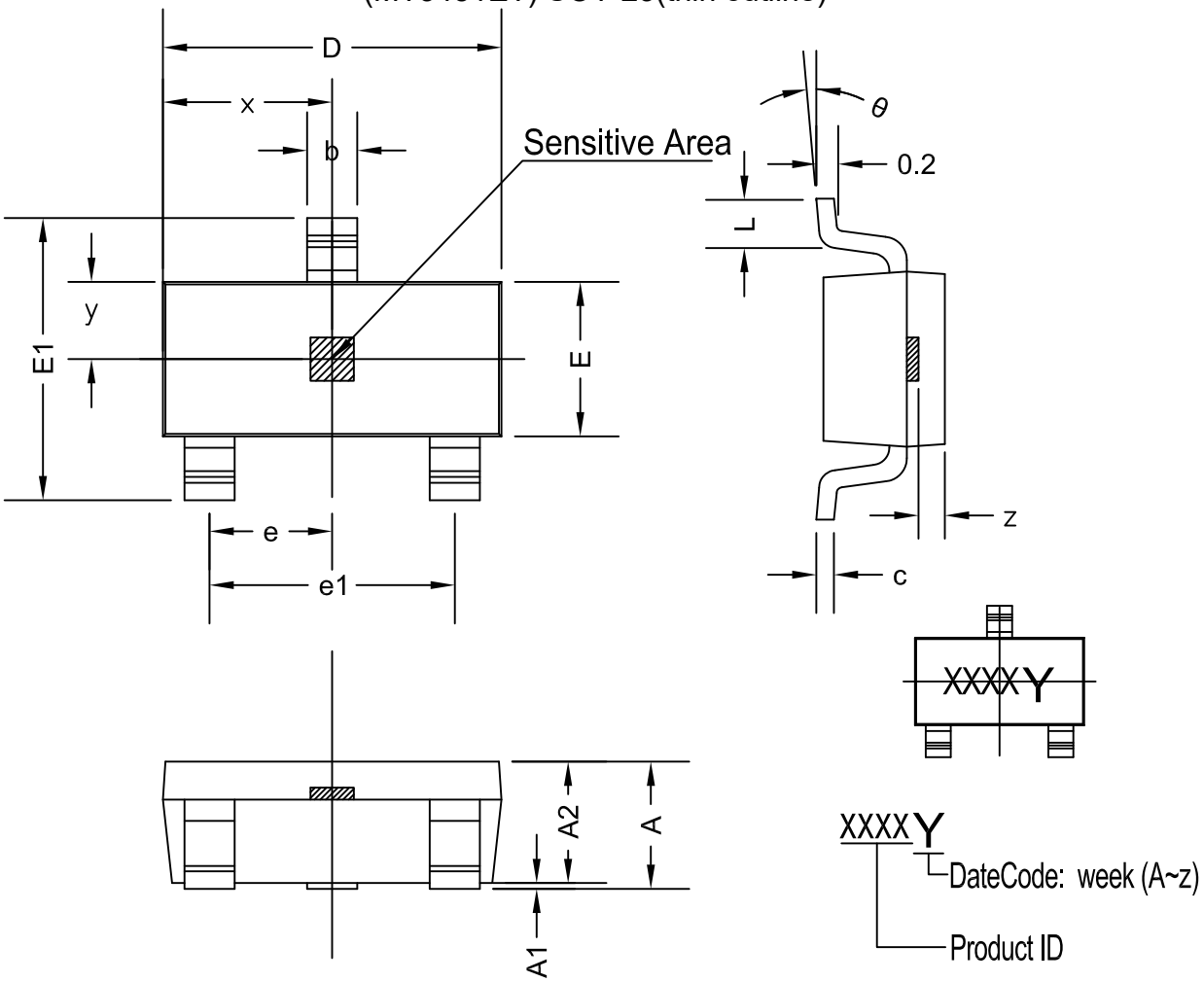
PACKAGE DESIGNATOR
(MT3451BT) SOT-89B



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A1	0.000	0.100	0.000	0.004
A2	1.220	1.420	0.048	0.056
b	0.300	0.500	0.012	0.020
b1	1.600	1.800	0.063	0.070
D	4.400	4.600	0.173	0.181
c	1.152 REF		0.045 REF	
E	2.400	2.600	0.094	0.102
HE	4.000	4.400	0.157	0.173
e	1.500 TYP		0.060 TYP	
L	0.350	0.550	0.014	0.022
x	2.250TYP		0.089TYP	
y	1.250TYP		0.049TYP	
z	0.300TYP		0.012TYP	

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PACKAGE DESIGNATOR
(MT3451ET) SOT-23(thin outline)

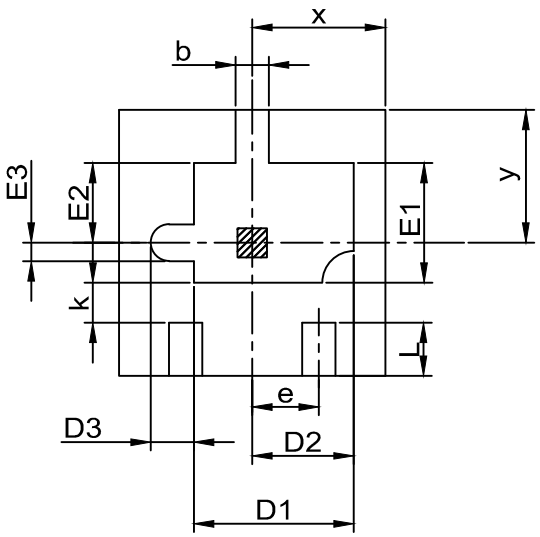


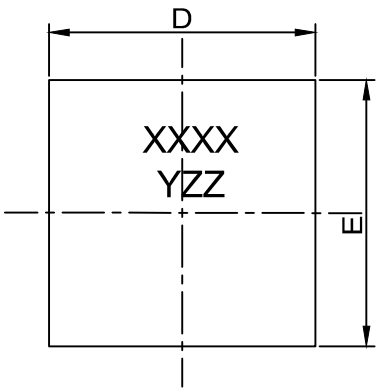
Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0. 080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550REF		0.022REF	
x	1.460TYP		0.057TYP	
y	0.650TYP		0.026 TYP	
z	0.500TYP		0.020TYP	
θ	0˚	8˚	0˚	8˚

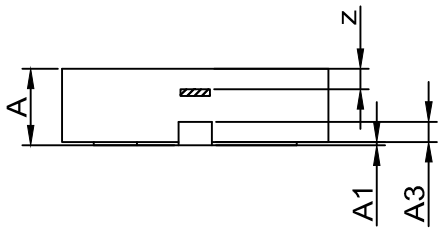
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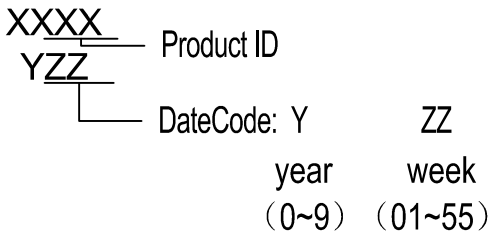
PACKAGE DESIGNATOR

(MT3451DT) DFNWB2*2-3L-B









Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.450/0.550	0.550/0.650	0.018/0.022	0.022/0.026
A1	0.000	0.050	0.000	0.002
A3	1.152REF		0.006REF	
D	1.924	2.076	0.076	0.082
E	1.924	2.076	0.076	0.082
D1	1.100	1.300	0.043	0.051
D2	0.763REF		0.030REF	
D3	0.325REF		0.013REF	
E1	0.800	1.000	0.031	0.039
E2	0.600REF		0.024REF	
E3	0.138REF		0.005REF	
k	0.200MIN		0.008MIN	
b	0.200	0.300	0.008	0.012
e	0.500TYP		0.020TYP	
L	0.324	0.476	0.013	0.019
x	0.150/0.183	0.183/0.217	0.006/0.007	0.007/0.009
y	0.962	1.038	0.038	0.041
z	0.962	1.038	0.038	0.041

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