MT3303-EN Series

High Voltage Omni-polar Hall-Effect Sensors

Features and Benefits

- **BiCMOS Technology**
- **Wide Operating Voltage Range:** Supply Voltage 2.8~24V
- **Specified Operating Temperature Range:** From -40℃~150℃
- **Low Operating Current:** 2.3mA
- **Lead Free Package** Flat TO-92, SOT-23
- **Open Drain Output**
- **Reverse Battery Protection**
- **RoHS Compliant:**2011/65/EU

Applications

- **Solid-state Switch**
- **Speed Detection**
- **Angular Position Detection**
- **Proximity Detection**

Family Members

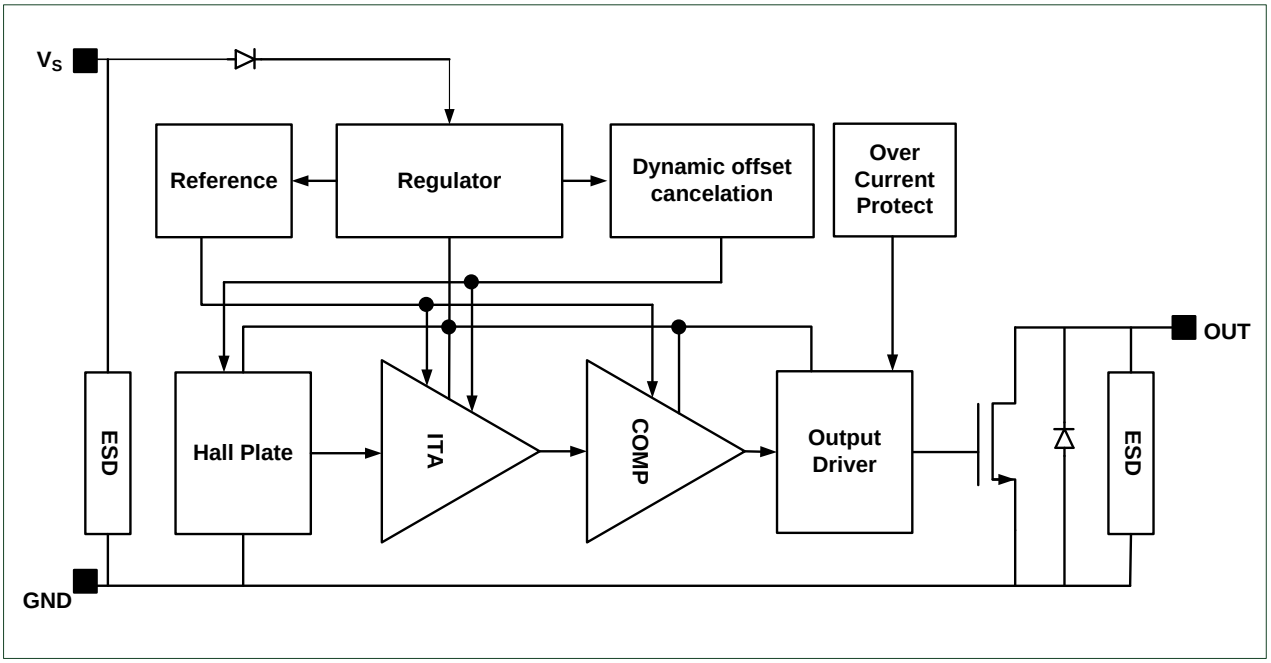
Part number	Description
MT3303A-EN	Flat TO-92 package, bulk packaging (1000pcs/bag)
MT3303AT-EN	SOT-23 package, tape and reel packaging(3000pcs/bag)

General Description

The MT3303-EN family are Hall-effect omni-polar switch designed in mixed-signal technology. The Hall IC internally includes a voltage regulator for operation with supply voltage of 2.8 to 24V, a dynamic offset cancellation system, a Schmitt trigger and an open-drain output driver, all in a single package.

As to its wide operating voltage range and extended choice of temperature range, it is quite suitable for use in automotive, industrial and consumer applications. It also includes an anti-reverse bias block to prevent from reverse bias condition.

MT3303-EN series provide a variety of packages to customers: SOT-23 for surface mount and flat TO-92 for through-hole mount. All packages are RoHS compliant.



Functional Block Diagram

Function Description

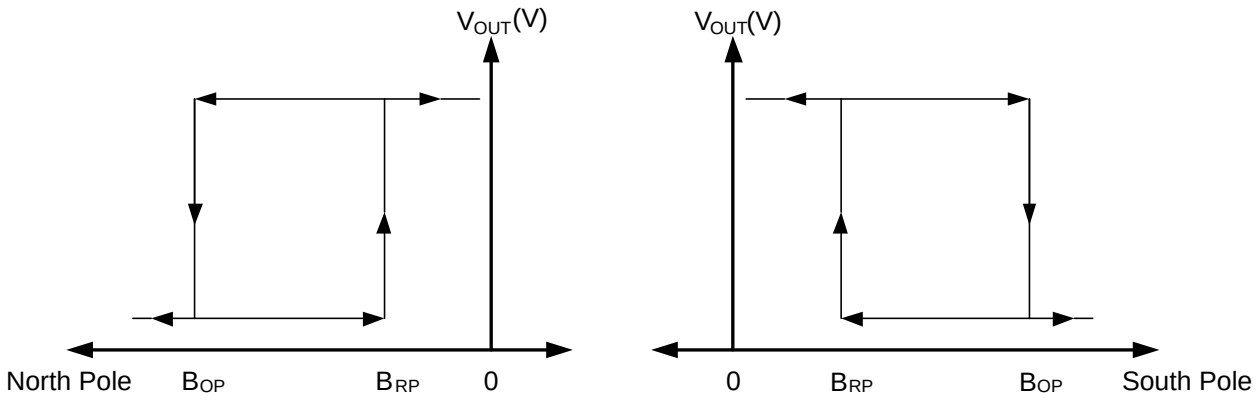
Definition of Magnetic Parameters

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)

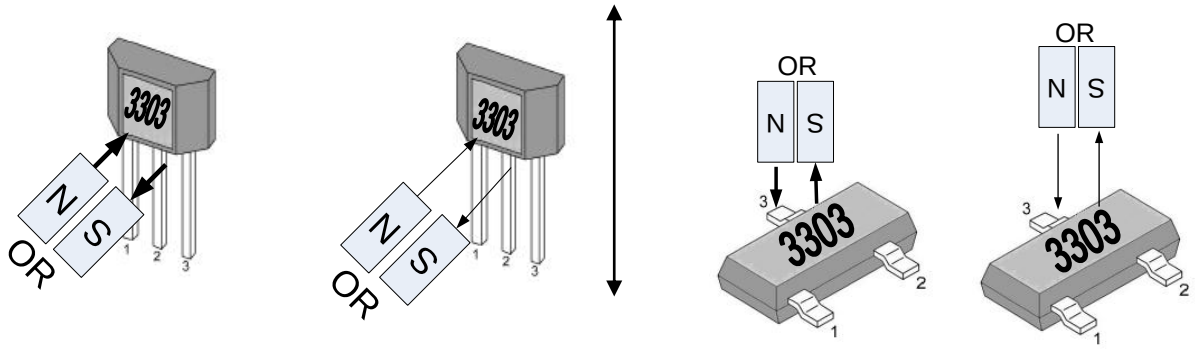
B_{HYST}: Hysteresis Window, $|B_{OP}-B_{RP}|$

Definition of Switching Function



Switching Behavior

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OUT=Low OUT=High OUT=Low OUT=High

Switching point of A Switching point of AT

Note: ⇄ Direction of magnetic flux, ⟶ Close to the chip, ⟶ Far away to the chip

Pin Description

MT3303A-EN

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

MT3303AT-EN

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

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Electrical and Magnetic Characteristics

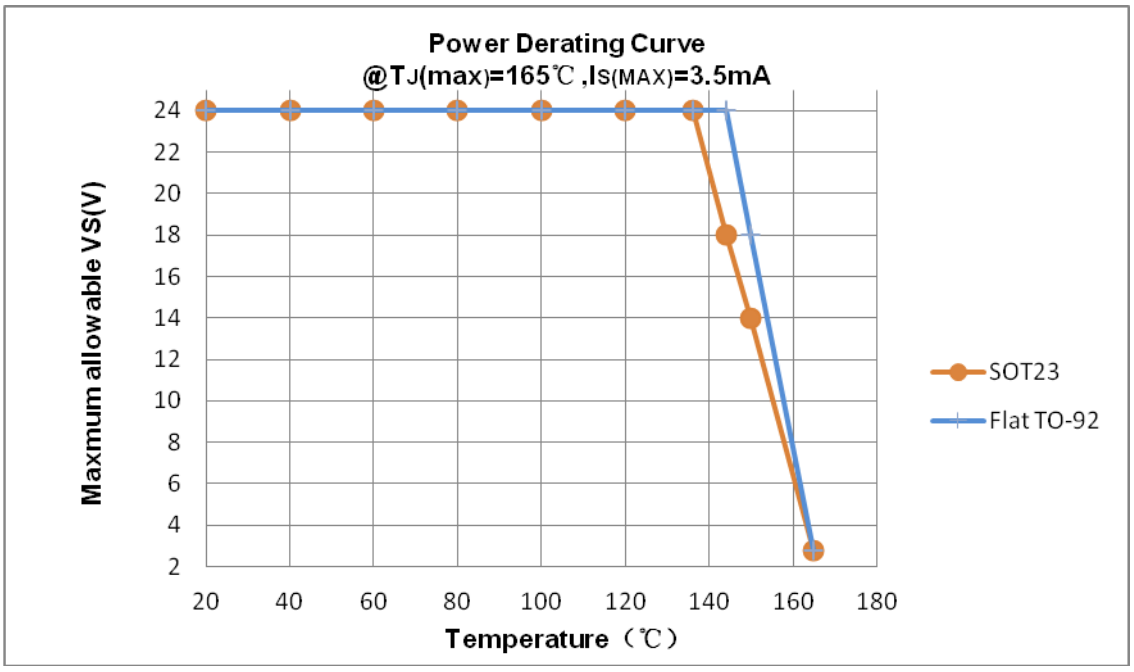
Absolute Maximum Ratings

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	-	27	V
V_{RCC}	Reverse Battery Voltage	-27	-	V
V_{OUT}	Output Voltage	-	27	V
I_{OUT}	Continuous output current	-	50	mA
T_A	Operating ambient Temperature	-40	150	℃
T_S	Storage temperature	-50	165	℃
T_J	Junction Temperature	-	165	℃
B	Magnetic Flux	No Limit		Gauss

Power derating Curve



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MT3303-EN Specifications

At T_A =-40 to150℃, 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}	1	2.3	3.5	mA
I_{OCP}	Short Circuit Protection Current	B>BOP, V_{OUT}=V_S		50		mA
V_{DSON}	Output Saturation Voltage	I_{OUT}=20mA, B> B_{OP}	-	-	0.4	V
I_{OL}	Output Leakage Current	V_{OUT}=24V, B< B_{RP}	-	-	10	μA
T_R[1,2]	Output Rise Time	R_L=1KOhm,C_L=20pF	-	-	1.0	μs
T_F[1,2]	Output Fall Time	R_L=1KOhm,C_L=20pF	-	-	1.0	μs
T_{PO}[1]	Power On Time	dV_S/dt>5V/uS, B>$B_{OP(MAX)}$	-	-	25	μs
F_C[1]	Chopping Frequency		-	200	-	KHz
R_{TH}	SOT-23 Package Thermal Resistance		-	301	-	℃/W
	TO-92 Package Thermal Resistance		-	230	-	℃/W
B_{OPS}	Magnetic Operating Point of South Pole	T_A =25℃	90	150	190	Gauss
B_{RPS}	Magnetic Release Point of South Pole		70	120	160	Gauss
B_{HYSTS}	Hysteresis Window of South Pole		10	30	50	Gauss
B_{OPN}	Magnetic Operating Point of North Pole	T_A =25℃	-190	-150	-90	Gauss
B_{RPN}	Magnetic Release Point of North Pole	T_A =25℃	-160	-120	-70	Gauss
B_{HYSTN}	Hysteresis Window of North Pole		-50	-30	-10	Gauss

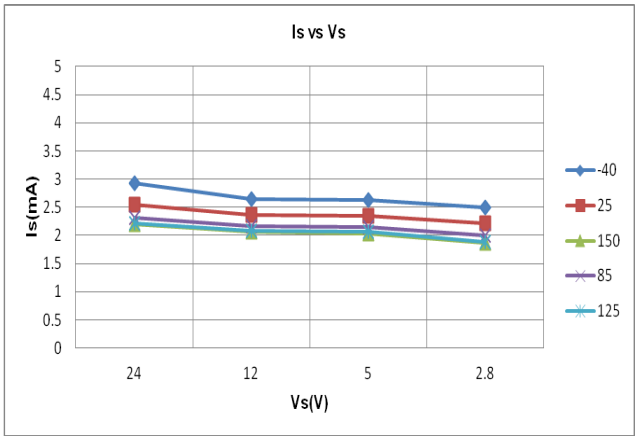
1 Guaranteed by device design and characterization.

2 CL = oscilloscope probe capacitance.

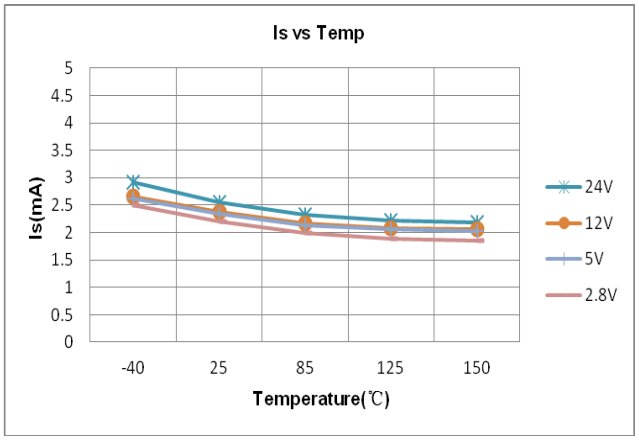
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Characteristic Performance

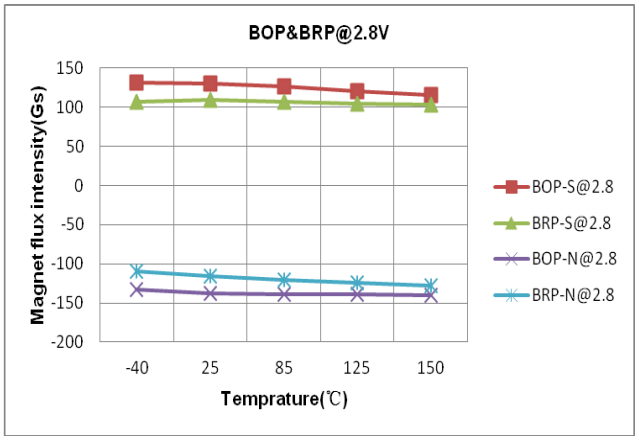
Average Supply Current versus Supply Voltage



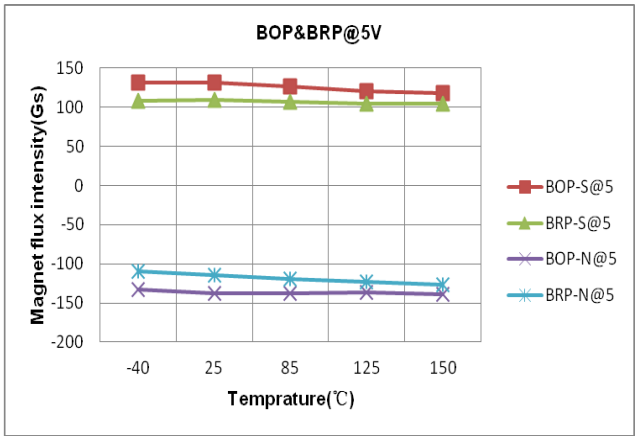
Average Supply Current versus Temperature



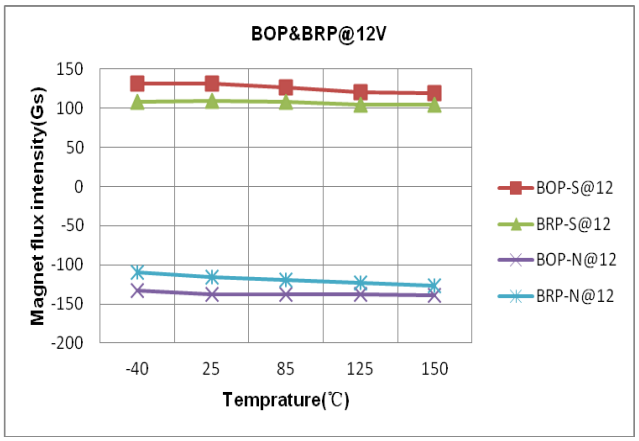
Magnetic Characteristics versus Temperature V_S=2.8V



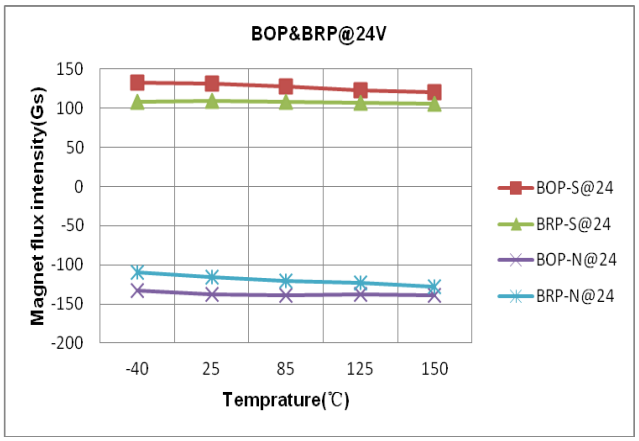
Magnetic Characteristics versus Temperature V_S=5V



Magnetic Characteristics versus Temperature V_S=12V

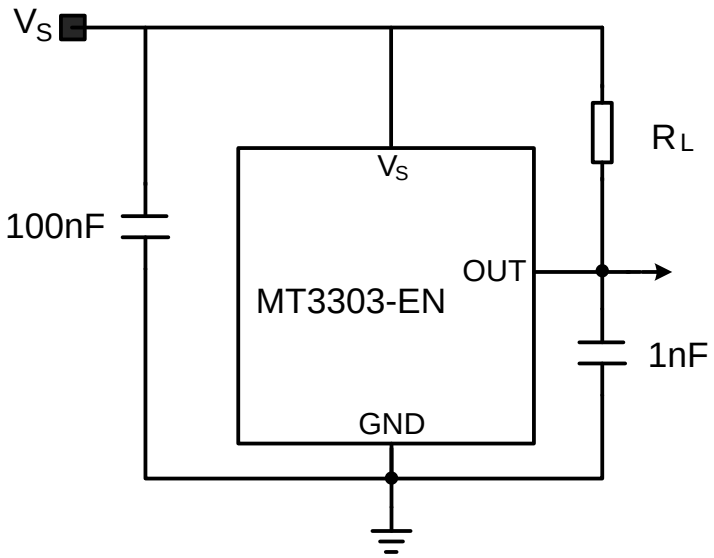


Magnetic Characteristics versus Temperature V_S=24V

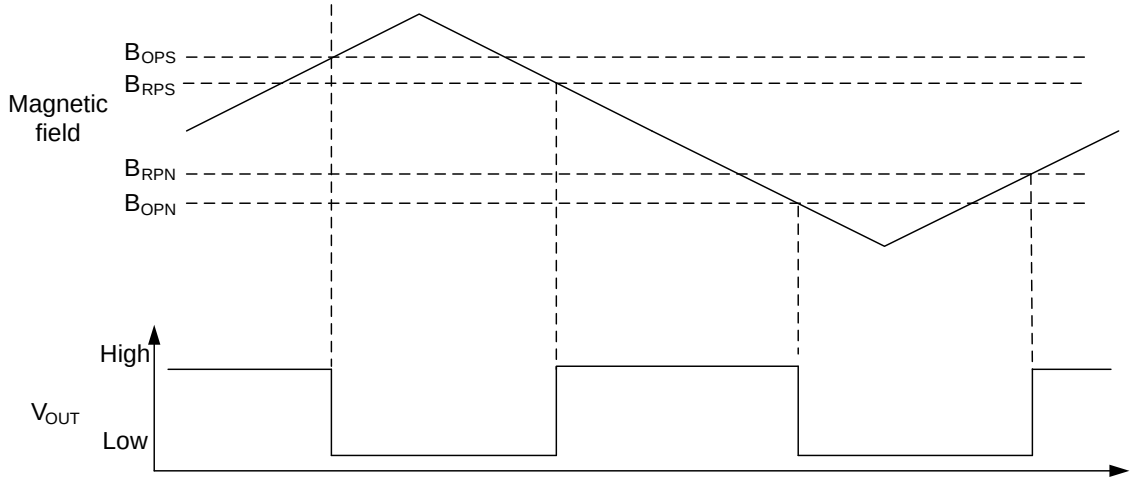


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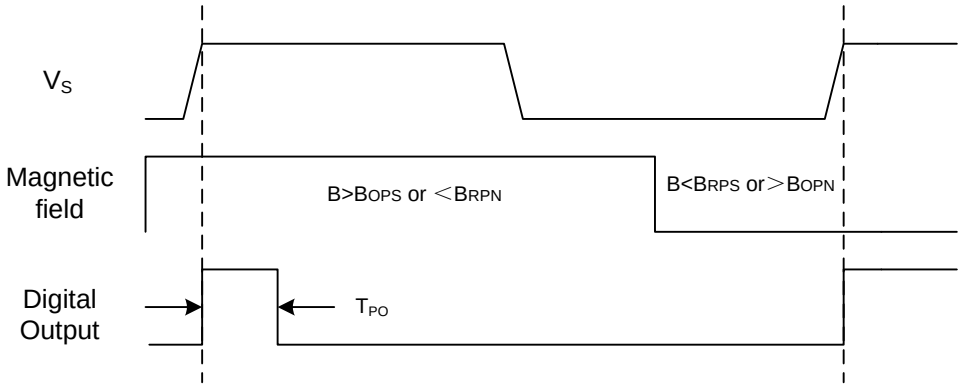
Typical Application Circuit Note: R_L recommend 1KOhm to 10KOhm



Typical Output Waveform



Power On Output Waveform (The Flat TO-92 package as an example)

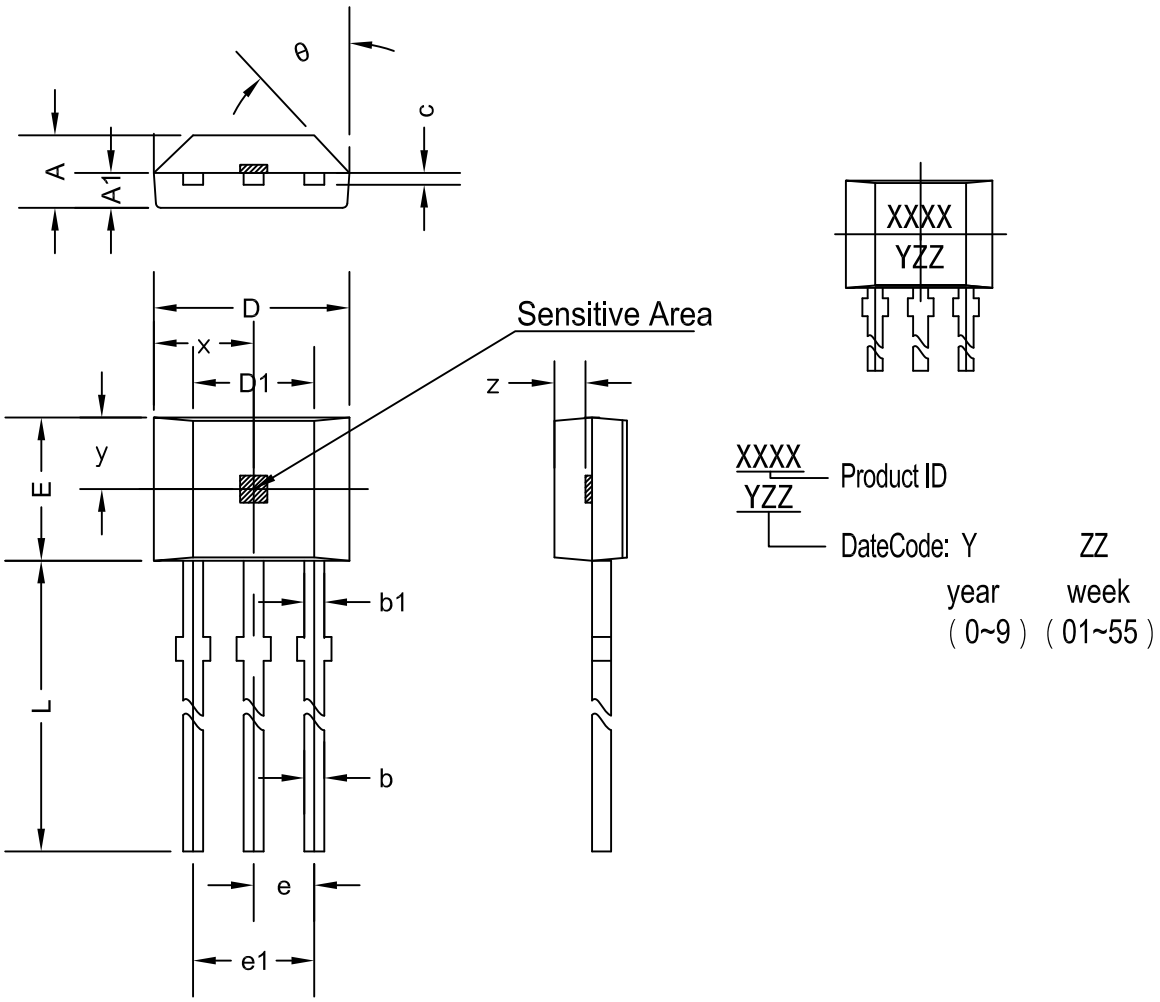


Note: Vs rise time<1us, T_{PO} is the time from Vs becoming stable to output becoming valid.

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PACKAGE DESIGNATOR

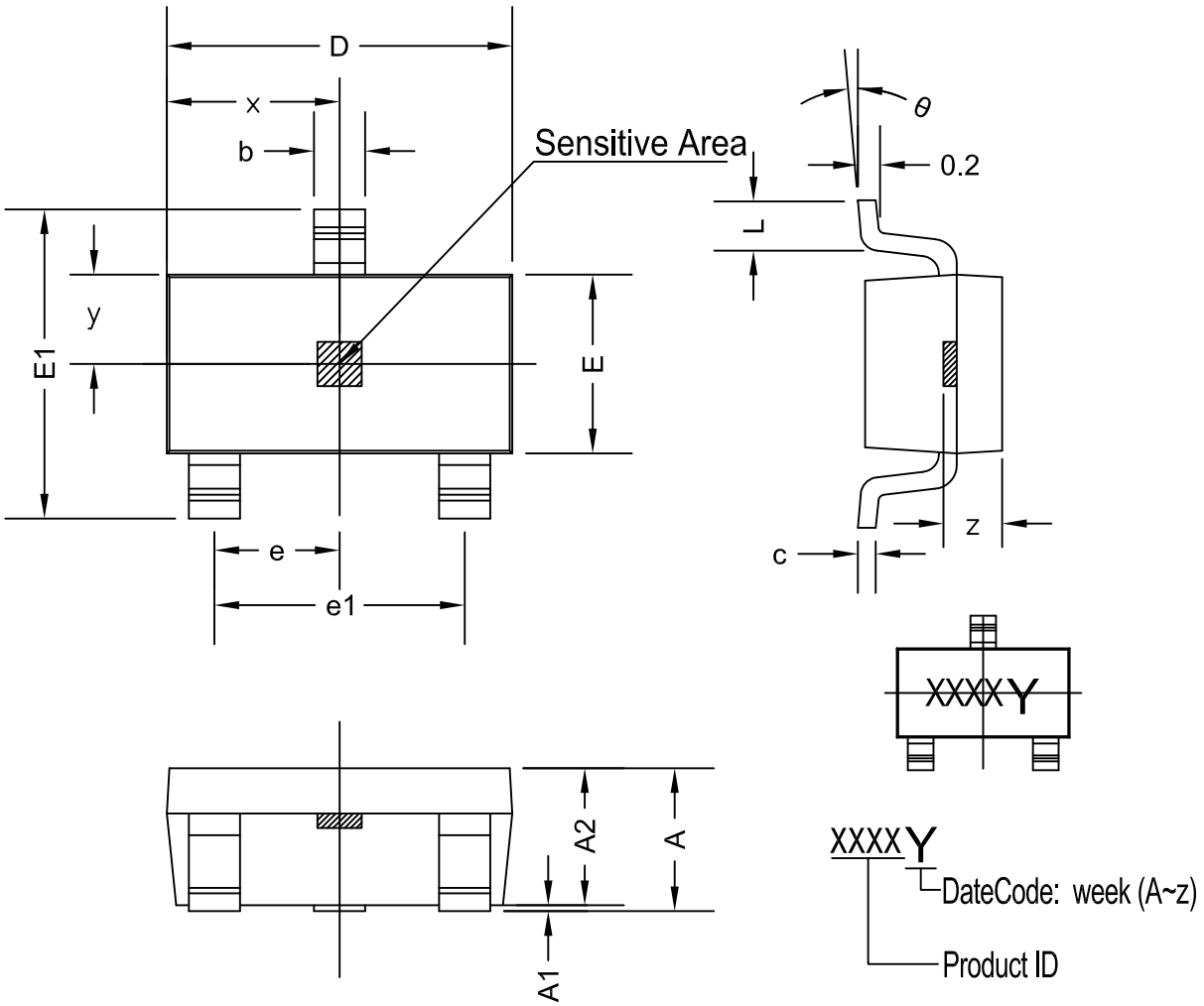
(MT3303A-EN) Flat TO-92



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
(MT3303AT-EN) 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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