

# N-Channel Enhancement Mode MOSFET

## 1. Product Information

### 1.1 Features

- ✓ Surface-mounted package
- ✓ Advanced trench cell design

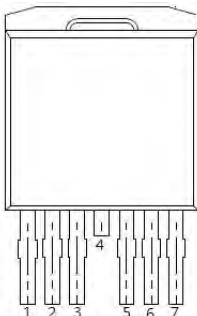
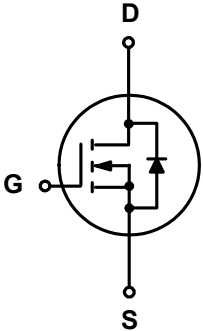
### 1.2 Applications

- ✓ LCD TV appliances
- ✓ LCDM appliances
- ✓ High power inverter system

### 1.3 Quick reference

- ✓  $BV \geq 120\text{ V}$
- ✓  $P_{tot} \leq 250\text{ W}$
- ✓  $I_D \leq 175\text{ A}$
- ✓  $R_{DS(ON)} \leq 3.0\text{ m}\Omega @ V_{GS} = 10\text{ V}$
- ✓  $R_{DS(ON)} \leq 3.8\text{ m}\Omega @ V_{GS} = 6\text{ V}$

## 2. Pin Description

| Pin   | Description | Simplified Outline                                                                                                 | Symbol                                                                                |
|-------|-------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1     | Gate(G)     |  <p>Top View<br/>TO-263-7L</p> |  |
| 2,3   | Source (S)  |                                                                                                                    |                                                                                       |
| 4     | Drain(D)    |                                                                                                                    |                                                                                       |
| 5,6,7 | Source (S)  |                                                                                                                    |                                                                                       |
|       |             |                                                                                                                    |                                                                                       |

### 3. Limiting Values

| Symbol                          | Parameter                               | Conditions                                     | Min | Max  | Unit |
|---------------------------------|-----------------------------------------|------------------------------------------------|-----|------|------|
| V <sub>DS</sub>                 | Drain-Source Voltage                    | T <sub>C</sub> = 25 °C                         | -   | 120  | V    |
| V <sub>GS</sub>                 | Gate-Source Voltage                     | T <sub>C</sub> = 25 °C                         | -   | ±20  | V    |
| I <sub>D</sub> <sup>*,***</sup> | Drain Current ( DC )                    | T <sub>C</sub> = 25 °C, V <sub>GS</sub> = 10 V | -   | 175  | A    |
| I <sub>DM</sub> <sup>**</sup>   | Drain Current ( Pulsed )                | T <sub>C</sub> = 25 °C, V <sub>GS</sub> = 10 V | -   | 700  | A    |
| P <sub>tot</sub>                | Drain power dissipation                 | T <sub>C</sub> = 25 °C                         | -   | 250  | W    |
| T <sub>stg</sub>                | Storage Temperature                     |                                                | -55 | 150  | °C   |
| T <sub>J</sub>                  | Junction Temperature                    |                                                | -   | 150  | °C   |
| I <sub>S</sub>                  | Continuous-Source Current               | T <sub>C</sub> = 25 °C                         | -   | 175  | A    |
| E <sub>AS</sub> <sup>*</sup>    | Single Pulsed Avalanche Energy          | V <sub>DD</sub> = 50 V , L= 1.0 mH             | -   | 1682 | mJ   |
| R <sub>θJA</sub> <sup>*</sup>   | Thermal Resistance- Junction to Ambient |                                                | -   | 40   | °C/W |
| R <sub>θJC</sub> <sup>*</sup>   | Thermal Resistance- Junction to Case    |                                                | -   | 0.5  |      |

Notes :

\* Surface Mounted on 1 in<sup>2</sup> pad area, t ≤ 10 sec

\*\* Pulse width ≤ 300 μs, duty cycle ≤ 2 %

\*\*\* limited by bonding wire

### 4. Marking Information

| Product Name | Marking                                 |
|--------------|-----------------------------------------|
| UP003N12D7   | <div>003N12<br/>AYWW01<br/>XXXXXX</div> |

### 5. Ordering Code

| Product Name | Package          | Reel Size | Tape width | Quantity | Note |
|--------------|------------------|-----------|------------|----------|------|
| UP003N12D7   | TO263-7L(D2-PAK) |           |            | 1000     |      |

## 6. Electrical Characteristics ( $T_A=25^\circ$ Unless Otherwise Noted )

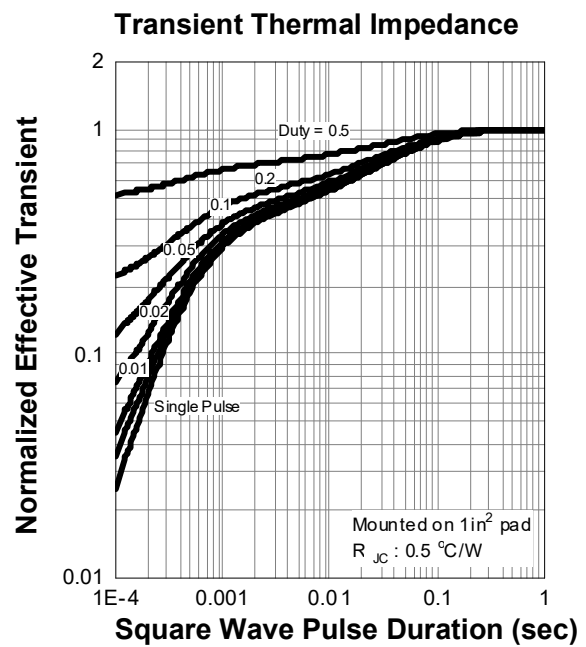
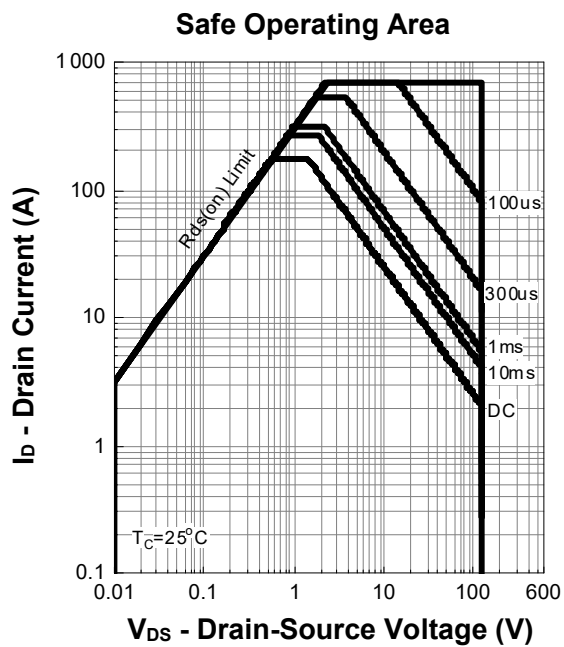
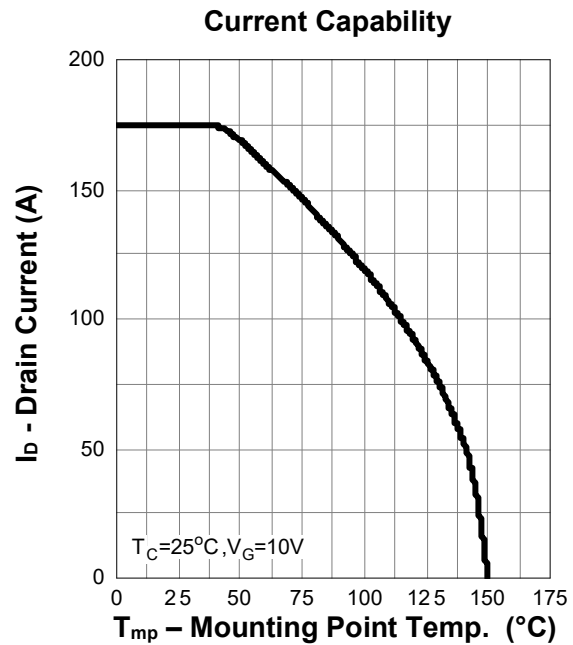
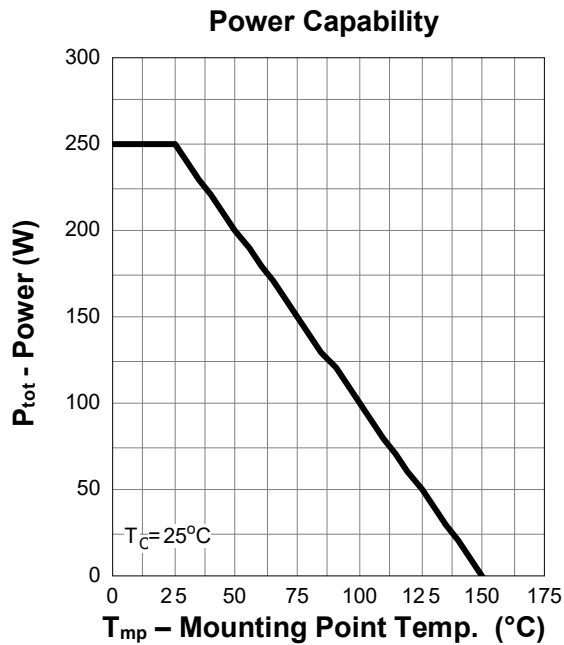
| Symbol                                   | Parameter                      | Conditions                                                                                                                    | Min | Typ  | Max  | Unit |
|------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Static Characteristics                   |                                |                                                                                                                               |     |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage | V <sub>GS</sub> = 0 V, I <sub>DS</sub> = 250 μA                                                                               | 120 | -    | -    | V    |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage         | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA                                                                  | 2   | -    | 4    | V    |
| I <sub>DSS</sub>                         | Drain Leakage Current          | V <sub>DS</sub> = 96 V, V <sub>GS</sub> = 0 V                                                                                 | -   | -    | 1    | μA   |
| I <sub>GSS</sub>                         | Gate Leakage Current           | V <sub>GS</sub> = ± 20 V, V <sub>DS</sub> = 0 V                                                                               | -   | -    | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>a</sup>         | On-State Resistance            | V <sub>GS</sub> = 10 V, I <sub>DS</sub> = 50 A                                                                                | -   | 2.7  | 3.0  | mΩ   |
|                                          |                                | V <sub>GS</sub> = 6 V, I <sub>DS</sub> = 20 A                                                                                 | -   | 3.2  | 3.8  |      |
| Diode Characteristics                    |                                |                                                                                                                               |     |      |      |      |
| V <sub>SD</sub> <sup>a</sup>             | Diode Forward Voltage          | I <sub>SD</sub> = 50 A, V <sub>GS</sub> = 0 V                                                                                 | -   | -    | 1.3  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time          | I <sub>DS</sub> = 50 A, V <sub>GS</sub> = 0 V<br>dI <sub>SD</sub> /dt = 100 A/μs                                              | -   | 116  | -    | nS   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge        |                                                                                                                               | -   | 436  | -    | nC   |
| Dynamic Characteristics <sup>b</sup>     |                                |                                                                                                                               |     |      |      |      |
| C <sub>iss</sub>                         | Input Capacitance              | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 60 V<br>Frequency = 1 MHz                                                            | -   | 9140 | -    | pF   |
| C <sub>oss</sub>                         | Output Capacitance             |                                                                                                                               | -   | 1019 | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance   |                                                                                                                               | -   | 89   | -    |      |
| t <sub>d(on)</sub>                       | Turn-on Delay Time             | V <sub>DS</sub> = 60 V, V <sub>GEN</sub> = 10 V,<br>R <sub>G</sub> = 3.9 Ω, R <sub>L</sub> = 1.2 Ω,<br>I <sub>DS</sub> = 50 A | -   | 27   | -    | nS   |
| t <sub>r</sub>                           | Turn-on Rise Time              |                                                                                                                               | -   | 95   | -    |      |
| t <sub>d(off)</sub>                      | Turn-off Delay Time            |                                                                                                                               | -   | 101  | -    |      |
| t <sub>f</sub>                           | Turn-off Fall Time             |                                                                                                                               | -   | 91   | -    |      |
| Gate Charge Characteristics <sup>b</sup> |                                |                                                                                                                               |     |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge              | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 10 V,<br>I <sub>DS</sub> = 50 A                                                     | -   | 155  | -    | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge             |                                                                                                                               | -   | 48   | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge              |                                                                                                                               | -   | 37   | -    |      |

Notes :

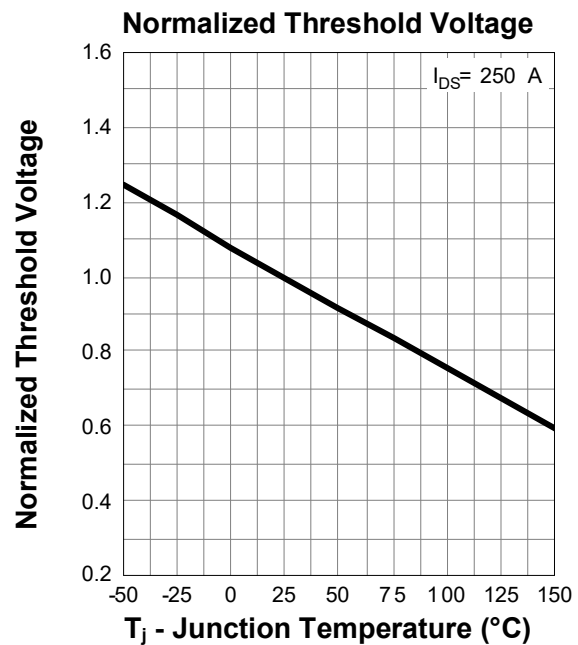
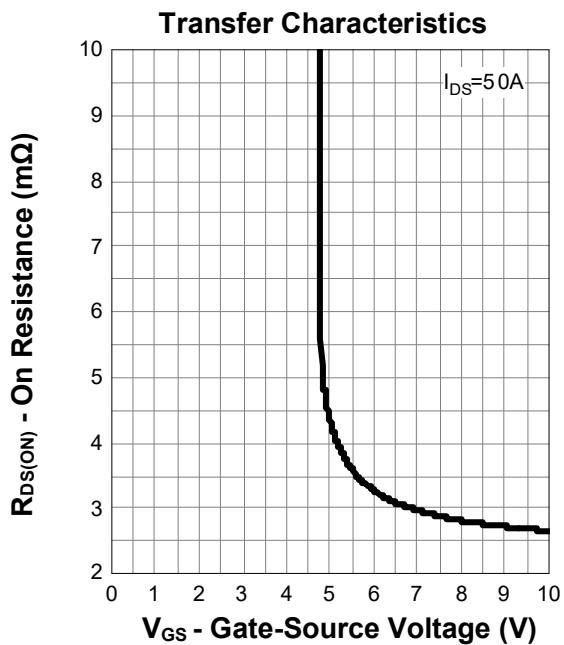
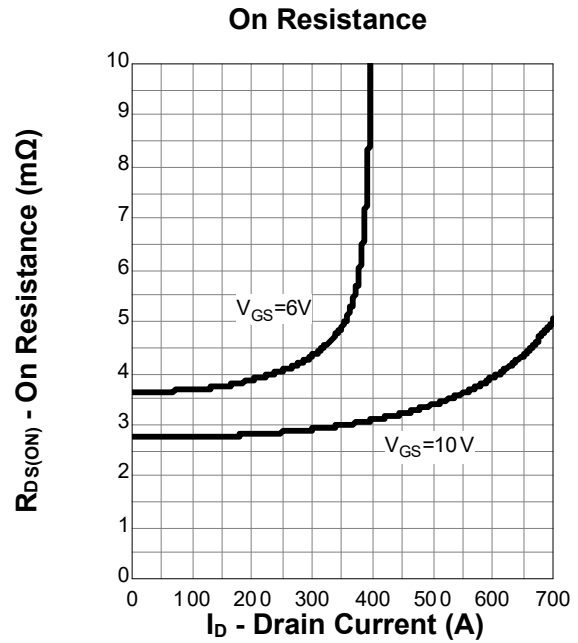
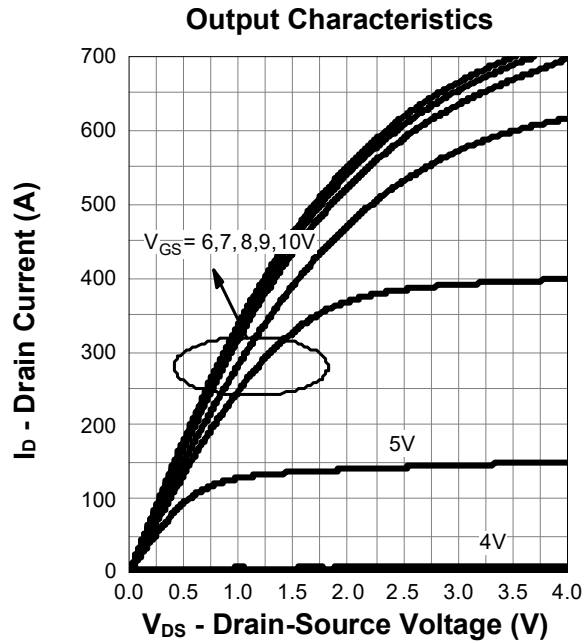
a : Pulse test ; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

b : Guaranteed by design, not subject to production testing

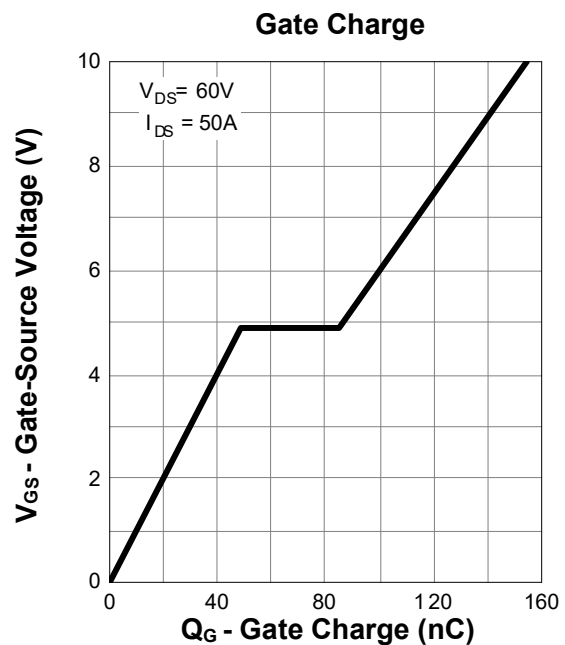
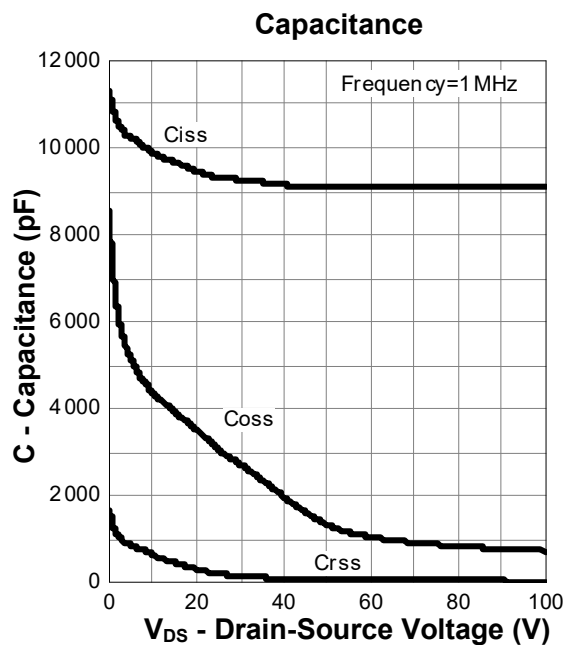
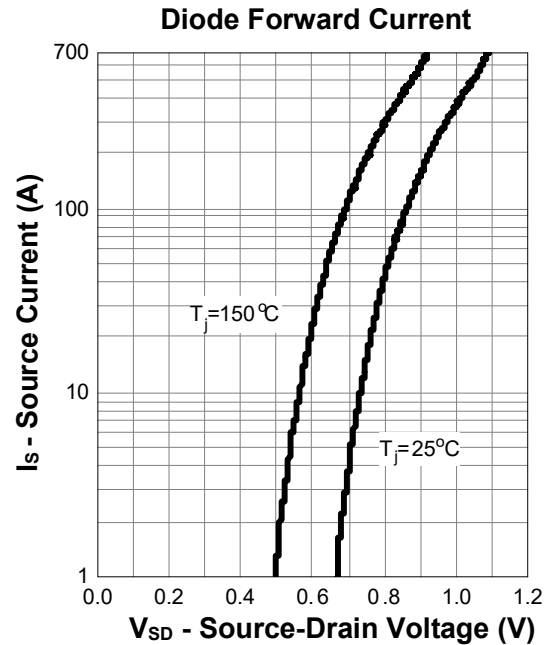
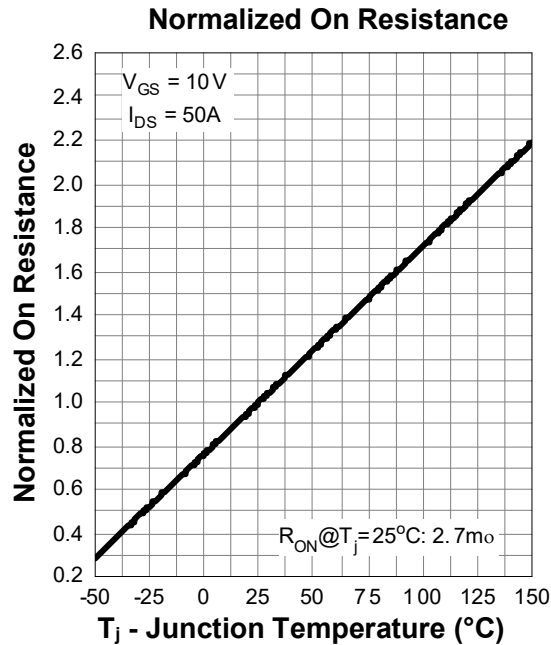
## 7. Typical Characteristics



## 7. Typical Characteristics (cont.)

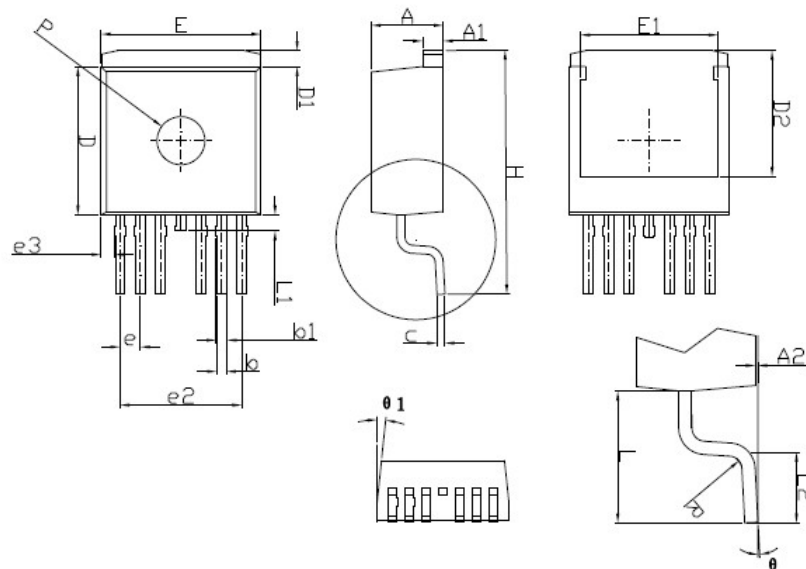


## 7. Typical Characteristics (cont.)



## 8. Package Dimensions

### TO-263-7L Package



| Symbol | Dimensions In Millimeters |       |
|--------|---------------------------|-------|
|        | MIN.                      | MAX.  |
| A      | 4.30                      | 4.70  |
| A1     | 1.20                      | 1.40  |
| A2     | 0.05                      | 0.30  |
| b      | 0.50                      | 0.70  |
| b1     | 0.50                      | 0.90  |
| c      | 0.40                      | 0.60  |
| D      | 9.05                      | 9.45  |
| D1     | 0.70                      | 1.30  |
| D2     | 7.35                      | 8.35  |
| E      | 9.80                      | 10.20 |
| E1     | 8.10                      | 9.10  |
| e      | 1.07                      | 1.47  |
| e2     | 7.32                      | 7.92  |
| e3     | 0.64                      | 1.04  |
| H      | 14.65                     | 15.65 |
| L      | 4.47                      | 5.47  |
| L1     | 0.90                      | 1.50  |
| L2     | 2.20                      | 2.80  |
| θ      | 0°                        | 8°    |
| Ø1     | 0°                        | 10°   |
| ØP     | 2.70                      | 3.30  |