

Features and Benefits

- **Bipolar Technology**
- **Magnetic Type: Latch**
- **Wide Operating Voltage Range:**
Supply Voltage 3.5~60V
- **Specified Operating Temperature Range:**
From -40°C~150°C
- **Magnetic Sensitivity**
 $B_{OP}=50\text{Gauss}$, $B_{RP}=-50\text{Gauss}$ (typical)
- **Lead Free Package**
Flat TO-92, SOT-23, SOT-89B
- **Open Collector Output**
- **RoHS Compliant**
2011/65/EU

Applications

- BLDC communication for E-Bike
- BLDC communication for E-Motorcycle

Family Members

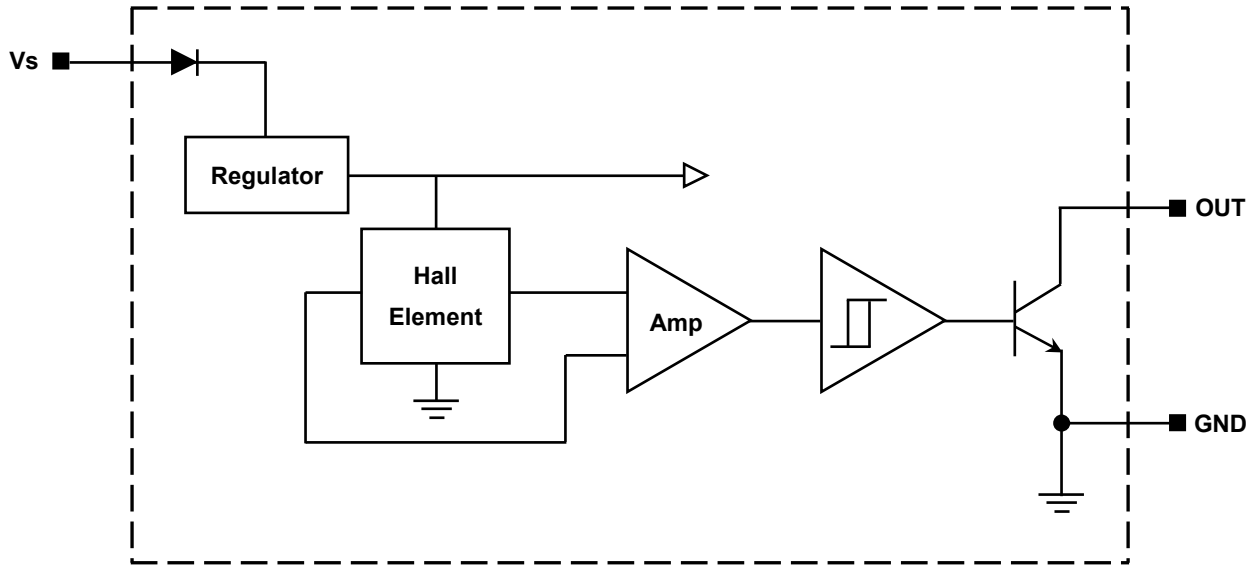
Part number	Description
MT4451A	Flat TO-92 package, bulk packaging (1000pcs/bag)
MT4451LA	Flat TO-92 package, long lead, bulk packaging (1000pcs/bag)
MT4451A-T	Flat TO-92 package, radial lead, bulk packaging (1000pcs/bag)
MT4451AT	SOT-23 package, tape and reel packaging (3000pcs/bag)
MT4451BT	SOT-89B package, tape and reel packaging (1000pcs/bag)
MT4451ET	SOT-23(thin outline) package, tape and reel packaging (3000pcs/bag)

General Description

The MT4451 family, produced with Bipolar technology. The Hall IC internally includes an on-chip Hall voltage generator, a voltage regulator for operation with supply voltages of 3.5 to 60V, reverse protection diode, temperature compensation circuitry, small-signal amplifier, Schmitt trigger and an open-collector output.

They are designed to respond to alternating North and South poles. While the magnetic flux density(B) is larger than operate point (B_{OP}), the output will be turned on (Low), the output is held until the magnetic flux density(B) is lower than release point (B_{RP}), then turn off (High).

The MT4451 family provides a variety of packages to customers: SOT-23/SOT-89B for surface mount and flat TO-92 for through-hole mount. All packages are RoHS compliant.



Functional Block Diagram

Function Description

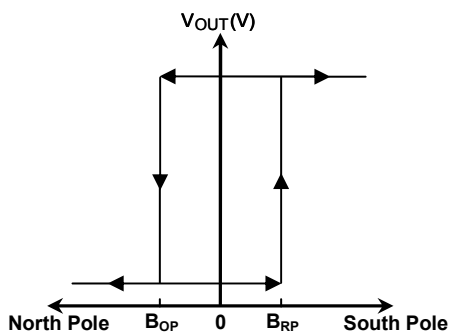
Definition of Magnetic Parameters

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

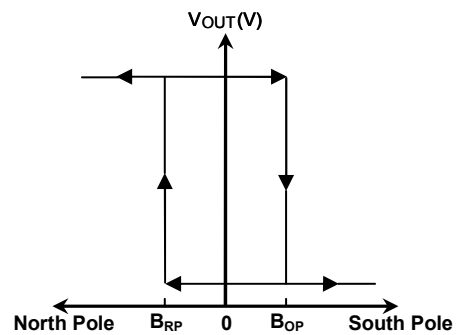
B_{RP} : Release Point, Magnetic flux density applied on the branded side of the package which turns the output driver OFF ($V_{OUT}=High$)

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

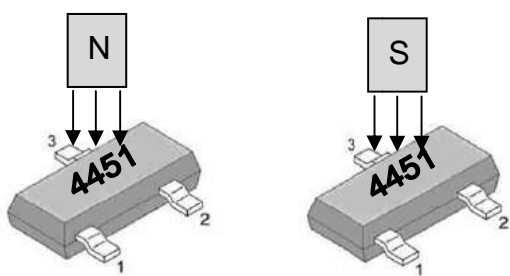
Definition of Switching Function



Switching Behavior of AT



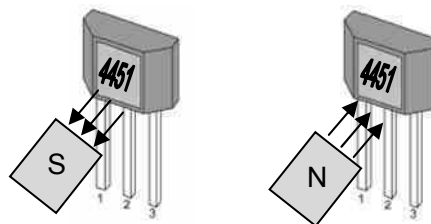
Switching Behavior of A, BT and ET



OUT=Low

OUT=High

Switching Point of AT

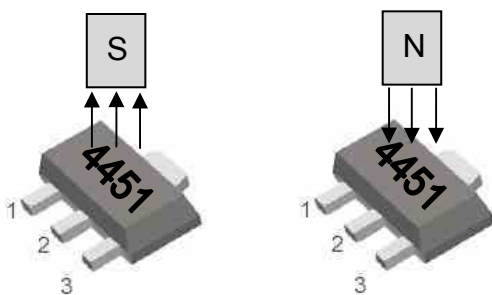


OUT=Low

OUT=High

Switching Point of A

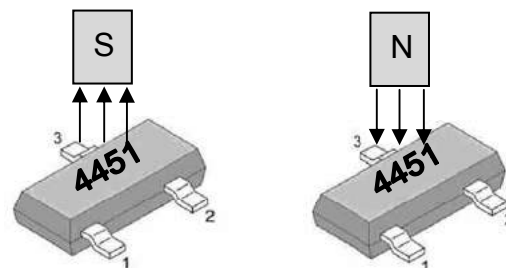
Motion



OUT=Low

OUT=High

Switching Point of BT



OUT=Low

OUT=High

Switching Point of ET

Motion

Note: Direction of magnetic flux

Pin Description

MT4451AT

Name	Number	Description
Vs	1	Power
GND	3	Ground
OUT	2	Open-Collector output

MT4451A (MT4451LA MT4451A-T)

Name	Number	Description
Vs	1	Power
GND	2	Ground
OUT	3	Open-Collector output

MT4451BT

Name	Number	Description
Vs	1	Power
GND	2	Ground
OUT	3	Open-Collector output

MT4451ET

Name	Number	Description
Vs	1	Power
GND	3	Ground
OUT	2	Open-Collector output

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.

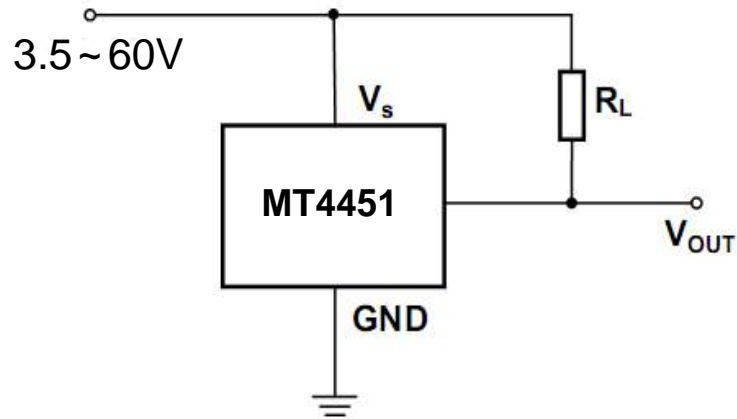
Symbol	Parameters	Min	Max	Units
V _S	Supply Voltage	-	80	V
V _{RCC}	Reverse Battery Voltage	-	-80	V
V _{OUT}	Output Voltage	-	80	V
I _{OUT}	Continuous output current	-	20	mA
T _A	Operating Ambient Temperature	-40	150	°C
T _S	Storage temperature	-50	150	°C
T _J	Junction temperature	-	165	°C
B	Magnetic flux	No Limit		Gauss

MT4451 Series Specifications

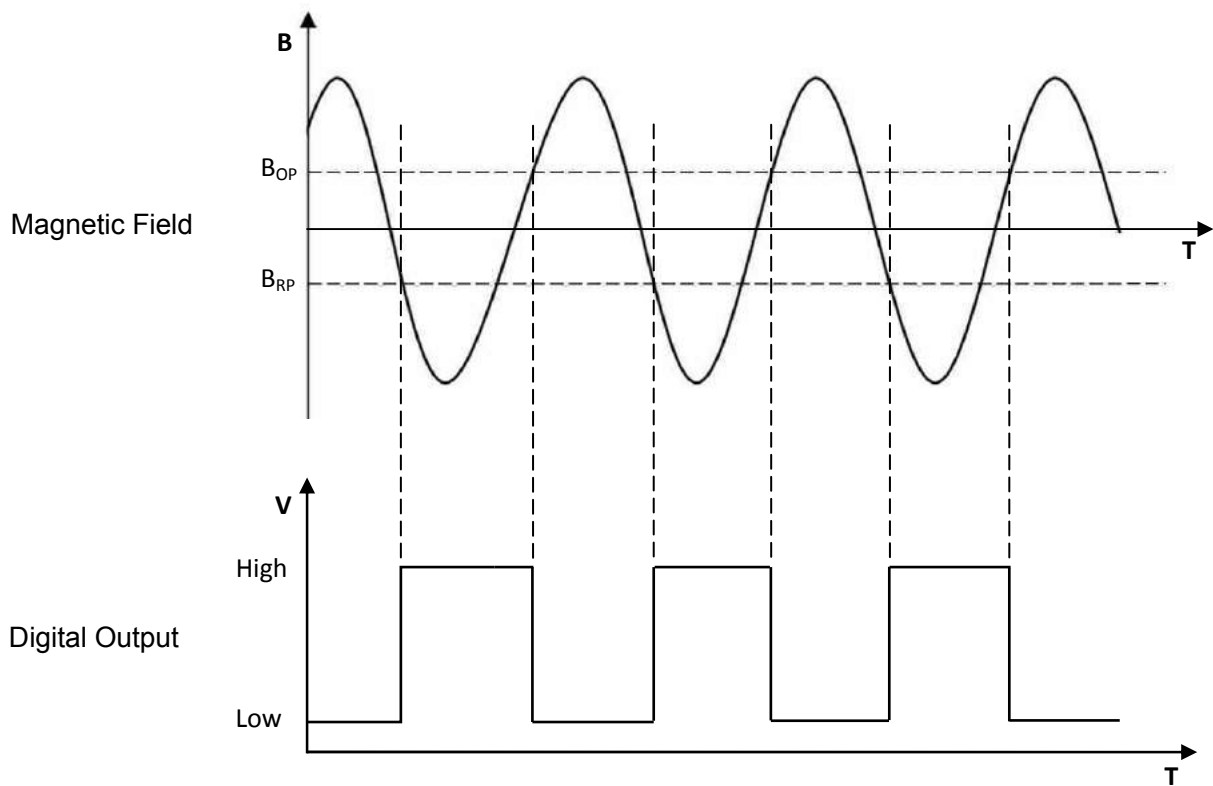
At T_A = -40°C to 150°C, V_S = 3.5V to 60V (unless otherwise specified)

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
V _S	Supply Voltage	Operating	3.5	-	60	V
I _S	Supply Current	B < B _{RP}	-	4	10	mA
V _{SON}	Output Saturation Voltage	I _{OUT} = 10mA, B > B _{OP}	-	-	0.4	V
I _{OFF}	Output Leakage Current	B < B _{RP} , V _{OUT} = 60V	-	-	10	µA
T _R	Output Rise Time	R _L = 1KOhm, C _L = 20pF	-	-	1.5	µs
T _F	Output Fall Time	R _L = 1KOhm, C _L = 20pF	-	-	1.5	µs
F _{SW}	Maximum Switching Frequency		100	-	-	KHz
R _{TH}	SOT-23 Package Thermal Resistance		-	301	-	°C/W
	TO-92 Package Thermal Resistance		-	230	-	°C/W
	SOT-89B Package Thermal Resistance		-	230	-	°C/W
B _{OP}	Magnetic Operating Point	At T _A = 25°C	5	50	100	Gauss
B _{RP}	Magnetic Release Point	At T _A = 25°C	-100	-50	-5	Gauss
B _{HYST}	Hysteresis Window	At T _A = 25°C, B _{OP} - B _{RP}	70	100	130	Gauss

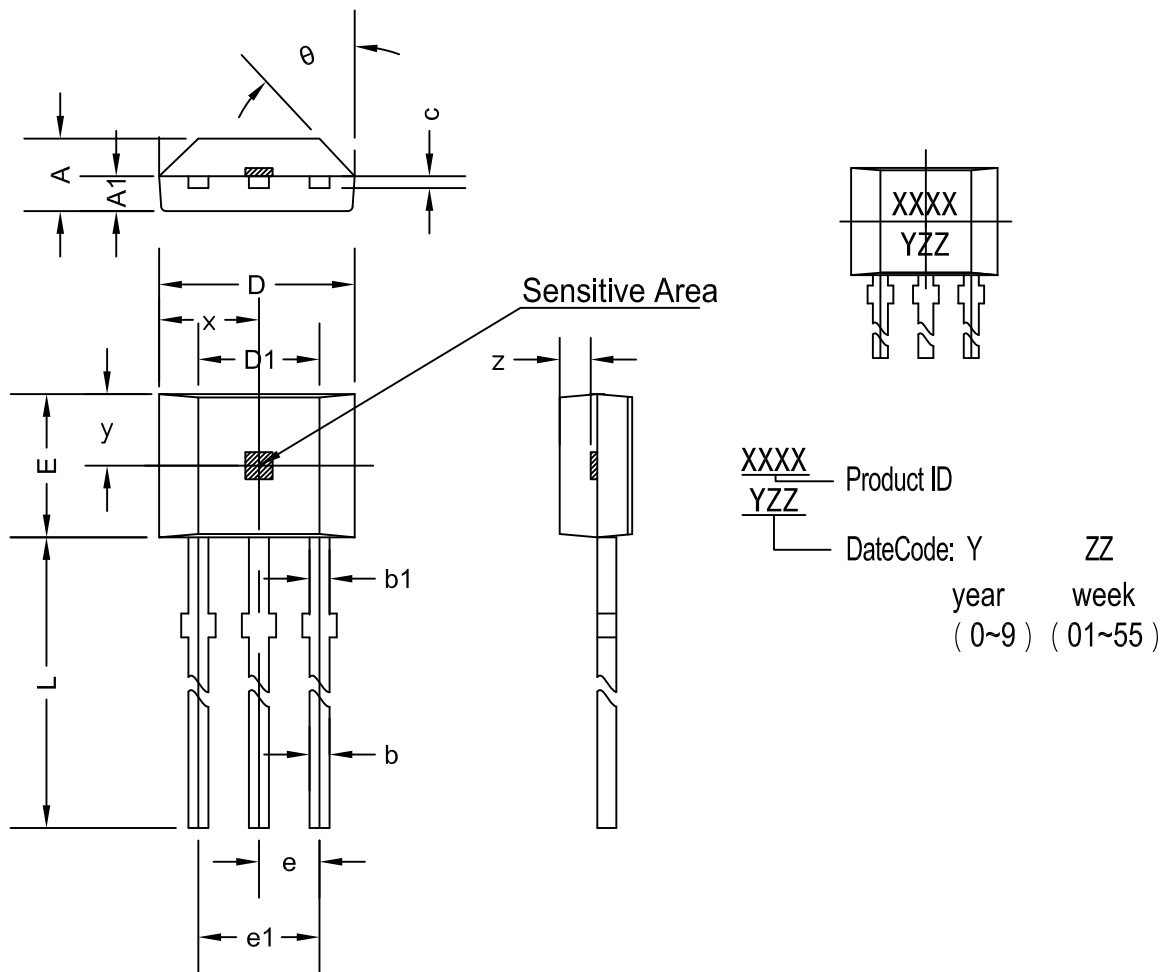
Typical Application Circuit Note: R_L recommend 1KOhm to 10KOhm



Typical Output Waveform (The TO-92 package as an example)



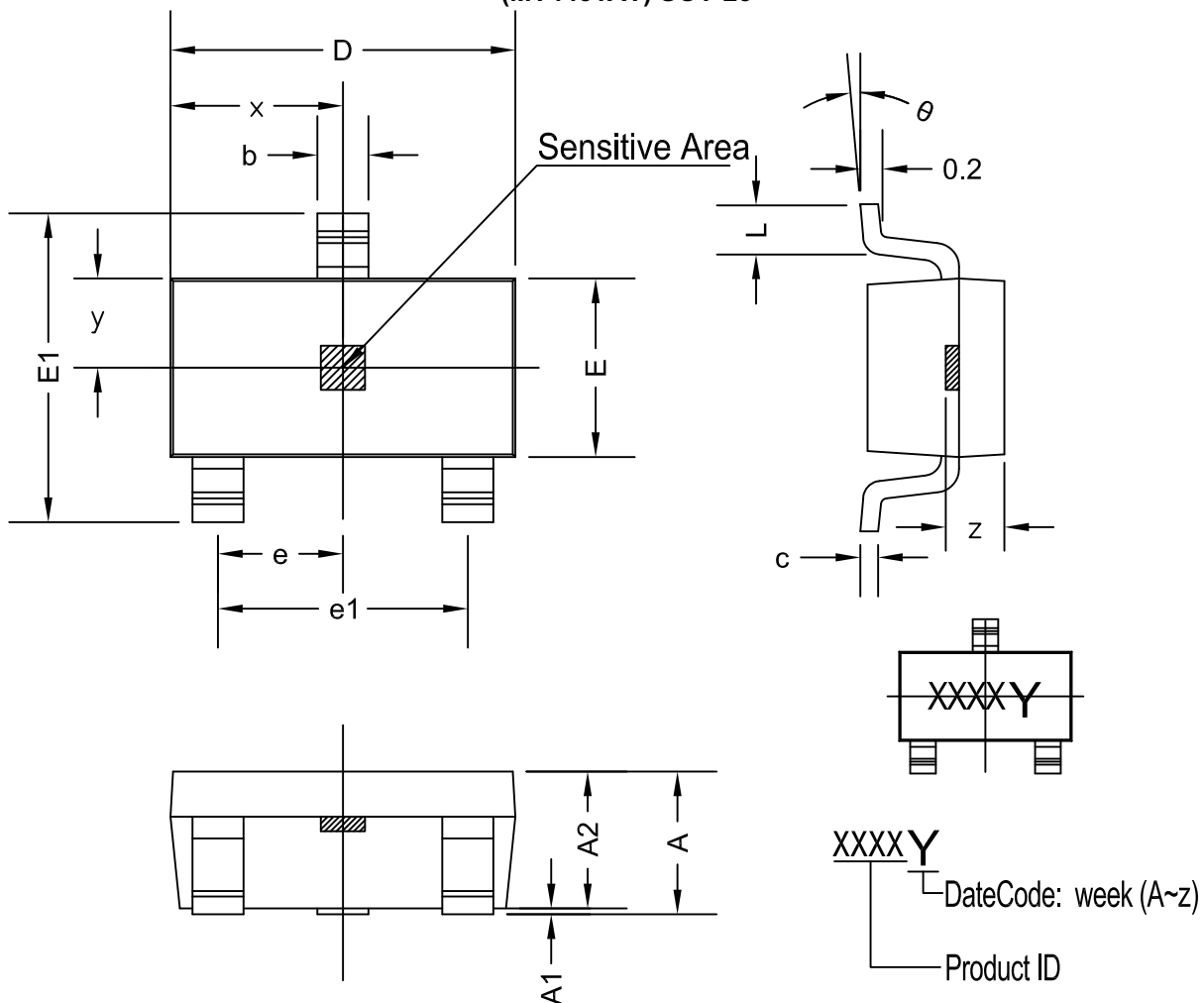
PACKAGE DESIGNATOR (MT4451A MT4451LA) Flat TO-92



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(A)	13.500	15.500	0.531	0.610
L(LA)	15.500	16.200	0.610	0.638
x	2.025TYP		0.080TYP	
y	1.545TYP		0.061TYP	
z	0.500TYP		0.020TYP	
θ	45°TYP		45°TYP	

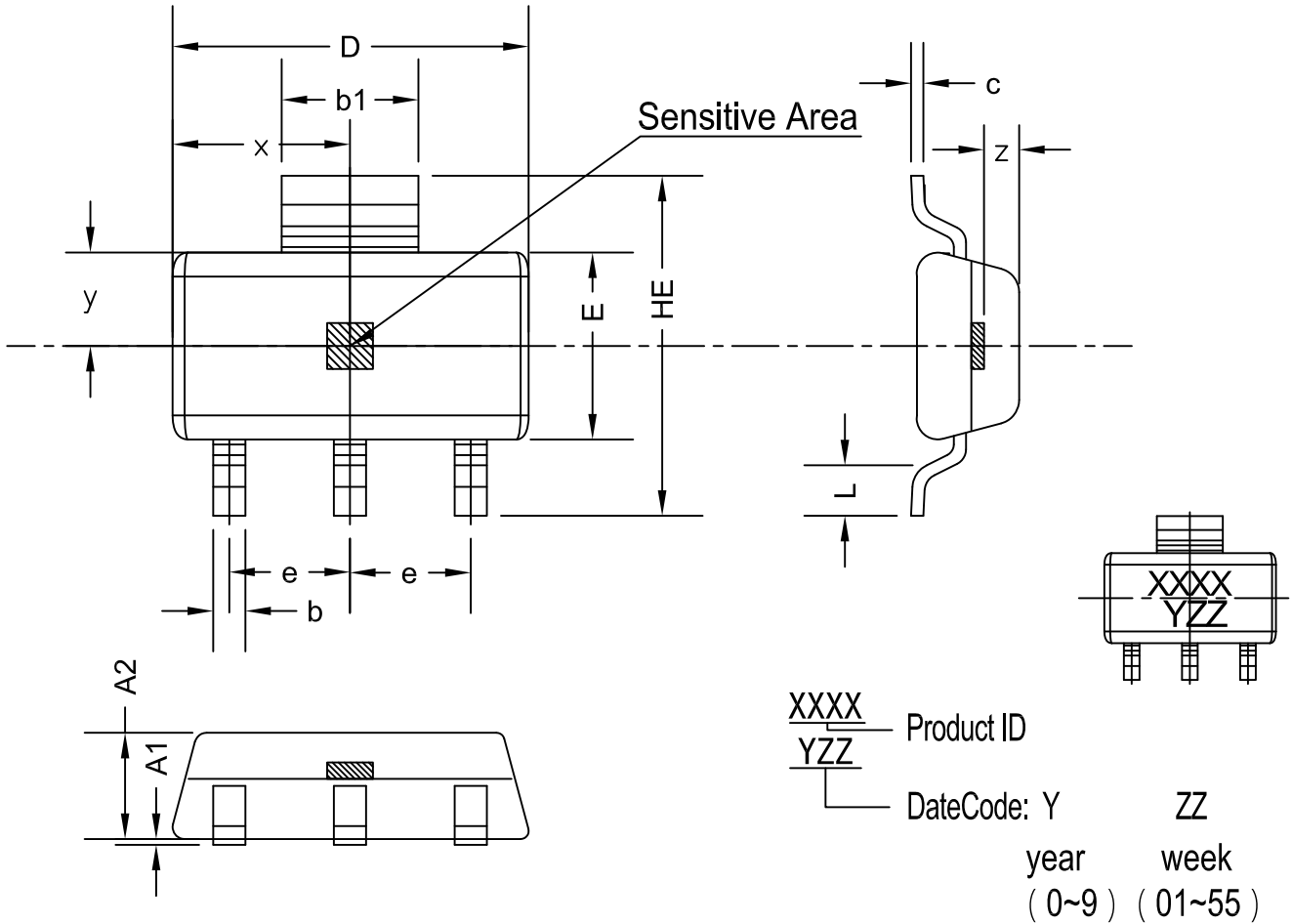
PACKAGE DESIGNATOR

(MT4451AT) SOT-23



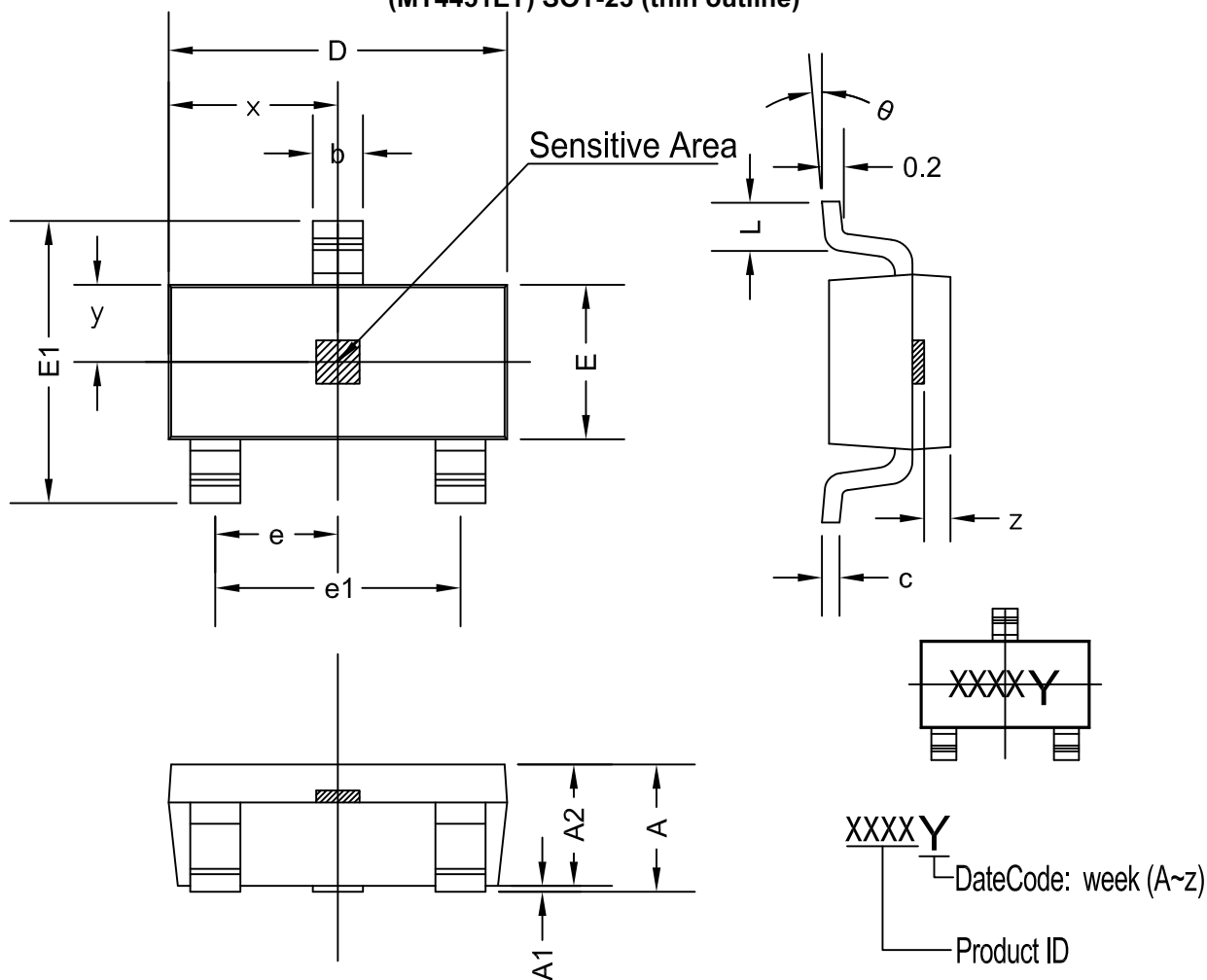
Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 TYP		0.037 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°

PACKAGE DESIGNATOR (MT4451BT) 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	

PACKAGE DESIGNATOR (MT4451ET) 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°