

Features

- Micropower consumption
- 2.0V~5.5V power supply
- Chopper stabilized amplifier stage
- CMOS/NMOS output
- Unipolar Hall Switch
- Very High Sensitivity Hall Sensor
- Package: SOT23,SOT23-3, 3Pin SIP,SOT553
- High ESD protection,HBM>4KV

Applications

- Solid State Switch
- PDA
- Pad PC
- Handheld Wireless Handset Awake Switch
- Magnet Proximity Sensor for Switch Replacement in Low Duty Cycle Applications

General Description

The TX254 is fabricated from mixed signal CMOS technology. It internally includes an on-chip Hall voltage generator, a voltage regulator for operation with supply voltages of 2.0 to 5.5V, a sleep/awake logic for low power consumption, temperature compensation circuitry, small-signal amplifier, Hall sensor with dynamic offset cancellation system, Schmitt trigger and an open-drain output.

A south pole of sufficient strength will turn the

sensor output on. The output will be turned off under no magnetic field. While the magnetic flux density (B) is larger than operating point (Bop), the output will be turned on (low), the output is held until B is lower than release point (Brp), and then turned off.

The total power consumption in normal operation is typically 15 μ W with a 3.3V power source. Operating temperature range of the TX254 is from -40°C to 85°C.

Block Diagram

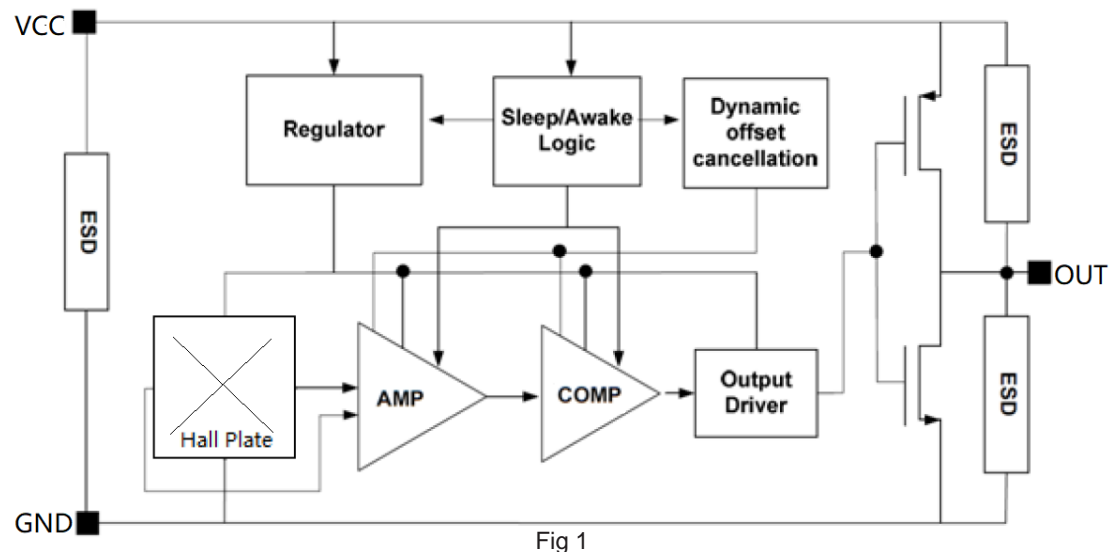


Fig 1

Pin Assignment

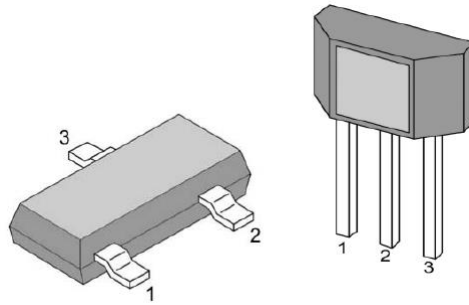


Fig2 SOT23 and SOT23-3 3Pin-SIP

Pin Description1

| SOT Pin Number | SIP Pin Number | Pin Name | Function |
|----------------|----------------|----------|----------------|
| 1 | 1 | VCC | Supply Voltage |
| 2 | 3 | OUT | CMOS Output |
| 3 | 2 | GND | Ground |

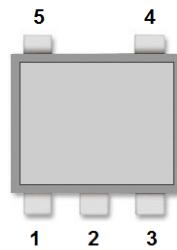


Fig3 SOT553

Pin Description2

| Pin Name | Pin No. | I/O | Pin Function |
|----------|---------|-----|--------------------|
| | SOT553 | | |
| VCC | 5 | P | Input Power Supply |
| GND | 2 | P | Ground |
| NC | 1, 3 | - | Not Connected |
| OUT | 4 | O | Output Pin |

Order Information

| Part number | Description | Magnetic direction |
|-------------|--|--------------------|
| TX254NR | SOT23 package, tape and reel packaging(3000pcs/bag),RoHS/Pb Free | South pole |
| TX254MR | SOT23-3 package, tape and reel packaging(3000pcs/bag),RoHS/Pb Free | North pole |
| TX254TR | 3Pin SIP package, bulk packaging (1000pcs/bag),RoHS/Pb Free | South pole |
| TX254ER | SOT553 package, tape and reel packaging(3000pcs/bag),RoHS/Pb Free | South pole |

Absolute Maximum Ratings

| Symbol | Parameter | Value | Unit | |
|-----------------|--------------------------------------|------------|-------|----|
| V _{CC} | Supply Voltage | -0.5~6.0 | V | |
| I _{DD} | Supply Current | 5 | mA | |
| B | Magnetic Flux Density | Unlimited | Gauss | |
| T _J | Operating Junction Temperature Range | -40 to 150 | °C | |
| T _S | Storage Temperature | -65 to 150 | °C | |
| PD | Power Dissipation | 3Pin SIP | 550 | mW |
| | | SOT23-3 | 230 | mW |
| | | SOT553 | 230 | mW |

Note: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. “Absolute Maximum Ratings” for extended period may affect device reliability.

Recommended Operating Conditions

(T_A=25°C unless otherwise noted)

| Parameter | Symbol | Min | Max | Unit |
|---------------------|-----------------|-----|-----|------|
| Supply Voltage | V _{CC} | 2.0 | 5.5 | V |
| Ambient Temperature | T _A | -40 | 85 | °C |

Electrical Characteristics

(V_{CC}=3.3V T_A=25°C, unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|---------------------------------|---|------|------|------|------|
| I _{CC} | Average Supply Current | V _{CC} =3.3V, Output Open | - | 5 | 10 | uA |
| I _{ON} | Supply current (operating mode) | V _{CC} =3.3V | - | 1.2 | - | mA |
| I _{ST} | Supply current (stand-by mode) | V _{CC} =3.3V | - | 2.5 | - | uA |
| V _{SAT} | Output Saturation Voltage | I _O =2mA, B>B _{op} | - | 0.05 | - | V |
| I _{OL} | Output Leakage Current | V _{OUT} =5V, B<B _{rp} | - | <0.1 | 1 | uA |
| T _{awake} | Awake Time | V _{CC} =3.3V | - | 90 | - | us |
| T _{period} | Period | V _{CC} =3.3V | - | 120 | - | ms |
| ESD | Electro-Static Discharge | HBM | | 4 | | KV |

Magnetic Characteristics

(VCC=3.3V Ta=25°C, unless otherwise specified)

| Characteristics | Symbol | Min | Typ | Max | Unit |
|-----------------|--------|-----|-----|-----|------|
| Operating Point | Bop | +20 | +35 | +50 | Gs |
| Releasing Point | Brp | +10 | +25 | +40 | Gs |
| Hysteresis | Bhys | - | 10 | - | GS |

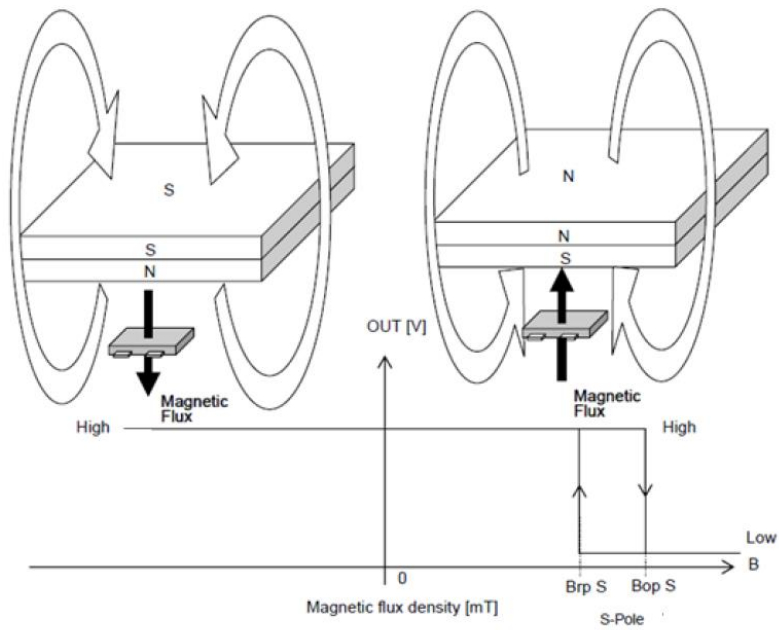


Fig4 Magnetic Operation Characteristic of TX254NR/ER/TR

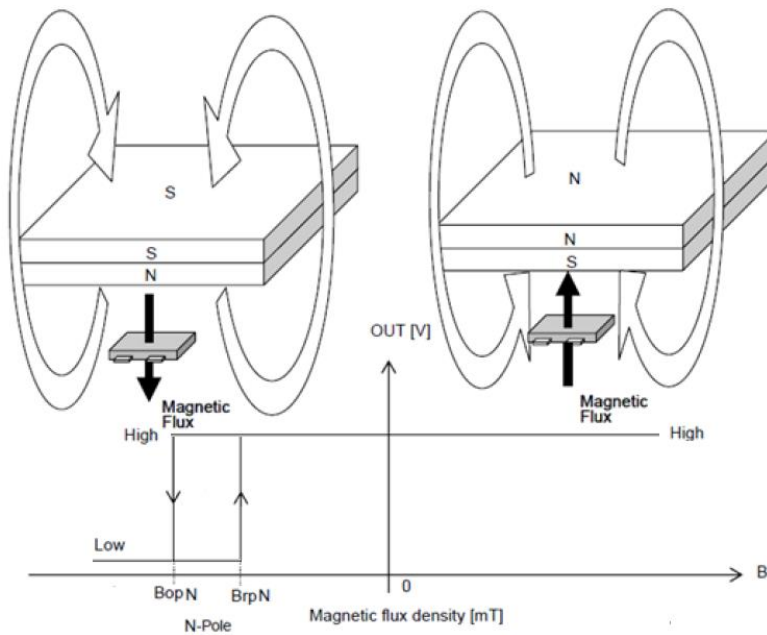


Fig5 Magnetic Operation Characteristic of TX254MR

Application Circuits

CMOS Output

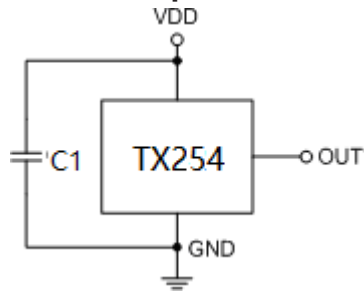


Fig 5

N-ch Open drain Output

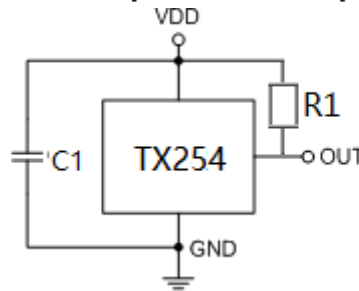


Fig 6

TX254's pole-independent sensing technique allows for operation with south pole magnet orientation, enhancing the manufacturability of the device.

C1 serves two purposes: minimizing ripples on the input voltage and enhancing immunity from RF transmission noises within close proximity. Recommended values are between 10nF and 100nF. The larger the capacitance, the better the noise immunity is for the TX254.

R1=100K.

It is strongly recommended that an external bypass capacitor be connected (in close proximity to the Hall sensor) between the supply and ground of the device to reduce both external noise and noise generated by the chopper-stabilization technique. This is especially true due to the relatively high impedance of battery supplies. The simplest form of magnet that will operate these devices is a bar magnet with south pole near the branded surface of the device.

Thermal Considerations

The maximum IC junction temperature should be restricted to 125°C under normal operating conditions. This restriction limits the power dissipation of the TX254. Calculate the maximum allowable dissipation, PD(max), and keep the actual dissipation less than or equal to PD(max). The maximum-power-dissipation limit is determined using following equation:

$$P_{D(MAX)} = \frac{125^{\circ}\text{C} - T_A}{R_{\theta JA}}$$

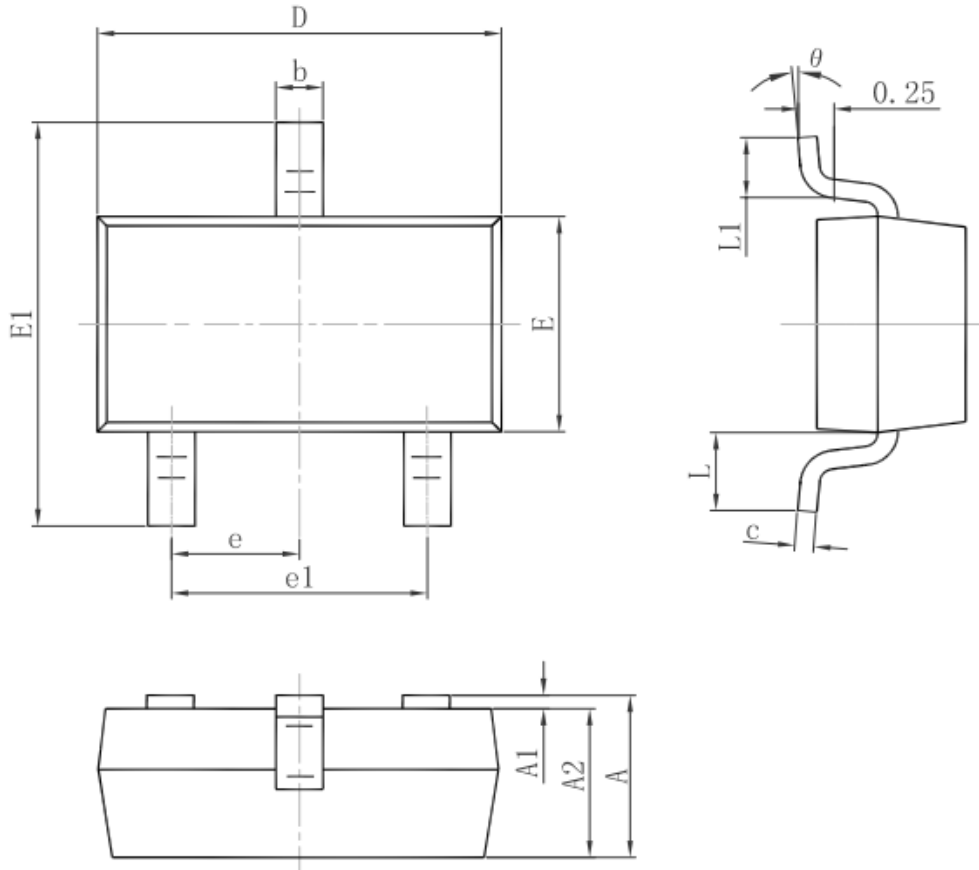
Where, T_A is the maximum ambient temperature for the application. R_{θJA} is the thermal resistance junction-to-ambient given in Power Dissipation Table.

TX254

Unipolar, MicroPower Hall-Effect Switch

Package Information

PACKAGE DESIGNATOR SOT23 (TX254NR)

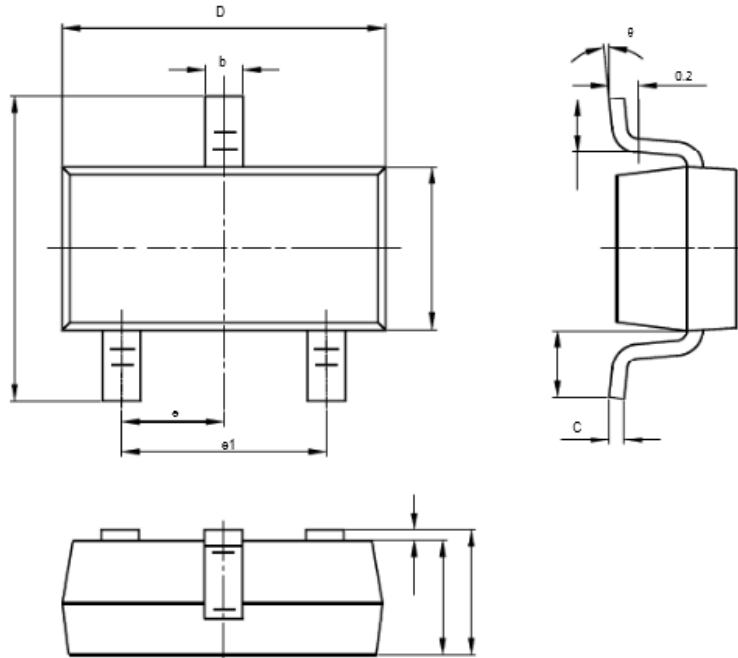


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.150 | 0.035 | 0.045 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.050 | 0.035 | 0.041 |
| b | 0.300 | 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 | 0.550 REF. | | 0.022 REF. | |
| L1 | 0.300 | 0.500 | 0.012 | 0.020 |
| θ | 0° | 8° | 0° | 8° |

TX254

Unipolar, MicroPower Hall-Effect Switch

PACKAGE DESIGNATOR SOT23-3(TX254MR)

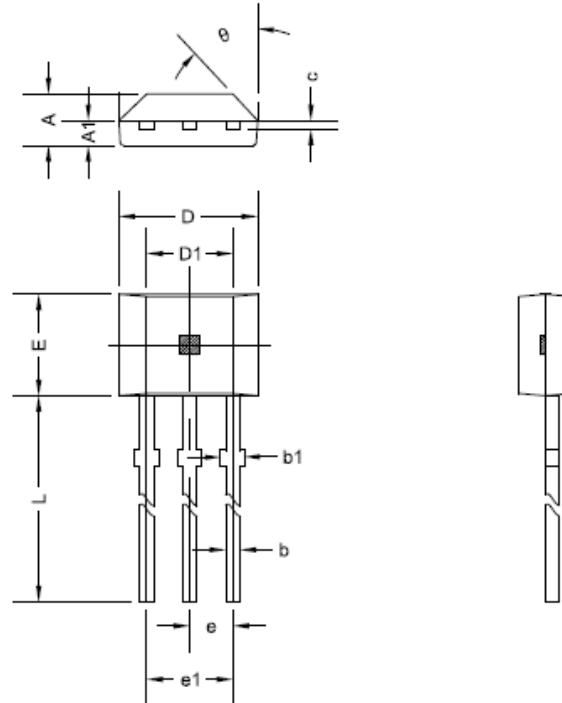


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.400 | 0.012 | 0.016 |
| 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 | 0.950TPY | | 0.037TPY | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.700REF | | 0.028REF | |
| L1 | 0.300 | 0.600 | 0.012 | 0.024 |
| φ | 0° | 8° | 0° | 8° |

TX254

Unipolar, MicroPower Hall-Effect Switch

PACKAGE DESIGNATOR 3pin SIP(TX254TR)

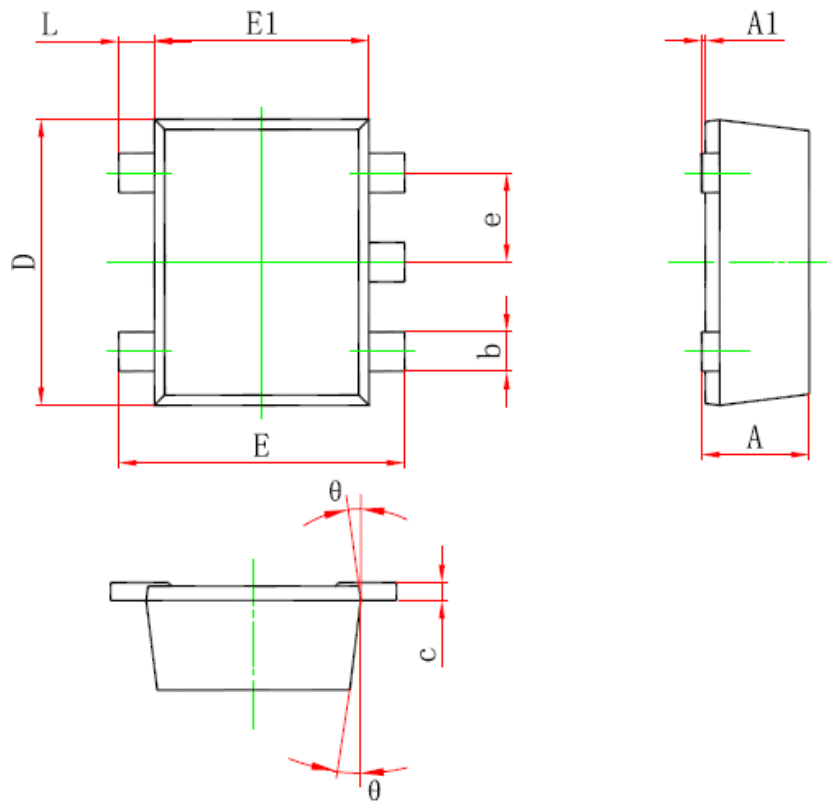


| Symbol | Dimensions in Millimeters | | Dimensions in Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.420 | 1.620 | 0.056 | 0.064 |
| A1 | 0.660 | 0.860 | 0.026 | 0.034 |
| b | 0.350 | 0.480 | 0.014 | 0.019 |
| b1 | 0.400 | 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 | 2.870 | 3.124 | 0.113 | 0.123 |
| e | 1.270 TYP. | | 0.050 TYP. | |
| e1 | 2.440 | 2.640 | 0.096 | 0.104 |
| L | 13.600 | 15.500 | 0.535 | 0.610 |
| θ | 45° TYP. | | 45° TYP. | |

TX254

Unipolar, MicroPower Hall-Effect Switch

PACKAGE DESIGNATOR SOT553(TX254ER)



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.525 | 0.600 | 0.021 | 0.024 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| e | 0.450 | 0.550 | 0.018 | 0.022 |
| c | 0.090 | 0.160 | 0.004 | 0.006 |
| D | 1.500 | 1.700 | 0.059 | 0.067 |
| b | 0.170 | 0.270 | 0.007 | 0.011 |
| E1 | 1.100 | 1.300 | 0.043 | 0.051 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| θ | 7° REF | | 7° REF | |
| L | 0.100 | 0.300 | 0.004 | 0.012 |