

- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent Cdv/dt effect decline
- ★ Advanced high cell density Trench technology

## Product Summary

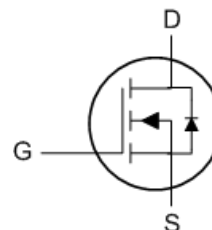
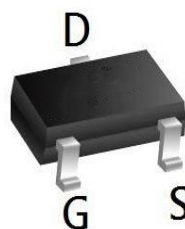


| BVDSS | RDSON | ID    |
|-------|-------|-------|
| 150V  | 245mΩ | 4.0 A |

## Description

The XR4N15L is the high cell density trenched N-ch MOSFETs, which provides excellent RDSON and efficiency for most of the small power switching and load switch applications. The XR4N15L meet the RoHS and Green Product requirement with full function reliability approved.

## SOT23-3L Pin Configuration

Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

| Parameter                                        |                           | Symbol         | Value      | Unit             |
|--------------------------------------------------|---------------------------|----------------|------------|------------------|
| Drain-Source Voltage                             |                           | $V_{DS}$       | 150        | V                |
| Gate-Source Voltage                              |                           | $V_{GS}$       | $\pm 20$   | V                |
| Continuous Drain Current                         | $T_C = 25^\circ\text{C}$  | $I_D$          | 4.0        | A                |
|                                                  | $T_C = 100^\circ\text{C}$ |                | 2.0        |                  |
| Pulsed Drain Current <sup>1</sup>                |                           | $I_{DM}$       | 15         | A                |
| Single Pulse Avalanche Energy <sup>2</sup>       |                           | EAS            | 1.25       | mJ               |
| Total Power Dissipation                          | $T_C = 25^\circ\text{C}$  | $P_D$          | 3          | W                |
| Operating Junction and Storage Temperature Range |                           | $T_J, T_{STG}$ | -55 to 150 | $^\circ\text{C}$ |

## Thermal Characteristics

| Parameter                                                | Symbol          | Value | Unit               |
|----------------------------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance from Junction-to-Ambient <sup>3</sup> | $R_{\theta JA}$ | 85    | $^\circ\text{C/W}$ |

**Electrical Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)**

| Parameter                               |                       | Symbol               | Test Conditions                                                                                           | Min. | Typ. | Max. | Unit |
|-----------------------------------------|-----------------------|----------------------|-----------------------------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics                  |                       |                      |                                                                                                           |      |      |      |      |
| Drain-Source Breakdown Voltage          |                       | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                              | 150  | -    | -    | V    |
| Gate-body Leakage current               |                       | I <sub>GSS</sub>     | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V                                                              | -    | -    | ±100 | nA   |
| Zero Gate Voltage Drain Current         | T <sub>J</sub> =25°C  | I <sub>DSS</sub>     | V <sub>DS</sub> = 150V, V <sub>GS</sub> = 0V                                                              | -    | -    | 1    | μA   |
|                                         | T <sub>J</sub> =100°C |                      |                                                                                                           | -    | -    | 100  |      |
| Gate-Threshold Voltage                  |                       | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                                | 1.5  | 2    | 2.5  | V    |
| Drain-Source on-Resistance <sup>4</sup> |                       | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 4A                                                                | -    | 245  | 300  | mΩ   |
| Forward Transconductance <sup>4</sup>   |                       | g <sub>fs</sub>      | V <sub>DS</sub> = 10V, I <sub>D</sub> = 4A                                                                | -    | 25   | -    | S    |
| Dynamic Characteristics <sup>5</sup>    |                       |                      |                                                                                                           |      |      |      |      |
| Input Capacitance                       |                       | C <sub>iss</sub>     | V <sub>DS</sub> = 75V, V <sub>GS</sub> =0V, f =1MHz                                                       | -    | 450  | -    | pF   |
| Output Capacitance                      |                       | C <sub>oss</sub>     |                                                                                                           | -    | 23   | -    |      |
| Reverse Transfer Capacitance            |                       | C <sub>rss</sub>     |                                                                                                           | -    | 14   | -    |      |
| Gate Resistance                         |                       | R <sub>g</sub>       | f =1MHz                                                                                                   | -    | 1.5  | -    | Ω    |
| Switching Characteristics <sup>5</sup>  |                       |                      |                                                                                                           |      |      |      |      |
| Total Gate Charge                       |                       | Q <sub>g</sub>       | V <sub>GS</sub> = 10V,V <sub>DS</sub> = 75V, I <sub>D</sub> =1.5A                                         | -    | 8.2  | -    | nC   |
| Gate-Source Charge                      |                       | Q <sub>gs</sub>      |                                                                                                           | -    | 1.5  | -    |      |
| Gate-Drain Charge                       |                       | Q <sub>gd</sub>      |                                                                                                           | -    | 2.2  | -    |      |
| Turn-on Delay Time                      |                       | t <sub>d(on)</sub>   | V <sub>GS</sub> =10V, V <sub>DD</sub> =75V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = 1A,R <sub>G</sub> = 75Ω | -    | 8.2  | -    | ns   |
| Rise Time                               |                       | t <sub>r</sub>       |                                                                                                           | -    | 10.2 | -    |      |
| Turn-off Delay Time                     |                       | t <sub>d(off)</sub>  |                                                                                                           | -    | 20.5 | -    |      |
| Fall Time                               |                       | t <sub>f</sub>       |                                                                                                           | -    | 15.3 | -    |      |
| Drain-Source Body Diode Characteristics |                       |                      |                                                                                                           |      |      |      |      |
| Diode Forward Voltage <sup>4</sup>      |                       | V <sub>SD</sub>      | I <sub>S</sub> = 1A, V <sub>GS</sub> = 0V                                                                 | -    | -    | 1.2  | V    |
| Continuous Source Current               | T <sub>C</sub> =25°C  | I <sub>S</sub>       | -                                                                                                         | -    | -    | 4.0  | A    |

**Notes:**

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ\text{C}$ .
2. The EAS data shows Max. rating . The test condition is  $V_{DD} = 25V, V_{GS} = 10V, L = 0.1mH, I_{AS} = 5A$ .
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
5. This value is guaranteed by design hence it is not included in the production test.

### Typical Characteristics

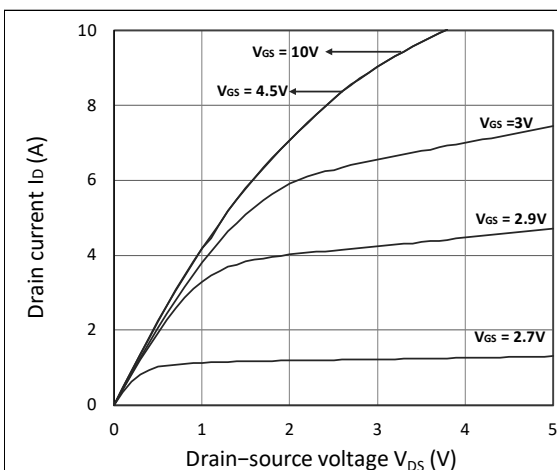


Figure 1. Output Characteristics

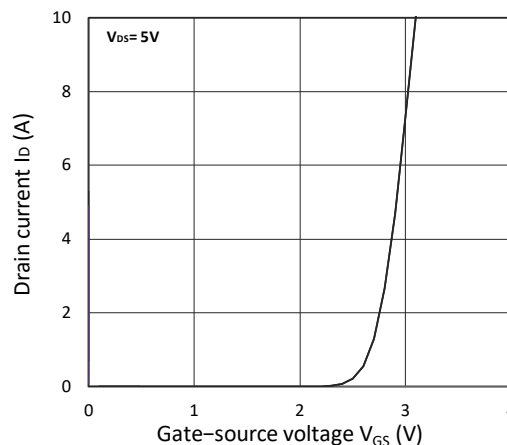


Figure 2. Transfer Characteristics

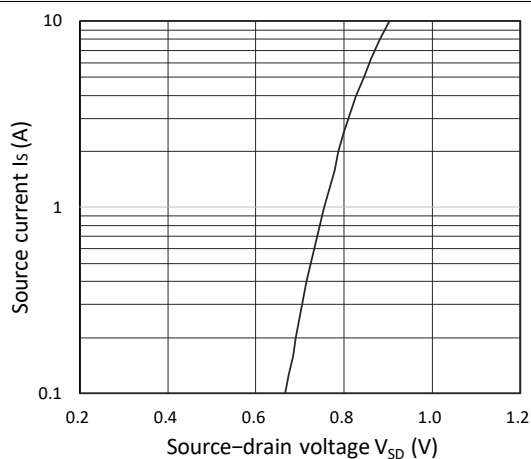


Figure 3. Forward Characteristics of Reverse

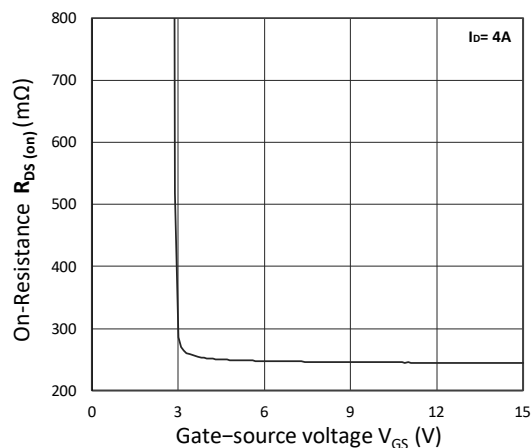


Figure 4.  $R_{DS(on)}$  vs.  $V_{GS}$

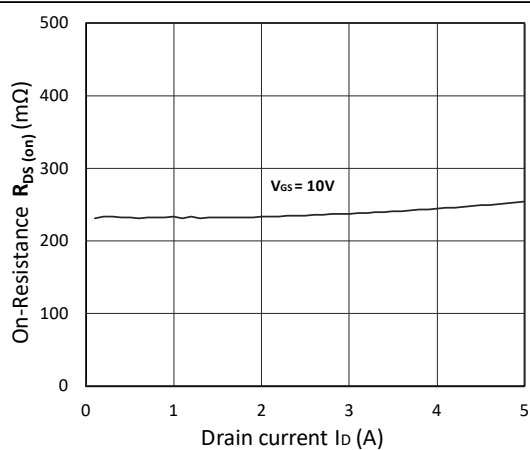


Figure 5.  $R_{DS(on)}$  vs.  $I_D$

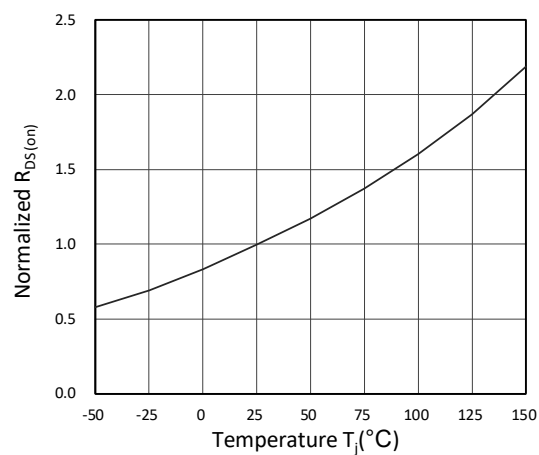


Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

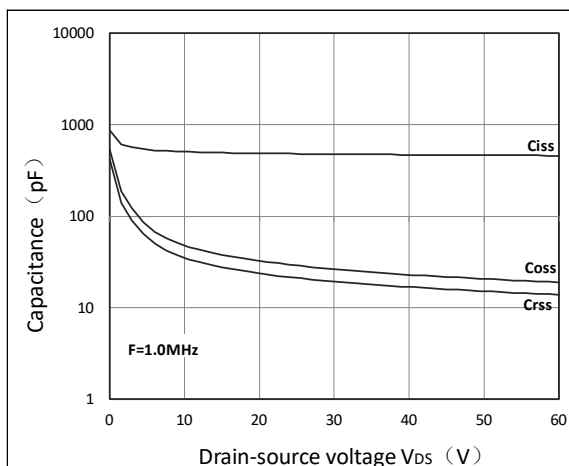


Figure 7. Capacitance Characteristics

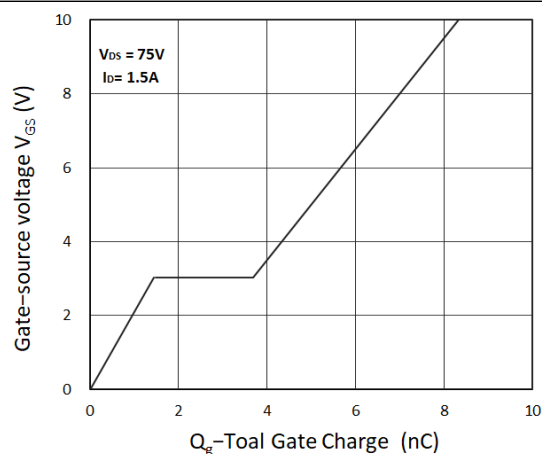


Figure 8. Gate Charge Characteristics

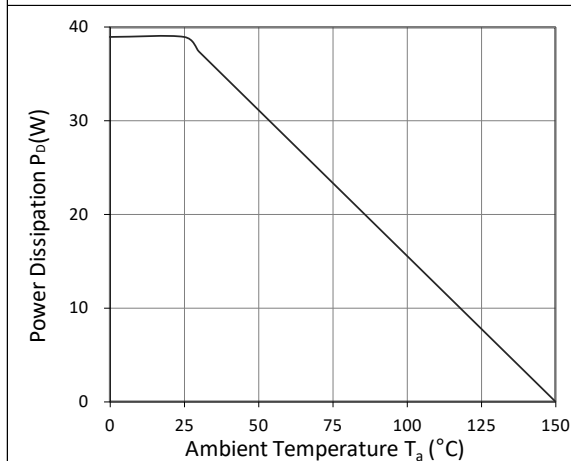


Figure 9. Power Dissipation

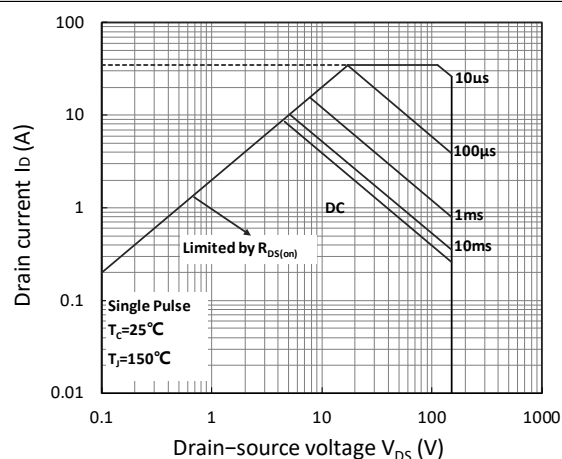


Figure 10. Safe Operating Area

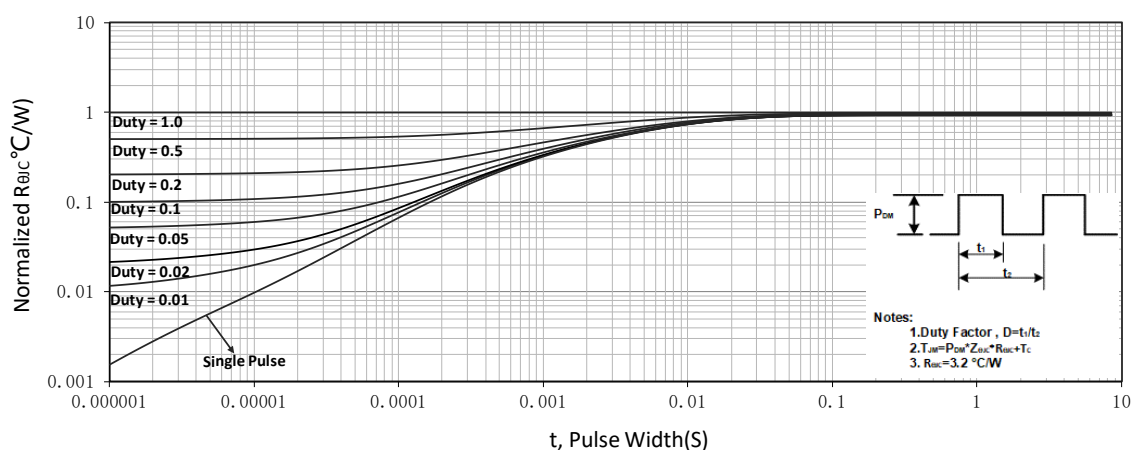


Figure 11. Normalized Maximum Transient Thermal Impedance

#### Test Circuit

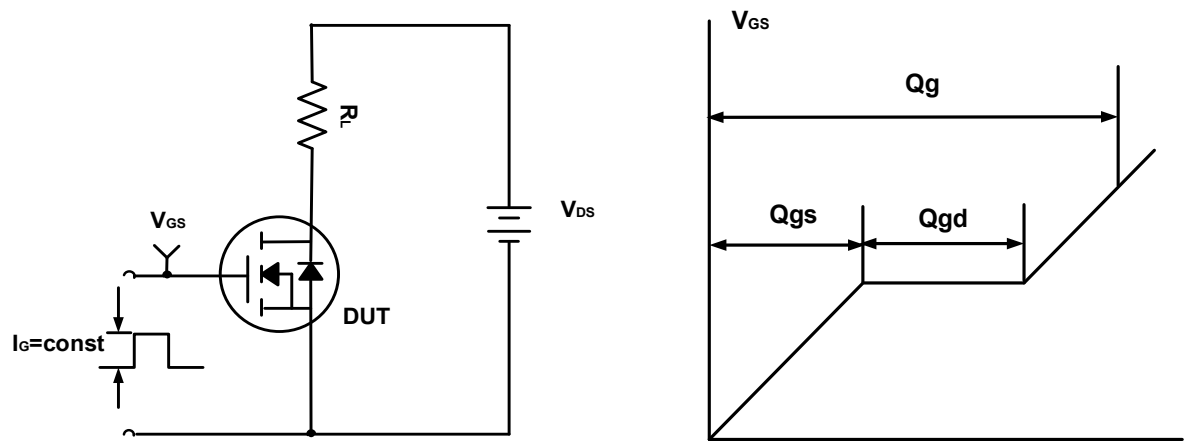


Figure A. Gate Charge Test Circuit & Waveforms

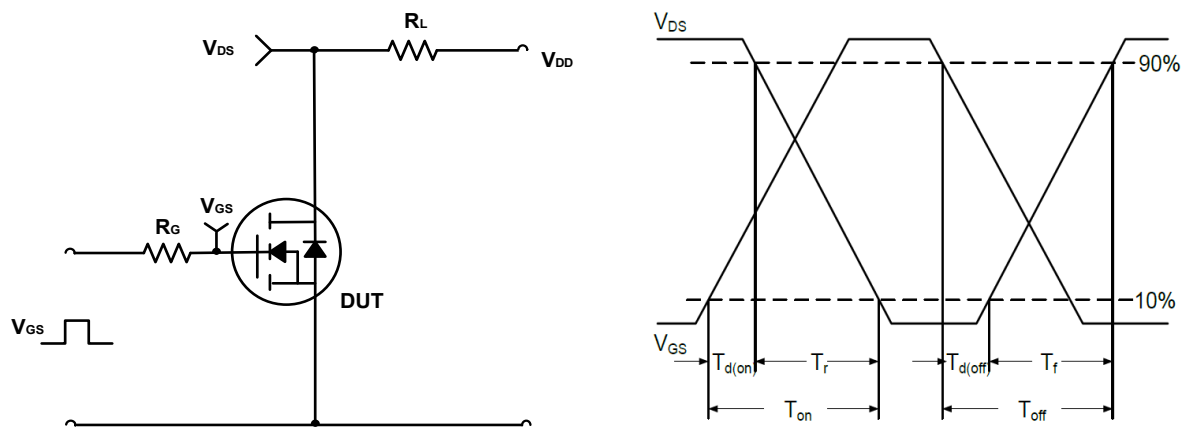


Figure B. Switching Test Circuit & Waveforms

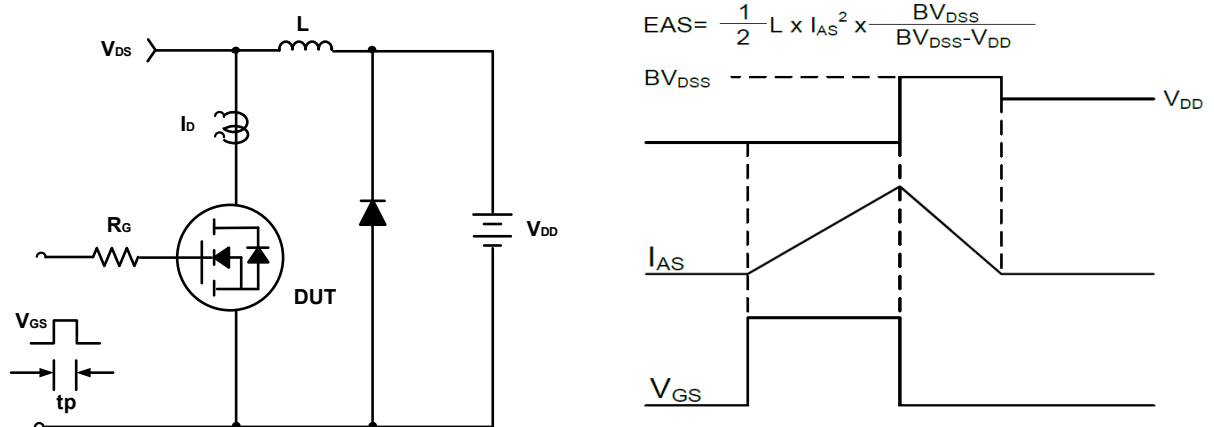
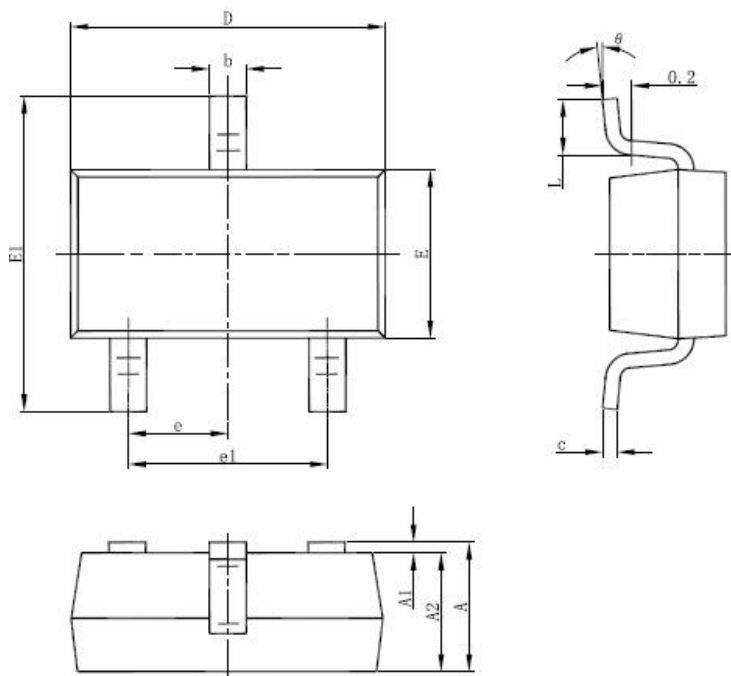


Figure C. Unclamped Inductive Switching Circuit & Waveforms

#### SOT-23-3L Package Information



| 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(BSC)                |       | 0.037(BSC)           |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.300                     | 0.600 | 0.012                | 0.024 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |