

Features and Benefits

- **AEC-Q100 automotive qualified**
- **BiCMOS Technology**
- **Magnetic Type: Latch**
- **With Internal Pull Up Resistor**
- **Wide Operating Voltage Range:**
Supply Voltage 2.8~24V
- **Specified Operating Temperature Range:**
From -40 ~150
- **High Magnetic Sensitivity**
 $B_{OP}=24\text{Gauss}$, $B_{RP}=-24\text{Gauss}$ (typical)
- **Reversed Power Supply Protection**
- **Output Limiting-Current Protection**
- **RoHS Compliant**
2011/65/EU

Applications

- Automotive, Home appliances, Industrial
- DC Fan, Electric tools
- Magnetic Encoder
- Flow Sensor

Family Members

| Part number | Description |
|----------------|--|
| MT3411A-EN | Flat TO-92 package, bulk packaging (1000pcs/bag) |
| MT3411A-T-EN | Flat TO-92 package, radial lead, bulk packaging (1000pcs/bag) |
| MT3411AT-EN | SOT-23 package, tape and reel packaging (3000pcs/bag) |
| MT3411AT-N-EN* | SOT-23 package, invert output, tape and reel packaging (3000pcs/bag) |

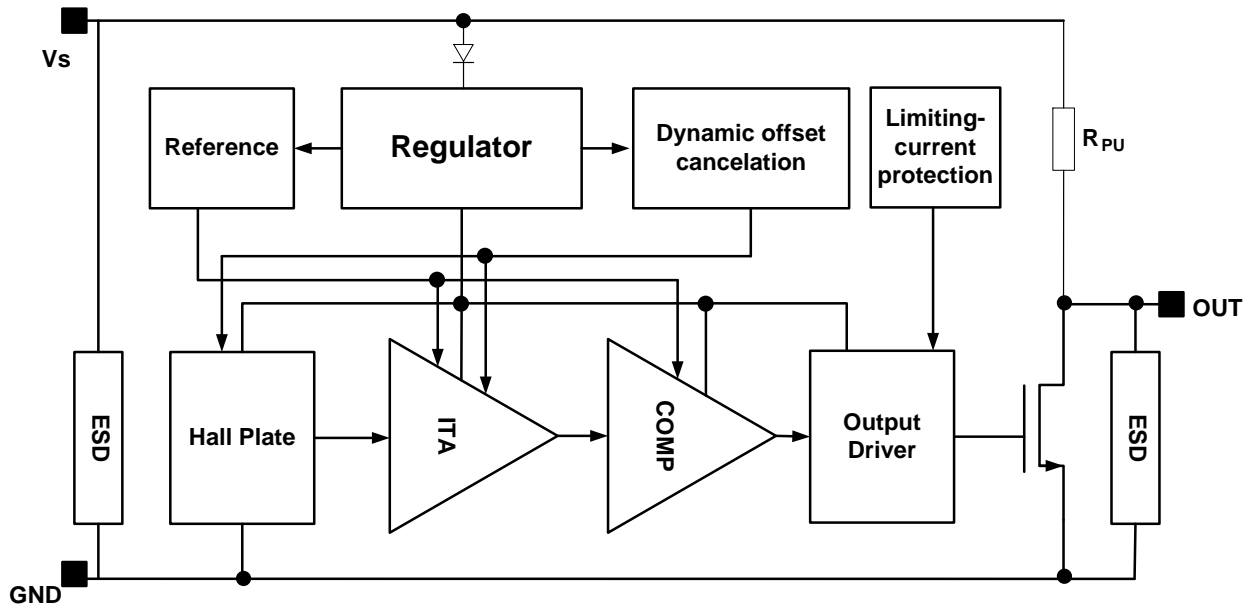
*MT3411AT-N-EN chip mark is 411NY, and Y represents date code

General Description

The MT3411-EN family is produced with BiCMOS technology. The Hall IC internally includes an on-chip Hall voltage generator, a voltage regulator for operation with supply voltage of 2.8V to 24V, temperature compensation circuitry, small-signal amplifier, Hall sensor with dynamic offset cancellation system, Schmitt trigger and an output drain with pull-up resistor. It also includes an clamp diode at output and reversed power supply protection enhances the robustness of Hall IC.

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 MT3411-EN family provides 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

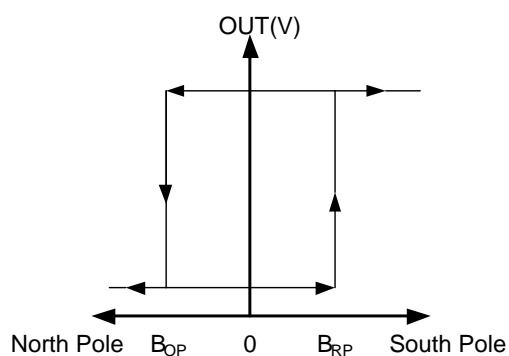
Definition of Magnetic Parameters

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

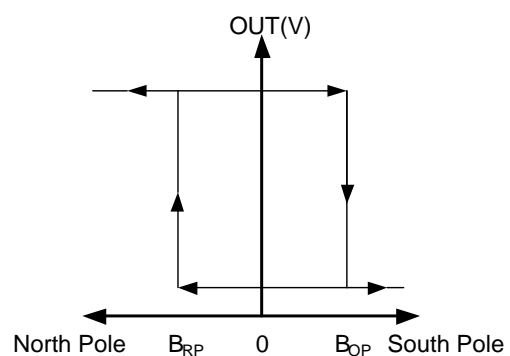
B_{RP} : Release Point, Magnetic flux density applied on the branded side of the package which turns the output driver OFF ($V_{OUT}=High$)

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

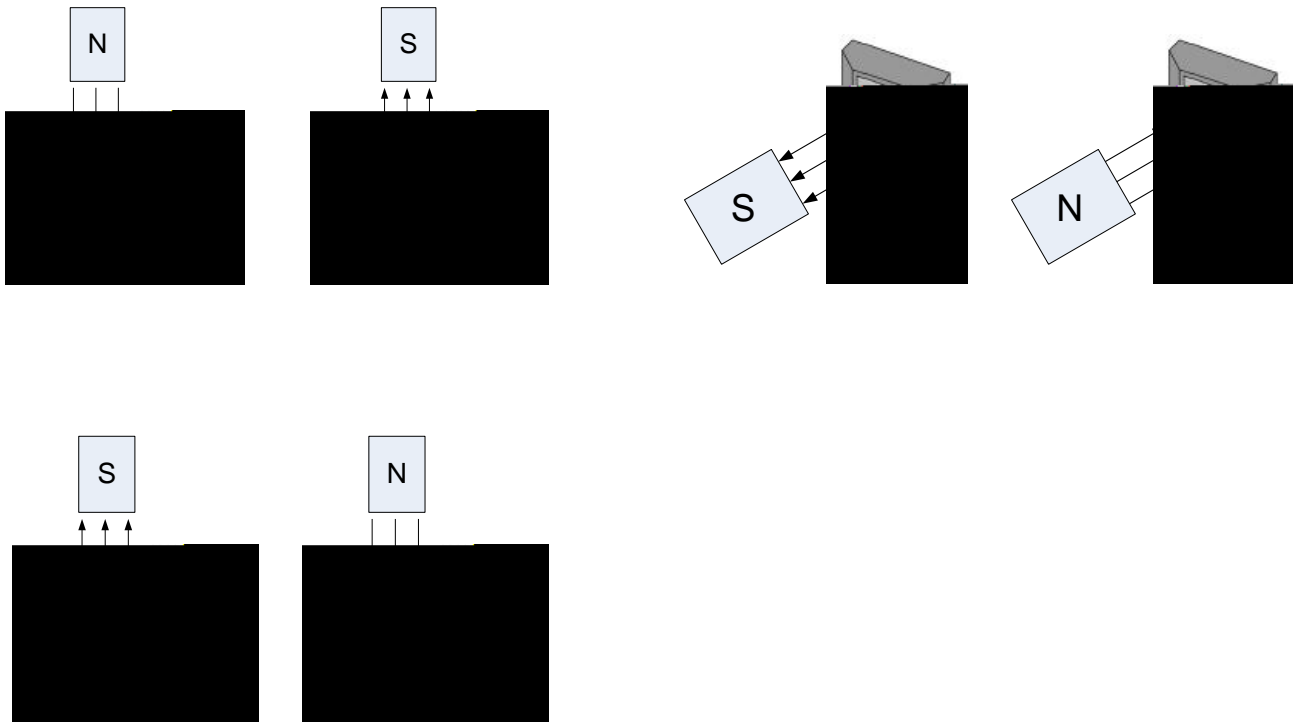
Definition of Switching Function



Switching Behavior of AT



Switching Behavior of A and AT-N



Note:

Pin Description

MT3411AT-EN

| Name | Number | Description |
|----------------|--------|--------------------------|
| V _s | 1 | Power |
| GND | 3 | Ground |
| OUT | 2 | Include pull-up resistor |

MT3411A-EN (MT3411A-T-EN)

| Name | Number | Description |
|----------------|--------|-------------|
| V _s | 1 | Power |
| GND | 2 | Ground |
| OUT | | |

MT3411AT-N-EN

Electrical and Magnetic Characteristics

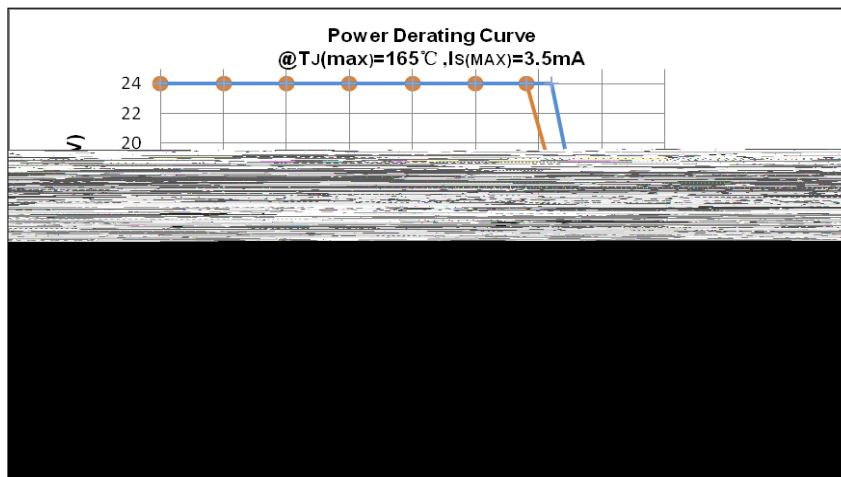
Absolute Maximum Ratings

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 | - | 27 | 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 |

Power derating Curve



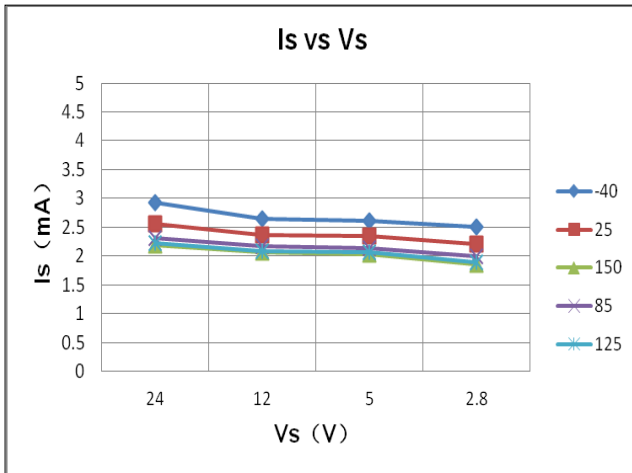
MT3411-EN Series Specifications

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

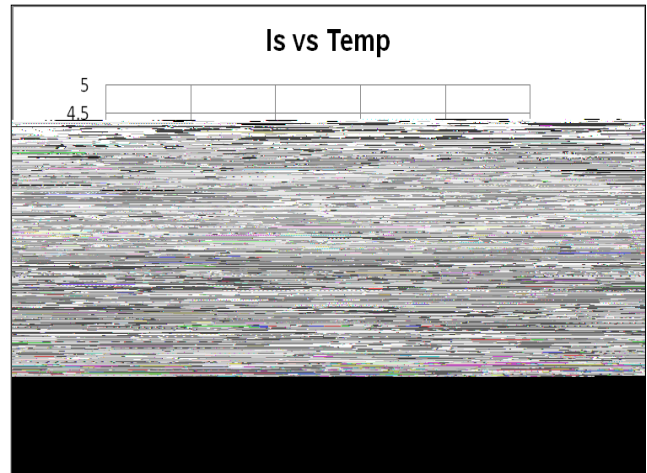
| Symbol | Parameter | Test Condition | Min | Typ | Max | Units |
|-------------|----------------------------------|---------------------------------|-----|-----|-----|---------|
| V_S | Supply Voltage | Operating | 2.8 | - | 24 | V |
| I_S | Supply Current | $B < B_{RP}$ | 1 | 2.3 | 3.5 | mA |
| I_{OCP} | Short Circuit Protection Current | $B > B_{OP}$, $V_{OUT} = V_S$ | | 50 | | mA |
| V_{DSON} | Output Saturation Voltage | $I_{OUT} = 20mA$, $B > B_{OP}$ | - | - | 0.4 | V |
| I_{OFF} | Output Leakage Current | $V_{OUT} = 24V$ | - | - | 10 | μA |
| $T_R^{1,2}$ | Output Rise Time | $C_L = 20pF$ | - | - | 3.0 | μs |

Characteristic Performance

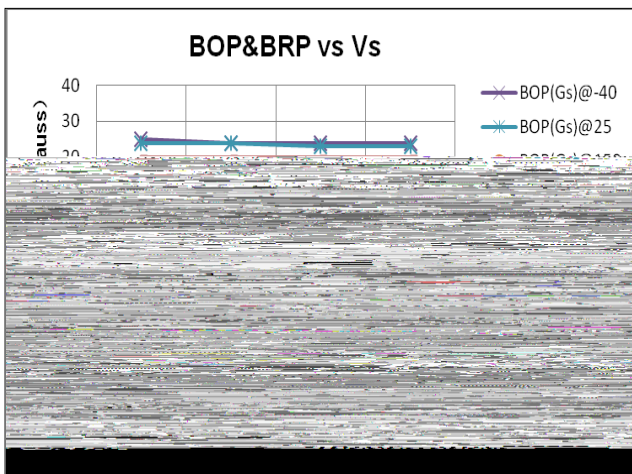
Average Supply Current versus Supply Voltage



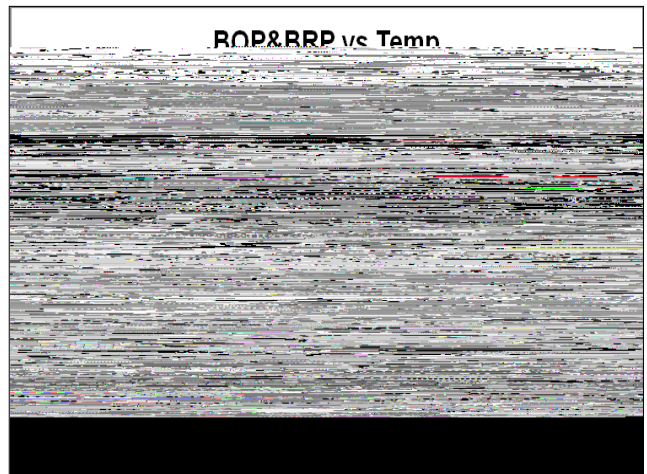
Average Supply Current versus Temperature



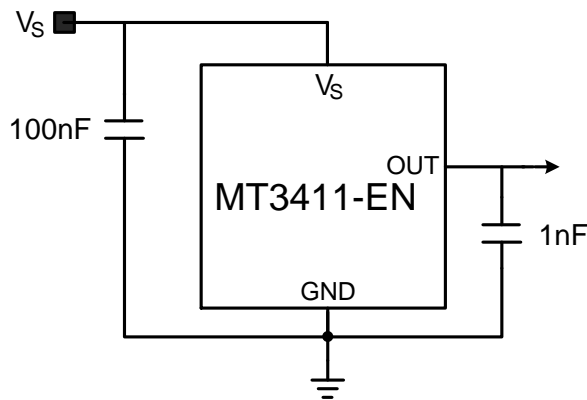
Magnetic Characteristics versus Supply Voltage



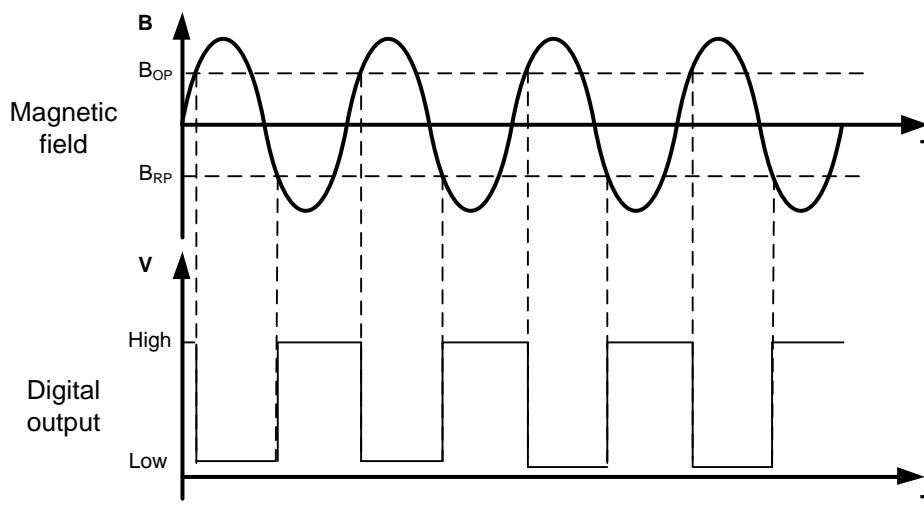
Magnetic Characteristics versus Temperature



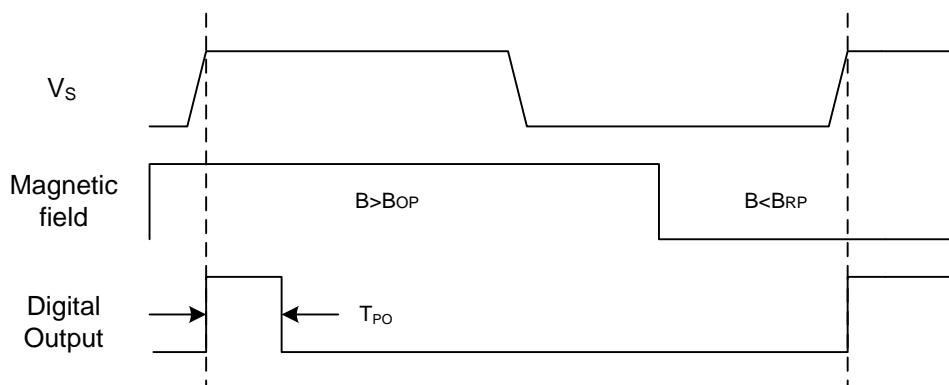
Typical Application Circuit



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

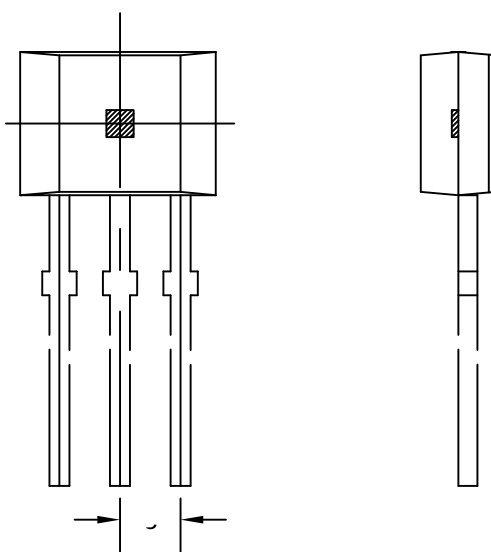
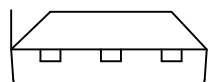


Power On Output Waveform (The Flat TO-92 package as an example)



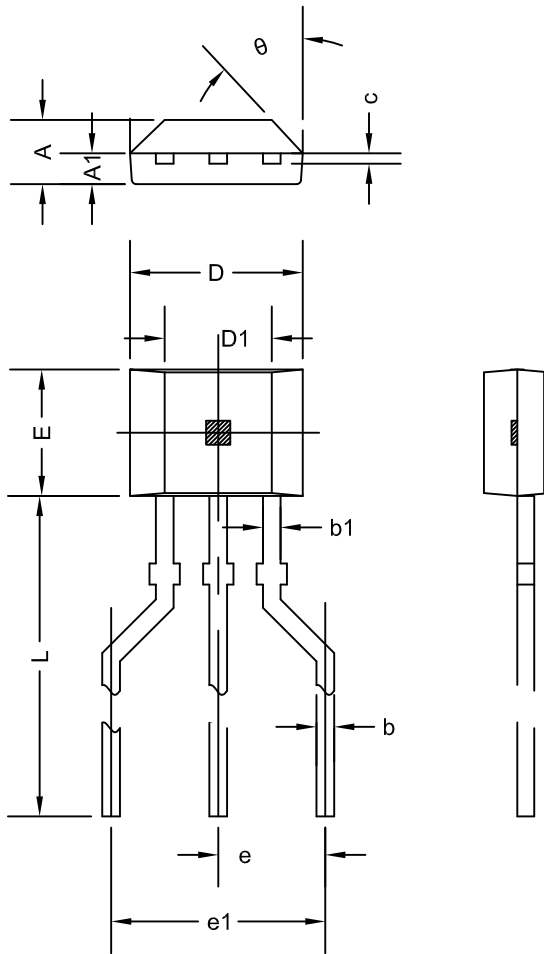
Note: V_S rise time $< 1\mu s$, T_{PO} is the time from V_S becoming stable to output becoming valid.

PACKAGE DESIGNATOR
(MT3411A-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 | |
| | 45°TYP | | 45°TYP | |

PACKAGE DESIGNATOR
(MT3411A-T-EN) Flat TO-92 Radial Lead



| 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 | |
| | 45°TYP | | 45°TYP | |

PACKAGE DESIGNATOR
MT3411AT-EN (MT3411AT-N-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 | | | |